

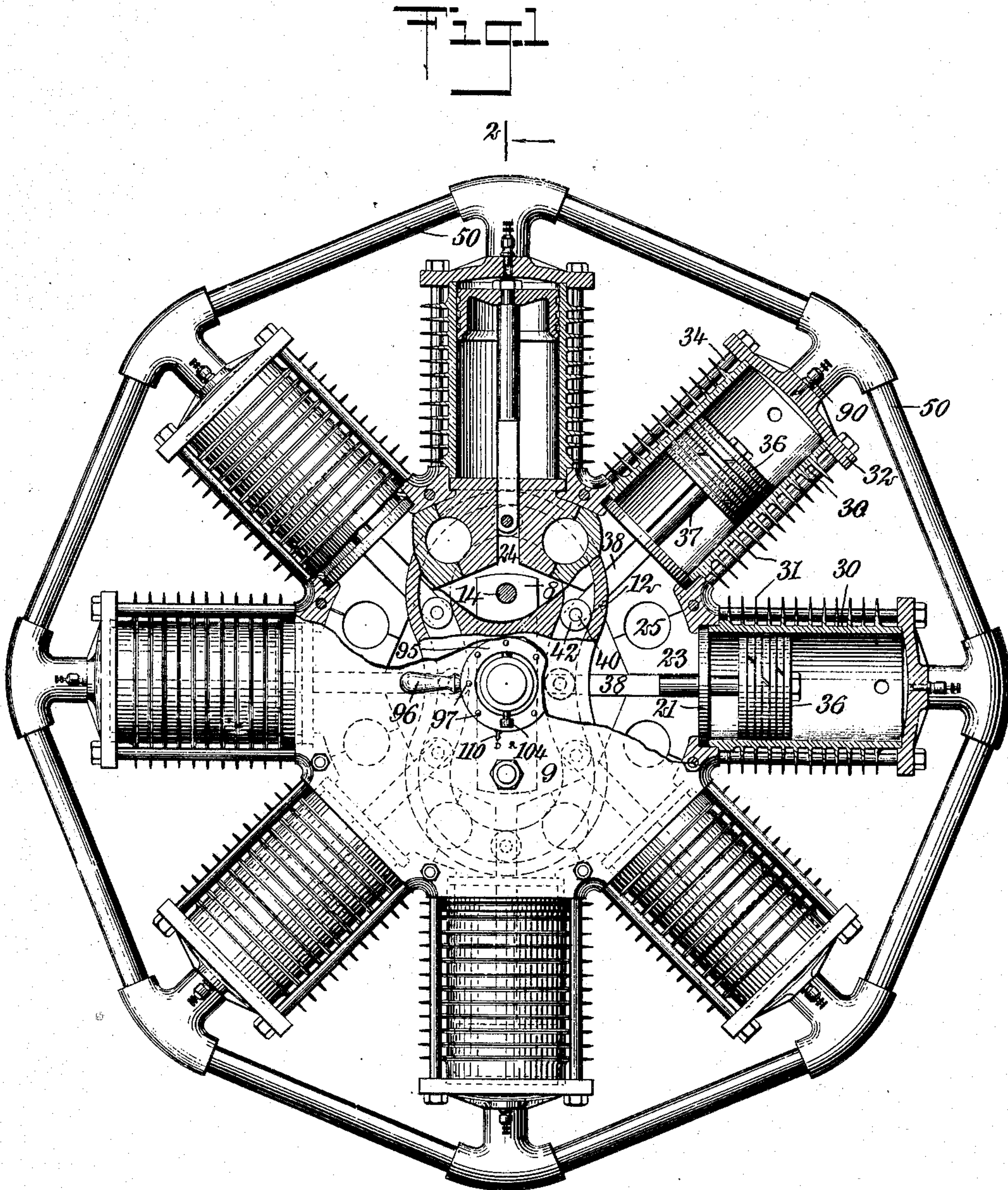
G. DORFFEL.
GAS ENGINE.

APPLICATION FILED NOV. 10, 1908.

947,226.

Patented Jan. 25, 1910.

2 SHEETS—SHEET 1.



WITNESSES

Wm. J. Joffe
A. C. Remon

INVENTOR

George Dorffel
BY *Mum & Co.*
ATTORNEYS

G. DORFFEL.

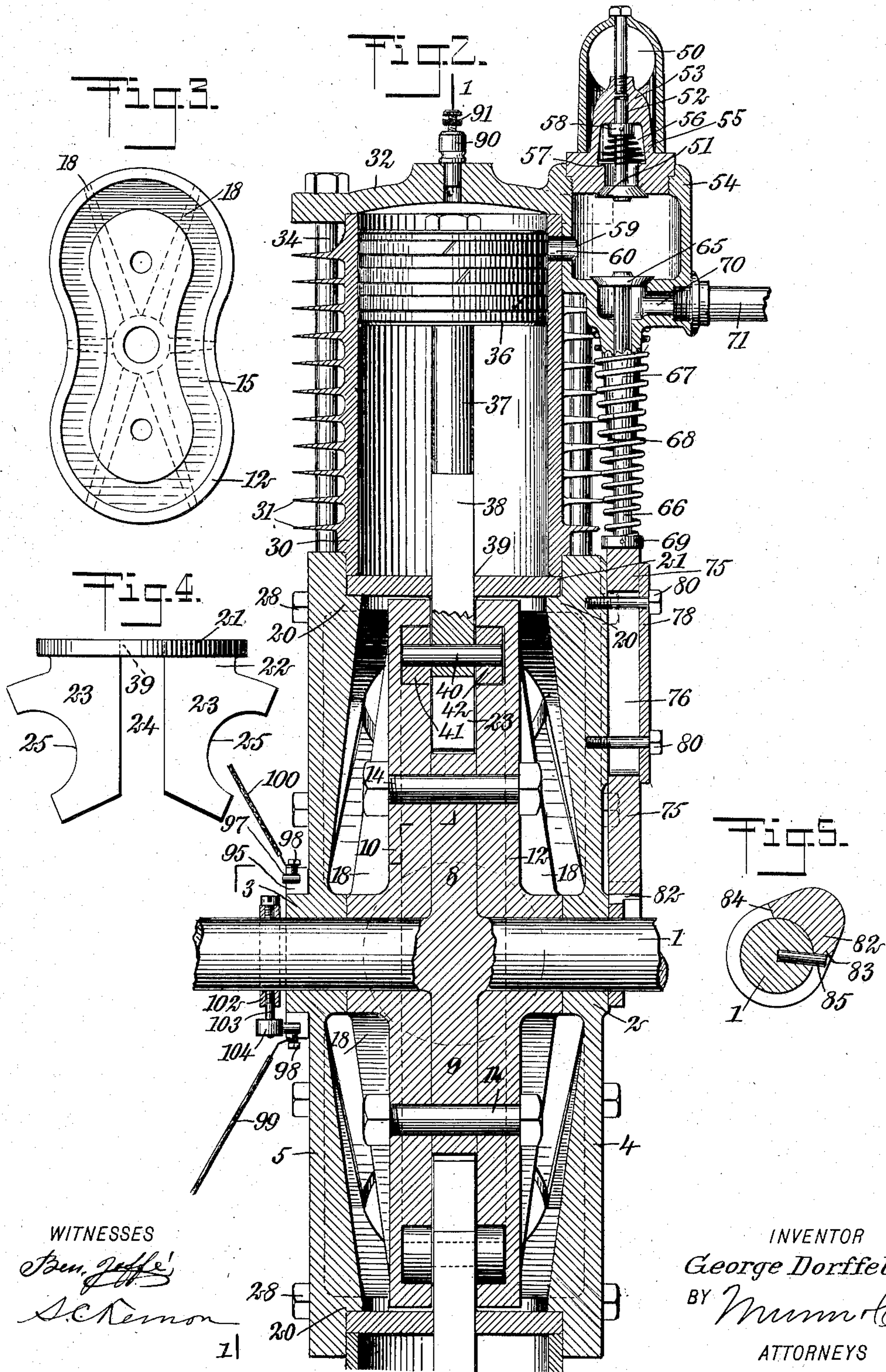
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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

GEORGE DORFFEL, OF FRUITVALE, CALIFORNIA, ASSIGNOR OF ONE-HALF TO
WILLIAM C. CLARK, OF FRUITVALE, CALIFORNIA.

GAS-ENGINE.

947,226.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed November 10, 1908. Serial No. 461,873.

To all whom it may concern:

Be it known that I, GEORGE DORFFEL, a citizen of the United States, and a resident of Fruitvale, in the county of Alameda and State of California, have invented a new and Improved Gas-Engine, of which the following is a full, clear, and exact description:

This invention relates to gas or internal combustion engines.

One object of the invention is to provide means whereby a gas engine of considerable power may be constructed to occupy a comparatively small space, and one in which the cylinders are located radially about the main or driving shaft.

A further object is to provide an engine having rigid piston rods moving in suitable guides and operatively connected to drive the main shaft through the medium of a guide secured to said shaft.

A further object is to provide an engine in which the cylinders may be so located with respect to one another as to produce a balancing action on a rotary structure.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which simalar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a sectional view partly in elevation, taken on the line 1—1 of Fig. 2; Fig. 2 is a central vertical section taken on the line 2—2 of Fig. 1; Fig. 3 is a detail plan view of one of the guide members; Fig. 4 is a side elevation of one of the guides for the end of the piston rod; and Fig. 5 is a sectional view showing the cam for operating the exhaust valves.

In said drawings, the main or drive shaft 1 is journaled in suitable bearings 2 and 3 formed in the side frames 4 and 5, respectively. Formed integrally with the shaft 1 are two laterally-extending arms 8 and 9. Mounted about the shaft 1 and upon opposite sides of the arms 8 and 9, are guide members 10 and 12, which are secured to said arms by means of bolts 14 passing through the guides and the arms. Each guide is provided with a groove 15, which is substantially rectangular in cross section but extends around the guide, the groove at each end portion of the guide being in the form of a semicircle, and the intermediate or side

portions of the groove being curved inward or toward each other. The outer contour of the guide may be made to conform to the shape of the groove 15, as clearly shown in Fig. 3. The grooves 15 on the two guide members 10 and 12 are upon the inner faces of said guides and register with one another. Said guide members 10 and 12 may be stiffened by means of webs 18.

In the present embodiment of my invention, I have shown eight cylinders located radially about the side frames 4 and 5. It is to be understood that the number of cylinders may be varied anywhere within the limits of the capacity of the groove 15 for containing the rollers which cooperate with the ends of the pistons in the various cylinders.

The side frames 4 and 5 may be made duplicates of one another and act as a housing for the interior driving mechanism. Said frames 4 and 5 are provided with a series of flat seats 20 for the reception of the disks 21 of piston guides 22. The side frames 4 and 5 may be bored out on their inner faces to the proper diameter for receiving the disks 21. Each guide 22 comprises two ears 23, which are connected to the disk 21 and separated by a slight space 24 of sufficient width to form a guide for the end of the piston rod passing between the ears 23. Said ears 23 may be provided with notches 25 in order to lighten them.

By reference to Fig. 1, it will be seen that the guides 22 are spaced about the side frames 4 and 5 and meet at the outer edges of the ears 23. Said guides are maintained in position when the frames 4 and 5 are fastened together by means of bolts 28 passing through said frame and clamping the same together.

Each disk 21 forms the inner cylinder head of the corresponding cylinder. Each cylinder comprises a cylindrical chamber 30, having cooling fins 31 surrounding the same. The outer cylinder head 32 fits against the outer end of the cylindrical chamber 30 and the entire structure is held in position by means of bolts 34 passing through the cylinder head 32 and into the frames 4 and 5. A piston 36 is connected to a rigid piston rod 37 which is flattened at 38 for a portion of its length where it passes through a hole 39 in the disk 21. In the outer end of each piston rod 37 is a pin 40, upon the outer ends

of which rollers 41 and 42 are journaled. Said rollers are adapted to travel in the grooves 15 formed on the inner faces of the guide members 10 and 12. Said guide members 10 and 12 being bolted to the shaft, may be considered as one guide and will be so designated in the claims.

The supply of combustible material may be passed through any suitable form of carbureter and then fed to the pipe 50 extending around the engine and connected by means of a suitable valve to each cylinder.

The inlet valve for each cylinder comprises a body portion 51 mounted upon a stem 52, adapted to slide in a bearing 53. Said bearing is screw-threaded at its lower end to fit the valve casing 54 and comprising a circular boss at its upper end joined by a plurality of webs 55 to the screw-threaded lower end. Surrounding the stem 52 is a spiral spring 56 adapted to bear against a shoulder 57 at one end and at its upper end against a collar 58 which is pinned to the stem 52. The spring 56 normally tends to keep the valve 51 in its raised position but said valve may be lowered by the suction caused by the piston as it travels toward the shaft. The gas coming from the pipe 50 passes between the webs 55 formed in the bearings 53 and then passes through the opening which is controlled by the valve body 51. The gas then enters the casing 54 and passes through apertures 59 and 60 into the cylinder when the piston 36 has traveled inwardly far enough to expose the aperture 60.

An exhaust valve 65 is seated at the lower end of the casing 54 and mounted upon a valve stem 66 which passes through a sleeve 67 formed on the lower end of the casing 54. A spiral spring 68 surrounds the stem 66 and also the sleeve 67, bearing against the under side of the casing 54, and also against the upper side of a collar 69 pinned to the stem 66. The valve 65 controls a passage 70 in the lower end of the casing 54, which communicates with an exhaust pipe 71. The lower end of the valve spindle 66 rests upon a slide 75 having a slot 76 and bearing against the outer face of the side frame 4. A plate 78 bears against the outer face of the slide 75 and is held in position by bolts 80 passing through the slot 76 into the side frame 4. The lower end of the slide 75 is adapted to rest against a cam 82 which is rotatably mounted about the shaft 1 and provided with shoulders 83 and 84 adapted to rest against a pin 85 secured in the shaft 1. The rotation of the driving shaft 1 causes the pin 85 to come in contact with the shoulder 83 or 84, depending upon the direction of rotation of said shaft. The cam 82 coming in contact with the slide 75 raises the same and with it the valve stem

66 and the valve 65, to allow the products of combustion to be exhausted from the cylinder through the exhaust pipe 71.

In the upper end of each cylinder is a fiber jacket 90 provided with a binding screw 91 for connecting a wire with the spark plug held in said jacket. A ring 95 made of insulating material is rotatably mounted upon the exterior of the bearing 3 and provided with an operating handle 96 whereby the sparks of the various cylinders may be controlled. The ring 95 is provided with a series of pins 97, one for each cylinder, to each of which a wire is connected by means of a set-screw 98. Two such wires 99 and 100 are shown in Fig. 2, but it will be understood that there is one connected to each pin and suitably connected to a spark coil circuit for producing a spark in the corresponding cylinder.

A pointer 110 may be provided on the ring 95, passing over a proper index to show the position of the spark-controlling device. Fastened to the shaft 1 is a collar 102, having a stem 103 projecting therefrom, upon which is rotatably mounted a roller 104 adapted to come in contact with the end of each pin 97 as the shaft 1 rotates, thereby closing the circuit in the proper cylinder for causing the explosion of the combustible mixture.

The piston rod is rigid with the piston in each cylinder and the thrust is taken up directly by the rollers and the guide secured to the driving shaft 1.

From the construction above set forth, it will be noted that the number of cylinders located about the shaft 1 may be varied and a power unit of considerable size confined to a small radius.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In an internal combustion engine, the combination with a plurality of cylinders, their pistons and piston rods, of a shaft, a guide rigidly secured to the shaft, means at the end of each piston rod for coöperating with said guide to rotate said shaft, and means for guiding each of said piston rods, the said means comprising a disk forming the inner head of the cylinder, and having an opening for the passage of the piston rod, and ears projecting from said disk and spaced from each other for the passage of the end of the piston rod.

2. In an internal combustion engine, the combination with a plurality of cylinders, their pistons and piston rods, of a shaft, a guide rigidly secured to said shaft and having a continuous groove therein, the groove having oppositely arranged semi-circular end portions and oppositely arranged side portions curved inward or toward each

other, and means at the end of each piston rod for cooperating with the groove in said guide to rotate said shaft.

3. In an internal combustion engine, the combination with a pair of side frames, a shaft journaled in said frames, and a plurality of cylinders, their pistons, and piston rods rigidly attached to the pistons, of a guide composed of two members secured to said shaft in juxtaposition to one another, means attached to the inner end of each of said piston rods for cooperating with both guide members to rotate said shaft, and means for guiding the piston rod of each cylinder, the said means comprising a disk forming the inner head of the cylinder and provided with an opening for the passage of the piston rod, and spaced projections on said disk between which the end of the piston rod passes.

4. In an internal combustion engine, the combination with a pair of side frames, a shaft journaled in said frames, a plurality of cylinders mounted upon said frames and extending radially therefrom and pistons in said cylinders having piston rods rigidly attached thereto, of a guide composed of two members secured to said shaft and in juxtaposition to one another, each having a continuous groove formed in its inner face, each groove having oppositely arranged semi-circular end portions and oppositely arranged side portions curved inward or toward each other, and a pair of rollers near the inner end of each piston rod adapted to travel in the grooves in said guide.

5. In an internal combustion engine, the combination with a shaft journaled in side frames, a plurality of cylinders radially disposed about said frames, and pistons in said cylinders having piston rods rigidly attached thereto, of a guide rigidly secured to said shaft, and composed of two oppositely disposed plates each having a continuous groove formed on its inner face, each groove having semi-circular end portions and side portions curved inward or toward each other, the said piston rods being each flattened for a portion of its length, guiding means for the flattened end of each piston rod, and rollers mounted at the inner end of each piston rod and adapted to travel in the grooves in said guide.

6. In an internal combustion engine, the combination with a frame, and a plurality of cylinders, their pistons and piston rods, of a shaft journaled in said frame, a guide composed of two members secured to said shaft in juxtaposition to one another, means attached to the inner end of each of said piston rods for cooperating with both guide members to rotate said shaft, and projections on the inner head of each cylinder and extend-

ing between the guide members, the said projections being spaced apart to form a guide for the end of the piston rod.

7. In an internal combustion engine, the combination with a plurality of cylinders, their pistons, and piston rods, of a frame, a shaft journaled in the frame and provided with two laterally extending arms, a guide comprising two members mounted on the shaft and secured to opposite sides of the said arms, disks forming the inner heads of the cylinders and having openings for the passage of the piston rods, spaced ears projected from each disk and extending between the said guide members, the end of each piston rod passing between the corresponding ears, and means attached to the end of each of said piston rods for cooperating with said guide members.

8. In an internal combustion engine, the combination with a plurality of cylinders, their pistons and the piston rods rigidly connected with the pistons, of a shaft having laterally extending arms, a guide comprising two members mounted on the shaft and rigidly secured to said arms, the said members being each provided with a continuous groove on its inner face, piston guides comprising disks forming the inner heads of the cylinders and having openings for the passage of the piston rods, two ears connected to each disk and spaced apart to form a guide for the end of the corresponding piston rod, the said piston guides meeting each other at the outer edges of said ears, and rollers carried at the end of each piston rod and adapted to travel in the grooves formed in said guide members.

9. In an internal combustion engine, the combination of a shaft having laterally extending arms, a guide comprising two members mounted on the shaft and rigidly secured to said arms, the said members being each provided with a continuous groove on its inner face, piston rods, rollers carried at the end of each piston rod and adapted to travel in the grooves formed in said guide members, and guiding means for the ends of the piston rods.

10. In an internal combustion engine, the combination of a shaft mounted to turn, oppositely arranged guide members rigidly secured to said shaft, and each provided with a continuous groove, the engine having a plurality of piston rods each flattened for a portion of its length, guiding means for the flattened end of each piston rod, and rollers mounted at the end of each piston rod and adapted to travel in the grooves in said oppositely arranged guide members.

11. In an internal combustion engine, a shaft, grooved guide members rigidly secured thereto, a piston rod, means attached to the end of the piston rod for cooperating

with said guide members, and a guide for the piston rod having an opening for the passage of the piston rod and spaced ears extending between said grooved guide members, the end of the piston rod passing between said ears.

12. In an internal combustion engine, a shaft, grooved guide members rigidly secured thereto, piston rods, rollers carried at the ends of the piston rods and adapted to travel in the grooves of said guide members, and piston guides comprising disks having

openings for the passage of the piston rods and two ears connected to each disk and spaced apart to form a guide for the end of the corresponding piston rod. 15

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE DORFFEL.

Witnesses:

BEULAH MASTERSON,
S. W. ELROD.