T. F. SCOLLARD.

STEAM ENGINE.

APPLICATION FILED OCT. 5, 1907.

912,183.

Patented Feb. 9, 1909.

Fig. 5.

Fig. 1.

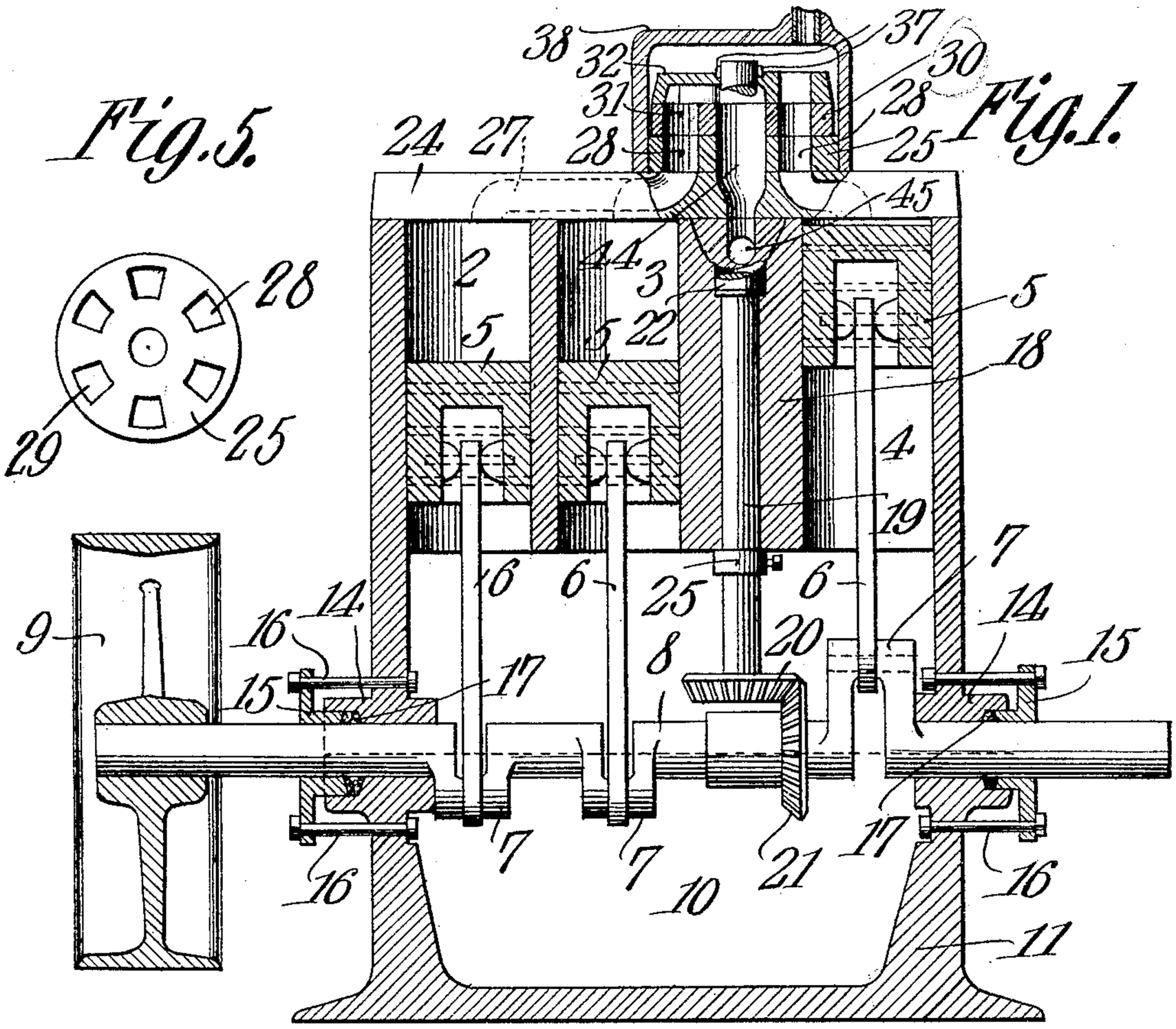


Fig. 2.

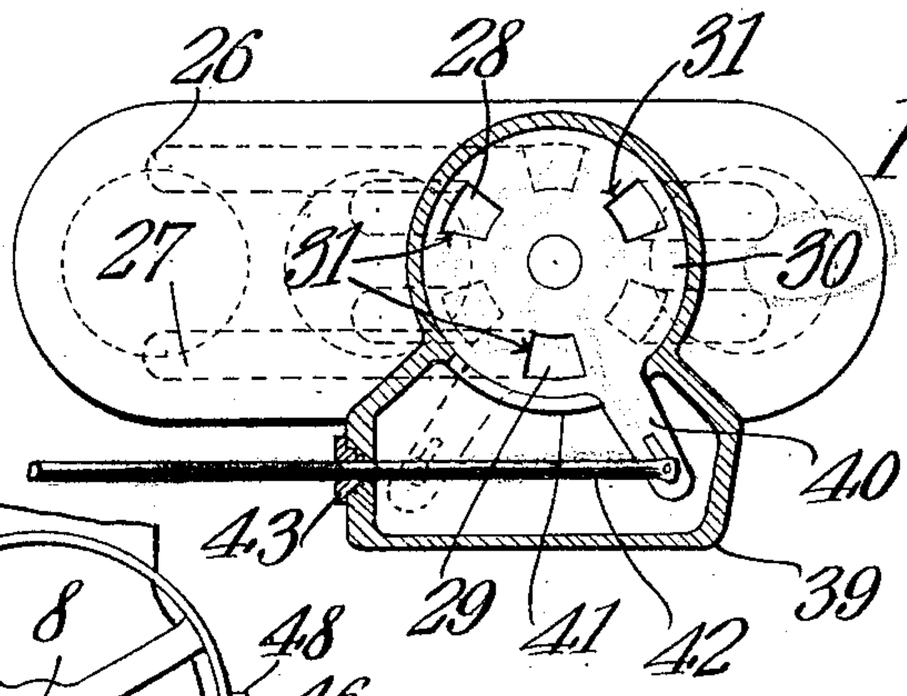


Fig. 4

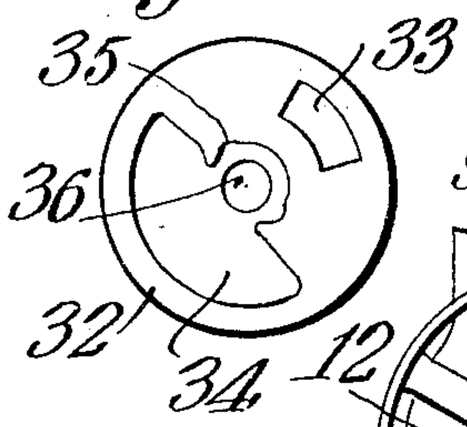
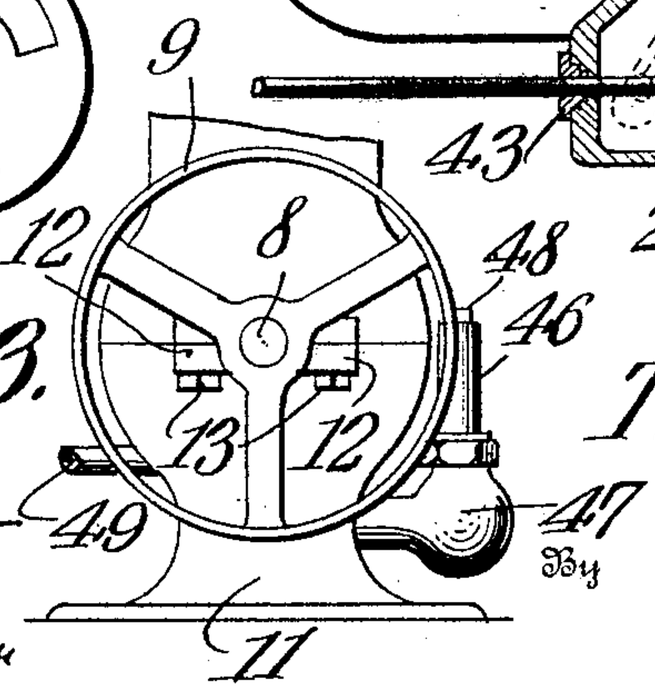


Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

THOMAS F. SCOLLARD, OF WARSAW, INDIANA.

STEAM-ENGINE.

No. 912,183. Specification of Letters Patent. Patented Feb. 9, 1909.

Original application filed June 4, 1907, Serial No. 377,167. Divided and this application filed October 5, 1907. Serial No. 396,075.

To all whom it may concern:

Be it known that I, THOMAS F. SCOLLARD, a citizen of the United States, residing at Warsaw, in the county of Kosciusko and State of Indiana, have invented a new and useful Steam-Engine, of which the following is a specification.

This invention has reference to improvements in steam engines, and its object is to provide an engine that will operate without skilled attention of any kind through long periods of time.

The improved engine is adapted particularly for use in connection with heating plants wherein hot-air heaters are provided with steam generators, so that the steam thus generated may be utilized for the production of mechanical energy to be converted into useful work or into electrical energy, which latter may be converted into useful work or may be utilized for the charging of storage batteries to be later converted into useful work.

Since hot-air heating plants are mostly used in private dwellings for the heating of such dwellings, and since it is often advantageous to utilize the same source of heat for the production of steam and from this steam obtain mechanical or electrical energy to be converted into various forms of useful work, and since the average householder is not skilled in the running and control of steam engines, the engine which I have devised is designed to operate under such conditions without requiring any skill whatsoever on the part of the householder, and to start or stop or run under the conditions present in the operation of an ordinary hot-air furnace.

The present invention relates more particularly to the construction of an engine which will fulfil the conditions named but does not relate to the system set forth, since such system forms the subject-matter of my application No. 377,167, filed June 4, 1907, for a heating system, of which the present application is a division. However, while the engine forming the subject-matter of the present application is particularly adapted to the system described and claimed in my aforesaid application, still the present invention is not limited to such use, and the engine may be utilized under any conditions to which it is applicable.

The invention will be best understood by reference to the following detailed description, taken in connection with the accompanying drawings forming part of this specification, in which—

Figure 1 is a vertical section, with parts in elevation, of the improved steam engine, Figs. 2, 3, 4 and 5 are detail views of parts of the engine.

Referring to the drawings, there is shown an engine 1 provided with three cylinders 2, 3 and 4 in the same longitudinal plane and each provided with a piston 5 of the familiar trunk type, connected by a piston-rod 6 to a crank 7 upon the drive shaft 8, which latter carries a drive wheel or pulley 9. The three cylinders may be all cast in one piece, and this same casting may constitute one-half of the crank chamber 10, the other half being constituted by a base casting 11, and the two parts being suitably connected together by flanges 12 and bolts 13. The shaft 8 extends through suitable journal boxes 14 formed at the meeting faces of the cylinder and base castings, and glands 15, held in place by bolts 16, are employed to hold packing rings 17 in place. The two cylinders 2 and 3 in the particular structure shown in the drawings are in close relation and the cylinder 4 is separated from the cylinder 3 by a thick section 18, centrally through which extends a vertical shaft 19 carrying at its lower end a bevel pinion 20 meshing with another bevel pinion 21 fast on the shaft 8. Near the upper end of the thickened portion 18 the shaft 19 is enlarged, as indicated at 22, and the passage through which the shaft 19 extends is counter-bored to form a seat for the thickened portion of said shaft. Below the portion 18 of the cylinder casting the shaft 19 carries a set collar 23 which prevents the said shaft from rising from its seat in the counter-bored portion of the passage for the shaft and also holds the bevel pinion 20 to the bevel pinion 21.

The upper open ends of the cylinders 2, 3 and 4 are covered by a cap plate 24 in which there is formed, at a point above the thickened portion 18, a circular valve seat 25. Extending from each cylinder are ducts 26 and 27 terminating in ports 28 and 29 in the valve seat. It will be seen that each cylinder is connected to diametrically opposite ports in the valve seat and that there are six ports in the seat for the three cylinders.

Resting on the valve seat there is a disk shaped ported member 30 provided with three equi-distant through passages or ports 31, and covering the disk 30 is a rotary valve 32, shown in bottom plan view in Fig. 4, and this valve is provided with a through port 33 and a segmental recess 34 with a passage 35 continued around its center where the valve is perforated, as shown at 36, so as to receive the upwardly extending end of the shaft 19, which latter extends above the enlarged portion 22 and up through the cap plate 24, the valve seat 25, the plate or disk 30 and the rotary valve 32. Above this valve 32 the shaft is provided with a through pin 37 holding said valve to its seat on the disk 30. The pin 37 may be seated in the upper side of the valve 32 or any other connection may be made between the shaft 19 and the valve 32 so that the latter is constrained to rotate with the shaft 19.

Surrounding the valve seat 25, the disk 30 and the valve 32 is a steam chest 38 receiving steam through a suitable pipe coming from a source of steam supply. The steam chest is provided with a side extension 39 in which moves an arm 40 extending radially from the disk 30 through a slot 41 in the side of the steam chest, and an operating rod 42 is connected to this arm 40 and extends through a packing gland 43 in the side of the extension 39.

When the disk 30 is in one position two of the three openings 31 therein will be coincident with two ports 28 and the third opening 31 will be coincident with one port 29, and when this disk is in another position, indicated by dotted lines in Fig. 2, the passages 31 will be coincident with one of the ports 28 and two of the ports 29. This provides means whereby the direction of rotation of the engine may be reversed at will.

Now, let it be supposed that steam is admitted, say to the cylinder 4, and that steam is still driving the piston in the cylinder 3 but is exhausting from the cylinder 2, the cranks 7 of the shaft 8 being disposed one hundred and twenty degrees apart. In this position the port 33 is coincident with the port 28 leading to the cylinder 4, and the exhaust recess 34 is coincident with the port 29 leading from the cylinder 2, while both ports 28 and 29 leading to the cylinder 3 will at this time be closed and the steam be acting expansively. The arrangement of the ports is such that when the piston 5 in the cylinder 2 reaches its uppermost limit of travel the exhaust port of this cylinder is closed and the steam port is opened, but the piston 5 in the cylinder 3 has already begun its return stroke and the exhaust port in this cylinder has been opened in the meantime, while the steam port in the cylinder 4 is closed to permit the steam to work expansively. This cycle of operations is continued indefinitely, steam being fed to the several cylinders in succession and exhausted therefrom in proper sequence.

In order to provide an escape for the exhaust steam there is an opening 44 extending through the disk 30 and valve seat 25 to one side of the passage provided for the shaft 19 but coincident with the passage 35 in the valve 32, and the opening 44 finally leads to an exhaust passage 45 extending through the enlargement 18 and communicating with an exhaust pipe (not shown).

It will be observed that the valve 32 is rotated continuously by the connection of the shaft 19 with the main shaft 8, and the steam being fed to and exhausted from one end of the cylinders the valve 32 is the only valve used in the entire machine.

Now, in order that the lubrication of the machine may be entirely automatic the base 11 is made water and oil tight and oil is introduced through a sight glass 46 carried by a coupling 47 communicating with the base 11, as shown in Fig. 3. The upper end of the sight or oil level glass 46 is closed by a plug 48 and on the removal of this plug water may be introduced into the base 11 until it reaches the level of a water over-flow pipe 49, also shown in Fig. 3. When this amount of water has been introduced into the base oil may be poured through the sight glass 46 until it reaches the shaft 8 and may even partially cover said shaft. When the engine is in operation the several parts immersed in the oil of course receive proper lubrication, while the pistons and the journal bearings therein for the pitmen 6 may receive lubrication by the splashing of the oil. The upright shaft 19 and the valve 32 may be lubricated by graphite lubricants, while the valve 32 will be additionally lubricated by the steam.

By underlaying the lubricating oil with water all dirt or other extraneous matter which might be harmful to the parts to be lubricated will gravitate to the bottom of the water, and since the oil and water do not mix there is no danger of setting up currents which would lift these deleterious matters so that they would find access to the parts being lubricated. At long intervals the oil and water may be removed and fresh oil and water introduced.

It will be observed that the entire machine is self-contained, without exposed moving parts except the ends of the shaft and pulley and the rod 42 by means of which the direction of rotation of the machine is reversed, this rod moving only when actuated manually, which, under ordinary circumstances, is seldom done. The engine is provided with practically but one valve, or, more properly, with but one moving valve structure, and while of the three-cylinder type contains a minimum number of moving parts aside from the pistons.

All the moving parts are so lubricated as to require no attention through long periods of time, and said moving parts while thoroughly lubricated are protected from dust and dirt and other harmful matters from the fact that the parts are all inclosed in a tight case.

Since the engine is adapted more particularly for use with a house heating system in which the furnace fires are utilized to heat air to be conveyed through the house for heating purposes and at the same time to act upon a steam generator for the production of steam, it is important that the engine should always start as soon as the steam pressure in the generator is sufficiently high, and this is accomplished by making the engine without a dead center. As it is customary to run the furnace fires at a greater heat in the day time than at night the engine may be utilized for the purpose of driving a dynamo and the dynamo may be used to charge storage batteries, so that when the furnace fires die down at night and steam is no longer generated the energy stored up in the batteries may be utilized for the production of useful work of any kind to which the batteries are adapted.

While I have shown and described an engine of three cylinders, the invention is not necessarily confined to a three-cylinder engine but any other number of cylinders may be used so long as the resultant engine embodies the features of the present invention.

I claim:—

1. In a multi-cylinder steam engine, the combination with cylinders each having two steam ducts leading from the same end of the cylinder, of a valve mechanism therefor comprising a valve seat having as many live steam ports as there are ducts leading from all the cylinders, the ducts from each cylinder communicating with diametrically disposed ports in the valve seat, and said valve seat also having a central exhaust port, a reversing valve member on the seat having one-half as many live steam ports as there are live steam ports in the valve seat, and also having a central exhaust port matching the exhaust port in the valve seat, and a rotary valve member on the reversing valve member, said rotary valve member having a through port to match any one of the live steam ports in the reversing valve member and also having a bridging recess with an axial extension for coupling any of the ports in the intermediate member to the central exhaust port.

2. In a multi-cylinder steam engine, the combination with cylinders each having two steam ducts leading from the same end of the cylinder, of a valve mechanism therefor comprising a valve seat having twice as many live steam ports as there are cylinders in the engine, and a central exhaust port, a valve member on said valve seat having half as many live steam ports as there are live steam ports in the valve seat, and also having a central exhaust port matching the exhaust port in the valve seat, said valve member having a side arm, a rotary valve member on said first named valve member, said rotary member having a through port to match the live steam ports in the other valve member and also having a bridging recess with an axial extension for coupling any two of the ports in said other member to the central exhaust port, and a steam chest housing the several valve members and provided with a side extension for the reception of the side arm of the intermediate valve member.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

THOMAS F. SCOLLARD.

Witnesses:

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ANDREW G. WOOD.