(No Model.)

D. H. DUGAR.

VALVE GEAR.

No. 345,372. Patented July 13, 1886.

Fig. 1.

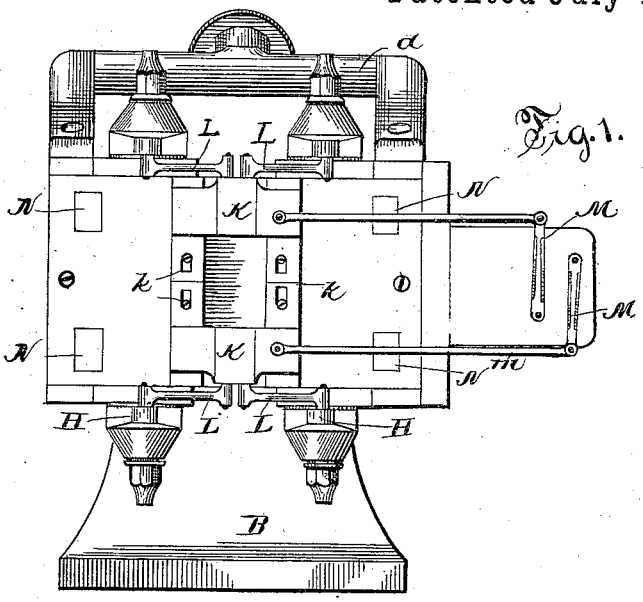


Fig. 2.

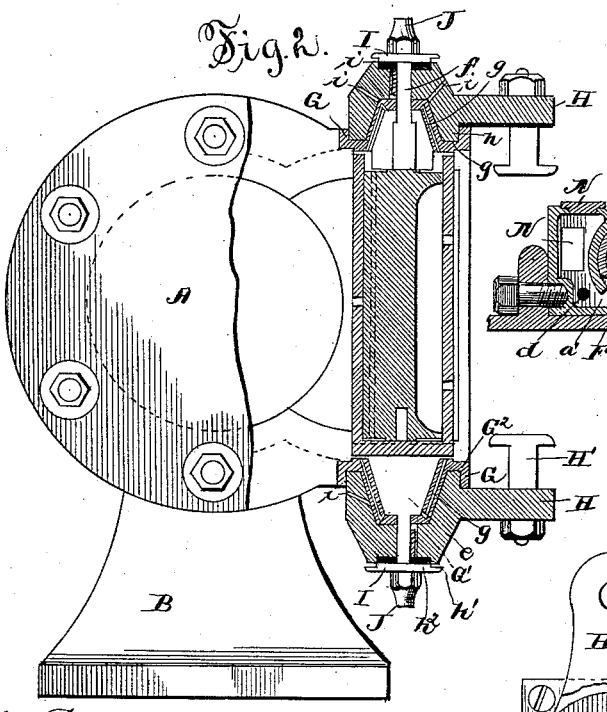


Fig. 3.

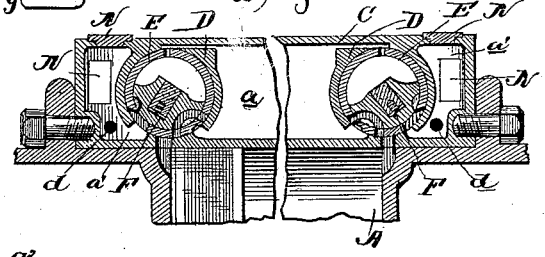
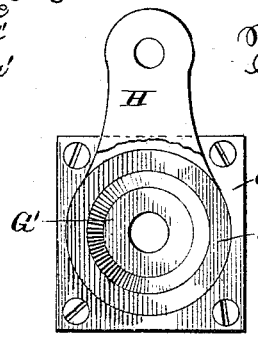


Fig. 4.



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UNITED STATES PATENT OFFICE.

DELANO H. DUGAR, OF CEDARTOWN, GEORGIA.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 345,372, dated July 13, 1886.

Application filed May 19, 1886. Serial No. 202,664. (No model.)

To all whom it may concern:

Be it known that I, DELANO H. DUGAR, a a citizen of the United States, residing at Cedartown, in the county of Polk and State of Georgia, have invented certain new and useful Improvements in Valve-Gears; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to steam-engines; and it consists in the novel features more particularly hereinafter set forth and claimed, and shown in the annexed drawings, in which—

Figure 1 is a side view of an engine of my construction adapted to carry out and provided with my improvements. Fig. 2 is an enlarged end view, parts broken away and partly in section. Fig. 3 is a longitudinal sectional view on an enlarged scale, and the middle portion being broken away of the cylinder and chest. Fig. 4 is a front view, par s broken away, of the crank and its supporting-plate.

The cylinder A, supported on the foot or bed B, is provided on one side with a chest, C, having valve-casings D dividing it into three compartments—a middle and two end or exhaust chambers—rotary cylindrical valves E, and oscillating cut-offs F, all arranged substantially as shown and described in the patent granted to me February 9, 1886. The central compartment, *a*, is supplied with live steam, in the usual manner, while the end or exhaust compartments, *a'*, communicate with a common exhaust-pipe, *d*. The valve-stems *e* and *f*, secured to the valve and cut-off, respectively, project through and beyond the sides of the steam-chest in opposite directions, and have conical enlargements on their inner end, the smaller end of which extends outward. Cap-plates G, having corresponding hollow conical projections G' fitting over the conical enlargements of the valve-stems, are secured to the sides of the chest directly opposite the ends of the valves, and form bearings for the cranks H, which are conically recessed to fit over and are mounted on said projections. An annular flange, *h*, extending from the inner side of the crank, fits into a corresponding groove, *g*, formed in the cap-plate, preferably at the base of the projecting conical shell G', to steady the crank in its movements and at the same time give a better joint. The cranks are keyed to the outer ends of the valve-stems so as to have a slight longitudinal motion relative thereto, but compel them to move therewith when turned about their axis. The outer ends are provided with a recess, *h'*, in which is seated a packing, h^2, on which bears the central portion, *i*, of a flanged washer, I, held in place by nuts J. Openings *i'*, formed obliquely through the crank-hub, serve as ducts through which to feed a lubricant to the wearing surfaces between the cranks and the conical shell projections G'. The openings *g* in the body of the projections G' extend through from the inner edge to within a short distance of the outer end, when they make an abrupt turn and lead into the interior of the shell, as shown. By this construction steam escaping from the ends of the valves into an annular compartment, at or near the base of the conical enlargements communicating with the openings and entering said openings, is conveyed to and discharged upon the outer or smaller ends of the conical enlargements between them and the inner wall of the shell, will force the conical projections of the cap-plates and the conical enlargements of the valve-stems relatively apart; but as the cap-plates are fixed, the conical enlargements are forced inward, carrying the valve-stems and the nuts and washers. The raised portion *i* of the washers bearing upon the packing compresses it and preserves at all times a tight joint, besides holding the cranks in place. The conical enlargements may form an integral part of the valve-stems or be separate and slipped thereover, and have a bearing on shoulders formed thereon. Cross-heads K, held on a side of the steam-chest by adjustable gibs *k*, one near each side of the chest, are connected with the cranks H by pitmen L. The cross-heads are located about midway between the valves, and each is connected with the valve-stems on its respective side of the chest, so that at a single movement of each both of the valves and both of the cut-offs are simultaneously operated. The cross-heads are ac-

tuated from eccentrics on the crank-shaft (not shown) by the rocking arms M and connecting-rods *m*. Removable plate N close openings on top of the exhaust-chambers, through which the condition of the valves may be observed and any leakage detected. It will be observed that exhaust-steam only enters the exhaust-chambers, and that intermittently; hence, if there is a leakage, the exhaust-chamber will be filled with steam constantly, the amount varying proportionately to the size of the opening or leak through which the live steam escapes. These plates may be removed and any leakage detected while the engine is running.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with the valve-stem having a conical enlargement and the cap-plate having a conical shell projecting therefrom fitting over the enlargement, and provided with openings extending therethrough which terminate near the small end, of the crank mounted on the cap-plate projection and keyed to the valve-stem, a washer and nut on the outer end of the valve-stem, and a packing interposed between the washer and the crank, substantially as and for the purpose set forth.

2. The combination of the valve-stem having a conical enlargement, the cap-plate having a conical shell projection fitting over the enlargement and provided with openings or passage-ways leading from the inner face to the interior of the shell near its closed end, the crank mounted on the projection keyed to the stem and recessed on its outer face, a packing fitting in the recess, a flanged washer having a raised central projection bearing upon the packing, and a nut on the outer end of the valve-stem to hold the parts in place, substantially as set forth.

3. The combination, with the valve-stem having a shoulder formed thereon and a truncated cone-shaped washer fitted thereon and bearing upon the shoulder, of a cap-plate fitted over the washer and having passage-ways formed therethrough, substantially as shown, a crank mounted on the projection of the cap-plate and keyed to the valve-stem, a nut and washer on the outer end of the valve-stem, and a packing interposed between the washer and the crank, substantially as set forth.

4. The combination, with the cap-plate having a cone-shaped projection and an annular groove at the base of the projection, of the crank mounted on the projection and having an annular flange fitting in the groove, substantially as and for the purposes set forth.

5. The combination, with the steam-chest and valves located therein near each end dividing it into a central and end compartments, forming a live and exhaust chambers, respectively, of removable plates closing sight holes or openings leading into the end or exhaust compartments, substantially as and for the purposes set forth.

6. The combination of the steam-chest, rotary and cut-off valves located therein near each end and placed in a perpendicular position, cranks keyed to the stems of each, a cross-head on each side of the chest located midway of the valves, and pitmen connecting the cranks of the valve-stems and the cranks of the cut-off stems with the respective cross-heads, whereby each two sets of valves are actuated simultaneously and independently of each other, substantially as set forth.

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

DELANO H. DUGAR.

Witnesses:

THOMAS BURRY,

AMOS G. WEST.