No. 647,669. Patented Apr. 17, 1900.

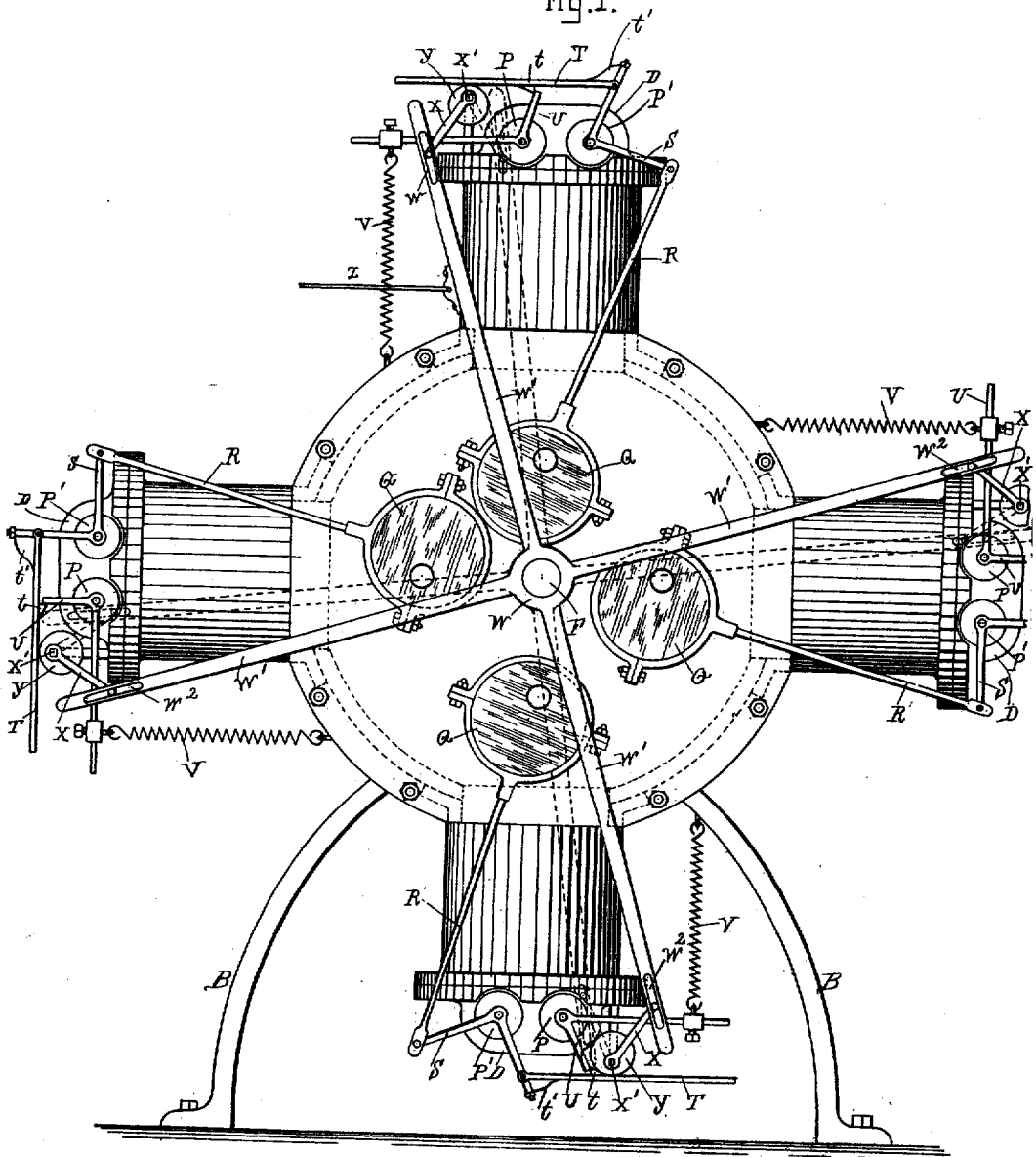
G. CODE.

STEAM ENGINE.

(Application filed June 5, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses.

Laurits N. Möller

Edward S. Brown

Inventor:

George Code

by Edwin Pearce

attorney.

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Patented Apr. 17, 1900.

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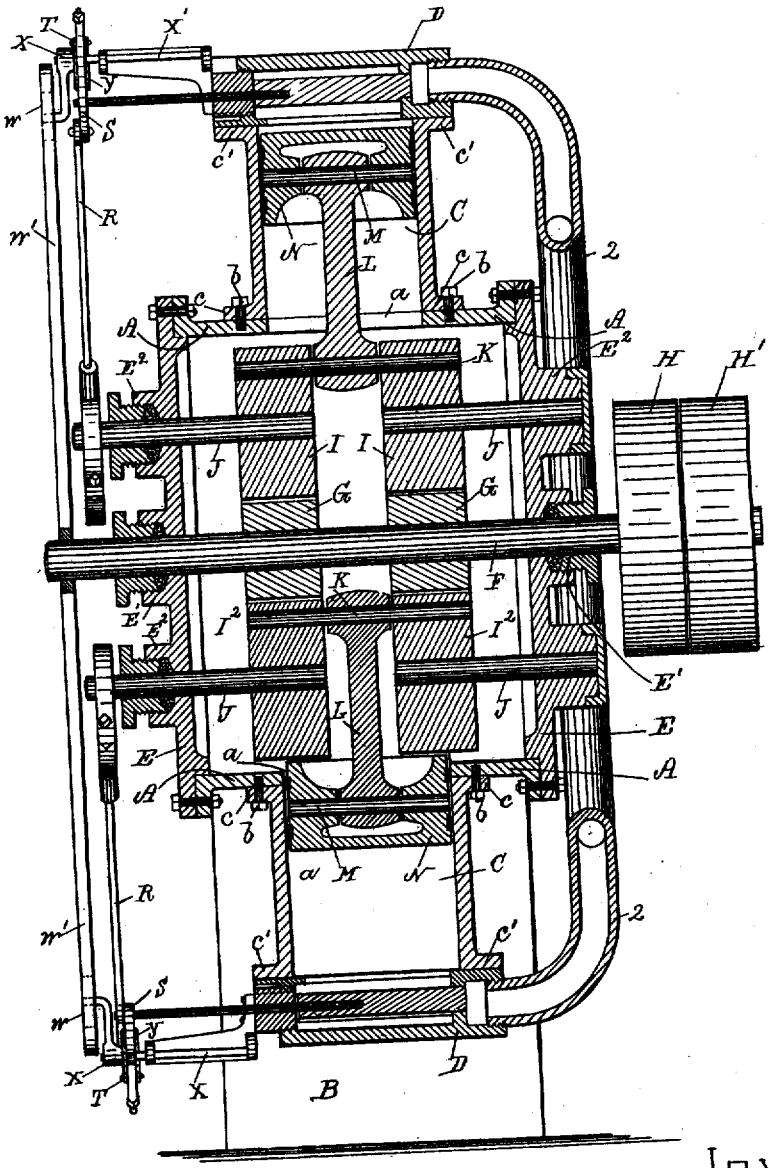
STEAM ENGINE.

(Application filed June 5, 1899.)

3 Sheets—Sheet 2.

(No Model.)

Fig. 2.



Witnesses.

Laurits N. Möller

Edward L. Brown

Inventor.

George Code

by Edwin Planta

attorney.

No. 647,669.

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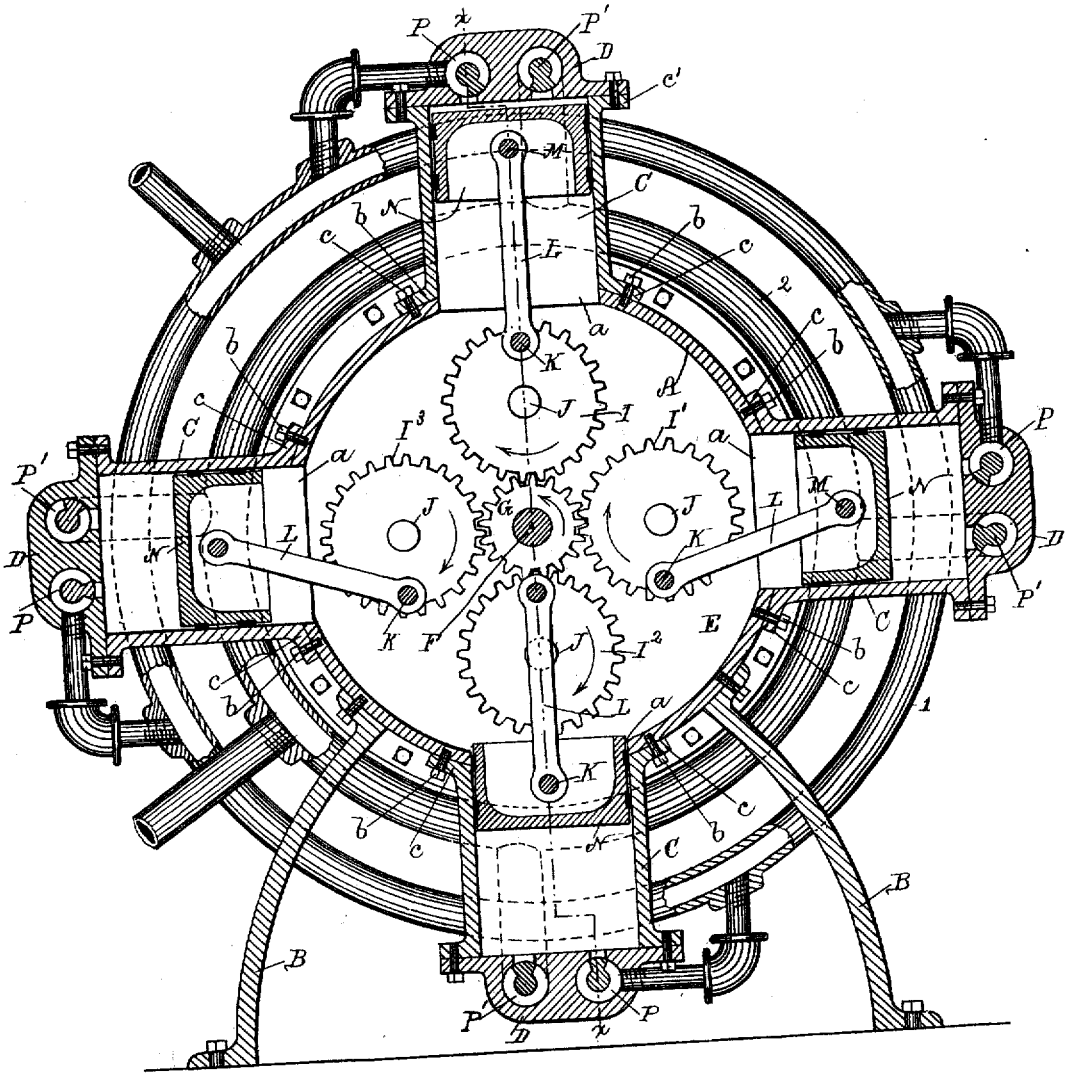
3 Sheets—Sheet 3.

(No Model.)

Fig. 3.



Witnesses

Lauritz N. Möller

Edward S. Brown

Inventor

George Code

by Edwin Planta

attorney.

UNITED STATES PATENT OFFICE.

GEORGE CODE, OF BOSTON, MASSACHUSETTS.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 647,669, dated April 17, 1900.

Application filed June 5, 1899. Serial No. 719,346. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CODE, a subject of the Queen of Great Britain, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

The object of my invention is to produce an engine that can be driven by steam, gas, or air in which the total expansion of the element is utilized in each cylinder, so that compounding the cylinders is obviated and the pistons of all of said cylinders driving a common shaft; and the invention consists of a number of independent cylinders the pistons of which work partly under a full head of steam and partly under the expansion of the same, each piston transmitting motion to separate cog-wheels, all of which are in gear with central cog-wheels mounted upon a shaft, from which the power can be utilized, and also in certain details of construction, as hereinafter set forth.

Referring to the accompanying drawings, Figure 1 represents a side view of an engine embodying my invention. Fig. 2 is a vertical longitudinal section of same, and Fig. 3 is a transverse vertical section.

A represents a circular casing supported by legs B. The casing is formed with openings *a* of a diameter equal to the internal diameter of cylinders C, that consists of short tubes, having an outwardly-extending flange at each end, the inner flange *c* being a form to fit into the side of the casing and secured thereto by bolts *b*, and to the outer flange *c'* is secured a valve-casing D.

E E are covers for the casing A and are each formed with a central base that forms a bearing and shifting box E' for a driving-shaft F, upon the central portion of which are secured two cog-wheels G G, and upon one end of said shaft is mounted a fast and loose pulley H H', as shown. Each of the cog-wheels G is in gear with four cog-wheels I I' I^2 I^3, each of which is mounted upon a separate shaft J, their outer ends being carried in boxes or projections E^2, formed in one with the cover E, caps or covers being provided on one side and stuffing-boxes on the other side through which said shafts pass. Each pair of said cog-wheels are connected together by a shaft-bar K, so that each pair of cog-wheels I, shaft J, and shaft K form a crank.

Upon each of the shafts or bars K is mounted one end of a connecting-rod L, the other end of which is attached to a rod M, secured to one of the pistons N, that work in one of the cylinders C. These pistons are so arranged that when one is fully thrown out the opposite one will be drawn in, as shown.

Each valve-chamber is fitted with two oscillating valves P P', one for admission of steam and the other for the escape of the exhaust. The exhaust-valves P' are operated from eccentrics Q, mounted upon the shaft J on one side of the engine, said eccentrics being connected by a rod R' to a bell-crank S, secured on the end of the valve P'. To the other arm of said bell-crank is fulcrumed a lever T, having a projection *t*, that engages with the upper arm of a bell-crank lever U, the lower arm of which is drawn down by a suitable spring V, and the lever T is held down by a spring *t'*, secured to the upper arm of the bell-crank lever S, so that when the bell-crank on the exhaust-valve is operated the lever U is drawn back by the projection *t* and opens the steam-inlet valve until said projection *t* is free of the bell-crank U, when the spring V draws upon the outer arm of said bell-crank and instantly cuts off the supply of steam.

In order to regulate the supply of steam to the cylinders, I employ a controlling device that is operated by a governor. (Not shown in the drawings.) The regulator consists of a base W, loosely mounted upon the central shaft F and having four arms W', each having near its outer ends a slot w^2, in which works the end of a crank X, mounted upon a rod X', carried in suitable bearings. Upon this rod X' is secured a cam Y, upon which the lever T rests. One of the arms W' is, by a rod Z, connected to a governor, so that should the engine be running at a proper speed the eccentric X' will be in a position so that the lever T will simply slide on it; but should the engine be running too fast then the arms W' will be operated from the governor by the rod *z*, and thus turn the eccentrics Y and

raise the lever T until the projection *t* is free from the upper arm of the bell-crank lever U, and the spring V will then draw the outer arm down, thus cutting off the steam-supply.

1 is a steam-supply pipe that is connected to all of the chambers containing the admission-valves, and 2 is an exhaust-pipe connected to all of the chambers in which the exhaust-valves work.

It will be seen that by this construction all the four pistons N simultaneously assist in operating the central shaft F through the pitman L and gears I G, so that when one of the pistons has completed its outward stroke the opposite piston will have completed its inward stroke, while both the other pistons will be midway in their stroke, one being under a full head of steam, while the other will be operated by the expansion of the steam in the cylinders until the inward stroke is completed, when the exhaust-valve is opened and the steam allowed to escape. Then the steam is utilized until it has expanded double its original volume, and by the arrangement of pistons all dead-centers are avoided.

What I claim is—

In an engine an outer casing, two pairs of cylinders secured thereon, each pair being diametrically opposite each other, covers for said casing, one cover having boxes forming bearings and the other cover having stuffing-boxes, a central shaft having two cog-wheels mounted thereon within the casing, and a series of pairs of cog-wheels in gear with said cog-wheels on the main shaft, each wheel being mounted upon a separate shaft and connected together in pairs by a rod or shaft, so as to act as a crank, that are operated by the pistons in said cylinders; as set forth.

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

GEORGE CODE.

Witnesses:
NEWELL D. ATWOOD,
EDWIN PLANTA.