No. 730,345. PATENTED JUNE 9, 1903.

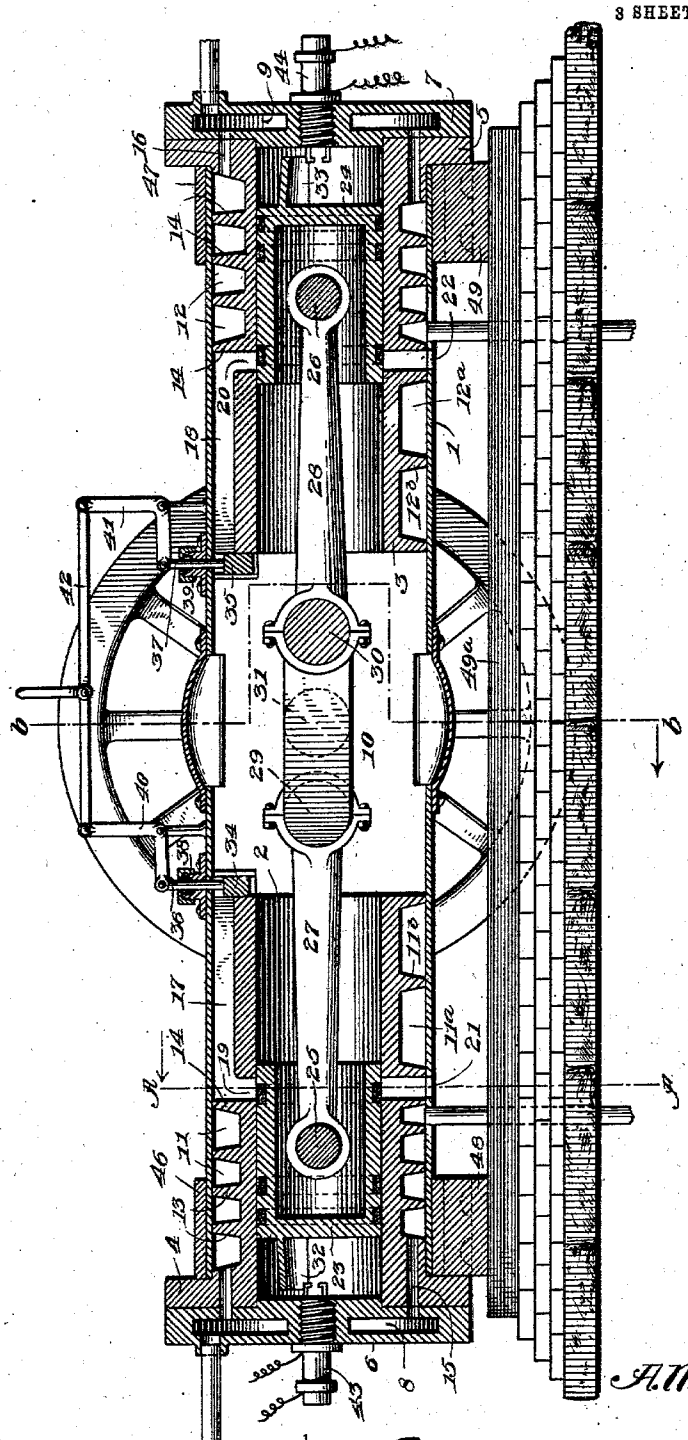
A. M. COBURN.

TWO CYCLE GAS ENGINE.

APPLICATION FILED JUNE 18, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.



Witnesses
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NO MODEL. 3 SHEETS—SHEET 2.

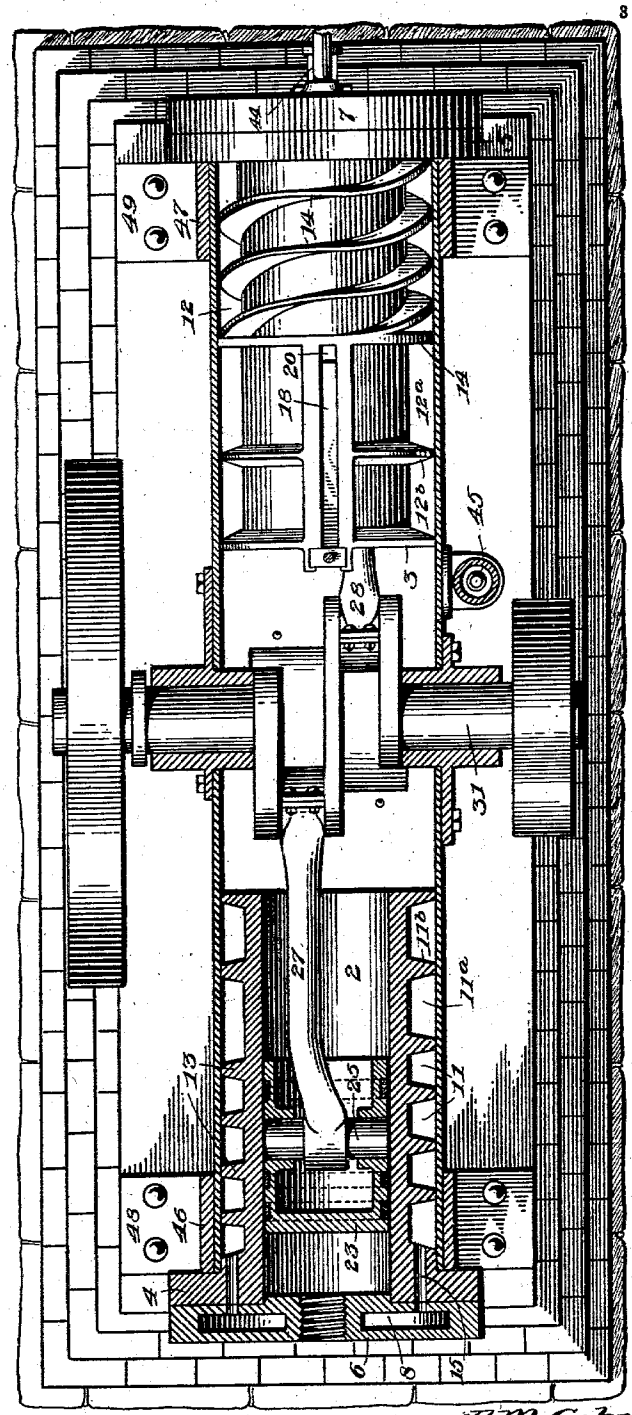



Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 4.

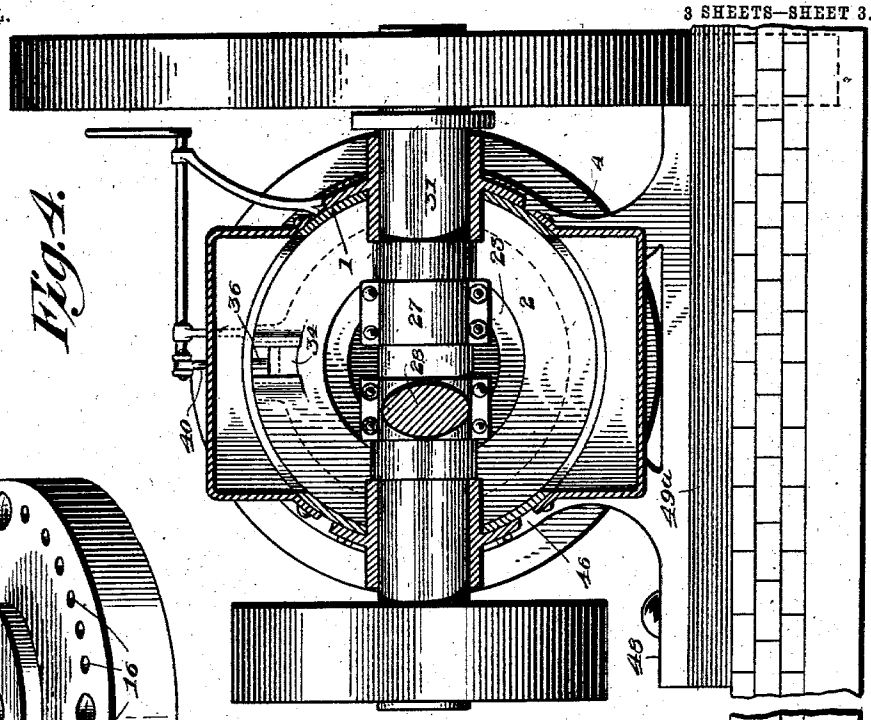



Fig. 5.

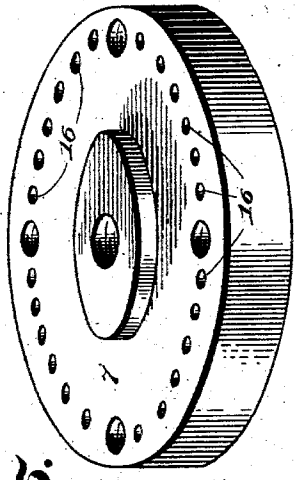
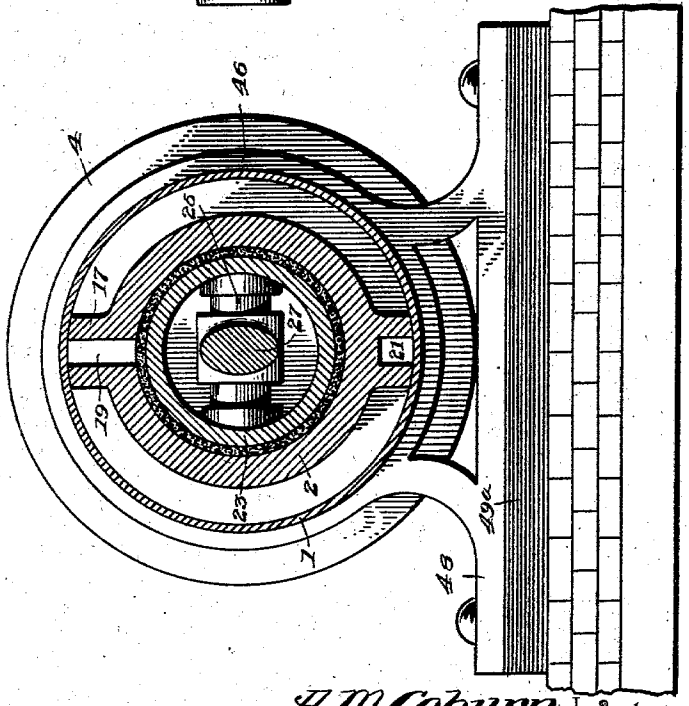



Fig. 3.




Witnesses

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No. 730,345. Patented June 9, 1903.

# UNITED STATES PATENT OFFICE.

AVON MENZOR COBURN, OF DAUNT, CALIFORNIA.

## TWO-CYCLE GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 730,345, dated June 9, 1903.

Application filed June 18, 1901. Serial No. 65,055. (No model.)

*To all whom it may concern:*

Be it known that I, AVON MENZOR COBURN, a citizen of the United States, residing at Daunt, in the county of Tulare and State of California, have invented a new and useful Two-Cycle Gas-Engine, of which the following is a specification.

This invention relates to engines operated by gases generated by explosion within the cylinders; and it consists in the construction, combination, and arrangement of parts, as hereinafter shown and described, and specifically pointed out in the claims.

In the drawings illustrative of the invention, Figure 1 is a longitudinal sectional elevation. Fig. 2 is a plan view in transverse section. Fig. 3 is a transverse section on the line *a a* of Fig. 1. Fig. 4 is a transverse section on the line *b b* of Fig. 1. Fig. 5 is a perspective view of one of the cylinder-heads detached.

The framework and outer casing are in one piece of tubing 1, bored true to a gage, and adapted to receive two cylinders 2 3, one in each end, the cylinders each having laterally-projecting flanges 4 5, abutting against the ends of the tubular frame, as shown. The cylinders will be turned to correspond to but a trifle larger than the bore of the tube, so that the latter may be "shrunk" upon the cylinders by expanding the shell or casing by heat and then inserting the cylinders and allowing the shell to contract by cooling, and thus form a very close union between them. The cylinders are closed at their outer ends by heads 6 7, the heads being hollow, as at 8 9, and bolted to the flanges 4 and 5. The inner ends of cylinders are open, as shown, and the space 10 within the combined tubular casing and frame between the cylinders forms the crank-chamber and also the chamber into which the explosive mixture of gas and air is drawn through a light check-valve 45 by the outward motion of the pistons and which is then compressed in said chamber upon the return stroke of the pistons simultaneously toward the center, by which means the gas is distributed to the explosive-chambers in the outer ends of the cylinders at each revolution of the crank-shaft.

The exterior surfaces of the outer portions of the cylinders 2 3 are formed with helical grooves 11 and 12 encircling them, with ribs 13 14 between the grooves, to form a continuous water-circulating cavity around each cylinder at the points which are subjected to to the greatest heat. Each of the helical water-grooves 11 12 is connected, respectively, with the hollow spaces 8 9 in the cylinder-heads 6 and 7 by small apertures 15 16, so that a free circulation of the water will be permitted between the water-spaces.

17 18 are longitudinal channels or ducts formed in the exterior of the cylinders 2 and 3, leading from the inner ribs 13 14 and connected with ports 19 20, the ports and channels forming connections between the chamber 10 and the cylinders 2 and 3. The inner portions of the cylinders 2 3 are cut away, as at $11^a$ $12^a$, to lighten the cylinders, each of the cylinders at these points supported by ribs $11^b$ $12^b$, as shown. At points opposite the ports 19 20 are located the exhaust-ports 21 22, opening into the outer air through the sides of the cylinders and the casing 1.

23 24 are the pistons, which are of the "trunk" pattern and each provided with a transverse stud 25 26 to afford means for the reception of one end of connecting-rods 27 28, the other ends of the rods being coupled to reversed cranks 29 30 on a main driven shaft 31, properly mounted through the casing or frame 1, as shown. By this means the pistons being moved simultaneously to and from the crank-shaft serve to revolve it. Projecting outwardly from the closed ends of each piston are plates 32 33 to deflect the entering charge of explosive mixture in the usual manner toward the top of cylinder.

Arranged to cover and uncover the entrances to the channels 17 and 18 are valves 34 35, each with a valve-rod 36 37, passing outward through stuffing-boxes 38 39 in the casing 1 and provided with bell-crank levers 40 41, each of the bell-cranks connected by a rod 42 by their upper ends, so that motion imparted to the rod will simultaneously move the valves 34 35, and thus simultaneously cover or uncover the entrance to the chambers 17 19. The rod 42 may be connected by hand to govern the amount of explosive mixture entering the cylinders, and thus regulate the speed of the engine, or it may be attached to a suitable governor driven by the engine.

In case either cylinder should be disabled the engine may still be run by disconnecting rod 42 and throttling the disabled cylinder by means of either valve 34 or 35.

Disposed centrally through the cylinder-heads are the "jump" spark-plugs 43 44 of the usual construction and so connected and arranged that by connecting a secondary terminal from a Ruhmkorff coil to each plug simultaneous sparks occur in the cylinders by the use of but one coil, electrical connection being made between the plugs by the engine itself or when plugs are used having both electrodes insulated may be made by a wire from one plug to the other.

The air and the gas forming the explosive mixture are introduced into the chamber 10 through check-valve 45 in the casing 1.

Supporting-bands 46 47 will be clamped around the casing 1 at the ends and each band provided with projections 48 49 to afford means for supporting the engine upon a suitable base or bed frame 49ª, which need not be heavy nor solid, as the reciprocating parts balance each other, and the explosions being produced simultaneously, thereby prevent any shock, especially when "on the center," as a shock in one cylinder only when the pistons are both at the outer ends of the stroke is a serious matter, subjecting all the parts to severe strains and frequently causing breakage of the parts. By exploding the gas in both cylinders at once, however, this objection is avoided. By forming the outside casing of a single tube and shrinking it upon the cylinders a very light, compact, and strong structure is produced, especially suitable for automobile or launch use.

The helical arrangement of the water-chambers around the cylinders is an important feature of my invention, as it provides for a continuous flow of water through the water-chamber and insures a free, rapid, and constant circulation throughout all the water-chambers.

What I claim as new is—

1. In a gas-engine, the combination of the two oppositely-disposed open-ended cylinders having helical flanges or ribs to form water-chambers and provided with peripherally-disposed gas-passages leading from a central compression-chamber to the explosion-chambers, a casing formed of a single length of metallic tubing having its opposite end portions shrunk upon the peripheries of the cylinders and forming the said central compression-chamber at a point between the two cylinders, the casing forming one wall of the gas-passages and one wall of all of the water-chambers on the peripheries of said cylinders, trunk-pistons in said cylinders, a crank-shaft, and connecting-rods extending between the pistons and the crank-shaft.

2. The combination in a gas-engine, of a pair of oppositely-facing cylinders, each provided with peripherally-disposed ribs arranged to form water-jackets and gas-passages, a casing formed of a single length of metallic tubing shrunk tightly on all of said ribs and forming one wall of the water-jackets and gas-passages, the central portion of the tube forming a gas-compression chamber, valves arranged between the compression-chamber and the two cylinders to regulate the quantity of explosive mixture supplied to the cylinders, trunk-pistons in said cylinders, a cranked shaft, and connecting-rods extending between said cranked shaft and the trunk-pistons.

3. The combination in a gas-engine, of the oppositely-facing cylinders 2, 3, having helical ribs 13, 14 to form water-chambers and provided with longitudinally-disposed gas-passages 17 and 18 respectively in communication with cylinder-ports, a casing 1 formed of a single piece of metallic tubing shrunk on the ribbed and channeled cylinders and forming one wall of the water-chambers and gas-passages, the central portions of said tube forming a gas-compression chamber in communication with the gas-passages, valves 34 and 35 for controlling a supply of gas from the compression-chamber to the passages 17 and 18 respectively, crank-shaft bearings supported by the tubular casing, a crank-shaft adapted to said bearings, pistons disposed within the cylinders and connected to said crank-shaft, and exhaust-ports leading through the walls of the cylinders and the casing, substantially as specified.

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

AVON MENZOR COBURN.

Witnesses:
M. L. CRAMER,
T. W. PEDIGO.