No. 772,109. PATENTED OCT. 11, 1904.

R. A. MORTON.

CENTER FIRE BALANCE ENGINE.

APPLICATION FILED MAR. 16, 1903.

NO MODEL.

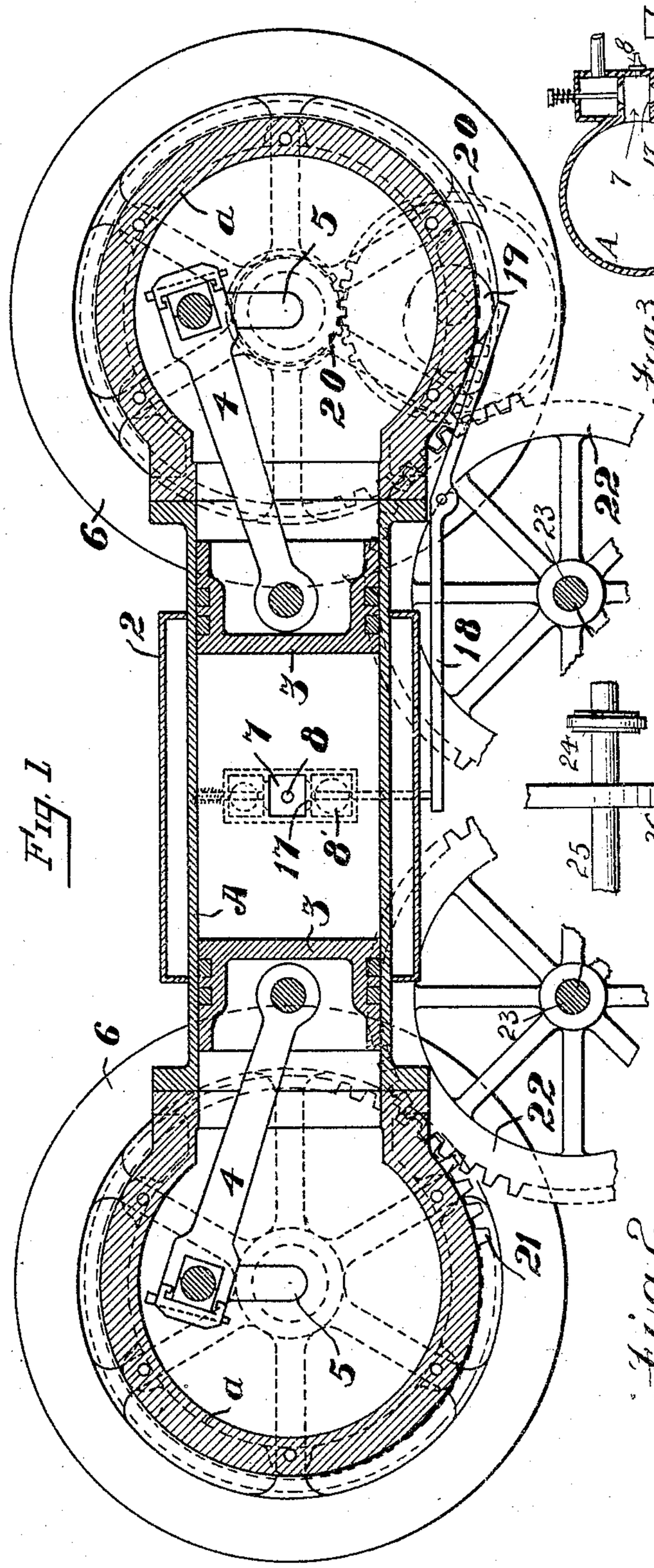

Fig. 1

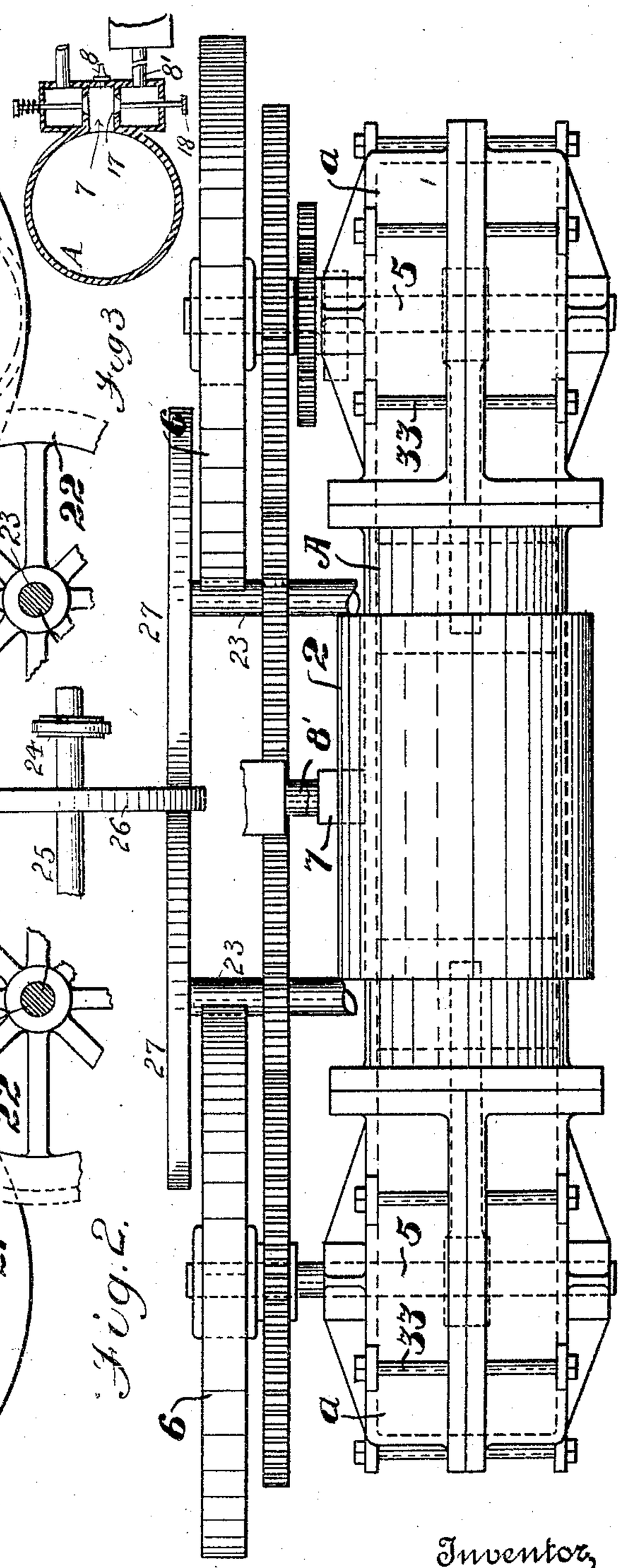

Fig. 2.

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No. 772,109. Patented October 11, 1904.

UNITED STATES PATENT OFFICE.

ROLLA A. MORTON, OF SAN JOSE, CALIFORNIA.

CENTER-FIRE BALANCE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 772,109, dated October 11, 1904.

Application filed March 16, 1903. Serial No. 148,112. (No model.)

To all whom it may concern:

Be it known that I, ROLLA A. MORTON, a citizen of the United States, residing at San Jose, county of Santa Clara, State of California, have invented an Improvement in Center-Fire Balance-Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in engines of the type employing opposed pistons operated simultaneously in a single cylinder through the expansive force of a propelling medium introduced between the pistons. Its object is to provide a motor suitable for use in automobiles, launches, yachts, and the like which shall be simple in construction and operation, of high efficiency, practically noiseless, and free from all vibration.

It consists of the parts and the construction and combination of parts hereinafter more fully described, having reference to the accompanying drawings, in which—

Figure 1 is a longitudinal section of my engine. Fig. 2 is a plan view of same. Fig. 3 is a transverse central section of same.

A represents a horizontally-disposed cylinder open at both ends and secured rigidly at each end to the crank-cases *a*, by which latter the engine is supported on suitable bases. If desired, the cylinder may be provided with a water-jacket, as 2. A piston 3 operates in each end of the cylinder, and each piston has a rod 4, connecting with a crank on a shaft 5, carrying a fly-wheel 6 at opposite ends of the cylinder. The two pistons have an opposite and simultaneous movement, and their length of stroke is regulated to bring them alternately into juxtaposition centrally of the cylinder and then carry them outward toward the ends of the cylinders, each piston serving in lieu of a cylinder-head for the other.

Any suitable propelling medium may be employed to drive the engine. In the present instance an inflammable vapor from any suitable source of supply is introduced into a chamber 7 on the side and centrally of the cylinder and therein ignited by a suitable sparking device 8, operated in the usual manner from one of the drive-shafts, but not necessary here to be detailed. The expanding gases pass from chamber 7 into the cylinder and between the two pistons at their moment of closest approach to each other to force the pistons outward. On the return stroke the spent products are expelled through chamber 7 into the exhaust 8′, passing through a muffler before finally escaping to the outer atmosphere. Exhaust from chamber 7 is controlled by means of a valve 17, operated in the usual manner through the medium of a lever 18, engaged at proper intervals by a cam 19, carried on the two-to-one gear 20, driven from a shaft 5.

The chief novelty of this invention lies in the manner of coupling up the two opposed crank-shafts so that the throw of one will counteract that of the other. In all gas-engines there occurs at the moment of each explosion an outward thrust or augmented impulse on the piston-rod and from that transmitted to the crank and fly-wheel, due to the sudden expansion of the confined gases. This is noticeable in all single-cylinder engines and gives rise to a certain amount of vibration not entirely counteracted by the fly-wheel. It is likewise apparent in engines of the present class, where the fly-wheels turn each in the same direction. It has been found by experiment that with both fly-wheels turning in the same direction and with the ends of the engine supported on springs a decided rocking motion was imparted to the engine, which with a speed of one thousand to twelve hundred revolutions a minute resolved into a pronounced vibration. On the other hand, by coupling up the fly-wheels, as shown in Fig. 1, so that they revolve in opposite directions, the outward thrust on each piston and crank being simultaneous, equal, and opposite, the above-mentioned objectionable rocking movement or vibration is eliminated. The advantage and value of such a construction is apparent where the engine is to be used in yachts, automobiles, and the like, the use for which the engine is more particularly designed.

Each fly-wheel 6 carries a gear 21, which intermeshes a corresponding gear 22 on shaft 23. The connection between the fly-wheels

is completed by the mutual engagement of the gears 22.

Either or both of shafts 23 or either or both of shafts 5 may serve as drivers.

The engine is admirably adapted for light marine work by virtue of the two oppositely-rotatable shafts 33, each operating a propeller, the reverse or back-up being obtained from the two corresponding shafts 5. For automobile purposes it is especially adapted to a system of friction transmission in which a straight disk 26 is mounted on a shaft 25, having suitable bearings and carrying a sprocket 24, over which a chain passes to the rear axle, disk 26 being engaged simultaneously and equally from its two opposite sides by friction-rollers 27 on the ends of shafts 23, which by virtue of their special construction roll in opposite directions, each exerting and transmitting an equal amount of power on and to disk 26 through rollers 27.

In an ordinary engine-cylinder explosion takes place against a solid head. Here each piston forms the cylinder-head for the other, and what is usually resolved into vibration and lost power is utilized in this case as a positive propelling force. This, together with the means shown for coupling up the fly-wheels, results in a perfect balance-engine.

The crank-cases *a* are each made in two sections divided longitudinally of the engine and united by bolts, as shown at 33. The seams between each section and between each casing and the cylinder are preferably made dust and air tight, so that the crank-fittings are perfectly protected and an air-cushion provided for each piston to work against.

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

1. In an engine, the combination of a cylinder open at both ends, oppositely-reciprocating pistons therein, piston-rods, respective crank-shafts, a drive-shaft, and intermediate gearing between said crank-shafts and the drive-shaft, said gearing including two parallel shafts having intermeshing gears engaging corresponding gears on the crank-shafts, and friction-pulleys on said parallel shafts engaging opposite sides of a similar pulley on drive-shaft.

2. In power-transmission apparatus, the combination of a single open-ended cylinder, opposed reciprocating pistons therein, piston-rods, a crank-shaft directly connected with each of said rods, fly-wheels rigid with said crank-shafts, gears on said crank-shafts, oppositely-rotatable interengaging gears meshing with said crank-shaft gears, shafts for said interengaging gears, a drive-shaft transverse to said interengaging-gear shafts, and interengaging friction-pulleys on the latter shafts and said drive-shaft substantially as described.

In witness whereof I have hereunto set my hand.

ROLLA A. MORTON.

Witnesses:
C. H. JOHNSON,
E. W. KNAPP.