J. A. DOWLING.

ENGINE.

APPLICATION FILED JUNE 26, 1908.

952,311.

Patented Mar. 15, 1910.

3 SHEETS—SHEET 1.

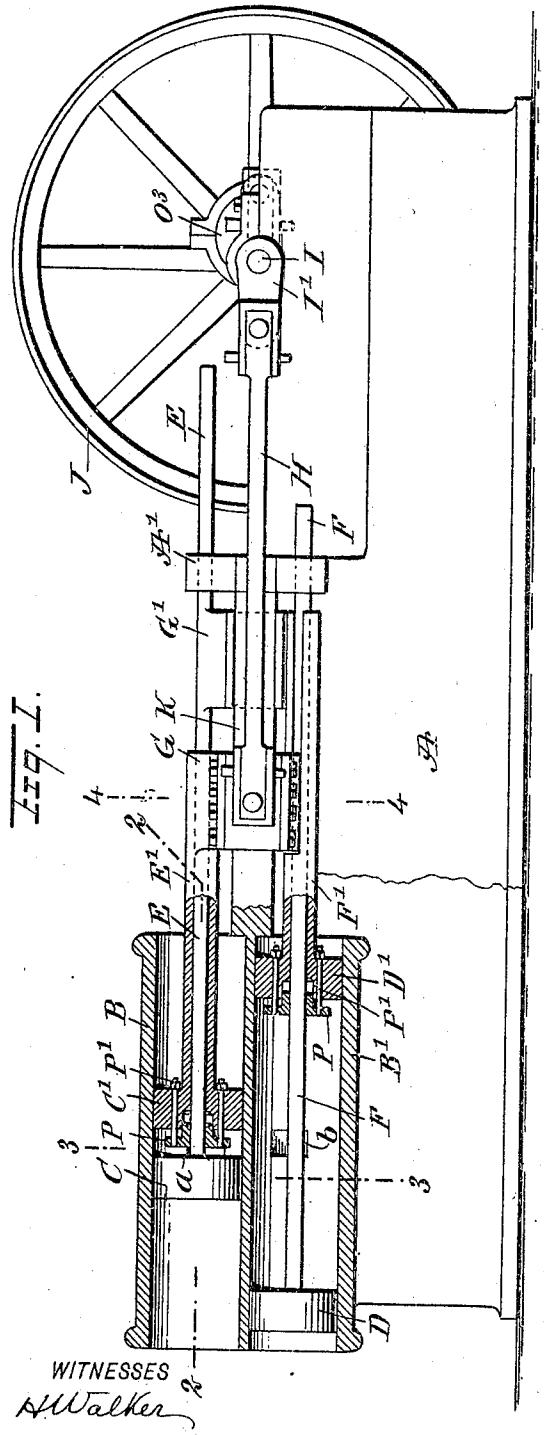

Fig. 1.

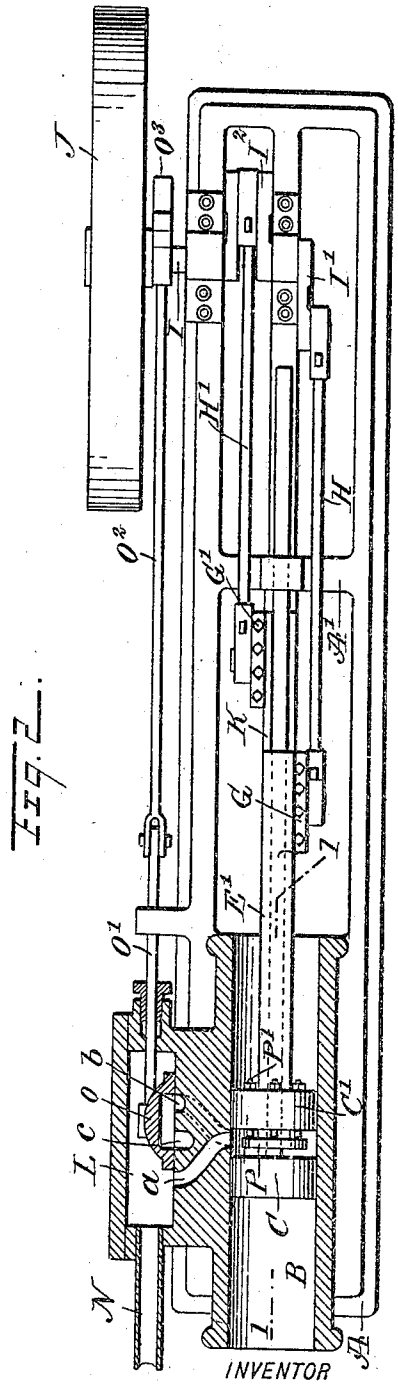

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

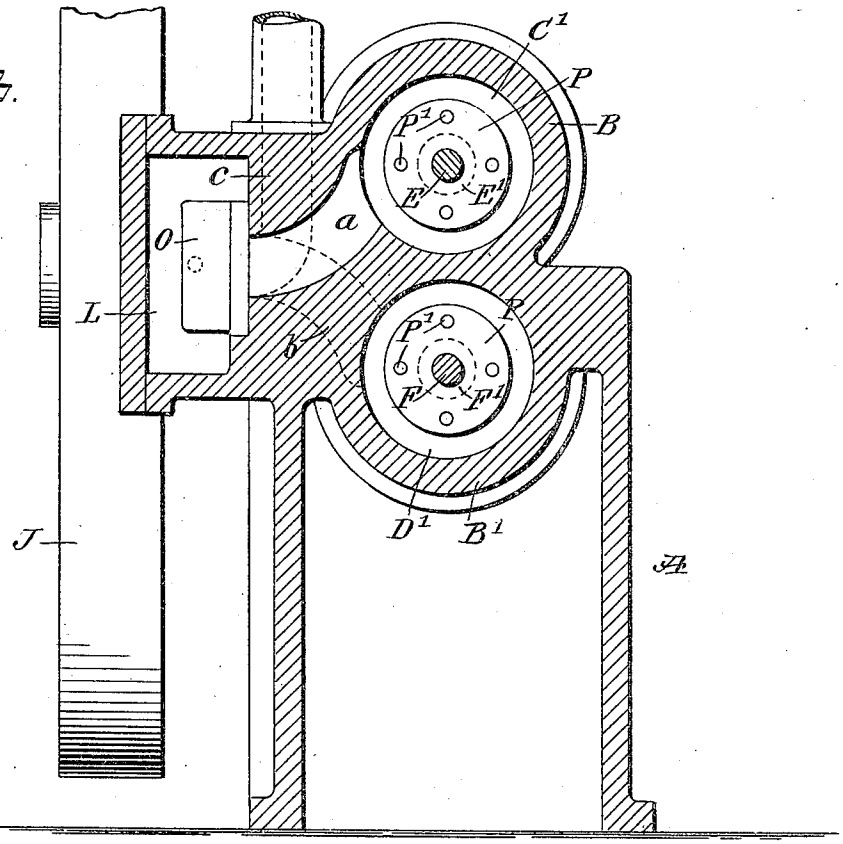
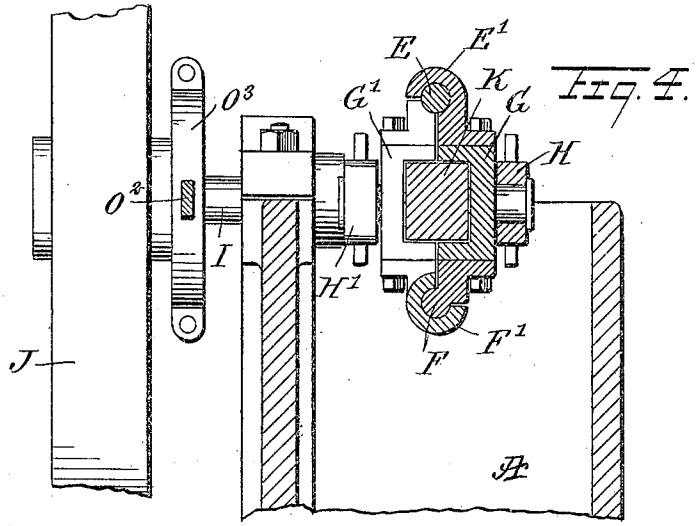


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

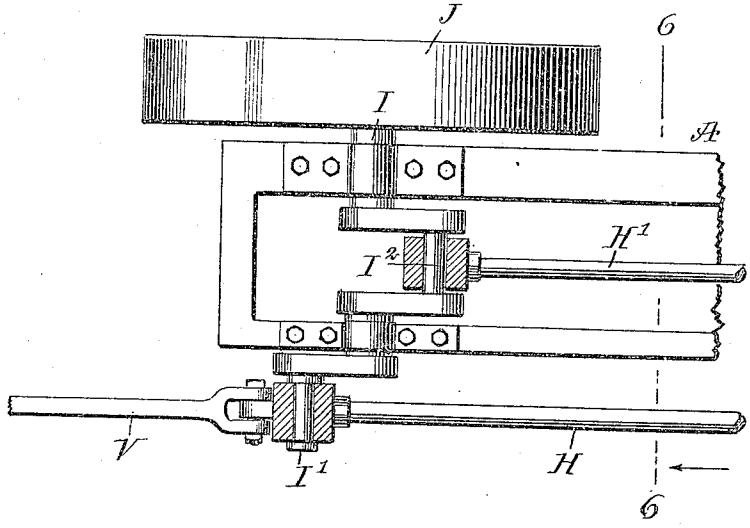
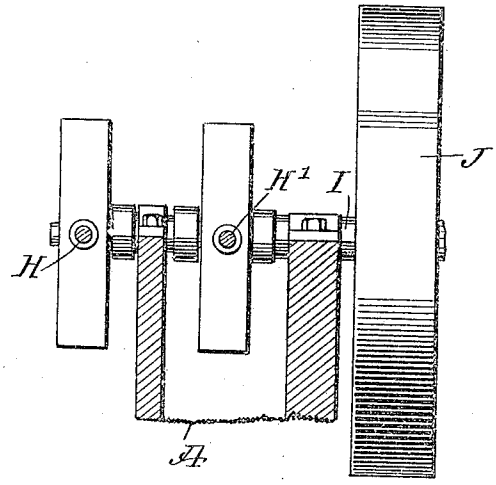


Fig. 6.



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UNITED STATES PATENT OFFICE.

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ENGINE.

952,311. Specification of Letters Patent. Patented Mar. 15, 1910.

Application filed June 26, 1908. Serial No. 440,506.

To all whom it may concern:

Be it known that I, JAMES A. DOWLING, a citizen of the United States, and a resident of Biloxi, in the county of Harrison and State of Mississippi, have invented a new and Improved Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved engine, in which the motive agent is introduced between two pistons reciprocating in headless cylinders, to utilize the motive agent to the fullest advantage and to allow of compounding the engine in a simple and efficient manner.

The invention consists of novel features and parts and combinations of the same which will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the improvement, partly in section on the line 1—1 of Fig. 2; Fig. 2 is a plan view of the same partly in section on the line 2—2 of Fig. 1; Fig. 3 is an enlarged cross section of the same on the line 3—3 of Fig. 1; Fig. 4 is a similar view of the same on the line 4—4 of Fig. 1; Fig. 5 is a sectional plan view of the double yoke of the headless twin pump cylinders; and Fig. 6 is a cross section of the same on the line 6—6 of Fig. 5.

On the main frame A of the engine illustrated in Figs. 1 to 4, inclusive, are mounted the upper and lower headless cylinders B and B′, in which reciprocate the pairs of pistons C, C′ and D, D′, respectively, of which the pistons C and D are provided with solid piston rods E and F, while the pistons C′ and D′ are provided with tubular piston rods E′ and F′, through which extend the solid piston rods E and F. The tubular piston rod E′ and the solid piston rod F are secured to a cross head G, and the solid piston rod E and the tubular piston rod F′ are secured to a cross head G′, the said tubular rods E′ and F′ being slotted for connecting the cross heads G and H with the solid rods F and E. The cross heads G and G′ are pivotally connected by pitmen or connecting rods H, H′ with the crank arms I′, I² of the engine shaft I, journaled in suitable bearings on the main frame A and carrying the usual fly wheel J. The cross heads G and G′ are mounted to slide on opposite sides of a guide bar K supported at one end by the cylinders B, B′ and at the other end by a bracket A′ held on the main frame A. The solid piston rods E and F are mounted to slide at their outer ends in bearings on the bracket A′. The crank arms I′ and I² are arranged diametrically on the engine shaft I, so that when the engine is running the pistons C and C′ reciprocate toward and from each other, while the pistons D, D′ reciprocate from and toward each other.

On the rear sides of the cylinders B and B′ is arranged a steam chest L connected by a pipe N with a boiler or other suitable source of motive agent supply, and in the said steam chest L is mounted to slide a valve O having its valve stem O′ connected with the eccentric rod O² of an eccentric O³, held on the engine shaft I; thus when the engine shaft is running a sliding motion is given to the slide valve O, to control the motive agent passing into and out of the cylinders B and B′. For the purpose mentioned the steam chest L is connected by a port *a* with the interior of the cylinder B at or near the middle thereof, and a similar port *b* connects the interior of the steam chest L with the cylinder B′ at or near the middle thereof. The slide valve O alternately connects the ports *a* and *b* with an exhaust port *c* for exhausting the motive agent from the cylinders B and B′ alternately.

The pistons C′ and D′ are provided at their inner faces with stuffing boxes P for the solid piston rods E and F to slide in, and the said stuffing boxes P are engaged by bolts P′ extending to the outer faces of the pistons C′ and D′, to allow of adjusting the stuffing boxes P from the outside without taking the engine apart.

The operation is as follows: When the several parts are in the position illustrated in the drawings, then the motive agent from the steam chest L passes by way of the port *a* into the cylinder B between the pistons C and C′, now in their innermost position as shown in Figs. 1 and 2, so that the motive agent acts on both pistons C and C′ simultaneously, to move the same in op-

posite directions. In doing so, the cross head G is moved to the right while the cross head G′ is moved to the left, and consequently the power of the pistons C and C′ is transmitted to the engine shaft I by the pitmen H, H′ and the crank arms I′, I². During the time this takes place the port *b* is connected with the port *c* so that the interior of the cylinder B′ is connected with the exhaust and consequently the motive agent contained in the cylinder B′ can pass to the atmosphere, the pistons D, D′ now moving from their outermost position toward the middle of the cylinder B′. When the sets of pistons C, C′ reach the end of their outward stroke and the pistons D, D′ reach the end of their inward stroke, then the slide valve O is shifted so as to connect the interior of the cylinder B by way of the ports *a* and *c* with the atmosphere, while the interior of the steam chest L is connected with the interior of the cylinder B′ by way of the port *b*. The motive agent thus passes into the cylinder B′ to act on both pistons D, D′ simultaneously and force the same on their outward stroke. When this takes place the motion of the cross heads G, G′ is reversed so that another impulse is given to the main shaft I. During the outward movement of the pistons D, D′ the pistons C, C′ move inward toward each other, and when the pistons reach the ends of their strokes the valve O is again shifted back to the position shown in Fig. 2, and the above described operation is repeated.

By arranging the cylinders B, B′, the pistons C, C′, D, D′, cross heads G, G′ and guide bar K in the manner described, it is evident that the construction of the engine is greatly simplified, space economized and the motive agent is utilized to the fullest advantage.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. An engine comprising a pair of headless cylinders arranged one above the other, a pair of pistons in each cylinder and movable toward and from each other, one piston of each pair having a tubular and slotted piston rod and the other piston of said pair having a solid piston rod working in the tubular piston rod, cross heads adapted to pass each other, each cross head being secured to the tubular piston rod of one cylinder and to the solid rod of the other cylinder, a horizontal crank shaft provided with oppositely arranged cranks, said shaft being arranged in the median plane of the said cylinders, and pitmen connecting the cranks with the cross heads.

2. An engine comprising a pair of headless cylinders arranged one above the other, a pair of pistons in each cylinder and movable toward and from each other, one piston of each pair having a tubular and slotted piston rod and the other piston of said pair having a solid piston rod working in the tubular piston rod, the pistons having the tubular piston rods being provided with stuffing boxes on their inner faces, cross heads adapted to pass each other, each cross head being secured to the tubular piston rod of one cylinder and to the solid rod of the other cylinder, a horizontal crank shaft provided with oppositely arranged cranks, said shaft being arranged in the median plane of the said cylinders, and pitmen connecting the cranks with the cross heads.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES ALLISON DOWLING.

Witnesses:

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V. J. A. TUCEI.