(No Model.)

G. B. BRAYTON.

Device for Reversing Motion.

No. 235,732. Patented Dec. 21, 1880.

Fig. 1.

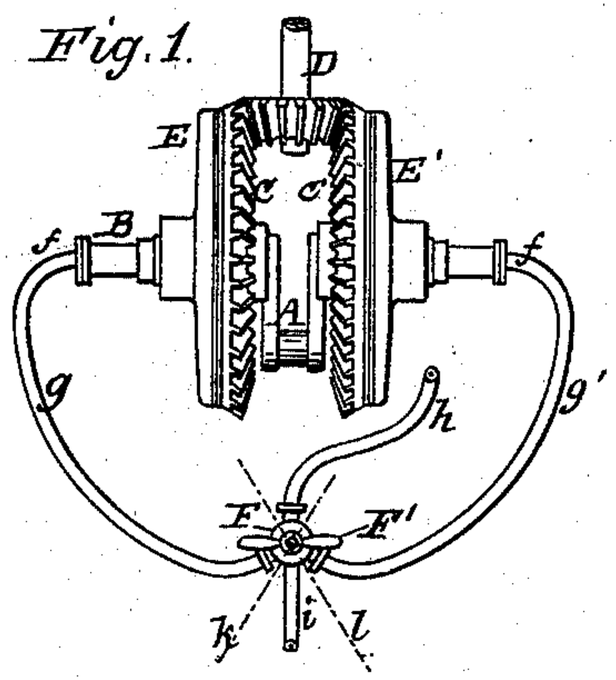


Fig. 3.

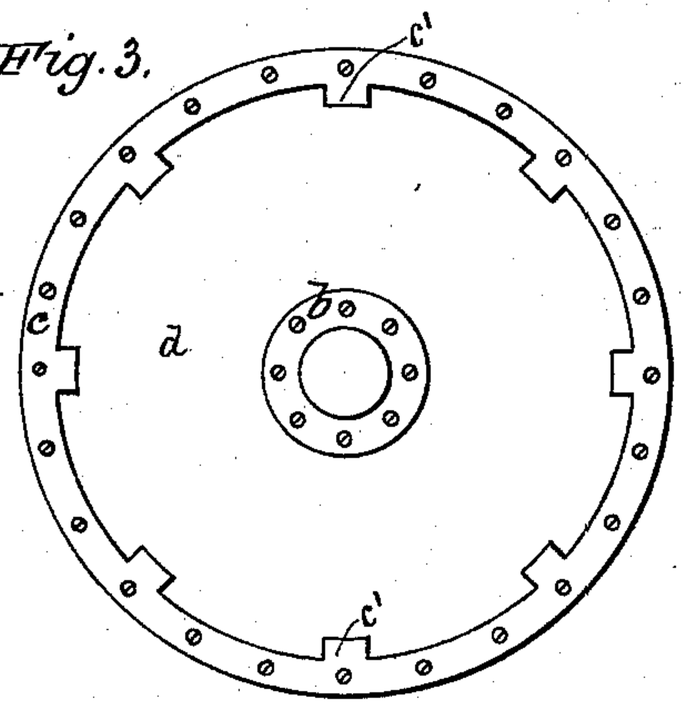


Fig. 2.

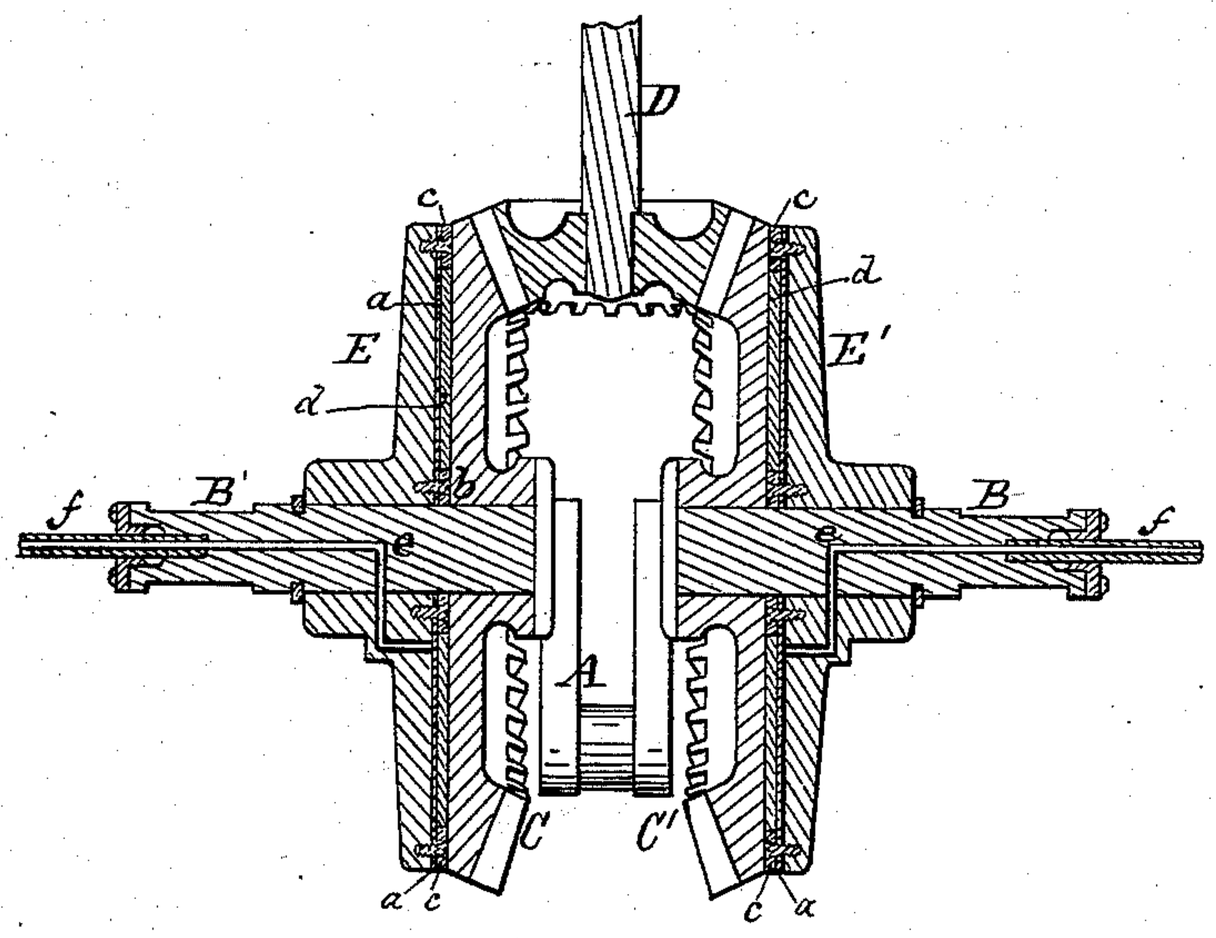
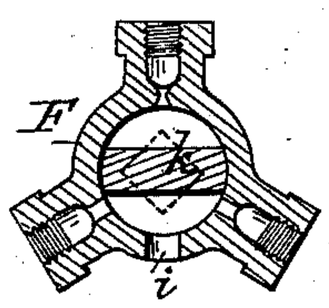


Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE B. BRAYTON, OF BOSTON, MASS., ASSIGNOR TO THE BRAYTON PETROLEUM ENGINE COMPANY, OF HARTFORD, CONN.

DEVICE FOR REVERSING MOTION.

SPECIFICATION forming part of Letters Patent No. 235,732, dated December 21, 1880.

Application filed June 7, 1880. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. BRAYTON, of Boston, in the county of Suffolk and State of Massachusetts, have invented a certain new and useful Reversing-Motion, specially designed for use with such motors as involve combustion within a piston-cylinder—as, for instance, such hydrocarbon-engines as have heretofore been patented by me—but my invention is also susceptible, in whole or in part, of use in various other connections, wherein the frequent stopping, starting, and reversing of mechanism are involved—as, for instance, in steam-hoisting engines; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of the several features of my invention.

It is well known that serious difficulties are encountered in hydrocarbon and other similar engines of the class referred to, in reversing the action of the engines, and that the provision for attaining the ends desired must be such as to admit of the continuous and unvariable action of the engine. In applying such engines to use, especially as motors for screw-propellers for yachts and other vessels, I have heretofore employed clutches and reversing-gear of various kinds on the screw-shaft; but I have now devised a reversing-motion which is applied directly to the crank-shaft of the engine.

In carrying out my invention I have availed myself of the well-known advantages incident to the friction-clutch, and also of the well-known principle involved in the employment of steam or water under pressure for operating such clutches. I use for that purpose, however, compressed air, because it is readily available from the air-reservoir employed with my hydrocarbon-engines.

The several features of my invention will be fully specified in detail in the claims annexed to this specification.

Referring to the drawings, Figure 1 is a plan view of an engine crank-shaft, a propeller-shaft, and my "reverse-motion" applied in accordance with my invention. Fig. 2 is a central sectional view of the crank-shaft gearing and the clutches employed therewith. Fig. 3 is a side view of the inner face of one of the friction-clutches which engage with the crank-shaft gearing. Fig. 4 is a central transverse section of the cock by which the friction-clutches are controlled.

It is to be understood that the crank A is keyed or otherwise secured as usual to, or forged solidly with, the two-part crank-shaft B B′, and that the bevel-gears C C′ are loosely mounted upon said crank-shaft, and that both may be separately made to drive the propeller or screw shaft D, but in opposite directions; and also that both may be so released as to allow the screw-shaft to freely revolve in either direction, according to the backward or forward motion of the vessel at the time of the disconnection of the screw-shaft from the motor. The rear sides of the bevel-gears C C′ are smoothly and truly faced off, to afford good frictional surface for the clutch-plates.

Two disks, E E′, are keyed securely to the crank-shaft, one on each part thereof. Their faces, which are coincident with the rear sides of the gears, may be truly finished or slightly concaved, and thereto is secured a strong flexible annular diaphragm, *a*, preferably composed of vulcanized gum and a textile fabric. This annular diaphragm is secured or clamped centrally to the disk by means of a clamping-ring, *b*, and screws, and at its periphery by means of a clamping-ring, *c*, as clearly shown in the drawings. Interposed between the diaphragm and the rear side of the gear is an annular friction-plate, *d*, which is prevented from rotation by means of inwardly-projecting lugs *c′* on the outer ring, *c*, and corresponding recesses in the periphery of the plate.

Each half of the crank-shaft is provided with a central longitudinal air-passage, *e*, which extends from the outer end of the shaft inward to a point adjacent to the hub of the disk mounted thereon, thence radially through the shaft into the hub, and thence through the face of the disk beneath the diaphragm.

As thus far described it will be readily understood that if air, steam, or water under pressure be admitted beneath either diaphragm

it will cause its disk to be frictionally clutched with and to drive its gear, and that the shaft to be driven by said gear will be rotated in a corresponding direction. The flexible diaphragm cannot be unduly strained, and the escape of the fluid under pressure is practically impossible. The wear of the clutch is limited to the friction-plate, and that can be readily renewed from time to time. I find that brass plates are well suited for this purpose. For attaining tight connections with the ends of the crank-shaft they are provided with packing-boxes for receiving the air-pipes *f f'*, which are well finished off externally for properly occupying the boxes.

For controlling the clutches I employ a four-way cock specially adapted for the purpose. The controlling-cock F is connected with the opposite ends of the crank-shaft by the pipes *g g'*, and with the air-reservoir, (not shown,) or equivalent source of supply for vapor or fluid under pressure, by way of the pipe *h*, and diametrically opposite this latter pipe is an exhaust-port, *i*. To obviate sudden strains, the opening of the pipe *h* into the cock-chamber has a smaller area than either of the other openings. The plug *k* occupies a diametrical position within the cock-chamber, and the plug and the outlet or clutch ports are so arranged that both of the latter may be in communication at the same time with the exhaust-port, for rendering both clutches inoperative; but under no circumstances can both clutch-ports be placed into communication with the inlet-port, nor can the inlet and outlet ports be placed in communication.

In describing the operation of the devices shown, it will be assumed that the engine is running, and that Fig. 1 shows both clutches to be free and the screw-shaft stationary. The cock-lever F' is parallel with the crank-shaft, and the pipes *g* and *g'* are both open to the exhaust-port *i*. It will also be assumed that the clutch, composed in part of disk E and gear C, is arranged for a forward movement of the screw-shaft, and E' C' for a backward movement. The movement of the cock-lever F' about one-eighth of a circle, so as to occupy the position indicated by the dotted line *k*, places the induction-port of pipe *h* into communication with the pipe *g*, and causes the clutch E C to operate in driving the screw-shaft forward. The placing of the lever in the position indicated by the dotted line *l* would operate clutch E' C', and cause the screw-shaft to be driven backward.

Although I have specially devised my reversing-motion for direct application to the crank-shaft of an engine, it will be obvious that the same mechanism may be applied to an unbroken shaft, however this latter may be driven, and that a counter-shaft corresponding with the propeller-shaft shown may be driven in either direction or allowed to remain inactive, and that said reversing-motion is capable of use in various connections.

It is also obvious that the peculiar value incident to the employment of the flexible diaphragm with its friction-plate, constructed and arranged as described, may be rendered available in connection with machines of various kinds, whether employed singly or in pairs, as herein shown.

The feature of combining friction-clutches of any kind directly with the two-part crank-shaft and with suitable gearing and controlling mechanism is believed to be novel with me, and in that connection I do not limit my invention to friction-clutches operated by air or steam under pressure, although they are deemed preferable by me to any of the various clutches containing levers, &c., as heretofore employed with friction-clutches generally.

Although I have shown the gears and disks so constructed as to co-operate in forming the clutch, I do not limit my invention to the precise construction shown, for it is immaterial in what manner the gears are frictionally clutched to the shaft, although the two clutches should be so coupled that both cannot operate at the same time, and so that both may be rendered wholly inoperative. While I prefer the flexible diaphragm for the purposes indicated, I do not limit myself to that particular device in certain combinations hereinafter specified, because friction-plates, operating as pistons within chambered disks, may be employed with the loose gears and the controlling-cock without departing from certain features of my invention, one of which embraces the combination, with keyed disks and loose gears combined to operate as clutches, of a controlling-cock, through which air or steam is supplied to and exhausted from the clutches, and another feature which embraces the combination of the controlling-cock with friction-clutches, however constructed, provided they are actuated by air, or its equivalent, under pressure, by way of the controlling-cock.

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

1. The combination, substantially as hereinbefore described, of a two-part engine crank-shaft, two friction-clutches, loose bevel-gears, and suitable controlling mechanism, whereby either of said clutches may be operated or both rendered inactive, the whole constituting a reversing-motion for a driving-shaft driven by gears on the two-part crank-shaft of an engine.

2. The reversing-motion, substantially as hereinbefore described, consisting of a shaft and keyed disks and loose gears, combined to operate as two friction-clutches by means of air, or its equivalent, under pressure, and a controlling-cock for admitting the air to or exhausting it from the clutches, as set forth.

3. The combination, substantially as hereinbefore set forth, of the disk, the flexible diaphragm, the friction-plate, and the shaft containing a passage leading to the space at the rear of the diaphragm.

4. The combination, in a friction-clutch op-

erated by air, or its equivalent, under pressure, of the flexible diaphragm, the clamping-ring provided with lugs, and the friction-plate provided with recesses in its periphery for the reception of the lugs on the clamping-ring, substantially as and for the purposes specified.

5. The clutch-controlling cock containing the main induction and the exhaust openings and the two openings for alternately operating as outlets and inlets, in combination with two reversely-operating friction-clutches adapted to be actuated by air, or its equivalent, under pressure, by way of the controlling-cock, substantially as described.

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