O. DUCKER.

EXPLOSIVE ENGINE.

APPLICATION FILED SEPT. 24, 1910. RENEWED JAN. 2, 1912.

1,038,541. Patented Sept. 17, 1912.

Fig. 1.

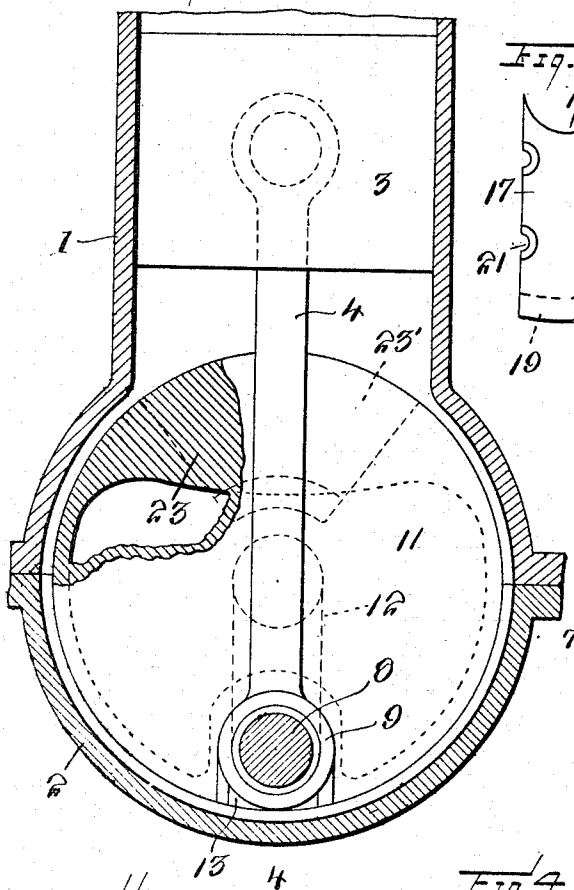


Fig. 3.

Fig. 2.

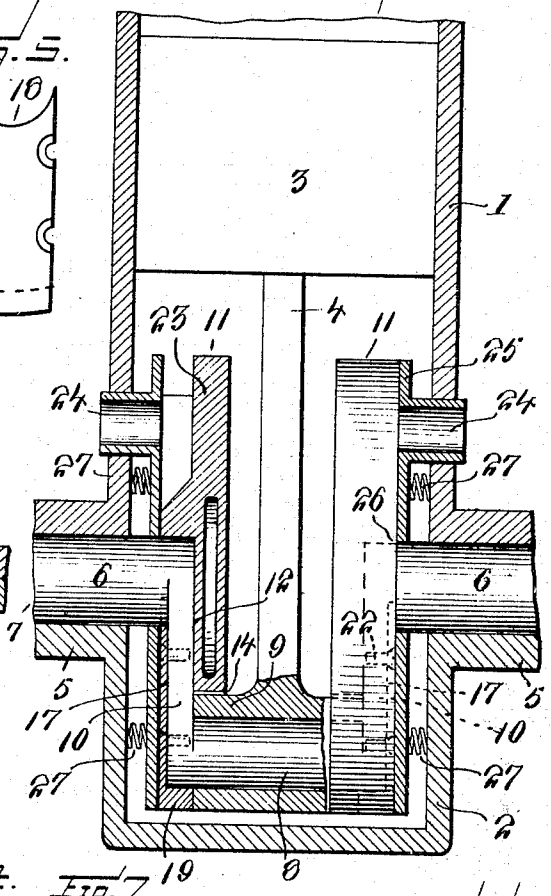


Fig. 4.

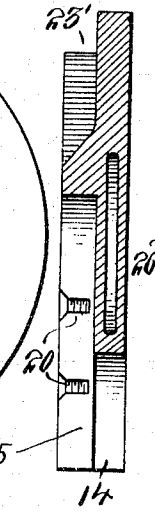


Fig. 7.

Fig. 5.

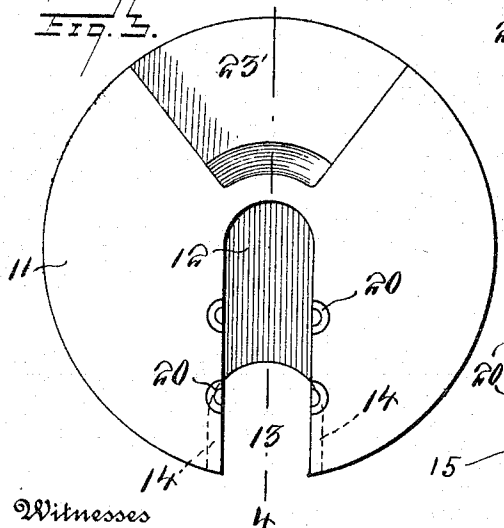
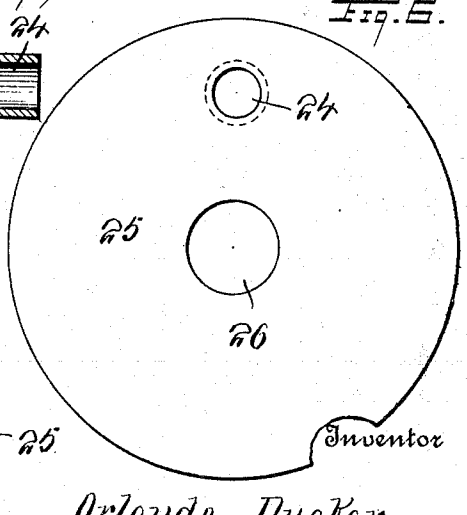


Fig. 6.



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EXPLOSIVE-ENGINE.

1,038,541. Specification of Letters Patent. Patented Sept. 17, 1912.

Application filed September 24, 1910, Serial No. 583,626. Renewed January 2, 1912. Serial No. 669,126.

To all whom it may concern:

Be it known that I, ORLANDO DUCKER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Explosive-Engines, of which the following is a specification.

This invention relates to explosive engines of the two cycle type, contemplating the provision of improved means for feeding and compressing the explosive charge and regulating the action of the power transmitting parts of the engine to secure ease of operation and freedom from excessive vibration.

One of the objects of the invention is to provide simple and effective means for counterbalancing the weight of the crank shaft, thus enabling a smaller fly wheel to be used and an easier and smoother operation of the crank and connecting rod to be obtained.

Another object of the invention is to provide means of the described character which will fill and diminish the area of the crank casing to a sufficient extent to permit high compression of the charge mixture.

Still another object of the invention is to provide simple and effective means, coöperating with the balancing means, for controlling the supply of the fuel mixture to the crank casing.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a vertical section through the crank casing and lower portion of the cylinder of a two cycle engine embodying my invention. Fig. 2 is a vertical section taken through the casing and cylinder on a plane at right angles to the plane of section shown in Fig. 1. Fig. 3 is an outer face view of one of the counterbalancing disks. Fig. 4 is a section on the line 4—4 of Fig. 3. Fig. 5 is an outer face view of the closure plate. Fig. 6 is an inner face view of one of the feed disks. Fig. 7 is a sectional view of the same.

Referring to the drawing, 1 designates the cylinder and 2 the crank casing of the engine, within which cylinder operates the piston 3 to which is coupled one end of the connecting rod 4. The casing 2 is provided with bearings 5 for the journals 6 of the crank shaft 7, to the wrist pin 8 of which the opposite end of the connecting rod is coupled by means of the usual sleeve 9.

10 are the side arms of the crank which connect the journals 6 with the wrist pin 8. Supported upon the arms 10 of the crank are counterbalancing devices 11, each consisting of a circular disk provided in its outer face with a radial recess 12 communicating at its outer end with a transverse slot 13. The recess 12 extends from the center of the disk a distance somewhat greater than one-half the distance between the center of the disk and the periphery thereof, the slot 13 extending from the outer end of said recess to and through the periphery of the disk. As shown, the said recess 12 and slot 13 respectively receive the inner end of the adjacent journal 6 and the arm 10, while the slot 13 receives and provides for the passage of the adjacent end of the wrist pin 8, such construction allowing the disk to be slidably engaged with and disengaged from the crank arm through reverse radial movements in a direction longitudinally of said arm. In its inner face the disk is formed with a recess 14 of greater width than the slot 13 and communicating therewith, said recess serving to receive and accommodate the adjacent end of the sleeve 9 and permit free relative movement thereof. This construction provides shoulders 15 at the sides of the recess 14 against which the end of the sleeve abuts, whereby the inward movement of the counterbalancing disk is properly limited. The recess 12 is of somewhat greater depth than the thickness of the arm 10 and is adapted to be closed at its outer side by a plate 17, which plate is provided at its inner end with a partially circular recess 18 to receive and accommodate the adjacent journal 6 and at its outer end with an inwardly extending lug or projection 19 to close the outer end of the slot 13 and abut against the sleeve 9 to hold the parts in position against endwise movement. The edges of the walls of the recess 12 and the edges of the plate 17 are respectively formed with semi-circular threaded recesses 20 and 21 coöperating to produce threaded openings to receive securing screws 22, whereby the plate is secured in position and the disk thus clamped upon the contiguous journal and arm of the shaft crank.

It will be observed that by the provision

of a groove 12 and a slot 13 instead of a continuous radial slot the disk is made to snugly receive and inclose the crank arm and adjacent ends of the crank wrist and sleeve, while a wall is provided at the inner side of the groove to bear against the inner side of the crank arm and serve as a rigid backing, whereby the disk is firmly held from outward lateral movement. By the use of the clamping plate to close the outer sides of the groove and slot, which plate lies flush with the outer face of the disk, said face of the disk is made continuous or without break, so as to work smoothly against the disk 25, while at the same time the plate forms a wall or backing which bears against the outer side of the crank arm and draws the backing wall of the groove firmly into contact with the arm, thus fastening the disk against possibility of independent movement, so that the retaining screws cannot work loose or become strained. The inner end wall of the groove and the projection 19 on the plate hold the disk from sliding movement in either direction while allowing free movement of the sleeve 9, as will be readily understood. By the construction described the counterweights may be applied upon detaching the removable crank case section by simply slipping the disks on or off the arms, thus avoiding the necessity of taking the crank case apart, as would be the case if the construction were such as to require the disks to be slipped over the journals 6 in the operation of applying and removing them.

The body of each counterbalancing disk is mainly hollow for purpose of lightness, but each disk is provided with a solid portion 23 at its side diametrically opposite the wrist pin of the crank shaft, the weighted portions of the disks operating to balance the weight of the crank, thus enabling a smaller fly wheel to be employed to secure a continuity of motion of the parts. As a result of this construction also an easier and smoother action of the crank and connecting rod is obtained, with a material decrease in the irregularities of motion and shocks and vibration produced in the ordinary construction of engine through the excess weight of the crank. By making the body of the disk hollow and providing it with a solid counterbalancing portion, lightness and economy of material are secured and greater accuracy insured in the distribution of the excess weight at one side of the center over constructions employing solid disks.

The outer face of each counterbalancing disk is formed with a feed cavity 23′ adapted to register with a feed fort or passage 24 through which the fuel mixture is supplied to the crank casing. As shown, the port 24 consists of a laterally extending tubular projection upon the outer face of a disk or plate 25, said projection being arranged adjacent the edge of the disk and eccentric to a central opening 26 therein through which passes the adjacent journal 6, the plate thus being held from rotary movement. Springs 27 are disposed between the side of the crank case and the plate 25 and hold the latter in close contact with the outer face of the counterbalancing disk, thus preventing the inlet of the fuel mixture through the port 24 except at such period when said port is in registry with the feed cavity 23′. While a feed connection of the character described is shown at each side of the crank casing, only one of the feed devices need be employed.

From the foregoing description, it will be apparent that the counterbalancing disks not only balance the weight of the crank but also serve to take up or occupy a portion of the interior of the crank casing, thus diminishing the internal area and charge receiving capacity of the casing. By this means the charge may be compressed to a higher degree on the compression stroke of the piston and at the same time the amount of the fuel mixture supplied to the casing to secure this result may be decreased over the customary practice. The size and the arrangement of the feed cavity 23′ in each counterbalancing disk may be such as to provide for the feed of the explosive mixture during the whole or any portion of the upward or suction stroke of the piston and the cutting off of the feed during the entire compression stroke of the piston. The advantages of my attachments will thus be readily understood, and it will be seen that the construction disclosed adapts said attachments to be applied for use upon the shaft crank and within the crank casing of any ordinary type of two cycle engine.

Having thus described the invention, what I claim as new is:—

1. A counterbalance for the crank shafts of explosive engines comprising a disk having excess weight at one side and provided in one of its faces with a radial groove communicating at its outer end with a transverse slot extending through the periphery and both faces of the disk, a clamping plate adapted to close said groove and slot, and means for securing said clamping plate to the disk.

2. A counterbalance for the crank shafts of explosive engines comprising a disk having excess weight on one side of its center and provided in one of its faces with a radial groove arranged mainly on the opposite side of its center and communicating at its outer end with a slot opening through the peripheral edge and both faces of the disk, said disk being formed in its other face

with a recess of greater width than said slot, a clamping plate adapted to fit within the groove and slot and provided at one end with a projection to close the outer end of the slot, and means for securing said clamping plate to the disk.

3. A counterbalance for the crank shafts of explosive engines comprising a disk hollow on one side of its center and having a solid portion at the opposite side of its center, said disk being formed in one face of its hollow side with a radial recess communicating at its outer end with a slot extending transversely through the disk and opening through the adjacent edge thereof, the other face of the disk being provided with a recess of greater width than the slot, a clamping plate adapted to fit within the first-named recess and slot and provided with a projection to close the outer end of the slot, and means for securing said clamping plate in position.

4. A counterbalance for the crank shafts of explosive engines comprising a disk having excess weight at one side and provided in one face with a radial groove communicating at its outer end with a slot extending through the periphery and both faces of the disk, said slot being widened on the other face of the disk, and a clamping plate adapted to fit within the radial groove and to close the outer side of said groove and the adjacent side of the slot, said plate being adapted for attachment to the disk and provided at its outer end with an inwardly extending projection to close the outer end of the slot.

5. In an explosive engine, a crank casing provided with an opening in one of its sides, a crank shaft journaled in said casing, a counterbalancing disk mounted upon one of the arms of the shaft and provided with a fuel feed recess in its outer face, a disk arranged between the first-named disk and the adjacent side of the casing and having a tubular projection forming a feed port adapted to register with said recess and projecting outwardly through said opening in the casing, and springs interposed between the second-named disk and said side of the casing for pressing said disk against the adjacent side of the counterbalancing disk.

6. In a gas engine, a cylinder, a piston therein, a crank case provided with an intake port, a crank shaft within said crank case, a disk mounted on said shaft adjacent the intake port provided with a recess on the side adjacent the intake port and wholly on one side the center of said disk extending out through the periphery thereof but not extending through said disk, said recess cooperating with said port to admit a charge of an explosive mixture radially of the disk, substantially as described.

7. In a gas engine, a cylinder having a piston to reciprocate therein, a crank case provided with an intake port, a crank shaft, a disk in said crank case rotated by the crank shaft and having a recess wholly on one side of its center, said recess extending less than through said disk and from a central part to the periphery and having walls diverging outwardly, said recess registering with the said intake port to admit a charge of an explosive mixture radially of the disk, substantially as described.

8. In a gas engine, a cylinder having a piston to reciprocate therein, a crank case provided with an intake port, a crank shaft, a disk in said crank case rotated by said crank shaft having a recess wholly on one side its center and extending less than through the disk, said recess having convergent walls from its periphery toward a central part thereof, said recess arranged adjacent the said intake port and coöperating therewith to admit a charge of an explosive mixture radially of the disk, substantially as described.

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

ORLANDO DUCKER.

Witnesses:
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