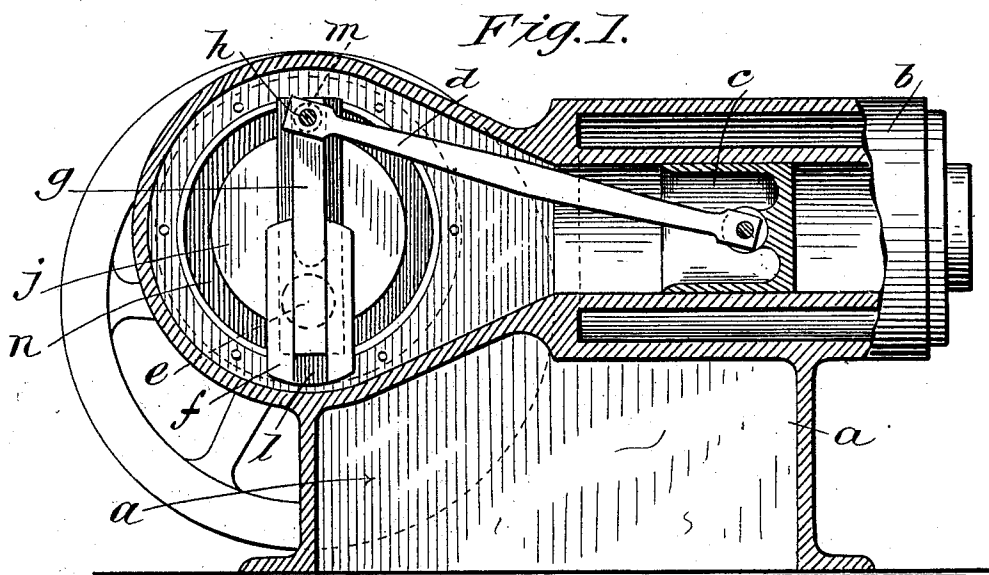
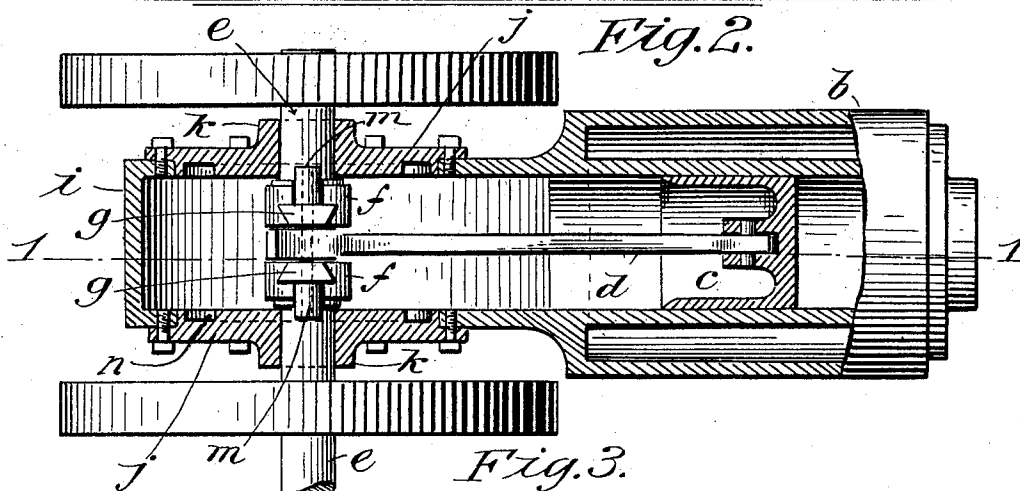
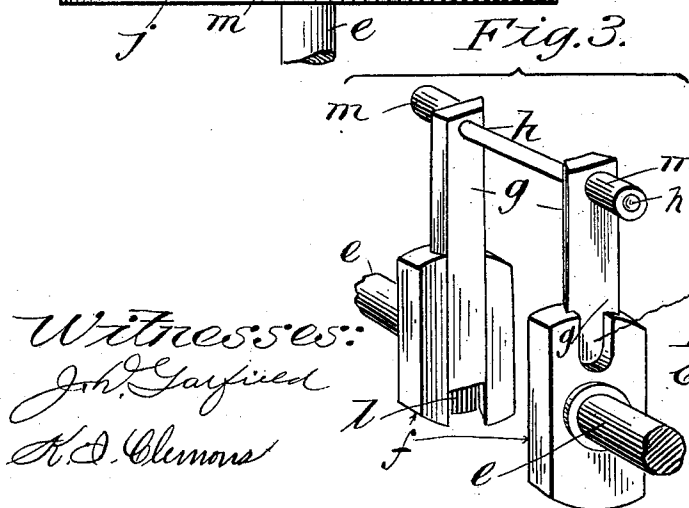


No. 763,742.

PATENTED JUNE 28, 1904.

E. E. EMERSON.
VARIABLE CRANK MOTION.
APPLICATION FILED NOV. 13, 1901.

NO MODEL.



Witnesses:
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UNITED STATES PATENT OFFICE.

ESTELON E. EMERSON, OF WILLIMANSETT, MASSACHUSETTS, ASSIGNOR OF FIFTY-ONE ONE-HUNDREDTHS TO MACE MOULTON, WILLIAM W. HERRICK, AND EDWARD W. BEATTIE, JR., OF SPRINGFIELD, MASSACHUSETTS.

VARIABLE CRANK-MOTION.

SPECIFICATION forming part of Letters Patent No. 763,742, dated June 28, 1904.

Application filed November 13, 1901. Serial No. 82,102. (No model.)

To all whom it may concern:

Be it known that I, ESTELON E. EMERSON, a citizen of the United States of America, residing at Willimansett, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Variable Crank-Motions, of which the following is a specification.

This invention relates to motors, and has especial reference to the construction of the crank-motion of single-acting motors, the object of the invention being to provide a construction in which the effective part of the stroke of the piston shall be applied to the crank-shaft through the arc of a circle having a longer radius than the arc described by the return or ineffective stroke of said piston.

In the drawings forming part of this application, Figure 1 is a vertical sectional view on line 1 1, Fig. 2, of a motor having my invention applied thereto. Fig. 2 is a sectional plan view of the same. Fig. 3 is a perspective view of the cranks and a portion of the crank-shaft.

Referring to the drawings, *a* indicates the base of a motor; *b*, the cylinder thereof; *c*, the piston; *d*, the piston-rod; *e*, the two-piece crank-shaft, having thereon the grooved T-heads *f*. *g* is the crank, having a sliding movement at right angles to the axis of the crank-shaft in said T-heads *f*.

h indicates a wrist-pin.

In the type of motor shown herein a crank-casing is shown cast integrally with the cylinder and is indicated by *i*, on the opposite sides of which circular openings are provided concentric to the axis of the crank *g*, into which openings are fitted the plates *j*. In these plates *j* bearings are provided for the crank-shaft *e* and are indicated by *k*.

The crank-shaft is in two parts, the inner end of each having secured thereto the heads *f*, which are located transversely thereof and which are provided with the dovetailed groove *l*, in which the similarly-shaped cranks *g* may slide. As shown in the drawings, these cranks are connected together at their upper ends by

the wrist-pin *h*, thus connecting the two parts of the crank-shaft *e*, and this pin extends through the cranks, and on the outer side of the latter are two freely-rotatable rolls *m*, which are adapted to enter the annular groove *n*, formed in each of the plates *j* eccentrically to the crank-shaft *e*; this groove determining the stroke of the piston. It is thus seen by a glance at the drawings that both sections of the crank-shaft *e* will rotate as one through the connection of the wrist-pin *h* with the upper ends of the cranks *g*; but as far as the crank-arm *g* is concerned it has a variable radius relative to the axis of the crank-shaft. In the position shown in Fig. 1 the crank is shown extended to the point of its longest leverage, and it is at this point that it receives the maximum effect of the piston-stroke, and as the crank travels from said position through the next half-circle the radius of the crank gradually decreases until at the opposite point it passes quite close to the axis of the crank-shaft *e*. By confining the upper end of the cranks *g* to a true circular path, as is done by means of the rolls *m* and the groove *n*, there is imparted to the crank-shaft and its connections great steadiness of rotation, notwithstanding the eccentricity of the path of the crank *g* relative to the axis of the crank-shaft.

The above-described device is particularly applicable to explosion-engines, wherein all of the power must be applied to the crank-shaft at a certain point in the revolution of the latter in order to utilize to the highest degree the pressure developed in the cylinder. This pressure increases in proportion to the degree of compression of the explosive charge, and this is herein attained at less cost of power by reason of the shortening of the radius of the crank-arm on the compression-stroke than in motors whose crank motion is concentric to the axis of the crank-shaft. The result of this construction, therefore, in motors of the explosive or internal-combustion type is an increased efficiency due to the lengthening of the crank leverage following for a certain time the explosion of the charge, whereby

the maximum of the effect is transmitted to crank-shaft and balance-wheel, and to the subsequent shortening of said crank leverage during that portion of the revolution of the motor in which the stored energy in the balance-wheel is being applied to the compression of the next charge.

At that point in the rotation of the cranks when the wrist-pin would be opposite to its location shown in Fig. 1 the rolls *m* would come in contact with the end of the heads *f* if the latter were left solid; but to accommodate said rolls a slot *o* is cut in that end of said heads next to the rolls *m*, into which the latter may enter during that part of the revolution referred to.

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

The combination with a motor having a crank-casing extending from the cylinder and

provided with openings in its opposite sides, of removable plates fitted in said openings, each plate provided with concentric grooves, crank-shafts journaled in the plates at a point below the horizontal diameter of the grooves, transversely-disposed grooved heads on the ends of the crank-shafts provided with slotted ends, crank-arms slidably mounted in said grooves, a wrist-pin connecting the crank-arms and extending laterally from the ends thereof and adapted to enter the grooves in the plates and the slots in the heads, and a piston-rod journaled on the wrist-pin between the crank-arms, whereby the crank leverage is lengthened and shortened upon the explosion and compression-stroke respectively.

ESTELON E. EMERSON.

Witnesses:

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