J. T. WEINZIERL & J. STURTEVANT.

SAFETY STARTING CRANK FOR EXPLOSIVE ENGINES.

APPLICATION FILED DEC. 19, 1910.

1,040,598.

Patented Oct. 8, 1912.

Fig. 1.

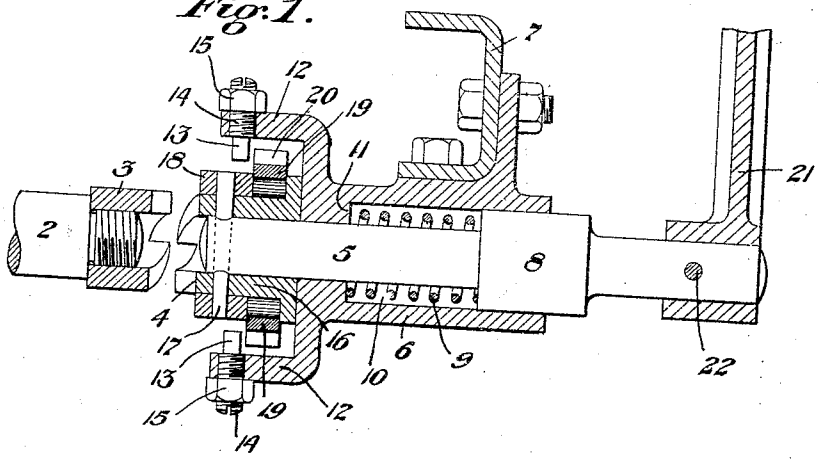


Fig. 2.

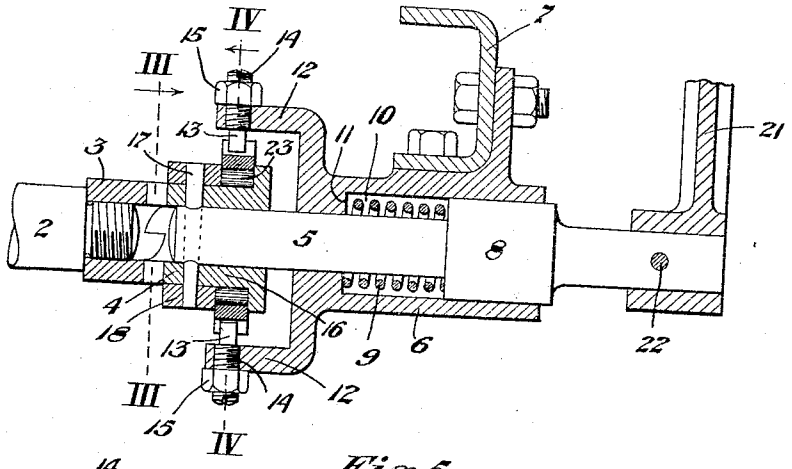


Fig. 3.

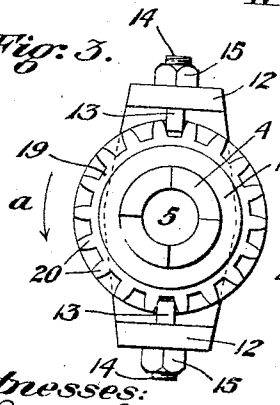


Fig. 5.

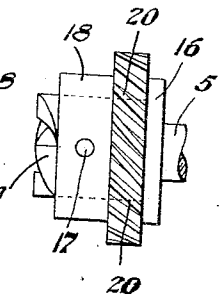
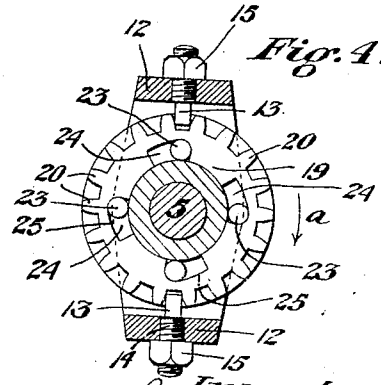


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH T. WEINZIERL AND JULIUS STURTEVANT, OF NEW KENSINGTON, PENNSYLVANIA.

SAFETY STARTING-CRANK FOR EXPLOSIVE-ENGINES.

1,040,598. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed December 19, 1910. Serial No. 598,058.

To all whom it may concern:

Be it known that we, JOSEPH T. WEINZIERL and JULIUS STURTEVANT, citizens of the United States and of the Empire of Germany, respectively, residing at New Kensington, in the county of Westmoreland and State of Pennsylvania, have invented certain new and useful Improvements in Safety Starting-Cranks for Explosive-Engines, of which the following is a specification.

Our invention consists of an improvement in safety starting cranks for explosive engines, having for its object to provide means for actuating the main shaft of an explosive engine in the normal direction of its rotation and provided with means for immediate automatic disconnection of the crank upon reversal of said movement, due to "back firing" or any other cause.

Generally stated, the starting crank, which is normally disconnected from the engine shaft, is adapted to be normally held outwardly in disengaged position therefrom by spring mechanism and to be thrust into clutch engagement with the shaft, and is provided with ratchet mechanism permitting the crank to be turned in the direction of normal rotation of the engine, but effecting the disconnecting operation by means for shifting the starting crank longitudinally away and in disengagement from the engine shaft.

In the embodiment of the invention as disclosed in the drawings of the present application: Figure 1 represents a longitudinal sectional view of the mechanism in its normal retracted position. Fig. 2 is a similar sectional view showing the crank thrust into rotative engagement with the engine shaft. Fig. 3 is a cross sectional view on the line III. III. of Fig. 2. Fig. 4 is a similar view on the line IV. IV. of Fig. 2. Fig. 5 is a detail plan view of the abutment ring and its connected parts.

2 represents the engine shaft provided with the usual terminal clutch 3 having clutch teeth adapted to be engaged by the teeth of a clutch 4 mounted on the inner end of crank shaft 5. Said crank shaft is rotatably mounted in a bearing or housing 6 secured to the front end sill 7 of the chassis of an automobile or other corresponding portion of the framework of any structure in which the engine is used.

Crank shaft 5 is preferably provided with an annular enlargement 8 providing an inner shoulder against which bears the end of the retracting spring 9 mounted in a cavity 10 in housing 6 bearing by its other end at the one end of said cavity, against the stationary shoulder 11. Surrounding the crank shaft 5 at the inner end of housing 6, and fixedly incorporated therewith, as by integral extensions 12 are one or more inwardly extending abutments 13, formed by the terminals of stud bolts 14 secured in the extensions 12 by nuts 15, or otherwise as desired. Embracing the inner end of crank shaft 5 is a sleeve 16, fixedly secured thereto by any suitable means as a pin 17, together with an additional ring 18, or other limiting device, similarly secured. Loosely mounted around sleeve 16 is a ring 19 having a series of annular abutments 20 arranged at an angle of about 45°, more or less, and adapted to inter-engage with the stationary abutments 13 when the shaft 5 is thrust inwardly. Each one of said series of annular abutments 20 is in effect an inclined plane which when the crank shaft 5 is thrust inwardly and turned in the normal direction to engage clutches 3, 4, will effect interlocking engagement of the abutments of sleeve 19 with abutments 13, whereby to hold the ring against rotation. On the other hand, when, due to any cause crank shaft 5 is reversed and its motion is imparted to sleeve 16, the rotative action will effect outward travel and disconnection of sleeve 19 from abutments 13, due to the inclination of the inter-engaging inclined abutments 20.

The crank shaft 5 is provided with the usual crank 21 fixedly secured by a pin 22 or otherwise and having a terminal handle, not shown. For the purpose of permitting rotation of the crank by its handle in cranking the engine shaft 2 in the usual direction, clockwise, without impartation of any rotative movement to sleeve 19 and of effecting immediate clutch engagement between the sleeve 16 of shaft 5 and said sleeve 19, upon reversed movement of the engine shaft and crank 5, due to "back firing", etc., a series of rollers or balls 23 are interposed between

the exterior of sleeve 16 and a series of receiving sockets 24 having inclined faces 25 on the inner portion of sleeve 19. These rolling bearings are of well known construction and function and are in effect another form of ratchet mechanism permitting free rotation of the crank in cranking independent of sleeve 19, but effecting immediate interlocking engagement therewith upon reversal of the engine shaft 2 and the crank shaft 5 and its crank 21. By this construction, it will be seen that the crank shaft 5 will be normally held outwardly by spring 9, clutches 3, 4, being disconnected, and abutments 13 and 20 being likewise disconnected as in Fig. 1. When the operator grasps the handle of crank 21 and thrusts the shaft 5 inwardly, the shaft will rotate slightly in the direction of the arrow *a*—due to the ratchet engagement of bearing surfaces 25—as affected by the interlocking engagement of the abutments 13—20. Upon rotation of crank shaft 5, engine shaft 2 will thereby be rotated in the proper or normal direction, the sleeve 16 rotating freely within the ratchet devices 23.

Upon occurrence of a "back fire" in the cylinders or undue resistance from any other cause, and resulting reversal of the engine shaft 2, the crank shaft 5 will also be reversed, whereupon the immediate effect is to thrust the crank shaft outwardly, due to the fact that the slightest reverse rotation of shaft 5 and the sleeve 16 will cause an interlocking engagement by the ratchet devices 23, between the said sleeve and sleeve 19. Thereupon rotation of said sleeve 19 in a reversed direction, effects outward thrust and resulting immediate disconnection of abutments 20 from abutments 13, in connection with the assisting effect of spring 9, which action promptly disengages clutches 3, 4. The reverse rotative movement imparted to the crank shaft 5 is merely that corresponding to the number of radial degrees between the terminals of the inclined abutments 20, which is very slight, and not sufficient to endanger the operator.

It will be observed that with the construction as thus shown and described the crank shaft may be freely rotated in either direction when in its outwardly thrust position, quite independent of the inter-engaging parts, which do not become operative until the crank shaft is first thrust inwardly.

We are aware that it is not broadly new to utilize cam surfaces and ratchet controlled elements for effecting a similar purpose to that above described, and do not broadly claim the same. The particular advantage of the present construction is that the mechanism is very compactly assembled entirely within the inner portion of the housing 6, and avoiding the presence of any special parts at the outer portion of the crank shaft adjacent to the crank.

What we claim and desire to secure by Letters Patent is:—

1. The combination with an engine shaft provided with a clutch coupling; of a fixed housing having an inner abutting surface and an outer cylindrical shaft receiving cavity, a crank shaft rotatably mounted in the housing having a limited range of longitudinal movement therein and provided with a clutch for engagement with the engine shaft clutch, a spring within the housing adapted to hold the crank shaft and clutch in normal inoperative position away from the engine shaft clutch, inwardly extending stationary abutments supported by arms extending outwardly and backwardly from the inner end of said housing, a sleeve fixedly secured to the inner end of the crank shaft, a sleeve loosely mounted around said sleeve having an annular series of inclined abutments for engagement with the first named abutments, and means between said sleeves for effecting interlocking engagement of said parts upon reverse movement of the shaft, substantially as set forth.

2. The combination with an engine shaft provided with a clutch coupling; of a fixed housing having an inner abutting surface and an outer cylindrical shaft receiving cavity, a crank shaft rotatably mounted in the housing having a limited range of longitudinal movement therein and provided with a clutch for engagement with the engine shaft clutch, a spring within the housing adapted to hold the crank shaft and clutch in normal inoperative position away from the engine shaft clutch, inwardly extending stationary abutments supported by arms extending outwardly and backwardly from the inner end of said housing, a sleeve fixedly secured to the inner end of the crank shaft, a sleeve loosely mounted around said sleeve having an annular series of inclined abutments for engagement with the first named abutments, said outer sleeve having in its interior one or more wedging surfaces, and rolling locking devices interposed between the fixedly secured sleeve and the surfaces of said outer sleeve for effecting interlocking engagement between said parts upon reverse movement of the shaft, substantially as set forth.

3. The combination with an engine shaft provided with a clutch coupling; of a fixed housing having a shaft receiving cavity in longitudinal alinement with the engine shaft provided at its end adjacent to the clutch coupling thereof with a bearing face and outwardly and backwardly projecting arms carrying fixed inwardly extending abutment pins, a crank shaft rotatably mounted in the housing having a limited

range of longitudinal movement therein and provided with a terminal clutch adapted for engagement with the clutch of the engine shaft, a spring within the housing adapted to hold the crank shaft and clutch in a normal inoperative position, a crank secured to the outer end of the crank shaft, a sleeve fixedly secured to the inner end of the crank shaft, a sleeve loosely mounted around said sleeve provided with an annular series of inclined abutments for engagement with said pin abutments and having on its interior one or more wedging surfaces, and interlocking rolling devices between the fixed sleeve and said loosely mounted sleeve for effecting interlocking engagement of said parts upon reverse movement of the shaft, substantially as set forth.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

JOSEPH T. WEINZIERL.
JULIUS STURTEVANT.

Witnesses:
C. M. CLARKE,
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."