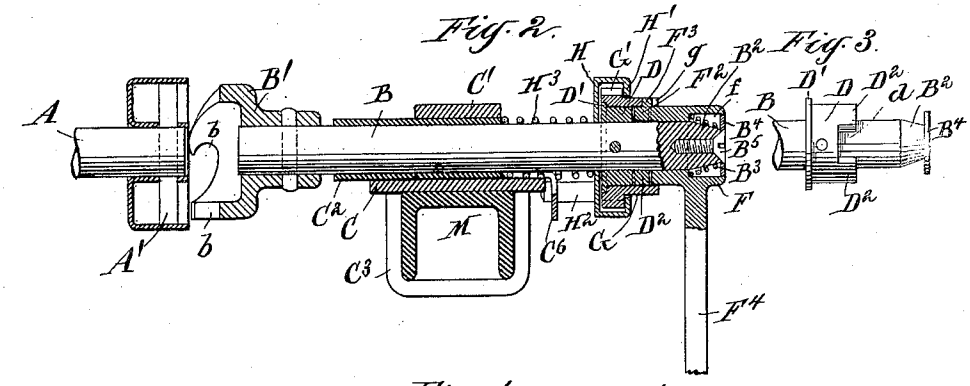
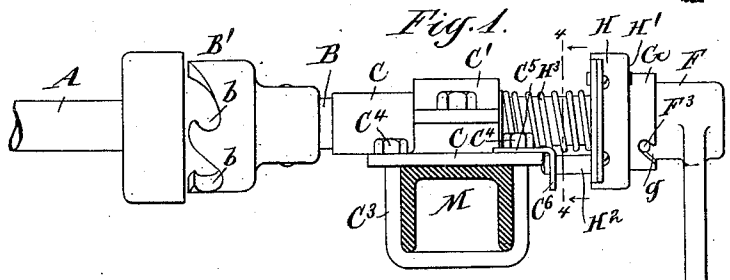
M. M. BALSAM.

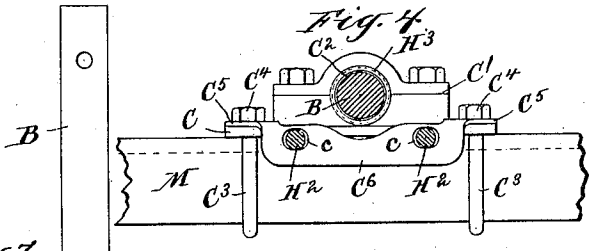
STARTING MECHANISM FOR INTERNAL COMBUSTION ENGINES.

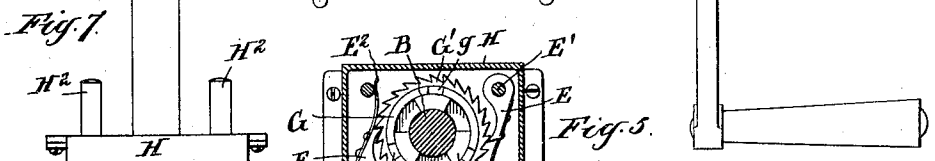
APPLICATION FILED FEB. 18, 1919.

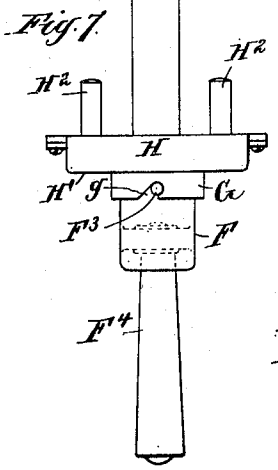
1,338,668. Patented May 4, 1920.

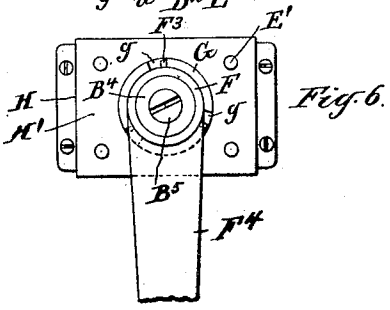












INVENTOR

Maurice M. Balsam,

BY

Charles R. Searle

ATTORNEY

UNITED STATES PATENT OFFICE.

MAURICE M. BALSAM, OF NEW YORK, N. Y.

STARTING MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

1,338,668. Specification of Letters Patent. Patented May 4, 1920.

Application filed February 18, 1919. Serial No. 277,831.

To all whom it may concern:

Be it known that I, MAURICE M. BALSAM, a citizen of the United States, residing in the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Starting Mechanism for Internal-Combustion Engines, of which the following is a specification.

The invention relates to safety devices employed in "cranking" the motor, and the object of the invention is to provide simple, inexpensive, and self-contained mechanism adapted to serve with the motor-shaft, whereby the dangerous effects of preëxplosion or "kick" are avoided, and which may be easily applied to or substituted for the usual cranking means now employed on various types of cars and trucks.

The invention consists in certain novel features and details of construction and arrangement by which the above objects are attained, to be hereinafter described and claimed.

The accompanying drawings form a part of this specification and show an approved form of the invention.

Figure 1 is a side elevation of the device mounted on a transverse member of the chassis, shown in cross-section.

Fig. 2 is a corresponding vertical axial section, partly in elevation.

Fig. 3 is an elevation of the forward portion of the starting-shaft alone.

Fig. 4 is a transverse section taken on the line 4—4 in Fig. 1, showing a portion of the mechanism in front elevation.

Fig. 5 is a vertical transverse section through the starting-shaft and a portion of a casing thereon, showing the inclosed parts in elevation.

Fig. 6 is a front elevation of the device.

Fig. 7 is a plan view of the starting-shaft and its connected parts.

Similar letters of reference indicate the same parts in all the figures.

A is the forward end of the crank or motor-shaft of the engine, having a cup and transverse pin A^1 therein adapted to be engaged by the spiral notches *b* of a clutch B^1 on the starting-shaft B when the latter is forced rearwardly into such engagement, as usual.

The starting-shaft is mounted in a tube C^2 held in axial alinement with the motor-shaft in a housing C^1 on a transversely extending horizontal plate C firmly held to the beam M of the chassis by yokes C^3 and nuts C^4 thereon. The tube C^2 offers a long bearing and guide for the midlength of the starting-shaft and permits the latter to slide axially therein.

Near the forward end of the shaft B is secured a collar D having a circumferential flange D^1 on its rear end and its front deeply notched as at *d* to form a number of radial clutch sectors D^2 separated by the notches or depressions *d*, adapted to match to and engage corresponding radial clutch sectors F^2 on a sleeve F slidably mounted on the front end of the shaft B.

Inclosing the rear portion of the collar D is a ratchet-wheel G^1 formed on a hub G projecting forwardly slightly beyond the clutch sectors D^2, and having on its forward edge or rim a plurality of notches *g* arranged to receive a corresponding number of radial pins F^3 on the periphery of the sleeve F. The ratchet-wheel and its hub are held in place by the engagement of the flange D^1 on the collar D with a corresponding annular recess in the rear of the ratchet-wheel, and the front plate H^1 of a rectangular casing H against which the forward face of the ratchet-wheel contacts.

The rear plate of the casing covers the rear face of the collar D and ratchet-wheel and the casing is held against rotation with the shaft B and its connected parts, by two rearwardly projecting posts H^2 slidably received in holes *c* in a downwardly projecting flange C^6 on a fixed bracket C^5 secured upon the plate C by the yoke-nuts C^4. A helical expansion spring H^3 abutting at one end against the housing C^1 and at the other against the rear plate of the casing H serves to hold the shaft B normally forward with its clutch B^1 out of engagement with the pin A^1.

The front end of the sleeve F is recessed as at *f* and the front end of the shaft B is tapered as at B^2 at the front to provide space for a spiral expansion spring B^3 abutting at the rear against the bottom of the recess *f* and at the front against a disk B^4 secured to the end of the shaft B by an axial screw B^5; the disk is adapted to be received in the recess when the sleeve is moved outwardly relatively to the shaft. A crank F^4 on the sleeve F affords means for turning the latter and the starting-shaft B.

Within the casing H are mounted two

pawls E, one on each side on studs E^1 and each has a spring E^2 holding it yieldingly to the ratchet-wheel G^1.

The notches *g* are so shaped as to receive the pins F^3 and permit the ratchet-wheel G^1 with its hub, and the collar D engaged by its sectors D^2 with the sectors F^2 of the sleeve, all to turn together and rotate the shaft B when the crank F^4 is turned in the direction to start the engine, but a reverse movement of these parts is resisted by the pawls E which hold the ratchet-wheel and cause the pins F^3 to ride forwardly on the inclined faces of the notches *g* and rest upon the rim or edge of the collar. This forward movement thus caused, is sufficient to withdraw the sectors F^2 from engagement with the sectors D^2 of the collar and free the sleeve and crank from participation in the reverse movement.

In starting the engine the shaft B and its crank F^4 and other connections are forced axially toward the rear against the resistance of the spring H^3, and the clutch B^1 is engaged with the pin A^1 on the motor-shaft. The casing H moves rearwardly with the starting-shaft B but is held against rotation by the posts H^2 engaged in the holes *c* of the bracket C^5. Thus conditioned the motor-shaft A is rotated in the direction to induce the initial compression and explosion in the motor; when thus started the rotations of the motor will automatically force the starting-shaft forward and disengage the clutch B^1 from the pin A^1 by reason of the inclination of the clutch-notches *b*. In the event of pre-explosion or "kick", the impulse is so sudden that disengagement of the clutch B^1 from the pin A^1 cannot take place; when this occurs the reverse movement of the starting-shaft B tends to carry with it the ratchet-wheel G^1, sleeve F and crank F^4 but the ratchet-wheel is held by its pawls E and the movement results in instantly forcing the sleeve F forward by the movement of its pin F^3 along the inclines of the notches *g* and this forward movement of the sleeve disengages the sectors F^2 D^2 leaving the sleeve F and its crank F^4 free. This unlocking or release of the sleeve and its crank is practically instantaneous and takes place with so little reverse travel of the crank as to be entirely harmless. The arc of crank-travel depends largely on the location of the pawls relatively to the next tooth of the ratchet-wheel, and by making the space between the teeth short, or by arranging the pawls as shown so that a peripheral movement equal to one half a tooth-space will bring one or the other pawl into engagement, or, by a combination of both methods, the arc of back travel or throw of the crank may be reduced to a negligible minimum.

It will be noted that the mechanism occupies but little space and is designed to be substituted for the usual crank with but little alteration, and that the operation of cranking is in all respects as usual, while the danger of accident is eliminated.

I claim:—

1. A starting-crank release for internal combustion engines, consisting in the combination with the motor-clutch of such engine, of a starting-shaft mounted to slide axially and engage such clutch, a relatively fixed bearing for said starting-shaft serving as a guide for such axial movement, a collar fixed on said starting-shaft, clutch sectors on said collar, a sleeve slidable on said starting-shaft and having clutch sectors adapted to engage said collar-sectors, a ratchet-wheel and hub therefor inclosing said collar, said hub having inclined notches in its rim, pins on said sleeve adapted to engage such notches, a casing inclosing said collar and ratchet-wheel and adapted to hold the latter against axial movement, pawls in said casing arranged to co-act with said ratchet-wheel, a crank on said sleeve, and means for holding said casing against rotation and permitting axial movement of the starting-shaft and casing.

2. A starting-crank release for internal combustion engines, consisting in the combination with the motor-clutch of such engine, of a starting-shaft mounted to slide axially and engage such clutch, a relatively fixed bearing for said starting-shaft serving as a guide for such axial movement, a collar fixed on said starting-shaft, clutch sectors on said collar, a sleeve slidable on said starting-shaft and having clutch sectors adapted to engage said collar-sectors, a ratchet-wheel and hub therefor inclosing said collar, said hub having inclined notches in its rim, pins on said sleeve adapted to engage such notches, a casing inclosing said collar and ratchet-wheel and adapted to hold the latter against axial movement, pawls in said casing arranged to co-act with said ratchet-wheel, a crank on said sleeve, posts on said casing, a bracket on said bearing having openings for the reception of said posts and serving to permit axial movement of said starting-shaft and casing and to hold said casing against rotation.

3. A starting-crank release for internal combustion engines, consisting in the combination with the motor-clutch of such engine, of a starting-shaft tapered at its forward end, mounted to slide axially and engage such clutch, a relatively fixed bearing for said starting-shaft serving as a guide for such axial movement, a collar fixed on said starting-shaft, clutch sectors on said collar, a sleeve slidable on said starting-shaft and having clutch sectors adapted to engage said collar sectors, a ratchet-wheel and hub therefor inclosing said collar, said hub having inclined notches in its rim, pins on said sleeve

adapted to engage such notches, a casing inclosing said collar and ratchet-wheel and adapted to hold the latter against axial movement, pawls in said casing arranged to co-act with said ratchet-wheel, a crank on said sleeve, coöperating means on said casing and bracket serving to permit axial movement of said starting-shaft and casing and to hold said casing against rotation, a recess in said sleeve inclosing said tapered portion of said starting-shaft, a disk on the end of said starting-shaft, and a conical spiral spring in said recess tending to force said sleeve rearwardly and to hold said pins in engagement with said notches and said sectors in engagement with each other.

In testimony that I claim the invention above set forth I affix my signature.

MAURICE M. BALSAM.