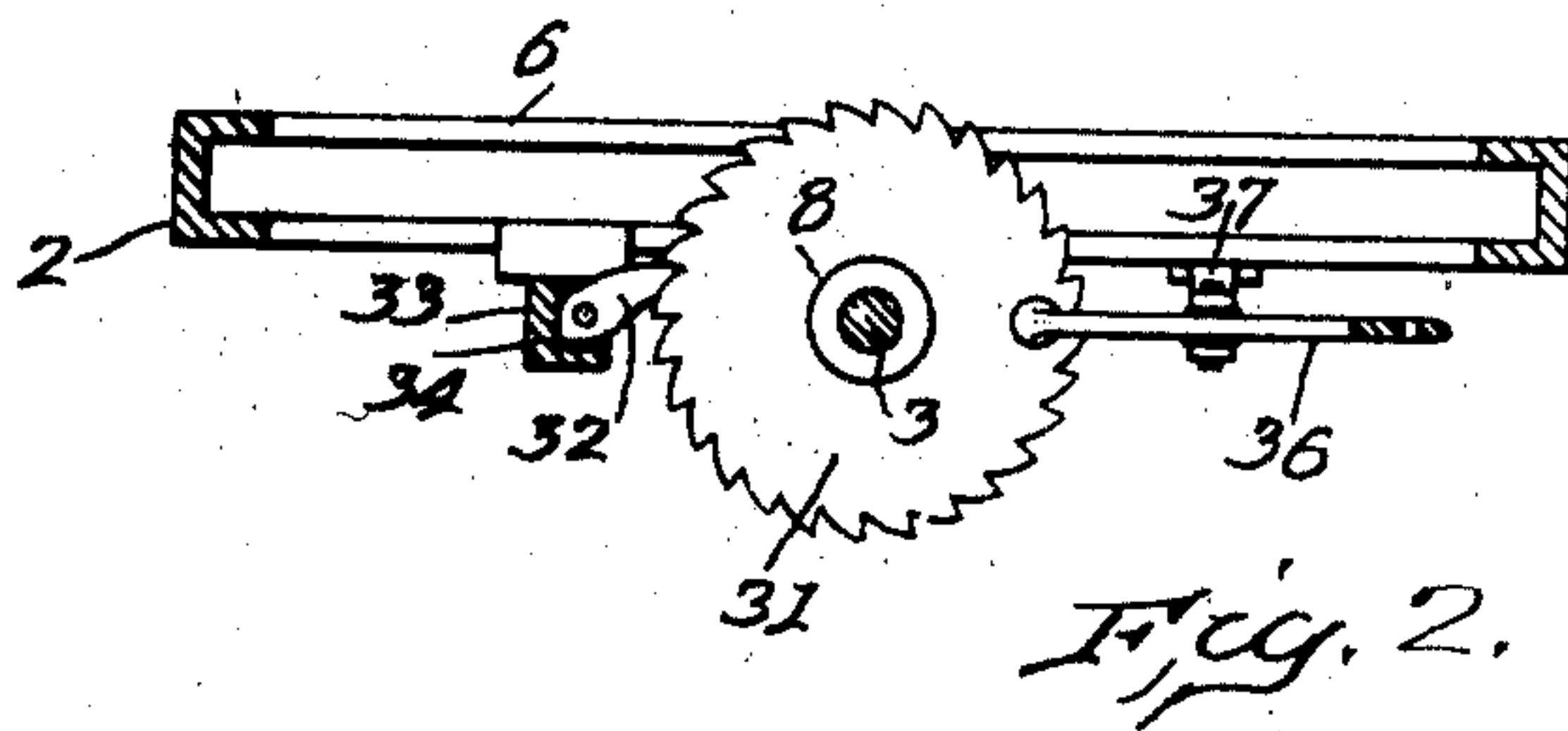
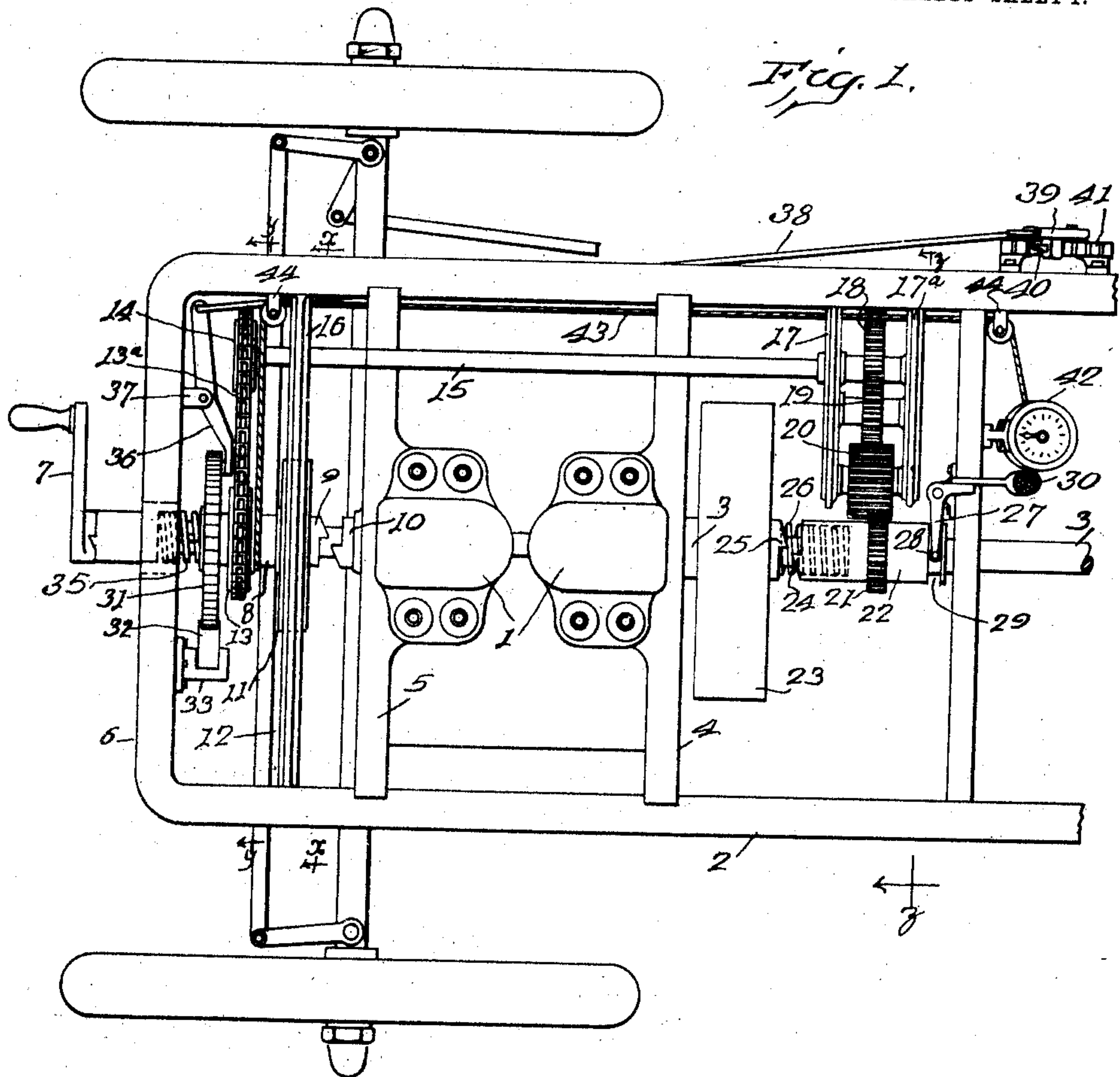


J. A. BLACK.
STARTER FOR EXPLOSIVE ENGINES.
APPLICATION FILED OCT. 20, 1909.

984,066.

Patented Feb. 14, 1911.
2 SHEETS—SHEET 1.



Witnesses
H. Howard Walsley,
Edward H. Reed.

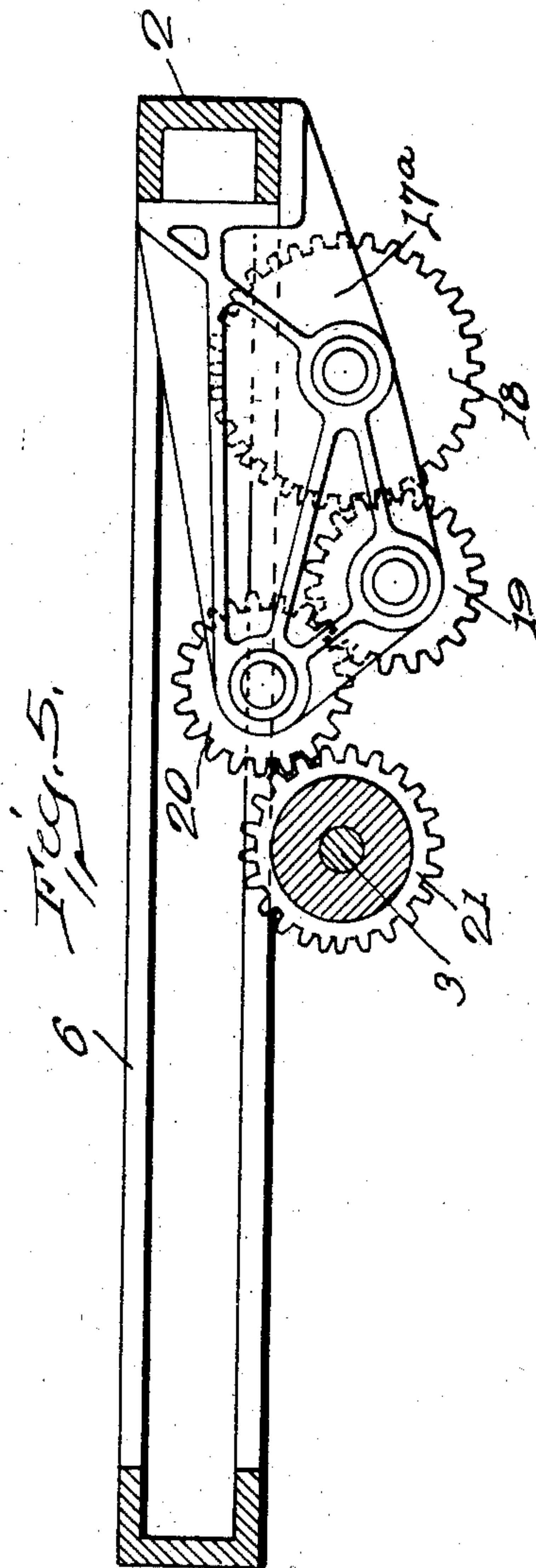
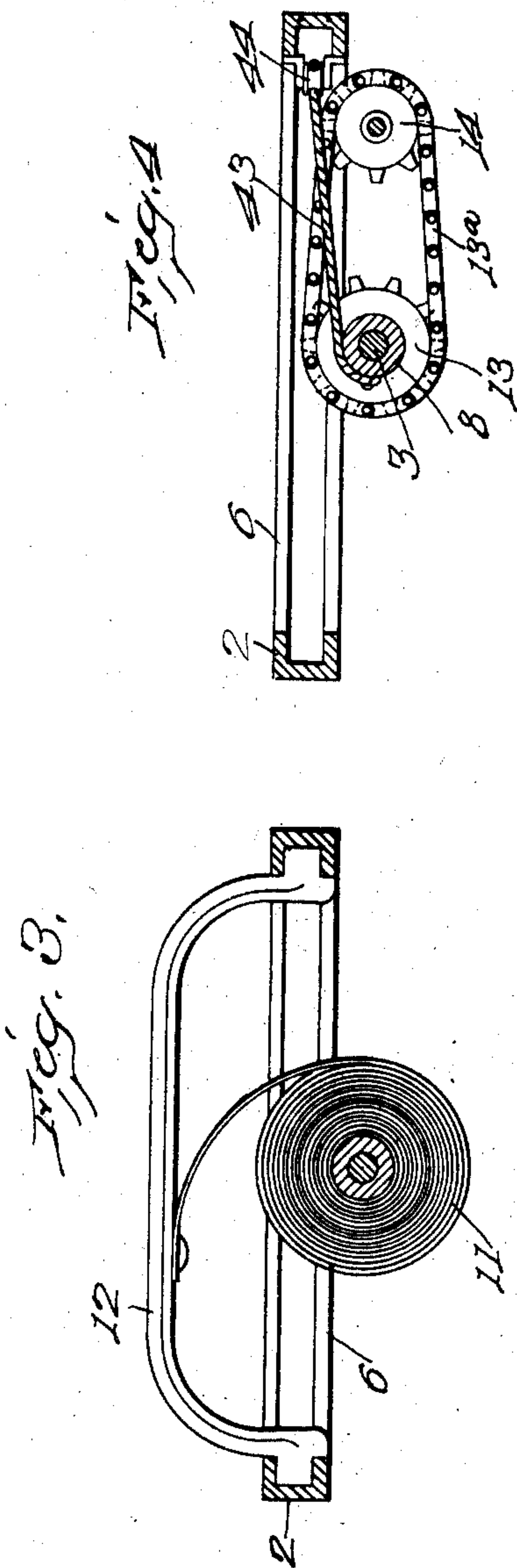
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UNITED STATES PATENT OFFICE.

JOHN A. BLACK, OF SPRINGFIELD, OHIO.

STARTER FOR EXPLOSIVE-ENGINES.

984,066.

Specification of Letters Patent.

Patented Feb. 14, 1911.

Application filed October 20, 1909. Serial No. 523,604.

To all whom it may concern:

Be it known that I, JOHN A. BLACK, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Starters for Explosive-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to starters for explosive engines, and more particularly to starters for automobile engines.

The object of the invention is to provide means whereby the engine of an automobile, 15 of that type employing explosive engines, can be started by the chauffeur from his seat in the automobile with but slight effort.

To this end it is a further object of the invention to provide means for storing 20 power in a sufficient quantity to rotate the engine shaft and impart the initial movement to the piston of the engine; to provide means for applying this power to the engine shaft; and further, to provide means 25 whereby the power will be stored by the action of the engine itself while in operation.

With these objects in view my invention consists in certain novel features and in certain combinations and arrangements of parts 30 hereinafter to be described, and then more particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a top plan view of the forward portion of an automobile equipped with my invention; 35 Fig. 2 is a detail view of the ratchet mechanism by means of which the sleeve is controlled; Fig. 3 is a transverse, sectional view, taken on the line *x x* of Fig. 1 and looking in the direction of the arrows; Fig. 4 is a 40 transverse, sectional view taken on the line *y y* of Fig. 1 and looking in the direction of the arrows; and Fig. 5 is a transverse, sectional view, taken on the line *z z* of Fig. 1 and looking in the direction of the arrows.

45 In these drawings I have illustrated one embodiment of my invention and have shown the same as applied to an explosive engine of the type ordinarily employed for driving automobiles.

50 As here shown, the engine 1, which may consist of any desired number of cylinders, is supported upon the main frame 2 and is operatively connected to the engine shaft 3 which is journaled in transverse members 4 55 and 5 of the main frame and extends forwardly beyond the forward transverse mem-

ber 6 of the main frame, where it may be provided with a crank 7 for rotating the same to start the engine, but this crank, if provided when the engine is equipped with 60 the starting mechanism, would be used only in case of emergency. The shaft extends rearward and is connected with the transmission gearing in the usual manner.

Loosely mounted upon the shaft 3, forward of the engine 1, is a sleeve 8 having at 65 its rear end a clutch member 9 adapted to cooperate with a clutch member 10 rigidly secured to the shaft 3. The clutch members are so arranged that when the sleeve is rotated in a forward direction, *i. e.*, in the direction in which the shaft rotates to drive 70 the machine forward, the sleeve and shaft will be caused to rotate together, but, should the shaft attain a greater speed than that at which the sleeve is rotating, it will move 75 ahead of the sleeve, the clutch members of the sleeve riding loosely over the clutch member of the shaft. A spring 11 is coiled about the sleeve 8, has its inner end rigidly secured 80 thereto and its outer end connected to a fixed part of the frame, such as an arch or transverse member 12 extending between the side members of the main frame. This spring is so arranged that when the sleeve 8 is rotated 85 in a reverse direction, *i. e.*, in a direction opposite the direction of forward rotation of the shaft, the spring will be compressed, and, when released and permitted to expand, will rotate the sleeve 8 in a forward 90 direction, and, if the clutch members are in engagement, the shaft 3 will be rotated and the initial movement imparted to the pistons of the engine.

The sleeve 8 may be rotated to compress 95 the spring 11 in any desired manner, but I have shown the sleeve as having mounted thereon, preferably at a point forward of the spring, a sprocket wheel 13 which is connected by means of a sprocket chain 13^a 100 with a second sprocket wheel 14 secured to a countershaft 15 which is mounted in bearing brackets 16, 17 and 17^a secured to one of the side members of the main frame, and which extends rearwardly substantially 105 parallel with the engine shaft and has rigidly secured thereto near the rearward end thereof a gear 18 which is connected by means of idle gears 19 and 20 with a pinion 21 rigidly secured to a sleeve 22 110 which is loosely mounted upon the shaft 3 in the rear of the engine 1 and preferably

beyond the balance wheel 23. The sleeve 22 carries at its forward end a clutch member 24 adapted to cooperate with the corresponding clutch member 25 rigidly secured to the shaft 3. These clutch members are so arranged that when they are in engagement and the engine shaft is rotating in a forward direction, the sleeve will be caused to rotate in unison with the shaft and movement will be imparted through the train of gearing to the shaft 15 and from the shaft 15 through the sprocket chain 13^a to the sleeve 8, the arrangement of the gearing being such that the sleeve will be rotated in a reverse direction, thereby compressing the spring 11. The sleeve 2 is held normally in its rearward position in which the clutch members 24 and 25 are out of engagement one with the other, it being retained normally in this position by means of a spring 26. Suitable means under the control of the chauffeur are provided for throwing the clutch members into engagement and thus causing the spring to be compressed. This means is here shown as comprising a bell crank lever 27 connected with the sleeve 22 by means of a pin 28 which is carried by one of the arms thereof and enters an annular groove 29 in the sleeve. The other arm of the bell crank lever 27 is connected with a push rod 30 arranged in a position to be readily actuated by the chauffeur from his seat in the vehicle. Thus, when it is desired to compress the spring, the foot lever 30 is actuated to throw the clutch members 24 and 25 into engagement and thus actuate the sleeve 8 and compress the spring 11. It will be noted that the idle gear 20 is of a width sufficient to allow the necessary movement to the pinion 21 and sleeve 22.

The spring 11 may be retained in its compressed condition in any suitable manner, but, to accomplish this, I have, in the present instance, mounted a ratchet wheel 31 upon the sleeve 8 and have mounted a pawl 32 in a bracket 33 which is secured to the main frame. This pawl is of but slightly greater width than is the ratchet wheel and is provided with a toe 34 which engages the bracket 33 in such a manner as to prevent the same from dropping below a certain position. A spring 35 arranged between the end of the sleeve 8 and the transverse member 6 of the main frame tends to move the sleeve 8 rearwardly and thus bring the clutch members 9 and 10 into operative relation. The sleeve is, however, held against such movement by means of a lever 36 which is pivotally mounted on a bracket 37 carried by the transverse member 6 of the main frame and has one arm thereof arranged to engage the rear side of the ratchet wheel 31 and the other arm thereof connected by means of a rod 38 with a hand lever 39

mounted on the main frame 2 in a position near the chauffeur's seat and provided with the usual dog 40 which engages the toothed segment 41 to retain the lever in its adjusted position. Thus, by adjusting the hand lever 39 to throw that end of the lever 36, which is in engagement with the ratchet wheel 31 forward, and locking the same in that position, the clutch members 9 and 10 will be held out of engagement one with the other. As soon as the hand lever 39 is released, however, the spring 35 will move the sleeve 38 rearward to bring the clutch member 9 into operative relation with the clutch member 10. This rearward movement of the sleeve also carries the ratchet wheel 31 out of engagement with the pawl 32 and permits the spring 11 to expand, this expansion rotating the sleeve 8 in a forward direction and, through the medium of the clutch members 9 and 10, rotating the engine shaft forward sufficiently to impart the initial movement to the piston of the engine and start the operation of the same. When the operation of the engine begins the beveled face of the clutch member 10, which is secured to the engine shaft, will ride over the beveled nose of the clutch member 9 of the sleeve until the lever 39 has been actuated to withdraw the sleeve 8. The toe 34 of the pawl maintains the same in such a position that the ratchet can again be moved into engagement therewith. After the sleeve has been moved forwardly to separate the clutch members 9 and 10 the foot lever 30 is actuated to bring the clutch members 24 and 25 into their operative relation and the forward movement of the engine again compresses the spring 11 and stores the power necessary to again start the engine after it has come to a stop.

In order that the operator or chauffeur can ascertain when the spring is completely wound or sufficient power has been stored, a gage 42 is supported in such a position that it can be conveniently read by him and is connected, by means of a cord 43 which extends about guides 44, with the sleeve 8 to which it is secured in such a manner that the rotation of the sleeve in a reverse direction to compress the spring will wind the cord upon the sleeve and thus actuate the gage which will indicate the number of revolutions of the sleeve, and, consequently, the amount of compression of the spring.

The operation of the device has been fully described in connection with the description of the several parts thereof and it will be apparent that I have provided means whereby power may be stored at a point adjacent the engine shaft by the action of the engine itself while it is in operation and may be applied to the engine shaft while the engine is idle to impart the initial movement to the piston of the engine and thus start the

same into operation; and that this mechanism is of such a character that it can be controlled by the chauffeur from his seat in the vehicle with a very small amount of effort, the only exertion required being the manipulation of the hand lever to apply the power to the shaft to start the engine and the manipulation of the foot lever to store the power necessary for the next starting of the engine.

It will be understood that, while I have shown and described the apparatus as applied to an automobile, the principle can be readily adapted for use in connection with stationary engines or explosive engines of any character. Further, it will be understood that the mechanism herein shown and described is for the purpose of illustration only and that the invention consists broadly in providing means for storing power, which power may be applied at will to the engine shaft while the engine is idle, and, when so applied, will impart to the engine the initial movement; and further, in providing means whereby this power may be stored by the action of the engine itself while the latter is in operation and may then be retained for use at a future time. It will, therefore, be understood that I do not wish to be limited to the details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

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

1. The combination, with an explosive engine, and a shaft, of a member rotatably mounted on said shaft, a spring having one end secured to said member and arranged to be compressed by the rotation thereof in one direction, means for operatively connecting said rotatable member with said shaft and disconnecting the same therefrom, a second rotatable member, means for connecting said second rotatable member with said shaft and disconnecting the same therefrom; and means for operatively connecting said second rotatable member to the first-mentioned rotatable member to rotate said first rotatable member in a direction to compress said spring.

2. The combination, with an explosive engine, and a shaft, of a sleeve mounted on said shaft and normally disconnected therefrom, a spring connected to said sleeve and arranged to be compressed by the rotation thereof in one direction, a second sleeve mounted on said shaft and normally disconnected therefrom, means for operatively connecting said second sleeve to the first-mentioned sleeve to rotate the same in a direction to compress said spring, and means under the control of the operator for connecting and disconnecting either of said sleeves with said shaft.

3. The combination, with an explosive engine, and a shaft, of a sleeve rotatably mounted on said shaft and having a clutch member, a second clutch member mounted on said shaft and arranged to cooperate with the clutch member of said sleeve, a spring connected to said sleeve and arranged to be compressed when said sleeve is rotated, means for moving the clutch member of said sleeve into and out of operative relation with the clutch member on said shaft, a second sleeve rotatably mounted on said shaft and operatively connected to the first-mentioned sleeve to rotate the same, and means for connecting said second sleeve with said shaft.

4. The combination, with an explosive engine, and a shaft, of a sleeve, a clutch member rigidly secured to said shaft, a sleeve rigidly mounted on said shaft and having a clutch member adapted to cooperate with the clutch member on said shaft, means for holding the clutch member of said sleeve normally out of engagement with the clutch member on said shaft, a spring connected to said sleeve and adapted to be compressed by the rotation of said sleeve in one direction, means for retaining said spring in compressed condition, a second sleeve operatively connected to the first-mentioned sleeve to rotate the same to compress said spring, means for connecting and disconnecting said second sleeve with said shaft, and means under the control of the operator for actuating the first-mentioned sleeve to move its clutch member into engagement with the clutch member on said shaft and to release said spring from said retaining means.

5. The combination, with an explosive engine, and a shaft, of a sleeve rotatably and slidably mounted on said shaft and having a clutch member, a cooperating clutch member rigidly secured to said shaft, a spring tending normally to actuate said sleeve to move its clutch member into operative relation with the clutch member on said shaft, means under the control of the operator for holding said sleeve in its retracted position against the tension of said spring, a spring connected to said sleeve and arranged to be compressed by the rotation thereof in one direction, means for retaining said spring in its compressed condition, a second sleeve rotatably and slidably mounted on said shaft, cooperating clutch members carried by said second sleeve and said shaft, means for retaining such clutch members normally in their inoperative position, means under the control of the operator for moving said clutch members into operative relation, and means for operatively connecting said second sleeve to the first-mentioned sleeve to rotate said first-mentioned sleeve to compress said spring.

6. The combination, with an explosive en-

gine, and its shaft, of a sleeve rotatably mounted on said shaft on one side of said engine, clutch mechanism under the control of the operator for connecting and disconnecting said sleeve to and from said shaft, a spring connected to said sleeve and arranged to be compressed by the rotation thereof in one direction, a second sleeve mounted on said shaft on the opposite side of said engine, clutch mechanism under the control of the operator for connecting and disconnecting said second sleeve to and from said shaft, a countershaft extending substantially parallel with the first-mentioned shaft, and means for operatively connecting each of said sleeves with said shaft.

7. The combination, with an explosive engine, and a shaft, of a sleeve loosely mounted on said shaft, means for operatively connecting said sleeve with said shaft, a spring connected to said sleeve and arranged to be compressed by the rotation thereof in one direction, means actuated by said engine for rotating said sleeve to compress said spring, means for holding said sleeve against rotation in the opposite direction, and means for simultaneously connecting said sleeve with said shaft and for disconnecting the same from said holding means, thereby permitting said spring to expand and to rotate said shaft.

8. The combination, with an explosive engine and its shaft, of a sleeve loosely mounted on said shaft and having a clutch member, a second clutch member mounted on said shaft adapted to cooperate with the clutch member of said sleeve, a spring connected to said sleeve and adapted to be compressed by the rotation thereof, a second sleeve mounted on said shaft and operatively connected to the first-mentioned sleeve, means for connecting and disconnecting the last-mentioned sleeve to said shaft, and means for actuating the first-mentioned sleeve to move the clutch member carried thereby into and out of operative relation with the clutch member on said shaft.

9. The combination, with an explosive engine, and a shaft, of a sleeve loosely mounted on said shaft and having a clutch member, a clutch member mounted on said shaft and arranged to cooperate with the clutch member on said sleeve, the clutch member on said sleeve being normally out of engagement with the clutch member on said shaft, a spring connected to said sleeve and adapted to be compressed by the rotation thereof in one direction, means for rotating said sleeve to compress said spring, means for holding said sleeve against rotation in the opposite direction, and means for moving the clutch member of said sleeve into operative relation to the clutch member on said shaft and for releasing said clutch member from said holding means.

10. The combination, with an explosive engine, and a shaft, of a clutch member rigidly secured to said shaft, a sleeve loosely mounted on said shaft and having a clutch member arranged to cooperate with the clutch member on said shaft, a spring connected to said sleeve and adapted to be compressed by the rotation thereof in one direction, means for rotating said sleeve to compress said spring, holding means to prevent the rotation of said sleeve in the opposite direction, a spring tending to shift said sleeve to move the clutch member thereof into operative relation with the clutch member on said shaft and to release said sleeve from said holding means, and means for retaining said sleeve in its retracted position against the action of said spring.

11. The combination, with an explosive engine and its shaft, of a sleeve loosely mounted thereon and having a clutch member, a clutch member mounted on said shaft and adapted to cooperate with the clutch member of said sleeve, a spring connected to said sleeve and adapted to be compressed by the rotation of said sleeve in one direction, means actuated by the engine for rotating said sleeve in a direction to compress said spring, means for retaining said sleeve against rotation after said spring has been compressed, and means for moving said sleeve to cause the clutch member thereof to engage the clutch member on said shaft and to release said holding means and permit said sleeve to be rotated by the expansion of said spring.

12. The combination, with an explosive engine and its shaft, of a sleeve loosely mounted thereon and having a clutch member, a second clutch member mounted on said shaft and adapted to cooperate with the clutch member on said sleeve, a spring connected to said sleeve and adapted to be compressed by the rotation of said sleeve in one direction, means adapted to be actuated by the engine while in operation to rotate said sleeve in a direction to compress said spring, a ratchet secured to said sleeve, and a pawl adapted to engage said ratchet to hold said sleeve against rotation and retain said spring in its compressed condition, a second spring tending to impart longitudinal movement to said sleeve to move said clutch members into operative relation one with the other, and means under the control of the operator for releasing said last-mentioned spring.

13. In an automobile, the combination, with an explosive engine and its shaft, of a sleeve loosely mounted on said shaft in front of said engine and having a clutch member, a second clutch member mounted on said shaft adapted to cooperate with the clutch member on said sleeve, a spring coiled about said sleeve having one end connected thereto and the other end connected to the frame of

said automobile, a ratchet wheel secured to said sleeve, a pawl mounted on the main frame of said automobile and adapted to engage said ratchet, a second spring arranged 5 to move said sleeve longitudinally of said shaft to move said clutch members into operative relation one with the other and to disengage said ratchet from said pawl, means under the control of the chauffeur for moving 10 said sleeve longitudinally of said shaft against the tension of the last-mentioned spring and for retaining the same in such position, a second sleeve mounted on said shaft in the rear of said engine and having 15 a clutch member, a cooperating clutch member mounted on said shaft, means for moving said last-mentioned sleeve longitudinally of said shaft to move said last-mentioned clutch members into and out of operative relation one with the other, a countershaft, and means for connecting said countershaft to both of said sleeves. 20

14. In an automobile, the combination, with an explosive engine and its shaft, of a 25 sleeve loosely mounted on said shaft and having a clutch member, a clutch member mounted on said shaft and adapted to cooperate with the clutch member of said sleeve, a spring connected with said sleeve

and adapted to be compressed by the rotation of said sleeve in one direction, means adapted to be actuated by the engine when in operation for rotating said sleeve to compress said spring, and a gage connected to said sleeve and arranged in view of the 35 chauffeur to indicate the amount of compression of said spring.

15. The combination, with an explosive engine, and a shaft, of a rotatable member mounted on said shaft and normally disconnected therefrom, a spring connected with 40 said rotatable member and arranged to be compressed by the rotation thereof in one direction, a second rotatable member mounted on said shaft and normally disconnected 45 therefrom, and means for operatively connecting said second rotatable member with the first-mentioned rotatable member to rotate the latter in a direction to compress said spring, and means for connecting said 50 rotatable members with said shaft and for disconnecting the same therefrom.

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

JOHN A. BLACK.

Witnesses:

ELZA F. MCKEE,
EDWARD S. REED.