No. 768,374. PATENTED AUG. 23, 1904.

C. R. B. KEETLEY.

STARTING DEVICE FOR EXPLOSION MOTORS.

APPLICATION FILED DEC. 31, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.

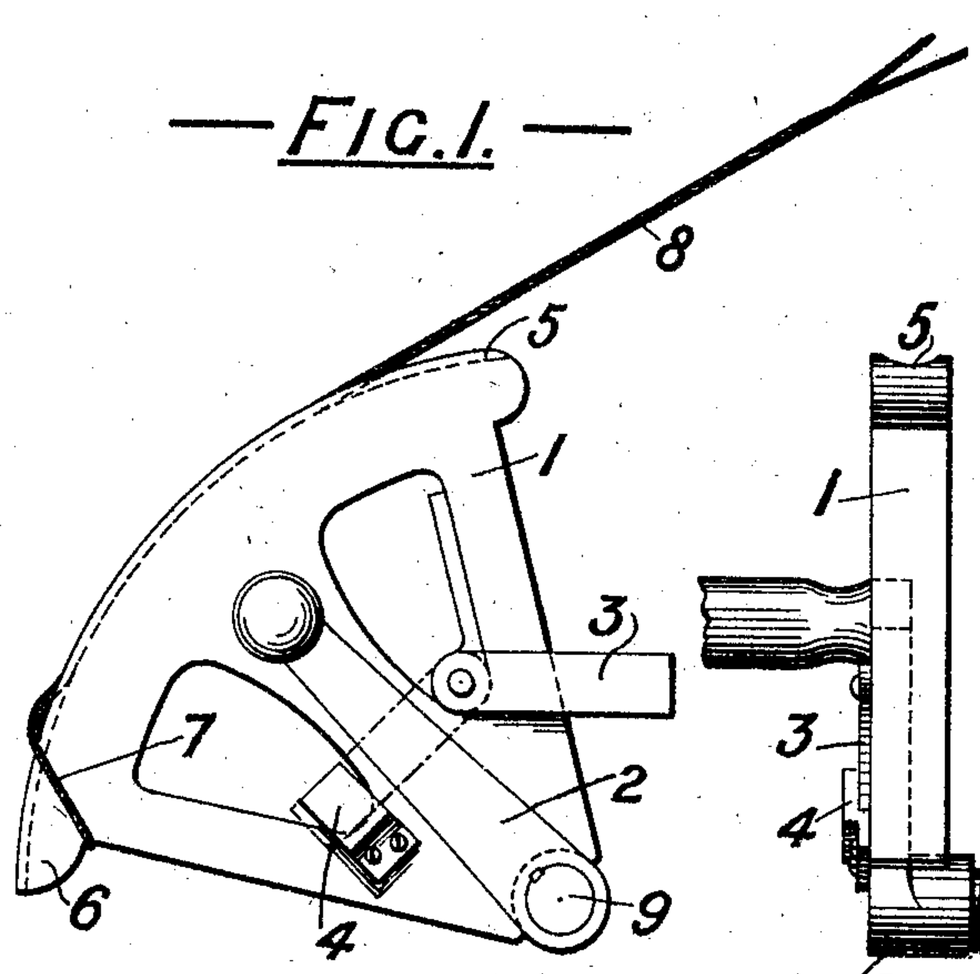


FIG. 2.

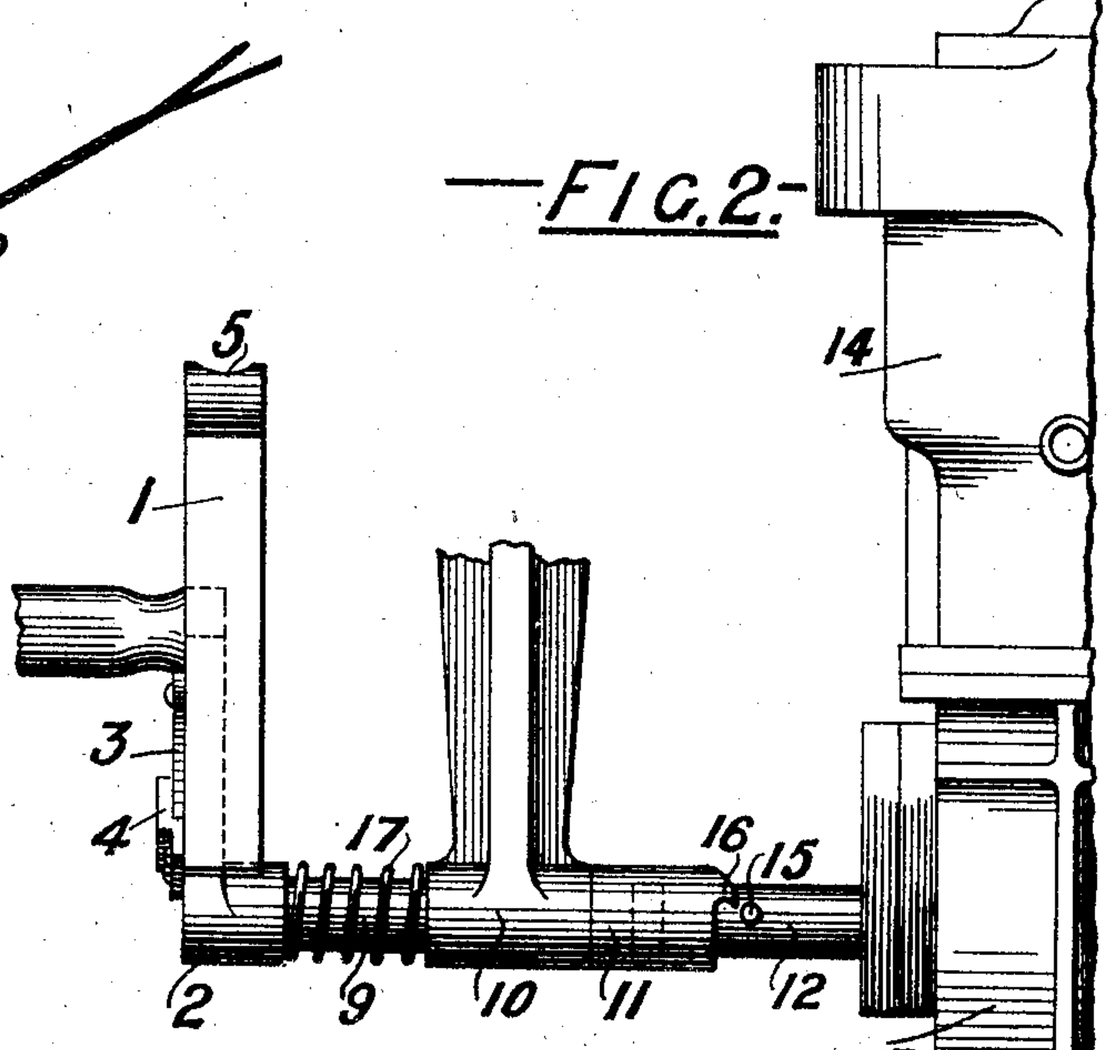
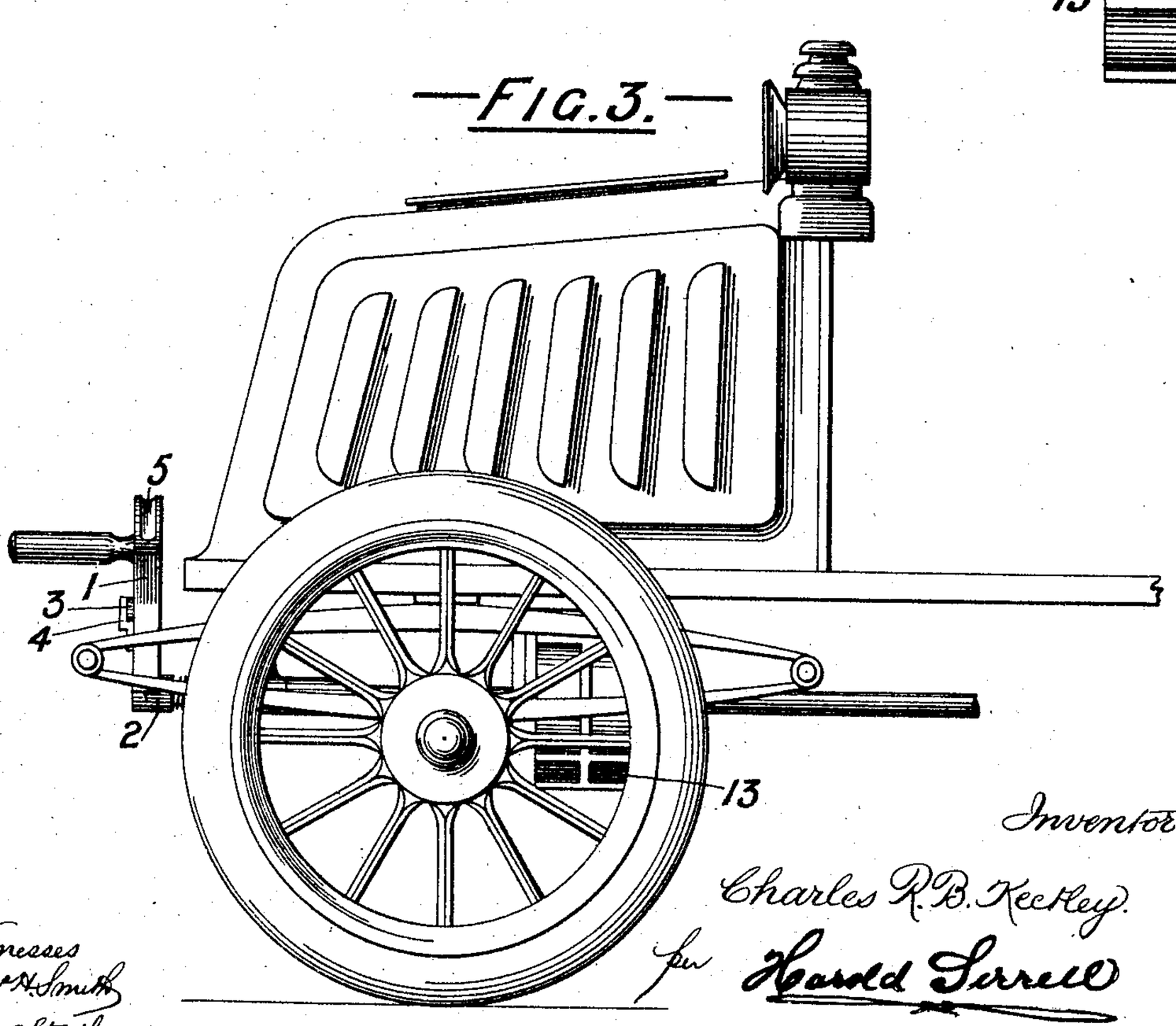


FIG. 3.



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STARTING DEVICE FOR EXPLOSION MOTORS.

APPLICATION FILED DEC. 31, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

FIG. 4.

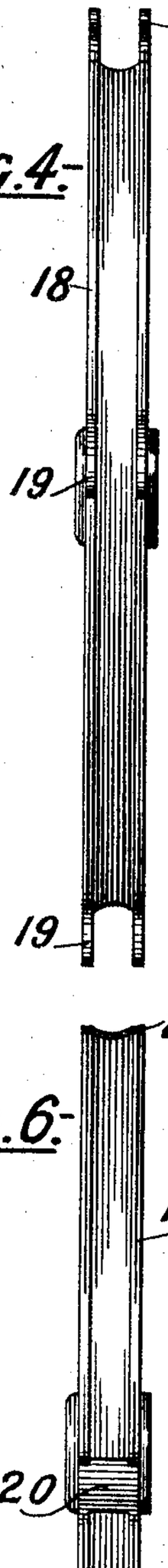


FIG. 5.

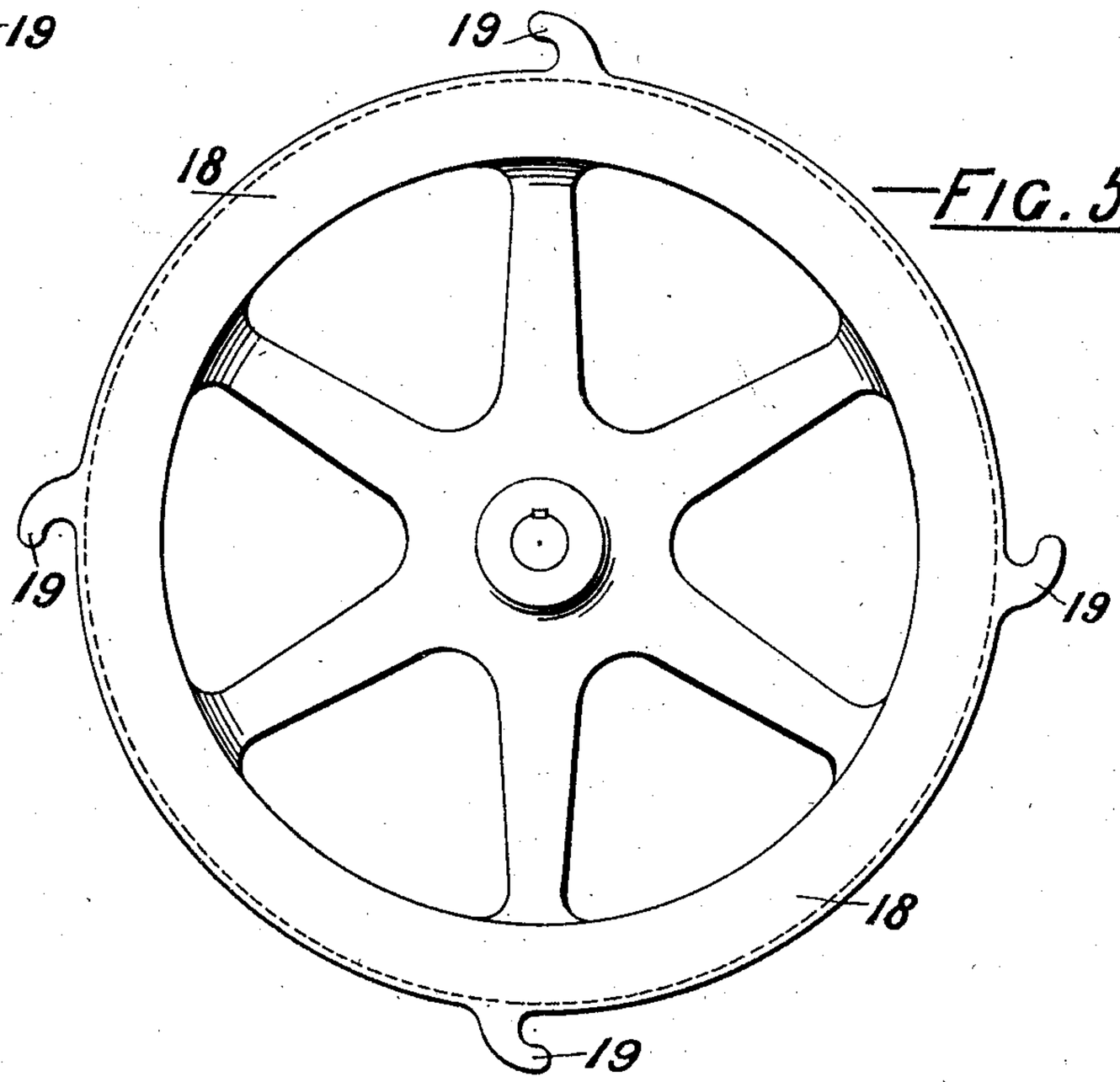
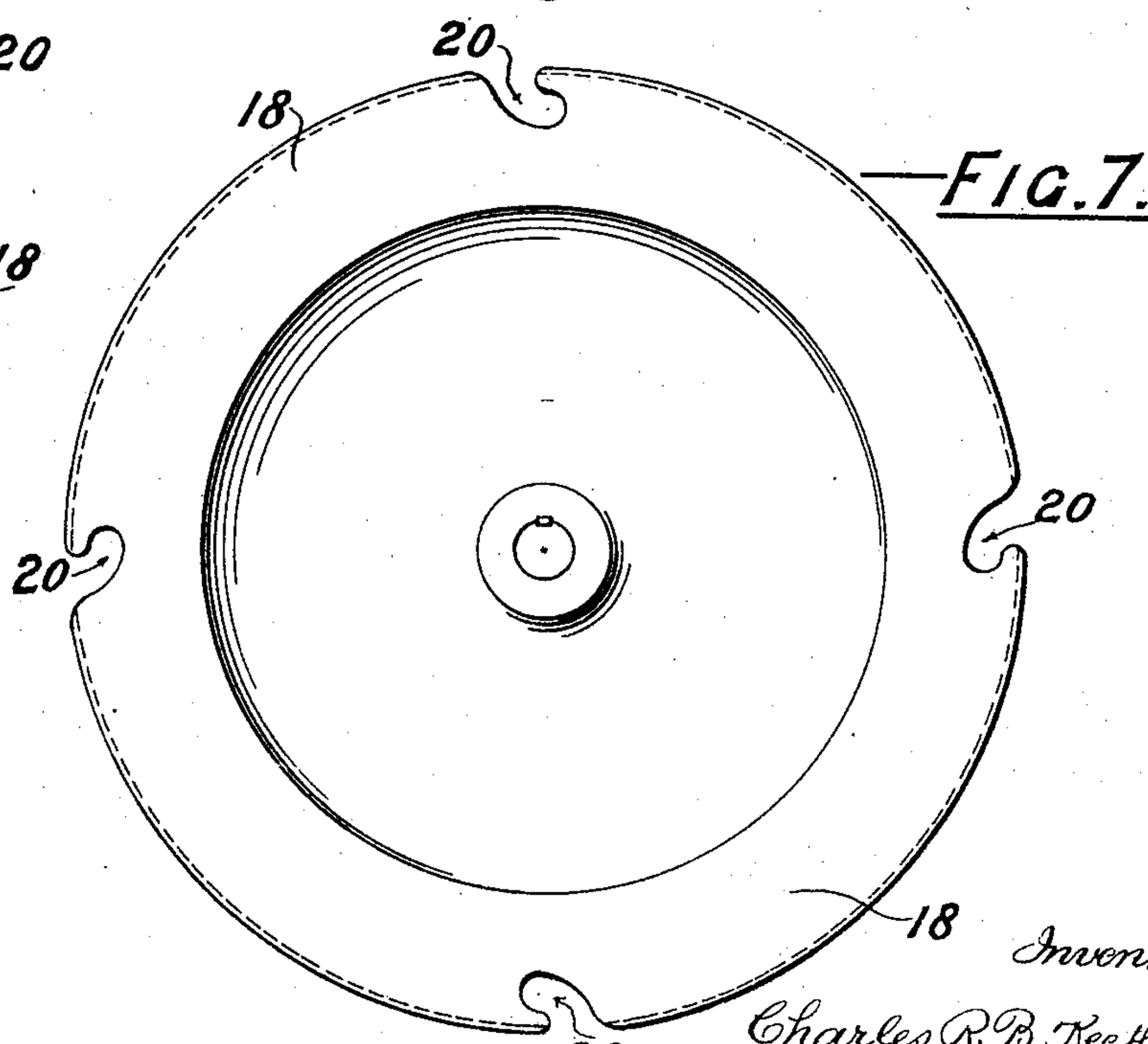


FIG. 6.

FIG. 7.



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No. 768,374. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

CHARLES ROBERT BELL KEETLEY, OF LONDON, ENGLAND.

STARTING DEVICE FOR EXPLOSION-MOTORS.

SPECIFICATION forming part of Letters Patent No. 768,374, dated August 23, 1904.

Application filed December 31, 1903. Serial No. 187,289. (No model.)

To all whom it may concern:

Be it known that I, CHARLES ROBERT BELL KEETLEY, a subject of the King of Great Britain, residing at London, England, have invented certain new and useful Improvements in Starting Devices for Explosion-Motors, of which the following is a specification.

In starting explosion-motors, and particularly in starting the explosion-motors employed upon motor-driven road-vehicles, the device commonly employed is to provide a shaft having a crank-handle on its end and to so fit that shaft that by moving it endwise against the action of a spring it can be caused to engage the motor-shaft or a shaft connected therewith, so that the operator by turning the crank-handle will rotate the motor-shaft, drawing in the explosive mixture, compressing and firing it to start the motor. Upon the motor starting the crank-handle shaft is thrown out of engagement with the motor-shaft and is held out of engagement by spring action. At the same time this well-known means of starting the motor has attendant advantages, particularly as regards the simplicity of the apparatus, and therefore the object of my invention is to provide an improved device capable of being fitted to the ordinary starting crank-handle or to the motor-shaft, which device will give the operator greater mechanical advantages over the starting action, be suitable and inexpensive in construction, and capable of application to existing motors without any alteration thereto.

Referring to the accompanying drawings, Figure 1 is an end elevation, and Fig. 2 a side elevation, showing a construction of my improved starting device which is applicable to the starting-handles of motors as already employed, and the drawings show the device fitted thereto, so much of the motor and its ordinary starting-handle being shown as is necessary for the purposes of this description. Fig. 3 is a side elevation of the front portion of a motor-vehicle in order to show the ordinary location of my starting device. Fig. 4 is a side elevation, and Fig. 5 a front elevation, of a modified formation of the starting device, Figs. 6 and 7 being similar views of another modification hereinafter referred to.

Referring more particularly to Figs. 1, 2, and 3, there is provided, according to my invention, a quadrant 1, made of any suitable material, and it may even be hard wood, the radius of the quadrant 1 being somewhat greater than the radius of the crank-handle 2. The quadrant 1 is fitted at the rear of the crank-handle 2 and is recessed to receive that handle, so that when in position it forms, as it were, a portion of the said crank-handle, and in order to retain it in position the quadrant is fitted with a pivoted bar 3, which is turned from the position shown in full lines at Fig. 1 to the position shown in dotted lines thereon and so that the end of the bar 3 takes behind a bracket-piece 4 and, as I have found in practice, forms an efficient and simple fixing, although obviously other means may be employed for fixing the quadrant to the crank-handle.

The peripheral arc of the quadrant is grooved, as at 5, Fig. 2, and at one end 6, Fig. 1, it is formed with an extension or projection to receive the loop 7 of a cord 8, by which the quadrant is pulled over for revolving the crank-handle 2.

Other parts of the construction shown at Figs. 1 and 2 are common to, I may say, the majority of explosion-motors employed with motor-driven vehicles; but in order that it may be fully understood I would explain that the crank-handle 2 is fixed onto a shaft 9, carried by and capable of revolving and sliding in a bracket 10, which is fixed to the framework of the car which carries the engine.

On the opposite side of the bracket 10 the shaft 9 has a tubular socket 11, which receives the end 12 of the motor crank-shaft or, of course, of a shaft in connection therewith. In the drawings, 13 is the crank-case of the engine, and 14 is the water-cooled cylinder.

The engine-shaft 12 has a fixed pin 15, and the end of the socket 11 is formed with a ratchet-tooth 16, projecting in the direction of the axis of the shaft. Between the bracket-bearing 10 and the collar of the crank-handle 2 a spring 17 is provided, which normally holds the shaft 9 in such an endwise position that its socket-tooth 16 is held disengaged from the pin 15 of the motor-shaft 12.

When my improved device is fitted as shown, in order to start the engine the operator seizes the handle of the crank 2, moves the shaft 9 endwise, compressing the spring 17 and bringing the end of the socket 11 up against the stationary pin 15. Then by turning the crank-handle a short distance the tooth 16 will engage the pin 15 and the shaft of the engine will be turned by the handle until the compression of the explosive mixture in the engine-cylinder is felt. The cord 8 is then placed so that the loop 7 passes onto the projection 6, as shown, and lies within the groove 5 in the arc of the quadrant 1. Immediately the action of compression is felt by the operator the cord is held taut, and the crank-handle 2 being released the cord is pulled with some degree of velocity, and thus starts the motor, acting both effectively and reliably, as I have found by practical experiments. As the quadrant rotates about its axis the cord 8, by which it is pulled round, will automatically become disengaged from the said quadrant. The employment of a device of this character provides for a more advantageous application of the necessary muscular force than is common with the device now usually employed, and no jerk or blow can be given to the operator should the motor "back-fire" as the cord slips away from its engagement, or should it fail to do so by any chance would be pulled through the operator's hands.

Instead of employing a detachable quadrant, as described, I may in some cases dispense with the crank-handle and fix on the end of the shaft 9 or directly onto the motor-driven shaft a wheel such as illustrated at Figs. 4 to 7. The periphery of the wheel 18 should be formed with a groove to receive the cord and with projections 19, as at Figs. 4 and 5, to receive and hold the loop of the cord. Instead of the projections recesses 20 might be formed, as at Figs. 6 and 7. Such a wheel when fixed to the shaft 9 can then in order to start the motor be turned through the requisite distance until the compression is about to take place and then may have the flexible connection adjusted to it and be pulled through the necessary remaining angular distance by means of the said cord.

In grasping the cord to pull round the quadrant or the wheel the operator should not wrap or twist the cord round his hand, but should grasp it so that should the engine "back-fire" the cord would simply be drawn through his hands without causing any injury or inconvenience.

I claim as my invention—

1. In starting devices for explosion-motors, the combination with a motor-driven shaft, a revoluble starting-shaft, bearings for supporting the same, and means for connecting the starting-shaft with the motor-driven shaft in one direction of motion and for allowing the motor-driven shaft to overrun the starting-shaft; of a framework fixed to the starting-shaft in a plane at right angles to the axis thereof, and having a grooved circular periphery, and a projection on the frame adapted to hold a loop formed in one end of a cord which is placed in the circular groove of the frame and is to be pulled by hand to revolve the frame and the starting-shaft, the said cord being released from the projection at the termination of the angular motion of the frame, substantially as set forth.

2. In starting devices for explosion-motors, the combination with a crank-shaft of a motor, a revoluble starting-shaft coaxial with the motor-shaft, bearings for supporting the starting-shaft while permitting it to revolve and have endwise motion in the direction of the motor-shaft, a socket on the end of the starting-shaft, a ratchet-tooth on the socket, a fixed pin on the motor-shaft with which the ratchet-tooth engages when the starting-shaft is moved endwise, and a spring to hold the ratchet-tooth normally out of engagement with the pin of the motor-shaft, of a framework fixed to the starting-shaft in a plane at right angles to the axis thereof, and having a grooved circular periphery, and a projection on the frame adapted to hold a loop formed at one end of a cord which is placed in the circular groove of the frame and is to be pulled by hand to revolve the frame and start the shaft, the said cord being released from the projection at the termination of the angular motion of the frame, substantially as set forth.

3. In starting devices for explosion-motors, the combination with the motor-driven shaft, a revoluble starting-shaft, bearings for supporting the starting-shaft, means for connecting the starting-shaft with the motor-driven shaft in one direction of motion and for allowing the motor-driven shaft to overrun the starting-shaft, and a crank fixed upon the outer end of the starting-shaft, of a quadrant-frame having a radial recess in the face thereof to receive the crank on the end of the starting-shaft and a groove on the circular periphery of the quadrant-frame to receeive a portion of the length of a cord, means for fixing the quadrant-frame to the said crank, and a peripheral projection at one end of the quadrant-frame to receive a loop formed at one end of the cord, and adapted to release the said loop after the cord has been pulled by hand to revolve the quadrant-frame through the requisite angle, substantially as set forth.

4. In starting devices for explosion-motors, the combination with the motor crank-shaft, a revoluble starting-shaft arranged coaxial therewith, bearings for supporting the starting-shaft, means for connecting the starting-shaft with the crank-axle of the motor in one direction of motion and for allowing the said crank-shaft to overrun the starting-shaft, and a crank fixed upon the outer end of the starting-shaft, of a quadrant-frame having a grooved

circular periphery concentric with the starting-shaft and a radial recess on its face to receive the crank, a bar pivoted to the quadrant-frame on one side of the recess, a socket fixed to the frame on the other side of the recess to receive the free end of the pivoted bar for securing the quadrant-frame to the crank, and a projection at one end of the circular grooved periphery of the quadrant-frame to receive a loop formed at one end of a cord, while the said cord is received by the aforesaid peripheral groove for pulling over the quadrant to revolve the starting-shaft and to start the motor, substantially as set forth.

5. In starting devices for explosion-motors, the combination with the motor-driven shaft, a revoluble starting-shaft coaxial therewith, bearings for supporting the starting-shaft and allowing it to have endwise motion, a socket on one end of the starting-shaft to receive the end of the motor-driven shaft, a ratchet-tooth on the end of the socket, a fixed pin on the motor-driven shaft with which the ratchet-tooth engages in one direction of motion, a spring on the starting-shaft to hold the said shaft normally out of engagement with the motor-driven shaft, a crank fixed on the starting-shaft, and a handle at the outer end of the crank, of a quadrant-frame having a grooved circular periphery concentric with the starting-shaft and a radial recess on its face to receive the crank, a bar pivoted to the quadrant-frame on one side of the recess and a socket fixed to the frame on the other side of the recess to receive the free end of the pivoted bar for securing the quadrant-frame to the crank, and a projection at one end of the circular grooved periphery of the quadrant-frame to receive a loop formed at one end of a cord, while the said cord is received by the aforesaid peripheral groove for pulling over the quadrant to revolve the starting-shaft and to start the motor, substantially as set forth.

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Witnesses:
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