R. D. CLEMSON.

CRANKING DEVICE.

APPLICATION FILED MAY 22, 1912.

1,052,438.

Patented Feb. 4, 1913.

3 SHEETS—SHEET 1.

Fig. 1.

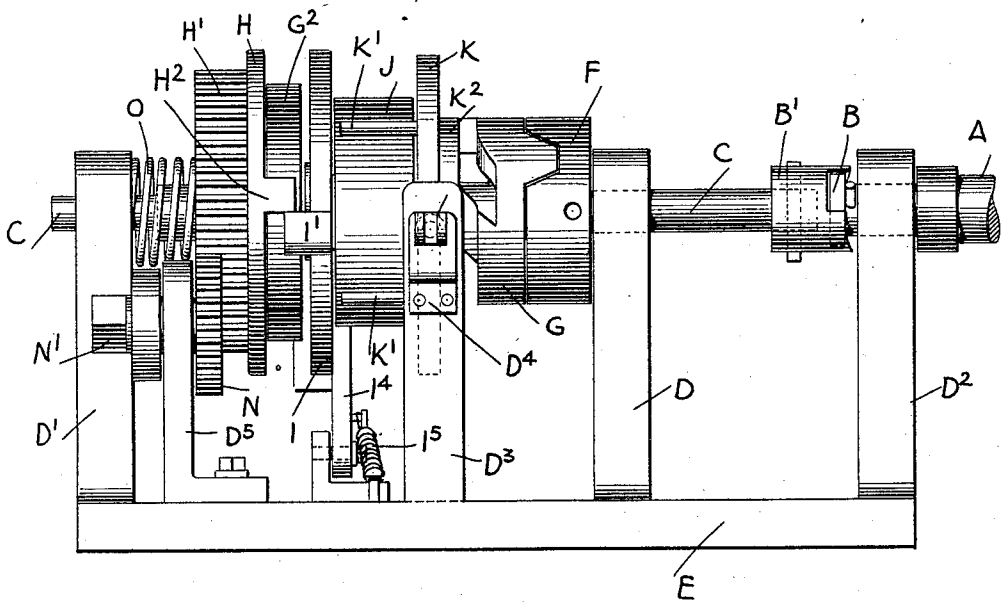
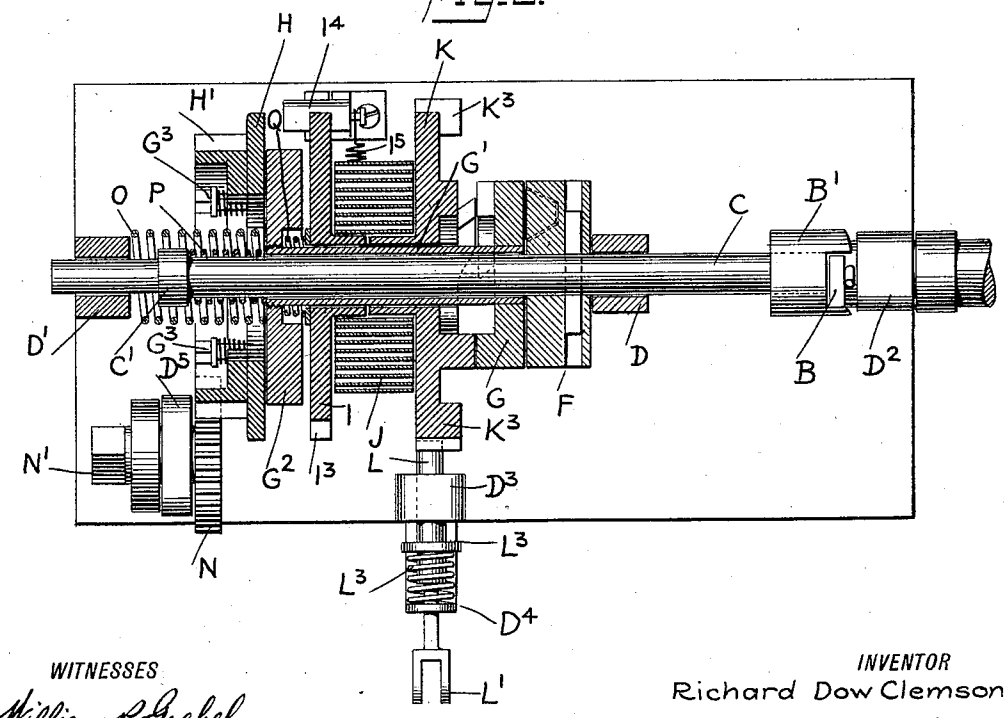


Fig. 2.



WITNESSES

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Fig. 3.

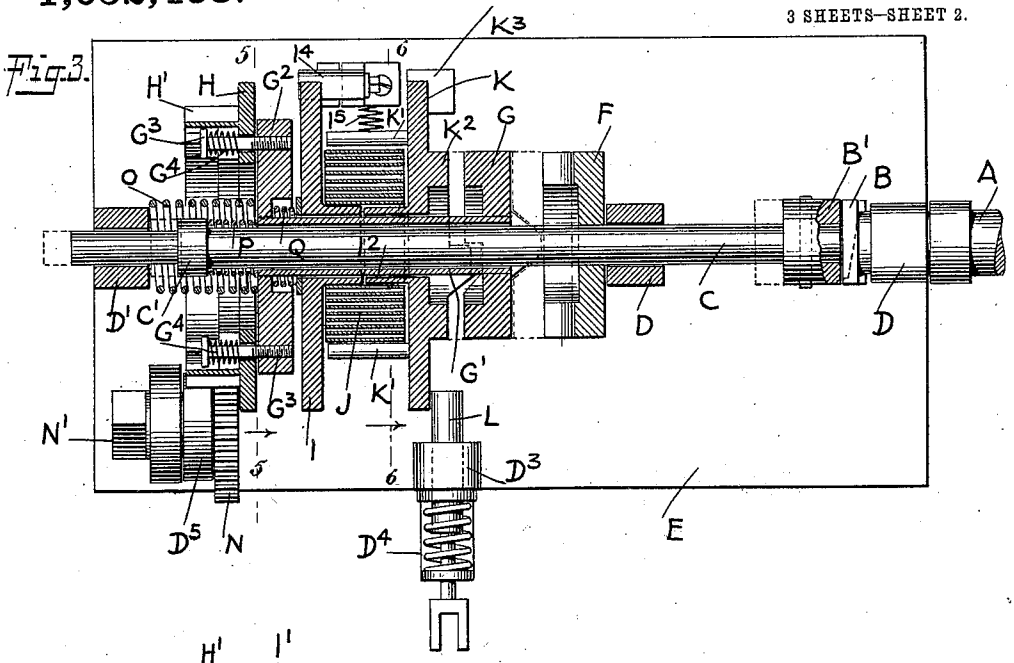


Fig. 4.

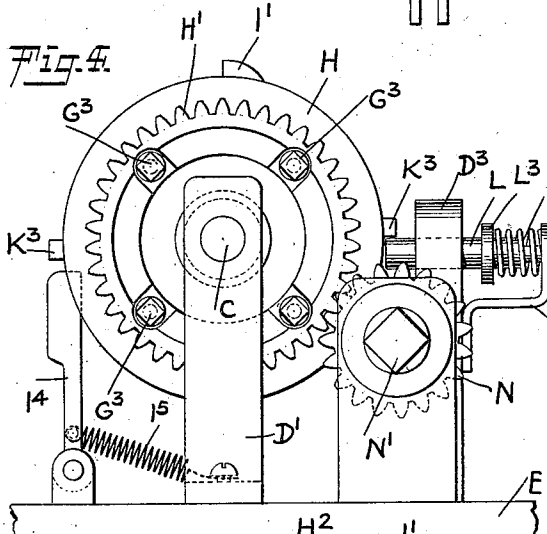


Fig. 6

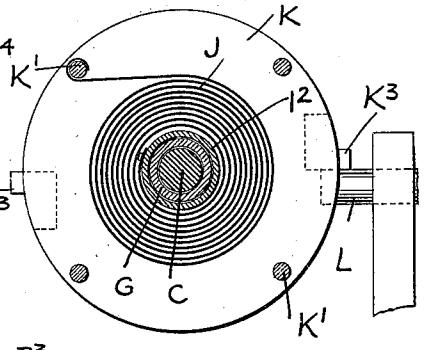
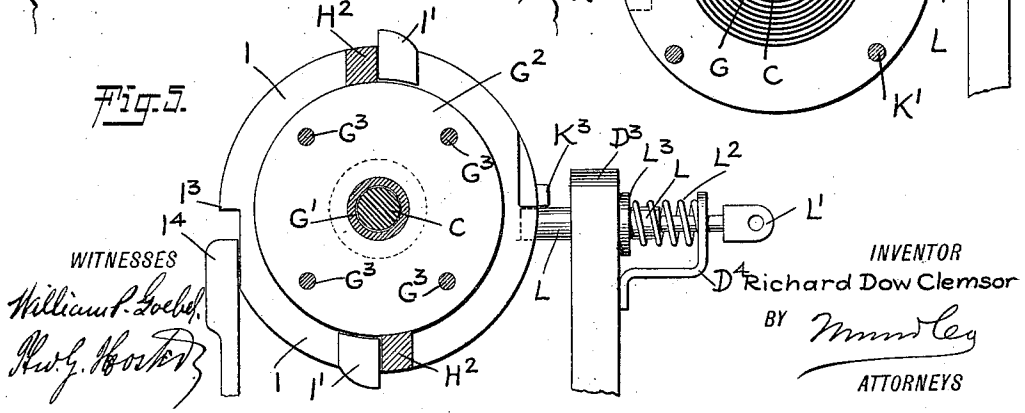


Fig. 5.



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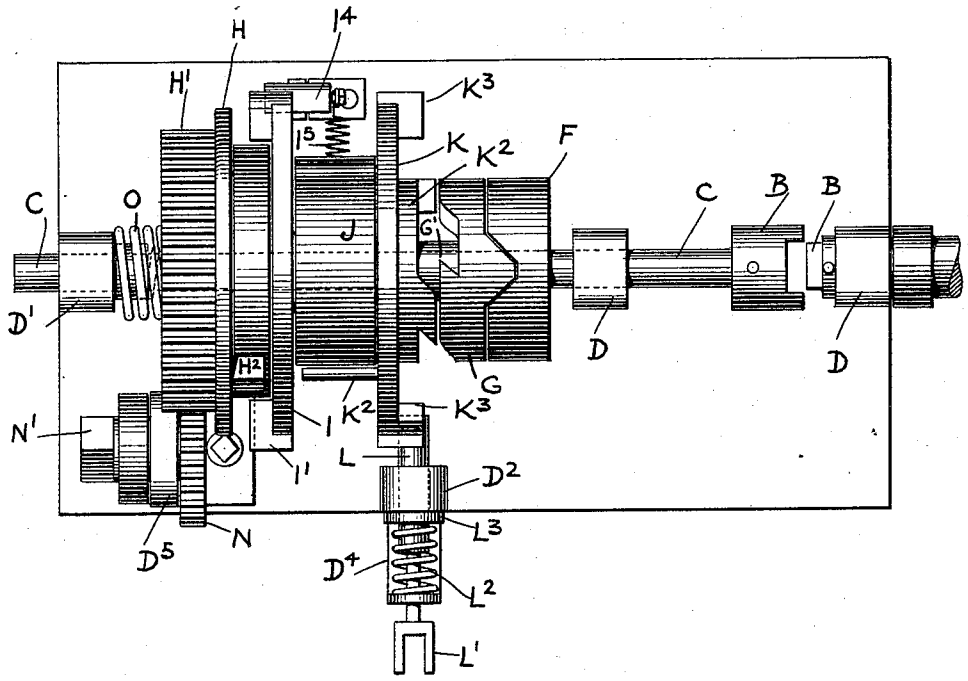
3 SHEETS—SHEET 3.

Fig. 7.



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CRANKING DEVICE.

1,052,438. Specification of Letters Patent. Patented Feb. 4, 1913.

Application filed May 22, 1912. Serial No. 698,905.

To all whom it may concern:

Be it known that I, RICHARD DOW CLEMSON, a citizen of the United States, and a resident of Middletown, in the county of Orange and State of New York, have invented a new and Improved Cranking Device, of which the following is a full, clear, and exact description.

The invention relates to internal combustion engines and its object is to provide a new and improved cranking device arranged to utilize the power of a wound-up spring of a spring motor to do the cranking, to cause the engine after being started to wind up the spring of the motor and to automatically disconnect the cranking device from the engine shaft to permit the engine to run free of the cranking device, and to have the cranking device ready for re-starting the engine whenever it is desired to do so.

For the purpose mentioned use is made of a spring motor, coupling means for coupling the motor with the engine shaft, means for automatically uncoupling the spring motor from the engine shaft at the time the spring of the motor is wound up, and a manually-controlled locking and releasing device for locking the spring motor in wound up and uncoupled position, and for releasing said spring motor to allow the said coupling means to couple the spring motor with the engine shaft and to allow the spring of the motor to unwind with a view to drive the engine shaft.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the cranking device with the parts in position for winding up the spring of the motor by the running engine shaft; Fig. 2 is a sectional plan view of the same; Fig. 3 is a similar view of the same with the parts in position after the spring of the motor is completely wound up; Fig. 4 is an end view of the cranking device; Fig. 5 is a transverse section of the same on the line 5—5 of Fig. 3; Fig. 6 is a similar view of the same on the line 6—6 of Fig. 3; and Fig. 7 is a view of the cranking mechanism, showing the spring motor wound up and the cranking device uncoupled from the engine shaft.

The engine shaft A of an internal combustion engine is provided with a coupling member B adapted to be engaged by a coupling member B′ secured on one end of a shaft C mounted to turn and to slide lengthwise in bearings D and D′ arranged on a suitable base E bolted to the engine frame or other suitable support adjacent to the engine. On the shaft C is secured a clutch member F adapted to be engaged by a clutch member G secured on one end of a sleeve G′ through which extends loosely the shaft C, and on the other end of the sleeve G′ is secured a disk G^2 provided with pins G^3 extending parallel to the axis of the shaft C and the sleeve G′ and mounted to slide in a flange H formed on the gear wheel H′. On the said pins G^3 are coiled springs G^4 bearing against the outer face of the wheel H′ to provide a yielding connection between the disk G^2 and the flange H. On the flange H are arranged a pair of diametrically-extending lugs H^2 adapted to engage corresponding lugs I′ on a disk I having a hub I^2 mounted to turn loosely on the sleeve G′, as plainly indicated in Figs. 2 and 3. The disk I is provided at its peripheral face with diametrically-arranged notches I^3 arranged at a right angle to the lugs I′ and adapted to be engaged by a dog I^4 pivoted on the base E and pressed on by a spring I^5 to hold the dog in contact with the peripheral face of the disk I to engage either the notches I^3 or the lugs I′ to prevent return movement of the disk I. On the hub I^2 of the disk I is secured the inner end of a helical spring J (see Fig. 7) secured at its outer end to a pin K′ projecting from the face of a disk K mounted to rotate loosely on the sleeve G′. The disk K is provided on its outer face with a clutch member K^2 adapted to engage the adjacent face of the clutch member G, previously mentioned, so that when the spring J unwinds, as hereinafter more fully explained, then a rotary motion is given to the disk K and by the latter to the clutch member G and the clutch member F to rotate the shaft C at the time the coupling member B′ is in engagement with the coupling member B to cause the rotation of the engine shaft A to start the engine. The disk K is provided at its peripheral face with a lug or lugs K^3 extending beyond the outer face of the disk, and any of the said lugs K^3 are adapted to be engaged by a locking and releasing pin L mounted to slide transversely in a bearing D^3 attached to or form-

ing part of the base E. The outer end of the pin L is in the form of a fork L′ connected with a treadle mechanism or the like under the control of the operator for withdrawing the pin L from the corresponding lug K^3 whenever it is desired to crank the engine by the use of the cranking device. A spring L^2 is coiled on the pin L and bears with its inner end on a collar L^3 formed on the pin L and the outer end of the spring L^2 abuts against a bracket D^4 attached to the bearing D^3 so that the spring L^2 normally holds the pin L in an inner position, that is in engagement with a lug K^3. The inner end of the pin L is also adapted to engage besides the lug K^3 the outer face of the disk K to hold the latter against movement to the right at the time the spring J is wound up.

The gear wheel H′ previously mentioned, is in mesh with a pinion N secured on the shaft N′ journaled in a bearing D^5 attached to the base E, and the outer end of the shaft N′ is adapted to be engaged by a crank under the control of the operator to permit of winding up the spring J by hand whenever it is desired to do so instead of winding up the spring through the action of the started engine. A heavy spring O is coiled around the shaft C and bears with one end against the bearing D′ and presses with its other end against the disk G^2, and a spring P is coiled on the shaft C and bears with one end on a collar C′ fixed on the said shaft C, while the other end of the spring P abuts against the sleeve G′ (see Figs. 2 and 3). A spring Q is coiled on the sleeve G′ and is interposed between the disk G^2 and the disk I.

The operation is as follows: When the several parts are in the position shown in Fig. 7 then the spring J is wound up and the coupling member B′ is disengaged from the coupling member B and the locking device L is in engagement with the outer face of the disk K and is engaged by one of the lugs K^3 to hold the spring motor in locked wound-up position and to hold the coupling member B′ out of engagement with the coupling member B. When it is desired to start the engine it is only necessary for the operator to withdraw the pin L from engagement with the disk K and the corresponding lug K^3 so that the spring O moves the shaft C to the right to engage the clutch member B′ with the clutch member B and the spring Q forces the disks I and K and the spring J to the right to engage the clutch member K^2 with the clutch member G, at the same time allowing the spring J to unwind so that the rotary motion is transmitted by the disk K to the clutch member G now in engagement with the clutch member F to rotate the shaft C and consequently the engine shaft A to start the engine. When the spring has run down the operator releases the lever L so that the latter engages one of the lugs K^3 at the left-hand side thereof and as the engine is now running it turns the shaft C and in doing so the clutch member G pushes the clutch member K^2 to the left to move the lugs I′ into the path of the lugs H^2 whereby the disk I is turned from the disk G^2 rotating with the clutch member G and the clutch member F, it being understood that during this winding-up operation the disk K is held against rotation by the pin L engaging one of the lugs K^3 (see Figs. 1 and 2). When the spring J is completely wound up then the clutch member G is held against rotation but as the shaft C is still driven from the engine shaft A it is evident that the clutch member F pushes the clutch member G, its sleeve and parts thereon to the left whereby a like motion is given to the disk K, the spring J and the disk I, to compress the springs O and P and to permit the spring-pressed pin L to move farther inward and into engagement with the outer or right-hand side of the disk K, thus locking the latter against movement to the right. When the clutch members G and F register then the shaft C is moved to the left thus disengaging the clutch member B′ from the clutch member B to disconnect the shaft C from the engine shaft A and thereby allow the engine to run free of the cranking device. The cranking device has its spring J now wound up and after the engine has stopped and it is desired again to start the engine, it is only necessary for the operator to withdraw the pin L to repeat the above-described operation.

It is understood that when the spring is fully wound up by the engine shaft A turning the shaft C, the clutch member F forces the clutch member G to the left and with it the disk K so that the locking pin L engages the outer or right-hand face of the disk K. The movement of the clutch member G to the left causes a like movement of the disk G^2 whereby the springs O and P are compressed, and when the clutch member F, on further turning of the shafts A and C, again registers with the clutch member G then the shaft C is pushed to the left by the action of the spring P and hence the clutch member B′ disengages the clutch member B of the engine shaft A to allow the engine to keep on running free of the cranking device.

By reference to the drawings, it will be noticed that the lugs K^3 are sufficiently wide to engage the pin L to hold the disk K against turning during the winding up of the spring and while the disk K is shifted to the left to allow the pin L to finally engage the outer right-hand face of the disk K. When the pin L is withdrawn, as

above explained, the compressed spring O shifts the several parts to the right to engage the clutch member B′ with the clutch member B, the movement of the parts to the right being limited by the clutch member F abutting against the bearing D. When the pin L is withdrawn the spring Q also shifts the disks I and K and the spring J so that the clutch member K^2 engages the clutch member G.

When it is desired to wind up the spring J by hand the operator applies a wrench or other tool to the shaft N′ and turns the same so that the pinion N rotates the gear wheel H′ and the flange H. The rotating motion of the flange H is transmitted by the lugs H^2 and the lugs I′ to the spring disk I whereby the spring J is wound up as the other disk K is held against rotation by the locking and releasing pin L. The teeth of the gear wheel H′ are sufficiently wide to remain in mesh with the pinion N whenever the gear wheel H′ is shifted to the left or to the right.

In case the engine should back-fire during the starting, the spring J cannot be broken as the dog I^4 holds the disk I against back movement, and in a like manner the pin L holds the disk K against return movement and consequently the clutch member F merely forces the clutch member G to the left without affecting the spring J.

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

1. A cranking device for internal combustion engines, comprising a spring motor having a shaft adapted to turn and to slide in the direction of its axis and adapted to be coupled directly to the engine shaft for the latter to wind up the spring of the motor, means for automatically disconnecting the spring motor shaft from the engine shaft after the spring is wound up, and a locking and releasing means adapted to automatically lock the spring motor in the wound-up and disconnected position, and when released allow the spring motor shaft to couple with the engine.

2. A cranking device for internal combustion engines, comprising a spring motor, having a shaft in alinement with the engine shaft, coupling means for coupling one end of the said motor shaft directly with the engine shaft, means for automatically uncoupling the spring motor shaft from the engine shaft after the spring of the motor is wound up, and a manually-controlled locking and releasing device for locking the spring motor in wound up and uncoupled position, and for releasing the said spring motor to allow the said coupling means to couple the spring motor shaft with the engine and to allow the spring motor to unwind to drive the engine.

3. A cranking device for internal combustion engines, comprising a pair of spring disks, of which one is provided with a coupling member and the other with lugs and notches, a helical spring secured at its ends to the said spring disks, a sleeve on which the said spring disks are mounted to slide and to turn loosely, a spring motor shaft extending loosely through the said sleeve and adapted to be coupled with the engine shaft, the said spring motor shaft being mounted to turn and to slide, a shaft coupling member fixed on the said shaft, a sleeve coupling member secured on the said sleeve and adapted to engage the said shaft coupling member and the said disk coupling member, a spring pressing the said sleeve in the direction of its length, a manually-controlled locking and releasing means adapted to engage the said disk having the coupling member, a member fixed to said sleeve and having means for interlocking with the other spring disk, and spring-pressed means adapted to engage the lugs and notches of the last-mentioned disk.

4. A cranking device for internal combustion engines, comprising a pair of spring disks, of which one is provided with a coupling member and the other with lugs and notches, a helical spring secured at its ends to the said spring disks, a sleeve on which the said spring disks are mounted to slide and to turn loosely, a spring motor shaft extending loosely through the said sleeve and adapted to be coupled with the engine shaft, the said spring motor shaft being mounted to turn and to slide, a shaft coupling member fixed on the said shaft, a sleeve coupling member secured on the said sleeve and adapted to engage the said shaft coupling member and the said disk coupling member, a spring pressing the said sleeve in the direction of its length and toward the engine shaft, a spring pressing the said shaft in the direction of its length and away from the engine shaft, a manually-controlled locking and releasing means adapted to engage the said disk having a coupling member to hold the disk against turning and against movement toward the engine shaft, a disk fixed to the said sleeve, lugs connected with said disk and adapted to engage lugs on the other spring disk, and a spring pressed dog for engaging the lugs and notches of the last mentioned spring disk.

5. A cranking device for internal combustion engines comprising a spring motor having a shaft mounted to turn and to slide in the direction of its axis, coupling means for coupling the said shaft with the engine shaft, a manually-controlled locking and releasing device for the said spring motor to hold the latter locked in wound-up position, a spring for shifting the motor and its shaft when released toward the engine shaft, a

spring pressing the said spring motor shaft in an opposite direction, and means for controlling the action of said springs.

6. A cranking device for internal combustion engines comprising a spring motor having a shaft mounted to turn and to slide in the direction of its axis, coupling means for coupling the said shaft with the engine shaft, mechanism for winding up the spring motor when the spring motor shaft is turned from the engine shaft, a manually-controlled locking and releasing device for the said spring motor to hold the latter locked in wound-up position, a spring for shifting the motor and its shaft when released toward the engine shaft, a spring pressing the said spring motor shaft in an opposite direction, means for controlling the action of said springs and manually-controlled means for winding up the spring motor independent of the engine shaft.

7. A cranking device for internal combustion engines comprising a pair of spring disks, of which one is provided with a coupling member and the other with lugs and notches, a helical spring secured at its ends to the said spring disks, a sleeve on which the said spring disks are mounted to slide and to turn loosely, a spring motor shaft extending loosely through the said sleeve and adapted to be coupled with the engine shaft, the said spring motor shaft being mounted to turn and to slide, a shaft coupling member fixed on the said shaft, a sleeve coupling member secured on the said sleeve and adapted to engage the said shaft coupling member and the said disk coupling member, a spring pressing the said sleeve in the direction of its length and toward the engine shaft, a spring pressing the said shaft in the direction of its length and away from the engine shaft, a manually-controlled locking and releasing means adapted to engage the said disk having a coupling member to hold the disk against turning and against movement toward the engine shaft, and a spring-pressed dog adapted to engage the said lugs and notches on the said spring disk.

8. A cranking device for internal combustion engines comprising a pair of spring disks, of which one is provided with a coupling member and the other with lugs, a helical spring secured at its ends to the said spring disks, a sleeve on which the said spring disks are mounted to slide and to turn loosely, a spring motor shaft extending loosely through the said sleeve and adapted to be coupled to the engine shaft, the said spring motor shaft being mounted to turn and to slide, a shaft coupling member fixed on the said shaft, a sleeve coupling member secured on the said sleeve, and adapted to engage the said shaft coupling member and the said disk coupling member, a disk fixed on the said sleeve, a manually-controlled mechanism connected with the said disk and having lugs adapted to engage lugs on one of said spring disks to rewind the said helical spring, a spring pressing the said sleeve in the direction of its length, a manually-controlled locking and releasing means adapted to engage the said disk having the coupling member, and means for preventing return movement of the other spring disk.

9. A cranking device for internal combustion engines comprising a pair of spring disks, of which one is provided with a coupling member and the other with lugs and notches, a helical spring secured at its ends to the said spring disks, a sleeve on which the said spring disks are mounted to slide and to turn loosely, a spring motor shaft extending loosely through the said sleeve and adapted to be coupled with the engine shaft, the said spring motor shaft being adapted to turn and to slide, a shaft coupling member fixed on the said shaft, a sleeve coupling member secured on the said sleeve and adapted to engage the said shaft coupling member and the said disk coupling member, a disk on the said sleeve, a flange having lugs adapted to engage lugs on one of the said spring disks, spring-pressed pins on the said sleeve disk and slidingly engaging the said flange, a spring pressing the said sleeve in the direction of its length, and a manually-controlled locking and releasing means adapted to engage the said disk having the coupling member.

10. In a cranking device for internal combustion engines, a pair of spring disks one of which is provided with a coupling member and the other with lugs, a helical spring secured at its ends to the said disks, a sleeve on which the said disks are mounted to slide and to turn, a shaft extending through said sleeve and mounted to turn and to slide, the said shaft being adapted to be coupled to the engine shaft, a coupling member on the said shaft, a coupling member on one end of the sleeve and adapted to engage the coupling member on the shaft and the coupling member on the spring disk, a disk secured to the other end of the sleeve, a flange having lugs adapted to engage the lugs on the other spring disk, a connection between the disk secured to the sleeve and the said flange, a manually-controlled locking and releasing means for the spring disk having the coupling member, means for preventing return movement of the other spring disk, and springs for controlling the sliding movement of the said sleeve and shaft.

11. A cranking device for internal combustion engines, comprising a pair of spring disks, one of which is provided with a coupling member, a helical spring secured at its ends to the said disks, a sleeve on which the said disks are mounted to slide and to

turn, a shaft extending loosely through said sleeve and mounted to turn and to slide, the said shaft being adapted to be coupled with the engine shaft, a coupling member on the said shaft, a coupling member on one end of the said sleeve and adapted to engage the coupling member on the shaft and the coupling member on the spring disk, a disk secured on the other end of said sleeve, a spring interposed between said disk and the other spring disk, a spring coiled on the said shaft and bearing at one end on a collar on the shaft, the other end of said spring abutting against the sleeve, a spring heavier than the last mentioned spring and also coiled around the shaft, a fixed bearing against which one end of the spring bears, the other end of said spring pressing against the disk secured to the sleeve, means for locking and releasing the spring disk having a coupling member, a flange having lugs adapted to engage lugs on the other spring disk, a yielding connection between the disk secured to the sleeve and the said flange, and means for preventing return movement of the last mentioned spring disk.

12. In a cranking device for internal combustion engines, a pair of spring disks, a helical spring secured at its ends to the said spring disks, a sleeve on which the said spring disks are mounted to slide and to turn loosely, a spring motor shaft extending loosely through said sleeve, and adapted to be coupled to the engine shaft, the said spring motor shaft being mounted to turn and to slide, means for coupling the said sleeve to the motor shaft and to one of said spring disks, a locking and releasing means for the said spring disks, a disk secured to the said sleeve, and an interlocking connection between the said disk and the other spring disk.

13. In a cranking device for internal combustion engines, a pair of spring disks, one of which is provided with a coupling member, a helical spring secured at its ends to the said spring disks, a sleeve on which the said disks are mounted to slide and to turn loosely, a spring motor shaft extending loosely through the said sleeve and adapted to be coupled to the engine shaft, the said spring motor shaft being mounted to turn and to slide, a shaft coupling member fixed on the spring motor shaft, a sleeve coupling member secured on the said sleeve and adapted to engage the shaft coupling member and the disk coupling member, means for locking and releasing the spring disk having the coupling member, a disk secured to the sleeve, and a manually controlled mechanism connected with the disk and adapted to interlock with the other spring disk to rewind the spring.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

RICHARD DOW CLEMSON.

Witnesses:
GEO. W. BEAKES,
ULLIA W. WOODWARD.