H. D. HINCKLEY.

AUTOMATIC ELECTRICALLY GOVERNED ENGINE CONTROLLING APPARATUS.

APPLICATION FILED OCT. 20, 1910.

996,854.

Patented July 4, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

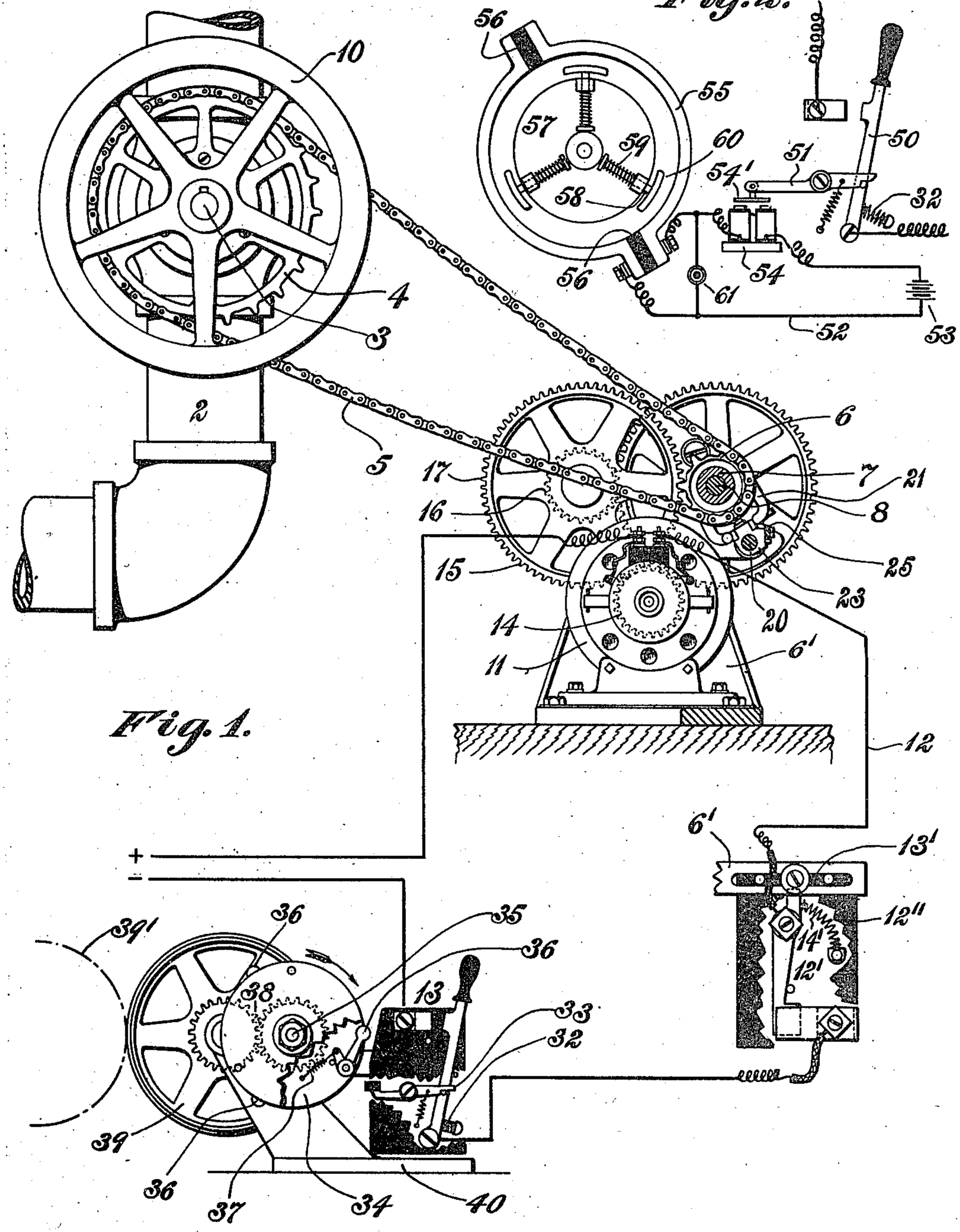

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

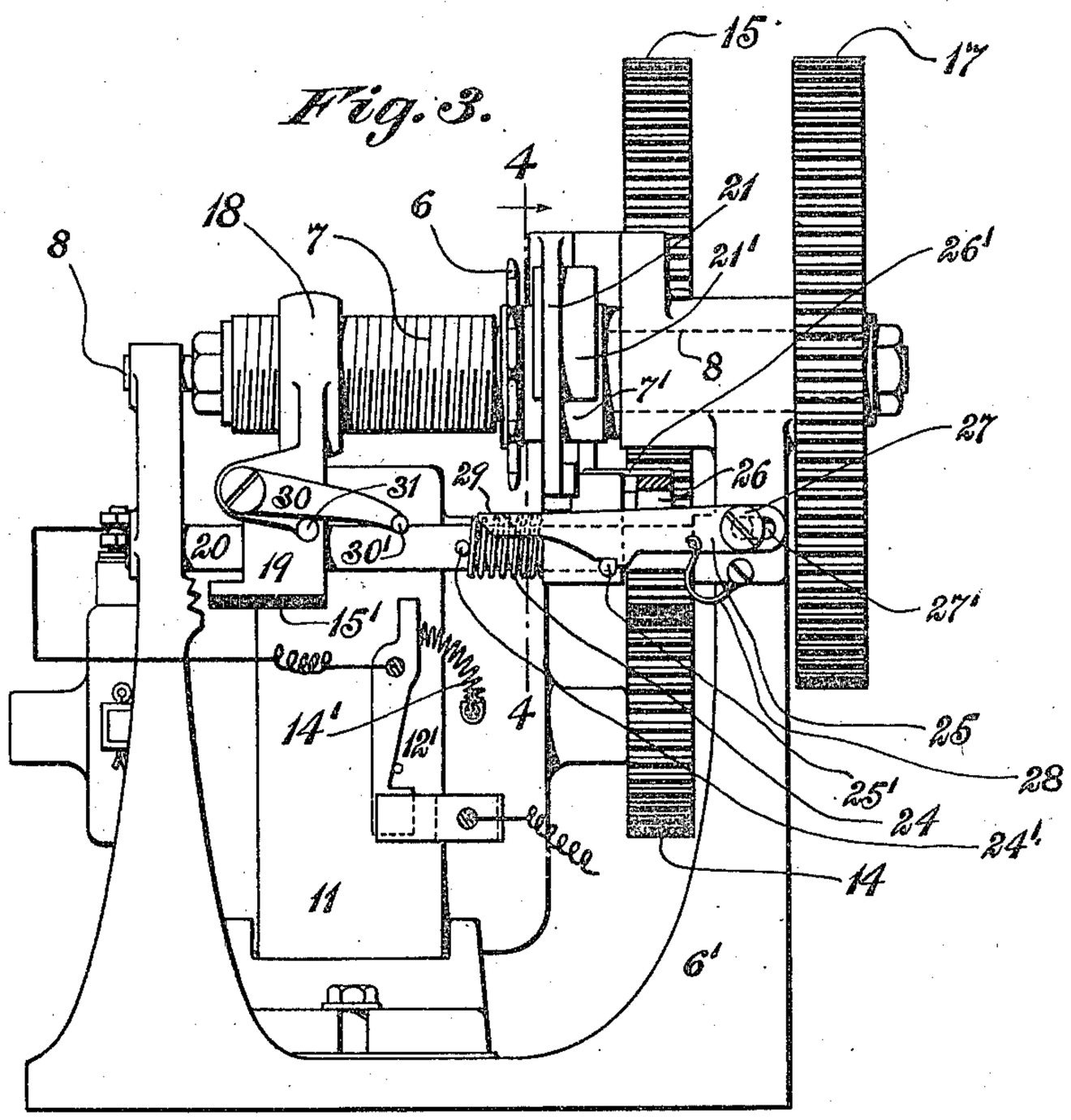


Fig. 4.

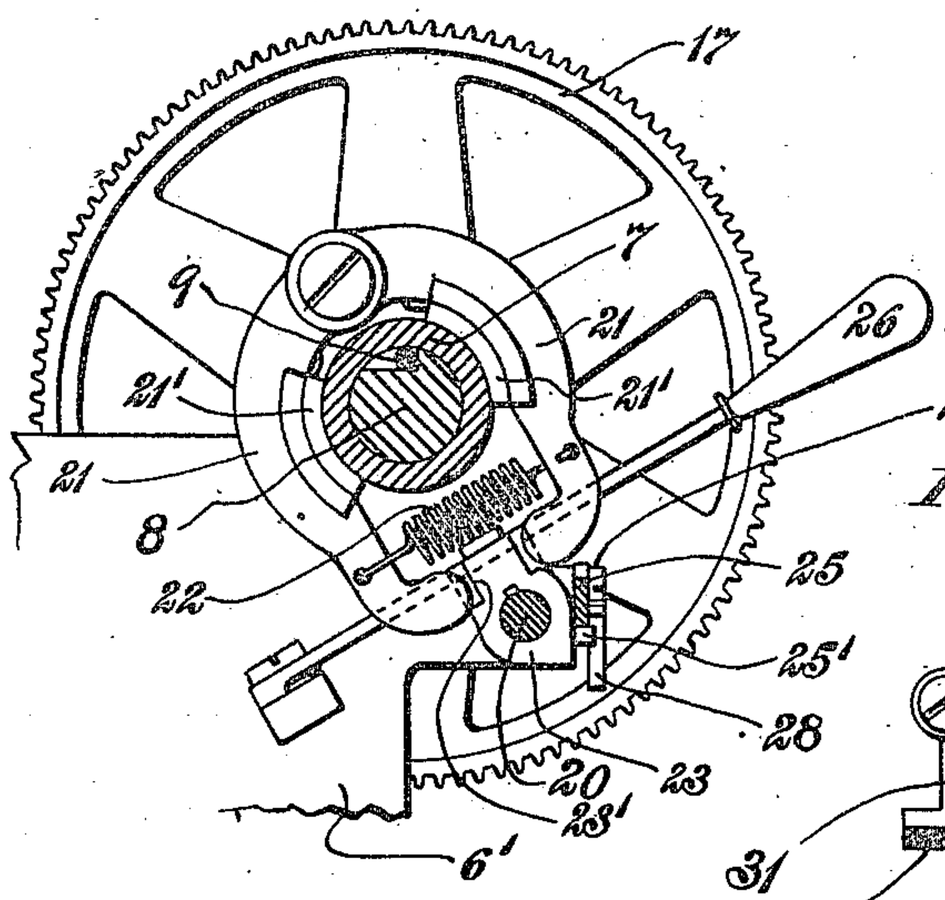


Fig. 5.

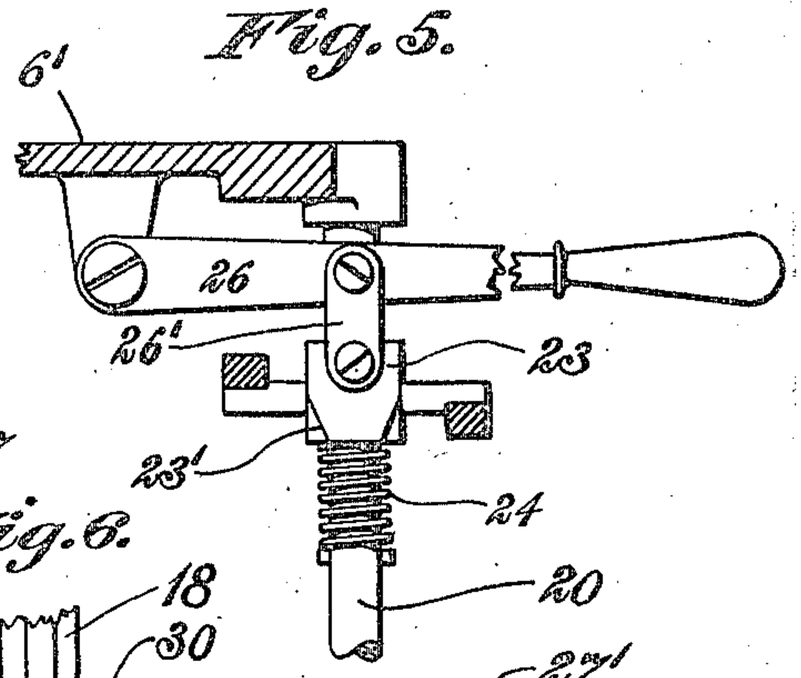
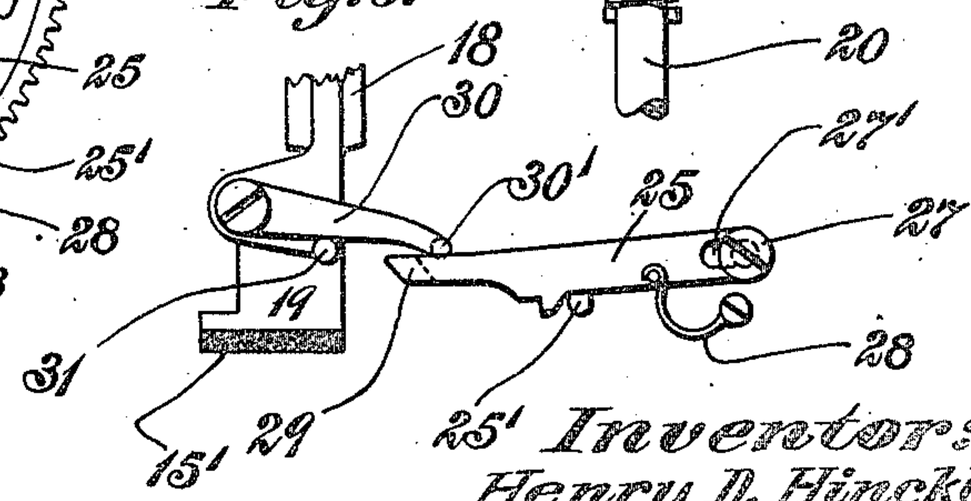


Fig. 6.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC ELECTRICALLY-GOVERNED ENGINE-CONTROLLING APPARATUS.

996,854. Specification of Letters Patent. Patented July 4, 1911.

Application filed October 20, 1910. Serial No. 588,106.

To all whom it may concern:

Be it known that I, HENRY D. HINCKLEY, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Automatic Electrically-Governed Engine-Controlling Apparatus, of which the following is a specification.

This invention relates to an automatic electrically-governed engine controlling apparatus, the object of the invention being to provide an appliance of this character whereby the engine can be automatically stopped when the speed of the same passes beyond a certain point and whereby also the engine can be stopped at will, the latter being of particular advantage in case of various kinds of accidents, and I prefer to effect the stoppage of the engine by the closing of the throttle valve or equivalent thereof, and the parts are so organized that this function can be secured without jamming said valve against its seat.

An apparatus involving my invention possesses other features of novelty and advantage which with the foregoing will be set forth at length in the following description wherein I will outline in full that form of embodiment of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. From the observation just made it will be apparent that I do not restrict myself to the showing made by said drawings and description, as I may depart therefrom in several respects within the scope of my invention as included in the claims succeeding said description.

Referring to said drawings: Figure 1 is a diagrammatic elevation of controlling mechanism involving my invention, showing a supply pipe, the valve of which is operatively connected with said controlling mechanism. Fig. 2 is a diagram of a modified arrangement showing the switch and a means whereby the switch can be automatically and manually operated. Fig. 3 is a side elevation with the parts broken away, of the controlling mechanism itself. Fig. 4 is a cross section on the line 4—4 of Fig. 3. Fig. 5 is a sectional detail view of the brake mechanism, and, Fig. 6 is a like view of a latch and trip means therefor.

Like characters refer to like parts throughout the several figures.

While it is conceivable that controlling means including my invention may be associated with an engine in different ways, I prefer to connect the same with the throttle valve thereof, said valve being carried by the supply pipe 2 and its stem being denoted by 3. In this way I shut off the power practically at its prime source when occasion requires. There are divers means by which the power of a motor, hereinafter described, can be transferred to said stem 3 for the purpose of closing the valve connected therewith, and although I do not limit myself in this particular, I have found sprocket gearing as satisfactory for this purpose, said stem having a sprocket wheel 4 rigidly connected therewith and driven by the sprocket chain 5 which passes over the driving sprocket wheel 6 of comparatively small diameter, said sprocket wheel 6 which constitutes part of the controlling mechanism, being rigid with a sleeve 7 loose on the shaft 8, there being an automatic clutch 9 between the sleeve 7 and the shaft 8, the purpose of which will be hereinafter set forth. The different parts of the controlling mechanism may be supported by a frame as 6′ which may be located suitably with respect to the pipe or conduit 2 and the said frame supports the rotary shaft 8. The stem 3 is equipped with a suitable device whereby the same can be turned by hand to open the valve, and the wheel 10 properly subserves this function. The shaft 8, as will hereinafter appear, is operated by a motor, preferably electric, when the speed of the engine with which the device is connected passes beyond a prescribed or safety point, and when this action occurs, the shaft through the clutch 9 will turn the sleeve 7 and the sprocket wheel 6 whereby the chain 5 and wheel 4 will be operated in a direction to shut the valve. The valve will be opened by turning the wheel 10 and owing to the presence of the clutch 9 can be closed by hand should occasion require, and on such closing movement the shaft 10 is, of course, not turned.

My invention, therefore, comprehends the provision of an engine-governing member consisting preferably but not necessarily, of an engine starting and stopping device,

which in the present instance takes the form of a valve, although as intimated it may consist of any other suitable part by the action of which the operation of an engine or motor can be governed either to stop, limit or partially arrest the action of or to start the same.

As a means for automatically turning the shaft 8, I have shown the electric motor 11 which will generally be connected with a source of city current supply or a secondary battery might be employed, and in the motor circuit 12 is an automatically operable starting switch 13, which I will hereinafter describe. It will be understood that when the switch 13 is operated, the motor circuit 12 will be closed, whereby the motor will be started. As will hereinafter appear, the switch 13 is automatically operated to close the motor circuit 12 when the speed of the engine passes beyond a certain or safety point whereby the engine can be stopped. The shaft of the motor 11 is shown having fastened thereto a pinion 14 in mesh with the spur gear 15 fastened to its shaft, the latter being provided with a pinion 16 in mesh with the spur gear 17 fastened to the shaft 8, and it will, therefore, be evident that when the motor 11 is started the shaft 8, through the intermediate gearing just described, will be forwardly rotated thereby through the automatic clutch 9 rotating the sleeve 7 and sprocket wheel 6 to close the throttle valve through the chain 5 and sprocket wheel 4.

The sleeve 7 is externally threaded to present a feed screw and on it is a nut 18 constituting a suitable means for actuating a circuit breaker as will hereinafter appear, provided with a projection 19 perforated to receive the stationary guide rod 20. On the turning of the wheel 10 to open the valve to start the engine, the screw-sleeve 7 through the described sprocket gearing will be rotated to run the nut 18 outward or toward the left in Fig. 3. On the opposite or automatic movement of the said screw-sleeve 7, said nut will be run inward. This nut is shown provided with means to effect the breaking of the motor circuit 12 and afterward the tripping of a latch which latter, as will hereinafter appear, holds a brake in its ineffective position, and this brake coöperates in the present instance with the sleeve 7 to prevent the sudden final closing of the valve.

Just before the throttle valve is finally seated or closed I prefer to break the motor circuit 12, and for this purpose the circuit breaker 12′ may be utilized, the carrying member 12″ for the circuit breaker being preferably made of some insulating material and being connected with the frame-work 6′ by an adjustable pin and slot connection such as that denoted in a general way by 13′. The circuit breaker 12′ is normally held in operative or circuit closing position by a spring 14′. Just before the throttle valve is closed the insulated strip 15′ on the projection 19 engages the circuit breaker 12′, it being understood that during this period the nut 18 is being automatically moved inward, so that on the continued movement of the nut, the circuit breaker will be operated to open the circuit 12, and this opening or breaking of said circuit will occur preferably just an instant before the valve reaches its seat, the final closing movement being not effected by power but by the momentum of the parts and being also controlled by the brake to which brief allusion has been made. The sleeve 7 has a plain portion 7′ at its inner end for coöperation with the brake which is shown consisting of companion levers 21 pivotally mounted on the frame work and of segment or arc form, the shoes or active portions 21′ of said brake levers being adapted to engage the plain or non-threaded peripheral portion of the sleeve or feed screw 7 when the brake is set.

For setting the brake I prefer to provide spring means, the spring 22 being shown for this purpose and being connected with the brake levers at a point beyond their common axis and beyond their active portions. By employing a spring I can yieldingly set the brake or gradually arrest the motion of the moving parts so as to prevent the valve being thrust too quickly against its seat just at the end of its closing movement, while by the brake I can insure the valve being closed always at the same point; and in such relation as to effectively cut off the steam. I might employ other types of brakes and they might operate in any convenient place, but the construction described has been found satisfactory.

To normally hold the brake levers 21 apart or in their unset relation, I may provide a detent 23 shown consisting of a block slidable on the guide rod 20 and the outer ends of said levers when in said relation engage the parallel flat side faces of said detent, and it will be seen that the latter beyond said parallel faces has a wedge portion 23′, the purpose of which is to spread or open the levers on the outward movement of the detent or block 23. In Fig. 5 the detent or block 23 is in its operative position so as to hold the two brake levers apart and for moving said detent to its lever releasing position whereby the brake may be set, any suitable means may be provided, for example, the spring 24, one end of which engages the detent or block while the other end of which engages a pin 24′ on said rod.

It will be understood that some means will be necessary to normally maintain the detent or block in its effective position, and for this purpose the latch 25 may be pro-

vided, said latch when in active position engaging a catch which may consist of the pin 25′ on the outer side of the detent as shown in Fig. 3. When the latch is tripped to release the catch, the compressed spring 24 immediately becomes effective for moving the detent or block 23 toward the right in Fig. 1, thereby bringing the wedge portion 23′ opposite the outer ends of the two brake levers 21 and permitting the same to be swung toward each other by the spring 22. This also results in causing the shoes 21′ to engage the plain portion 7′ of the sleeve 7, and thereby checks the rotation of said sleeve and also the parts which receive their motion therefrom, among which is the throttle valve. To return the detent 23 to its operative position the hand lever 26 pivoted to the frame work 6′ may be provided, said hand lever being connected by a link 26′ with the block 23. It will be assumed that the part 15′ has operated the circuit breaker 12′ so as to break the circuit. Just after this occurs the latch 25 will be tripped thereby freeing the block 23 whereby the latter will be moved toward the right in Fig. 3 at an accelerated speed to effect the setting of the brake in the manner indicated. It will be understood that when the brake is set the shoes 21′ straddle or grip the plain portion 7′, and although at this time the parts are being moved by momentum, the valve cannot be jammed against its seat in view of the yieldable checking action of the brake.

At this point I might state that the relation between the latch 25 and its tripper is a novel and advantageous one, being of such character that the engaging portion of the latch and tripper are, at practically the instant the latch is tripped, moved out of what might be termed the tripping zone by virtue of which the detent or block 23 can be returned to its primary position so as to spread the brake levers 21 by the action of the wedge portion 23′, and this result in the present case is secured by giving to the latch 25 an endwise movement on the tripping of the same, although as will be apparent, this effect might be otherwise secured.

The pivot for the latch 25 is designated by 27, and it is shown consisting of a screw tapped into the frame work 6′ and extending through a longitudinal slot 27′ in the latch 25 near the outer end thereof, from which it will be apparent that the latch is capable of longitudinal movement. There is shown connected with the frame work a spring 28 which exerts a constant tendency to thrust the latch 25 in one direction which in the present case is toward the left in Figs. 3 and 6. Normally the active portion of the latch 25 engages the catch or pin 25′ and the spring 28 presses the said active portion of the latch against this pin. On the inner side of the latch 25 there is a toe 29 engageable by the trip device 30, the latter having a lateral stud 30′ for this purpose. The trip device is shown as being of pivoted form, so that it constitutes in effect a by pass device, being adapted on one stroke to engage the projection 29 to trip the latch 25, while on the opposite stroke the stud or finger 30′ will engage and ride idly over said toe or lateral projection 29. The latch 30 is shown as pivoted to the projection 19 and as normally resting on a stop 31 on said projection.

In Fig. 3 the latch 25 is shown as engaging the pin 25′ so as to hold the detent or block 23 in its operative position to thereby maintain the brake levers 21 apart or in their unset condition, while the nut 18 to which the trip device 30 is connected is in its outer position. It will be assumed that the motor circuit 12 is closed in the manner previously described. When this occurs, the motor 11 will be started, and the nut 18 will be fed inward, and just before the throttle valve reaches its seat and an instant after the part 15′ has operated the circuit breaker 12′ to break the circuit 12 the finger 30′ on the tripper 30 will engage the angular face of the toe or projection 29, and on the continued movement which is comparatively slight, the latch 25 will be lifted free of the catch or pin 25′ whereby the block 23 will be released and shot forward to its inoperative position so as to release the two brake levers 21 and simultaneously with this action the latch 25 will be bodily thrust to the left in Fig. 1 to the position it is shown as occupying in Fig. 6 so as to carry the right end wall of the longitudinal slot 27′ against the pivot 27, it being understood that when the latch is set the left end wall of said slot 27′ is against said pin 27. Owing to this endwise movement of the latch 25 the toe or projection 29 is carried some distance away from the tripping point and sufficiently far therefrom to permit the detent 23 to be brought to its original position and to be latched or held therein by the latch 25 irrespective of the fact that the part 30 is in its tripping position.

The switch 13 to which I have already referred is of the knife pattern, although it may be of any other suitable type, it being provided with a push spring 32 for positively shifting the same at the desired time to close the motor circuit 12, the switch being normally held in its retracted position by a latch 33 also spring actuated. It will be clear that when the latch 33 is tripped, the switch 13 will be instantly operated by its spring 32 so as to effect the closing of said circuit whereby the motor 11 will be operated to effect, through the described parts, the closing of the throttle valve, and there are various ways by which this latch

33 may be tripped, although the tripping means therefor when the action is automatic is preferably of centrifugal type. I have shown for this purpose a wheel 34 which may, as represented, consist of companion disks fastened to each other and to a shaft 35, the levers 36 being pivoted between the sections of said wheel 34 and being normally held in their retracted positions by means of springs 37. The wheel 34 is adapted to be operated constantly by some moving part as the crank shaft, of the engine which it is desired to control, and there are, of course, many ways in which this action can be secured, although one is shown. The shaft 35 is shown connected by gearing denoted in a general way by 38 with the friction wheel 39, the switch and the parts immediately associated therewith being mounted on a base plate 40 whereby the friction wheel 39 may be placed against the crank shaft 39′ or some equivalent part of the engine at which time said base plate will be firmly held in place. On the action of the engine the friction wheel 39 will turn, and as it turns the wheel 34 through the described parts will be also turned and when the speed of the engine passes beyond the safety point, the levers or knock-off devices 36 will be thrown outward by centrifugal force, and one of them will engage an insulated piece on the tail of the latch 33 and thereby trip the latch, so that the switch 13 will be immediately operated to close the circuit 12 and start the motor 11.

It will be apparent that the apparatus is fully automatic in its action and that it is absolutely certain. One of the important points of the construction is that the valve cannot be opened unless the motor circuit is opened and unless the brake to which I have referred is unset or in releasing position. In certain types of engine stops with which I am familiar the engineer usually first opens his valve and then sets the controlling mechanism, and it is frequently the case that after the valve has been opened the controlling mechanism is not set, so that when an emergency does arise which necessitates the use of the controlling mechanism, an accident is the result. In my case, as I have intimated, the controlling mechanism necessarily has to be set before the valve can be opened. The valve, as will be evident, cannot be opened until the brake is released, and it will be assumed that the engineer opens the valve with the brake in its releasing position. When this occurs the engineer may open the valve, but if he does so without opening the electric circuit 12, the motor will start and practically instantaneously close the valve automatically, and thereby necessitate the breaking of the circuit before the valve can be opened.

In the modified arrangement I have shown a motor closing or starting lever 50, said switch lever being normally maintained in its retracted position by the spring operated latch 51 which are practically equivalents of the switch lever 13 and latch 33 already described. The lever 50, however, is controlled by a local or battery circuit as 52 including a battery 53 and a magnet 54. As a part of said circuit are the two sections of the divided stationary ring 55 normally insulated from each other by insulating blocks 56 located approximately at diametrically opposite points. Owing to the separation of the sections of the ring 55, it will be evident that the circuit 52 is normally open. Said circuit may be closed by bridging the interval or space between the two sections of said ring at either of the two places indicated. Within the ring 55 is mounted a disk 57 adapted to be operated by the engine with which the mechanism is connected, and this disk carries rods 58 normally held in their retracted position by springs 59 and provided at their outer end with shoes 60 constituting circuit closers. When the speed of the engine with which the disk 57 is connected passes beyond a certain point, the shoes 60 will be thrown outwardly sufficiently to bridge the space between the ends of the sections of the ring 55 to thereby close the circuit 52 and energize the magnet 54. The armature 54′ of the magnet is pivotally connected with the tail of the latch 51, and it will be clear that when the magnet is thus energized it attracts its armature 54′ and thereby trips the latch 51 to release the lever 50 whereby the motor circuit will be closed. I may interpose in the circuit 52 a push button 61 or its equivalent, so that I can effect the energization at will of the magnet 54. A similar push button or switch might be interposed in the motor circuit already described. By virtue of the organization set forth in Fig. 2 I can obtain automatic control of the engine or can stop the same at will. The insulated support or carrier for the switch 13 is like the corresponding part of the circuit breaker 12′, adjustably mounted, so that in this way I can regulate with precision and exactness the point at which the latch 33 should be tripped.

What I claim is:

1. In an apparatus of the class described, the combination of an engine starting and stopping device, an electrical circuit including a motor, operative connections between said motor and said engine starting and stopping device, means for closing the said motor circuit to start the motor and thereby operate said engine starting and stopping device toward its engine stopping position, and automatic means for breaking the said circuit at a predetermined point.

2. In an apparatus of the class described,

the combination of a valve, a motor, means for putting the motor into operative connection with the valve to move said valve toward its closed position and for subsequently throwing said motor out of operative relation with said valve before the latter is fully closed, and means for checking the final closing movement of the valve.

3. In an apparatus of the class described, the combination of a valve, a motor, means for putting the motor into operative connection with the valve to move said valve toward its closed position and for subsequently throwing the motor out of operative relation with said valve before the latter is fully closed, a valve checking device, and means for throwing the valve checking device into active relation with the valve approximately at the time the motor is thrown out of operative relation with said valve.

4. The combination of an engine starting and stopping device, an electric circuit including a motor, power transmitting connections between said motor and said engine starting and stopping device, means for closing the said circuit whereby the motor will be started to move said engine starting and stopping device toward its engine stopping position, means for breaking the circuit before said device has reached its engine stopping position, and means for checking the final engine stopping movement of said engine starting and stopping device.

5. In an apparatus of the class described, the combination of an engine starting and stopping device, a motor, means for putting said motor into operative connection with said motor starting and stopping device to move the latter in a direction to stop the engine, and for subsequently throwing said motor out of operative relation with said device before the latter reaches its engine stopping position, and automatic means for checking the final engine stopping movement of said engine stopping and starting device.

6. In an apparatus of the class described, the combination of an engine starting and stopping device, a motor, connections between the motor and the engine starting and stopping device for moving the engine starting and stopping device into its engine stopping position, said connections having means to permit the manual operation of the said engine starting and stopping device into its engine starting position, independently of the motor, and means for checking the final part of the engine stopping movement of said engine starting and stopping device and approximately at the point that the motor is stopped.

7. In an apparatus of the class described, the combination of a driven member, a driving member, operative connections between the driving and driven member, an electric circuit containing an electric motor for operating said driving member, means for closing said circuit, and automatic means for subsequently opening said circuit to thereby stop the motor.

8. In an apparatus of the class described, the combination of a driven member, a driving member operatively connected with said driven member, an electric circuit containing a motor, operative connections between said motor and driving member for actuating the latter, means for closing said circuit, and means operative by the motor for opening said circuit.

9. In an apparatus of the class described, the combination of a driven member, a driving member operatively connected with said driven member, a motor operatively connected with said driving member for actuating the latter, means for putting the motor into action at a desired point, automatic means for effecting the stoppage of the motor, and automatically active mechanism for checking the action of the driving member on the stopping of said motor.

10. In an apparatus of the class described, the combination of a driven member, a driving member operatively connected with said driven member, a motor operatively connected with said driving member for actuating the latter, means for starting the motor at a desired point, automatic means for effecting the stoppage of said motor, and mechanism yieldably active against said driving member on the stoppage of the motor.

11. In an apparatus of the class described, the combination of a driven member, a driving member operatively connected with said driven member, a circuit containing an electric motor operatively connected with said driving member for actuating the latter, means for closing said circuit, means governed by the motor for breaking said circuit, and automatically operative brake mechanism in connection with said driving member for checking the latter, the motor having means connected therewith for causing the action of the brake mechanism, substantially on the breaking of said circuit.

12. In an apparatus of the class described, the combination of a driven member, a driving member operatively connected with said driven member, an electrical circuit including a motor operatively connected with said driving member for actuating the latter, said circuit also having a spring actuated switch, means for holding the switch in a position to normally maintain the circuit open, and automatically active means for effecting the release of said switch to thereby close said circuit and automatic means for breaking said circuit at a predetermined point.

13. In an apparatus of the class described, the combination of a feed screw, a nut on said feed screw, an electric circuit including

a motor operatively connected with said feed screw for turning the same, and means operative by the nut for breaking said circuit.

14. In an apparatus of the class described, the combination of a feed screw, of a nut on said feed screw, means for turning said feed screw, brake mechanism coöperative with said feed screw, and automatically operative means adapted to be thrown into action by said nut, for putting the brake mechanism into action.

15. In an apparatus of the class described, the combination of a feed screw, a nut on said feed screw, means for turning said feed screw, brake mechanism coöperative with said feed screw, means including a latch for holding the brake mechanism in an inoperative position, and means connected with said nut for tripping said latch.

16. In an apparatus of the class described, the combination of a feed screw, a nut on said feed screw, an electric circuit including a motor operatively connected with said feed screw for turning the same, means connected with said nut for breaking the circuit at a predetermined point, brake mechanism cooperative with said feed screw, and automatically operative means adapted to be thrown into action by said nut, for putting the brake mechanism into action.

17. In an apparatus of the class described, the combination of a rotary shaft, a feed screw on said shaft, an automatically operative clutch for transferring the effect of said shaft to said feed screw, a nut on said feed screw, a motor operatively connected with said shaft for actuating the same, and means operable by said nut for stopping the motor.

18. In an apparatus of the class described, the combination of brake mechanism, means including a latch for holding the brake mechanism in an ineffective position, an automatically operative tripper for tripping said latch, and means for causing a relative movement of the tripper and latch when the latter is tripped for carrying the engaging portion of one of said parts out of the tripping zone.

19. In an apparatus of the class described, the combination of brake mechanism, means including a latch for holding the brake mechanism in an ineffective position, an automatically operative tripper for tripping said latch, and means active against the latch for moving the same in an endwise direction when tripped.

20. In an apparatus of the class described, the combination of brake mechanism, means including a longitudinally slotted latch for holding the brake mechanism in an inoperative position, an automatically operative tripper for tripping the latch, a pivot for said latch extending through the slot thereof, and means for moving said latch in an endwise direction when tripped.

21. In an apparatus of the class described, the combination of a pair of brake levers, a spring actuated detent for holding the brake levers apart in their inoperative positions, a latch for engaging said detent, and automatically operative means for tripping said latch.

22. In an apparatus of the class described, the combination of a driven member, a driving member operatively connected with said driven member, brake mechanism for governing the action of the driving member, a detent for normally holding the brake mechanism in an inoperative position, means tending constantly to operate the detent to effect the release of the brake mechanism, a latch for normally holding the detent in its operative position, means operative with said driving member to trip said latch, a motor operatively connected with said driving member for actuating the same, and means also connected with said driving member for stopping the motor.

23. In an apparatus of the class described, the combination of a feed screw, a nut on said feed screw, a motor operatively connected with said feed screw for turning the same, means connected with the nut for stopping the motor, a pair of brake levers, the feed screw having a plain portion engageable by said brake levers, means for causing the brake levers to engage the plain portion of the feed screw, a spring actuated detent for normally holding the brake levers separated, a latch for holding the detent in an ineffective position, and means operable by said nut for tripping said latch.

24. In an apparatus of the class described, the combination of a feed screw, a nut on said feed screw, a motor operatively connected with the feed screw for actuating the same, a pair of brake levers, the feed screw having a plain portion engageable by said brake levers, a spring actuated detent for normally holding the brake levers in their unset relation, a latch for normally holding the detent in its effective position, and means connected with said nut for stopping the motor, and tripping said latch in succession.

25. In an apparatus of the class described, the combination of an engine starting and stopping device, a motor, means for throwing the motor into operative relation with said device to move the same toward its engine stopping position, said device having manually operable means associated therewith for moving the same toward its engine starting position, and means for preventing full manual movement of said device to said engine starting position until the motor is thrown out of active relation therewith.

26. In an apparatus of the class described, the combination of an engine starting and

stopping electric motor and the circuit thereof, said circuit having two breaks, a switch normally closing one of the breaks and provided with means for holding the same in such position, the motor having means for moving said switch into its circuit opening position at a predetermined point, a detent for normally holding the other switch against circuit closing movement, and automatic means for effecting the release of the last mentioned switch.

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

HENRY D. HINCKLEY.

Witnesses:
HEATH SUTHERLAND,
FREDERIC E. ANDERSON.