O. P. OSTERGREN.

STARTING MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAR. 7, 1911.

1,025,295.

Patented May 7, 1912.

5 SHEETS—SHEET 1.

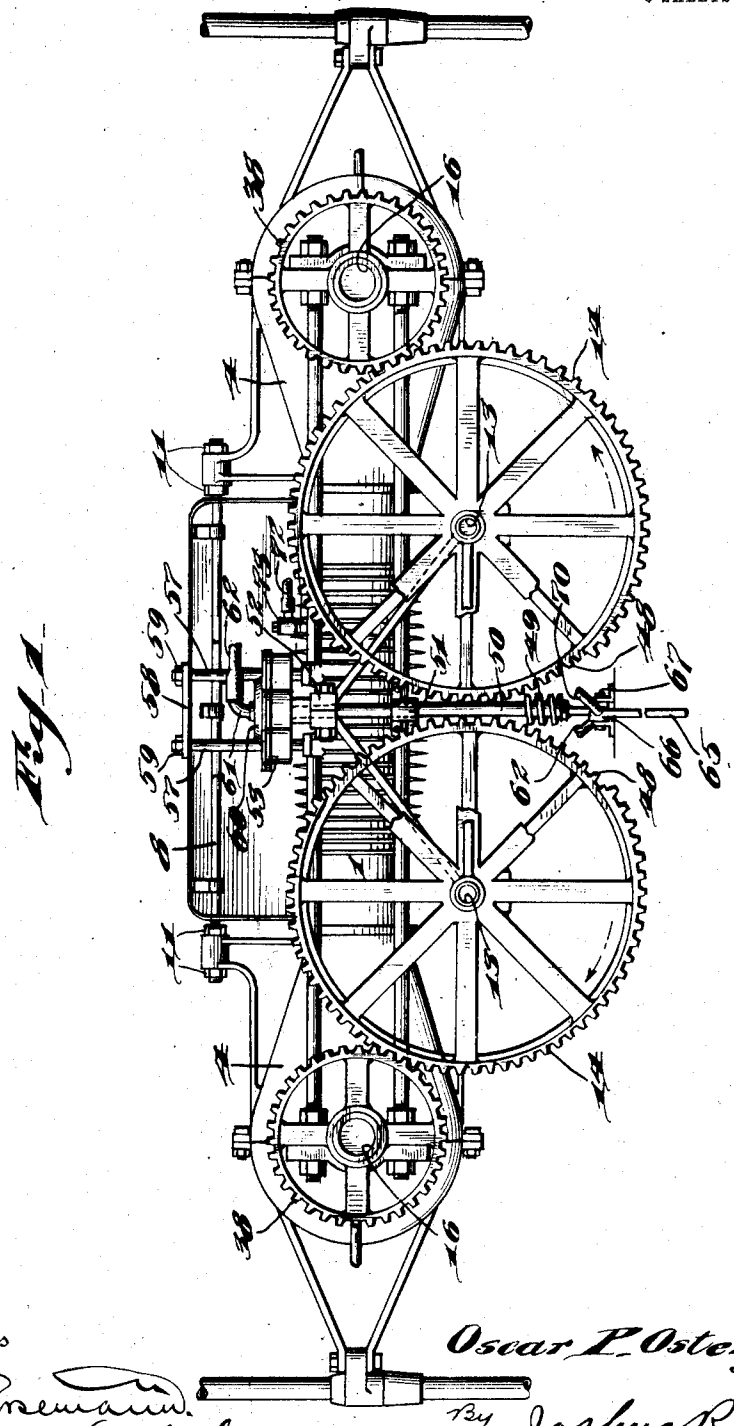

Fig. 1.

Witnesses

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R. A. Krenkel.

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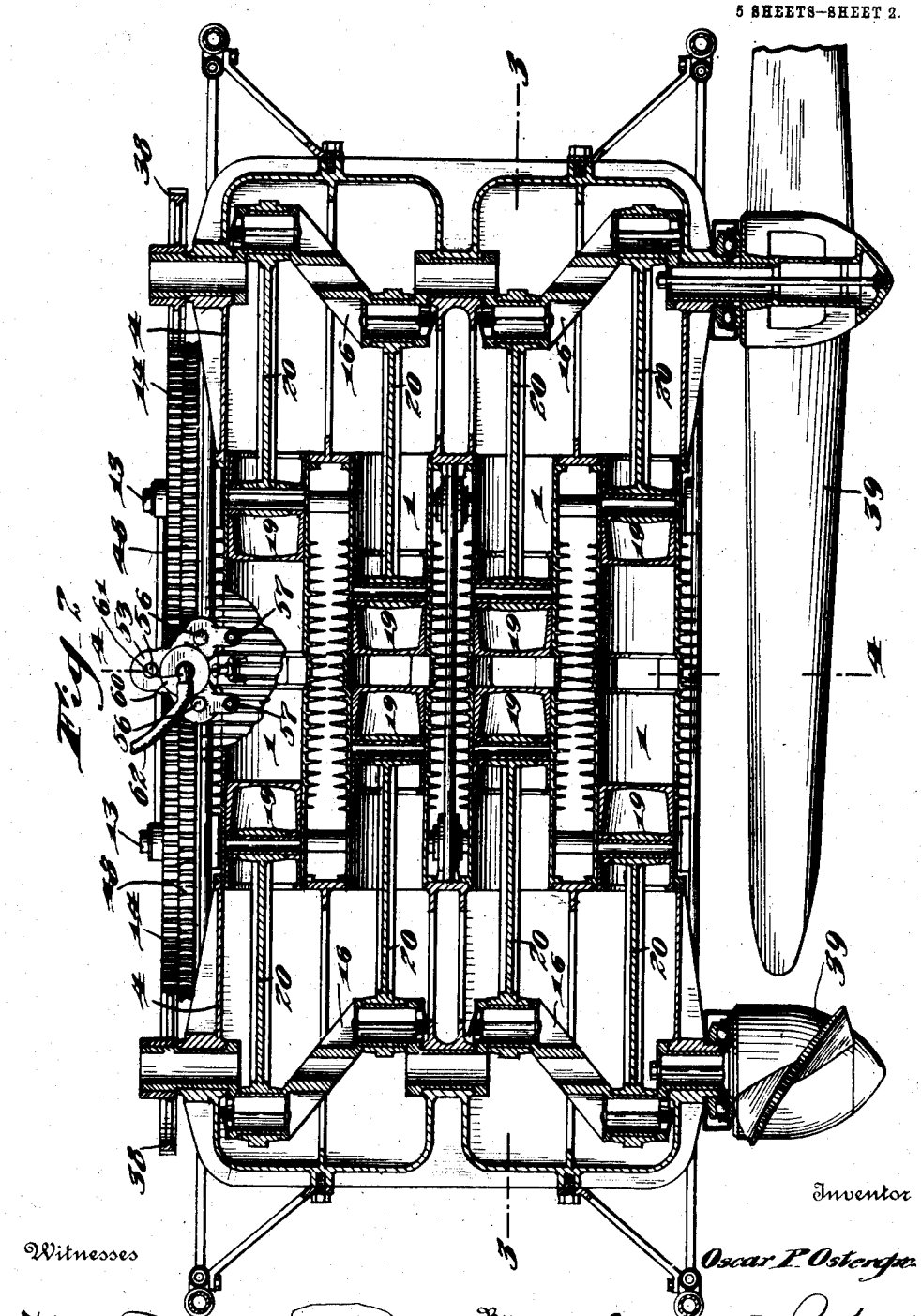

Witnesses

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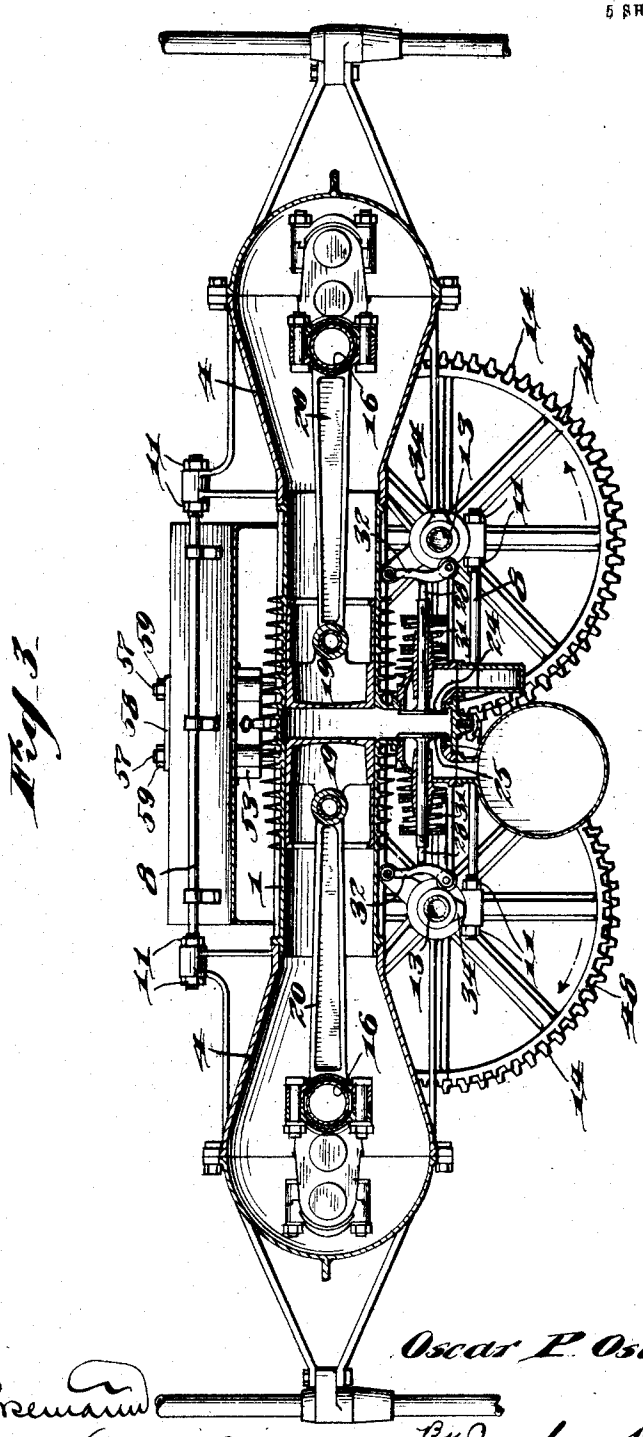

Fig. 3.

Witnesses

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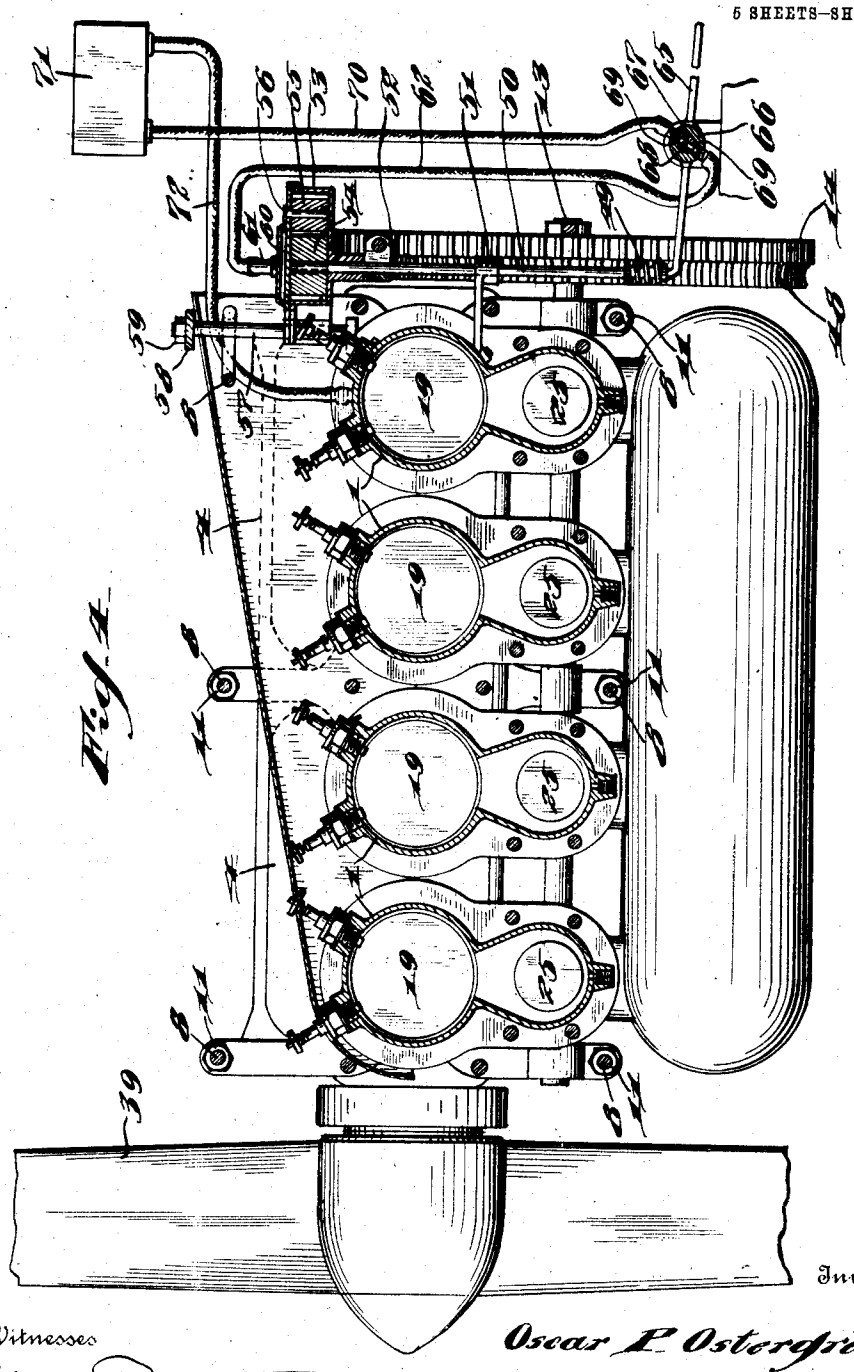

Fig. 4.

Witnesses

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5 SHEETS—SHEET 5.

Fig. 5.

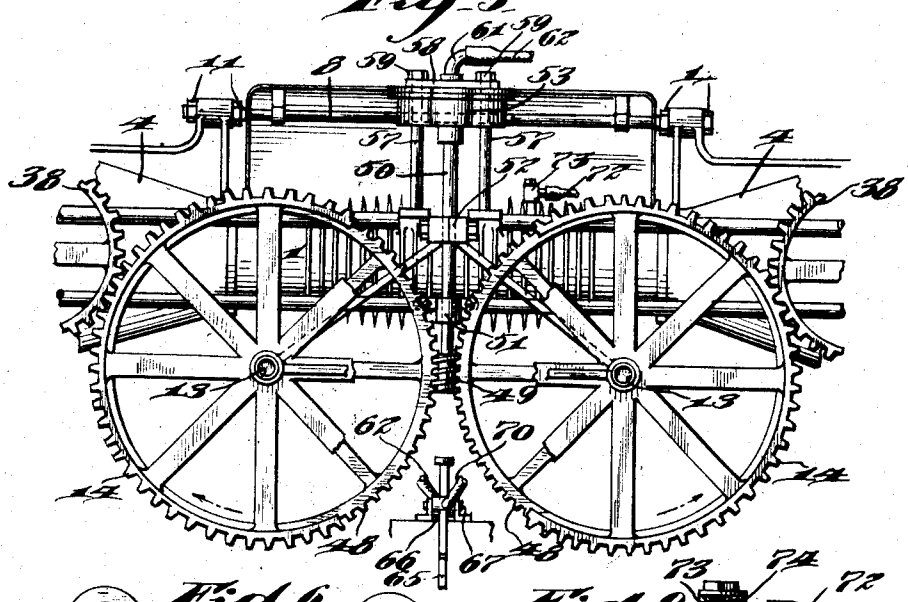


Fig. 6.

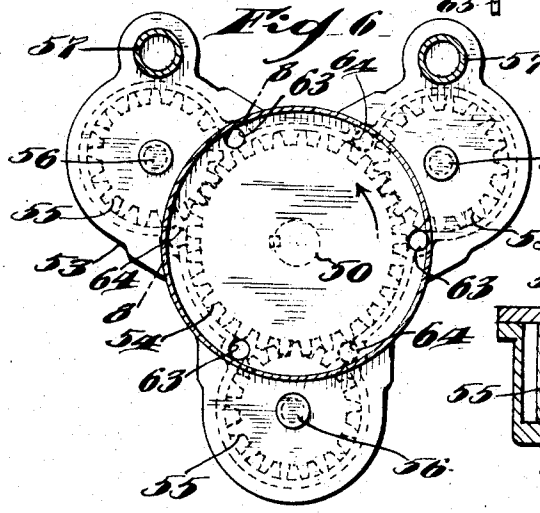


Fig. 9.

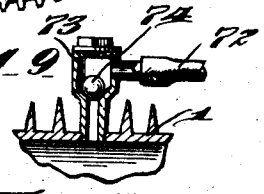


Fig. 7.

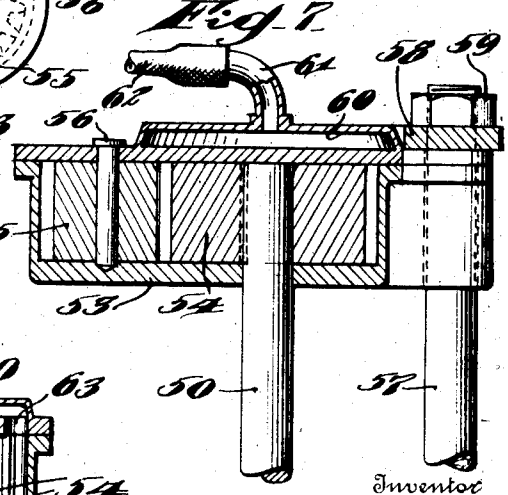
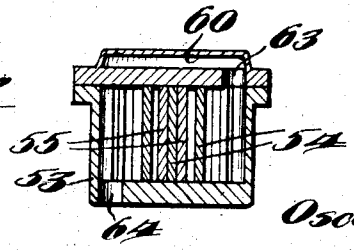


Fig. 8.



Witnesses

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R. N. Krenkel.

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Attorney

UNITED STATES PATENT OFFICE.

OSCAR P. OSTERGREN, OF BROOKLYN, NEW YORK, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO HARRY REIS AND ONE-HALF TO SAMUEL S. MARLEY, BOTH OF WILMINGTON, DELAWARE.

STARTING MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

1,025,295. Specification of Letters Patent. Patented May 7, 1912.

Application filed March 7, 1911. Serial No. 612,807.

To all whom it may concern:

Be it known that I, OSCAR P. OSTERGREN, a subject of the King of Sweden, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Starting Mechanism for Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in starting mechanism for internal combustion engines, the object of the invention being to provide improved means for imparting initial compression in the cylinder or cylinders, and which dispenses with the necessity of cranking, as is customary with engines of this type.

A further object is to provide improved mechanism of this character, which when moved into operative position will turn the gears of the engine to compel the initial compression, and when the speed of the gears exceeds the speed imparted thereto by the starting mechanism, said gears will force the starting mechanism to its normal inoperative position.

A further object is to provide an improved starting mechanism which utilizes fluid under pressure, and which preferably employs the exhaust from the engine although other fluid may be employed as desired.

A further object is to provide a starting mechanism of this character which may be attached to engines with but slight modification, and while it is particularly adapted for use in connection with the engine set forth in my application executed on even date herewith, it is in no wise limited to that particular engine.

With these and other objects in view, the invention consists in certain novel features of construction and combinations and arrangements of parts, as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings: Figure 1, is a view in elevation illustrating my improvements. Fig. 2, is a view partly in plan and partly in horizontal section. Fig. 3, is a view in longitudinal section on the line 3—3 of Fig. 2. Fig. 4, is a view in transverse section on the line 4—4 of Fig. 2. Fig. 5, is a fragmentary view in elevation showing the starting mechanism in operative position. Fig. 6, is a sectional plan view on an enlarged scale illustrating the motor used for starting. Fig. 7, is an enlarged view in vertical section of the motor and its support. Fig. 8, is a view in section on the line 8—8 of Fig. 6, and Fig. 9, is an enlarged sectional detail view illustrating the connection between one of the engine cylinders and the fluid reservoir.

As above stated, my improved starting mechanism is illustrated in connection with my improved engine, in which a plurality of cylinders 1 (preferably four) are secured in parallelism and in rigid relation with each other by means of crank casings 4, rods 8, and nuts 11, and in said cylinders pistons 19 are located, and are connected by links 20 with crank shafts 16 supported in bearings 15 in the crank casings. On these shafts 16, gears 38 are fixed, and mesh with larger gears 14 on countershafts 13. On these countershafts 13, cams 34 are fixed for operating the inlet and exhaust valves 24 and 25 respectively, through the medium of pivoted arms 32 and stems 28, said valves being normally held in closed position by means of the springs 31.

Propellers 39 are secured on the ends of shafts 16, when the machine is to be used in connection with a flying machine, and when provided with my improved starting mechanism, two worm wheels 48 are secured on the countershafts 13. These worm wheels are in alinement and located close to each other, so that they may both be turned by a worm 49, which is fixed to a vertical shaft 50, and is normally in the position shown in Fig. 1 in a plane too low to engage the teeth of the worm wheels. A shaft 50 is supported in two fixed bearings 51 and 52, both of which are fixed to the engine structure and insure a vertical alinement of the shaft. The upper end of shaft 50 projects into a casing 53, and is keyed to a relatively large gear 54 in said casing.

The casing 53 is of somewhat triangular form, so that it not only accommodates the large gear 54 centrally therein, but also houses three smaller gears 55, all of which mesh with the larger gear 54. These gears 55 are each mounted to turn upon journal pins 56 secured in the casing, and the casing

together with the gears and shaft 50 are adapted to move vertically, said casing being guided in its vertical movement on two parallel vertical rods 57 fixed to the engine structure, and connected at their upper ends by means of a cross bar 58. This cross bar 58 is held against upward movement by means of nuts 59 screwed onto the upper ends of the rods 57, and said bar serves to limit the upward movement of the casing 53. On top of casing 53, an air chamber or distributing chest 60 is fixed or made integral, and is provided with an inlet pipe 61 to which a hose 62 is connected for supplying the necessary fluid to operate the motor above described. The top of casing 53 is provided with three openings 63 connecting the casing 53 with the fluid distributing chest 60, and outlet openings 64 are provided in the bottom of casing 53. It will be noted that fluid which enters the inlet openings 63, must move gear 54 in the direction of the arrow, when said fluid forces its way between the gears 54 and 55 before said fluid finds its outlet 64, thus compelling gear 54 and shaft 50 to turn.

To move the shaft 50 and its motor upwardly, I provide a lever 65 which is made with a central circular sleeve 66, constituting a bearing on a fixed journal 67, and one end of this lever engages under the lower end of worm 49. The sleeve 66 and the journal 67 constitute a valve as the journal 67 is provided with an opening 68, which is adapted to register with openings 69 in sleeve 66, when the lever 65 elevates worm 49 far enough to engage the teeth of worm wheels 48, but in all other positions the openings are out of alinement. This valve formed at the fulcrum of lever 65, preferably connects a hose 62 with a hose 70, communicating with a tank 71. Tank 71 may be supplied with fluid in various ways, but I prefer to connect the same by means of a hose 72, with an outlet 73 connected with one of the engine cylinders 1. In this outlet 73, a ball valve 74 is located and this ball 74 closes only when the desired pressure in tank 71 is maintained.

It will be noted that the outlet 73 is located at a point between the point of explosion and the end of the cylinder, so that it receives the explosive gases under a somewhat reduced pressure, and the pressure at this point is automatically maintained in the tank.

The operation is as follows: We will assume the engine to be at a stand still when the parts will be in the position shown in Fig. 1. To start the engine, lever 65 is moved so that it raises worm 49, shaft 50, and motor casing 53, far enough for worm 49 to engage the teeth of worm wheels 48. When the lever is in this position, there will be an open communication between pipes 62 and 70, so that the fluid from tank 71 will pass into the motor casing and turn shaft 50 as above explained. When this shaft 50 begins to turn, and the worm 49 is in mesh with worm wheels 48, the first rotary motion imparted to the worm will cause the worm to move upwardly, while gears 48 stand still. This moves the worm away from lever 65, and moves upwardly until such movement is limited by the motor casing 53 contacting with cross bar 58. When in this position, worm 49 will be centrally between the two worm wheels 48 and in mesh with both of the latter. As the worm cannot move upwardly, its continued rotary motion will necessarily impart a rotary movement to worm wheels 48, causing the latter to turn gears 14 and 38 and crank the engine. As soon as explosions begin to take place in the engine, the speed imparted to the shafts 16 and 133 will be in excess of the speed imparted to the shafts by the worm, hence this excess speed of the gears will move the worm 49 downwardly out of mesh with the worm wheels 48, until the worm strikes lever 65 and cuts off the supply of fluid to the motor. It will therefore be noted that to start the engine, it is simply necessary to move lever 65 and that the engine after starting will automatically throw the starting mechanism out of operative position, and that the movement of the worm, namely, by lever 65 automatically starts the motor, so that all that is necessary to be done is to manipulate lever 65.

Various slight changes might be made in the general form and arrangement of parts described without departing from my invention, and hence I do not limit myself to the precise details set forth, but consider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of the appended claims.

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

1. A starting mechanism for engines, comprising an engine driven worm wheel, a worm, a shaft to which said worm is secured, a motor on said worm shaft, means for moving said worm shaft to move the worm into engagement with the worm wheel, said last-mentioned means controlling the operation of the motor, substantially as described.

2. A starting mechanism for engines, comprising an engine driven worm wheel, a worm, a shaft to which said worm is secured, a motor on said worm shaft, means for moving said worm shaft to move the worm into engagement with the worm wheel, means for operating said motor, and said shaft moving means controlling the motor operating means, substantially as described.

3. A starting mechanism for engines comprising an engine driven worm wheel, a worm normally out of engagement with said worm wheel, a shaft to which said worm is

secured, a motor connected with said shaft, means for moving the shaft to position the worm in mesh with the worm wheel, and said shaft moving means controlling the operation of said motor, substantially as described.

4. A starting mechanism for engines comprising an engine driven worm wheel, a worm normally out of engagement with said worm wheel, a shaft to which said worm is secured, a motor connected with said shaft, means for moving the shaft to position the worm in mesh with the worm wheel, a fluid reservoir, a pipe connecting said fluid reservoir with said motor, and said shaft moving means controlling the flow of fluid to the motor, substantially as described.

5. A starting mechanism for engines comprising an engine driven worm wheel, a worm shaft, a worm on said shaft normally out of engagement with the worm wheel, a fluid motor on said worm shaft, a fluid tank, a pipe connecting said fluid tank and motor, and means constructed to move said worm shaft and control the flow of liquid through said pipe, substantially as described.

6. A starting mechanism for engines comprising an engine driven worm wheel, a worm shaft, a worm on said shaft normally out of engagement with the worm wheel, a fluid motor on said worm shaft, a fluid tank, a pipe connecting said fluid tank and motor, a lever fulcrumed between its ends, one end adapted to engage the worm and move the worm shaft, and the fulcrum of said lever constituting a valve in said pipe, whereby the flow of fluid to the motor is controlled by the movement of the lever, substantially as described.

7. A starting mechanism for engines comprising an engine driven worm wheel, a worm normally out of engagement with said worm wheel, a shaft to which said worm is secured, a motor connected with said shaft, means for moving the shaft to position the worm in mesh with the worm wheel, said motor comprising a casing, a gear in said casing fixed to the worm shaft, smaller gears meshing with the larger gear, and said casing having inlets and outlets compelling the passage of fluid between said larger gear and said smaller gears, substantially as described.

8. A starting mechanism for engines comprising an engine driven worm wheel, a worm normally out of engagement with said worm wheel, a shaft to which said worm is secured, a motor connected with said shaft, means for moving the shaft to position the worm in mesh with the worm wheel, and said shaft moving means controlling the operation of said motor, said motor comprising a casing, a gear in said casing fixed to the worm shaft, smaller gears meshing with the larger gear, and said casing having inlets and outlets compelling the passage of fluid between said larger gear and said smaller gears, substantially as described.

9. A starting mechanism for engines comprising an engine driven worm wheel, a worm normally out of engagement with said worm wheel, a shaft to which said worm is secured, a motor connected with said shaft, means for moving the shaft to position the worm in mesh with the worm wheel, a fluid reservoir, a pipe connecting said fluid reservoir with said motor, and said shaft moving means controlling the flow of fluid to the motor, said motor comprising a casing, a gear in said casing fixed to the worm shaft, smaller gears meshing with the larger gear, and said casing having inlets and outlets compelling the passage of fluid between said larger gear and said smaller gears, substantially as described.

10. A starting mechanism for engines comprising an engine driven worm wheel, a worm shaft, a worm on said shaft normally out of engagement with the worm wheel, a fluid motor on said worm shaft, a fluid tank, a pipe connecting said fluid tank and motor, means constructed to move said worm shaft and control the flow of liquid through said pipe, said motor comprising a casing, a gear in said casing fixed to the worm shaft, smaller gears meshing with the larger gear, and said casing having inlets and outlets compelling the passage of fluid between said larger gear and said smaller gears, substantially as described.

11. A starting mechanism for engines comprising an engine driven worm wheel, a worm shaft, a worm on said shaft normally out of engagement with the worm wheel, a fluid motor on said worm shaft, a fluid tank, a pipe connecting said fluid tank and motor, a lever fulcrumed between its ends, one end adapted to engage the worm and move the worm shaft, and the fulcrum of said lever constituting a valve in said pipe, whereby the flow of fluid to the motor is controlled by the movement of the lever, said motor comprising a casing, a gear in said casing fixed to the worm shaft, smaller gears meshing with the larger gear, and said casing having inlets and outlets compelling the passage of fluid between said larger gear and said smaller gears, substantially as described.

12. The combination with an internal combustion engine, and two parallel shafts driven by said engine, of gears on said drive shafts, countershafts, gears on said countershafts meshing with the first-mentioned gears, worm wheels on said countershafts, a worm shaft disposed between the worm wheels and mounted to move longitudinally, a worm on said worm shaft normally out of engagement with the worm wheels, a motor for turning said worm shaft, and means for moving said worm shaft longitudinally to

position the worm in engagement with the worm wheels, substantially as described.

13. The combination with an internal combustion engine, and two parallel shafts driven by said engine, of gears on said drive shafts, countershafts, gears on said countershafts meshing with the first-mentioned gears, worm wheels on said countershafts, a worm shaft disposed between the worm wheels and mounted to move longitudinally, a worm on said worm shaft normally out of engagement with the worm wheels, a motor for turning said worm shaft, means for moving said worm shaft longitudinally to position the worm in engagement with the worm wheels, and said shaft moving means controlling the operation of said motor, substantially as described.

14. The combination with an internal combustion engine, and two parallel shafts driven by said engine, of gears on said drive shafts, countershafts, gears on said countershafts meshing with the first-mentioned gears, worm wheels on said countershafts, a worm shaft disposed between the worm wheels and mounted to move longitudinally, a worm on said worm shaft normally out of engagement with the worm wheels, a motor for turning said worm shaft, parallel rods projecting through said motor casing and guiding the movement thereof, a cross bar on said rod limiting the movement of said casing, and means for moving said worm shaft and casing, substantially as described.

15. The combination with an internal combustion engine, and two parallel shafts driven by said engine, of gears on said drive shafts, countershafts, gears on said countershafts meshing with the first-mentioned gears, worm wheels on said countershafts, a worm shaft disposed between the worm wheels and mounted to move longitudinally, a worm on said worm shaft normally out of engagement with the worm wheels, a motor for turning said worm shaft, parallel rods projecting through said motor casing and guiding the movement thereof, a cross bar on said rod limiting the movement of said casing, a lever constructed to engage said worm and move it longitudinally to position said worm in engagement with the worm wheels, substantially as described.

16. The combination with an internal combustion engine, and two parallel shafts driven by said engine, of gears on said drive shafts, countershafts, gears on said countershafts meshing with the first-mentioned gears, worm wheels on said countershafts, a worm shaft disposed between the worm wheels and mounted to move longitudinally, a worm on said worm shaft normally out of engagement with the worm wheels, a motor for turning said worm shaft, parallel rods projecting through said motor casing and guiding the movement thereof, a cross bar on said rod limiting the movement of said casing, a lever constructed to engage said worm and move it longitudinally to position said worm in engagement with the worm wheels, and means operated by said lever for controlling the operation of the motor, substantially as described.

17. The combination with an internal combustion engine, and two parallel shafts driven by said engine, of gears on said drive shafts, countershafts, gears on said countershafts meshing with the first-mentioned gears, worm wheels on said countershafts, a worm shaft disposed between the worm wheels and mounted to move longitudinally, a worm on said worm shaft normally out of engagement with the worm wheels, a fluid motor on said worm shaft, fixed bearings for said worm shaft, fixed rods guiding the movement of said fluid motor and limiting the movement thereof, a fluid tank, a pipe connecting said tank, and means constructed to move said worm and control the flow of fluid through the pipe, substantially as described.

18. The combination with an internal combustion engine, and two parallel shafts driven by said engine, of gears on said drive shafts, countershafts, gears on said countershafts meshing with the first-mentioned gears, worm wheels on said countershafts, a worm shaft disposed between the worm wheels and mounted to move longitudinally, a worm on said worm shaft normally out of engagement with the worm wheels, a fluid motor on said worm shaft, fixed bearings for said worm shaft, fixed rods guiding the movement of said fluid motor and limiting the movement thereof, a fluid tank, a pipe connecting said tank, means constructed to move said worm and control the flow of fluid through the pipe, a pipe connecting said tank with an engine cylinder, and a valve in said pipe, substantially as described.

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

OSCAR P. OSTERGREN.

Witnesses:

ALMA M. OSTERGREN,

JOHN F. GRAHAM.