No. 887,347. PATENTED MAY 12, 1908.

A. SCHIEFERSTEIN.

HYDROCARBON ENGINE.

APPLICATION FILED APR. 24, 1906.

3 SHEETS—SHEET 1.

Fig 1

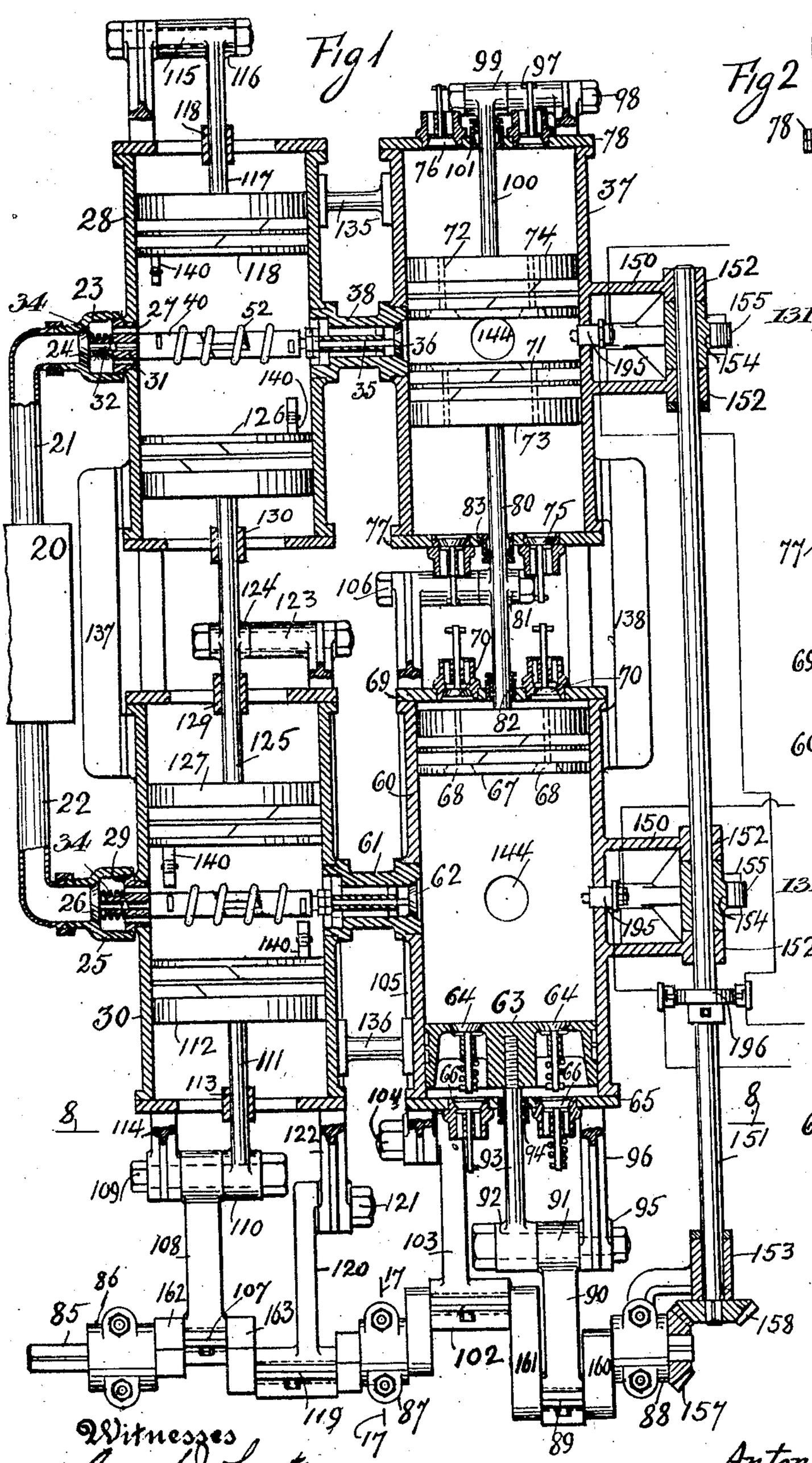
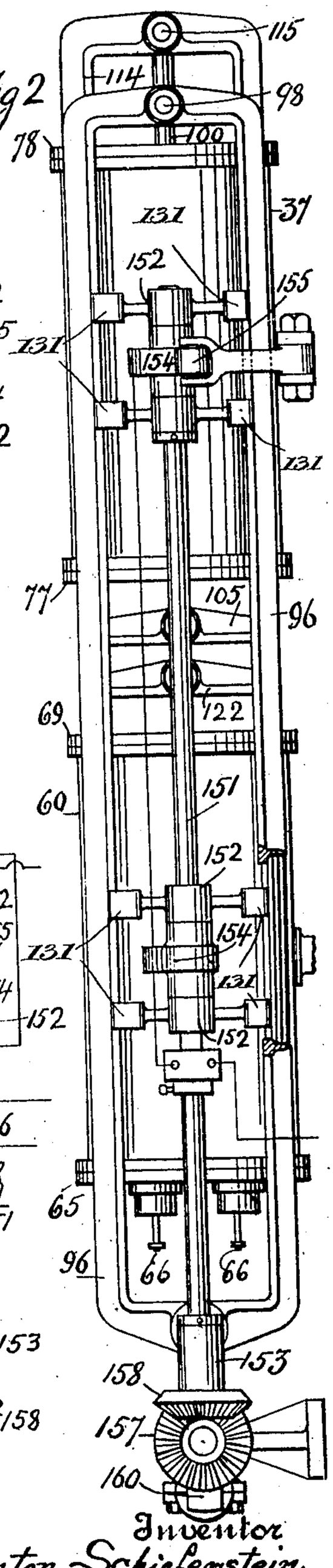


Fig 2



Witnesses
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F. B. Spencer

Inventor
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By His Attorneys
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3 SHEETS—SHEET 2.

Fig 3

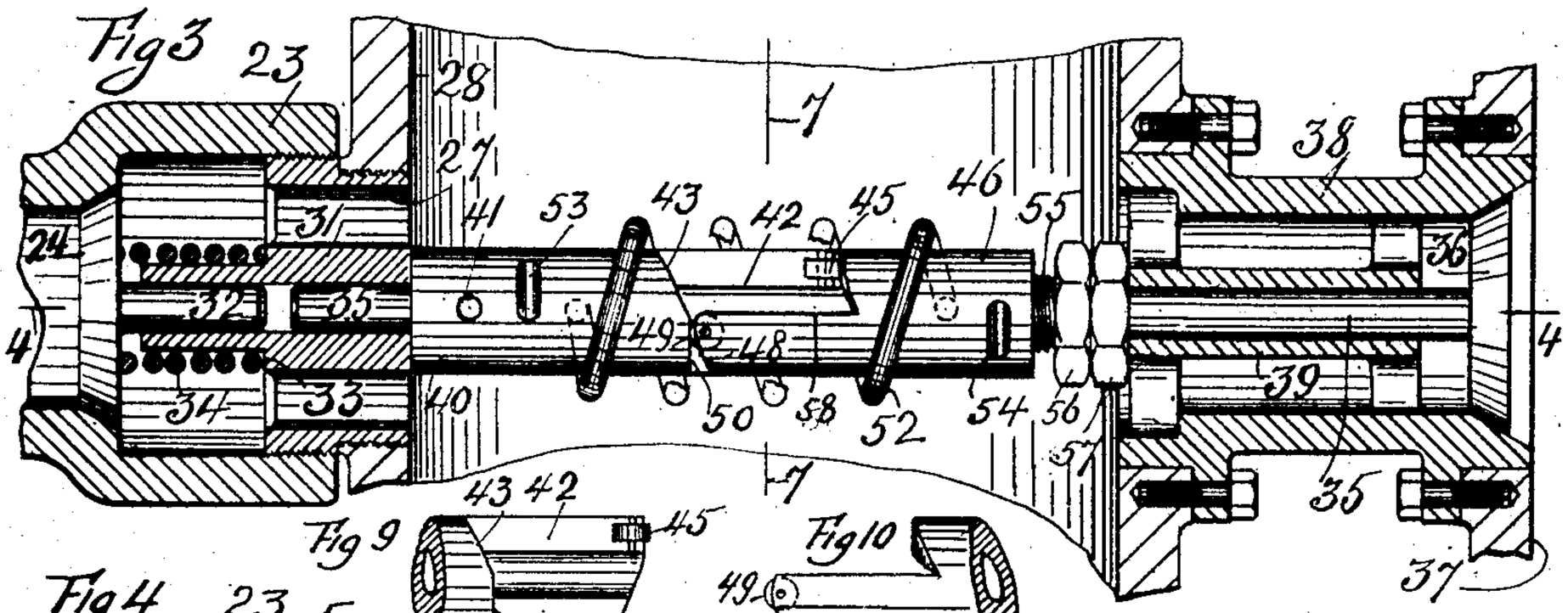


Fig 9

Fig 10

Fig 4

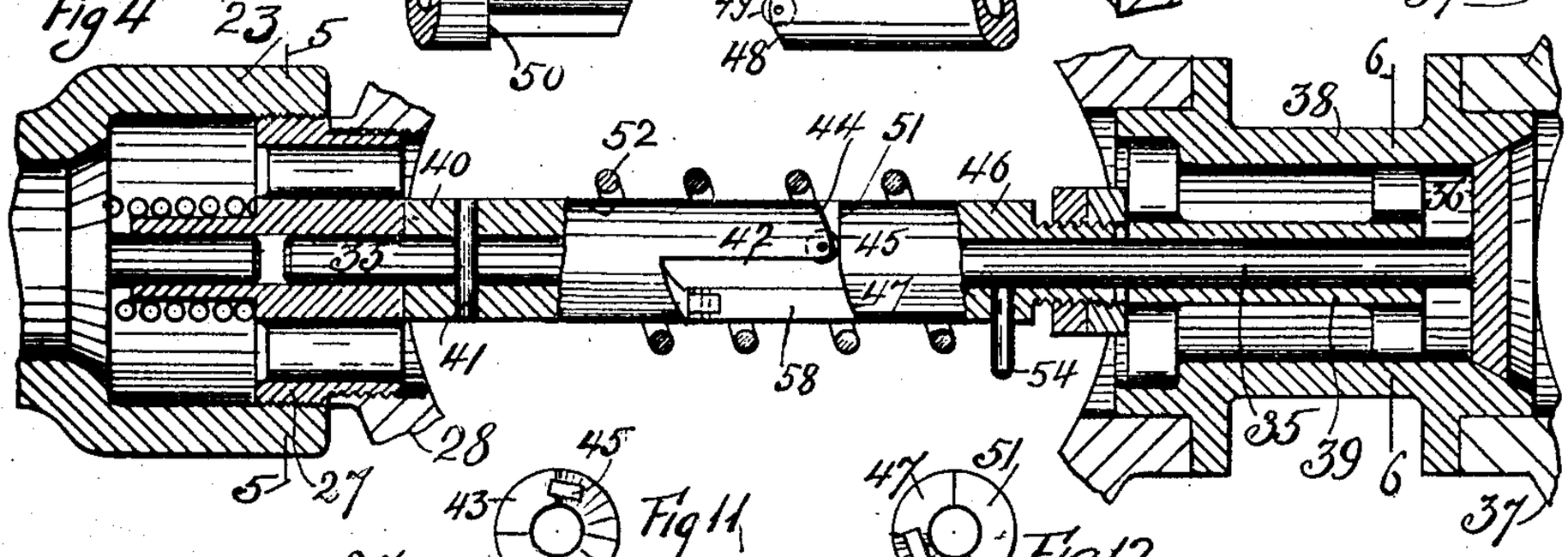


Fig 11

Fig 12

Fig 5

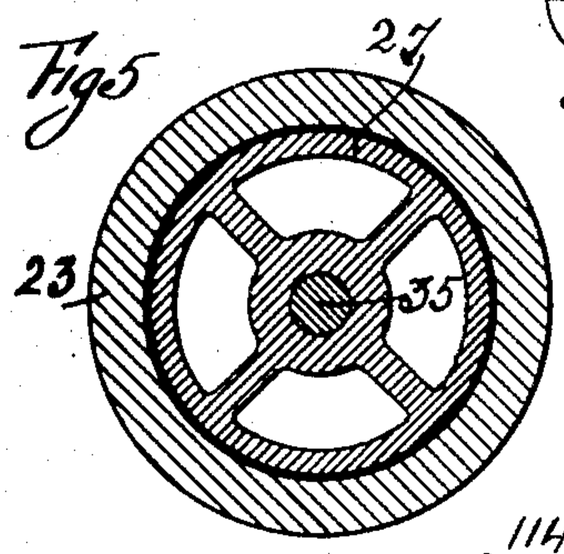


Fig 7

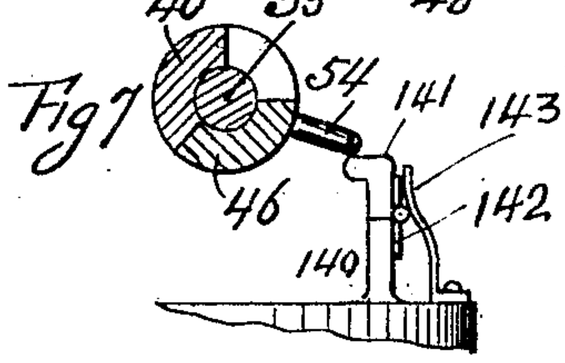
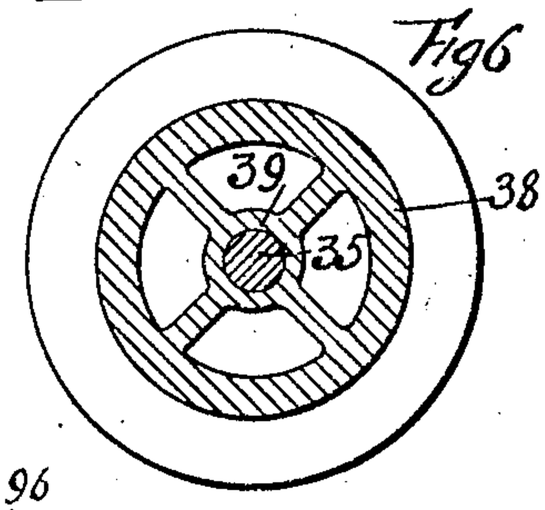


Fig 6



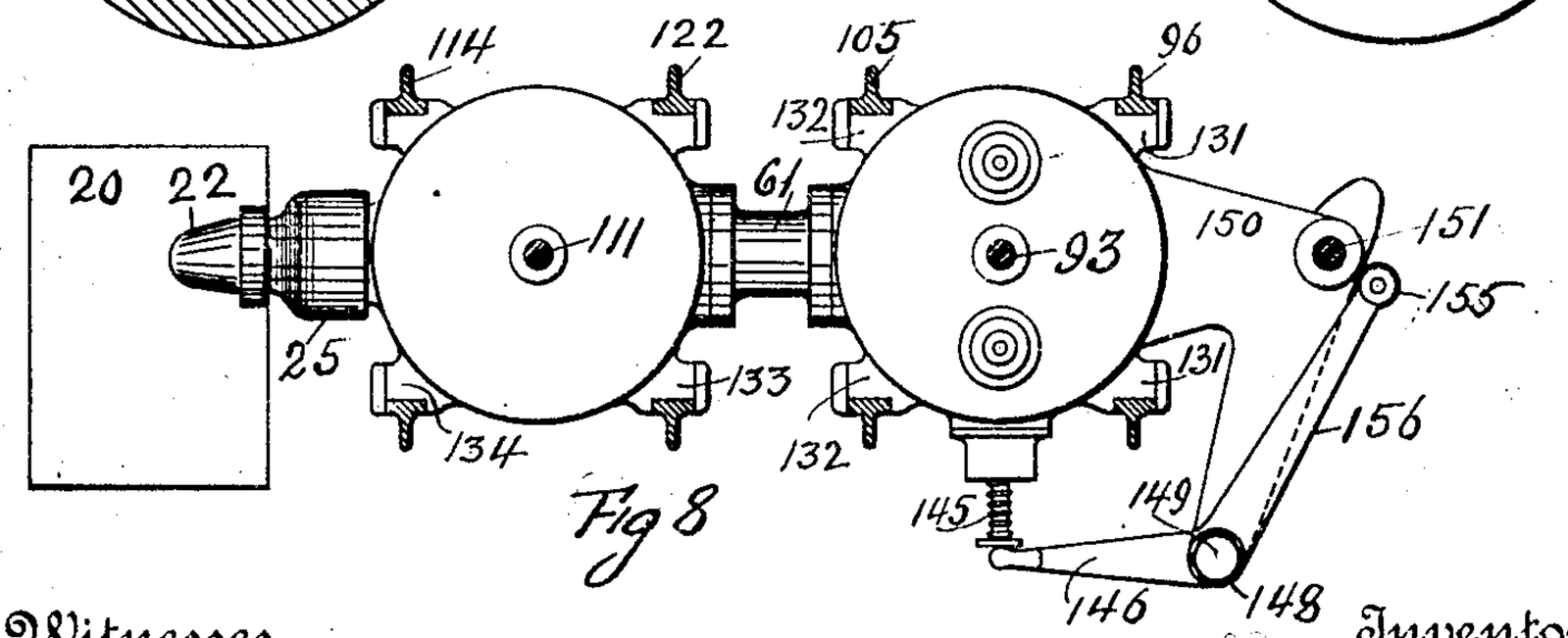


Fig 8

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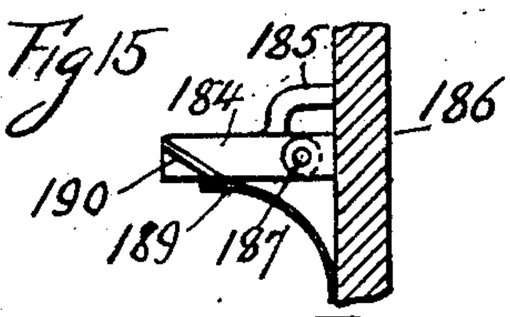
3 SHEETS—SHEET 3.

Fig 15



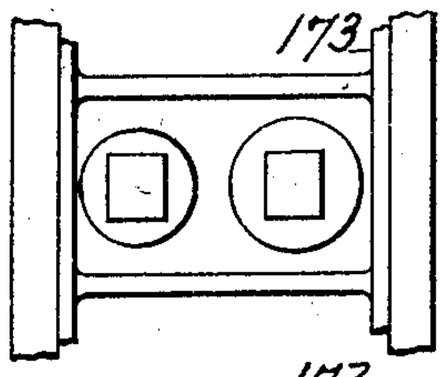


Fig 16

Fig 13

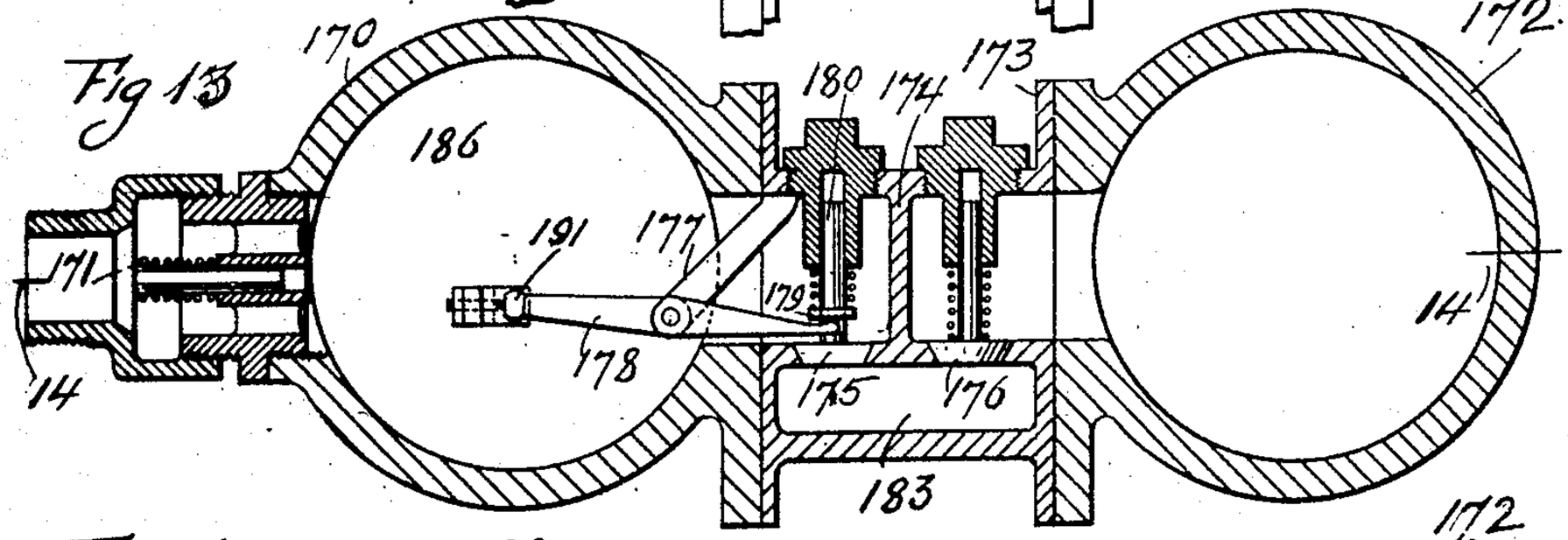


Fig 14

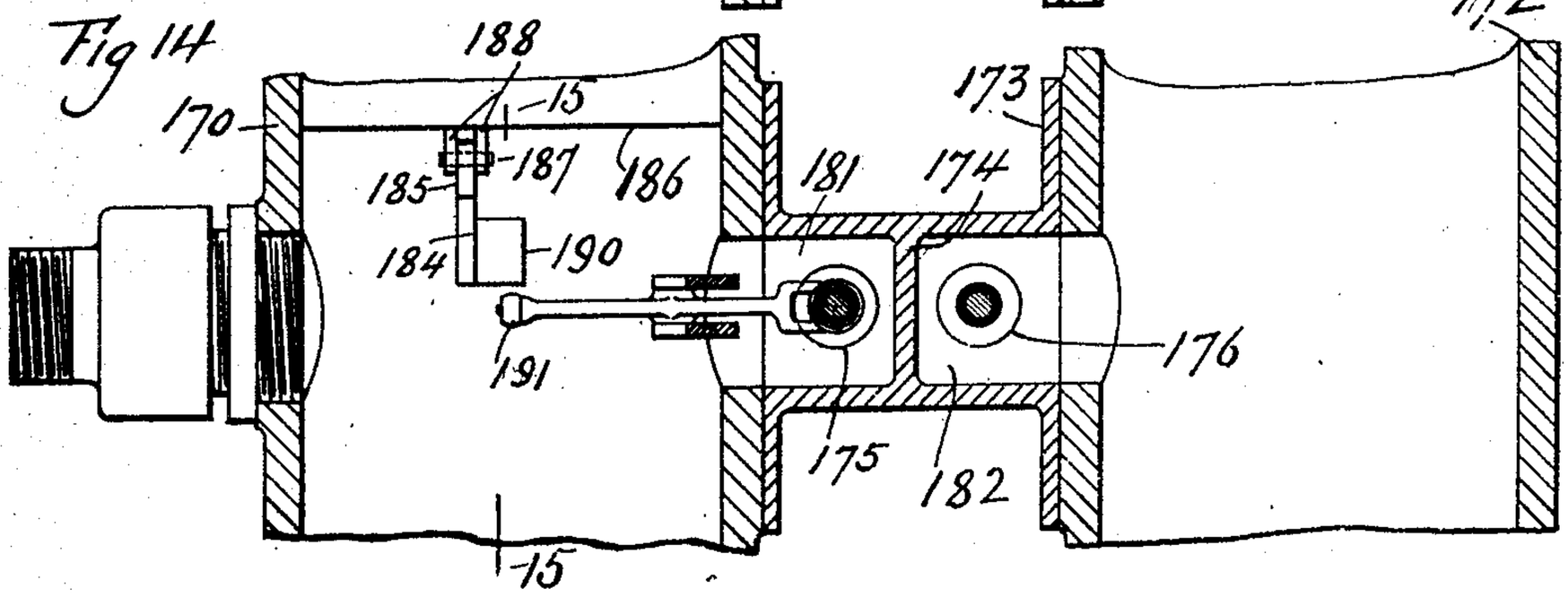


Fig 17

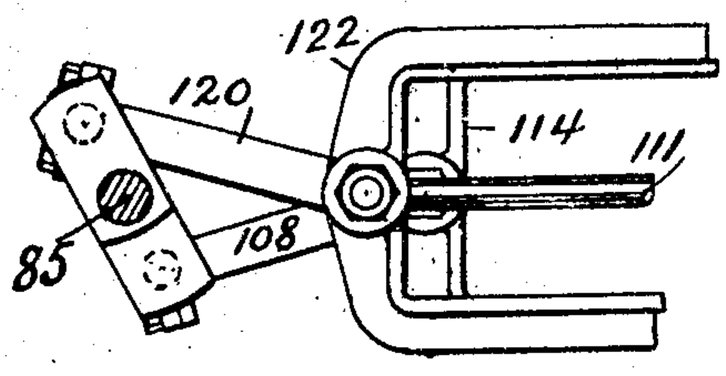
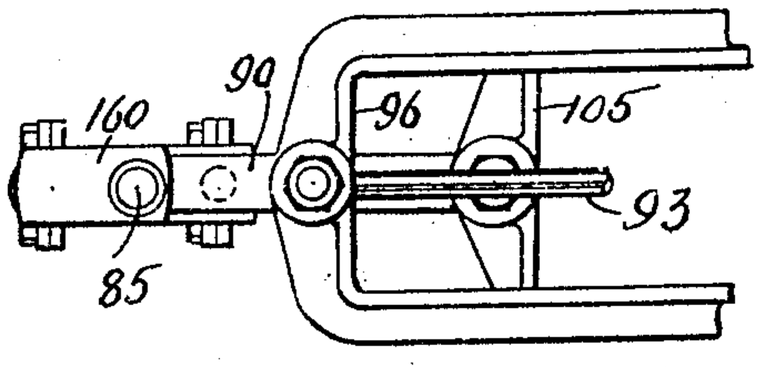


Fig 18



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UNITED STATES PATENT OFFICE.

ANTON SCHIEFERSTEIN, OF BAYONNE, NEW JERSEY.

HYDROCARBON-ENGINE.

No. 887,347. Specification of Letters Patent. Patented May 12, 1908.

Application filed April 24, 1906. Serial No. 313,381.

To all whom it may concern:

Be it known that I, ANTON SCHIEFERSTEIN, a citizen of the United States, and a resident of Bayonne, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Hydrocarbon-Engines, of which the following is a specification.

This invention relates to improvements in hydrocarbon engines, petroleum engines, gas engines and the like. Its organization comprises essentially a pair of compression cylinders, in each of which a pair of pistons operate opposite each other, for compressing the charges; a pair of exploding or power cylinders, in each of which a pair of power pistons operate opposite each other; an inlet valve for each power cylinder, controlled by the pistons of its accompanying compression cylinder; air inlet valves in each end of each power cylinder, and transfer valves in each piston of the power cylinders; an exhaust valve for each power cylinder; connections between the adjacent pistons of the power cylinder; connections between the distant pistons of the power cylinders, and similar connections between the pistons of the compression cylinders and means for exploding the charges in the power cylinders.

In the drawings, Figure 1 shows a partial axial longitudinal section of the engine, Fig. 2 represents a side elevation of Fig. 1, Fig. 3 is an enlarged view of a portion of Fig. 1, Fig. 4 shows a section of Fig. 3 on the line 4, 4, Fig. 5 represents a section of Fig. 4 as on the line 5, 5, Fig. 6 is a section of Fig. 4 on the line 6, 6, Fig. 7 shows a partial section of Fig. 3 on the line 7, 7, Fig. 8 represents a section of Fig. 1 about on the line 8, 8. Fig. 9 shows a front elevation of the right-hand end of a portion of the sleeve 40, Fig. 10 is a front elevation of the left-hand end of a portion of the sleeve 46, Fig. 11 is an end view of Fig. 10 and Fig. 12 is an end view of Fig. 9, Fig. 13 is a cross-section of a modification of the invention and appurtenances, Fig. 14 shows a section of Fig. 13 on the line 14, 14, Fig. 15 represents a partial section of Fig. 14 on the line 15, 15, Fig. 16 is a top-view of a portion of Fig. 13, Fig. 17 shows a partial section of Fig. 1 on the line 17, 17, and Fig. 18 is a partial side view of Fig. 1.

A carbureter is shown at 20, from which lead the pipes 21 and 22. To the pipe 21 is connected the valve chamber 23 for the inlet valve 24, and to the pipe 22 is connected the valve chamber 25 with the inlet valve 26. A cage 27 is secured in an opening of the compression cylinder 28, and a cage 29 is secured in an opening in the compression cylinder 30.

The cage 27 has formed therewith the sleeve 31, which at its left hand end guides and supports the spindle 32 of the valve 24. A shoulder 33 is formed on the cylindrical surface of the sleeve 31, for the spring 34 which bears between the said shoulder and the said valve 24.

The right hand end of the sleeve 31 supports the valve spindle 35 of the valve 36, which latter opens into the power cylinder 37. A cage 38 is supported between the cylinders 28 and 37, and it has formed therewith the sleeve 39, which supports and guides the right hand end of the valve spindle 35.

To the spindle 35 is secured the sleeve 40 with the pin 41, and its right hand end is cut away through a plane passing through its longitudinal axis, as shown at 42 and its right hand edges 43 and 44 are formed into approximately helical surfaces. In one of the said edges is journaled the roller 45. On the other end of the spindle is supported the sleeve 46, which has its left hand end cut away, as shown at 58, similar to 42 of the sleeve 40. The left hand edges of the sleeve 46 have the helical surfaces 47 and 48, and in the latter is journaled the roller 49. A portion of the edges of each sleeve is at right angles to the longitudinal axis of the spindle as shown at 50 and 51, and against this portion the roller of the other sleeve bears, when the sleeves are spread apart from each other as far as they can be moved. The sleeves are joined by the spring 52 which tends to keep them apart and locks the valve 36. Extending from each sleeve and radially therefrom are pins 53 and 54. The right hand end of the sleeve 46 terminates in the threaded end 55 on which are supported a pair of jam nuts 56 and 57, that bear against the cage 38 for adjustment.

The compression cylinder 30 is connected to the power cylinder 60, with a cage 61 similar to the cage 38. The valve 26 with its appurtenances is similar to the valve 24 and its appurtenances. An inlet valve 62 for the cylinder 60 is similar and has appurtenances for its operation which are similar to those of the valve 36.

The power cylinder 60, contains the pis-

ton 63, with the transfer valves 64, and in the head 65 are supported the inlet valves 66. In the piston 67 are the transfer valves 68 similar to the valves 64, and in the cylinder head 69 are the inlet valves 70 similar to the valves 66. Transfer valves 71 and 72 are located respectively in the pistons 73 and 74 similar to the valves in the pistons of the cylinder 60, and inlet valves 75 and 76, are respectively located in the cylinder heads 77 and 78 of the power cylinder 37.

The inlet valves 66, 70, 75 and 76 in Fig. 1 are shown in a plane at right angles to their locations as shown in Fig. 8 to avoid confusion, and the location in Fig. 8 is the correct one, so as to give clearance for some of the moving parts of the engine.

A piston rod 80, connects the two pistons 67 and 73, a boss 81 being formed in the rod 80, and a stuffing box 82 is located for the rod in the cylinder head 69, and a stuffing box 83 is formed in the cylinder head 77.

A crank shaft 85 is supported in bearings 86, 87, 88, and at the right hand end on its pin 89 is carried the link 90, which carries a pin 91, that supports the boss 92 of the piston rod 93 of the piston 63. A stuffing box 94 for the rod 93 is formed in the cylinder head 65. The pin 91 also carries the boss 95 of the bow 96, which latter at its other end has formed therewith the boss 97, that carries a pin 98 for the boss 99 of the piston rod 100 connected to the piston 74. A stuffing box 101 is formed in the cylinder head 78 for the piston rod 100. On the crank pin 102 is carried the link 103, from which latter extends the pin 104, that supports the bow 105. The latter is pinned with a pin 106 to the boss 81 of the piston rod 80.

On the pin 107 is supported the link 108, which carries a pin 109, and on the latter is supported the boss 110 of the piston rod 111, of the piston 112 in the cylinder 30, a guide 113 being supported at the end of the cylinder 30 for the piston rod 111. From the pin 109 extends the bow 114, which latter connects with the pin 115, that supports the boss 116 of the piston rod 117. The piston rod 117 reciprocates through a guide 118 located at the outer end of the cylinder 28, and to the piston rod 117 is fastened the piston 118. From the pin 119 of the crank shaft 85, extends the link 120, to which is connected with the pin 121 which supports one end of the bow 122, the other end of which latter carries the pin 123, that extends through the boss 124 of the piston rod 125. The piston 126 of the cylinder 28 is connected to the rod 125 at one end, and the piston 127 in the cylinder 30 is connected to the same at the other end. Guides 129 and 130 are connected to the cylinders 28 and 30 for the rod 125. The bow 96 is supported on guides 131, and the bow 105 on guides 132, extending from the cylinders 37 and 60. The bow 122 is supported in guides 133, and the bow 114 in guides 134 extending from the cylinders 28 and 30.

The cylinders 28 and 37 are connected by the bracket 135, and the cylinders 30 and 60 by the bracket 136. The cylinders 28 and 30 are connected by the bracket 137, and the cylinders 37 and 60 are connected by the bracket 138.

On the face opposite the piston rod of each of the pistons 112, 127, 126 and 118 there projects a post 140, to which is hinged a tripper 141, by means of a hinge 142, and a spring 143 bears up against the back of the hinge 142 and is supported on the piston.

For each of the cylinders 37 and 60 there is an exhaust valve 144, the spindle 145 of which is actuated by an arm 146 of a bell crank 148. Each of the bell cranks is carried on a pin 149, supported in the brackets 150 that extend from the cylinders 37 and 60. A cam shaft 151 is supported in bearings 152 formed in the brackets 150, and it has a support 153 extending from the bearing 88. The shaft 151 carries cams 154, that actuate rollers 155 in the arms 156 of the bell crank 148. A bevel gear 157 on the shaft 85 meshes with a bevel gear 158, on the cam shaft 151.

It will be noted that the arms 160 and 161 of the crank shaft 85 are set with respect to the arms 162 and 163, so that the pistons in the compression cylinders 28 and 30 are a little ahead of the pistons in the power cylinders 37 and 60. Also that when the pistons in the cylinder 60 are approaching each other, the pistons in the cylinder 37 are receding from each other, also when the pistons in the cylinder 30 are approaching each other, the pistons in the cylinder 28 are receding from each other. The relations of the arms of the crank shaft as just described may be varied.

To explode the compressed charges in the power cylinders 37 and 60, there is provided for each, a spark plug 195, each of which is controlled by a contact breaker 196 in the usual manner.

Figs. 13 to 16 show a modification of the invention, and there is shown a cross section of a compression cylinder 170 with an inlet valve 171. A power cylinder 172 is connected with the compression cylinder 170, by means of the valve chamber 173. A dividing wall 174 divides the valve chamber 173 into two compartments 181 and 182, and a communicating chamber 183 is formed below the dividing wall 174. A valve 175 opens from the communicating chamber 183 into the compartment 181, and a valve 176 opens from the chamber 183 into the compartment 182.

A journal bracket 177 in the compartment 181 supports a lever 178, that at one end bears up against a collar 179 on the spindle

180 of the valve 175, and at the other end it is actuated by a spring adjusted tripper 184, that carries a foot 185 which can abut against the face of the piston 186 in the cylinder 170.

The tripper 184 is supported on the pin 187 carried in the lugs 188 that extend from the piston 186, and a spring 189 extends from said piston, and bears against the tripper. An inclined projection 190 extends from the tripper which engages with the roller 191 carried on the lever 178.

To operate the engine the charges of gas are furnished by the carbureter 20, and when the pistons in the compressing cylinder 28, and the pistons in the cylinder 30 are receding from each other the valves 24 and 26 are respectively drawn open, and the said cylinders are charged with the exploding mixture. When the pistons in cylinders 28 and 30 approach each other, the charges therein are compressed, and when the trippers 141 strike the hooks as 53 and 54, the valves 36 and 62 are opened, and the charges are forced into the power cylinders 37 and 60, where they are further compressed by the pistons therein, and then are ignited by the spark plugs.

The operations of the valves 36 and 62 being similar the operations of the former will only be described in detail. When the trippers 141 strike the hooks 53 and 54, the hook 53 will be pushed down and the hook 54 will be pushed up, the effect of which will be to rotate the valve spindle 35 with its sleeve 40 in the direction of the rotation of the hands of a watch and to rotate the sleeve 46 in a direction opposite thereto. Before the trippers strike the said hooks the relative and normal positions of the sleeves 40 and 46 are plainly shown in Fig. 3, and in said normal positions the roller 49 of the sleeve 46 is bearing against the edge 50 of the sleeve 40, which edge being at right angles to the longitudinal axis of the sleeve maintains the roller 49 in position, without danger of rolling off said edge. At the same time the roller 45 of the sleeve 40 bears against the edge 51 of the sleeve 46 which latter edge is at right angles to the longitudinal axis of its sleeve. The combinations of the rollers 49, 45 with the edges 50 and 51 constitute locking devices for the sleeves 40 and 46 and consequently for the valve 36. When the trippers 141 strike the hooks 53, 54, the roller 49 rolls on the helical edge 43 and the roller 45 rolls on the helical edge 47 which will cause the sleeves 40 and 46 to rotate relatively to each other. The rotation of the sleeves is possible on account of the clearance space between them incident to the cut away portions indicated at 42 and 58. When the said sleeves rotate one approaches each other in the direction of their common longitudinal axis. The sleeve 46 being able to rotate on the spindle 35, and the sleeve 40 being fastened to the spindle 35, the latter sleeve with its spindle will approach the sleeve 46 and open the valve 36. The trippers after pushing the hooks 53 and 54 out of the way pass beyond them, when the spring 52 will cause the sleeve 40 with the spindle 35 and valve 36 to take its normal position with the latter on its seat. The trippers 141 are allowed to move away from the hooks 53 and 54 by reason of the action of the hinge 142.

It is to be noted that any form of exploder may be used. After the gases have been exploded they are forced out of the openings of the exhaust valves.

It will be noted that when the pistons 63, 67 in the cylinder 60 are approaching each other, that the inlet valves 66 and 70 are drawn open, and air is drawn into the cylinders between the head 65 and the piston 63, and between the head 69 and the piston 67, and that when the pistons 63 and 67 recede from each other, the air between the pistons and the heads of the cylinder is pocketed therein by reason of the valves 66 and 70 closing. Now when the exhaust valve has opened the cylinder 60 is released of any pressure between the inner faces of the pistons, which occurs somewhat before the ends of the outward strokes of the pistons therein, and when the pressure of the compressed air between the pistons in the cylinder and its heads, exceeds the pressure between the pistons, the transfer valves 64 and 68 will allow the air to take the place of the spent gases in the cylinder, which will cool the cylinder and displace all of the spent gases, and finally will leave the cylinder by way of the exhaust valve. The same action takes place in the cylinder 37.

Having described my invention, I claim:

1. In a hydro-carbon engine the combination of a compressing cylinder, a power cylinder adjacent thereto, a valve cage connecting the cylinders, an inlet valve for the compressing cylinder, an inlet valve for the power cylinder located in the said cage, means to explode the charge in the power cylinder, pistons in the power cylinder, transfer valves in the pistons of the power cylinder, and inlet valves for air in the power cylinder.

2. In a hydro-carbon engine the combination of a compressing cylinder, a power cylinder adjacent thereto, a valve cage connecting the cylinders, an inlet valve for the compressing cylinder, a valve for the power cylinder arranged to seat on a seat in the said valve cage, a spindle of said valve extending into the compressing cylinder, sleeves on said spindles with their adjacent end edges bearing against each other, and formed so that one edge can ride on the other to decrease the distance between the outer and distant edges of the sleeves and the said spindle secured to one of the sleeves.

3. In a hydro-carbon engine the combination of a compressing cylinder, a power cylinder adjacent thereto, an inlet valve for the compressing cylinder, a valve cage connecting the two cylinders, an inlet valve for the power cylinder located in the valve cage, means to actuate the latter valve by the pistons in the compressing cylinder and charge the power cylinder with a compressed charge, pistons in the power cylinder, transfer valves in the pistons of the power cylinder, air inlet valves in the power cylinder to charge the latter cylinder therewith after each explosion.

4. In a hydro-carbon engine the combination of a pair of compressing cylinders, and a pair of power cylinders, the compressing cylinders axially in line, and the power cylinders axially in line, one piston rod joining the piston in one cylinder with its adjacent piston in the other cylinder axially in line therewith, the other two pistons of each pair of cylinders axially in line joined by a bow, an inlet valve for each compressing cylinder, an inlet valve for each power cylinder, means connected with the latter valves to be actuated by the movements of the pistons in the compressing cylinders.

5. In a hydro-carbon engine the combination of a compressing cylinder, a pair of pistons therein, a power cylinder adjacent to the compressing cylinder, a pair of pistons in the latter cylinder, a valve cage connecting the cylinders, an inlet valve for the exploding charge connected to the compressing cylinder, an inlet valve for the power cylinder in the said valve cage, a valve spindle of the latter valve extending into the compressing cylinder, sleeves on the said valve spindle, one of said sleeves fastened to the valve spindle, and one of the sleeves arranged to move relatively to said spindle, the adjacent edges of the sleeves formed so that one can ride on the other, a spring connecting the sleeves and tending to spread them apart, pins extending from the sleeves, a tripper extending from each piston in the compressing cylinder in the path of the said pins, an exhaust valve for the power cylinder, and means to explode a charge in said power cylinder.

6. In a hydro-carbon engine the combination of a compressing cylinder, a pair of pistons therein, means to reciprocate the pistons so that they will alternately approach and recede from each other, a power cylinder adjacent to the compressing cylinder, an inlet valve for charging the compressing cylinder, a valve connecting the two cylinders to conduct a compressed charge from the compressing cylinder to the power cylinder, a spindle for the latter valve extending into the compressing cylinder, means to lock the latter valve against the pressure of the charge in the compressing cylinder, and the said valve maintained on its seat by the pressure in the power cylinder, and means connected with the latter valve actuated by the pistons in the compressing cylinders to open the valve, means to explode the charge in the power cylinder, means to exhaust the spent gases in the said power cylinder.

7. In a hydro-carbon engine the combination of a compressing cylinder, a pair of pistons therein, means to reciprocate the pistons so that they will alternately approach and recede from each other, a power cylinder adjacent to the compressing cylinder, an inlet valve for charging the compressing cylinder, a valve connecting the two cylinders to conduct a compressed charge from the compressing cylinder to the power cylinder, a spindle for the latter valve extending into the compressing cylinder, means to lock the latter valve against the pressure of the charge in the compressing cylinder, and the said valve maintained on its seat of the pressure in the power cylinder, means connected with the latter valve actuated by the pistons in the compressing cylinders to open the valve, means to explode the charge in the power cylinder, air inlet valves in the power cylinder, a transfer valve in each of the pistons of the power cylinder to transfer the air drawn in with the said inlet valves to the space between the pistons of the power cylinder.

8. In a hydro-carbon engine the combination of a compressing cylinder, a pair of pistons therein, means to move the pistons in opposite directions from each other, a power cylinder adjacent to the compressing cylinder, an inlet valve for charging the compressing cylinder, a valve for the power cylinder connecting the two cylinders, a spindle for the latter valve extending into the compressing cylinder, a sleeve fastened to said spindle and a sleeve on said spindle arranged to move relatively thereto, a pair of jam nuts on the latter sleeve to adjust the axial movements of one sleeve with respect to the other, means to explode the charge in the power cylinder, means to force air through the power cylinder when exhausting the spent gases therefrom.

9. In a hydro-carbon engine the combination of a pair of compressing cylinders axially in line with each other, a pair of power cylinders adjacent thereto and axially in line with each other, an inlet valve for each compressing cylinder, a valve connecting each compressing cylinder with one of the power cylinders, a pair of pistons in each compressing cylinder, a piston rod connecting one piston of one of the compressing cylinders with a piston in the other compressing cylinder, a connection between the remaining pistons in the compressing cylinders, a pair of pistons in each of the power cylinders, a piston rod connecting a piston in one of the power cylinders with a piston in the other power cylinder, a connection between the remaining pistons

in the power cylinder, a crank shaft adjacent to the cylinders, connections between said shaft and all the said pistons, air inlet valves for each power cylinder, transfer valves in each piston of the power cylinder, an exhaust valve for each power cylinder, means to actuate the exhaust valves, and a spark plug for each power cylinder.

Signed at Bayonne in the county of Hudson and State of New Jersey this 14th day of April A. D. 1906.

ANTON SCHIEFERSTEIN.

Witnesses:
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A. A. DE BONNEVILER.