

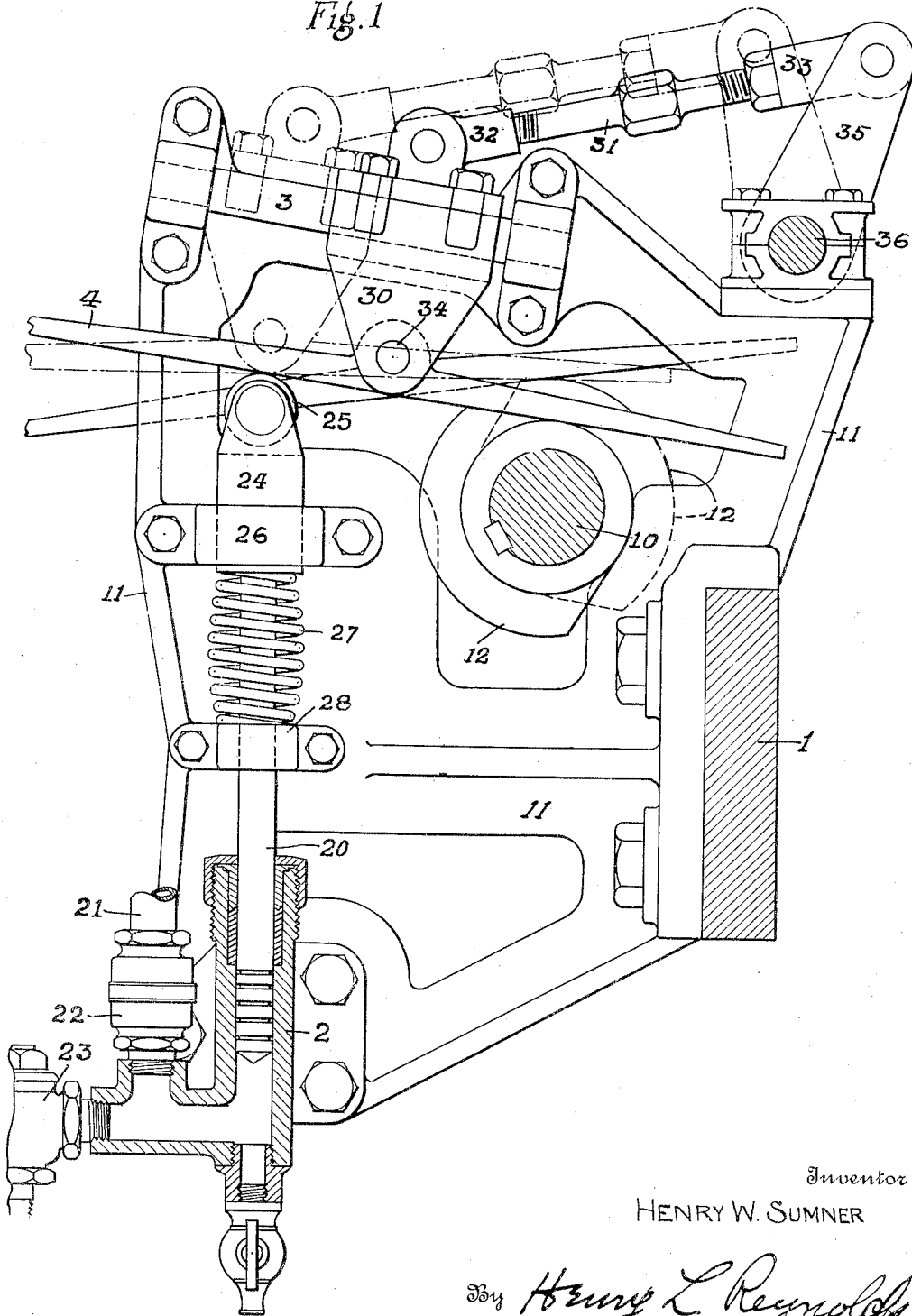
H. W. SUMNER.
FUEL FEEDING DEVICE FOR OIL ENGINES.
APPLICATION FILED JULY 3, 1918.

1,352,637

Patented Sept. 14, 1920.

6 SHEETS—SHEET 1.

Fig. 1



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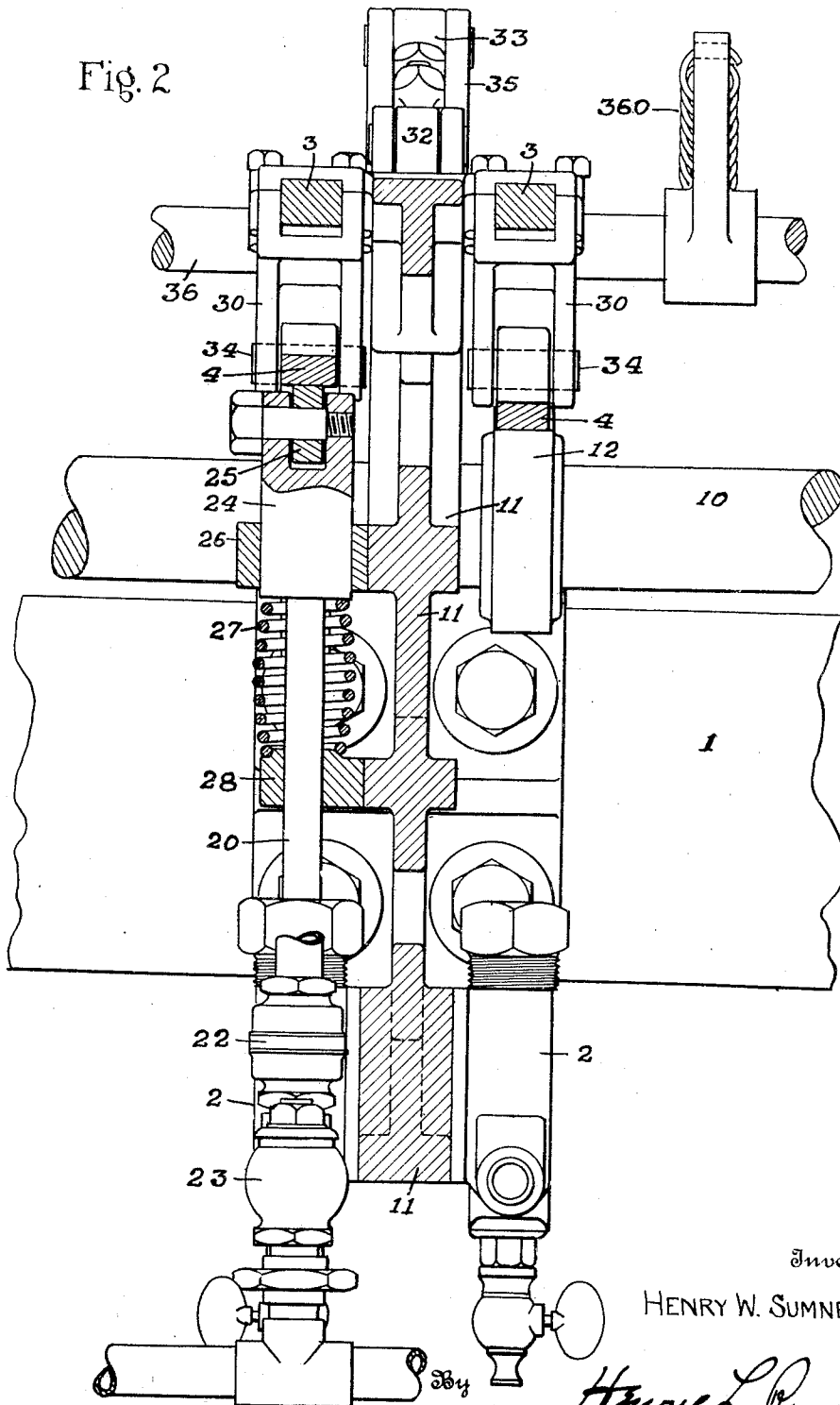
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Fig. 2



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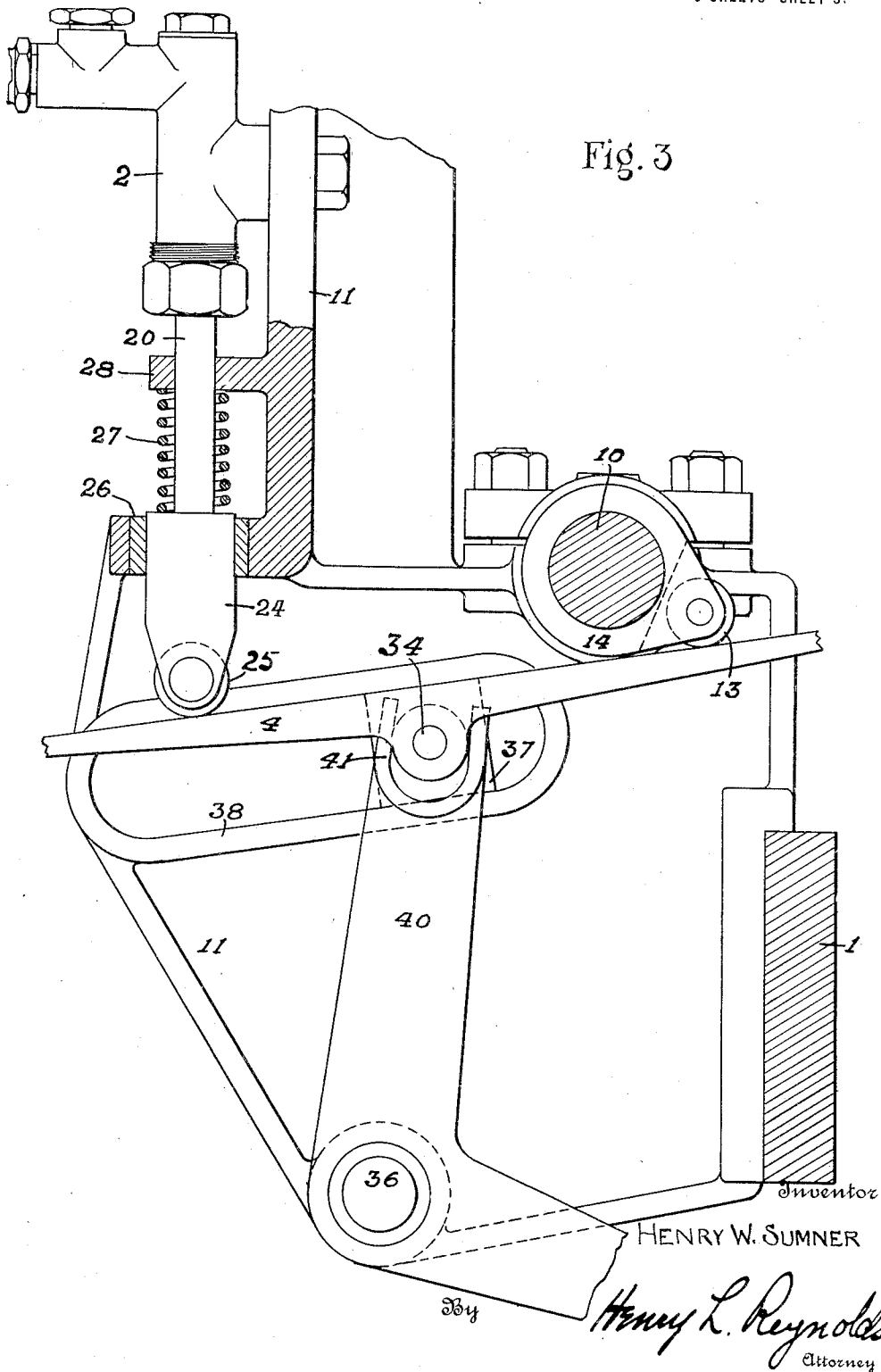
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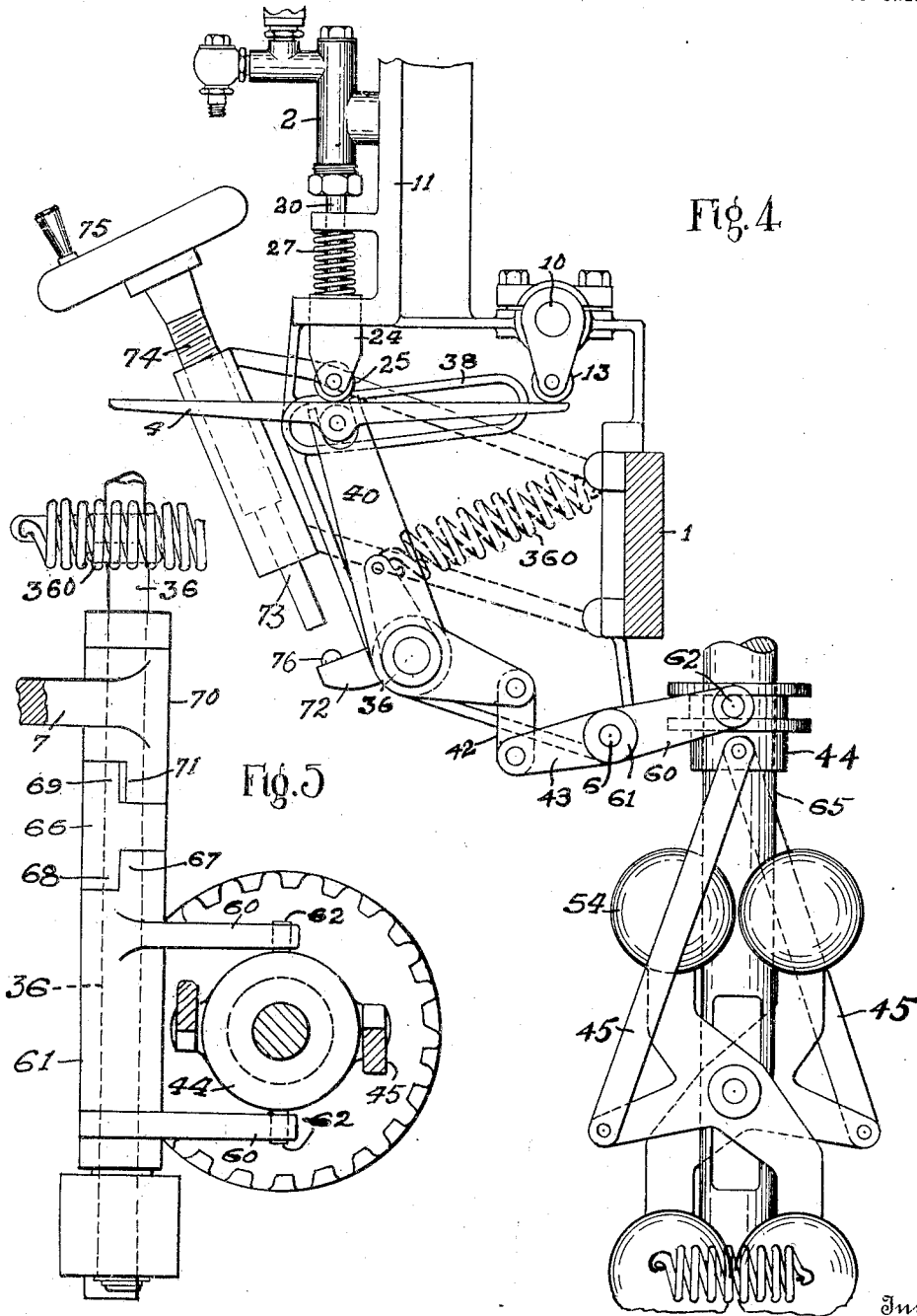


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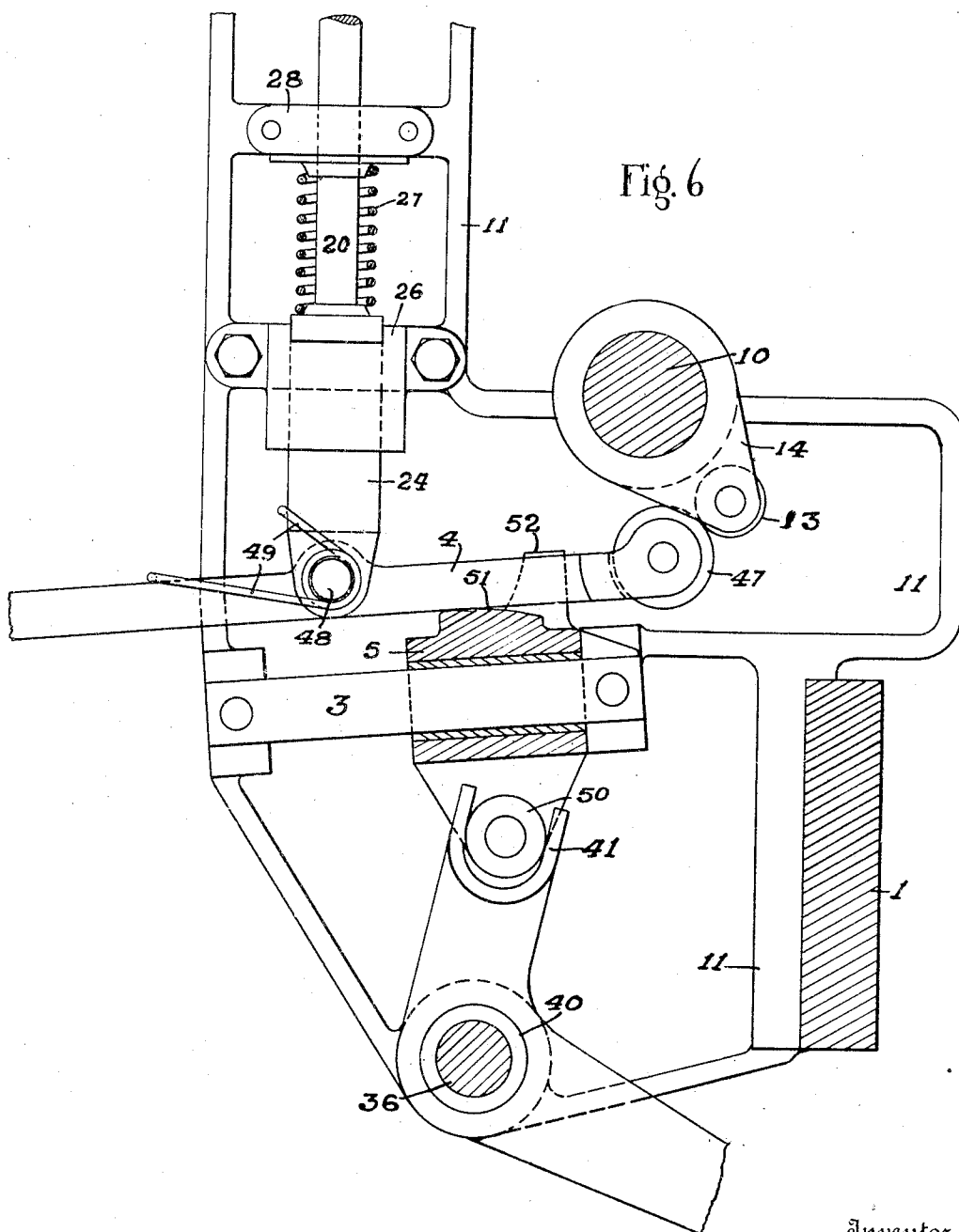
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6 SHEETS—SHEET 5.



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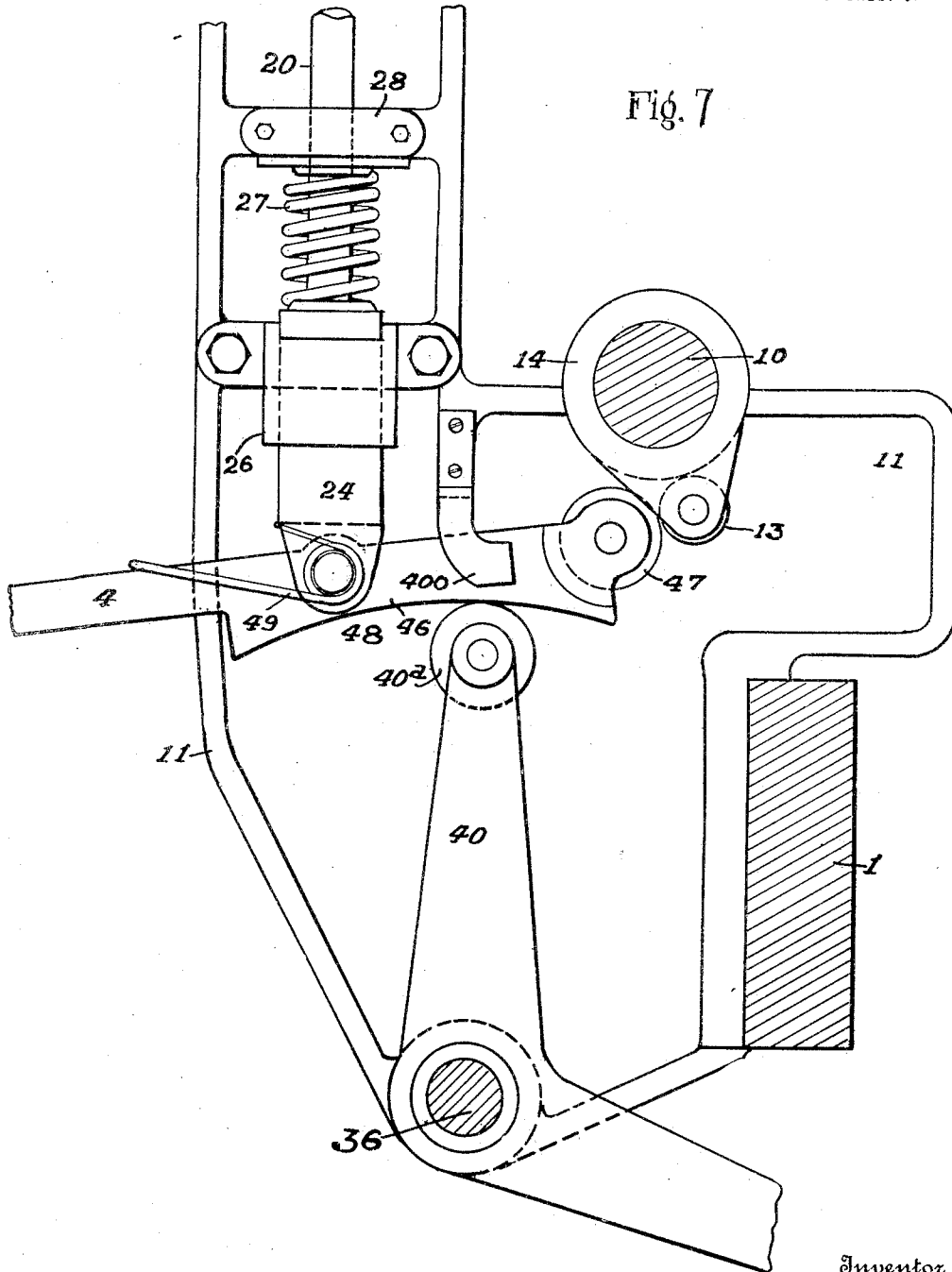
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

HENRY W. SUMNER, OF SEATTLE, WASHINGTON.

FUEL-FEEDING DEVICE FOR OIL-ENGINES.

1,352,637.

Specification of Letters Patent. Patented Sept. 14, 1920.

Application filed July 3, 1918. Serial No. 243,213.

To all whom it may concern:

Be it known that I, HENRY W. SUMNER, a citizen of the United States, and resident of the city of Seattle, county of King, and State of Washington, have invented certain new and useful Improvements in Fuel-Feeding Devices for Oil-Engines, of which the following is a specification.

My invention relates to oil engines and more particularly to means employed for operating and controlling the fuel supply, both in amount and in time.

The object of my invention is to provide improved and simplified mechanisms for these purposes by which a more perfect and scientific result and control may be secured and wherein the adjustment thereof may be easily and quickly made and wherein either a hand or an automatic control may be secured, or hand and automatic control may be combined.

The features and combinations which I consider new may be seen from a study of the specification and particularly the claims which terminate the specification.

In the accompanying drawings I have shown an engine in which is embodied the features of my invention, the same being shown in the form of construction which I now believe to be best adapted to their purpose and which I now prefer to use.

Figure 1 is a side elevation of the pump and its immediate actuating mechanisms, certain of the parts being in section.

Fig. 2 is a front elevation of the same, parts thereof being sectioned on a plane back of the pumps.

Fig. 3 is a side elevation of a modified type of pump actuating mechanisms which employs the same principles.

Fig. 4 is a similar view of the type shown in Fig. 3, in which the manner of connecting with a governor is shown.

Fig. 5 is a plan view of a part of the mechanism through which the governor control is applied.

Fig. 6 is an elevation of a further modification in which the same principles are incorporated, and Fig. 7 a like view of a further modification.

The construction of the devices shown in the drawings will be particularly described, from which the principles of my invention may be understood. The type of engine for

which these devices were originally designed, is of a multiple cylinder, vertical, two cycle type. The same principles of construction and like combinations of parts may be applied to other types of engines. As my present invention has no necessary connection with any one kind of engine, I have not herein illustrated the chief engine parts, but have shown only such parts as are immediately connected therewith.

In these drawings 1 represents a supporting bar which may be a part of, or secured to, or supported from any suitable and convenient portion of the frame or other part of the engine. The part 11 is a frame which is secured to the bar 1 and upon which are mounted the various parts of the mechanism which constitutes the present invention. In this frame 11 is journaled a shaft 10 which is turned by any suitable and convenient mechanism from a rotating part of the engine. The manner of turning this is immaterial so long as its turning is properly timed.

Upon shaft 10 is mounted the cam or tappet mechanism by which the oil feed pump is actuated. As shown in Figs. 1 and 2, which construction I will first describe, this consists of a cam or cams, 12, while in Figs. 3, 4, 6 and 7, it consists of a tappet roller 13 carried by ears upon a collar 14.

The particular construction of the oil feed pump is not the important part of this invention. This may be widely varied. The invention lies in the means employed for the actuation and control of the oil feed pump, and whereby this means may be controlled, both automatically by a governor and manually, to vary the amount of fuel oil delivered to the engine cylinders.

The pump illustrated has a plunger 20 reciprocable in a cylinder 2, discharge and inlet check valves 22 and 23, which delivers the oil to a discharge pipe 21. This pipe 21 leads to the mechanism through which the oil is injected into the cylinder. This is not shown. The plunger or stem 20, has an exterior guide 28 and a head 24, reciprocable in a guide 26 and carrying a roller 25. A spring 27 returns the pump plunger.

Upon a guide 3 is mounted a sliding fulcrum block 30, to which, at 34, is pivoted the pump actuating lever 4. This lever 4 engages the roller 25 and the cam 12, tappet

13, or such other actuating member as is employed, so that when the actuating member moves the lever 4, the pump plunger 20 is reciprocated, the extent of this reciprocation depending on the relative lengths of the two ends of the lever used.

In the construction shown in Fig. 7, the fulcrum for the lever 4 consists of the roller 40^a, which is directly mounted on the controlling lever 40, and the lever 4 is pivotally secured at 48 to the pump plunger. The undersurface 46 of the lever 4, in this modification, should be an arc of a circle having its center coinciding with the pivot center of the arm 40. The lever 4 is held toward the actuating tappet or cam roller 13 by a spring 49 and is held against side swing by the embracing fork or finger 400.

In the position shown by full lines in Fig. 1, the maximum movement of the plunger would be obtained, as the position of the fulcrum 34 makes the cam engaging arm the shortest and the pump engaging arm the longest. When the fulcrum block has been moved to the other end of its guide 3, so as to bring the fulcrum pivot 34, or roller 40^a, as the case may be, in line with the pump plunger, as is shown by broken lines in Fig. 1, the reciprocation of the lever by the cam 12, or by the tappet roller 13, will produce no movement of the pump plunger.

The return movement of the bar 4 is secured through the action of the spring 27, or spring 49, or may be secured in any other suitable manner. Reciprocation of the oil pumps may be secured at any time by manually engaging the outwardly projecting ends of the levers 4.

The angular position of the guide 3 should preferably be parallel with the surface of the lever 4 which engages the cam 12 and the roller 25, at the time when the pump plunger is at its maximum return stroke, or that shown in full lines in Fig. 1.

The sliding fulcrum block 30, of Fig. 1, 37 of Fig. 3, 5 of Fig. 6, or the roller 40^a of Fig. 7, may be connected with a governor to be controlled thereby in any one of many different ways. As shown in Fig. 1, a link 31 which is adjustable in length connects it with a lever arm 35 carried by a rock shaft 36, the latter being controlled in position by a governor. The link shown is adjustable by having its control section 31 secured to its pivot ears 32 and 33, by right-and-left threads.

In the modifications shown in Figs. 3, 4, 6 and 7, the crank arm or lever 40 is the equivalent of the lever 35, and directly engages or carries the fulcrum block or roller, as the case may be.

In the device as shown in Fig. 3, the oil feed pump has been reversed in position, the plunger or stem 20 being above and the roller 23 down. The actuating lever 4 is

pivoted upon a block 37 which slides in a guide slot 38 in the frame bracket 11. This block is shifted by means of a rock arm or lever 40, which has a slotted end forming a yoke 41 which embraces a roller carried by the fulcrum pin 34. The conditions of parallelism as between the lever 4 and the slot 38 should be the same as previously stated for the construction shown in Fig. 1.

Instead of the cam 12 of Fig. 1, I show in Figs. 3, 4, 6, and 7, a tappet roller 13 carried by a collar 14, which is secured upon shaft 10. One object of this is to reduce the time of depression of the pump actuating lever 4, while at the same time reducing the wear between surfaces and also substituting a construction which is cheaper to make.

The device shown in Fig. 6 differs to a somewhat greater degree from that of Figs. 1 and 2. The position and action of the oil feed pump 20 is like that of Figs. 3, and 4, as is also the tappet or cam roller 13 and the controlling bell crank lever 40. The pump actuating lever 4 is, however, pivoted at 48 to the head 24 of the pump plunger and at its inner end it carries a roller 47 which contacts with the tappet roller 13. A spring 49 tends to hold the inner or tappet engaging end toward the shaft 10.

The movable fulcrum consists of a block 3 which is mounted to slide upon a guide bar 3 which is positioned and functions exactly like the bar 3 shown in Fig. 1. This fulcrum block is moved along the guide bar 3 by the bell crank lever 40 which engages a roller 50 carried by the fulcrum block. Two fingers 52 extend upward to engage the sides of the pump actuating lever 4 to prevent lateral movement of the lever to displace it. This construction is very like that shown in Fig. 7 and previously described.

The bearing surface 51 of the fulcrum block which engages the lever 4, is preferably made convexly curved with the high part toward the pump, so that the relative lengths of the ends of the actuating lever 4 will vary during the stroke, becoming progressively shorter for the power or driven end and longer for the pump end. The pump is thus started slower and its rate of movement accelerated.

The bell crank lever 40 is mounted on the shaft 36 which is connected with a governor which controls its position. As shown in Fig. 4, this is done through a link 42 and a pivoted lever 43 which is connected with a collar 44 on the shaft of the governor through shaft 6 and crank arms 60 and actuated from the ball arms through the links 45. A means by which the fulcrum shifting shaft 36 may be controlled is shown in Figs. 4 and 5.

The shaft 36 has indirectly connected therewith, crank arms 60 which are connected by a sleeve 61. The ends of crank

arms 60 have pins 62 which engage the flanges of collar 44 which slides upon the governor shaft 65 being raised and lowered through links 45 by the action of the weights of a governor 54.

The sleeve 61 is loose on shaft 36. A collar 66 is secured to this shaft. Sleeve 61 has at one end a projection 67 and collar 66 has like projections 68 and 69 at opposite ends thereof. The side faces of projections 67 and 68 are adapted to engage, whereby the governor may, through the mechanism described, act to shift the fulcrum block members, as 30, 37, 5 or 40^a, in the direction to either increase or reduce the travel of the pump piston and the amount of fuel delivered. The segments 67, 68, 69, and 71, are not of such angular extent that the contacting pairs fill the circle, thus leaving a segment which permits slack movement in one direction. The spring 360, shown in Fig. 2, will withdraw the fulcrum blocks when permitted to do so.

Alongside the collar 66 is a sleeve 70, which constitutes a hub for a lever 7. This is loose on the shaft, and has an end projection 71 positioned to engage the projection 69 of the sleeve 66 which latter is secured to the shaft, to thereby act as a stop to limit the return movement of the shaft, thereby limiting the movement of the fulcrum blocks 30, 37, 5 or 40^a, in their movement toward the pump actuating cams 12 or 13, thereby defining the maximum delivery of the pumps. By adjusting this lever and securing it in position, the maximum fuel supply may be limited, thereby limiting the maximum speed of the engines. Also the speed of the engine may be manually controlled and varied at will.

In Fig. 4 the lever arm 72 is an equivalent of the arm 7, being connected with a sleeve such as 70. An adjustable stop consisting of the rod 73 which is an extension of or controlled in position by the threaded rod 74, turned by the hand wheel 75. Turning this rod so as to engage the hardened pin 76 of arm 72 by the rod 73, limits the return movement of the sleeve 66 and the shaft 36 to which the latter is attached and thereby limits the maximum capacity of the oil feed pumps.

It will be seen that the cam 12 or 13 is revolved at a fixed rate of speed, and gives a fixed throw to the arm of the lever 4 which contacts therewith. As long as the fulcrum block 30, 37, 5 or 40^a remains in the same position, a fixed throw will be given to the piston plunger 20, the amount varying with respect to the throw of the cam directly as the length of the adjacent lever arms. Assume, however, that movement of the governor due to speeding up or racing of the engine occurs. Such movement is transmitted through the crank arms

60, rock shaft 36, lever arm 35 and link 31, as described. The movable fulcrum block. The fulcrum block is caused to move toward the prolongation of the axis of the piston plunger 20, carrying the lever 4, which is fixedly pivoted upon it. As the pivot point 30 approaches the prolongation of the axis of the plunger 20, the throw of the plunger is reduced proportionately to the decreasing length of the lever arm. This may be continued until the pivot point 30 lies in the prolongation of the axis of plunger 20. The lever arm is then zero, except for a slight rocking due to the curvature of the roller 25, and the throw of the plunger is zero. The revolution of the cam 12 or 13 and the regular throw of the arm of the lever 4 contacting therewith, may then continue as long as the engine turns over, without affecting the pump plunger 20. It will be noted that the effect described above is due to the fact that the lever 4, while fixedly pivoted with respect either to the fulcrum block 30 or 37 or the plunger head 24, and in driving engagement with the cam 12 or 13 and the plunger 20, is yet freely movable lengthwise of itself with respect to the cam and plunger, or with respect to the cam. In other words, there is no fixedly positioned connection between the cam and the lever 4, and in the preferred construction, in addition, there is no fixed connection between the plunger and the lever. The lever is free to move with respect to both, while still connected to actuate both of them.

What I claim as my invention is:

1. An oil feeding mechanism comprising a pump, a driving member, a lever interposed between said driving member and the pump and forming the driving connection therebetween, and means for moving the fulcrum of said lever in a direction parallel to its position at one extreme to interrupt the driving connection between the pump and the driving member.

2. An oil feeding mechanism comprising a pump, a driving member, a lever interposed between said driving member and the pump, a fulcrum member pivotally secured to said lever, and means for moving said fulcrum member in a direction parallel to the position of the lever at one extreme position.

3. An oil feeding mechanism comprising a pump, a driving member, a lever interposed between and operatively connecting said driving member and the pump, said lever being adjustable, longitudinally of itself, with respect to both the driving member and the pump, to thereby vary the ratio of its operating arms.

4. An oil feeding mechanism comprising a pump, a driving member alongside the pump, a pivoted lever actuated by said driv-

ing member and actuating the pump, and a fulcrum member movable lengthwise the lever, upon which said lever is pivotally fixed.

5 5. An oil feeding mechanism comprising a pump, a driving member alongside the pump, a pivoted lever actuated by said driving member and actuating the pump, a movable fulcrum member upon which the lever is pivotally fixed and supporting guides for said fulcrum member extending lengthwise the lever.

6. An oil feeding mechanism comprising a pump, a driving member alongside the pump, a pivoted lever actuated by said driving member and actuating the pump, a movable fulcrum member upon which the lever is pivotally fixed and supporting guides for said fulcrum member extending parallel the direction of said lever at the beginning of its operating stroke.

7. The combination with a feed pump and an actuating member having a uniform operating movement, of means for producing a variable movement of the pump comprising a lever, a fulcrum member fixedly pivoted to said lever between the actuating member and the pump, and means for shifting said fulcrum member and the lever to vary the ratio of the acting arms of the lever.

8. A fuel feeding mechanism comprising a reciprocating pump, a rotative cam and a lever operatively connecting said parts, a fulcrum member upon which said lever is fixed, and means for shifting said fulcrum member in a direction lengthwise said lever.

9. A fuel feeding mechanism comprising a reciprocating pump, a rotative cam, a lever connecting said parts, a fulcrum member for said lever, a guide for said fulcrum member extending in a direction parallel to the position of that side of the lever which contacts with cam and pump, the cam being in one extreme position, and means for moving said fulcrum member to shift the fulcrum from a position which is in alignment with the pump toward the cam.

10. A fuel feeding mechanism comprising a pump, a spring acting to withdraw the piston member of the pump, a rotative cam, a pivoted lever engaging the cam and the piston member of the pump by one face, a fulcrum member upon which the lever is fixedly pivoted between the piston member and the cam, and means for shifting said fulcrum member toward and from the piston member.

11. A feed mechanism for oil engines comprising a pump having a reciprocative member, a driving member adapted to impart a reciprocative movement, a lever having one end actuated by said driving member and having operating connection by its other end with the pump member, a fulcrum

member upon which said lever is fixedly pivoted, and means for shifting said fulcrum member to vary the proportionate active length of its ends.

12. A feed actuating mechanism comprising a pivoted lever, driving means engaging one end of the lever to give the same a uniform reciprocative movement, a pump actuating member actuated by the other end of the lever and means for shifting the fulcrum from a point which is alined with said pump actuating member to a point between this position and the driving means.

13. A fuel feeding device for oil engines comprising a reciprocating piston, a pivoted lever having one end actuating said piston, means for giving the other end of the lever a continuous reciprocating movement, a fulcrum block upon which said lever is fixedly pivoted, a guide for the fulcrum block paralleling one position of the lever, a rock shaft and a link connecting said rock shaft with the fulcrum block.

14. A fuel feeding device for oil engines comprising a fuel pump, a pivoted lever having operating engagement with said pump, a driving member having operating connection with said lever, a fulcrum for said lever, and means for shifting said fulcrum lengthwise the lever from a point alined with the point of operating engagement with the pump toward the point of engagement with its operating member.

15. A fuel feeding device for oil engines comprising a fuel pump, a pump operating member alongside the pump, a lever having engagement with both said parts, a fulcrum member for said lever having its pivot axis normally lying between said parts and means for shifting the pivot axis into alinement with the axis of the pump connection.

16. A fuel feeding device for oil engines comprising a fuel pump, a pump operating member alongside the pump and having a constant travel, a lever having sliding engagement with both said parts, a fulcrum member upon which said lever is fixedly pivoted between said parts, and means for shifting said fulcrum member from a point substantially alined with the pump toward the actuating member.

17. A fuel feeding device for oil engines comprising a fuel pump, a pump operating member alongside the pump and having a constant travel, a lever having sliding engagement with both said parts, a fulcrum member having pivotal connection with said lever between said parts, a guiding support for the fulcrum member paralleling the face of said lever which engages the pump and the operating member, and means for moving said fulcrum member along said guide to shift the fulcrum pivot from a point substantially alined with the pump connection toward the operating member.

18. A fuel feeding device for oil engines comprising a reciprocative pump member, a shaft adjacent thereto, a cam on the shaft, a lever normally fulcrumed between said shaft and pump member and engaging the latter and the cam, and means for shifting the fulcrum pivot to a point substantially alined with the pump member.

19. A fuel feeding device for oil engines comprising a reciprocative pump member, a shaft adjacent thereto, a cam on the shaft, a lever engaging said pump member and the cam, a fulcrum block having its pivotal engagement with the lever between said cam and pump member, a guide for said fulcrum block permitting movement of the fulcrum pivot from a point substantially alined with and at one end of the path of movement of

the pump member toward the cam, a rock shaft under automatic control, and a controlling connection from said rock shaft to said fulcrum block.

20. An oil feeding mechanism comprising a pump, a driving member, a frame, a lever interposed between said driving member and the pump and forming the driving connection therebetween, said lever having a fulcrum upon each of said pump, said driving member, and said frame, and means for moving one of said fulcrums relative to the remaining two and the lever without varying the relative positions of the lever and the two remaining fulcrums.

Signed at Seattle, Washington, this 25th day of April, 1918.

HENRY W. SUMNER.