Aug. 26, 1924. 1,506,540

T. MATSON

COMPENSATING CONNECTING ROD FOR INTERNAL COMBUSTION ENGINES

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Fig. 1.

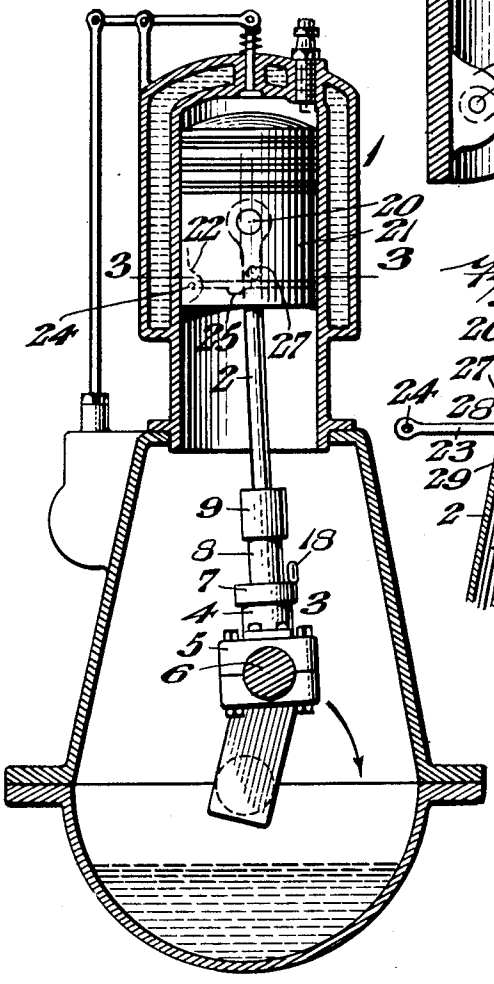


Fig. 2.

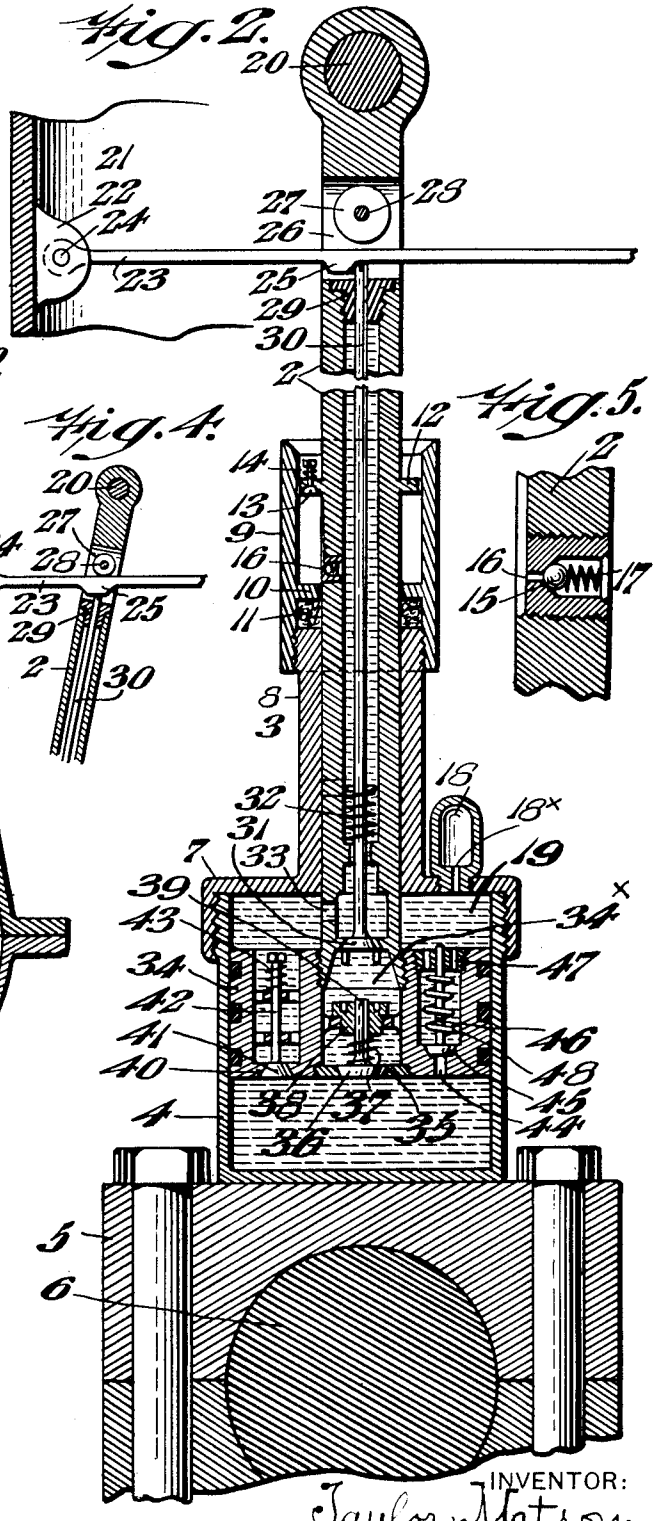


Fig. 3.

ON LINE 3-3. FIG. 1.

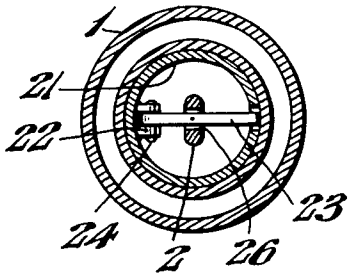


Fig. 4.

Fig. 5.

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COMPENSATING CONNECTING ROD FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, TAYLOR MATSON, a citizen of the United States, residing at Philadelphia, county of Philadelphia, State of Pennsylvania, have invented a new and useful Compensating Connecting Rod for Internal-Combustion Engines, of which the following is a specification.

My invention relates to a novel construction of extensible or compensating connecting rod for an internal combustion engine, whereby I am enabled automatically to keep the compression in the engine cylinders at a predetermined, invariable point during all positions of the piston at the extremes of its compression stroke.

It further consists of a novel construction of an extensible or compensating connecting rod composed of telescopic sections provided with a piston and novel valvular pumping mechanism and control mechanism, whereby the connecting rod will automatically shorten or lengthen according to requirements.

It further consists of a novel method of operating an internal combustion engine.

It further consists of other novel features of construction and advantage as will be hereinafter pointed out.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a side elevation of my novel compenating, connecting rod showing also partly in section an engine to which the same is applicable.

Figure 2 represents, on an enlarged scale, a sectional view of the connecting rod and its adjuncts.

Figure 3 represents a section on line 3—3 of Figure 1.

Figure 4 represents a sectional view of the upper end of the hollow compensating connecting rod showing the position the same rod and its adjuncts assume when the connecting rod is inclined from the position seen in Figure 2.

Figure 5 represents, on an enlarged scale, a sectional view similar to the left-hand portion of Figure 2 showing a check valve and its adjuncts.

Similar numerals of reference indicate corresponding parts.

Referring to the drawings, 1 designates an internal combustion engine of any conventional type and as its general mode of operation will be apparent to those skilled in the art, I shall confine my description to the novel construction of extensible or compensating connecting rod, which is composed of the upper member 2 and the lower member 3 into which said upper member telescopes. The lower member comprises a cylinder 4 mounted or secured upon the upper member 5 of the bearing for the crank shaft 6, the bearing and crank shaft being of the usual construction.

The cylinder 4 is provided with a cap or cover 7 having the upwardly extending outer tubular extension 8. 9 designates a pump cylinder having its lower end threaded upon the top of the extension 8 and provided with the inwardly extending flange 10 between which and the upper end of the extension 8 is located the packing 11 which acts as a stuffing box. The upper portion of the cylinder 9 contains the piston 12 attached to or formed on the upper hollow member 2, said piston carrying the check valve 13 which seats upwardly and is held normally closed by the spring 14.

It will be obvious that the check valve 13 acts as the valvular element of a pump, since it unseats at the proper period to admit any fluid above the piston 12 to fall into the chamber below said piston.

15 designates an outwardly seating check valve controlling the port 16 and held nor-

mally against its seat by the spring 17, as will be understood from Figure 4.

The air reservoir 18 is carried by the cap 7 and communicates by the port 18× with the oil or other liquid 19 contained in the cylinder 4. The upper end of the upper portion 2 of the extensible connecting rod is connected by the wrist pin 20 to the engine piston 21 which has the internal lugs 22 to which is pivoted at the point 24 the cam rod 23 having the bottom cam face 25, said cam rod passing through a slot 26 in the portion 2, the roller 27 being located in said slot above said cam rod and being rotatable upon the pin 28. 29 designates a stuffing box mounted in the bottom wall of the slot 26 through which passes the upper end of the valve rod 30 at the lower end of which is the upwardly seating valve 31, which is held normally seated by the spring 32. Above the valve 31 is the port 33 which communicates with the interior of the cylinder 4.

34 designates the compensating piston which is provided with piston rings and is secured to the lower end of the hollow piston rod or member 2 and reciprocates in the cylinder 4.

34× designates a centrally located chamber in the compensating piston 34 which has the hollow port or valve seat 35 which is controlled by the downwardly seating valve 36 which is held normally seated by the spring 37, whose tension is adjusted by the nut 38 which also serves as a guide for the valve stem 39. 40 designates a port or valve seat in the bottom of the compensating piston 34 which is controlled by the upwardly seating valve 41 having the valve stem 42 whose upper end is engaged by the spring 43 which serves to hold said valve 41 normally seated.

44 designates a port in the piston 34 located oppositely to the valve 41 and controlled by the downwardly seating safety valve 45 having the stem 46 guided in the apertured plate 47, the spring 48 serving to keep said safety valve seated.

It will be seen from the foregoing that my novel compensating piston has the flow of the liquid therethrough controlled by a set of four valves, two of which are centrally located. The upper central valve seats upwardly while the lower central valve seats downwardly. Of the two outer valves in said piston one seats upwardly while the other or safety valve seats downwardly.

The operation is as follows:—

On the intake stroke of the engine piston 21 the latter is moving downwardly from the position seen in Figure 1 and the compensating piston 34 is in the act of moving upwardly from the position seen in Figure 2. During this upward movement of the piston 34 the valve 41 unseats and the liquid or oil has free circulation through said piston. On the compression or upward stroke of the engine piston 21, as soon as the compression above said piston has reached a certain point, the compensating piston moves downwardly from the position seen in Figure 2.

As the piston 34 moves downwardly the valve 36 opens or moves upwardly and in addition as the parts are now about in the position seen in Figure 4, the cam 25 is pressing the rod 30 downwardly which unseats or opens the valve 31. The oil in 19 can then flow past the open valves 36 and 31 and through the port 33 and during this operation the piston 34 moves towards the bottom of its cylinder 4.

It will be seen from the foregoing that when the valves 36 and 31 are open and the piston 34 is moving downwardly, said piston and its cylinder 4 function somewhat as a dash pot and permits the extensible connecting rod composed of the parts 2 and 3 and their adjuncts to shorten or lengthen in a smooth and even manner.

Assuming that the engine piston 21 is near the end of its compression stroke, as seen in Figure 1, the cam 25 has moved from the position seen in Figure 4 to the position seen in Figure 2 and the valve 31 is closed by the spring 32, which prevents the flow of oil past said valve 31 and the compensating piston 34 is prevented from further downward movement. Following the explosion above the engine piston 21, the latter is driven downwardly and during this downward movement the valve 31 is held closed and there is no lengthening or shortening of the connecting rod composed of the telescoping parts 2 and 3 until the beginning of the intake stroke of the engine piston 21. The tension of the spring 37 is regulated by the nut 38 so that as the tension of the spring 37 is increased, the extent of compression above the piston 21 is correspondingly increased. When the engine is throttled down, the stroke of the engine piston 21 is permitted automatically to lengthen by reason of the presence of the extensible connecting rod composed of the telescoping members 2 and 3 and their adjuncts which automatically keeps the compression above the engine piston 21 up to the proper extent.

It will thus be seen that on the first or intake stroke the connecting rod automatically lengthens out. On the next or compression stroke, the connecting rod automatically shortens up when the right amount of compression is made. On the power or firing stroke, the connecting rod is stationary longitudinally and does not shorten or lengthen. On the exhaust stroke, the connecting rod is also stationary longitudinally

and does not shorten or lengthen which effects a large saving in fuel by reason of the engine having full compression when in a throttled condition. The pumping member seen in Figure 2 functions during the telescoping action of the parts 2 and 3. The pump piston 12 has no rings and fits a little loose in the cylinder 9 which permits the escape of any air and at the same time in case of any leakage of oil through the stuffing box 29 or packing 11 said oil is forced through the check valve 15 into the column of oil in the member 2.

The air reservoir 18 permits the expansion and contraction of the liquid 19.

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

1. The herein described process of automatically maintaining by an extensible connecting rod the compression of an internal combustion engine at a predetermined, invariable point during all positions of the piston at the extremes of its compression stroke, and automatically holding said connecting rod from expansion and contraction on the firing stroke.

2. In an internal combustion engine, an engine piston, a cylinder therefor, a crank shaft, an extensible, automatically operated connecting rod interposed between said piston and crank shaft for automatically maintaining the compression above said piston at a predetermined, invariable point during all positions of the piston at the extremes of its compression stroke, and means for holding said connecting rod from expansion or contraction on the firing stroke.

3. In a device of the character stated, an engine piston, a cylinder therefor, a crank shaft, and a compensating, extensible, connecting rod interposed between said piston and crank shaft, said rod being composed of telescoping, tubular members, one of said members carrying a compensating piston provided with valves, and the other of said members comprising a cylinder for said compensating piston, secured to said crank shaft.

4. In a device of the character stated, an engine piston, a cylinder therefor, a crank shaft, and a compensating, extensible, connecting rod interposed between said piston and crank shaft, said rod being composed of telescoping, tubular members, one of said members carrying a compensating piston provided with valves, and the other of said members comprising a cylinder for said compensating piston, secured to said crank shaft, in combination with means for automatically unseating one of said valves during the reciprocations of said engine piston.

5. In a device of the character stated, an engine piston, a cylinder therefor, a crank shaft, and a compensating extensible connecting rod, interposed between said piston and crank shaft, said rod being composed of telescoping tubular upper and lower members, said upper member telescoping within said lower member and serving as a hollow piston rod, a compensating piston attached to said piston rod, a cylinder for said compensating piston carried by said lower member and secured to said crank shaft, a pair of centrally located valves carried by said compensating piston, the upper of said valves seating upwardly and the lower of said valves seating downwardly, a valve stem for said upper valve, cam actuated devices controlled by the piston for unseating said upper valve, means for varying the spring tension on the lower valve according to the compression desired, and a third spring pressed upwardly seating valve carried by said compensating piston.

6. In an internal combustion engine, an engine piston, a cylinder therefor, a crank shaft, and means comprising an extensible connecting rod and pumping and valvular mechanism carried thereby interposed between said piston and crank shaft for automatically maintaining the compression above said piston at a predetermined, invariable point during all positions of the piston at the extremes of its compression stroke.

7. In a device of the character stated, an engine piston, a cylinder therefor, a crank shaft, a compensating, extensible, connecting rod interposed between said piston and crank shaft, said rod being composed of telescoping, tubular members, one of said members carrying a compensating piston provided with valves, and the other of said members comprising a cylinder for said compensating piston, secured to said crank shaft, means carried by said engine piston for automatically unseating one of said valves, and means for permitting the unseating of others of said valves during the reciprocations of said compensating piston in opposite directions.

8. In a device of the character stated, an engine piston, a cylinder therefor, a crank shaft, a compensating, extensible, connecting rod interposed between said piston and crank shaft, said rod being composed of telescoping, tubular members, the upper of said members carrying a compensating piston provided with valves, and the lower of said members comprising a cylinder for said compensating piston, secured to said crank shaft, means for automatically unseating one of said valves during the reciprocations of said engine piston, and a pumping device common to the upper tubular member and the upper end of said lower member.

9. In a device of the character stated, a compensating connecting rod, composed of a lower cylinder, an upward outer tubular

extension therefor, a hollow piston rod telescoping in said extension, and a valved compensating piston movable in said cylinder.

10. In a device of the character stated, a compensating connecting rod, composed of a lower cylinder, an upward outer tubular extension therefor, a hollow piston rod telescoping in said extension, and a valved compensating piston movable in said cylinder, in combination with a pumping device common to said hollow piston rod and the upper end of said tubular extension.

TAYLOR MATSON.

Witnesses:
E. HAYWARD FAIRBANKS,
N. BUSSINGER.