O. F. PERSSON.

REGULATOR FOR STEAM GENERATING APPARATUS.

APPLICATION FILED DEC. 5, 1902.

974,181. **Patented Nov. 1, 1910.**

2 SHEETS—SHEET 1.

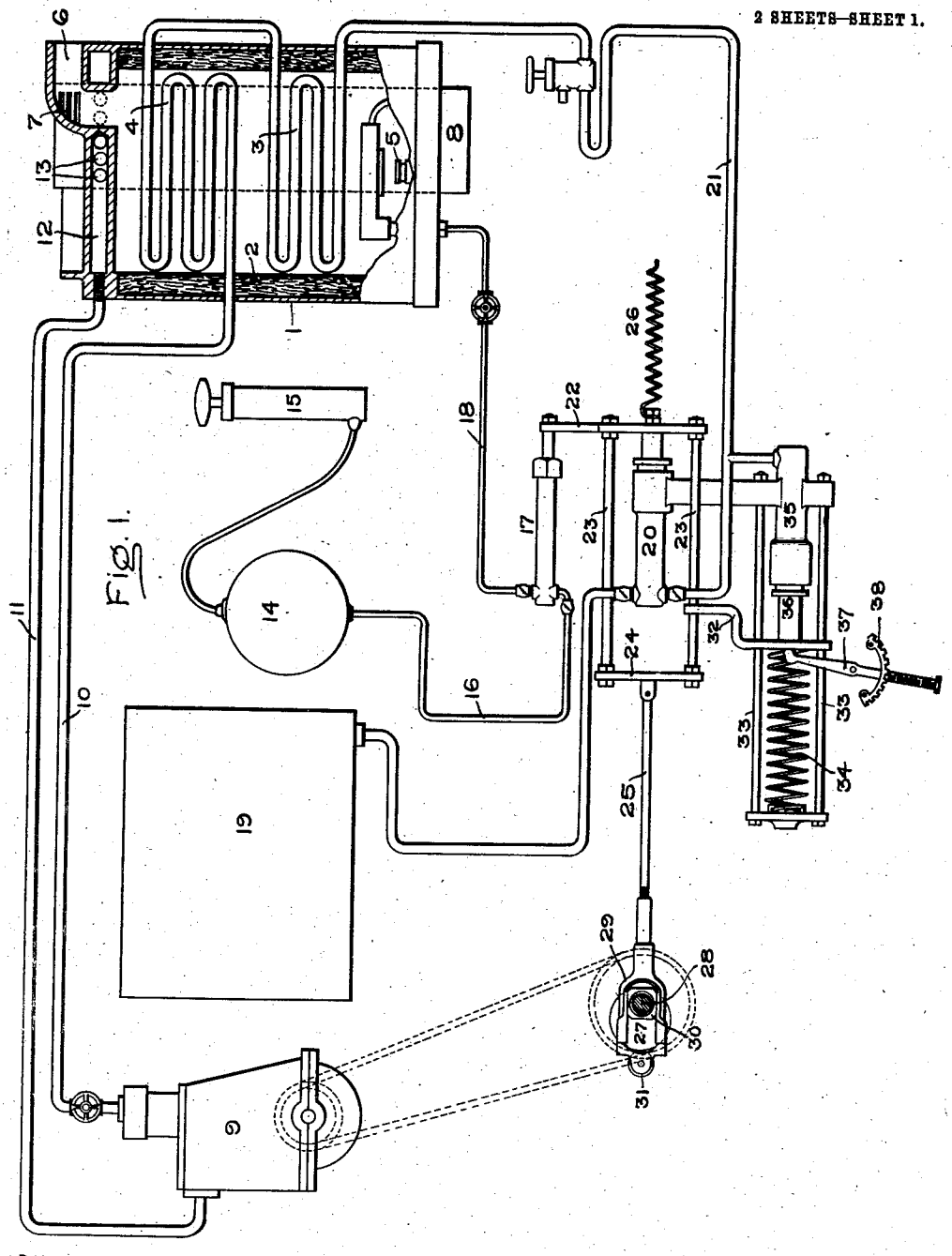

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

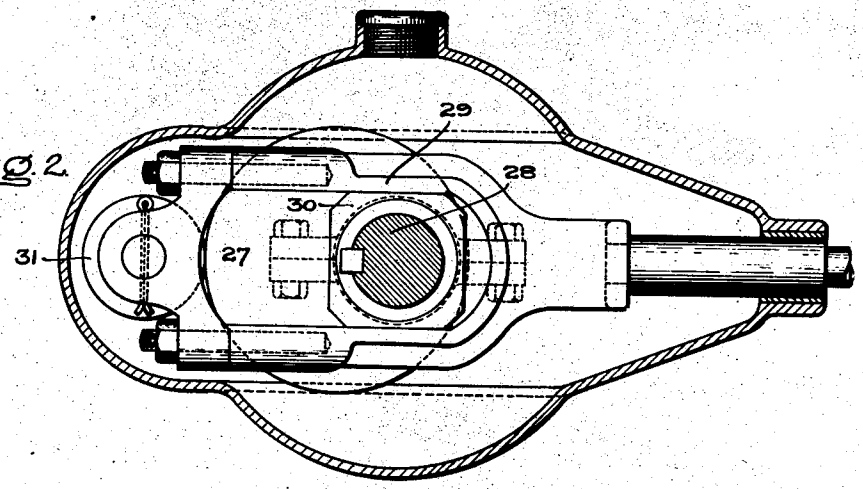
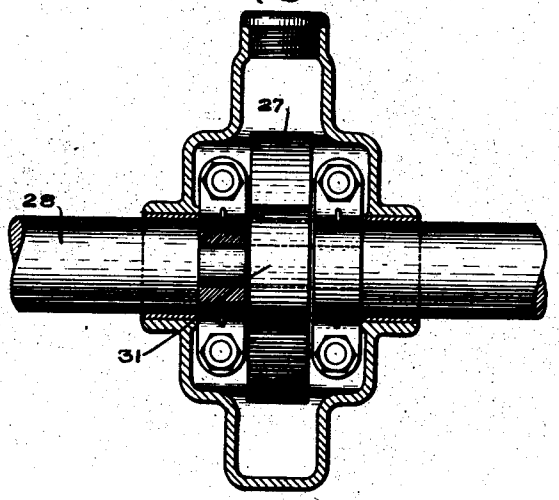


Fig. 3



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UNITED STATES PATENT OFFICE.

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REGULATOR FOR STEAM-GENERATING APPARATUS.

974,181. Specification of Letters Patent. Patented Nov. 1, 1910.

Application filed December 5, 1902. Serial No. 133,967.

To all whom it may concern:

Be it known that I, OTTO F. PERSSON, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Regulators for Steam-Generating Apparatus, of which the following is a specification.

This invention relates to steam or other vapor generating apparatus, and its object is to provide simple and efficient means for regulating the supply of liquid fuel and water to a burner and boiler, and more especially to a boiler of the type for rapidly generating steam commonly known as a semi-flash boiler or "flasher." It is desirable in this class of steam generators to be able to vary the water and fuel in accordance with the demands upon the boiler and in substantially the same degree, and also to vary them simultaneously and in the same proportions. My invention aims to accomplish this in a simple and automatic manner, and at the same time to allow for positive variation by the operator, when desired.

In carrying out my invention two separate pumps, or a double cylinder pump is employed, one pump or cylinder for water and the other for oil or other liquid fuel, both pistons being driven by a common cross-head or other connection which is moved positively in one direction by an eccentric or its equivalent, and in the other direction by a spring or its equivalent. The extent to which the spring is permitted to move the cross-head on the return stroke is limited by a stop, which is automatically adjusted in its position by a device responsive to the steam pressure in the boiler. As the steam pressure increases, the stroke of both pumps is shortened and the supply of water and fuel is cut down. Conversely, when the pressure falls, owing to an increased demand upon the boiler, the pump stroke is lengthened, and the supply of water and fuel is increased simultaneously and in the same proportion. The amounts of water and fuel delivered by the pumps vary substantially in the same degree as the demand for vapor and in substantial unison therewith.

In the accompanying drawings, Figure 1 is a diagrammatic view of a boiler, steam engine, fuel and water tanks, pumps, and the regulating devices which form the subject of this present invention; Fig. 2 is a side elevation of the eccentric, on a larger scale; and Fig. 3 is an end view of said eccentric and strap.

The boiler shown comprises a jacket 1 suitably lined with asbestos 2 or the like inclosing the steam or vapor generating coils 3 and the superheating coils 4 above the coils 3. Under the coils is a fire chamber containing a burner 5 of any approved type for burning oil or other liquid fuel. The products of combustion escape through the upwardly opening flue 6 or through suitable passages 7 into a down-draft flue 8. The engine 9 is supplied with steam through a pipe 10 leading from the superheating coil 4, and the exhaust steam escapes through a pipe 11 into a reheating compartment 12 at the top of the boiler, whence it goes through passages 13 into the down-draft flue. In circuit with the supply pipe to the engine is a throttle valve by means of which the activity of the system as a whole is controlled. The operator manipulates the valve and the automatic mechanism takes care of the water and fuel supplies.

The liquid fuel is contained in a tank 14, where it is put under an initial pressure by means of an air pump 15, preferably operated by hand. The oil tank is connected by a pipe 16 with the oil pump 17 from which a delivery pipe 18 leads to the burner 5. The water is stored in a tank 19, from which it is drawn by the water pump 20 and delivered through the pipe 21 to the lower end of the steam generating coil 3.

Inasmuch as there are times when the demand for steam is light, and as such times may occur when the vehicle is running at a relatively high speed, it is necessary to provide means whereby the effective delivery or discharge of the pump can be varied. This change in the effective discharge is accomplished by varying the stroke of the pump piston by means of a regulator comprising certain novel features in construction. The regulator is interposed between the pump piston and its actuating device in such manner that the pump may work at full stroke or at any portion of its stroke between maximum and zero. Means are also provided whereby the pump piston can be held stationary while the actuating device is in operation.

One advantage of my invention resides in the fact that the work done by the actuating device varies with the work done by the pump, so that as the effective discharge of the pump decreases from maximum to minimum so also the work by the actuating device is correspondingly reduced. This saving of power is of especial value in automobile vehicles.

The improved regulator is constructed as follows: The plungers of the oil and water pumps are rigidly secured to a common cross-head 22, which is connected, preferably by the rods 23 and yoke 24, with a connecting rod 25 engaging with a suitable device for actuating it in one direction to produce the expulsion stroke of the pumps. The return or suction stroke is effected by a spring 26 or the like attached to the cross-head.

For actuating the cross-head I prefer to use an eccentric 27 keyed on a shaft 28 which is driven by the engine 9. The eccentric engages with a forked head 29 secured to the end of the connecting rod and straddling the shaft 28, by which it is guided in its reciprocating movements under the action of the eccentric and the spring. Guide-blocks 30 may be suitably mounted on the shaft to fit between the jaws of the fork and afford a straight bearing surface for the same. The forked head is preferably double, as shown, its two branches receiving the eccentric between them and providing bearings for a cross-bar receiving the thrust of the eccentric. The bar preferably carries an anti-friction roll 31 pressing against the periphery of the eccentric on the side opposite to the cross-head and spring. The eccentric thus operates to pull the cross-head against the tension of the spring during one half of its revolution, but has no effect upon the cross-head during the other half of its revolution. To put the matter in a different way the driving connection includes a lost-motion device.

In order to vary the stroke of the pumps to correspond with the demand upon the boiler, an adjustable back-stop is provided to limit the return movement of the cross-head after it has been given an actuation by the eccentric. This stop is preferably, although not necessarily, a bar 32 lying in the path of the yoke 24 and movable along guide-rods 33 against the action of a spring 34. The position of this bar determines the length of the stroke of the pumps by stopping the cross-head on its return stroke. The bar is provided with means for automatically shifting it in accordance with the pressure on the water side of the boiler, such for instance as a cylinder 35 connected at one end with the pipe 21 and containing a plunger 36 pressing against the bar 32 and acting to move the bar and compress the spring 34 when the boiler pressure increases. The strength of the spring is so selected that the boiler pressure can rise to say 400 to 500 pounds per square inch before the plunger 36 can begin to move the bar to shorten the stroke of the pumps, from which point it will yield until the boiler pressure has risen to say 550 pounds, when the pumps will cease working entirely, and the eccentric will revolve freely between the forks without actuating the cross-head at all, and therefore without consuming any power. A lever 37 is arranged to move the bar when necessary, being provided with a ratchet and pawl locking device 38 to hold it in any desired position. The lever may be operated by the hand or foot of the chauffeur, so that the working of the pumps can be controlled at will.

It will thus be seen that my invention affords a simple and efficient device for regulating the feed of water and oil to a boiler and its burner in automatic correspondence with the demands upon the boiler; and also that the range of such automatic regulation can be varied at will by the operator.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. The combination with a boiler, of a liquid fuel burner, water and fuel pumps for supplying water to the boiler and fuel to the burner, means for simultaneously actuating the pumps, an adjustable back-stop for the pump pistons, and an automatic pressure regulator for adjusting the position of the stop.

2. The combination with a boiler, of a liquid fuel burner, water and fuel pumps for supplying water to the boiler and fuel to the burner, means for imparting simultaneous movements to the pumps, a driving connection for said means including a lost-motion connection, an adjustable stop for the pumps, and a device acted upon by the boiler pressure for adjusting the stop.

3. In combination, a boiler comprising a vaporizer and super-heating coils, a burner, water and fuel pumps, means for varying the effective deliveries of the pumps, a regulating device comprising a piston and cylinder located in the water supply connection between the pump and boiler, the movable element thereof being adapted to actuate said means in accordance with variations of the pressure at the water end of the boiler,

and a manually controlled lever for rendering the said movable element wholly or partially idle.

4. In combination, a boiler having a vaporizing and a superheating coil, a fire chamber, pumps for supplying liquid to the boiler and fuel to the fire chamber, a driving mechanism which tends at all times to impart a maximum stroke to the pumps, a stop interposed in the path of said driving mechanism which automatically varies the effective strokes of the pumps in accordance with the demand for superheated vapor and in substantially the same degree, and a manually-actuated device for modifying the action of said stop.

5. The combination with a boiler and liquid fuel burner for the same, of water and fuel pumps, a variable stroke mechanism for actuating the pumps simultaneously, a pressure device acted upon by the water pressure between the pump and boiler and adapted to automatically vary the stroke of said mechanism in accordance with the variation of the water pressure, and a manually controlled means for regulating the operation of the pressure device.

6. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps having their plungers connected with a common cross head, a lost-motion driving means attached to the cross head, and means sensitive to variations in the water pressure on the boiler for varying the amount of lost motion of the driving means to vary the deliveries of the pumps.

7. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps having their plungers connected, means for positively actuating said plungers in one direction, a spring for returning them, and means actuated by the boiler pressure for automatically varying the length of the stroke.

8. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps, means for simultaneously actuating their plungers in one direction, a spring for returning them, a stop for limiting the return stroke, and automatic means for adjusting said stop.

9. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps, means for simultaneously actuating them in one direction, a spring for returning them, a stop for limiting the return stroke, means for applying force to adjust said stop in one direction, and a spring for returning said stop when said force is withdrawn.

10. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps, means for simultaneously actuating them in one direction, a spring for returning them, a stop for limiting the return stroke, a plunger movable by the boiler pressure and acting to adjust said stop in one direction, and a spring for returning said stop.

11. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps, a common cross head connecting the plungers thereof, a forked rod pivotally connected with the cross head at one end, an eccentric engaging the forked end of the rod for moving the latter in one direction, a spring acting on the rod for returning it, and means for varying the extent of movement of the rod.

12. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps, a forked rod connected with their plungers, an eccentric revolving between the branches of said fork, and a cross-bar to receive the thrust of said eccentric.

13. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps, a common cross-head for their plungers, a rod connected with said cross-head and having a double fork at one end, guide blocks on which the branches of said fork slide, an anti-friction roll at one end of the fork between said branches, and an eccentric revolving between said branches and engaging with said roll.

14. The combination with a boiler and a liquid fuel burner therefor, of water and fuel pumps, a common cross head connecting the plungers thereof, a forked rod pivotally connected to the cross head at one end, an eccentric, a sliding connection between the eccentric and the forked end of the rod for moving the latter in one direction, a tension device acting in opposition to the rod for moving the plungers in the opposite direction, and means for varying the extent of movement of the rod against the tension of the said device.

15. The combination with a boiler and liquid fuel burner therefor, of water and fuel pumps, means for actuating the pumps simultaneously, a device independent of said actuating means which is controlled by the water pressure between the water pump and the boiler for simultaneously varying the strokes of the pumps, and a manually controlled means for rendering the pressure device wholly or partially inactive.

16. In a steam generating system, the combination of a boiler, a power pump for supplying water thereto, a variable stroke mechanism for the pump, a device automatically actuated by the pressure of the water supply for varying the length of stroke of said mechanism, and a means under the control of the operator for varying the movement of said device to any degree within its range of operation.

17. In a steam generating system for automobiles, the combination of a boiler, a

burner therefor, pumps for supplying water and fuel to the boiler and the burner, an engine receiving vapor from the boiler, a variable stroke mechanism common to the pumps which is driven by the engine, an automatic pressure device responsive to the water pressure between the pump and the boiler for varying the length of stroke of said mechanism, and means controllable from the vehicle seat for varying the effect of said device on the variable stroke mechanism.

18. In a steam generating system for automobiles, the combination of a boiler, a burner therefor, pumps for supplying water and fuel to the boiler and burner respectively, an engine, means driven by the engine for actuating the pumps simultaneously, a pressure device controlled by the fluid delivered by one of the pumps for simultaneously varying the strokes of both pumps, and a separately controlled means for regulating the effect of said pressure device to any degree between zero and maximum.

19. In a power system for automobiles, the combination of a boiler and burner therefor, pumps for supplying water and fuel to the boiler and burner respectively, an engine for driving the vehicle which receives vapor from the boiler, a driving mechanism for the pumps arranged to operate when the vehicle is moving, a pressure device controlled by the pressure of the fluid delivered by one pump for simultaneously varying the strokes of both pumps, and a manually controlled means which is operative during movements of the vehicle for controlling the range of operation of said pressure device.

In witness whereof I have hereunto set my hand this 25th day of November, 1902.

OTTO F. PERSSON.

Witnesses:

DUGALD McK. McKILLOP,

JOHN A. McMANUS.