No. 786,122. PATENTED MAR. 28, 1905.

H. K. HESS.

STEAM MOTIVE POWER.

APPLICATION FILED APR. 10, 1902.

Fig. 1.

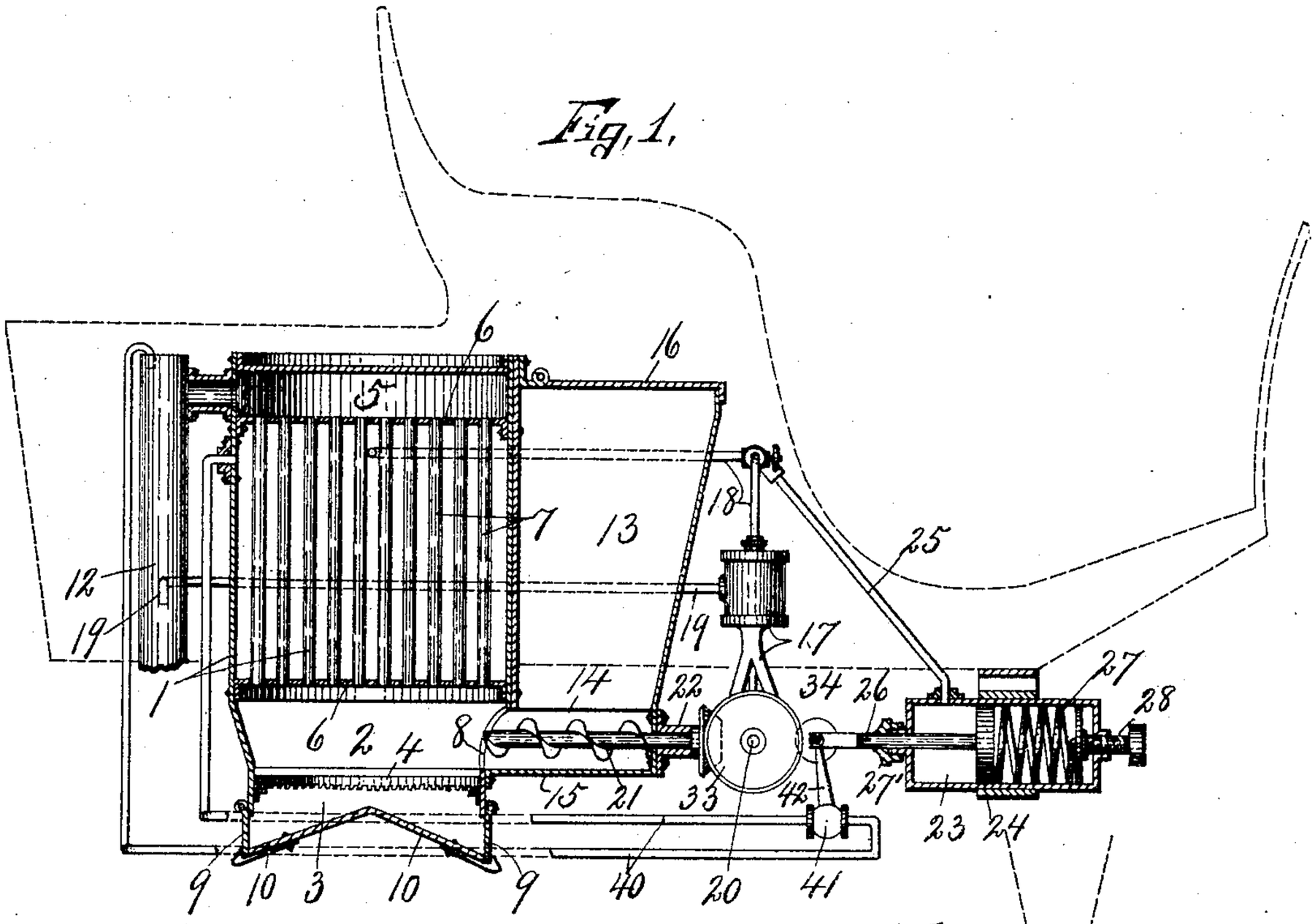


Fig. 4.

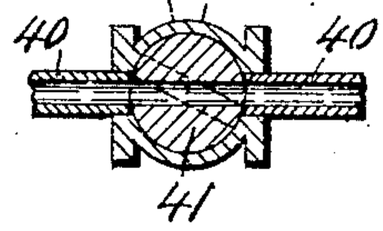


Fig. 2.

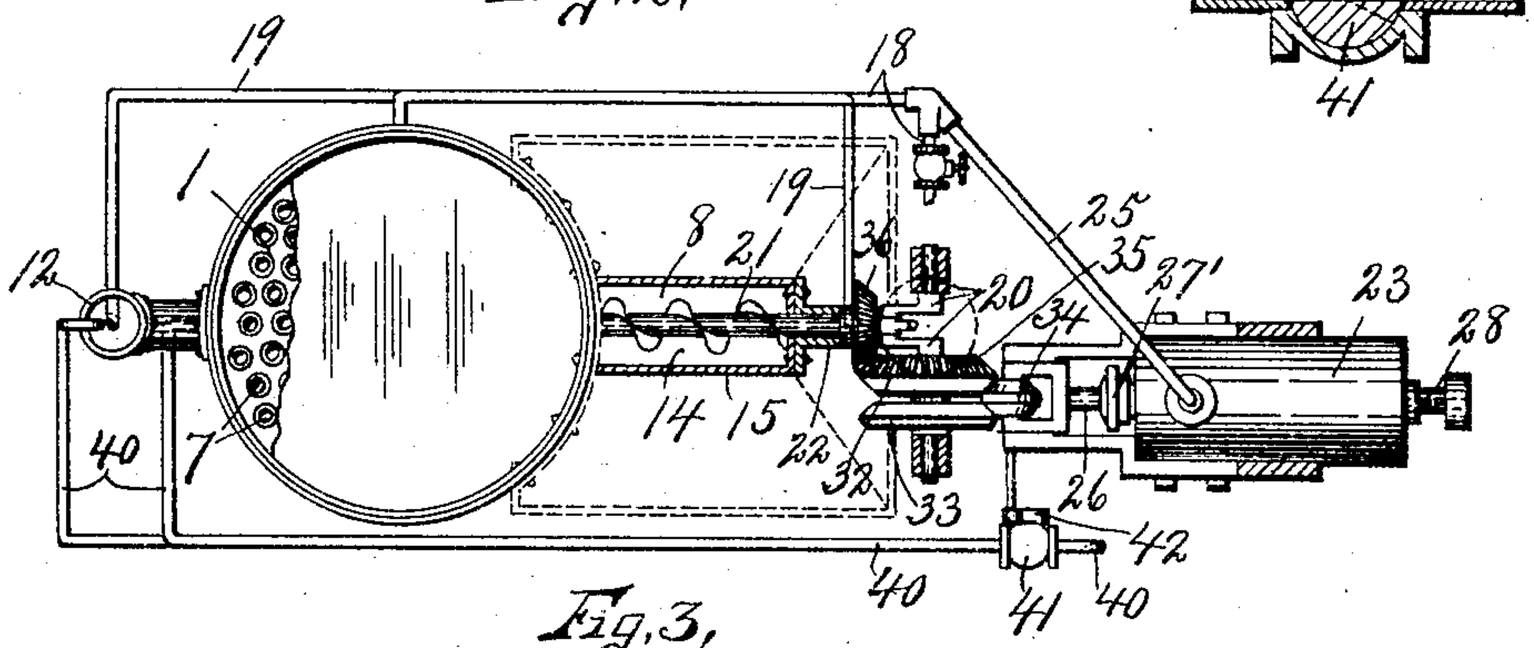
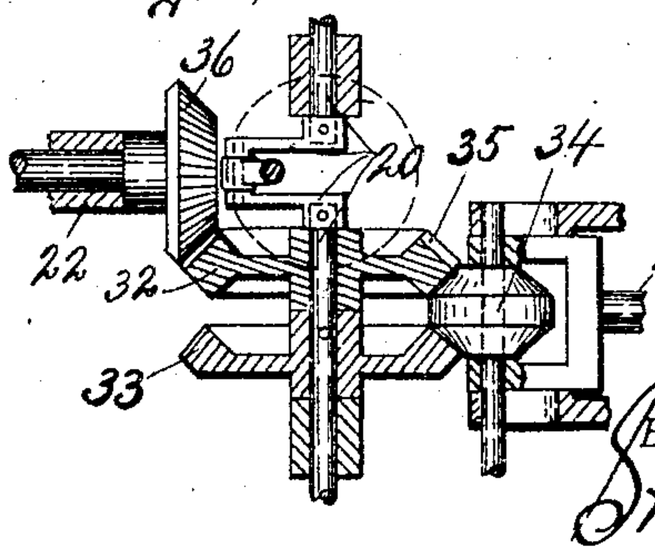


Fig. 3.



WITNESSES:

W. T. Brewer.

H. E. Chase

INVENTOR

Henry K. Hess.

BY

Smith & Wilson

ATTORNEYS.

No. 786,122. Patented March 28, 1905.

UNITED STATES PATENT OFFICE.

HENRY K. HESS, OF PHILADELPHIA, PENNSYLVANIA.

STEAM MOTIVE POWER.

SPECIFICATION forming part of Letters Patent No. 786,122, dated March 28, 1905.

Application filed April 10, 1902. Serial No. 102,199.

To all whom it may concern:

Be it known that I, HENRY K. HESS, of Philadelphia, in the county of Philadelphia, in the State of Pennsylvania, have invented new and useful Improvements in Steam Motive Power, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in steam motive power as applied more particularly to the propulsion of vehicles.

The broad object of my invention is to render the operation of the generator substantially automatic, in which the pressure of the steam controls the combustion and the combustion in turn controls the steam-pressure, thereby maintaining a substantially uniform degree of steam-pressure in the generator.

A more specific object is to provide means controlled by the steam-pressure for controlling the feed of the fuel to the combustion-chamber of the generator; and a still further object is to actuate the fuel-feed by means of the engine and to control the connection between the engine and fuel-feed by means of steam-pressure from the generator.

To this end the invention consists in the combination, construction, and arrangement of the parts of a steam motive power and its controlling mechanism, as hereinafter fully described, and pointed out in the claim.

Referring to the drawings, Figure 1 is a transverse vertical sectional view through a steam-generator and fuel-reservoir, showing the mechanism for automatically controlling the feed of the fuel and also for automatically controlling the draft, the engine being indicated in Fig. 1. Fig. 2 is a top plan of the parts seen in Fig. 1, the engine being omitted. Fig. 3 is an enlarged horizontal sectional view of the means for controlling the fuel-feed. Fig. 4 is a sectional view of the valve for controlling the passage of steam to the draft-pipe.

Similar reference characters indicate corresponding parts in all the views.

In the drawings I have shown a steam-generator consisting of an upright tubular boiler 1, having a combustion-chamber 2, an ash-box 3, an interposed grate 4, and a smoke-chamber 5.

The boiler 1 is provided with opposite heads 6 and flues 7, having their opposite ends expanded into said heads in the usual manner. The combustion-chamber or burner 2 is provided with a fuel-inlet opening 8, and the ash-box 3 is provided with clean-out doors 9 and inclined bottom walls 10, arranged to feed the ashes to the clean-out doors 9. The grate 4 may be of any desired form or construction, and is preferably arranged in a horizontal plane in substantial alinement with or slightly beneath the lower edge of the inlet-opening 8. The smoke-chamber 5 is provided with a draft opening or passage communicating with the draft-conduit 12, which is preferably arranged to discharge beneath the body of the vehicle, although it is apparent that this draft-pipe may extend in any direction for conveying the fumes or steam from the exhaust away from the vicinity of the operator.

Located at one side of the steam-generator is a fuel-reservoir 13, which is adapted to receive any kind of solid fuel, such as charcoal and similar combustible material, which may be readily fed from the reservoir to the combustion-chamber or burner 2. In order that the feed of the fuel may be as nearly automatic as possible, I provide the lower end of the reservoir 13 with a discharge-opening 14, communicating with the inlet-opening 8 of the combustion-chamber 2, these two openings being usually connected by a fuel-conduit 15. The upper end of the reservoir 13 is provided with an inlet-opening which is normally closed by a suitable closure 16, which is sufficiently tight when closed to prevent the entrance or exit of air to the reservoir 13, the object of this closure being to prevent any draft upwardly through the reservoir which would tend to carry the combustion into the reservoir.

In Fig. 1 I have shown an engine 17, which is connected by a conduit 18 to the steam-chamber of the generator, said engine being also provided with the usual exhaust-conduit 19, which is preferably arranged to discharge into the draft-pipe 12 in order to localize the

exhaust-steam and convey the same to some suitable point beyond the vicinity of the operator and body of the vehicle. This engine is provided with the usual crank-shaft 20, which may be connected in any desired manner to the driving mechanism of the vehicle, this driving mechanism for the vehicle forming no part of my present invention, and it is therefore unnecessary to further illustrate or describe the same.

Movable in the base of the reservoir 13 and preferably extending through the discharge-opening 14 into the conduit 15 is a rotary fuel-feed, as a screw 21, which is preferably arranged to be intermittently actuated by the crank-shaft 20 and is journaled at its outer end in a suitable bearing 22, provided on the shell of the reservoir 13.

In carrying out one of the objects of my invention—viz., to control the operation of the fuel-feed by means of the steam-pressure from the generator—I preferably employ a steam-chamber 23 and a piston or movable member 24, reciprocally mounted in the chamber 23 and controlled by the pressure of the steam from the generator, and suitable mechanism controlled by the movement of the piston 24 for connecting and disconnecting the fuel-feed to the engine. The chamber 23 is preferably connected directly to the steam-chamber of the boiler 1 by a conduit 25, forming a continuation of the conduit 18, which leads to the engine 17, although it is evident that separate conduits may be used leading, respectively, from the steam-chamber of the boiler 1 to the engine and to the chamber 23. The piston 24 is reciprocally mounted in the chamber 23 and is provided with a stem 26, projecting outwardly through a suitable stuffing-box 27′ in one end or wall of the chamber, said piston being normally arranged at one side of the inlet-opening of the conduit 25 and is actuated against the pressure of the steam by a suitable spring 27, interposed between the piston and one of the end walls of the chamber 23, the tension of said spring being regulated by an adjusting-screw or equivalent device 28. The tension of this spring is gaged to regulate the degree of pressure of the steam required in the boiler and operates conjointly with the pressure of steam in the manner hereinafter described. Any desired means controlled by the movement of the piston 24 and stem 26 may be employed for making and breaking the connections between the engines and fuel-feed as the pressure of steam raises and lowers, and in the drawings I have shown a mechanism for carrying out this object consisting of friction-wheels 32 and 33, mounted upon the crank-shaft 20, and an additional friction-wheel 34, mounted upon the stem 26 of the piston 24. The friction-wheel 32 is preferably loose on the crank-shaft of the engine and is provided with a gear 35, meshing with a pinion 36, which is secured to the shaft of the screw 21 at the outside of the reservoir 13. The friction wheel or disk 33 is arranged in close proximity to the friction-wheel 32 and is secured to the crank-shaft 20, both of said friction-wheels being held from endwise movement by suitable collars or shoulders provided on the crank-shaft or by set-screws, the exact securing means being immaterial. The friction-disk 34 is revolubly mounted upon the outer end of the stem 26 and is adapted to simultaneously contact with the friction-faces of both of the disks 32 and 33 when the piston is moved to its outward limit, said limit being regulated by the contact of the friction-disk 34 with the friction-faces of the disks 32 and 33. This frictional contact of the disk 34 with the disks 32 and 33 transmits rotary motion from the disk 33 to the disk 32 and to the screw 21 through the medium of the gear 35 and pinion 36. In the operation of this part of my invention, assuming that it is desired to maintain a uniform steam-pressure in the generator of seventy-five pounds to the square inch, the spring 27 is then tensioned to counteract this pressure upon the piston 24, and during the operation of the generator when the fuel becomes exhausted in the burner of the generator and the steam consequently drops below seventy-five pounds pressure the spring 27 forces the piston forwardly, and thereby moves the friction-wheel 34 into contact with the friction-wheels 32 and 33, thus operating the screw-feed 21 to feed additional fuel into the combustion-chamber 2. This feed will continue until the pressure of steam is again raised to its normal degree of seventy-five pounds or more, whereupon the piston 24 is forced inwardly against the action of the spring 27, and thereby disconnects the friction member 34 from the friction-wheels 32 and 33 and stops the rotation of the screw, this operation being repeated as often as the pressure of steam varies above or below its normal pressure, and it is therefore evident that a substantially uniform pressure is automatically maintained in the generator. In order to further provide for the automatic control of the combustion and steam-pressure, I provide a conduit 40, leading from the steam-chamber of the generator and discharging into the draft-conduit 12, the conduit 40 being provided with a valve 41, having an operating member 42, connected to the movable piston 24 through the medium of the stem 26. This operating member of the valve is arranged to open and close the passage of steam through the conduit 40 as the piston is reciprocated in the chamber 23—that is, when the pressure of steam is less than its normal degree, as, for instance, seventy-five pounds to the square inch, the valve 41 is automatically opened by the piston for the purpose of creating a steam-blast through the draft-conduit, and thereby increasing combustion at the same time that

the fuel is feeding into the combustion-chamber, and when the steam-pressure is raised above the normal degree the piston operates by means of the increased pressure to close the valve 41 at the same time that the fuel-feed is stopped. It is thus apparent that the steam-blast through the draft-pipe is automatically controlled by the steam-pressure simultaneously with the operation of the fuel-feed and that both operations are entirely automatic, the increased pressure of steam acting to check the draft and fuel-feed and the checking of the draft and fuel-feed operating to lower the steam-pressure.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that some change may be made in the detail construction and arrangement of the parts without departing from the spirit thereof. Therefore I do not limit myself to the precise construction and arrangement shown and described.

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

In combination with a vehicle-body, a steam-generator mounted on the body and provided with a draft-pipe, a fuel-reservoir located at the side of the generator, a feeding mechanism in the base of the reservoir for feeding fuel therefrom into the combustion-chamber of the generator, a steam-chamber and a steam-conduit on the body and both connected to the generator and receiving steam therefrom, the conduit leading into the draft-pipe, a valve in the conduit, and a piston in the steam-chamber acting to control the fuel-feed and the valve in the conduit simultaneously according to the pressure in the generator.

In witness whereof I have hereunto set my hand this 7th day of April, 1902.

HENRY K. HESS.

Witnesses:

WM. A. SHRYOCK,

THOS. J. REYNOLDS.