

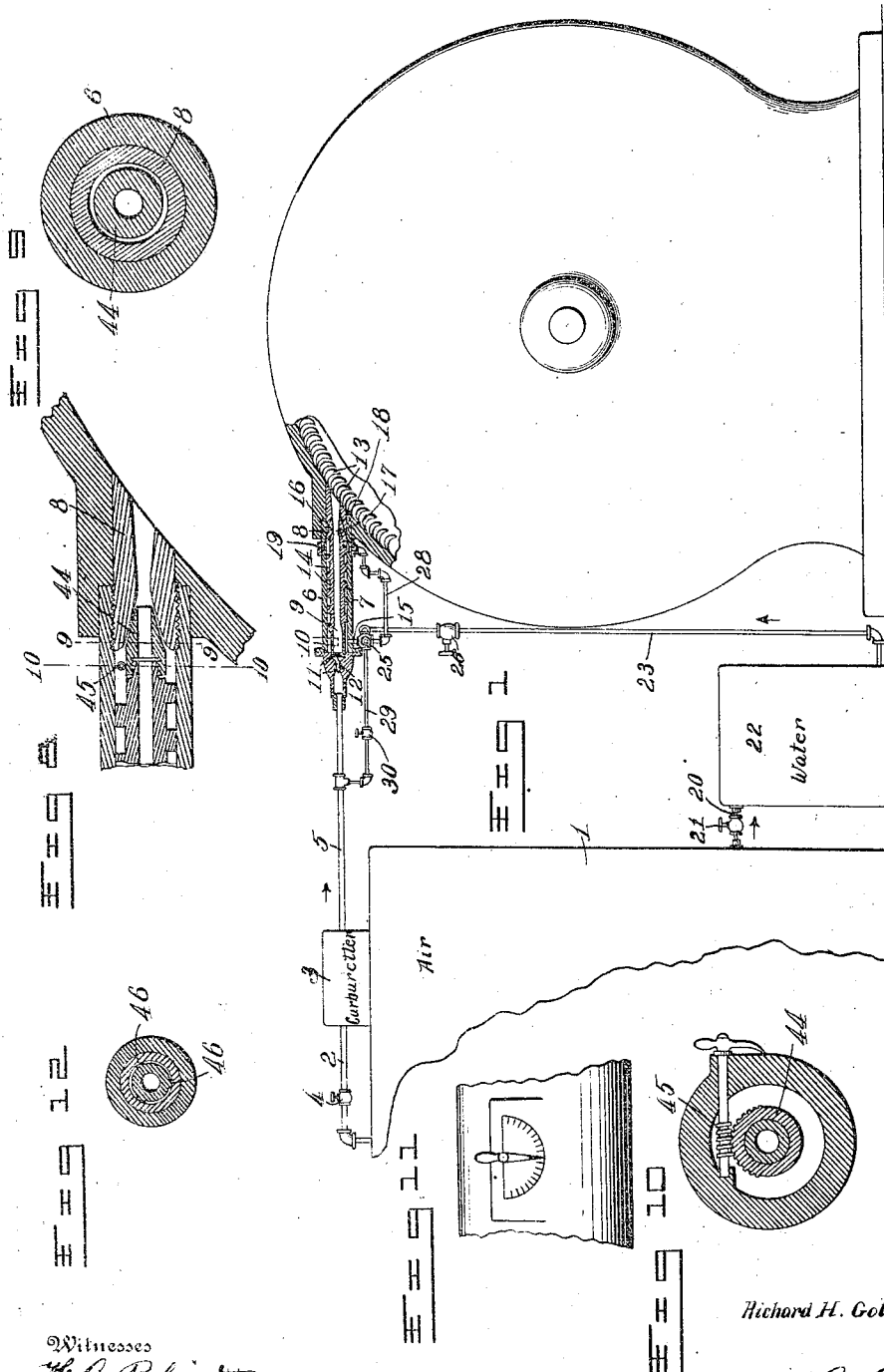
No. 871,993.

PATENTED NOV. 26, 1907.

R. H. GOLDSBOROUGH.
POWER SYSTEM.

APPLICATION FILED MAY 14, 1906.

2 SHEETS—SHEET 1.



Witnesses
H. A. Robinson,
F. B. Rosenthal

Inventor
Richard H. Goldsborough

G. Myers

Attorney

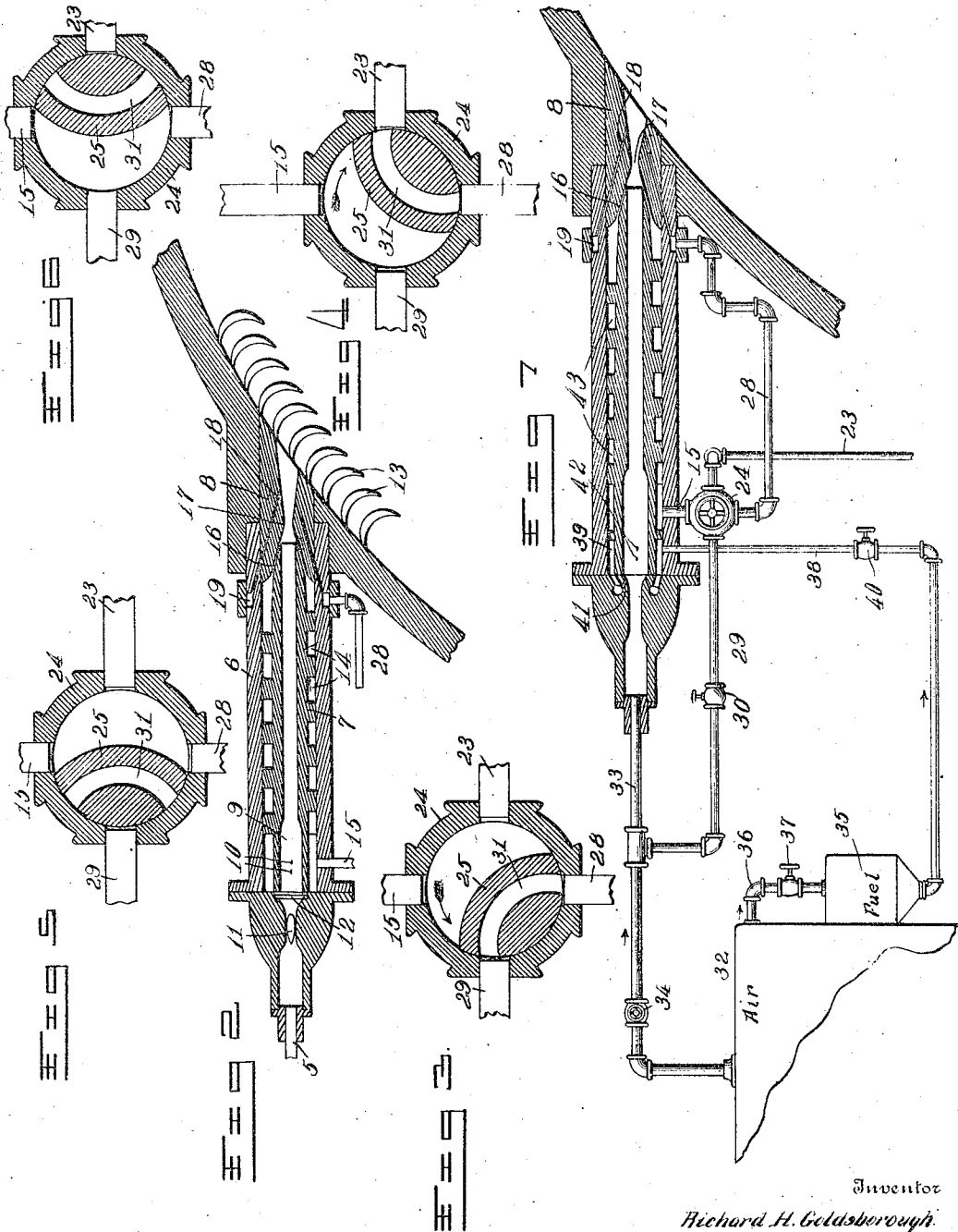
No. 871,993.

PATENTED NOV. 26, 1907.

R. H. GOLDSBOROUGH.
POWER SYSTEM.

APPLICATION FILED MAY 14, 1906.

2 SHEETS—SHEET 2.



Witnesses

H. A. Polmette
F. B. Rosenthal

By

Inventor
Richard H. Goldsborough.

G. Myers.

Attorney

UNITED STATES PATENT OFFICE.

RICHARD H. GOLDSBOROUGH, OF WASHINGTON, DISTRICT OF COLUMBIA.

POWER SYSTEM.

No. 871,993.

Specification of Letters Patent.

Patented Nov. 26, 1907.

Application filed May 14, 1906. Serial No. 316,733.

To all whom it may concern:

Be it known that I, RICHARD H. GOLDSBOROUGH, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Power Systems, of which the following is a specification.

My invention relates to an improvement in power systems; and it consists in the constructions, combinations and arrangements herein described and claimed.

An object of my invention is to provide a simple and efficient power system, which provides a maximum radius of operation with a minimum of size and weight, thereby especially adapting it for automobile uses.

A further object of my invention is to provide a compact power system in which fluid pressure and heat are converted into mechanical energy in a highly efficient manner with an elimination of the practical difficulties incident to excessive temperatures in heat motors.

In the accompanying drawings, forming a part of this application, and in which similar reference symbols indicate corresponding parts in the several views: Figure 1 is a detail elevation, partly in section, illustrating one embodiment of my invention; Fig. 2 is a sectional view, on a larger scale, of the nozzle and adjacent parts shown in Fig. 1; Figs. 3, 4, 5 and 6 are sectional views, on a larger scale, showing the different positions of the main controlling valve of Fig. 1; Fig. 7 is a detail elevation, partly in section, illustrating a modification of my invention; Fig. 8 is a detail sectional view, illustrating a slight modification of the nozzle and adjacent parts shown in Fig. 2; Fig. 9 is a sectional view, on a larger scale, taken on the line 9—9 of Fig. 8; Fig. 10 is a sectional view, on a larger scale, taken on the line 10—10 of Fig. 8; Fig. 11 is a view of the right-hand side of Fig. 10, and Fig. 12 is a sectional view, similar to Fig. 9, illustrating a slight modification.

Referring to the drawings, 1 indicates a reservoir for containing a supply of fluid under pressure, and connected by a pipe 2 with any suitable type of carbureter 3. The pipe 2 is provided with a reducing valve 4, which can be employed for cutting off the fluid supply to the carbureter when the system is not in use. A pipe 5 conducts the carbureted mixture from the carbureter 3 to a nozzle

member comprising an outer shell 6, an inner core 7 and a nozzle tip 8.

The carbureted mixture discharged at high velocity from the pipe 5 into the nozzle member is initially ignited at the portion 9 thereof by the sparking terminals 10; the combustion continuing within the inner core 7, which constitutes a combustion chamber leading to the nozzle tip 8. After being thus ignited, a continuous combustion of the carbureted mixture is maintained at a substantially constant pressure within the nozzle member; the parts being constructed and proportioned to transform a large portion of the heat of combustion into augmented velocity of the already rapidly flowing fluid without producing a material increase in the pressure. Suitable means, such as a perforated thick plate 11 and foraminated diaphragm 12, may be employed for insuring against back-firing of the combustible mixture, if desired; but such devices are not necessary with the high velocity of the combustible mixture employed in my invention. The products of combustion then flow with an augmented velocity through the core 7 and tip 8 of the nozzle member, and are directed by the latter at an efficient angle against the vanes 13 of a turbine motor.

The proportions of the carbureted mixture can be varied to produce any desired degree of combustion, thereby permitting the temperature and final velocity of the products of combustion to be varied within wide ranges. For example, where only a slight increase in the velocity is required and a low temperature is desired, an excess of air would be provided in the mixture.

Excessive local heating is prevented and the temperature of the parts equalized by extracting heat from the products of combustion at the hottest portion in their travel, and returning such extracted heat at another point in the travel of the products of combustion. Such transference of the heat is efficiently obtained by supplying a suitable cooling fluid through the pipe 15 to the spiral channel 14 under sufficient pressure to cause its satisfactory progressive flow through said channel. The heat absorbed by such cooling fluid during its progressive flow through the channel 14 augments its rate of flow, and the heated fluid is finally discharged from the channel 14 at high velocity through passages 16, which are constructed to direct it for-

wardly in a series of jets converging to a point in the axis of the nozzle at its most contracted portion 17. It will be noted that the minimum cross-section of the rapidly flowing stream of products of combustion occurs at the contracted portion 17; and that the products of combustion are in a condition of maximum velocity and minimum pressure at such point. This arrangement provides a very efficient operation, since the low pressure of the products of combustion adjacent the discharge ends of the passages 16 tends by induction to increase the velocity of the fluid jets discharged through said passages. Further, the high velocity of the products of combustion and intermingling conical series of jets, causes an intimate intermixture thereof, with a resultant rapid equalization of the temperature and velocity of such intermingling fluids by exchange.

The construction of the nozzle member can be readily varied to meet all practical requirements, and to produce any desired relation between the temperatures of the products of combustion and the fluid jets at their point of intermingling. The stream of intermingled fluids is finally discharged by the nozzle tip 8 to the turbine motor; said tip being preferably formed to diverge from its point 17 of minimum cross-section.

Under certain conditions, it may be desirable or advantageous to further reduce the velocity and temperature of the fluid jet prior to its impact on the turbine vanes. This result can be conveniently obtained by diluting such jet with a cooler fluid directed thereinto through a converging series of passages 18, similar to the series of passages 16, and communicating at their outer ends with an annular chamber 19, which latter is supplied with a relatively cool fluid under any desired pressure.

In the embodiment of my invention illustrated in Figs. 1—6, a pipe 20, provided with a reducing valve 21, connects the fluid under pressure in the reservoir 1 with a water tank 22. The fluid pressure thus maintained in the tank 22 forces the water therefrom through a pipe 23 to the casing 24 of a main controlling valve 25, the pipe 23 being shown provided with a cut-off valve 26. The valve casing 24 communicates with the channel 14 by a pipe 15, and with the annular chamber 19 by a pipe 28; a pipe 29, shown with a cut-off valve 30, being provided for establishing communication between the valve casing 24 and the pipe 5. It will be clear that with the main valve 25 in the position shown in Fig. 3, water will be supplied to the channel 14 and air to the chamber 19; in the position of the valve shown in Fig. 4, explosive mixture will be supplied to the channel 14 and water to the chamber 19; in the position of the valve shown in Fig. 5, water will be supplied to both the channel 14

and chamber 19; and in the position of the valve shown in Fig. 6, explosive mixture will be supplied to both the channel 14 and chamber 19. When it is desired to admit water to the channel 14 and cut off all supply to the chamber 19, the valve 25 is moved sufficiently from the position shown in Fig. 3 to cut off the valve port 31 from the explosive mixture pipe 29 without placing the pipe 28 in communication with the interior of the valve casing 24. If it be desired to admit explosive mixture to the channel 14 and cut off all supply to the chamber 19, the valve 29 is shifted sufficiently from the position shown in Fig. 4 to cut off the valve port 31 from the water pipe 23 without placing the pipe 28 in communication with the interior of the valve casing 24. The main controlling valve 25 and the valves 4, 21, 26 and 30 provide a simple means for conveniently controlling the character and quantity of the fluids supplied to the channel 14, and annular chamber 19.

Fig. 7 illustrates a modification of my invention in which air under pressure in a reservoir 32 is delivered at high velocity to the nozzle member, through a pipe 33 provided with a reducing valve 34. A tank 35 containing a suitable fuel, such as liquid hydrocarbon, is connected with the air under pressure in the reservoir 32 by a pipe 36 provided with a reducing valve 37. The pressure thus maintained in the tank 35 forces the fuel therefrom through a pipe 38 to an annular chamber 39 in the nozzle member, the pipe 38 being shown provided with a cut off valve 40. The channel 39 surrounds that portion of the inner core of the nozzle member in which combustion takes place, and is provided with a series of apertures 41 arranged to discharge fuel from the chamber 39 into the bore of said inner core. The fuel will be highly heated in the chamber 39, and, where a fluid hydro-carbon is employed, it will be vaporized and discharged in gaseous form through the series of apertures 41; thereby insuring an intimate intermixture with the rapidly flowing air in the nozzle member. Any suitable means, such as sparking terminals 42 can be employed for initially igniting the mixture of air and fuel, after which a continuous combustion of such mixture will be maintained, as in my previously described construction. This modification is provided with a valve casing 24 containing a main controlling valve for the pipes 15, 23, 28 and 29, in a manner similar to that described in reference to Figs. 1—6. The only modification in these parts from the previously described construction being that the spiral channel 43 is formed with a gradually increasing cross-section, to accommodate the expansion of the fluid which is heated while flowing therethrough.

Figs. 8—11 illustrate a slight modification

of the nozzle member, in which a conical nipple 44 is adjustably attached, as by screw threads, to the discharge end of the inner core 7; suitable means, such as a worm 45, being provided for conveniently adjusting said nipple on the core. In this modification the cooling fluid after absorbing heat during its flow through the spiral channel surrounding the inner core, is discharged through the space between the conical nipple and the adjacent conical face of the nozzle tip in a practically continuous sheet converging in the axis of the nozzle at its most contracted portion. This provides a very satisfactory construction, and permits convenient control of the discharge of cooling fluid into the nozzle for maintaining a maximum efficiency under various practical conditions of operation. It will be obvious, that such control and regulation of the discharge of cooling fluid into the nozzle could be equally conveniently obtained by adjustably mounting the nozzle tip, or by making both said tip and nipple adjustable.

Fig. 12 shows a slight modification of the adjustable nipple, in which the outer conical face thereof is provided with fins 46 for guiding and preventing swirling of the cooling fluid during its flow thereover.

I have illustrated and described preferred and satisfactory constructions, but, obviously changes could be made within the spirit and scope of my invention.

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

1. In a power system, means for producing a fluid jet, comprising a nozzle tip, a combustion chamber communicating therewith, means for supplying combustible mixture to said chamber, means for initially igniting such mixture, connections for conducting a cooling fluid in contact with the walls of said combustion chamber for absorbing heat therefrom and directing such heated fluid into said nozzle tip, other connections for discharging a cooling fluid into said nozzle tip, and a common means for controlling and cutting off either of said connections independently of the other, substantially as described.

2. In a power system, means for producing a fluid jet, comprising a tapered nozzle tip, a combustion chamber communicating therewith, means for supplying combustible mixture to said chamber, means for initially igniting such mixture, connections for conducting a cooling fluid in contact with the walls of said combustion chamber for absorbing heat therefrom and directing such

heated fluid into said nozzle tip in a series of jets converging at the most contracted portion of said tip, other connections for discharging a cooling fluid into said nozzle tip, and a common means for controlling and cutting off either of said connections independently of the other, substantially as described.

3. In a power system, means for producing a fluid jet comprising a nozzle tip, a combustion chamber communicating therewith, means for supplying combustible mixture to said chamber, means for initially igniting such mixture, two independent sources of cooling fluid under pressure, connections for conducting either of said cooling fluids in contact with the walls of said combustion chamber for absorbing heat therefrom and directing said heated fluid into said nozzle tip, other connections for discharging either of said fluids into said nozzle tip, and a common means for controlling said connections, said common controlling means constructed to permit simultaneous supply of cooling fluid to both connections from one of said independent sources or to permit simultaneous supply of cooling fluid to the respective connections from said two independent sources, substantially as described.

4. In a power system, means for producing a fluid jet, comprising a tapered nozzle tip, a combustion chamber communicating therewith, means for supplying combustible mixture to said chamber, means for initially igniting such mixture, two independent sources of cooling fluid under pressure, connections for conducting either of said cooling fluids in contact with the walls of said combustion chamber for absorbing heat therefrom and directing said heated fluid into said nozzle tip in a series of jets converging at the most contracted portion of said tip, other connections for discharging either of said cooling fluids into said nozzle tip, and a common means for controlling said connections, said common controlling means constructed to permit simultaneous supply of cooling fluid to both connections from one of said independent sources or to permit simultaneous supply of cooling fluid to the respective connections from said two independent sources, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

RICHARD H. GOLDSBOROUGH.

Witnesses:

ALEX. S. STEUART,
G. AYRES.