To all whom it may concern:

Be it known that I, Elbridge C. Collins, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Power-Generating Apparatus, of which the following is a specification.

My present invention relates generally to power plants, and more particularly to apparatus for generating power through the use of an impact engine, and the production, control, and continuous use of an expansible liquefiable gas as an impact fluid therefor, my object being to provide an effective apparatus of this character which will be simple and inexpensive as well as durable, which will permit of ready and easy control, and which may be erected within minimum space.

My invention further and particularly consists in the apparatus to be now described with reference to the accompanying drawing, forming a part of this specification, and in which the figure is a diagrammatic view of the entire plant, certain of the parts being shown in section, as hereinafter referred to.

As shown in the drawing, my invention contemplates the provision of a reservoir A having a valve E' leading into its upper end for supplying a suitable volatile or liquefiable gas, such as sulfur dioxid or anhydrous ammonia, the gas so supplied being in liquid form.

From the base of the reservoir A leads a pipe B, controlled by a valve B', the pipe B depending into the upper end of a supply tank C, from the lower end of which a pipe D extends downwardly into a generator E having a vent E' at its upper end and adapted to contain a heated fluid such as water, with or without calcium chlorid or oil, the heating of the fluid within the generator E being effected in any suitable manner, as by means of a steam of electric coil F having inlet and outlet pipes F' and F₂ respectively communicating between the same and the lower and upper ends of the generator.

The lower end of the pipe D within the generator E is connected to one end of a high pressure coil G, to the opposite end of which is connected one end of a gas pipe H, it being noted that the high pressure coil G is entirely surrounded by the heated liquid within the generator before mentioned.

The opposite end of the pipe H leads to the impact engine preferably in the form of a turbine, as seen at I, and is controlled by a valve H', the exhaust pipe J leading from said turbine and controlled by a valve J', being extended upwardly and connected to one end of the coil K' of a condenser K, the opposite end of which coil K' is connected to a pipe M, through a valve M', which latter pipe leads into the upper end of the reservoir A.

The shaft I' of the turbine I may be extended to any suitable point from which it is desired to take power therefrom, or may be utilized in any other suitable manner, as for instance, to drive a dynamo indicated at I'.

A pressure equalizing pipe N extends from the gas or high pressure pipe H as shown, and is provided with a controlling valve N' adjacent said pipe. Pressure equalizing pipe N is also provided with branches N₂ and N₃, each controlled by its respective valve N₂' and leading respectively into the upper end of the reservoir A and the supply tank C.

Thus in operation with the high pressure coil G heated to a desired temperature by the liquid within the generator E maintained at, for instance, 104° F., and with a supply of liquid gas in the reservoir A, the valve B' is opened permitting a quantity of the liquid to pass into the supply tank C by gravity, the valve B' being then closed and valve D' opened to permit the liquid from the supply tank C to pass downwardly to the high pressure coil G through pipe D. The liquid so finding its way into the high pressure coil, is promptly changed to its gaseous form, and in doing so expands to a high pressure and in such form and at such pressure passes through the gas or high pressure pipe H to the turbine I, valve H' having been opened. The valve N' of the pressure equalizing pipe N is then opened and valve N₂ of its branch N₂ also opened to permit of the passage of pressure within the supply tank C in order to balance the pressure above and below the supply of liquid gas therein, and permit of continuous feed of the liquid downwardly by gravity.

The gas at high pressure having been
utilized in the turbine I to drive its shaft I', passes through the exhaust pipe J, valve J' of which has been opened, to the condenser K, passing through the pipe thereof and after condensation and in liquid form, finding its way again to the reservoir A through the pipe M, valve M' of which has been opened.

The main valve B' may then at any time be opened, and by opening valve N^4 of branch N^2 of the equalizing pipe N, pressure may be introduced into the upper end of the reservoir A to feed a supply of liquid downwardly into the supply tank C.

If, for any reason, in the use of the apparatus the turbine I is temporarily shut down, or if the pressure of its gas generated as above described at any time and for any reason exceeds the demands of the turbine, the generated gas or the excess thereof, may pass directly from the high pressure gas pipe H to the exhaust pipe J at a point above the valve J' of the latter and thus directly in communication with the condenser, through a by-pass O in which a relief valve O' is mounted.

The reservoir A and supply tank C may be respectively provided with pressure indicators A^2 and C^2, and a pipe P may lead from the base of the supply tank C, through a cut-off valve P' and a regulating valve P^2 to a pump Q, the discharge pipe R of which, having a valve R', leads to the pipe D before mentioned at a point below the valve D' thereof.

Thus the pressure equalizing branches N^2 and N^4 may be cut off by closing valves N^2 in each of these pipes, and the supply of liquid gas to the high pressure coil G effected through the pump Q. In this event, the regulating valve P^2 is controlled by its pressure pipe P^2 leading from the pressure equalizing pipe N and having a controlling valve P^4.

Thus from the foregoing it will be seen that I provide an apparatus of a simple and inexpensive nature, capable of ready and convenient control and erection within a minimum space, and which will be durable and effective in its operation.

I claim:

1. In an apparatus of the character described, a reservoir having a valved inlet and a valved outlet depending therefrom, a supply tank into which said outlet depends, having a depending valved pipe, a fluid holding generator, means for heating the fluid within said generator, a high pressure coil within said generator and to one end of which said supply tank is connected, a valve high pressure gas pipe leading from the opposite end of said coil, an impact member to which said gas pipe leads, a condenser, a high pressure gas pipe also communicating with said coil, an impact member to which said gas pipe leads, a condenser connected to the exhaust side of said impact member, a reservoir with which said condenser communicates, having a valved connection with said supply tank, and a valved pressure equalizing pipe leading from said high pressure gas pipe and having valved branches respectively communicating with said reservoir and with said supply tank.

2. In an apparatus of the character described, a reservoir having a valved inlet and a valved outlet depending therefrom, a supply tank into which said outlet depends, having a depending valved pipe, a fluid holding generator, means for heating the fluid within said generator, a high pressure coil within said generator and to one end of which said supply tank is connected, a valve high pressure gas pipe leading from the opposite end of said coil, an impact member to which said gas pipe leads, a condenser, an exhaust pipe leading from the said impact member to the said condenser, a valve pipe leading from the condenser into said reservoir, a pressure equalizing pipe leading from said high pressure gas pipe, a feed pump for feeding liquid gas into the high pressure coil, having an intake pipe communicating with said supply tank, and a regulating valve in said intake pipe having a controlling pressure pipe leading into said supply pressure equalizing pipe.

3. In an apparatus of the character described, a reservoir having a valved inlet and a valved outlet depending therefrom, a supply tank into which said outlet depends, having a depending valved pipe, a fluid holding generator, means for heating the fluid within said generator, high pressure coil within said generator and to one end of which said supply tank is connected, a valve high pressure gas pipe leading from the opposite end of said coil, an impact member to which said gas pipe leads, a condenser, an exhaust pipe leading from the said impact member to the said condenser, a valve pipe leading from the condenser into said reservoir, a pressure equalizing pipe leading from said high pressure gas pipe, and having valved branches respectively communicating with said reservoir and said supply tank.

4. In an apparatus of the character described, a generator including a high pressure coil, a supply tank communicating with said generator coil, a high pressure gas pipe also communicating with said coil, an impact member to which said gas pipe leads, a condenser connected to the exhaust side of said impact member, a reservoir with which said condenser communicates, having a valved connection with said supply tank, and a valved pressure equalizing pipe leading from said high pressure gas pipe and having valved branches respectively communicating with said reservoir and with said supply tank.

5. In an apparatus of the character described, a generator including a high pressure coil, a supply tank communicating with said generator coil, a high pressure gas pipe also communicating with said coil, an impact member to which said gas pipe leads, a condenser connected to the exhaust side of said impact member, a reservoir with which said condenser communicates, having a valved connection with said supply tank, and a valved pressure equalizing pipe leading from said high pressure gas pipe and having valved branches respectively communicating with said reservoir and with said supply tank.
a condenser connected to the exhaust side of said impact member, a reservoir with
which said condenser communicates, hav-
ing a valved connection with said supply
tank, and valved pressure equalizing con-
nections between said gas pipe and said res-
ervoir and supply tank.

6. In an apparatus of the character de-
scribed, a reservoir having a valved inlet
and a valved outlet depending therefrom, a
supply tank into which said outlet depends
having a depending valved pipe, a fluid
holding generator, a high pressure coil with-
in said generator and to one end of which
said supply tank is connected, a valved high
pressure gas pipe leading from the opposite
end of said coil, an impact member to which
said gas pipe leads, a condenser, an exhaust
leading from the said impact member to
the condenser, a valved pipe leading from
the condenser into the said reservoir, and
a pipe extending directly between said gas
pipe and said exhaust pipe and having a
relief valve therein for the purpose de-
scribed.

7. In an apparatus of the character de-
scribed, a generator including a high pres-
Sure coil, a supply tank, a high pressure gas
pipe communicating with said coil, an im-
pact member to which said gas pipe leads, a
condenser connected to the exhaust side of
said impact member, a reservoir with which
said condenser communicates, having a
valved connection with said supply tank, a
feed pump for feeding liquid gas into the
high pressure coil having an intake pipe
communicating with said supply tank, and
a regulating valve in said intake pipe hav-
ing a controlling pressure pipe communicat-
ing with said high pressure gas pipe.

8. A power apparatus including a supply
tank for the reception of gas in liquid form,
a generator having a closed coil in which
the liquid is transformed into a gas at high
pressure, an impact member to the working
chamber of which the gas is fed directly
from the generator coil, having an exhaust
pipe, a condenser communicating with the
said exhaust pipe of the impact member and
having valved connection with the said sup-
ply tank, and means for feeding the liquid
from the supply tank directly into the said
generator.

ELBRIDGE C. COLLINS.