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MEANS FOR UTILIZING WASTE ENERGY.

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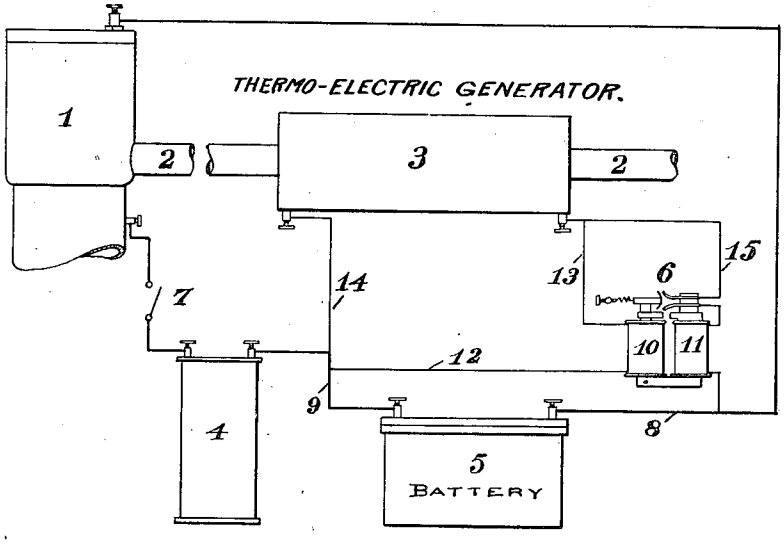


Fig. I.

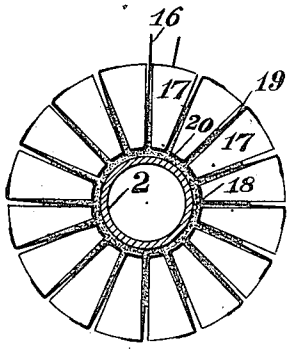


Fig. II.

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MEANS FOR UTILIZING WASTE ENERGY.

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To all whom it may concern:

Be it known that I, JOHN L. CREVELING, a citizen of the United States, residing at Wilmington, county of New Hanover, State of North Carolina, have invented certain new and useful Improvements in Means for Utilizing Waste Energy, as set forth in the following specification and drawing, forming a part thereof.

My invention has for its principal object to utilize energy usually wasted or lost in the operation of prime movers operated by heat and as the same is particularly applicable to internal combustion motors it is illustrated in the drawing and described in this specification as applied to such a motor and means are shown for utilizing the energy thus recovered in the operation of the motor itself.

Figure I. shows a diagrammatic view of my invention as applied to an internal combustion motor. Fig. II. shows a cross section of one form of apparatus employed in my invention for the utilization of the ordinarily wasted energy.

In Fig. I., numeral 1 denotes the cylinder portion of any suitable type of motor, in this case an internal combustion motor, as above stated. This may be of any desired type or construction, the particular type of motor forming no part of my present invention. The fuel or energy for operation may be supplied in any suitable manner (not shown) and a safe working temperature may be maintained in the cylinder by water circulation, or otherwise, (not shown) the same being old in the art and requiring no illustration.

A suitable exhaust pipe, or conduit, as indicated at (2) is provided for carrying the exhaust of the motor to the atmosphere, or to any form of muffler, (not shown) or other destination that might be desired. In operative relation to this exhaust duct is shown the thermopile, or theremoelectric generator (3) adapted to convert heat taken from the gases into electrical energy. These gases are in the normal operation of such motors discharged at high temperature—that is, above the temperature of steam at ordinary working pressures, and any of the well known thermoelectric couples placed in proper relation to, or in operative communication with the said gases may be used to convert heat taken from the said gases into electrical energy.

The motor (1) is shown as provided with an ordinary spark coil (4) which may be of any suitable type and also with a storage battery, or accumulator (5) which may be of any suitable kind to fulfil its office as hereinafter described. The motor (1) is provided with a suitable ignition device, in this case indicated as the make and break spark ignition. As the particular mechanism of this ignition device is not a part of my present invention, the customary binding posts upon the motor are alone shown to indictate the presence of this apparatus. The wire (8) leads from one of the said binding posts of the ignition device to one terminal of the storage battery (5). The other terminal of the storage battery (5) is connected to one terminal of the spark coil (4) as by wire (9). The other terminal of the spark coil (4) is connected with the remaining binding post of the ignition device through the circuit controlling switch indicated at (7), which is the usual arrangement for igniting devices of this character. Numeral (6) represents an automatic switch adapted to make and break the circuit through the lead (15) under predetermined conditions as will hereinafter appear. The lead (15) connects one terminal of the thermoelectric generator with the wire (8) through the contacts of the switch (6) and one of its magnet coils (11). The wire (14) connects the other terminal of the thermoelectric generator (3) with the wire (9). The magnet (10) of the switch (6) is placed in shunt across the thermoelectric generator as by wires (12) and (13).

The normal operation of my invention as shown applied in the above diagram is as follows: Starting with the various parts of the apparatus in the positions indicated in the drawing and with the motor and other parts at practically atmospheric temperature and the motor at rest, the first step will be to close switch (7) and start the motor in operation. If all adjustments of the motor are properly made and the battery in condition to operate the current will flow through spark coil (4) and upon proper arrangement of the ignition device cause a spark to fire the charges in a well known manner. The products of combustion passing through duct (2) will raise the temperature of the thermoelectric generator (3) in such manner as to create a difference of potential across the terminals of the same. If

this be properly designed and constructed, this difference of potential will increase until the voltage across the thermoelectric generator will exceed that of the storage battery (5) by a desired amount in the normal operation of the apparatus. If the switch (6) be properly designed in a manner well understood in the art of train lighting, when the difference of potential across the terminals of a thermoelectric generator shall be practically equal, or slightly in excess of that of the battery, the magnet (10) will cause the switch (6) to close and complete the circuit through the wire (15) and current will then flow from the thermoelectric generator through storage battery (5) and through magnet (11), serving to hold the switch closed so long as the current remains in the proper direction. Thus the thermoelectric generator will keep the storage battery charged and at times supply part of the current to the ignition device in multiple with the battery at the expense of heat derived from the exhaust. If the motor be stopped the voltage of the thermoelectric generator (3) will fall and when slightly below that of the storage battery, a slight back discharge through magnet (11) will assist switch (6) to break the circuit through wire (15) and thus further decrease in the voltage of the generator will not occasion loss of current from the battery.

Referring to Fig. II., which shows a cross section of one form of thermoelectric generator (3) which may be employed, (2) indicates the wall of the exhaust duct, or conduit, which may be surrounded by a heat conducting and electrically insulating material (18) serving to support the various elements of the generator which may be placed spirally around duct (2) and in series. The innermost, or high temperature end of one element (17) is attached to the other element (19) along the surface (20), the said element (19) then is led to the outermost, or coolest surface of the next element (17) as indicated and the end or terminal element (19) may be brought out as indicated at (16) and then connected into circuit as is also the terminal element (17). The insulating material may entirely fill the space between the elements, or partially, as shown in the figure, leaving the outer ends uncovered for the purpose of rapid radiation, or the entire apparatus may be water jacketed in any suitable manner to insure proper external cooling, if desired.

Any suitable material may be used for the positive and negative elements and proper voltage may be obtained by placing requisite number of couples in series, while proper resistance may be obtained by dimensions of the elements. As the particular material used for the elements forms no part of my present invention, no particular combination is given and any of the well known couples may be employed.

The above description is merely one showing one form of apparatus which may be used embodying my invention and I do not wish to limit myself in any way to any precise form of apparatus or details contained herein, other than set forth in claims.

Having thus described my invention, that which I consider novel and desire to cover by Letters Patent is as set forth in the following claims.

Claims:

1. The combination with a motor giving off heat and means conveying said heat away from the motor, of a thermoelectric generator in operative relation to said heat conveying means and means utilizing the energy given by said thermoelectric generator in the operation of said motor comprehending a storage means and ignition means both in multiple with said generator.

2. The combination with an internal combustion motor exhausting gases at high temperature, and means for conveying said gases, of a thermoelectric generator in operative relation to said conveying means for transforming heat taken from said gases into electrical energy, means for converting a portion of said electrical energy into chemical energy, automatic means for connecting said generator with said converting means and means whereby energy of said generator and said converting means operate jointly in the operation of said motor.

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Witnesses:
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