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ART OF PRODUCING CHARGES FOR POWER DEVICES.

APPLICATION FILED MAR. 2, 1918.

1,333,837. Patented Mar. 16, 1920.

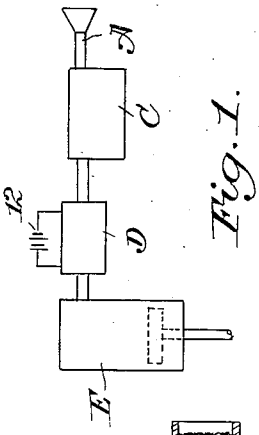

Fig. 1.

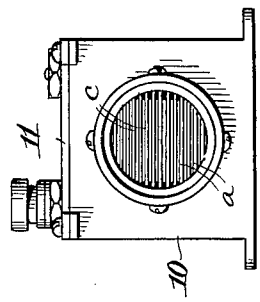

Fig. 4.

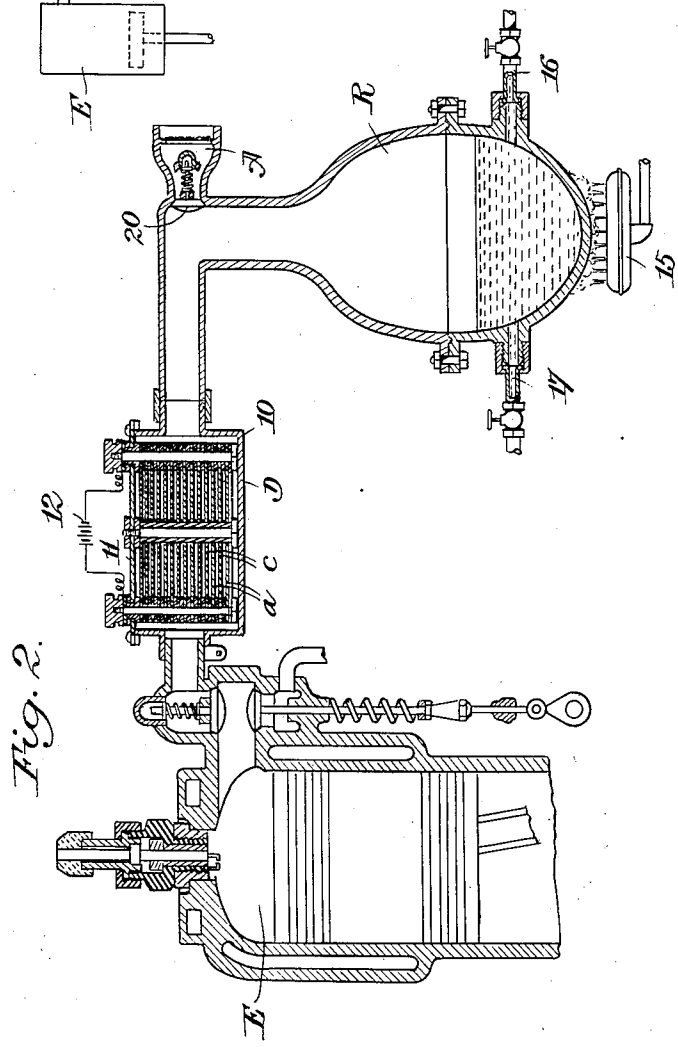

Fig. 2.

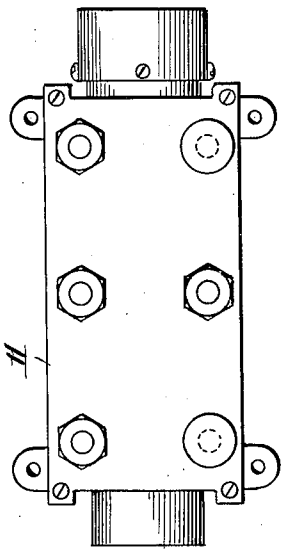

Fig. 3.

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UNITED STATES PATENT OFFICE.

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ART OF PRODUCING CHARGES FOR POWER DEVICES.

1,333,837. Specification of Letters Patent. Patented Mar. 16, 1920.

Application filed March 2, 1918. Serial No. 220,050.

To all whom it may concern:

Be it known that I, HENRY CSANYI, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in the Art of Producing Charges for Power Devices, of which the following is a specification.

This invention relates to the art of producing charges for power devices operating under internal combustion principles.

The charge introduced into the cylinder of an internal combustion power device preliminary to the charge combustion under present day practice comprises, in the main, atmospheric air and hydrocarbon, the latter generally in the form of vapor, the charge generally being produced by introducing the hydrocarbon content into the air as the latter is drawn toward the cylinder in what is known as the suction stroke of the cycle of operation. After compression, the charge is ignited, certain chemical reactions and changes taking place by reason of the explosive action brought about by the ignition of the compressed charge, these reactions being well-known, the carbon content of the hydrocarbon and a portion of the oxygen content of the air reacting into carbon-dioxid (CO_2), while the hydrogen content of the hydrocarbon reacts with the oxygen content of the air to produce a form of H_2O, the nitrogen content of the air being practically inactive.

The source of supply for the active oxygen content of the charge, under commercial operation, is atmospheric air, this source being practically inexhaustible and has the oxygen in a form capable of readily taking up the hydrocarbon vapor in the formation of the charge, the nitrogen content of the air remaining inactive and simply acting to dilute the charge. Another source of oxygen supply heretofore contemplated is that provided by the use of water introduced into the flowing air stream through the carbureting operation and concurrently with the hydrocarbons, the moisture being carried forward into the explosive chamber where it is decomposed during the explosion action, thus freeing the oxygen content of the water as an aid in the production of oxygen for combustion purposes. A somewhat similar action also may take place where the power device is being operated in damp or inclement weather, in which case the air supply carries more or less moisture. But in this case, also, the water or moisture content of the air is not affected while the charge is in charge form, the oxygen of the moisture content being liberated only by the explosive action.

In a companion application filed February 28, 1918, Ser. No. 219,687, I have disclosed a method by means of which the contents of the combustion charge are so formed as to provide an increase in efficiency of the power device, this result being obtainable through varying the character of the charge, decreasing the inactive nitrogen content of the charge and increasing the oxygen content, while at the same time retaining the use of atmospheric air as a part of and carrier for the charge. This result is obtained by employing moisture-laden atmospheric air as the source of supply for the oxygen content of the charge, the moisture of the air stream being decomposed to liberate its constituents during travel of the stream to the explosive chamber, the result being that the percentage of inactive gas (nitrogen) in the charge is reduced—depending upon the degree of saturation—and the oxygen content of the charge is increased or augmented through the liberation of the oxygen content of the moisture, this oxygen being added to the oxygen content of the atmospheric air, the hydrogen liberated by the decomposition of the moisture passing onward as a part of the charge. In said application, the general principles of the invention are more particularly pointed out and claimed as is the more or less specific application of these principles together with a preferred form of decomposing unit adapted for use in decomposing the moisture. The specific application of the general principles of the invention is by providing a decomposing action in advance of introducing the hydrocarbons into the air stream, so that the complete oxygen content of the charge is in condition to take up the hydrocarbon as the flowing air stream is carried through the carbureting apparatus. In the present invention, I employ these general principles in a different way and in a manner which enables the use of heavier hydrocarbons as the foundation for the hydrocarbon content of the charge.

In the simple application of these principles, I introduce water into the carbureting apparatus as has heretofore been contem-

plated, and thus introduce it into the air stream with the hydrocarbon during the carbureting action, providing a moisture-laden air stream which also contains the hydrocarbon content. This stream is then subjected to action to decompose the moisture content of the stream while the stream is traveling toward the explosive chamber, the result being that the oxygen content of the moisture is liberated and provides a more favorable condition for admixture of the oxygen and hydrocarbon, this action being completed in advance of the explosion period, so that the charge which enters the explosive chamber is complete as to its oxygen content, it being understood, of course, that the decomposing unit is located between the carbureting structure and the explosive cylinder or chamber.

The fact that moisture can thus be made to increase the efficiency of a charge for power devices of this type through more or less decrease in the inactive portion of the charge and a more or less increase in the oxygen content of the charge, enables the use of a different form of hydrocarbon as the hydrocarbon source for power devices of this type, making possible the use of forms of hydrocarbons heretofore incapable for use for this particular purpose excepting by the use of an entirely different type of power device. In fact, the present invention contemplates the use of heavier hydrocarbons in power devices heretofore considered adaptable for use only with lighter hydrocarbons.

The failure of heavy hydrocarbons for use in this type of power devices is due mainly to the inability to provide the proper vaporization of the hydrocarbon content, it being practically impossible to provide the proper break down or atomization of the hydrocarbon into the fineness essential for use in providing a charge for this purpose, it being understood, of course, that the hydrocarbon is to be taken up by an air stream flowing from the intake to the explosive chamber. Owing to the particular characteristics of the heavy hydrocarbon, the desired fine division of the hydrocarbon is impracticable.

If, however, water be added to the heavy hydrocarbon in advance of introduction to the flowing air stream, and the water and hydrocarbon be subjected to a heat action such, for instance, as will provide a combined vapor, this vapor is in a form which can be taken up by the flowing air and thereby provide for the formation of a charge adaptable for use in the explosive chamber. The vapor thus provided is necessarily heavy in moisture content, a content which would be more or less impracticable for use in power devices of this type. However, by employing the principles of the invention and converting the moisture content into its constituent gases before entering the explosive chamber, this objectionable feature is eliminated, the charge not only being one adaptable for use for the purpose, but in addition, being of a form to provide for more efficient operation through the increase in the oxygen content of the charge which is provided by the decomposition of the moisture content. In other words, the water is introduced for the purpose of enabling the production of hydrocarbon vapor of a proper character, and this water—in its vapor form—is changed into a condition effective to increase the efficiency of the charge instead of providing a factor of inefficiency.

To these and other ends, therefore, the nature of which will be readily understood as the invention is hereinafter disclosed, said invention consists in the improved methods and apparatus hereinafter more fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views:

Figure 1 is a diagrammatic view showing a simple form of apparatus for carrying out the general principles of the present invention.

Fig. 2 is a diagrammatic sectional view showing an apparatus adapted to provide the application of these principles when heavy hydrocarbons are employed.

Fig. 3 is a top plan view of a decomposing unit.

Fig. 4 is an end elevation of the same.

The simplest form of the present invention is shown diagrammatically in Fig. 1, in which E indicates an explosive or combustion chamber of the power device, D a decomposing unit, C a carbureting structure, these parts being operatively connected together to provide a passageway for an air stream introduced through air inlet A, the carbureting structure being adapted to be operative with both hydrocarbon and water, the hydrocarbon being in the form of gasolene or the like. The hydrocarbon and water are introduced into the air stream concurrently as the stream passes through the carbureting structure, thus causing the air to take up the hydrocarbon as well as the moisture provided by the water content, producing not only a hydrocarbon content within the stream, but also a moisture content, thus producing practically a moisture-laden stream which also carries the hydrocarbon, forming what may be termed an embryo charge stream. This stream then passes through the decomposing unit D which is shown in the form of an electrolytic cell of the type disclosed in the companion

application referred to, this cell having its anode and cathode electrodes in the form of spaced plates between which the stream passes. The spacing of the plates and the wattage of the cell is such that the moisture content of the moisture-laden currents will be decomposed, the hydrocarbon content being practically unaffected by the decomposing action.

The decomposing action serves to liberate the oxygen and hydrogen content of the moisture, thus augmenting the oxygen content of the atmospheric air by the liberated oxygen content of the moisture, this action taking place in the presence of the hydrocarbon and enabling a more intimate admixture of the oxygen and hydrocarbon of the charge, the completed charge then passing onward into the explosive or combustion chamber of the power device.

As a result, the percentage of oxygen content of the charge is materially increased through the fact that the additional source of oxygen supply is from an element carrying 33% of oxygen content as compared with the 20% oxygen content of atmospheric air. As the liberated oxygen is added to the atmospheric oxygen, the percentage of total free oxygen is materially increased, and since the hydrogen, which is also liberated, is an active element during the reactions provided by the explosion, the percentage of the charge which is provided by the inactive nitrogen is necessarily reduced.

Not only is this result obtained, but the charge introduced into the combustion or explosive chamber is of higher efficiency through the fact that the decomposing action which would normally be required within the chamber through heat action during the explosion, has been completed in advance of reaching the chamber, so that the charge is in a more favorable condition for flame propagation and for effective combustion.

The decomposing unit is shown in section in Fig. 2, in which the anode and cathode systems are indicated at *a* and *c*, the plates forming these systems being arranged in a pack formation carried by cover 11 of a casing 10, the plates being properly insulated and supported by suitable posts, two of which form terminals to which the source of electrical supply, indicated as battery 12, is secured. The particular construction and arrangement of the unit is more particularly described and is claimed in the companion application referred to, and hence is not described in greater detail. It will be understood, however, that the embryo charge stream—the air currents laden with moisture and hydrocarbon—enters the unit at one end, passes through the spaces between the plates and then passes out of the unit at the opposite end, the unit being located at a suitable point intermediate the carbureting structure and the combustion chamber so as to take care of the moisture content of the laden air currents.

Another form in which the general principles of the invention may be employed is shown somewhat diagrammatically in Fig. 2 wherein there is substituted for the carbureter of Fig. 1 a vaporizing retort-like structure R, which is adapted to provide for proper vaporization of the heavier hydrocarbons, this vaporization being provided by heat in any suitable manner, Fig. 2 indicating a burner 15 which is operative on the lower portion of the retort so as to heat the latter to provide the vaporization action therein. The showing of the burner is, of course, illustrative, as any suitable form of heating device may be employed, and it is preferred to employ a device which may be more or less under the control of the operator, various devices of this type being well-known. This latter is desirable in order that the heat may be controlled to take care of variations in running conditions of the power device as well as to start and stop the operations of the latter, such regulation providing for variation in the vaporizing action within the retort.

The retort may be of any desired type and is preferably arranged with an inlet 16 for the hydrocarbon and an inlet 17 for water, these inlets being controllable so as to regulate the admission of these elements into the interior of the retort. It may be desirable to provide suitable gages to determine the amounts of each within the retort, this arrangement being of the usual type and hence not particularly disclosed.

As will be understood, the difference in specific gravity of the hydrocarbon and water causes the former to float upon the water, and hence the application of heat not only serves to tend to produce a vaporizing effect on the hydrocarbon itself, but in addition, heating of the water content of the retort will cause water vapor to be formed and pass through the layer of hydrocarbon, thus not only taking up hydrocarbon, but in addition, tending to break down the hydrocarbon itself so as to provide a finer vaporization action on the hydrocarbon, the resultant vapor being a combined vapor of hydrocarbon and moisture content.

The retort is preferably located below the passageway through which the atmospheric air passes after being drawn into the air passageway, the upper end of the retort opening into this passageway, so that the flowing air will act to take up this combined vapor produced in the retort. The air inlet is shown as controlled by a valve 20, the arrangement being such that air is drawn in during the suction stroke of the

piston operating in the combustion chamber, this being a well-known form of structure and operation. While this valve is shown as arranged in proximity to the upper end of the retort, it will be understood that this may be varied and the air inlet may be located at a greater distance from the vapor outlet end of the retort.

Since the vapor of the retort is not only of hydrocarbon content but also carries a considerable amount of water content in the form of moisture, it will be readily understood that the atmospheric air admitted will become laden with the vapor and therefore carry the moisture content to produce a moisture-laden air current which is then passed through the decomposing unit to decompose the moisture and liberate the oxygen and hydrogen content thereof as in the arrangement indicated in Fig. 1. Since the moisture content of the vapor will supply a greater amount of oxygen from a given volume of moisture than is supplied by a similar volume of atmospheric air, it will be readily understood that the presence of considerable moisture within the retort vapor becomes of advantage when operating under the principles of the present invention, through the percentage of increase in oxygen content of the charge, enabling a less amount of atmospheric air to be employed and in this way decreasing the inactive portion of the charge, it being understood, of course, that sufficient air will be admitted to provide an efficient carrier for the charge. It will therefore be understood that by the present invention, the presence of the moisture content of the retort vapor, instead of providing a factor which would tend to prevent the use of heavy hydrocarbon for this purpose by reason of the action within the combustion chamber, is of positive advantage in that it forms a source of supply of oxygen content of greater value than a similar volume of atmospheric air, since it not only supplies the oxygen content but substitutes the active hydrogen content for the inactive nitrogen content which would be introduced with the air.

In addition to these advantageous results, the decomposing action produces an additional advantage through the fact that the break down or decomposing of the moisture molecules tends not only to additionally affect the hydrocarbon molecules, but also liberates any hydrocarbon content which may have been taken up and carried by the moisture molecules as the latter pass through the layer of hydrocarbon in the retort, thus providing a better mixture of the hydrocarbon and oxygen within the charge.

From the above it will be understood that the present invention is designed more particularly to produce what may be termed an embryo charge formation, which is afterward subjected to an action which causes decomposition of the moisture content of this embryo charge formation, the decomposing action liberating the gases active in the combustion of the charge.

In addition, the general principles of the invention may be employed for the purpose of utilizing the heavier hydrocarbons, since it enables these grades of hydrocarbon to be treated in a manner to produce the desired degree of vaporization of the hydrocarbon content, thus producing an embryo charge formation which, by reason of a material moisture content, could not be employed efficiently in power devices operating under internal combustion principles. Since, however, the moisture content is decomposed, thus overcoming the effect of the presence of a comparatively large amount of moisture in the charge, the heavier hydrocarbons can be utilized for the purpose, especially in view of the fact that the decomposing action increases the value of the charge by reason of the liberation of gases active in the charge combustion.

Obviously, the apparatus employed for practising the principles of the invention as herein disclosed, may vary widely in structure to meet the particular character of work to be performed. These variations are well within the skill of the constructing engineer and can be readily applied in carrying out the principles.

While I have herein shown and described various ways in which the general principles of the invention may be carried into effect, it will be readily understood that variations and changes therein may be found desirable or necessary in meeting the exigencies of use, and I desire to be understood as reserving the right to make any and all such changes or modifications as may be found desirable or essential, in so far as they may fall within the spirit and scope of the broad principles referred to and within the spirit and scope of the invention as expressed in the accompanying claims when broadly construed.

What I claim is:

1. In the art of producing charges for power devices operating under internal combustion principles, a method of producing the oxygen content of the charge which consists in subjecting air currents laden with moisture and hydrocarbon to moisture-decomposing treatment while *en route* to the point of combustion to augment the oxygen of the atmospheric content by the oxygen of the moisture content of the currents being treated.

2. In the art of producing charges for power devices operating under internal combustion principles, a method of producing the oxygen content of the charge which consists

in subjecting air currents laden with moisture and hydrocarbon to electrolysis treatment during travel of the currents to the point of combustion to decompose the moisture content and augment the oxygen of the atmospheric content by the oxygen of the moisture content.

3. In the art of producing charges for power devices operating under internal combustion principles, a method of producing the oxygen content of the charge which consists in subjecting air currents laden with moisture and hydrocarbon to electrolysis treatment during travel of the currents to the point of combustion to decompose the moisture content and augment the oxygen of the atmospheric content by the oxygen of the moisture content, said electrolysis treatment being effective on the moisture content and substantially ineffective on the hydrocarbon content of the charge.

4. The method of producing charges for power devices operating under internal combustion principles which consists in forming an embryo charge formation including air currents laden with moisture and hydrocarbon, and completing the charge during travel to the point of charge combustion by decomposing the moisture content of the charge.

5. The method of producing charges for power devices operating under internal combustion principles which consists in concurrently introducing into the air currents a moisture content and a hydrocarbon content, and then decomposing the moisture content during travel of the currents and in the presence of the hydrocarbon content and in advance of the point of charge combustion.

6. In the art of producing charges for power devices operating under internal combustion principles, the method of utilizing heavy hydrocarbons in the formation of the charge which consists in producing a vapor from the heavy hydrocarbon in the presence of water, introducing such vapor into flowing air currents to provide an embryo charge, and decomposing the moisture content of the charge in advance of charge location at the point of combustion.

7. In the art of producing charges for power devices operating under internal combustion principles, the method of utilizing heavy hydrocarbons in the formation of the charge which consists in mutually positioning the heavy hydrocarbon and water in accordance with their respective specific gravities, subjecting the positioned elements to a vaporizing action to produce a vapor of hydrocarbon and moisture content, introducing the resultant vapor to air currents to form an embryo charge, and then decomposing the moisture content of the embryo charge to complete the charge in advance of charge combustion.

8. In the art of producing charges for power devices operating under internal combustion principles, the method of utilizing heavy hydrocarbons in the formation of the charge which consists in mutually positioning the heavy hydrocarbon and water in accordance with their respective specific gravities, subjecting the positioned elements to a vaporizing action by heat to produce a vapor of hydrocarbon and moisture content, introducing the resultant vapor to air currents to form an embryo charge, and then decomposing the moisture content of the embryo charge to complete the charge in advance of charge combustion.

9. In the art of producing charges for power devices operating under internal combustion principles, the method of utilizing heavy hydrocarbons in the formation of the charge which consists in mutually positioning the heavy hydrocarbon and water in accordance with their respective specific gravities, subjecting the positioned elements to a vaporizing action by heat to produce a vapor of hydrocarbon and moisture content, introducing the resultant vapor to air currents to form an embryo charge, and then subjecting the embryo charge to electrolysis treatment effective on the moisture content of the charge to decompose such content and complete the charge in advance of charge combustion.

10. In the art of producing charges for power devices operating under internal combustion principles, and wherein the completed charge is delivered to the explosive chamber of the power device, means for producing an embryo charge including air currents laden with moisture and hydrocarbon, and means operative within the flow path of such embryo charge for decomposing the moisture content thereof to augment the oxygen of the atmospheric content by the oxygen of the moisture content.

11. In the art of producing charges for power devices operating under internal combustion principles, and wherein the completed charge is delivered to the explosive chamber of the power device, means for producing an embryo charge including air currents laden with moisture and hydrocarbon, and a decomposing unit operative within the flow path of such embryo charge for decomposing the moisture content thereof to augment the oxygen of the atmospheric content by the oxygen of the moisture content.

12. In the art of producing charges for power devices operating under internal combustion principles, and wherein the completed charge is delivered to the explosive chamber of the power device, means for producing an embryo charge including air currents laden with moisture and hydrocarbon, an electrolytic cell operative within

the flow path of such embryo charge for decomposing the moisture content thereof to augment the oxygen of the atmospheric content by the oxygen of the moisture content.

13. In the art of producing charges for power devices operating under internal combustion principles, and wherein the completed charge is delivered to the explosive chamber of the power device, means for producing an embryo charge including air currents laden with moisture and hydrocarbon, said means including a carbureting structure adapted to deliver hydrocarbon and moisture to air currents, and a decomposing unit operative within the flow path of such embryo charge and in advance of said chamber for decomposing the moisture content of the embryo charge to augment the oxygen of the atmospheric content by the oxygen of the moisture content.

14. In the art of producing charges for power devices operating under internal combustion principles, and wherein the completed charge is delivered to the explosive chamber of the power device, means for producing an embryo charge including air currents laden with moisture and hydrocarbon, said means including a chamber to receive the hydrocarbon and water, and means for vaporizing the contents of said chamber to produce a vapor of hydrocarbon and moisture content, and an air passageway located to permit introduction of the vapor content to the air currents of said passageway, and a decomposing unit located in the path of travel of the embryo charge and operative to decompose the moisture content of such charge to complete the charge in advance of charge combustion.

In testimony whereof I have hereunto set my hand.

HENRY CSANYI.