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**01/31/99 - A History of Vapor Carburetors
by Robert Felix**

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NOTICE: This article may be downloaded and copied to BBS without let or hindrance; no part of the contents may be changed. Material in this heading concerning its printing/publication must not be changed or deleted. Readers who attempt to build a vapour carburetor apparatus are encouraged to add their commentaries/drawings as a secondary file. This file must be so labelled as a seperate addition in the writer's own words.

Air pollution from internal combustion engines is caused by unburned hydrocarbons,i.e.pollution found in the exhaust. Only gasoline vapor will explode, droplets

end as pollution.

Using heat or mechanical agitation to more completely vaporize the gasoline before it enters the intake manifold can result in more efficient operation and a reduction in unburned hydrocarbons.

A list of over 500 'hidden' US patents using heat and mechanical action to vaporize gasoline is given; also instructions to access the US Patent Office over the Internet and download patents.

Following is a history of this technology from the turn of the century to the present. Two modern patents that use a process called thermo-catalytic cracking to vaporize the gasoline are described. Missing information that would enable the reader to build a working model of one - the Gunnerman patent - is footnoted at the end of this paper.

A list of all vapor patents in US class 123, subclass 545 is included. The Manual of Classification of the US Patent offices classes all types of devices in categories by using a number. Class 123 is internal combustion engines. A subclass of this class is defined as: "the various subordinate elements designed for and adapted to be used only with internal combustion engines and therefore included in this class are indicated in the definitions hereinafter appearing of the various subclasses."

¹ Class 545 is a type of carburetor for an internal combustion engine that vaporizes the gasoline using a heat exchanger. In the words of the Manual: "Class 545 = Heating medium surrounds combustible mixture-subject matter under subclass 543 in which the heating medium completely surrounds a conduit or passage containing the combustible mixture." The reference 'under subclass 543' further clarifies the definition: "the charge forming device or a part thereof for heating the combustible mixture formed by the charge forming means.

² Most of these patents use the heat from exhaust gases to do this. There exists a system of International Classes that can be used to cross reference US patents to similar patents in other countries. There also exist special patents called 'International Patents' that use this classification system. The International Classification for these patents in US Patent Class 123 [internal combustion engines] 545 [heat exchanger/vaporizer carburetors] is: F02M 031/00 [Use this syntax when searching the IBM website, otherwise use: F02M 31/00 in USPTO website]

There are three other subclasses that also contain many vaporizer patents. The USPTO site can also be searched using the International Classification. This brings up many vapor patents that for technical reasons are 'hidden' in other subclasses. To conduct a search on the USPTO website, follow this procedure:

1. Go to USPTO web page by entering its address: <http://www.uspto.gov> Click 'Search Patents'.
2. Under the category 'US Patent Bibliographic Database', click "Advanced Search".
3. In " Advanced Search" Page, click 'All' under Select Database subheading.
4. There are four US classes in total that contain vapor patents, and the International Class which acts as a cross reference to 'hidden' patents. These are listed in the following table:

A)Patent Classes

B)Number USP in Class

C)Definitions

D)Enter under 'Query'

A)123/545

B)569(1997-1900AD)

C)Heating Medium surrounds combustible mixture

D)CCL/123/545

A)123/546

B)57(1997-1976AD)

C)Combustible Mixture surrounds heating medium

D)CCL/123/546

A)123/547

B)111(1997-1976AD)

C)Combustible mixture and heating medium adjoin one another

D)CCL/123/547

A)123/543

B)44(1997-1976AD)

C)Heating of Combustible Mixture

D)CCL/123/543

A)F02M 31/00

B)578(1997-1976AD)

C)International Patent Classification for gasoline vapor patents &related devices.

D)ICL/F02M-31/00

5.In the "Advanced Search" Page, enter under 'Query' the appropriate command line to search for patents under the Patent Classes.

For example, enter ICL/F02M-31/00 after the flashing I-beam under 'Query' to access International Patent Classification database listed above under Definitions containing Patent Numbers of US Patents herein. Then Click 'Search' to bring these patents up onscreen on the USPTO Webpages.

There is a website on the Internet maintained by IBM corporation that has a file of US Patents going back over twenty years. The user is able to call up an image-copy of the original patent-text and drawings-on this website ,if they type in the patent number. The internet address of this site is:

<http://patent.womplex.ibm.com>

The images of the patent page on the computer screen can be captured by a screen saver such as Hypersnap and stored on the 'C' drive of the users computer as readable image files in BMP,GIF or JPEG format. To save the patent images and text in readable format, it is advisable to save them as BMP or Windows Bitmap files.

Hypersnap is shareware, and is fully functional. It is designed to work in the Windows95 and NT environment, and can be downloaded from;

<http://www.hyperionics.com/www.snap32.htm>

For users of Windows 3.1 there is wcaptr31.zip, or capture3.zip available as shareware from;

<http://www.rad.kumc.edu/win31/clipbrd.htm>

A Macintosh version of Hypersnap called Screen Catcher exists; there is a link for this on the Hypersnap WebPages. The full address for this is;

<http://www.stclairsw.com/ScreenCatcher/index.html>

The United States Patent Office maintains links to websites of Patent Offices throughout the world. This can be accessed at address;

<http://www.uspto.gov/web/menu/other.html>

On these other web pages, there are links as to yet other sites not given from the USPTO link. The user can also physically examine copies of the Official Gazette or actual US patents in the Patent Office of their respective country.

By international treaty, the USPTO has a reciprocal agreement to exchange patent information with other countries. In Israel, for example, copies of the weekly Official Gazette (which contains a drawing and abstract of newly issued patents) are available from;

* Israeli Patent Office Library
Lev Hagiva, Building 11,
Beit Hadebus Street, 11
POB 34255
Jerusalem 91341
Israel

The British Library maintains holdings of all US Patents from number one issued over two hundred years ago to the present. They can be accessed at;

Foreign Patents Reading Room
Chancery House
Chancery Lane
London, UK WC2
Telephone: 0171-412-7901 or -7902

There exist patents of recent vintage that deal with using heat to vaporize gasoline and intake air for fuel injection systems in internal combustion engines. The Chandler patent of 1995 is one of them, he even goes as far as to cite the patents and early work of the Canadian inventor CN Pogue on gasoline vaporization in the late 1930's!

³ An index of US Patents in class 123, subclass 545- 'internal combustion engine carburetors that use heat to vaporize gasoline' is given from the years 1997 to 1900;

Classification: 123/545

Total: 569

5606956 O 5598826 X 5555855 X 5396866 X 5353772 O 5335639 O 5327875
5327874 O 5291870 O 5247909 X 5146897 X 5134986 X 5123398 X 5101801
5086748 X 5086747 X 5048501 X 5042447 X 5040518 X 5040517 O 5038742
5027759 X 5019120 X 5012788 O 4984555 O 4979483 X 4971018 X 4955351
4883616 X 4883040 X 4865004 X 4862859 O 4829969 X 4768493 X 4718393
4717808 RX 4708100 X 4671245 O 4667643 O 4651702 X 4637365 O 4611567*
4603672 O 4593670 O 4592329 O 4583511 O 4574764 O 4548183 X 4534333
4524746 X 4513720 X 4513698 X 4503833 O 4491552 X 4478198 X 4469077
4467773 X 4465053 X 4463737 X 4452216 X 4438750 X 4434772 X 4425899
4420439 X 4416242 X 4407254 X 4404948 X 4401090 O 4399797 X 4399796
4399794 X 4388910 X 4379770 X 4377148 X 4372275 X 4366798 X 4357926
4351284 O 4338906 O 4327691 X 4318386 X 4302407 X 4300513 O 4286564
4256066 O 4212274 X 4192270 O 4167165* 4151820 X 4147144 O 4142481
4108953 X 4053013 X 4048969 X 4044741 O 4030457 X 4003357 O 3989014
3977366 X 3961616 O 3944634 X 3930476 O 3918423 X 3916859 X 3911881
3895617 O 3892211 X 3859971 X 3841284 O 3832985 O 3828736 X 3797468
3789817 O 3788292 O 3762385 O 3756022 X 3741180 O 3658042 X 3554174

3543736 X 3509860 O 3496919 X 3494342 X 3444848 X 3380442 O 3273550
3150652 X 3139874 X 3114357 X 3091229 X 3032023 O 3019781 O 2991778
2989956 O 2968297 O 2896658 X 2864355 O 2833262 X 2826183 O 2808041
2807245 X 2796855 X 2793633 O 2767699 O 2733698 O 2720197 X 2715520
2710605 O 2698613 O 2673446 O 2634983 X 2627257 X 2597977 O 2582916
2560197 X 2473808 O 2424723 X 2325850 X 2319752 O 2296790 O 2287593
2273957 X 2269930 O 2269706 O 2261493 O 2257047 X 2254775 O 2254634
2252415 O 2251999 O 2250786 O 2234901 X 2232413 O 2216801 X 2213154
2192067 X 2189022 X 2185573 X 2181058 O 2155162 O 2145029 O 2140254
2133775 O 2125216 O 2119885 O 2119179 X 2112568 X 2110806 O 2108639
2104013 X 2103902 X 2100466 O 2099278 X 2092246 O 2090823 X 2082666
2080662 O 2080420 X 2075330 O 2068952 O 2067292 O 2066922 X 2054997
2049596 X 2030508 O 2016881 O 2016695 O 2016694 X 2004093 O 2001669
2001466 O 2000669 X 1999237 X 1998497 X 1997497 X 1985271 O 1975093
1974722 X 1973889 O 1961249 O 1955242 X 1954586 X 1947048 O 1944396
1941487 X 1931781 X 1918380 O 1916952 O 1913684 O 1913497 O 1903433
1897540 O 1891768 O 1889648 X 1889619 X 1881671 O 1881562 O 1881434
1879551 O 1874327 O 1867457 O 1865515 X 1864608 X 1862723 X 1855129
1849135 O 1846008 O 1844298 O 1844041 O 1841740 O 1834202 O 1833552
1833183 O 1829400 X 1828899 O 1825225 O 1824926 O 1822147 O 1821047
1819284 O 1815432 O 1815178 X 1813406 X 1812950 O 1812939 X 1811540
1806581 X 1806045 X 1803461 X 1800426 O 1795037 O 1795036 X 1792828
1792367 O 1790812 O 1788929 O 1786233 X 1783781 O 1778190 O 1777554
1770689 O 1766794 O 1766781 O 1766709 O 1763948 O 1761960 O 1753788

1751511 O 1749035 O 1749029 O 1747361 X 1736003 O 1728421 O 1727605
1722846 O 1714210 X 1713701 O 1712465 O 1709968 X 1706492 O 1696881
1696761 X 1689942 O 1686609 X 1685564 O 1680373 O 1678045 X 1676955
1675870 O 1670550 O 1667886 O 1660609 O 1651393 O 1646779 O 1641619
1637768 O 1635266 O 1634968 X 1633909 O 1627671 X 1626783 O 1626727
1626561 O 1625135 O 1625134 O 1624249 O 1624229 X 1613029 O 1612377
1611299 X 1610541 O 1610000 O 1598289 X 1591071 X 1583584 O 1576301
1575859 X 1572747 X 1562670 X 1557657 X 1555807 X 1547474 X 1541431
1540144 O 1539963 O 1539126 O 1534290 O 1533855 O 1533432 O 1533196
1525956 X 1524680 O 1519516 X 1514189 X 1511820 X 1507315 O 1503900
1503821 O 1503805 X 1496102 X 1487234 O 1486058 O 1477724 O 1476316
1476281 X 1474359 O 1473999 X 1472899 O 1472326 X 1472264 X 1471600
1470659 O 1467759 X 1467225 X 1466647 O 1464759 O 1464466 O 1456572
1453007 X 1449333 X 1448781 O 1448641 O 1447975 O 1447089 X 1445194
1444852 O 1439146 O 1438877 X 1434353 O 1431327 O 1431326 O 1431281
1420684 X 1420616 X 1416977 X 1416352 X 1415086 O 1409093 X 1406598
1404215 X 1403350 X 1400955 X 1400485 O 1392168 X 1386376 X 1386297
1384281 X 1379437 X 1377990 O 1377369 O 1374927 X 1374280 O 1372194
1366831 X 1366018 X 1365564 X 1361503 X 1360098 X 1359168 O 1358686
1355076 X 1354484 O 1348066 O 1345927 X 1345378 X 1342950 O 1342869
1341141 X 1339870 X 1335990 X 1335665 O 1325998 O 1317709 X 1316346
1314872 X 1313639 X 1311417 O 1306496 O 1304987 X 1304205 X 1303559
1299648 X 1289605 X 1285652 X 1284643 X 1283125 X 1283068 X 1278558

1274707 X 1269252 X 1267924 X 1267139 O 1265735 X 1263259 X 1260388
1256738 O 1256186 X 1253682 O 1253681 O 1253642 X 1252796 X 1248417
1247983 X 1245519 O 1244151 O 1242975 X 1238404 X 1237536 O 1233744
1233287 X 1230116 X 1230092 X 1228415 O 1227649 O 1227551 X 1222860
1222548 X 1220281 X 1218867 O 1217781 X 1217448 X 1213817 X 1213736
1211775 X 1207664 X 1205540 X 1201977 O 1201871 X 1201731 X 1199573
1198013 O 1195764 X 1193004 X 1190252 X 1190129 O 1178972 O 1178276
1176816 X 1171435 O 1170337 X 1165656 X 1160438 X 1158494 X 1155599
1154617 X 1145995 X 1143902 X 1143092 X 1140064 X 1137057 O 1136675
1135113 O 1132420 X 1129794 X 1128133 X 1121868 X 1114200 X 1111140
1108916 X 1106881 O 1105592 X 1102478 X 1099842 O 1099271 X 1098915
1080139 X 1079338 X 1078919 O 1072875 X 1061626 X 1056760 X 1049417
1042004 X 1038300 X 1032937 O 1021326 X 1016741 X 1013759 X 1006088
0994658 O 0983307 O 0976237 X 0970429 X 0946780 X 0906671 X 0906111
0896183 X 0869675 X 0868834 O 0862377 O 0800777 X 0796684 X 0765814
0762271 X 0749864 X 0662169 X 0657738 O 0620586 O 0609831 O 0600107
0571495 X 0541773 X 0535914 X 0433806 X 0385121 X 0287578 X 0276075
X 3640256*

A United States Patent runs for 17 years from the date of its publication in the Official Gazette. After that, it expires. It then falls into the 'public domain', this means that the inventor has lost all legal proprietary rights over the invention and it can now be used by all. There is no longer

any legal or practical reason why a US inventor should maintain secrecy or keep proprietary information after the US Patent falls into the 'public domain'.

The address of an inventor is on file at the US Patent Office and may be obtained upon request. Would any of the inventors in this list share information concerning their devices after the patents expired?

Perhaps this information could save a researcher much time and money in perfecting a vapor carburetor or fuel injection system.

Several vaporizer devices using heat to vaporize fuel have been commercially produced in the first half of the twentieth century. Considering the Otto-cycle or four stroke internal combustion engine is mechanically the same since its invention before the turn of this century, could we not conclude that these vaporizer systems are practical and work?

Material discussed in - the Vapipe - (US Patent 3,957,024) - leads us to this conclusion. We have not been able to find any such examples commercially produced and marketed after 1940.

There are two types of heat-exchanger vaporizers - those that burn heavy oils and those that vaporize gasoline. Heavy oils and kerosene will run an internal combustion or 'gas' engine, if the heavy ends in the fuel can be put into a vapor state - either by heat or mechanical action.

Before the 'gas crises' of the 1970's, kerosene cost from 1/2 to 1/3 the price of an equivalent quantity of gasoline in the

USA. This made such vaporizers economically practical, since a farmer or machinery operator would save a considerable amount in fuel costs.

The 1905 Scientific American has an advertisement on page 433 for 'The Meitz And Weiss Kerosene and Gas Engine'. It was "belted or directly coupled to dynamo for electric lighting, charging storage batteries, pumping, and all power purposes - ADOPTED BY US GOVERNMENT; Highest award, direct coupled generator set Paris Exposition 1900; Gold Metal, Pan American Exposition 1901."

4 Gasoline engines were adopted in Great Britain for burning low grade kerosene and oils in generator and agricultural work as early as 1911.

5 Scientific American published further favorable comments on the development of 'distillate gasifiers' in 1913.

6 The Society Of Automotive Engineers was aware of vapor technology in 1913. N.B. Pope, Member of the Society says of this;

"It is evident that at least that a carburetor designed for heavy fuel may be more satisfactorily operated with gasoline than a gasoline carburetor with heavier fuel. To assist in the vaporization of the lower grade fuels, more heat is necessary than for gasoline."

7 The process of using heat to vaporize fuel was accepted by mainstream engineers from the earliest period.

8 A retired mechanical engineer told us that the US Government Bureau Of Standards certified and tested fuel vapor systems submitted for inspection up to the early 1930's. In view of the claim 'ADOPTED BY THE US GOVERNMENT' made in the early Scientific American advertisement, we wondered if such records of tests conducted might still exist in Government archives.

A Freedom Of Information Act(FOIA) request to the National Bureau Of Standards gave the following reply;

"records of the tests you are requesting have been disposed of. In the 1958-1960 period, National Bureau Of Standards made a decision to destroy certain test records after holding them for 20 years. This decision was made after Congressional approval was given.

9" A practical vapor carburetor system for use on the internal combustion engine in the Fordson tractor enabling it to use "the whole range of fuel oils, from benzol and gasoline down through kerosene to the very heavy fuels, such as black oil commonly used in Borneo." 10 The device was made by the Holly Carburetor Company, (which today makes carburetors for 'performance' cars or "hot rods") in the year 1925. The editors of Automotive Industries tested a Fordson tractor running the gasoline engine with waste crankcase lubricant! It was said of this;

"runs under actual field conditions were made with the tank filled with waste crankcase lubricant. Even with this unusual fuel, little or no smoke showed at the exhaust end and the engine had the flexibility of gasoline operation& the element time lag has been reduced to a minimum, so that with the improved economy the demand for flexibility and

ease of starting has been satisfied."

11 The Holley Vaporizer installed in the Fordson Tractor was so popular with farmers around the world that Bates and Strettell in the Proceedings Of the Institution Of Mechanical Engineers report on its widespread use in Great Britain in 1962!

12 In the intervening period, we found two other references to a multifuel vaporizer that was marketed to the public in the literature. In 1936, the Italian company Fiat developed a vaporizing system for heavy fuels known as the "Naftoil". It was two carburetors in one, starting on gasoline and switching to heavy oils such as kerosene and gas oil when the motor was warm enough to run the vaporizer carburetor.

13 The Italian engineer A.P. Castellini used fuel oil in a gasoline engine by using a high pressure pump which forced the fuel at a pressure of 3600 pounds through very fine jets into the intake passage. The oil is vaporized by mechanical means instead of heat. The engine was said to be readily started when cold, a problem with these systems. 14 This was in 1936, and we could find no more references to the production of such devices in the literature.

This system will work on the internal combustion engines of today. Refer to recently granted US Patent # 5,555,853. The possible practical result of further research into this is that so called 'waste oil' that is normally is discarded (recycled = given back to the oil companies) can be used to power a gas engine. This might be important if political crises like the oil price hikes of the early 1970's take place

again. The Abstract of the Patent says;

"A lightweight back-pack generator set having a spark-ignited engine operating on middle-distillate fuels (e.g.:JP-5 and F-34) has been provided. The generator set includes a back-pack frame; an alternator, and a spark-ignited combustion engine, adapted to operate on middle-distillate fuel. The engine uses a preheater for heating the intake manifold to facilitate start-up operation of the engine."

A conversation with one of the inventors in Canada by telephone revealed some interesting points. He was familiar with the 1925 Holley Vaporizer and said that his unit would also run on (filtered and strained) crankcase oil or other wastes of this type.

As described in the Abstract, this would make it practical for an infantry unit in a wartime environment, since the group could use almost any petroleum distillate as fuel. He also said it could be used in larger engines, such as an alternator/generator or stationery engines on a farm.

Pollution levels were at or below United States Environmental Protection Agency requirements for conventional gasoline engines. It was easy to start in cold weather-overcoming a major disadvantage of older units.

Vaporizer carburetors for gasoline using exhaust heat have been commercially produced in the past in the United States and elsewhere. In 1923, the Stewart-Warner Corporation sold an exhaust gas operated heat exchanger carburetor vaporizer system commercially in the United States. The system was favorably reported on in the technical literature of the time.

15 It was said;

"Further claims for the direct fuel system are that it eliminates the formation of carbon, as the fully vaporized fuel will burn more nearly completely; that it permits the use of lower jacket water temperatures; that it reduces the tendency to detonate; that it provides better fuel distribution-ensuring smoother performance and that it reduces crankcase dilution and its related troubles - wear and corrosion."

16 In 1924, a vaporizer was produced and sold by a group of Chicago engineers. It used exhaust gas to vaporize the gasoline, and claimed to be self adjusting inasmuch as it enriched the fuel for high speed and heavy pull and leaned it otherwise. "A decrease in the CO (ie: carbon monoxide) content of the exhaust combined with a greater fuel efficiency was noted in the article.

17 A gasoline vaporizer was developed in 1925 in Canton, Ohio. It was said of this device; "that none of the raw gasoline delivered by the carburetor during starting can get into the engine cylinders. The fuel is vaporized not by contact with the relatively small and excessively hot area, which often results in cracking, but by a differential action which removes the lightest constituents first and brings the remainder in contact with surfaces of increased temperature until they are vaporized also."

18 This principle is the same as that given in the writings of inventor R. Covey in his patent 4,611,567 and in literature privately printed and circulated by him.

19 Covey referred to the Voight patent 2,733,698 column 3, lines 40-45. He also referred to the Spindler patent 2,185,573 page1,column 2,lines 20-30 on 'dry' gas. He said that an understanding of these patents is essential to successfully designing an efficient vapor system.

Charles Nelson Pogue of Winnipeg, Canada produced a highly efficient vaporizer carburetor using exhaust gas as a source of heat for tractor and vehicle usage in the late 1930's. CN Pogue was issued US patents 1,750,354 1,997,497 and 2,026,798.

The final design based on his last patent would cut the gasoline consumption of a tractor under conditions of maximum load down to between one half and one third of what it was equipped with a 'stock' carburetor. It obtained 130 miles per Imperial gallon on a subcompact car with an 80 cubic inch engine cruising at 65 mph under ideal climatic conditions-early September-in Winnipeg and surrounding areas. This claim was made by the head of an auto firm in Winnipeg, Canada who has physical possession of part of a Pogue carburetor system.

20 In this article, the reader must be mindful that an Imperial gallon used in Canada in the 1930's equals five US quarts of gasoline. This becomes one hundred miles per US four quart gallon using a little arithmetic. The carburetor was sold to farmers until the beginning of WWII, and then its production and distribution stopped for undetermined reasons.

21 It has been said that the Pogue carburetor was used under conditions of strict military secrecy in the North African desert inside of the Bren Gun Carrier against

General Irwin Rommel's Afrika Korps and may have been a reason for his defeat. It was also said to have doubled the effective range of these vehicles under conditions of desert warfare-making them superior to Rommel's technically better equipment.

22 Former US President Ronald Reagen issued an Executive Order declassifying all activities and information recorded or experienced before the end of World War II in 1945; so these adventures are no longer under a security classification. If any readers know more and had actually been involved in these military operations, please [contact us](#).

Since CN Pogue in the late 1930's, a heat exchanger type vapor system has been commercially produced in the United States or Canada. The large energy and automobile companies have constructed working prototypes and done research on heat exchanger vaporizer carburetors since the oil crises of the 1970's, although these have not been brought to public attention in the mass media.

Douglas R. Hamburg of Ford Motor Company was awarded a patent for an 'Electric Fuel Vaporizer' in 1977.

23 He published SAE paper 760288 on his work with this patent.

24 He claims - as a significant innovation - an electric vaporizer in series with the exhaust operated system for an easy start from vapor. A gasoline vaporizer system described in the August,1923 SAE Journal makes a similar claim: "special efforts have been made in the design of the carburetor to facilitate starting in cold weather; to this end,

for starting, the gasoline is vaporized and superheated electrically."

25 The inventor Ray Covey solved the problem by leaving the conventional carburetor attached to the engine and placing the vaporizer in series with it connected by a heat insulated tube. The engine could be started from the regular carburetor and then switched over to vapor mode once the heat exchanger had reached the proper temperature by use of a two way electric solenoid switch in series with the carburetor fuel line.

This had the added advantage of being able to switch back to the 'stock' carburetor if there was a malfunction in the vapor system. Less complexity means fewer mechanical problems. Engineer Hamburg says;

"The basic vaporized gasoline metering system utilizes engine exhaust heat to fully vaporize liquid gasoline entering an exhaust gas heat exchanger."

26 Such technology has been well known to those skilled in the Art for over half a century. The SAE Journal for August, 1923 has an extensive discussion of this concept by one of its members in the article "Exhaust Heated Vaporizer."

27 One of the favorable results from this was; "The use of extended lean limit operation is an intriguing approach to the control of exhaust emissions, and is based on the relation of such emissions to air fuel ratio shown qualitatively in Figure 13.

28 Figure 13 of SAE paper 760288 shows an inverse

relationship between the percentage of NO, HC and Carbon Monoxide emissions from the exhaust and an increase in the Air-Fuel Ratio between 12:1 and 22:1.

The heat exchanger 26 in Figure One of Hamburgs' 'Electric Fuel Vaporizer' patent was granted a separate patent #4,161,931 in 1979.

29 Hamburg and Giardini conclude;

"Experimental results have indicated that to the extent to which the air-fuel ratio may be controlled more accurately, the ability to implement techniques for the reduction of atmospheric pollutants generated by a combustion engine may also be increased.

30 If the more complete combustion of gasoline made possible by heat exchanger technology makes workable lower polluting emissions because these elements in gasoline are now vaporized and used to power the engine, why hasn't the public learned of this new technology?

31 Would its use make a catalytic converter last the life of the engine? There are many other patents issued to energy and automotive companies.

32 A minor but very important point-the intake manifold must also be heated to prevent the gasoline vapor from condensing. See General Motors Patent 3,892,214. Also see 'Manifold Vaporization And Exhaust Gas Temperatures' in the SAE Journal.

33 Both the United States and British governments hold gasoline vapor patents. US Patent 3,640,256 'System For

Preconditioning A Combustible Vapor' was invented by George M. Low in 1970 and is held by the National Aeronautics And Space Administration.

Using a FOIA petition, we found that the project was shelved by a memorandum written by a John Brogan of the EPA office in Ann Arbor, Michigan citing SAE paper 670485. It is interesting to note in spite of results indicating a drop in pollutants consistent with all the literature cited previously, paper 670485 comes to an ambivalent conclusion.

Could it be poor design of the apparatus - the vapor storage tank is the size of a home hot water heater(9 cubic feet in size) when the one in Covey's successful system was only a fraction of its size?

Why did not the bureaucrat Brogan cite other SAE papers giving successful results that coincided with the lab tests on the NASA device? The British Government holds United States Patent 4,167,165.

³⁴ A look at the illustrations of the device-this patent bears an uncanny physical resemblance to the Bursley-Trask Fuel Adjuster in the March 1926(p.185) Scientific American Digest article 'Doubling The Automotive Mileage Per Gallon' If this older system can double the mileage of an automotive engine, then what can Ian C. Findlay's British patent do? We have found another vaporizer patent granted to Ian C. Findlay assigned to the Shell Oil Corporation!

³⁵ Mr. Findlay is a British subject and so are the other two inventors Rodger Lindsay and John Wilson of the patent assigned to the Shell Oil Corporation. Findlay holds the

British Government patent with a George Gallacher, who is also a British subject.

Why has the public never heard of these patents? These systems will not work with leaded gasoline, or gasoline having "detergent" additives. For experimentation, be sure to use 'white gasoline', or gasoline containing NO additives.

High efficiency may have been achieved by some vapor systems using thermo catalytic cracking, the breakdown of large multiple chain molecules down into singular carbon molecules such as vaporous natural gas and methanol.

These molecules have similar and lower vaporization temperatures than the 'heavy ends' in gasoline. They will burn instantaneously and completely on ignition. The heat exchanger will have to reach a high temperature (400-430F in manifold vacuum) for this reaction to occur. ³⁶ Many exhaust systems on an internal combustion engine may not be able to provide the exhaust heat to do this, since metals like steel have a low thermal conductivity. There is a solution.

Weld a catalytic converter in series between the exhaust manifold of the gasoline engine and the exhaust input to the heat exchanger/vaporizer that is described in the patents cited. The catalytic converter acts as a heat amplifier and its output is at a much higher temperature than its input.

The thermal conductivity of steel is lower than that of copper or brass, but this will compensate. Ray Covey (USP #4611567) used this with his system, as building a heat

exchanger of 1/8 or 1/4 inch dia. brass plate is very expensive.

37 To control the exhaust heat temperature to the exhaust input of the vaporizer heat exchanger, put two y-couplings and a pipe in parallel with the catalytic converter. A flapper valve in series with the parallel exhaust gas diverter pipe can be used to precisely control the temperature at the output of the catalytic converter/input to the heat exchanger/vaporizer.

Opening the flapper valve allows the exhaust gas to flow around the catalytic converter, closing the flapper valve forces the exhaust gas to flow through the catalytic converter.

Partial adjustments can also be made. Covey recommended a catalytic converter from a Triumph sports car or VW Rabbit. "Junk" catalytic converters can be used, provided they are not fouled.

Thermo catalytic cracking may be achieved by having nickel present in the steel walls of the heat exchanger vaporizing chamber, either as plating or as an alloy of the steel in a substantial percentage.[preferred]

The nickel is a catalyst - it promotes the breakdown reaction but does not change chemically itself. Hastelloy C2-76 Stainless Steel(UNS #N01276) is approximately 60-65 per cent nickel.

Inconel 625 is half nickel(UNS#N06625) and could also be used to build a heat exchanger vaporizer chamber that could exhibit the thermo catalytic effect on gasoline.

38 This concept is completely described in US Patent 5,156,114 issued October 20,1992 to Rudolph W. Gunnerman.

39 Having the thermo catalytic cracking metal element/vaporizer separate and external from the engine/cylinder head itself is to be preferred as a design consideration. An inventor, Paul Pantone has developed a device that performs similarly to Gunnerman's, but achieves the thermo catalytic cracking effect on an attachment mounted externally to the engine.

He has had his US patent application recently approved, but a patent number [and publication in the Gazette] has not been granted yet. (as of 5/29/98) Several US newspapers have described his device.

His invention, which he calls the GEET device,has not been tested by any official or corporate labs, as the Gunnerman device has, although it apparently runs on similar principles.

40 Other patents cited here may or may not run on the principle of thermo catalytic cracking of gasoline, (pyrolysis) or the inventors might have hidden this information in the patent application for legal reasons.

The late Ray Covey (US Patent 4611567) observed this process in his device but was unaware of exactly what was happening - more than just vaporization of the fractions of gasoline was occurring.

41 This vaporization using heat is as described in the

drawings of most of the patents cited.

In conclusion we have found information that might also be of interest to farmers. In the USA, a farmer can obtain a permit to convert waste vegetable material to alcohol for fuel.

The Mobil Oil Corp. published a paper describing work on the conversion of ethyl alcohol to gasoline. ⁴² The Environmental Protection Agency at the China Lake Naval Weapons Research Center developed a system that converts cellulosic (ie:green plant) type solid wastes or biomass (ie:plant material) to gasoline.

⁴³ Could the farmer use this to co operatively make his/her own gasoline for farm equipment from wastes normally discarded? Has further work been done on this?

The Ray Covey Patent 4611567* has been highlighted and underlined, and marked with an asterisk to bring it to the reader's attention. So have US(3,640,256*)& British Government(4,157,165*) held patents.

Footnotes:

[1] US Patent Office Internet version of Manuel Of Classification: <http://app1.1uspto.gov/cgi-bin/iftech4?index+CLASS+1+17392+257+0+19+OF+39+78+1+123%2f545>

[2] Ibid.

[3] US Patent 5,394,838 'Vaporized Fuel Injection System'. Also see: US Patent 5,056,495 (Texas Instruments)

[4] Scientific American Volume XCII, Number 21 May 27,1905 pp.433

[5] Engineering (Great Britain),February 17,1911. 'The Davis Paraffin Carburettor', page 216

[6] Scientific American August 2,1913 Article: 'Distillate Gasifiers For Motor Vehicles' page 95.

[7] SAE Transactions,1913 Part I, Volume VIII, pages 118-119. Article: "Low Grade Motor Fuel For Trucks"

[8] SAE Transactions, 1911 'Carburetor Division Report',1911 page 648. [Here the SAE sets construction standards for vaporizer carburetors!] Article:'Kerosene Carburetors', AC Bennett. [discussion and extensive bibliography. An early system, the 'Wilcox Bennet Vaporizer' illustrated. Source: University of Rochester Libraries. Dewey Decimal Classification: TL2 S678t v.6 Also, see Scientific American June 3,1916 page 584 Article: 'Plain Facts About Kerosene Carburetors', Victor W Page M.S.A.E.

[9] Karl E. Bell, Deputy Director Of Administration, F.O.I.A. Officer, FOIA request, 9/15/83

[10] Automotive Industries.,April 16,1925. page 698-699. Article: 'New Holly Vaporizer Permits Use of Any Grade Of Fuel'

[11] Automotive Industries Ibid., page 698

[12] Proc.Instn. Mech. Engrs.(A.D.) (Great Britain) No.4,1961-62 pages 146-157.[cite: pp 147] 'The Influence Of Tractor

Service Conditions On The Quality Of Fuels, Lubricants, and Protective Materials', E.S.Bates; R.P. Strettell

**[13] Automotive Industries. January 17,1924, pp.141.
"Vaporizing System For Heavy Fuels Designed By Fiat"**

[14] Motor., January 1936, page 62 Article: 'High -Pressure carburetor Uses Fuel Oil'

**[15] Automotive Industries, June 30,1923 pp. 1004-1006
'Atomization Takes Place In Tank In New Fuel System', A.F. Denham.**

[16] Automotive Industries., June 30,1923 pp.1006

[17] Automotive Industries, December 18,1924. pp. 1049-1050 'New Device Enriches Charge For High Speed and Heavy Pull And Leans It Otherwise'. By W.L. Carver.

**[18] Automotive Industries., September 24, 1925 pp.516
'Designs New Fuel Vaporizer'**

[19] R.Covey, personal communication

**[20] Winnipeg Free Press., August 18, 1973 page 6 Article:
'Auto Firm Head Recalls That F "Legendary" Carburetor By Greg Shilliday.**

[21] Winnipeg Free Press.,April 30,1942 page8. 'Hints Pogue Carburetor Sabotaged'

[22] personal communication-war veteran

[23] US Patent 4.047,512 Electric Fuel Vaporizer Douglas R. Hamburg and Jerome F. Hough Assignee: Ford Motor

**Company International Claims: F02M 031/00 US
Classification: 123/122**

[24] SAE Paper #760288 A Vaporized Gasoline Metering System For Internal Combustion Engines D.R. Hamburg and J.E. Hyland Engineering and Research Staff, Ford Motor Company.

[25] Journal Of The Society Of Automotive Engineers., August,1923. Vol.XIII.,Number 2. Page 131.

[26] SAE Paper#760288., pp.3

[27] The Journal Of The Society Of Automotive Engineers August,1923. pages 130-132. Article: 'Exhaust Heated Vaporizer'

[28] SAE Paper #760288 page 7.

[29] US Patent 4,161,931 Douglas R. Hamburg, Dante S. Giardini, 'Vapor Temperature Controlled Gas Heat Exchanger' Assignee: Ford Motor Corporation

[30] US Patent 4,161,931, column 2,line 20

[31] SAE Paper 720462 'Ethics Of The Professional Automotive Engineer'.

[32] Examples given are US Patents, assignee in parenthesis: 4,085,721 (Exxon), 3,996,906 (GM), 3,763,839 (Phillips Petroleum), 3,957,024 (Shell Oil), 3,927,651 (Shell Oil), 4,087,512 (Ford), 4,022,172 (American Motors), 3,851,633 (General Motors)

[33] SAE Journal., March,1922, Volume X, Number 3.,pages

171-176 "Manifold Vaporization And Exhaust Gas Temperatures", O.C.Berry and C.S. Kegerreis (Purdue University)

[34] US Patent 4,167,165 Fuel Vaporizer For Internal Combustion Engines. Ian C. Findlay and George C. Gallagher, both of Glasgow, Scotland., assignors to The Secretary Of State For Industry In Her Britannic Majesty's Government Of The United Kingdom Of Great Britain And Northern Ireland.

[35] US Patent 3,763,838. Ian C. Findlay, Rodger Lindsay, John Wilson 'Carburetor Having A Heat Pipe For Vaporizing Fuel' Assignee: Shell Oil Company, New York, New York. Oct 9,1973

[36] *McGraw-Hill Encyclopaedia Of Science And Technology*, 8th Edition, 1997 McGraw-Hill Pub.Corp. N.Y.. N.Y.. Volume 13, page 327

Aviation Gasoline=33 degrees to 170 degrees Centigrade, 100 degrees to 392 degrees Fahrenheit.

Automobile Gasoline=-1 degree to 200 degrees Centigrade, or 30 degrees to 390 degrees Fahrenheit. [page 325]

***Kirk-Othmer Encyclopaedia Of Chemical Technology*
J.Wiley & Sons. Corp,N.Y.,N.Y.. Vol..11,pp.661**

Light Gas Oil=200-300 degrees Centigrade=[324-572 degrees Fahrenheit]

Heavy Gas Oil=300-400 degrees Centigrade=(572-752 degrees Fahrenheit.)

[37] 7030 Brass.CDA260 Cartridge Brass

Used in rifle ammo = Copper 68%, .07% Lead,.05% Iron, rest is zinc

Cost: Metal plate, 1 square foot,1/8 inch-\$89.95(US)

Takes nickel plating well, will not decompose at 400F

[38] Inconel 625 = 61% Nickel,21% Chrome,9.5%

Molybdenum, 3.6% Niobium, plus tantalum.

Cost,one square foot 3/16 inch is: \$11.00/100 pound lot.

One square foot is 8 1/2 lbs.

Hastelloy G30 = 65% Nickel, 35% chromium, molybdenum, silicon, carbon (trace), copper (trace)

310 Stainless Steel = 20% Nickel, 25% Chrome, 1%

Manganese, 1/2% Silicon, Iron One square foot 3/16 inch plate is @ \$9.00

[39]*Business Week*, August 8,1994 "Engines That Run On Water?"

Author: Otis Port of New York. Science and Technology Section.

To search and retrieve on the Internet:

<http://bwarchive/businessweek.com/>

Business Week says that Gunnerman's company "A-55LP" has formed a joint venture with Caterpillar, Incorporated-the tractor company. In tests, Reno, Nevada powered a city bus with Gunnermans' system for five months.

The United States Air Force tested it at the Elmdorf Base in Alaska. The Minnesota Transportation Department sponsered a five vehicle journey from Reno to Minnesota using vehicles equipped with his system. We quote Business Week:

"Gunnerman claims to have a technology that enables engines to burn a mixture of half fuel, half water. Yes, water. What's more, he says, the mixture gets 40% better mileage from the gasoline it contains and emits significantly less pollution because engines run cooler.

In particular, tailpipes emit virtually no nitrogen oxides -- the principal source of smog. Why does the fuel result in better mileage? Gunnerman believes the water gets broken down into hydrogen and oxygen, and the hydrogen contributes energy to the combustion process.

That's because there is one additional trick in his patented process: A small piece of nickel must be attached to the crown of each piston or the top of the cylinder heads. The nickel seems to act as a catalyst in `dissociating' the water, says Gunnerman."

Read Gunnerman's patent 5,156,114 carefully before examining the following material, and use the column and line locators as a reference.

[Click here to read the entire patent with comments!](#)

In [column 7, line 10] Gunnerman describes his experiments with a Tecumseh stationary engine: "a platinum bar was installed in the bottom surface of the engine head forming the top of the combustion chamber. The platinum bar weighed one ounce and measured 2 5/16 inch in length, 3/4 inch in width, and 1/16 inch in thickness. The platinum bar was secured to the inside of the head with three stainless steel screws."

This quoted instruction is omitting information necessary

to get the device to work - the platinum bar must be completely electrically insulated from the top of the combustion chamber, as it forms a separate high voltage negative electrode the crankcase being the positive.

There must be asbestos or other electrical insulating material between the bar and the cylinder head for this purpose. If stainless steel screws are used to mount the electrode, they must be electronically completely insulated from the cylinder head using asbestos spacers and gaskets.

One of these 3 screws can serve as a lead in for the high voltage insulated electrode that the platinum bar functions as within the cylinder of the engine.

A nickle bolt may also be used: "Such an engine is equipped with a cylinder (head) but (this) is changed to accept two one half inch diameter nickle bolts or screws as the hydrogen producing catalyst, with the screw part being of 1/4 inch diameter to practice the invention." [col 12,line 5]

The 1/2 inch diameter nickle bolt and nut are insulated from the cylinder head by asbestos gaskets. Nickle washers are placed between the asbestos gaskets and the nickle bolt and nut to avoid deforming them when the nut is tightened. There is an asbestos collar surrounding the 1/4 inch diameter screw as it passes through the hole in the cylinder head from the bolt to the nut.

These are all insulated high voltage electrodes, as is the experiment with the Tecumseh engine in [column 7,line 10] ALL negatively polarized high voltage electrodes mounted to the cylinder head of the engine follow this rule - they

must be electrically insulated from the positive block of the engine for the Gunnerman process to work.

The spark plug and the electrode(s) share the same 90KV high voltage source. The inventor has omitted this critical information from the text of the patent. Use an engine with as short a piston stroke as possible when experimenting with anything over a 50% fuel/water mixture.[column 8,line 40]

Considering possible optimum design in relation to the surface area of the electrode; the nickel is NOT a small piece attached to the top of the cylinder. [Column 7,line 10] It could be seen as 1/4 inch wide strips 62/1000 of an inch thick bent to form a louver inside the cylinder head making sure these strips do not hit the top of the cylinder or the top of the head.

This louver is part of a nickel metal plate that acts as an insulated electrode. This is inserted between two pieces of a head gasket made of asbestos or other insulating material, and is thermally and electrically insulated from the engine block.

The nickel louver CANNOT physically touch any of the head bolts on the engine, and a tab leads out from between the two gasket halves. This tab is attached to a negative 90KV direct current voltage potential, the positive pole being attached to the block of the engine and serving as electrical ground.

These "electrodes" are completely electrically insulated from each other! A grid or screen made of interleaved number 12 AWG or SWG gauge nickel wire can also be

used for this electrode, with an external tab for the 90KV high voltage supply.

The louver inside the cylinder is important because the strips give a relatively large surface area for this to occur within the cylinder of the engine.

The maximum surface area of strips possible is what the designer looks for when the louver in the cylinder of the engine is to be designed. The catalytic reaction described in his patent - the breakdown of the water molecule into hydrogen and oxygen is caused by an electrical potential in the nickel catalyst and the heat liberated by the gasoline exploding in the cylinder of the engine.

Use the high spark plug voltages (i.e. 90KV) Gunnerman recommends in his patent and apply them to this "electrode", and the block of the engine.

[40] See: *Emery County Progress*(UT.) Tuesday, Friday 20, 1996 (Utah)

"Inventor Proposes Revolutionary Engine" By Scott Niendorf - Progress Editor. Page 2A

Also see: *Marin Independent Journal*(Ca.)

November 7, 1992 Nurturing, Inventions, Ideas.

Section/A-11. "In Quest Of Perfect Engine" By Tom Nelson, IJ Business Editor.

Also See: *El Dorado Gazette*(Ca.) Vol. IV, Nr.5.

November 7, 1984. "Garden Valley Inventor Fights Uphill Battle" By Dorothy Ingram.

The inventor can be contacted:

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FAX (801) 281-4578**

A fully working model, the 'University Special' is available for US\$ 1850 for research purposes by faculty in an accredited University.

[41] Personal communication to author.

[42]'Engineering Index Annual, 1982 Citation 04372, page 3210 Thermochemical Conversion Of Wastes/Biomass To Gasoline'.

Abstract: 'The process involves three operations: a selective pyrolysis step to convert the feedstock to gases rich in olefins such as thylene, propylene, and butylene, a compression and purification step to concentrate this gasolene, and a thermal polymerization step to convert the olefins primarily to high octane gasoline, this work discusses the information necessary to determine product yield as well as work done by Dow Chemical" reference

**[43]Liberick Walter W, Jr. (US EPA,Cincinnati Ohio, USA)
Symposium Paper: Energy From Biomass and Waste
#4,Buena Vista Fla USA January 21-25. 1980.
Published by the Institute of Gas Technology Chicago,
Illinois, USA pages 747-763.**

[Click here for Gunnerman patent and comments.](#)