LYMAN HORACE WEEKS

AUTOMOBILE BIOGRAPHIES

Lyman Horace Weeks

Automobile Biographies

Weeks L.

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Содержание

Lyman Horace Weeks Automobile Biographies / An Account of the Lives and the Work of Those Who Have Been Identified with the Invention and Development of Self-Propelled Vehicles on the Common Roads

FOREWORD

In a large sense the history of the rise of the automobile has been a history of some of the foremost inventors, mechanical engineers, manufacturers and active business men of more than a full century. The subject of self-propelled vehicles on the common roads has enlisted the faculties of many men whose minds have been engrossed with the study and the solution of mechanical and engineering problems, purely from an absorbing love of science; it has had the financial support of those whose energies are constantly and forcefully exerted in the industrial and commercial activities of the age; it has received the merited consideration of those who regard as of paramount importance any addition to the sum of successful human endeavor and any influence that contributes to the further advance of modern civilization.

Along these lines of thought this book of Automobile Biographies has been prepared. On its pages are sketches of the lives and the work of those who have been most active in planning, inventing and perfecting the modern horseless highway vehicle, in adapting it to the public needs for pleasure or business and in promoting its usefulness and broadening the field of its utility.

Included herein are accounts of the pioneer inventors, the noted investigators and the contemporaneous workers who have helped to make the automobile in its many forms the most remarkable mechanical success of to-day and the most valuable and epoch-making addition to the conveniences of modern social, industrial and commercial life. These sketches have been carefully prepared from the best sources of information, works of reference, personal papers and so on, and are believed to be thoroughly accurate and reliable. Much of the information contained in them has been derived from exceedingly rare old volumes and papers that are not generally accessible, and it comes with a full flavor of newness. Much also has been acquired from original sources and has never before been given to the public.

The investigator into this subject will find, doubtless, to his very great surprise, that the story of the pioneer inventors, who, in the early part of the nineteenth century, experimented with the problems of the steam road carriage, has been recorded voluminously and with much detail. It was a notable movement, that absorbed the abundant attention of inventors, manufacturers and the public at large at that time.

Writers of that day recorded with a great deal of particularity the experimenting with boilers, engines, machinery and carriages, and the promoting of companies for the transportation of passengers and the hauling of goods. Modern students and historians of this subject find themselves greatly indebted to the writers of that epoch, like Gordon, Herbert and others, who preserved, with such painstaking care, for future generations, as well as for their own time, the account of the lives and labors of such men as Watt, Trevithick, Maceroni, Hancock and others. Every modern work upon this subject draws generously from those sources.

Concerning the later period from the middle of the century that has just ended, down to the present time, there is less concrete information, readily available. With the cessation of public interest in the matter and its general relegation into the background, by inventors, engineers and those who had previously been financial backers of the experimenting, writers ceased to give the subject the enthusiastic attention that they had before bestowed upon it. Records of that period are scant, partly because there was so little to record and partly because no one cared to record even that little.

Until comparatively recent times the historian of the self-propelled vehicle, who was so much in evidence seventy-five years ago, had not reappeared. Even now his work is generally of a desultory character, voluminous, but largely ephemeral. It is widely scattered, not easily accessible and already considerably forgotten from day to day. Especially of the men of the last half century, who have made the present-day automobile possible and are now contributing to its greater future, the following pages present much that has never been brought together in this form. It is both history and the material for history.

It is believed that these sketches will be found peculiarly interesting and permanently valuable. Individually they are clear presentations of the achievements of some of the most distinguished engineers and inventors of the last hundred years. Collectively they present a complete story of the inception and gradual development of the automobile from the first clumsy steam wagons of Cugnot, Trevithick, Evans and others to the perfected carriage of to-day.

The chapter on The Origin and Development of the Automobile is a careful study and review of the conditions that attended the attempts to install the first common road steam carriages, the tentative experimenting with bicycles, tricycles and other vehicles in the middle of the last century and the renaissance of the last two decades. Several of the illustrations are from old and rare prints, and others are from photographs.

It is not possible to set down here all the authorities that have been consulted in the preparation of this work. Special acknowledgment, however, must be made to The Engineering Magazine for permission to use text and photographs, and to J. G. Pangborn for permission to use a great deal of interesting information regarding the early steam inventors contained in his work, The World's Railway, and to reproduce portrait sketches of Trevithick, Murdoch, and Read, from the same valuable volume.

Lyman Horace Weeks.

New York, January, 1905.

ORIGIN AND DEVELOPMENT OF THE AUTOMOBILE

Strange Early Vehicles

He who would fully acquaint himself with the history of the inception and growth of the idea of travel by self-propelled vehicles on the public highways must go further back in the annals of the past than he is likely first to anticipate. Nearly three centuries ago men of mechanical and scientific turns of mind were giving attention to the subject, although their thoughts at that time were mostly confined to the realms of imaginative speculation. Even before that philosophers occasionally dreamed of what might be in some far off time. Roger Bacon, in the thirteenth century, looking into the distant future, made this prediction: “It will be possible to construct chariots so that without animals they may be moved with incalculable speed.” It was several hundred years before men were ready to give practical attention to this idea, and about 1740 good Bishop Berkeley could only make this as a prediction and not a realization: “Mark me, ere long we shall see a pan of coals brought to use in place of a feed of oats.”

But the ancients, in a way, anticipated even Roger Bacon and Bishop Berkeley, for Heliodorus refers to a triumphal chariot at Athens that was moved by slaves who worked the machinery, and Pancirollus also alludes to such chariots.

Horseless Wagons in China

Approaching the seventeenth century the investigator finds that definite examples are becoming more numerous, even if as yet not very practical. China, which, like Egypt, seems to have known and buried many ideas centuries before the rest of the world achieved them, had horseless vehicles before 1600. These merit, at least, passing attention even though they were not propelled by an engine, for the present automobile is the outgrowth of that old idea to eliminate the horse as the means of travel.

Matthieu Ricci, 1552-1610, a Jesuit missionary in China, told how in that country a wagon not drawn by horses or other animals was in common use. In an early collection of travels this vehicle was described as follows: “This river is so cloyed with ships because it is not frozen in winter that the way is stopped with multitude; which made Ricius exchange his way by water into another (more strange to us) by waggon, if we may so call it, which had but one wheel, so built that one might sit in the middle as ’twere on horseback, and on each side another, the waggoner putting ’t swiftly and safely forwards with levers or barres of wood (those waggons driven by wind and gayle he mentions not.)” It was somewhat later than this that China was indebted to that other famous Jesuit missionary, Verbiest, for his steam carriage, which, however, was not much more than a toy.

Manually Propelled Vehicles

But in the seventeenth century most attention seems to have been given to devising carriages that should be moved by the hand or foot power of man. The auto car that was run in the streets of Nuremberg, Germany, by Johann Hautsch, in 1649, was of this description, and that of Elié Richard, the physician, of La Rochelle, France, about the same time, was of the same class.

Not long after this Potter, of England, came along in 1663 with a mechanical cart designed to travel on legs, and in the same year the celebrated Hooke presented to the Royal Society of England a plan for some sort of a machine by which one could “walk upon the land or water with swiftness, after the manner of a crane.” It does not quite appear what that cart and that machine were. One authority

thinks that the Hooke patent was for a one-wheel vehicle supposed to be propelled by a person inside the wheel. Then, also, there was Beza, another French physician, with a mechanical vehicle in 1710.

Other French and English Experiments

In fact, the interest in carriages worked by man power extended from the seventeenth well into the nineteenth century. Soon after the time of Beza, mechanical chariots, modeled after the Richard coach, were advertised to be run in London, but it does not appear that they met with public favor. Scientists and others gave much thought to the subject, both in England and in France. John Vevers, master of the boarding-school at Ryegate, Surrey, came out with a carriage that was evidently copied from that of Richard. Other forms of carriages worked by hand or foot power of man were described in the periodicals of the time. George Black, of Berwick-on-the-Tweed, built a wagon to be run by hand power in 1768. In England, John Ladd, of Trowbridge, Wilts, in 1757; John Beaumont, of Ayrshire, in 1788, and in France, Thomas in 1703, Gerard in 1711, Ferry in 1770, and Maillard, Blanchard and Meurice, in 1779, and others, were most active during this period.

It was well into the nineteenth century before this idea was wholly abandoned. Edmund Cartwright, inventor of the hand loom, contributed to the experimenting, and the 1831 patent to Sir James C. Anderson was for a very imposing vehicle rowed by twenty-four men.

Compressed Air Power

At the same time that the steam engineers in England were bringing out their vehicles, 1800-35, others were at work on the problem of compressed air carriages. Among these was W. Mann, of Brixton, who, in 1830, published in London a pamphlet, entitled A Description of a New Method of Propelling Locomotive Machines, and of Communicating Power and Motion to All Other Kinds of Machinery, and it contained a lithograph of the proposed carriage. Sir George Medhurst, of England, about 1800, with his proposed regular line of coaches run by compressed air was, perhaps, the most conspicuous experimenter into this method of propulsion.

Sailing Carriages on Land

Many men long speculated upon the possibility of wind propulsion on land as well as upon the sea. The most ambitious attempt in that line was the sailing chariot of Simon Stevin, of The Hague, in 1600. Vehicles of this kind were built by others, and in 1695 Sir Humphrey Mackworth applied sails to wagons on the tramways at his colliery at Neath, South Wales. The Frenchman, Du Quet, in 1714, and the Swiss clergyman, Genevois, proposed to get power from windmills mounted on their wagons. More curious even than these was the carriage drawn by kites, the invention of George Pocock, in 1826.

The Steam Carriage Predicted

But all these and other fantastic devices never got beyond the experimental stage, and nothing of a substantial, practical character was ever evolved from them. It remained for the latter part of the eighteenth century to see the subject taken up seriously and considered in a way that promised definite results. And it was steam that then brought the matter strongly to the front.

It is true that Sir Isaac Newton tentatively suggested the possibility of carriage propulsion by steam about 1680, but his suggestion lay dormant for nearly a century. Then the growing knowledge of the power of steam and the possibilities in the new element turned men's thoughts again very forcibly

to this theme. The stationary engine had shown its usefulness, and the consideration of making this stationary machine movable, and therefore available for transportation, naturally followed.

Dr. Erasmus Darwin is said to have urged James Watt and Matthew Boulton to build a fiery chariot as early as 1765. In his poem, The Botanic Garden, famous in that day, Dr. Darwin, like a prophet crying in the wilderness, sang of the future of steam in these lines:

"Soon shall thy arm, unconquered steam, afar
Drag the slow barge, or drive the rapid car;
On, on wide waving wings, expanded bear
The flying chariot through the field of air;
Fair crews triumphant, leaning from above,
Shall wave their fluttering 'kerchiefs as they move,
Or warrior bands alarm the gaping crowds,
And armies shrink beneath the shadowy clouds."

These lines may indeed be fairly interpreted as anticipating in prophetic prediction the modern motor airship, as well as the motor car.

The First Steam Vehicles

It was considerably later than this that the dream of Dr. Darwin approached to realization at the hands of the steam engine inventors and builders. Aside from Nicholas Joseph Cugnot, the French army officer who, about 1769, constructed an artillery wagon propelled by a high-pressure engine, those who first built successful self-propelled vehicles for highway travel were the famous engineers of England and Scotland, who harnessed steam and developed the high-pressure engine in the last half of the eighteenth century and the first half of the nineteenth. James Watt patented, in 1782, a double-acting engine, which he planned might be "applied to give motion to wheel carriages," the engine to be portable; but he never put the patent to trial. He was followed by George Stephenson, Richard Trevithick, Walter Hancock, Goldsworthy Gurney, David Gordon, William Brunton and others in England, and Oliver Evans, Nathan Read and Thomas Blanchard in the United States, with two score or more contemporaries. For more than half a century steam vehicles of various types were invented by these engineers and many of them were brought into practical use.

Soon after the end of the first quarter of the nineteenth century the interest in steam carriages had assumed large proportions in England. In 1833 there were no less than twenty such vehicles, either completed or in hand, around London, and a dozen corporations had been organized to build and run them over stated routes.

Alexander Gordon, the eminent engineer, wrote a book, entitled Treatise Upon Elemental Locomotion, that went into three editions inside of four years. He also brought out two special journals covering this field of mechanics. The Mechanic's Magazine, and other publications, also gave much attention to the subject, and the steam-carriage literature of the period became very voluminous.

Popular Prejudice Aroused

For a time it looked as though the new vehicle was destined to a permanency and to accomplish a revolution in the methods of travel on the high-roads. But several things arose to determine otherwise. There sprang up an unreasoning senseless hostility to any substitute for the horse as the agent of vehicular traffic. The stage-coach drivers were afraid that they would be thrown out of work. Breeders of horses foresaw the destruction of their business, when horses should no longer be in demand. Farmers were sure that with horses superseded by steam, they would never be able to sell any more

oats. This public animosity manifested itself wherever the steam carriages went. The coaches were hooted at and stoned amid cries of “down with machinery.” Stones and other obstacles were placed in the roads, trenches were dug to trap the unsuspicious driver and stretches of roadway were dug up and made into quagmires to stall the machines. Parliament was called upon and enacted excessive highway tolls, especially directed at steam carriages. Another law that stood on the statute books of Great Britain until within comparatively recent times compelled every self-propelled vehicle moving on the highway to be preceded by a man walking and carrying a red flag.

The Beginning of Railroads

All this was undoubtedly due, in a large measure, if not wholly, to what was then known as the Turn Pike Trusts, which, in conjunction with the stage-line companies, in many cases, were owners of a thousand and more horses. The latter, quite naturally, objected to the introduction of the mechanical vehicle, while the former had such relations to them that both their interests were identical.

But above all things, the great art of railroading had already grown from infant existence to a condition of great possibilities, which were now to be finally determined by a success, not alone mechanical and in the eyes of the inventor, but measured by the balance sheets of the companies of individuals who had made possible the construction of the various experimental locomotives or experimental lines then being operated in England and elsewhere. Just at this time, in the thirties of the nineteenth century, seems to have been the crucial point. The arguments of the engineers on the question of sufficient traction of the iron-shod wheels on iron or other hard railways, while given due consideration, were not wholly convincing, at least to the people investing their money in the enterprises; the profits were to tell in the final conclusion, and it would seem that the great era of railroading might be considered to have had its actual birth at this time, because:

The first dividend was paid on one of the great railroad enterprises.

Influence of the First Dividend

For the time being that seemed to sound the death knell of the common road steam-propelled vehicle. The engineers so strongly advocating the railroad had proven their various propositions in the eyes of those who had the financial powers to engage in the extensive introduction and development of the new means of transportation. Further demonstration, extensively exploited, was also made to the satisfaction of those investors, that vehicles could be pulled with less power on a hard roadbed such as a railway, than on an uneven and sometimes soft path such as common roads. It seems clear that these and various other arguments, heartily urged at that time, and, in some cases, unquestionable from a technical standpoint, were really decided by that first dividend. And the common road vehicle with the support and enthusiasm of its backers largely withdrawn from it dropped to a position greatly subordinate to the other branch of transportation.

The Steam Road Vehicle Again

On the other hand, the development which came in the next few decades in the railroad department brought also a renewed demand for common road vehicles for certain classes of work or for certain localities. The steam vehicle for stationary purposes, and also for the locomotive, were being rapidly developed and refined. The railroad settled down to the idea of a power unit drawing numerous wagons. That has been consistently adhered to to the present day, and only in the past decade have we gone back to the old and first principles of embodying the mechanical propelling means in the same vehicle that transports the passengers or goods. So, while Hancock and his worthy

contemporaries passed into history, other common road steam advocates continued their isolated attempts up to and past the middle of the nineteenth century, although without any such general enthusiasm as prevailed in the twenties and early thirties.

New Generation of Inventors

Many attempts in America, such as those of Fisher, Dudgeon, and others, and the work in England by numerous inventors and machine manufacturers, such as Tangye, Hilditch, Snowden, F. Hill, Jr., aided by the engineers, Macadam, Telford and M'Neil, who were improving the common roads so that they might approach the advantageous conditions of the railroad, assume prominence in connection with that period of the history. Rickett's carriage, in 1858; Carrett's, in 1862; Boulton's, in 1867; Catley's, in 1869, and others, were among the finger-posts of that time, pointing to more notable achievements of the future.

But in England the Act of Parliament, passed in 1836 and in force almost to to-day, known as the Locomotive Act, was the deterrent to progress in common road steam locomotion. This condition even continued after the select committee of Parliament, in 1873, endeavored to remove some of the restrictions, but succeeded only in producing the Act of 1878, which in no way improved the position of the common road vehicle.

In France and on the Continent political conditions doubtless mitigated against any general advance, and though this period included the great development of machinery and construction which paved the way for the future, it is not of prominence in this history.

A Period of Experimenting

A new era may be said to have commenced in the early part of the seventies when we find Amédèe Bollèe exhibiting a steam machine at the Vienna Exposition. In the seventies were also experiments on modified forms of power on vehicle propelling motors other than steam, but it still seemed to be the steam vehicle that characterized the new period of activity which blossomed out in the early eighties with many ardent advocates, and exhibited a type of light vehicle with efficient strong boiler and light engine. America should not be overlooked, however, when we consider the one small vehicle of Austin, which was constructed in Massachusetts, and attracted great attention at the shows of the Ocean Circus, in the early seventies, or thereabout. Bouton, of France, came to the fore in the early eighties, and the light steam vehicle seemed on the high road to a great development and a monopoly of the common roads vehicle industry, until its competitor appeared in what is now popularly known as the gasoline vehicle in the middle eighties.

The Selden Patent

From this time on the great industry of to-day advanced in strides and jumps, but while the future had been anticipated in some suggestions and experiments in Europe, at last one great mind had delved into the problem and anticipated the great future of the new type of vehicle in America. Selden, after a decade or more of study and work, and well-directed experiments, had made his own deductions, and with clear discerning had concluded what, to his mind, would be *the* vehicle in the future. The result of his labors and the subsequent filing, in 1879, of a patent application, when considered in connection with his persistent work from that time on, even to the present day, would seem to justly mark him as the pioneer in this type of vehicle; in fact, he was so called by the Commissioner of Patents of the United States when publishing his annual report, immediately after the issue of Selden's patent.

Advent of the Hydro-Carbon Engine

Then followed the work on carbureters and ignition devices and details of construction adapting the liquid hydro-carbons of uncertain quality to more satisfactory use. Details became and still are numerous, and optional to a great extent, but the liquid hydro-carbon engine of the compression type distinguished the new epoch. The development of the stationary engine operated with gas from receivers also proceeded rapidly in those days, though it was well into the eighties before the gas engine of the compression type involved a commercially successful industry to any extent; not for several years did the principal manufacturers take up commercially the proposition of the liquid hydrocarbon application. The development of the small engine using liquid hydro-carbons received attention from Marcus, in Austria, and the persistent attention of Benz and of Daimler, in Germany. The two latter, furthermore, adapted their engines to vehicles, and enthusiasm was great when Benz ran his three-wheeler, with explosive engine, through the streets of his native town.

Progress in France and America

England was still shackled; but in France many were inspired to change from steam to the hydro-carbon engine. About 1890 we find several French manufacturers procuring engines, or the right to manufacture the small explosive engines developed by the Germans, and promptly adapting them to their vehicle construction, already well developed for steam propulsion. Panhard & Levassor; Bouton, with his backer, DeDion; Bollèe, now Leon, the nephew; Delahaye and Peugeot, were among the earliest Frenchmen to appreciate the commercial possibilities of the new type. Then the large manufacturers, already experienced in other lines, and particularly in cycle manufacture, entered the field in 1893, 1894 and 1895; among them such old concerns as DeDetrich, manufacturers for one hundred and more years, grasped the opportunity. America was not idle, and while road conditions in this country militated largely against the early attempts in the industry, the efforts of the Duryeas and of Haynes, and various other experimenters, who have since retired, were heard from. It was difficult, however, with the obstacles then existing in America, for these early workers to secure encouragement, and progress was slow, just as the endeavors of Selden and some of the early steam vehicle people had received nothing but discouragement at the hands of those whom they endeavored to lead to the success of large manufacturing undertakings.

However, the Times-Herald race, in Chicago, near the close of 1895, brought forth a large number of inventors and several starters, including electric, steam and gasoline vehicles, and the showing was such as to practically satisfy the doubting that these were the beginning of the industry in this country.

The English Revival

Abroad, the leaders in the automobile movement organized the now historic races from Paris in different directions. With the runs of 1894, 1895 and 1896, and in each successive year thereafter, and with the road and other conditions improved, the industry rapidly developed. England also was at last reached. The restraints that had existed there for more than half a century could no more be endured. The burden was finally thrown off, for which great credit is due to Sir David Salomon, and the offensive Locomotive Act was at last repealed in August, 1896. The subsequent Locomotive Act which came into effect November 14, 1896, marked a red-letter day in motoring history for England, and was justly celebrated by a procession of vehicles from London to Brighton. Salomon had previously organized an exhibition in England, and had imported a French car, and as a prominent

member of scientific and technical societies, in which he presented many papers on the subject, had done, possibly, more than any other individual to influence public sentiment and to secure this new enactment. English manufacturers were not entirely unprepared for the change, and a great wave of interest and activity swept the country. Naturally this was followed by a reaction, but since then a counter-reaction has set in, resulting in the present grand development of that class of manufacturing in the British Isles.

The small steam vehicle of Whitney, and his contemporaries, the Stanleys in the United States, then came to the fore. Under energetic promotion thousands of small vehicles of that type were manufactured and put into use. These, in no small measure, became to the public at large the convincing object lesson of the practicability and possibilities of the small automobile for every-day use.

Modern Conditions

The Paris show of 1900 revealed a great forward step in the development of constructions, and the offer immediately thereafter of the James Gordon Bennett trophy of international racing gave to the automobile industry such an impetus as has seldom been the good fortune of any other art to receive. To-day the automobile has reached that stage of perfection where the question is no longer whether or not the vehicle will carry you to a certain place and back. Now it is only a question of the speed, absence of vibration, and sweetness of running the engine, absence of all noise, and other details of refinement. Vehicles are now of the Pullman type, luxurious to the extent of prices ranging into the thirties of thousands of dollars, while on the other hand, thousands of small vehicles, costing between five hundred and one thousand dollars, are annually made and sold.

The steam machine, after being practically succeeded by the gasoline, was again improved by the flash boiler. The main development of this new power was carried on by Serpollet, of France, and later, by Rollin T. White, in the United States, both whom have become most able competitors of manufacturers of machines of other classes.

The Industry To-Day

The beginning of 1905 finds us with the annual shows, which have been consecutive for many years, while the census of vehicles now in use, or made in the last ten years, will aggregate several hundred thousand. The annual production is estimated as probably approximating one hundred thousand in a few of the principal countries. The value of the electrical vehicle, particularly as the town vehicle for anything except speeding, is now well established, and reports from Paris as well as New York indicate the lack of facilities of factories in this line for producing these carriages as rapidly as demanded. Heavy ’buses and individual vehicles alike are also popular.

PIONEER INVENTORS

Nicholas Joseph Cugnot,
William Murdock,
Oliver Evans,
William Symington,
Nathan Read,
Richard Trevithick,
David Gordon,
W. H. James,
Goldsworthy Gurney,
Thomas Blanchard,
M. Johnson,
Walter Hancock,
W. T. James,
Francis Maceroni,
Richard Roberts,
J. Scott Russell,
W. H. Church,
Etienne Lenoir,
Amédèe Bollèe,
George B. Selden,
Siegfried Marcus,
Carl Benz,
Gottlieb Daimler,
M. Levassor,
Leon Serpollet.

Nicholas Joseph Cugnot

Born at Void, Lorraine, France, September 25, 1725. Died in Paris, October 2, 1804.

Concerning the early life of Cugnot, little is known. He was educated for the engineering service of the French army, and gained distinction as a military and mechanical engineer. He also served as a military engineer in Germany. Soon afterward he entered the service of Prince Charles of Lorraine, and for a time resided at Brussels, where he gave lessons in the military art. He did not return to his native land until 1763, and then invented a new gun, with which the cavalry were equipped.

This brought him to the attention of the Compte de Saxe, and under the patronage of that nobleman, he constructed in 1765 his first locomotive. This was a small wagon. On its first run it carried four persons, and traveled at the rate of two and a quarter miles an hour. The boiler, however, being too small, the carriage could go only for fifteen or twenty minutes before the steam was exhausted, and it was necessary to stop the engine for nearly the same time, to enable the boiler to raise the steam to the maximum pressure, before it could proceed on its journey. This machine was a disappointment, in consequence of the inefficiency of the feed pumps. It has been stated that while in Brussels he had made a smaller vehicle, which, if so, was soon after 1760.

Several small accidents happened during the trial, for the machine could not be completely controlled, but it was considered on the whole to be fairly successful and worthy of further attention. The suggestion was made that provided it could be made more powerful, and its mechanism improved,

it might be used to drag cannon into the field instead of using horses for that purpose. Consequently, Cugnot was ordered by the Duc de Choiseul, Minister of War, to proceed with the construction of an improved and more powerful machine. This vehicle, which was finished in 1770, cost twenty thousand livres. It was in two parts, a wagon and an engine. The wagon was carried on two wheels and had a seat for the steersman; the engine and boiler were supported on a single driving-wheel in front of the wagon. The two parts were united by a movable pin. A toothed quadrant, fixed on the framing of the fore part, was actuated by spur gearing on the upright steersman's shaft in close proximity to the seat, by means of which the conductor could cause the carriage to turn in either direction, at an angle of from fifteen to twenty degrees. In front was a round copper boiler, having a furnace inside, two small chimneys, two single-acting brass cylinders communicating with the boiler by the steam pipe, and other machinery. On each side of the driving-wheel, ratchet wheels were fixed, and as one of the pistons descended, the piston-rod drew a crank, the pawl of which, working into the ratchet-wheel, caused the driving-wheel to make a quarter of a revolution. By gearing, the same movement placed the piston on the other side in a position for making a stroke, and turned the four-way cock, so as to open the second cylinder to the steam and the first cylinder to the atmosphere. The second piston then descended, causing the leading wheel to make another quarter of a revolution, and restoring the first piston to its original position. In order to run the vehicle backwards, the pawl was made to act on the upper side, changing the position of the spring which pressed upon it; then, when the engine was started, the pawl caused the driving-wheel to turn a quarter of a revolution in the opposite direction with every stroke of the piston.

This machine was first tried in 1770 in the presence of a distinguished assembly, that included the Duc de Choiseul; General Gribeauval, First Inspector-General of Artillery; the Compte de Saxe, and others. Subsequently, other trials of it were made, with satisfactory results generally. The heavy over-balancing weight of the engine and boiler in front rendered it difficult to control. On one of its trips it ran into a wall in turning a corner and was partly wrecked. Further experiments with it were abandoned, and in 1800 it was deposited in the Conservatoire des Arts et Metier, Paris, where it still remains.

At a later period of his life, having lost his means of support, Cugnot's public services were considered to entitle him to a reward from the State. Louis Fifteenth gave him a pension of six hundred livres, but the French Revolution coming on, he was deprived even of that pittance, and he lived in abject misery in Brussels. His carriage was then in the arsenal, and a revolutionary committee, during the reign of terror, tried to take it out and reduce it to scrap, but was driven off. When Napoleon came to the throne, he restored the pension and increased it to one thousand livres. In addition to his inventions, Cugnot wrote several works on military art and fortification.

William Murdock

Born in Bellow Mill, near Old Cumnock, Ayrshire, Scotland, August 21, 1754. Died at Sycamore Hill, November 15, 1839.

Murdock was the son of John Murdoch, a millwright. He was modestly educated, and brought up to his father's trade, helping to build and put up mill machinery. A curious production of the father and son, at this period, was a wooden horse, worked by mechanical power, on which young Murdock traveled about the country. When he was twenty-three years of age he entered the employment of the famous engineering firm of Boulton & Watt, at Soho, and there remained throughout his active life.

Watt recognized in him a valuable assistant, and his services were jealously regarded. On his part he devoted himself unreservedly to the interests of his employers. In 1777 he was sent to Cornwall to look after the pumps and engines set up by the firm in the mines, and for a long period he lived at Redruth. For some five years after 1800 he was engineer and superintendent at the Soho foundry. While living at Redruth, in 1792, he began a series of experiments on the illuminating properties of

the gases of coal, wood, peat, and other substances, and in 1799 put up a gas-making apparatus at Soho. In 1803 he fitted the Soho factory with a gas-lighting system. Other inventions that are credited to him are models for an oscillating engine and a rotary engine, a method of making steam pipes, an apparatus for utilizing the force of compressed air, and a steam gun.

His early training and all his surroundings naturally and inevitably interested Murdock in the subject of steam locomotion, and before 1784 he began to experiment on these lines. That he made definite progress is shown in a letter that Thomas Wilson, agent in Cornwall of Boulton & Watt, wrote to his employers in August, 1786, saying, "William Murdock desires me to inform you that he has made a small engine of three-quarter-inch diameter and one and one-half inch stroke, that he has applied to a small carriage, which answers amazingly." He had made and run this model in 1784, and it is still in existence, and in the possession of the Messrs. Richard and George Tangye, England.

This model was on the high-pressure principle, and ran on three wheels, the single front one for steering. The vertical boiler, nearly over the rear axle, was heated by a spirit-lamp, and the machine stood only a little more than a foot high. The axle was cranked in the middle and turned by a rod connected to a beam moved up and down by the piston-rod projecting from the top of the cylinder. Yet it developed considerable speed. It is interesting to note that the use of the crank for converting the reciprocating motion of the steam engine into rotary was patented by Pickard in 1780, and Murdock's was probably its first application to self-propelled carriages.

The first experiment with this little engine was made in Murdock's house at Redruth, when the locomotive successfully hauled a wagon round the room, the single wheel, placed in front of the engine, fixed in such a position as to enable it to run round a circle.

Dr. Smiles, in his work on inventors, tells an amusing story concerning this machine. He says: "Another experiment was made out of doors, on which occasion, small though the engine was, it fairly outran the speed of its inventor. One night, after returning from his duties at the mine at Redruth, Murdock went with his model locomotive to the avenue leading to the church, about a mile from the town. The walk was narrow, straight and level. Having lit the lamp, the water soon boiled, and off started the engine with the inventor after it. Shortly after he heard distant shouts of terror. It was too dark to perceive objects, but he found, on following up the machine, that the cries had proceeded from the worthy vicar, who, while going along the walk, had met the hissing and fiery little monster, which he declared he took to be the Evil One in propria persona!"

But Murdock was too useful a man to Boulton & Watt to be allowed to have free rein, and his inclination toward steam locomotion invention was apparently curbed, though it would appear Watt thought the roads of that time an insurmountable obstacle to the development of road vehicles, and wanted Murdock to devote his time to mechanical matters more ripe for success. Boulton, writing to Watt from Truro, in September, 1796, tells how he met Murdock on his way to London to get a patent on a new model, and how he persuaded him to turn back. This model was for a steam carriage that was afterward shown as able to travel freely around a room with a light load of shovel, poker and tongs upon it. His was probably the first high-pressure steam-engine vehicle run in England. Though only a small model, it did its proportionate work well.

Watt continued to oppose Murdock's scheme, but on one occasion suggested that he should be allowed an advance of five hundred dollars to enable him to prosecute his experiments, and if he succeeded within a year in making an engine capable of drawing a post chaise, carrying two passengers and the driver, at four miles an hour, it was suggested that he should be taken as partner into the locomotive business, for which Boulton and Watt were to provide the necessary capital. This proposition was never carried out. Again, in 1786, Watt said: "I wish William could be brought to do as we do, to mind the business in hand, and let such as Symington and Sadler throw away their time and money in hunting shadows." Murdock continued to speculate about steam locomotion on common roads, but never carried his ideas further. He retired from the employment of Boulton & Watt in 1830, and practically retired from all work at the same time.

Murdock seems to have had a very clear idea of the possibilities of steam propulsion on the common roads. Had circumstances permitted he might well have been expected to have solved the problem in 1796 quite as completely as his successors did in 1835. But he was a quarter of a century ahead of the time. Even the moderate public interest that existed later on had not manifested itself at all in his day and the condition of the English highways offered almost insuperable obstacles to steam vehicular travel. Personally his lack of self-assertiveness and his feeling of dependence upon Boulton and Watt also held him back. So he remained simply one of the pioneer investigators pointing the way for others.

Oliver Evans

Born in 1755 or 1756, in Newport, Del. Died in Philadelphia, April 21, 1819.

Little has been preserved respecting the early history of Oliver Evans, who has been aptly styled "The Watt of America." His parents were farming people, and he had only an ordinary common-school education. At the age of fourteen he was apprenticed to a wheelwright or wagonmaker, and continued his meager education by studying at night time by the light that he made by burning chips and shavings in the fireplace.

While yet an apprentice his attention was turned to the subject of propelling land carriages without animal power. But the lack of definite knowledge in regard to steam power compelled him to abandon his plans, although his experiments were continued for a long time. Soon after attaining his majority he was engaged in making card-teeth by hand, and in connection therewith developed several labor-saving improvements. He also invented improvements in the construction of machinery of flour mills that effected a complete revolution in the manufacture of flour. These improvements consisted of the elevator, the conveyor, the hopper-boy, the drill and the descender, which various machines were applied in different mills so as to perform mechanically every necessary movement of the grain and meal from one part of the mill to the other, causing a saving of fully one-half in the labor of mill attendance and manufacturing the flour better. These improvements were not accepted by the mill owners at the outset, and Evans spent many discouraging years before he could finally persuade the manufacturers of the utility of his inventions. In the end, however, he lived to see his inventions generally introduced, and he profited largely thereby.

In the year 1786, Evans petitioned the Legislature of Pennsylvania for the exclusive right to use his improvements in flour mills and steam carriages in that State, and in the year following presented a similar petition to the Legislature of Maryland. In the former instance he was only successful so far as to obtain the privilege of the mill improvements, his representations concerning steam carriages being considered as savoring too much of insanity to deserve notice. He was more fortunate in Maryland, for, although the steam project was laughed at, yet one of his friends, a member, very judiciously observed that the grant could injure no one, for he did not think that any man in the world had thought of such a thing before, and therefore he wished the encouragement might be afforded, as there was a prospect that it would produce something useful. This kind of argument had its effect, and Evans received all that he asked for, and from that period considered himself bound in honor to the State of Maryland to produce a steam carriage, as soon as his means would allow him.

For several years succeeding the granting of his petition by the Legislature of Maryland, Evans endeavored to obtain some person of pecuniary resources to join with him in his plans; and for this purpose explained his views by drafts, and otherwise, to some of the first mechanics in the country. Although the persons addressed appeared, in several instances, to understand them, they declined any assistance from a fear of the expense and difficulty of their execution.

In the year 1800, or 1801, Evans, never having found anyone willing to contribute to the expense, or even to encourage him in his efforts, determined to construct a steam carriage at his own expense. Previous to commencing he explained his views to Robert Patterson, Professor of

Mathematics in the University of Pennsylvania, and to an eminent English engineer. They both declared the principles new to them, and advised the plan as highly worthy of a fair experiment. They were the only persons who had any confidence, or afforded encouraging advice. He also communicated his plans to B. F. Latrobe, the scientist, who publicly pronounced them as chimerical, and attempted to demonstrate the absurdity of Evans' principles in his report to the Philosophical Society of Pennsylvania on steam engines. In this he also endeavored to show the impossibility of making steamboats useful.

Evans commenced and had made considerable progress in the construction of a steam carriage, when the idea occurred to him that as his steam engine was altogether different in form, as well as in principle, from any other in use, a patent could be obtained for it, and then applied to mills more profitably than to carriages. The steam carriage was accordingly laid aside for a season of more leisure, and the construction of a small engine was commenced, with a cylinder six inches in diameter and a piston of eighteen inches stroke, for a mill to grind plaster of paris. The expense of its construction far exceeded Evans' calculation, and before the engine was finished he found it cost him all he was worth. He had then to begin the world anew, at the age of forty-eight, with a large family to support, and that, too, with a knowledge that if the trial failed his credit would be entirely ruined, and his prospects for the remainder of life dark and gloomy. But fortune favored him, and his success was complete.

In a brief account, given by himself, of his experiments in steam, he says: "I could break and grind three hundred bushels of plaster of paris, or twelve tons, in twenty-four hours; and to show its operations more fully to the public, I applied it to saw stone, on the side of Market Street, where the driving of twelve saws in heavy frames, sawing at the rate of one hundred feet of marble in twelve hours, made a great show and excited much attention. I thought this was sufficient to convince the thousands of spectators of the utility of my discovery, but I frequently heard them inquire if the power could be applied to saw timber as well as stone, to grind grain, propel boats, etc., and though I answered in the affirmative, they still doubted. I therefore determined to apply my engine to all new uses; to introduce it and them to the public. This experiment completely tested the correctness of my principles. The power of my engine rises in a geometrical proportion, while the consumption of the fuel has only an arithmetical ratio; in such proportion that every time I added one-fourth more to the consumption of the fuel, its powers were doubled; and that twice the quantity of fuel required to drive one saw, would drive sixteen saws at least; for when I drove two saws the consumption was eight bushels of coal in twelve hours, but when twelve saws were driven, the consumption was not more than ten bushels, so that the more we resist the steam, the greater is the effect of the engine. On these principles very light but powerful engines can be made suitable for propelling boats and land carriages without the great encumbrance of their weight as mentioned in Latrobe's demonstration."

In the year 1840, Evans, by order of the Board of Health of Philadelphia, constructed at his works, situated a mile and a half from the water, a machine for cleaning docks. It consisted of a large flat or scow, with a steam engine of five horse-power on board, to work the machinery to raise the mud into the scows. This was considered a fine opportunity to show the public that his engine could propel both land and water conveyances. When the machine was finished, he fixed, in a rough and temporary manner, wheels with wooden axletrees, and, of course, under the influence of great friction. Although the whole weight was equal to two hundred barrels of flour, yet his small engine propelled it up Market Street and round the circle to the waterworks, where it was launched into the Schuylkill River. A paddle-wheel was then applied to its stern, and it thus moved down that river to the Delaware, a distance of sixteen miles, leaving behind all vessels that were under sail.

This demonstration was in the presence of thousands of spectators, which he supposed would have convinced them of the practicability of steamboats and steam carriages. But no allowance was made by the public for the disproportion of the engine to its load, nor for the rough manner in which the machinery was fixed, or the great friction and ill form of the boat, and it was supposed that this was the utmost it could perform. Some individuals undertook to ridicule the experiment of driving so

great a weight on land, because the motion was too slow to be useful. The inventor silenced them by answering that he would make a carriage propelled by steam, for a wager of three thousand dollars, to run upon a level road, against the swiftest horse that could be produced. This machine Evans named the Oructor Amphibolis.

On the 25th of September, 1804, Evans submitted to the consideration of the Lancaster Turnpike Company a statement of the costs and profits of a steam carriage to carry one hundred barrels of flour, fifty miles in twenty-four hours; tending to show that one such steam carriage would make more net profits than ten wagons, drawn by five horses each, on a good turnpike road, and offering to build one at a very low price. His address closed as follows: "It is too much for an individual to put in operation every improvement which he may invent. I have no doubt but that my engines will propel boats against the current of the Mississippi, and wagons on turnpike roads, with great profit. I now call upon those whose interest it is to carry this invention into effect. All of which is respectfully submitted to your consideration." Little or no attention was paid to this offer, for it was difficult at that day to interest anyone in steam locomotion.

Evans' interest in the steam carriage forthwith ceased, but in his writings, published about that time, he remarked: "The time will come when people will travel in stages moved by steam engines from one city to another, almost as fast as birds fly, fifteen or twenty miles an hour. Passing through the air with such velocity, changing the scene in such rapid succession, will be the most rapid exhilarating exercise. A carriage (steam) will set out from Washington in the morning, the passengers will breakfast at Baltimore, dine at Philadelphia, and sup at New York in the same day." To accomplish this he suggested railways of wood or iron, or smooth paths of broken stone or gravel, and predicted that engines would soon drive boats ten or twelve miles an hour. In the latter years of his life, Evans established a large iron foundry in Philadelphia.

Although Evans' distinct contribution to the problem of steam locomotion on the common roads was not particularly practical it was at least important as being the first suggestion of anything of the kind in the United States. Road conditions in this country at that time were worse than they were in England and yet under more discouraging circumstances he was as far advanced in ideas and plans as his great contemporaries, Trevithick and others across the water. To Evans must be given the credit of perfecting the high-pressure, non-condensing engine, and even Trevithick, "the father of the locomotive," was largely indebted to him for his progress in the lines he was working on in England, his plans and specifications having been sent abroad for the English engineers to inspect in 1784.

William Symington

Born at Leadhills, Scotland, October, 1783. Died in London, March 22, 1831.

More fortunate than most of the English inventors of the seventeenth and eighteenth centuries, with whom he was associated, William Symington came of a family that was able to give him a good education. His father was a mechanic who had charge of the engines and machinery at the Warlockhead lead mines, and the son gained his first knowledge of mechanics and engineering in the shops with his father. Intended for the ministry, he was sent to the University of Glasgow and the University of Dublin to pursue his studies. But the ministry had slight attractions for him, and when the time came for him to choose a profession, he adopted that of civil engineering.

In 1786 he worked out a model for a steam road-car. This was regarded very highly by all who saw it. It is said that Mr. Meason, manager of the lead mines at Warlockhead, was so pleased with the model, the merit of which principally belonged to young Symington, that he sent him into Edinburgh for the purpose of exhibiting it before the professors of the University, and other scientific gentlemen of the city, in the hope that it might lead in some way to his future advancement in life. Mr. Meason became the patron and friend of Symington, allowed the model to be exhibited at his own house, and invited many persons of distinction to inspect it. The carriage supported on four wheels had a

locomotive behind, the front wheels being arranged with steering-gear. A cylindrical boiler was used for generating steam, which communicated by a steam-pipe with the two horizontal cylinders, one on each side of the firebox of the boiler. When steam was turned into the cylinder, the piston made an outward stroke; a vacuum was then formed, the steam being condensed in a cold water tank placed beneath the cylinders, and the piston was forced back by the pressure of the atmosphere. The piston rods communicated their motion to the driving-axle and wheels through rack rods, which worked toothed wheels placed on the hind axle on both sides of the engine, and the alternate action of the rack rods upon the tooth and ratchet wheels, with which the drums were provided, produced the rotary motion. The boiler was fitted with a lever and weight safety valve. Symington's locomotive was abandoned, the inventor considering that the scheme of steam travel on the common roads was impracticable.

Henceforth, Symington gave his attention to the study of boat propulsion by steam. In 1787 he got out a patent for an improved form of steam engine, in which he obtained rotary action by chains and ratchet-wheels. This engine, with a four-inch cylinder, was used to work the paddles of a pleasure boat on Dalswinton Loch, in 1788, the boat steaming at the rate of five miles an hour. This boat is now in the South Kensington Museum, and it has been termed "the parent engine of steam navigation." The experiment with this method of boat propulsion was so successful that a year later larger engines, with eighteen-inch cylinders, were fitted to another boat, which attained a speed of seven miles an hour. In 1801, Symington took out a patent for an engine with a piston rod guided by rollers in a straight path and connected by a rod with a crank attached directly to the paddle-wheel shaft—the system that has been in use ever since. Although the perfect practicability of this method of boat propulsion was fully demonstrated by a trial on the tugboat Charlotte Dundas, in March, 1802, the plan for steam power on canals and lakes was not carried further. The Forth and Clyde Company, and the Duke of Bridgewater, who were backing Symington, gave up the project and he could get help from no other sources. His inventions and experiments are generally regarded as marking the beginning of steam navigation. It is interesting to note that among those who were guests on the Charlotte Dundas, on the occasion of this trial trip, was Robert Fulton, who wrote a treatise on steam navigation in 1793, tried a small steamboat on the river Seine, in France, in 1803, and in 1807 launched his famous steamship, the Clermont, on the Hudson River.

Symington, disappointed and discouraged, gave up his work and went to London. The rest of his life was for the most part thrown away, and he became one of the waifs and strays of London. In 1825 he received a grant of one hundred pounds from the privy purse, and later on fifty pounds more, in recognition of his services for steam navigation. He died in obscurity and although he was unquestionably the pioneer in his country of the successful application of steam to navigation on inland waters his name is only a bare memory.

Nathan Read

Born in Warren, Mass., July 2, 1759. Died near Belfast, Me., January 20, 1849.

Graduated from Harvard College in 1781, Read was a tutor at Harvard for four years. In 1788 he began experimenting to discover some way of utilizing the steam engine for propelling boats and carriages. His efforts were mainly directed toward devising lighter, more compact machinery than then generally in use. His greatest invention at that time was a substitute for the large working-beam. This was a cross-head beam which ran in guides and had a connecting-rod with which motion was communicated. The new cylinder that he invented to attach to this working-frame was double-acting. In order to make the boiler more portable he invented a multi-tubular form, and this he patented, together with the cylinder, chain-wheel, and other appliances.

The boiler was cylindrical and was placed upright or horizontal, and the furnace was carried within it. A double cylinder formed a water-jacket, connected with a water and steam chamber above,

and a water-chamber below. Numerous small straight tubes connected these two chambers. Read also invented another boiler in which the fire went through small spiral tubes, very much as it does in the present-day locomotives, and this was a smoke-consuming engine. For the purpose of acquiring motion he first used paddle-wheels, but afterward adopted a chain-wheel of his own invention.

Конец ознакомительного фрагмента.