TIMELINE OF MOTORCYCLING

Volume One

From Year Zero to 1899

Compiled by Dave Richmond

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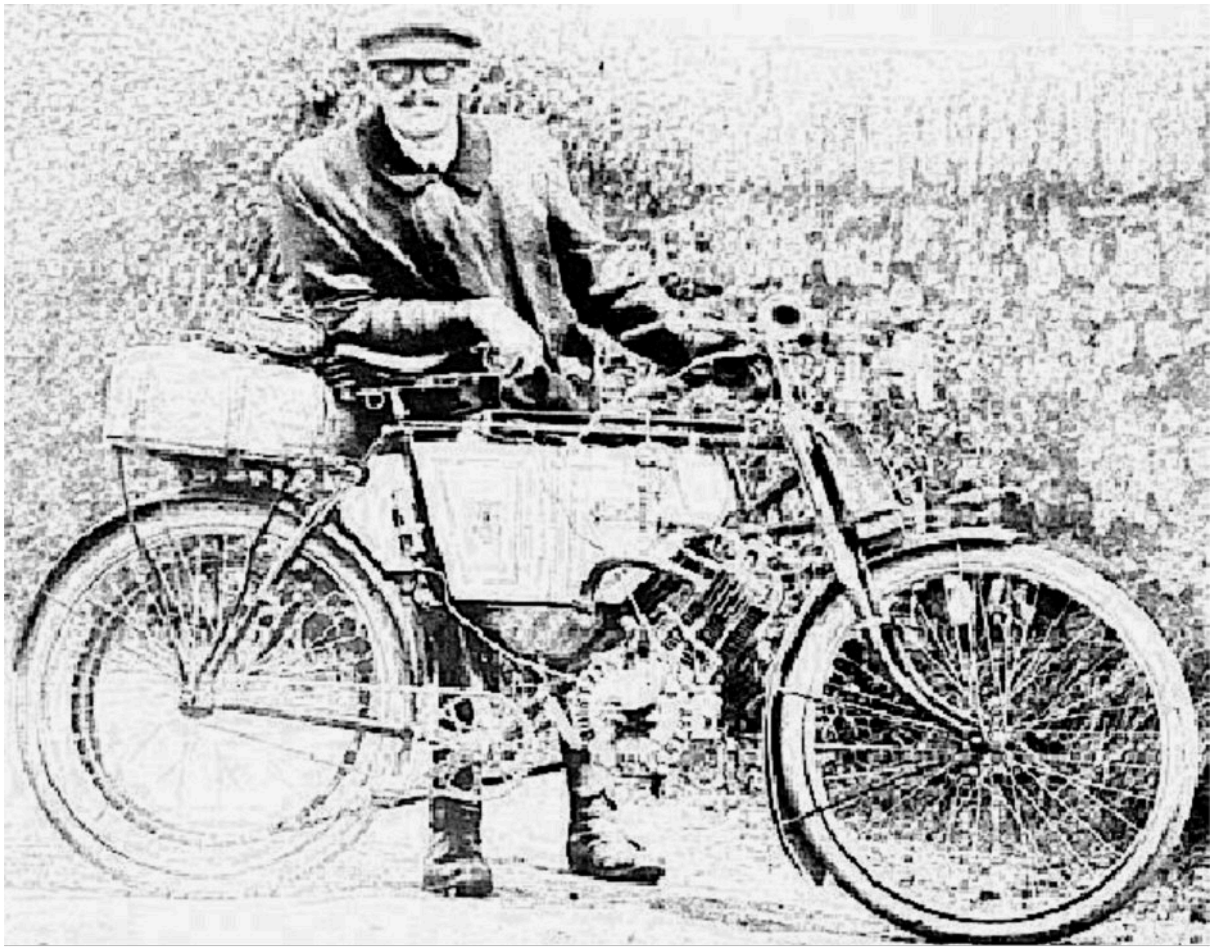
motorcycletimeline.com



A TIMELINE OF MOTOR CYCLING

From Big Bang to suck-squeeze-bang-blow and beyond…

MOTORCYCLING IS A MAGNIFICENT OBSESSION. I was bitten by the motor cycling bug at 16 and it has dominated many of my waking and some of my sleeping hours ever since. This website will not delve into the psychology of motor cycling. Nor will it seek to explain the obsession. It's simply an attempt to to review the story of the motor cycle from the start.

Most histories date that start to 1885 when a petrol powered two-wheeler (with stabilizer wheels to make it rideable but let's not quibble) was ridden, in Germany, by a brave teenager. But steam-powered two-wheelers were ridden in France and the USA nearly 20 years before. They could not have been made without a range of materials, techniques and the people to develop them. From that perspective the motor cycle story started a couple of hundred thousand years after the Big Bang, so that's where this timeline starts. It will end when I'm no longer capable of adding to it.

A note on the menu: The ***Timeline*** is reasonably complete and illustrated from the Big Bang to 1932 although more stories surface all the time so it's in a constant starte of

flux. A fair amount of text is in place up to the late 1930s with pics to follow and a few entries have been made for the fifties and sixties (because it's the year I got my first bike I've got ahead of myself and have covered 1969 in some detail). Features, from touring tales and whimsical fiction to TT, six-day trials and show reports are attached to the relevant years. ***Poetry*** (much better than it sounds). No, really, don't miss 'Mount Pleasant' and ***Artwork/Humour*** have their own pages (Cartoons/Humour has expanded to include some lovely old motor cycle badges and assorted illustrations). There's a large and growing ***A-Z Gallimaufry*** of biographies, marque histories forgotten slang and anything else that doesn't fit in elsewhere. In the ***Illustrative Melange (and the overflow 'melange' page)*** you'll find a large and growing gallery of images which didn't fit neatly into the main timeline. Think of it as a box of old photos discovered in an attic…fading images of long-dead motor cyclists, their families, their bikes—rummage to your heart's content. There's a wonderful collection of Great War images and loads of ancient Yankee bikes. Don't miss ***Tales from The Motor Cycle***, a fabulous history of motor cycling's early days by Ixion—well worth reading for his style as well as his unique grasp of motor cycling history. While readers' letters to the Blue 'Un and Green 'Un feature throughout the timeline I couldn't resist lumping some of the best under the imaginative heading ***Letters to the Editor***. Many, indeed most, of the pics in the Melange were supplied by my French chum Francois, who is a regular contributor the the Leicester Phoenix MCC's site lpmcc.net (one of my favourite sites and a must for anyone with a yen for touring and rallies). These contributions include ***Images of Yesteryear***, a wonderful series of themed photo-essays which Francois and lpmcc editor Ben kindly allowed me to reproduce here. Where would I be without mates? My Aussie chum Murray, whose site A-Z of Motorcycles is an unending source of delight, has produced timelines featuring many of the greatest bikes of all time. Like Francois he's allowed me to include them here as ***Murray's Timelines*** where you'll also find a link to his A-Z and, more recently, a six-volume 1,000-page 'flip book' which offers an astonishing cornucopia of Auusie motor cycling history, club characters, yarns of pioneering rides through the bush, reviews of restored bikes and…for goodness sake go ind out for yourself'. You're in for a treat. Unless you don't really like motorbikes, in which case why have you bothered to read this far?

A note on language: Spelling, punctuation and usage changes over time. In the early 20th century handlebars were handle-bars, motorcycles were motor cycles (or motor bicycles or just bicycles), carburettors were carburetters, the ACU was the A.C.U. (née A.C.C.) and motor cycle magazines were sprinkled with latin and french. As far as house style goes, I'm making it up as I go along. The use of English has changed over the decades, the obsession has not, and that's what counts. I'm British, as are most of my motor cycles, and much of the source material. If this has led to an Anglocentric bias (and let it be admitted that these islands have had an extraordinary influence on the history of the motor cycle) the rest of the planet certainly hasn't been ignored. As the

story draws nearer to the present the emphasis of the timeline will, of course, reflect the decline of the British industry and the rise of what were once called the Axis powers and latterly the Far East (there's that Anglocentricsm again. I wonder if enthusiasts in that part of the world refer to Europe as the Far West?).

An apology: Motor cycling…it's a big story. What am I saying, it's an impossibly huge story. With that in mind, the typography on this website would make a comp wince and design has cheerfully been abandoned in favour of content. Informed readers will, no doubt, find factual errors as well as typos and, no doubt, prejudices. I fear, to quote Douglas Adams, "it has many omissions and contains much that is apocryphal, or at least wildly inaccurate". Corrections, coments and material for additions are welcomed via **motorcycletimeline@gmail.com**. In conclusion, an apology for the lack of an index. Identifying themes and patterns is a temptation for any obsessive but that is not the role of this timeline. I think of it as a warehouse which I will never be able to fill (but there's a word-search function if you really must follow themes).

There's a blog on the site where you'll find updates on the latest posts. Enjoy.

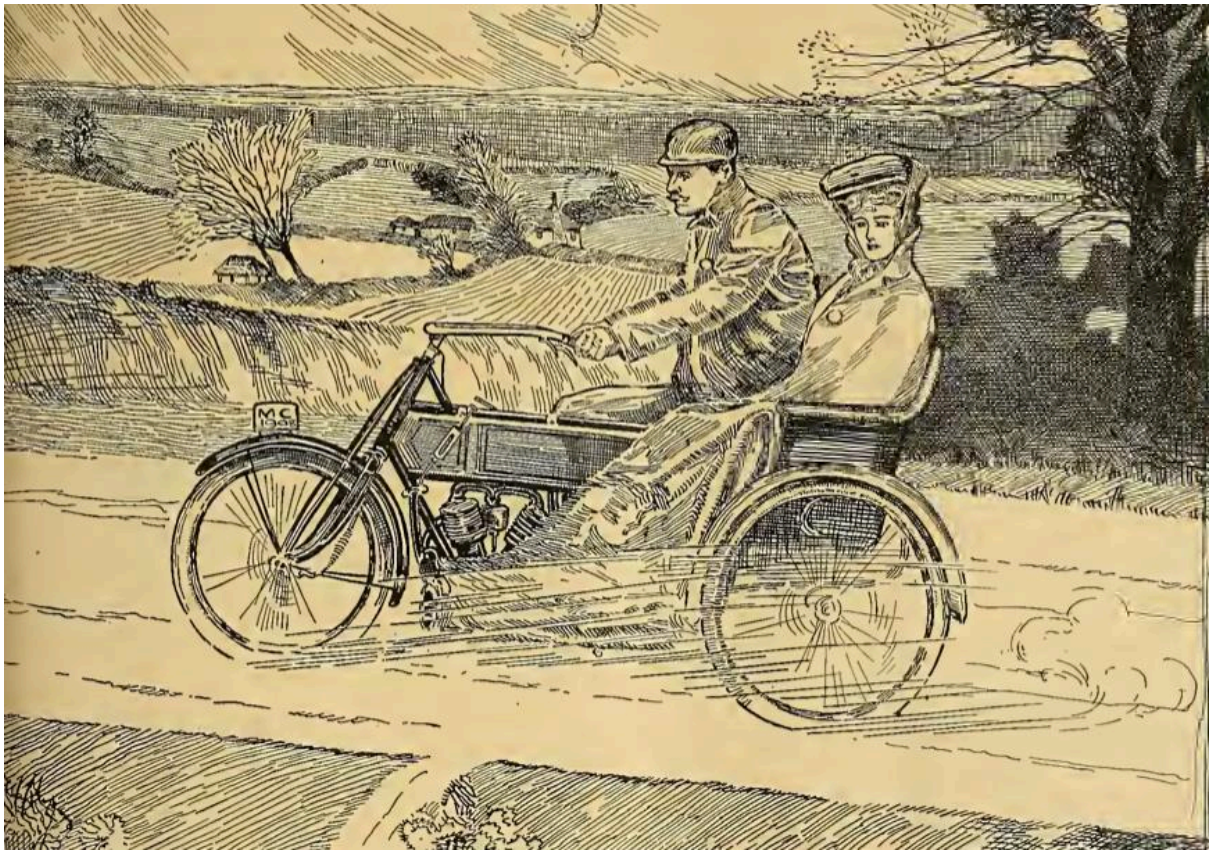
Dave Richmond
Isle of Wight, May 2023

PS

This poem, which dates from 1910, says it all.

Would you like to go a-touring in a manner most alluring,
Here and there,
And employ your well-earned leisure in obtaining health and pleasure
Everywhere?
Would you care to go a-flitting, on your saddle calmly sitting
At your ease,
Through the lively crowded highways or the lovely leafy byways
As you please?
Would you like to ride serenely, and enjoy the motion keenly
Of your steed,
Over hills and crests and ridges, under aqueducts and bridges
At full speed?
If you would, try motor biking; 'twill be greatly to your liking.
'Twill indeed!
There's no sport that's more beguiling when the sun is softly smiling,
Or ablaze,
For its joys are keen and many, and within the reach of any
Nowadays.
Therefore, if you've never tried it, buy a motor bike and ride it,

We advise,
And your voice you'll soon be raising, and the pastime loudly praising
To the skies
(A word is quite sufficient to the wise.)



"Would you like to go a-touring in a manner most alluring, Here and there?"

Contact Me

IF YOU FEEL LIKE COMMENTING on the timeline feel free to get in touch. The sheer scale of this project ensures a multitude of typos, omissions and mistakes. If you spot any please do let me know. Most of all, if you would like to add to the timeline…yes please! At the time of writing (February 2021) the timeline is reasonably complete up to 1924 but any facts, yarns, gossip and/or images from those years will be gratefully received. There is some text for later years but I've barely scratched the surface and it's woefully incomplete. I'm adding to the timeline as fast as I can but it will be a lifetime's work. So if you have access to contemporary sources for any year up to and including 2021 I'd like to hear from you. Naturally all contributions will be acknowledged.

As you'll have seen this timeline includes a good number of features including touring yarns and the like. If any veteran riders out there would like to send in reminiscences, particularly if you have pictures, there's a home for them in the timeline.

The gallimaufry (isn't that a wonderful word?) is the place for potted histories, biographies of your favourite motor cycling hero, technical definitions, definitions of obscure motor cycing slang…you get the picture.

If lockdown is boring you, kill some time by contributing to the timeline. I'm setting up a picture gallery so your eyecatching snaps are welcome too.

The email address is: **motorcycletimeline@gmail.com**

I look forward to hearing from you.

Be well, and, of course, ride safe.

Dave

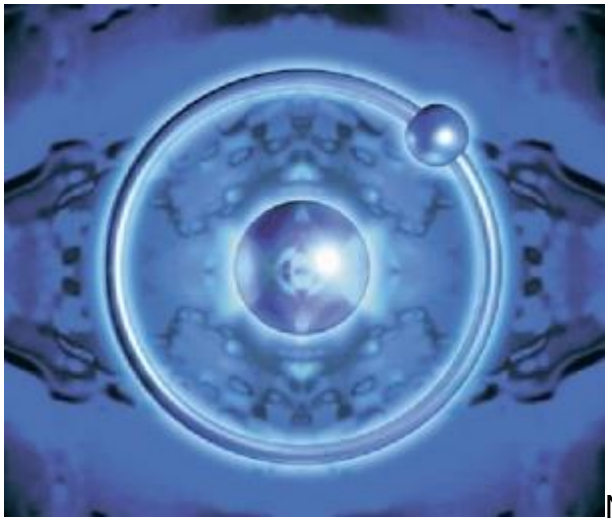
Big Bang-40BC

13,800,000,000 years ago

BIG **BANG!** After which nothing of interest to motor cyclists happened for the first 10 -36 seconds, at which point gravity separated from the other three fundamental forces (electromagnetism, weak nuclear and strong nuclear). Gravity is a Good Thing because it allows motor cycles to accelerate instead of floating about aimlessly. It also means it hurts when you fall off or drop a crankshaft on your foot, assuming you haven't evolved enough to wear steelies.

13,799,700,000ya

THE UNIVERSE calmed down enough (to 3,000° kelvin) for hydrogen and helium atoms to form. Again, a Good Thing. No hydrogen, no hydrocarbons. No hydrocarbons, no petrol, oil, plastic or, come to that, water for cooling Scotts, LE Velos and GT750 kettles.


No hydrogen, no hydrocarbons.

13,620,000,000ya

VAST CLOUDS of hydrogen coalesced into the first stars: fusion reactors that convert hydrogen into helium. so, for the first time, there was light, even if no-one said, "Let there be". Stars convert helium into carbon and oxygen which are essential for, among other things, petrol, welding and motor cyclists. Stars more than five times the size of ours also produce heavier elements like iron, nickel, chromium, aluminium and copper. When the biggest stars die they don't f-f-fade away, they explode as supernovae, blowing all those useful elements in all directions. As every hippy knows, "We're all made of star stuff, man," and so are our bikes. Or, as the late lamented Christopher Hitchens put it, we're all made of nuclear waste.

4,600,000,000ya

THE G2V STAR we call 'the sun', one of more than 100 million G2s in our galaxy, fired up. The Earth was among the planets formed from the leftover bits, giving us somewhere to

ride motor cycles as well as providing everything needed to build them. Matchless riders might appreciate the whimsy that they ride their G2s under the light of a G2.

Left: G2. Right: G2.

3,800,000,000ya

THE FIRST life appeared. Some forms of life would become the raw material for a range of fuels; other forms of life would invent, make and ride motorcycles. So life, clearly, is a Good Thing.

570,000,000ya

THE FIRST animals evolved but showed no inclination to build even the most primitive motorcycles. So, passing swiftly on,

220,000,000ya

MAMMALS APPEARED and this was clearly A Good Thing because mammals design, and indeed ride, motor cycles.

160,000,000ya

PLANTS AND animals that lived in the ocean died and sank to the bottom to be covered in mud, sand, and other mineral deposits. Their sacrifice gave us the hydrocarbons from which we get lubes and fuel, so let's be grateful.

3,600,000ya

HAIRY ANTHROPOIDS climbed down from the trees, made tools and left the forest to migrate across the open savannas in search of a Harley dealer.

From the left: Australopithecus dates back 3.6 million years; what more proof is needed that we evolved from protomotorcyclists? Homo Heidelbergensis dates back about 600,000 years and is riding Harleys. Neanderthal geezers were thriving until 40,000 years ago. I'm sure these pics were taken at a rally. The DNA record indicates they interbred with Homo Sapiens, and after a few beers, why not?

200,000ya

HOM SAP arrived on the scene with brains big enough to start the long climb from banging rocks together to building Beezas, Panthers and a range of lesser motor cycles, including Triumphs.

10,000BCE

OUR ANCESTORS took their time, but fermented beverages were being drunk by this time, as were the people who drank them. It's been suggested that beer might have preceded bread as a staple, which shows they had their priorities right. By the way, pigs were first domesticated about 9,000BCE but the first bread wasn't made until about 2,000BCE which is a bloody long wait for a bacon sandwich. And still no sign of brown sauce.

9,000BCE

FIRST USE of wrought, naturally occurring copper. Then someone noticed that when copper is hammered it gets harder.

5,000BCE

CLEVER CHAPS started building roads. They used stone to pave streets in Ur (in what is now Iraq); in a swamp in Glastonbury (in what is now Glastonbury) they used lumps of wood.

4,000BCE

COPPER WAS extracted from Malachite and Azurite. This was the birth of metallurgy which would be jolly useful when the time came to build motor cycles.

ALUMINIUMCOMPOUNDSwere used in Persia (Iran to you, sonny) to make stronger clay pots. In Egyptand Babylon they were used in fabric dyes and cosmetics. No-one sussed that these compounds could be refined into aluminium, but they had no bikes so it didn't matter.

3,500BCE

THEWHEELfirst rolled in Mesopotamia, a historical region of Western Asia between the rivers Tigris and Euphrates,starting a transport obsession that shows no sign of abating. Archaeologists reckon that wheels were used to turn pots for about 300 years before anyone got round to using them for chariots. The earliest known depiction of a wheeled vehicle (a four-axle wagon) on a clay pot excavated in southern Poland. Two-wheelers, as we know, came much later, proving that motor cycles are more evolved than cars.

By 3,500BCE those clever Sumerians were building three-part disc wheels with leather tyres.

WRITINGWASwrit in Sumer, paving the way for motorcycle handbooks, roadsigns and cafe menus.

GLASSWASproduced in Egyptand Mesopotamia, leading to bulbs and bike shop windows. Also, after 6,500 years, beer drinkers could have proper pint pots to replace their clapped out stone bowls.

3,000BCE

IRONTOOLSwere used in Egypt; in Syria and Turkey tin and copper were used to make bronze, as used on Rudge Ulster heads.

THEDISTILLATIONtechniquesdeveloped in China were just the ticket for extracting fuel, lubes and, praise be, Bushmill's Black Label.

2,800BCE

BUTTONSWEREinuse in India, keeping the draughts out of riding gear until zips came along.

2,500BCE

PAVEDROADSwerebuilt, in the Indus Valley, which would certainly have been A Good Thing had there been such a thing as the Indus Valley MCC. But, as far as is known, there wasn't.

2,300BCE

BABYLONIANSMADEmapson clay tablets which was all very well, but would they fit into your tank bag, that's the question.

2,000BCE

EARLIESTKNOWNuseofsteel, at a site in Anatolia. Nowadays this is Turkish territory but way back when it was home to Hittites, Lydians and Phrygians, none of whom showed the slightest interest in motor cycling. This might well be why they're no longer about.

1,100BCE

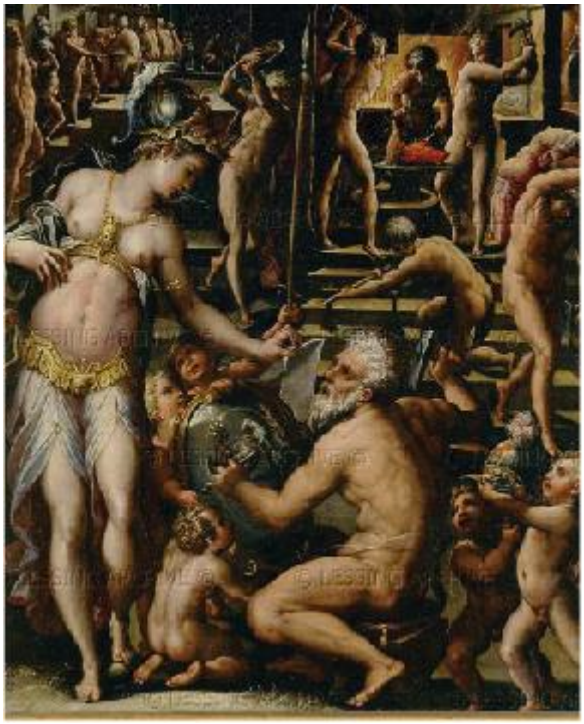
IRONWASbeing made in India, so they've had plenty of time to stockpile supplies. Some sensible chaps in Madras later put it to good use in RoyalEnfields.

SPOKEDWHEELSwerebeingused on chariots on the steppes to the east of the Ural River.

The Trundholm sun chariot, discovered in Denmark, is a 540mm-long cast bronze model that dates back to 1,100BC, just like the chariots used on the Steppes. It proves that spoked wheels were being used in Europe 3,000 years ago and it reminds us that metalworking skills go back a long, long way.

760BCE

HOMER'S ILLIAD includes a tale that Vulcan, blacksmith by appointment to the gods, knocked together 20 trikes in a single day "which, wondrous to tell, instinct with spirit rolled from place to place, around the blest abodes – self-moved, obedient to the beck of gods". Company vehicles for deities, there's a perk.

 Vulcan made 20 trikes in a day? Including all the paperwork involved in single vehicle type approval? Clearly a myth.

600BCE

HYDRAULICPOWERwasinuse in China, but not for motor cycle disc brakes. [With thanks to my old, and I do mean old, colleague Colin for spotting the typo—Ed.]

400BCE

CASTIRONwas in use in China, but not for motorcycle cylinder heads.

300BCE

'WOOTZ' STEELwasinvented in India.

260BCE

LEVERSWEREdescribedby Archimedes, though they were in use long before. They're put to a variety of uses in motor cycles; not least the levers that help us lock up our brakeswhen sufficiently alarmed.

200BCE

THEODOMETERwasinvented to measure mileage, (probably) by Archimedes, leading to the speedometer, which led in turn to speeding tickets.

100BCE

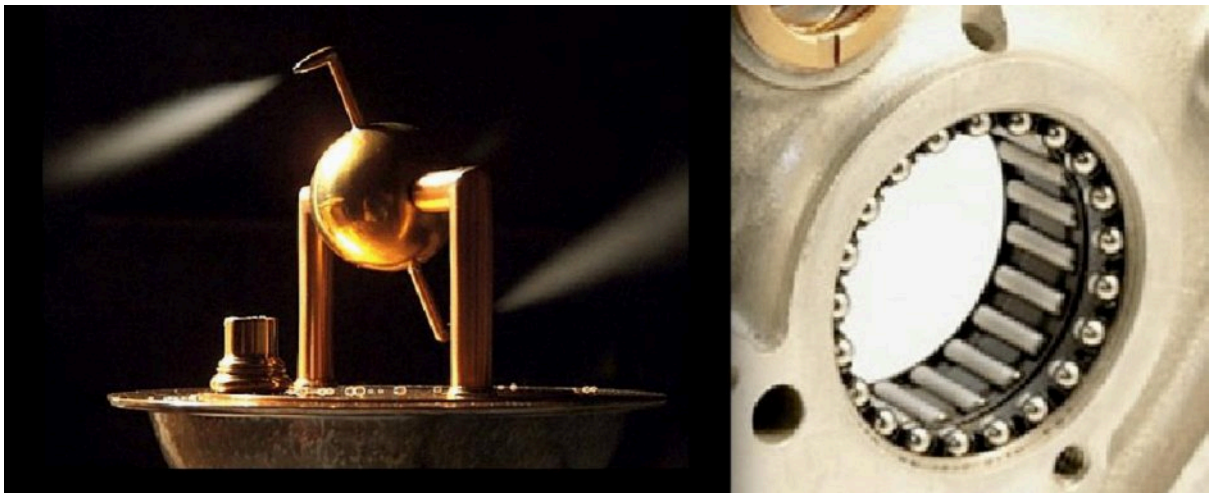
THEWHEELBARROWwasdeveloped by the Chinese as a secret weapon and is still the transport of last resort to get that wrecked bike home.

60BCE

HEROOF Alexandria described the aeolipile, a rotating ball spun by steam jets. It produced little power and had no practical application, but was the first device known to been moved by steam pressure. I once had a boss like that.

40BCE

ROLLERBEARINGS were in use by the Roman navy and it's a pity BSA didn't make more use of them for the mains of A10s although you can now get a conversion kit, which is either evolution in action, too little too late, or both.



As far as anyone knows, Hero's aelopile was the first device to move under steam pressure. A10s move more efficiently when fitted with roller main bearing.

40BC-1699

100AD

THETRIPHAMMER,powered by a water wheel, was in widespread use in China, setting a trend for the heavy machinery needed to put motorcycles into mass production.

THOSECLEVERChinesewere also making paper –just the job for handbooks, gaskets and air filters.

200AD

COMBINATIONLOCKSwereused in the Roman Empire, which must have made life tough for chariot thieves.

 This wouldn't have happened if he'd fitted a Thompson's lock.

350 AD

ARCHEOLOGICALevidenceis scanty, but there's a good chance that a water powered sawmill at Hieropolis (in what is now Turkey)featured a crank and conrod.

600AD

TOILETPAPERbecameavailable in China, by which time there must have been a hell of a queue at the lavatory. It is still much in demand after fast cornering on wet roads.

Sometimes riders have good reason to appreciate the invention of toilet paper.

800AD

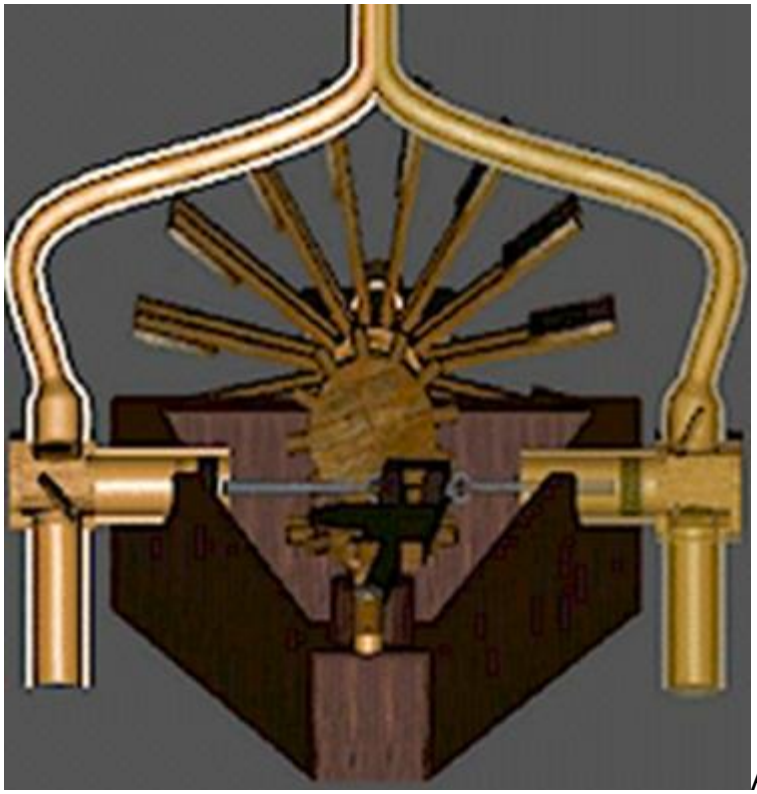
GUNPOWDERWASinvented in China although it was the Europeans who perfected its use for killing people. It was to play a surprising part in the evolution of the internal combustion engine.

THESTREETSofBaghdadwere paved with tar, which must have speeded up all those horses and camels no end.

 Baghdad's tarred roads allowed camels to hit their full potential, particularly the pretty ones.

1206

ISMAILAL-JAZARI,anengineer and mathematician who worked in Diyar-Bakir (in modern-day Turkey)described a pump which featured a piston, conrod and crankshaft to convert rotary motion into linear motion. Do it the other way and you have a reciprocating engine. Other clever chaps had previously made use of cranks in China and Byzantium but Al-Jazari also used wooden templates as patterns, ground in valves with an abrasive paste, understood static wheel balancing, made sandcast metal components and left accurate assembly instructions for 100 mechanical devices.


Al-Jazar's pump incorporated a crank and conrods.

1346

THE FIRST documented European use of gunpowder as a propellant, at the battle of Crecy. Why is this relevant to motorcycling history? Because guns rely on a rapidly expanding gas to propel an object along an accurately bored cylinder. And that process is at the heart of the petrol engines that propel motorcycles.

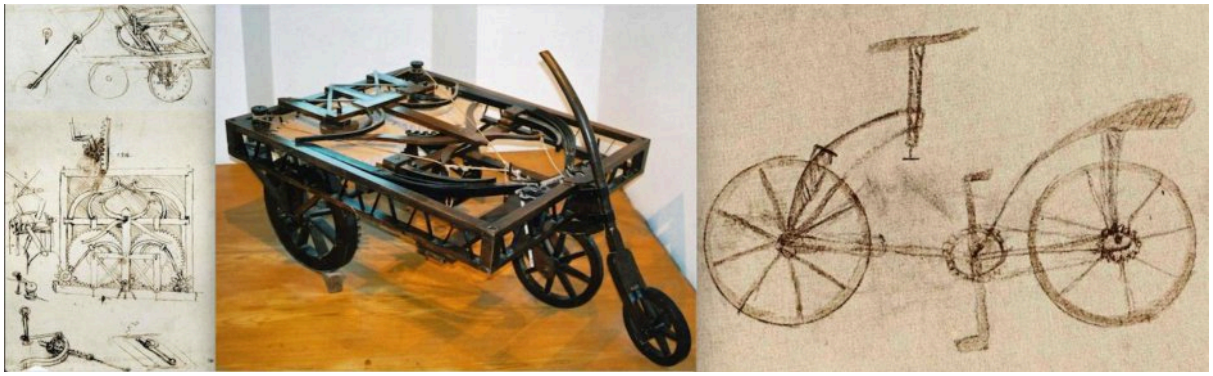
1419

Giovanni Fontana, a member of the Arts Faculty at Padua University, descrived a cart which was propelled by its driver pulling on a loop of rope running round a pulley geared to the rear wheels. A couple opf centuries later Johann Hautch of Nuremberg built some carriages to Fontana's design and word has it the system worked. Mind you, it sounds much harder than walking.

1478

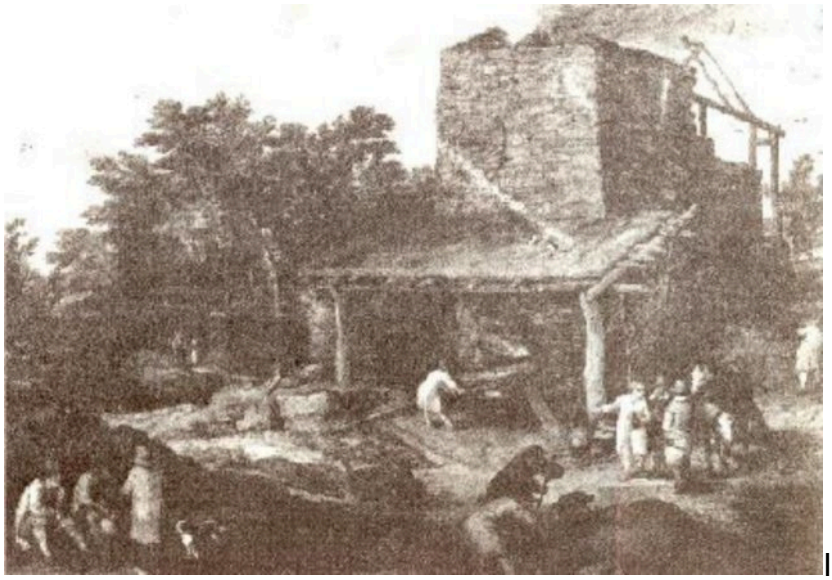
LEONARDO DA VINCI designed the first self-propelled vehicle in history. It was a 1.7×1.5m three-wheeler incorporating coiled springs that were wound up by revolving the wheels backwards, just like a kid's toy. To deliver power smoothly the design featured a balance wheel, as used in clocks. No seat was shown in the drawings; it seems the cart was designed as a spectacle to be used during festivals and it incorporated a control system using wooden pegs so it would follow a pre-programmed path. A mechanism similar to a differential allowed the turning angle to be pre-set. In

2004 the Museum of the History of Science in Florence, da Vinci's home town, built the cart to his design and it worked, albeit only for some 40m. In 1974 there was a lot of excitement, particularly in Italy, when a sketch of a bicycle, complete with pedals and drive belt, was discovered on the back of a sheet full of Leonardo's original sketches. A 16th century conservator had folded this sheet in half and glued it shut. Not because he wanted to rob us of the amazing bicycle, but because he found several doodles of phalluses on the back. The bicycle hadn't been there when the papers were examined in 1961, just before Italian monks started to restore them, so it seems one of the monks drew a bike among the willies [and that's not a sentence you see every day].



Da Vinci designed a self-propelled automated vehicles; 496 years later his home city's university proved it worked. Then there was excitement over the bicycle doodle, that looks like it was done by an eight-year-old. But the big question remains unanswered: who drew the willies?

IRON HAD been made in Britain since Roman times, but at about this time blast furnaces, using bellows to pump in air and increase the temperature, were first set up in the Kentish Weald. By the 18th century this technique spread across the country.



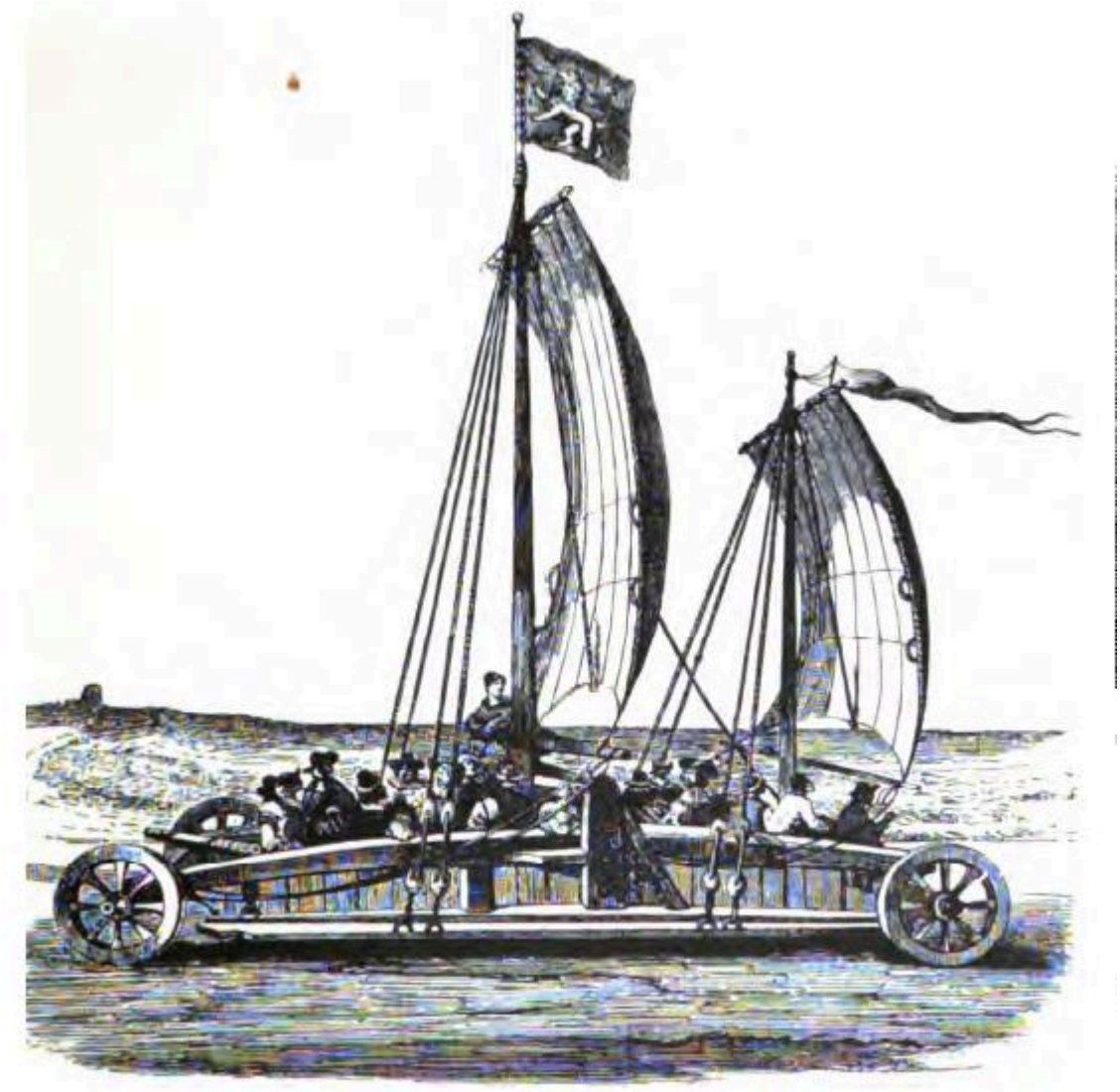
Iron production was improved by the use of bellows to create blast furnaces. This picture, Blast Furnace in the Woods, was painted by Jan Breugel in 1610.

1585

MASTERGUNNEREdwardWebbereported: “Whilst I was remaining prisoner in Turkey I myselfe was there constrained to make a cunning peece of fire work framed in form like to ye Arke of Noy, being 24 yardes high, and eight yardes broad, wherin was placed 40 men, drawen on 6 wheels, yet no man seene, but seemed to goe along, as though it were onely drawen by two Fiery Dragons, in which shew or Arke there were thirteene thousand severall peeces of fire worke.”

1600

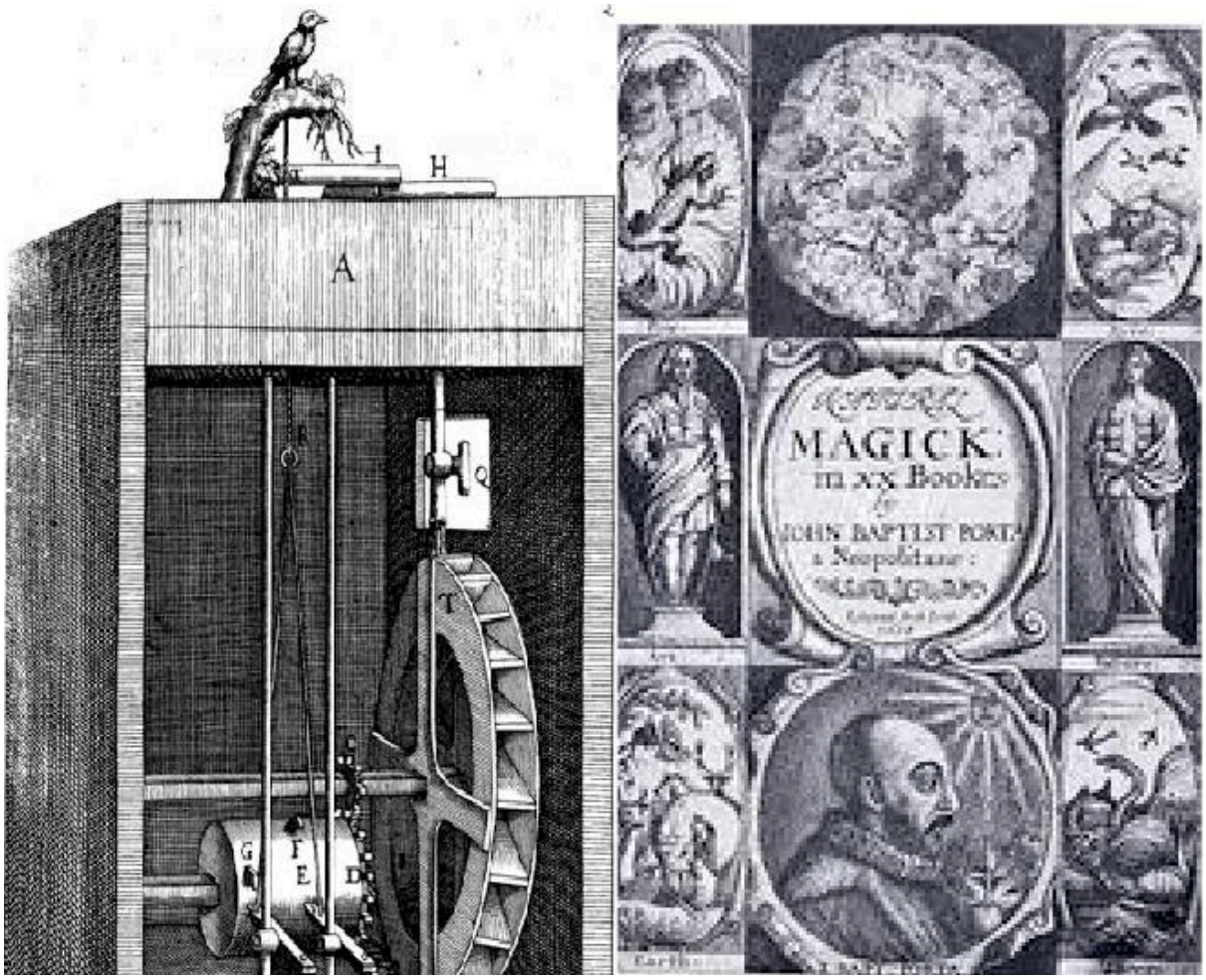
MATHEMETICIANSimonStevinbuilt two wind-powered carriages for Prince Morris of Nassau; the larger of them managed 42 miles in two hours while carrying 28 passengers. Assuming the prince (who steered it himself) had his family crest engraved on his toy, it’s nice to know there was a Morris on the road, or at least the beach, so long ago. The giant sand yacht is believed to have survived into the 19th century.



Stevin’s 28-seat PSVdid 20mph when the wind was right.

1601

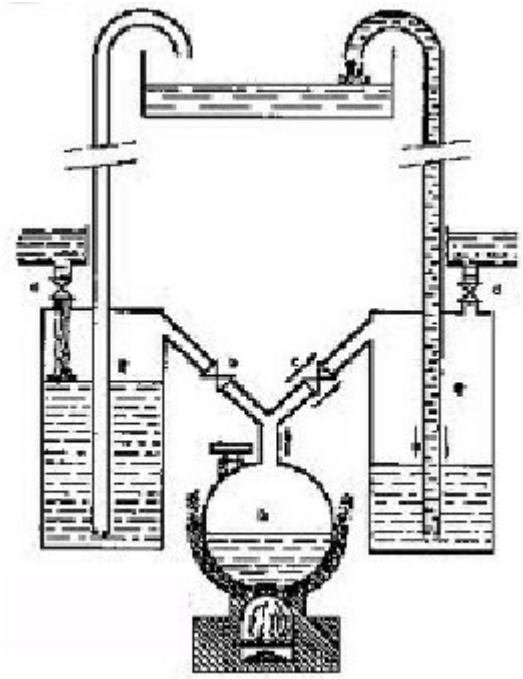
GIOVANNIBATTISTAdella Porta experimented with steam to create pressure or a vacuum. He was also a hydraulic engineer who delighted in making automata. They were toys, but their construction honed skills that he put to good use in early machinery. Being a man of his times della Porta wrote about everything from earthquakes and lightning to the appliance of magic—but he was one of the pioneers of the scientific approach which led to the Enlightenment, the Industrial Revolution and ultimately to motor cycles.



Della Porta was a polymath whose interests ranged from automata to ‘Magick’.

1606

SPANISHPOLYMATHJeronimode Ayanz y Beaumont patented a steam-powered system for pumping water out of deep mines. He also worked on a shipboard distillation plant to produce drinking water from seawater, a form of air conditioning to improve the atmosphere in mines, a diving bell and a submarine.



De Ayanz was removing water from mines a century before the Industrial Revolution started revolving.

1615

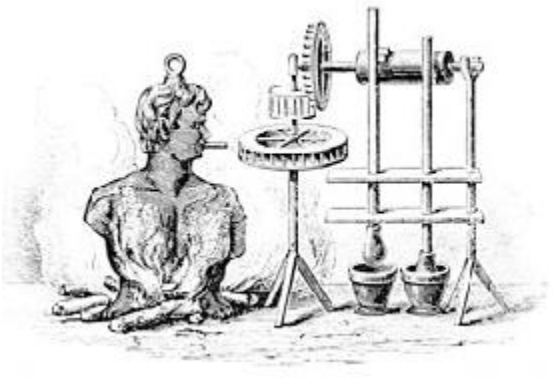
SALOMANDECAUS, who had been an engineer and architect under Louis XIII, published a book showing a device similar to della Porta's.

1625

JOHNMARSHALL petitioned for a patent for "a new invention of a cart of 15cwt to carry a great burden without help and guided but by himself." No details survive but it must have been more than a fantasy as Marshall was invited to present his petition directly to Charles I.

1629

ITALIANGIOVANNIBranca published designs for a number of ingenious mechanical contrivances, including a steam-engine in which the steam issuing from a boiler spun the vanes of a horizontal wheel. The same principle had been used by Hero of Alexandria more than 1,500 years before, but unlike Hero Branca suggested practical uses for his design.



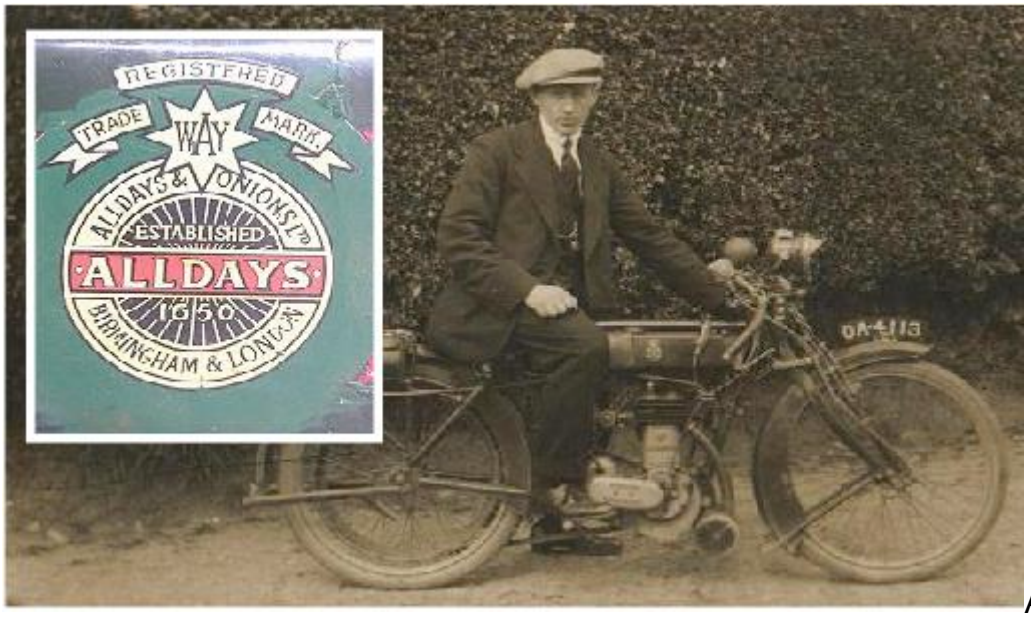
Giovani Branca's devcices certainly weren't steam engines. But he did use steam to move inanimate objects so he deserves his footnote in history.

1644

AN ANONYMOUS Englishman built a man-carrying clockwork carriage in Paris. It worked well on smooth ground but the labour involved in winding up the springs was so great that the project was abandoned.

1650

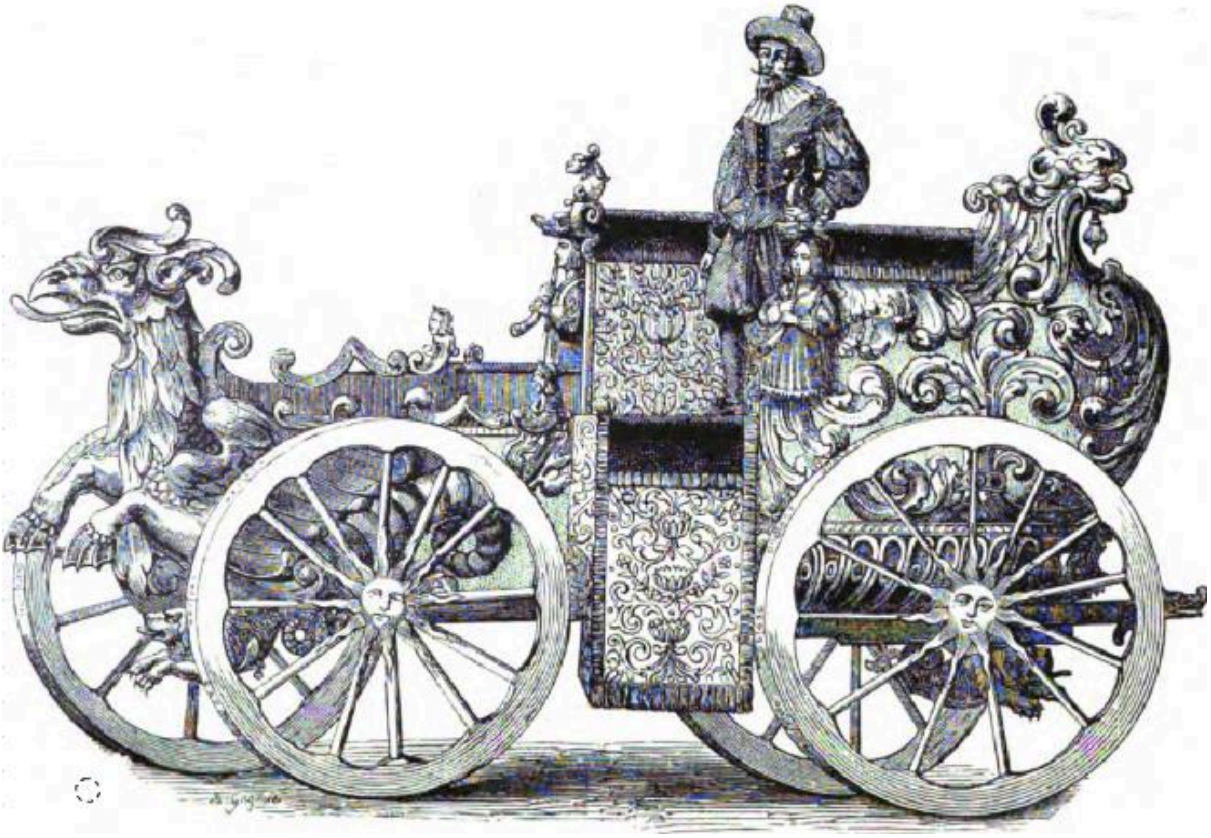
ALLDAYS&ONIONS would begin to build motor cycles in 1898 but the firm's roots go back to the launch of Onions Co in 1650 (Alldays didn't get started till 1720). Alldays & Onions riders might still enjoy telling Harley riders that their marque is half a century older than their country.



Alldays & Onions motor cycles can trace their roots back to 1650.

JOHANN HAUTSCH of Nuremberg built a horseless carriage able to carry several passengers at "2,000 paces an hour" thanks to a couple of stalwart chaps turning a winch driving the rear axle via a gear train. The dragon's head spouted water "for the

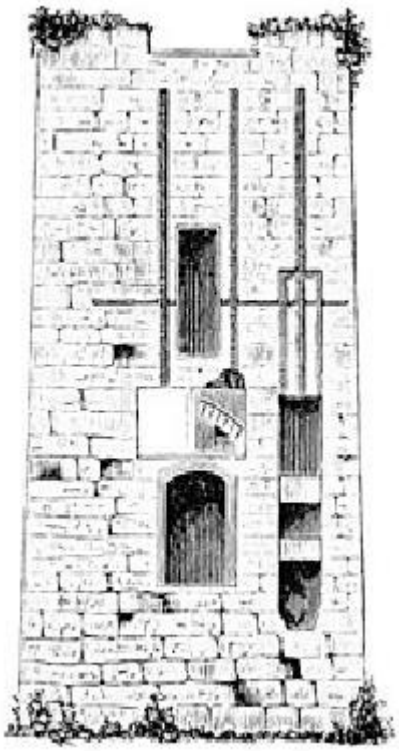
purpose of clearing the way in a crowd"; the dragon's eyes moved to and fro "with great rapidity" and angels on each side of the carriage "sounded their trumpets". It was sold to the Crown Prince of Sweden and Hautsch made another for the King of Denmark.



Hautsch's creation was powered by pedallers but this was clearly a horseless carriage.

1655

EDWARD SOMERSET, 2nd Marquis of Worcester, published a selection of his inventions including an innovative steam pump. He built what was (probably) the first industrial-scale steam engine into the side of Raglan Castle, his family home in South Wales. He fought for the Royalist cause during the Civil War and legend has it that when Parliamentarian forces arrived at the castle to demand its surrender, the order was given to start the steam pump. As it hissed and roared into life, someone shouted "The lions have got loose!" The Roundheads, knowing there was a menagerie at the castle, went home. The New Model Army were clearly sensitive souls.



Steam pumps like the ‘water-commanding engine’ Edward Somerset had built into the walls of Raglan Castle paved the way for steam engines.

1659

BURIED IN THE Philosophical Transactions of the Royal Society is an obscure report entitled A Description of a Well and Earth in Lancashire taking Fire by a Candle Approached to it. Imparted by Thomas Shirley, Esq, and Eye-witnesses. It starts: “About the latter end of February, 1659, returning from a journey to my house in Wigan, I was entertained with the relation of an odd spring situated in one Mr Hawkley’s grounds, about a mile from the town, in that road which leads to Warrington and Chester. The people of this town did affirm, that the water of this spring did burn like oyle; into which error they suffered themselves to fall for want of due examination of the following particulars. For when I came to the said spring, (being five or six in company together,) and applied a lighted candle to the surface of the water, ’tis true there was suddenly a large flame produced, which burnt vigorously. I began to examine what I saw; and observed that the water at the burning place did boyle, and heave like water in a pot upon the fire, though my hand put into it perceived it not so much as warm. This boyling I conceived to proceed from the eruption of some bitumous or sulphureous fumes, considering this place was not above thirty or forty yards distant from the mouth of a coal-pit there…Then applying my hand to the surface of the burning place of the water, I found a strong breath, as it were a wind, to bear against my hand. Then I caused a dam to be made, and thereby hindering the recourse of fresh water to the burning place, I caused that which was already there to be drained away; and then applying the burning

candle to the surface of the dry earth at the same point where the water burned before, the fumes took fire, and burned very bright and vigorous. The cone of the flame ascended a foot and a half from the superfices of the earth. I then caused a bucket-full of water to be poured on the fire, by which it was presently quenched, as well as my companions' laughter was stopped, who began to think the water did not burn…" Thomas Shirley had discovered a new fuel; we call it methane and you can run an engine on it.

1663

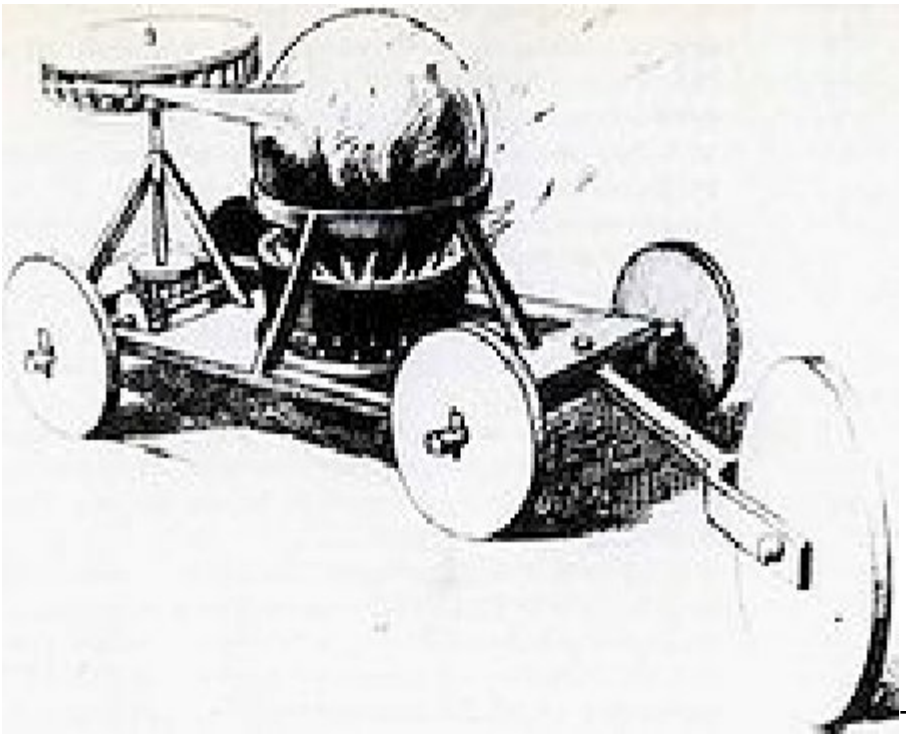
Robert Hooke (who, of course, was born on my adopted home, the Isle of Wight), newly elected a Fellow of the Royal Society, drew up plans for a machine with which one could "walk upon the land or water with swiftness, after the manner of a crane".

1666

JEAN-BAPTISTE Colbert, a minister of French King Louis XIV, established the Academy of Sciences at Paris with a brief of "discovering and perfecting a new source of power capable of effecting a dramatic human advance". He recruited multi-talented Dutch inventor Christian Huygens whose plans included "research into the power of gunpowder of which a small portion is enclosed in a very thick iron or copper case. Research also into the power of water converted by fire into steam."

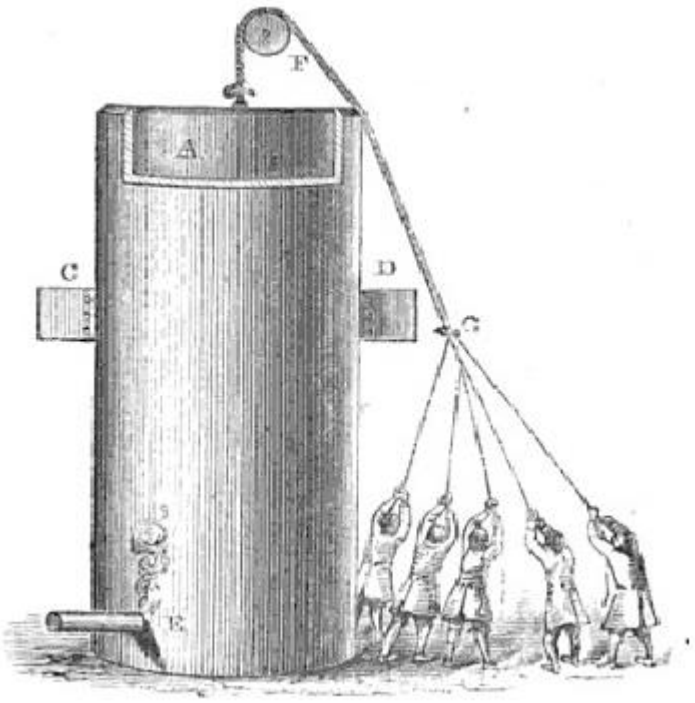
1668

FERDINAND VERBIEST, a Flemish Jesuit missionary in China, designed a toy for the young Chinese emperor Enkh Amgalan Khaan which was, probably, the first steam-powered vehicle in the world. It was 650mm long; steam generated in a spherical boiler was directed at a simple turbine, much like a water wheel, which drove the front axle via a vertical spindle. Another orifice in the boiler was fitted with a reed to imitate the song of a nightingale. The large fifth wheel could be set at an angle to make the toy steamer go in circles.

 This toy, made by a Jesuit for a Chinese emperor, was, probably, the first automobile.

1672

CHRISTIAN HUYGENS worked with German diplomat Gottfried Leibniz and Frenchman Dennis Papin to modify an air pump into an engine capable of extracting energy from burning gunpowder. It was the first engine to feature a cylinder and piston. Gunpowder was ignited in the cylinder, expelling the air through check valves, and leaving, after cooling, a partial vacuum. The pressure of the atmosphere then drove a piston down to the bottom of the vessel, lifting a weight or doing other work. After a decade's worth of experimenting Huygens reported that by burning a dram (2g) of gunpowder, in a cylinder 8ft high and 18in in diameter, his engine could raise seven or eight boys (or about 1,100lb) into the air.



Messrs Huygens, Leibniz and Papin made a gunpowder engine. Why just lift an iron test weight when you can watch a bunch of kids being dragged into the air ?

1675

SIR SAMUEL MORLAND patented a "plunger pump" and was granted a Royal Warrant granting him 14 years' exclusive use of his invention for raising "water out of pits to any reasonable height by the force of air and powder conjointly". It seems he was working along the same lines as Huygens.

1676

AN ANCESTOR OF the universal joint was used in ancient Greece on ballistae (giant crossbows that propelled stone balls of iron bolts). But in 1676 it was British polymath Robert Hooke who coined the term 'universal joint'; two years later he published a technical description of the UJ, which is why it's still known as Hooke's joint. Our Continental counterparts sometimes call a UJ a Cardano joint, named after the Italian Number 8 Hat Gerolamo Cardano who designed a UJ in about 1570 and also gave his name to the cardan shaft that spins the rear wheel of my GS850 combo. Bella questa, Girolamo!

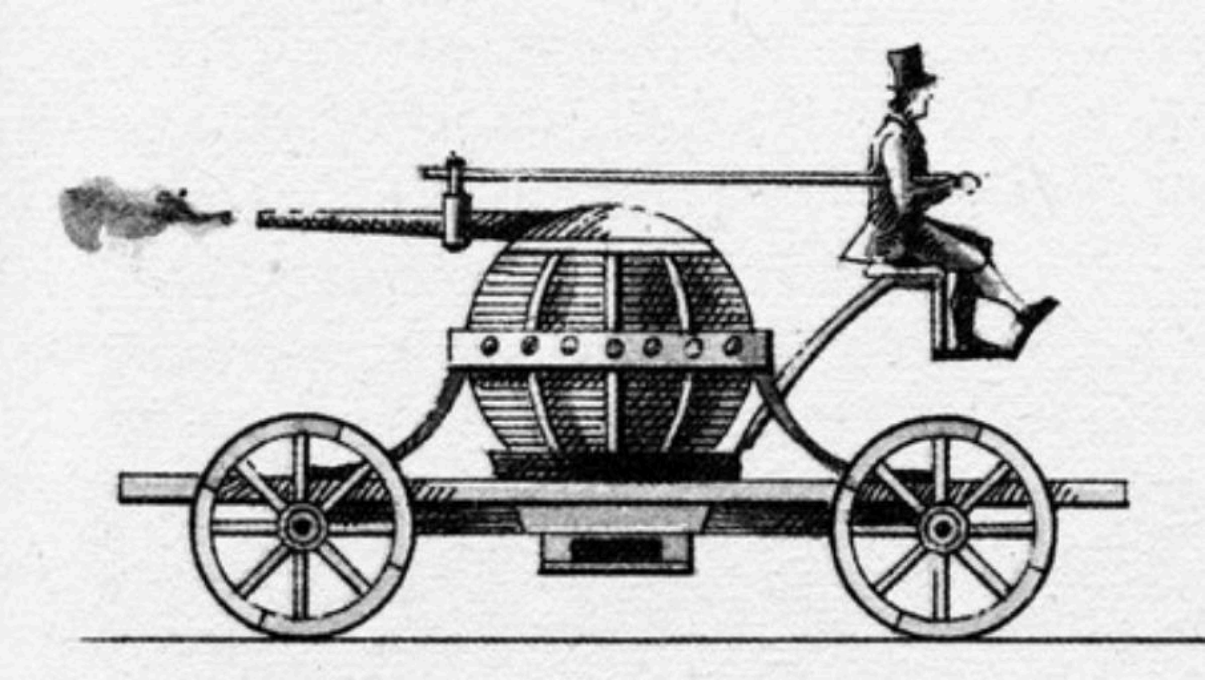
1678

JEAN DE HAUTEFEUILLE also proposed the use of gunpowder to obtain power by using the partial vacuum formed as gases cooled following combustion. His engine was designed to raise water from a reservoir.

PROFESSORVEGELIUSofJenawassaid to have constructed a spring-powered mechanical horse clad in horse skin. It worked, too, with a range of four 'German miles' a day (just under 19 miles). It's not known how often the prof had to dismount and wind up his metallic nag.

1687

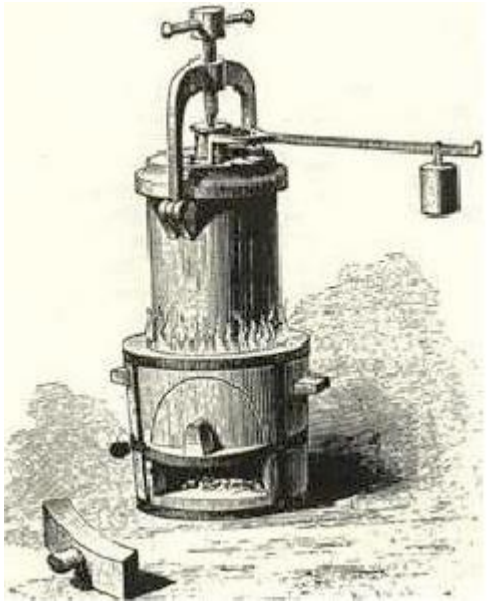
GRAVESANDE'SNATURALPhilosophyenvisageda carriage propelled by a jet of steam – effectively a rocket. The secret lies in the book's subtitle: An Introduction to Sir Isaac Newton's Philosophy (the third of Sir Isaac's laws of motion says that to every motion there is an equal and opposite reaction). It's unlikely that the boiler would have generated enough pressure to move the wagon which, considering its lack of steering or brakes, was definitely A Good Thing. Cool idea though, and the concept is sound. In 1730 the Admiralty tried propelling a ship by firing guns from the stern and it worked – but it took 30 barrels of expensive gunpowder to move 10 really **NOISY** miles. In due course rockets would propel motor cycles.



OK, you'd never generate enough steam pressure to move a heavy cart. But isn't it a cool idea for 1687?

1690

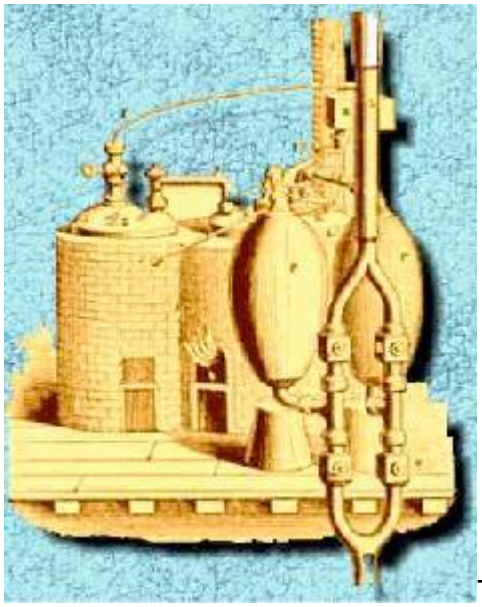
DENNISPAPINdesigned an engine with a piston and cylinder in which steam replaced the gunpowder charge of Huygens'scylinder, creating a more complete vacuum under the piston to take better advantage of atmospheric pressure. He also envisaged using his engine to drive a boat via rotary paddles.



Papin's engine was far from practicable but it could lift a 60lb weight by heating and cooling the water-filled cylinder.

1698

THOMASSAVERYintroduced a steam pump he called the 'Miner's Friend'. Saverywas granted an exclusive patent which would have given him control of any steam-powered device Papin might invent in England. One US source claims: "The early history of the invention of the steam engine shows without doubt that the British RoyalSociety, including Isaac Newton personally, deliberately prevented the industrial and naval applications of steam power for nearly 100 years. In fact, the RoyalSociety was so intent on burying Denis Papin's 1690 invention of a paddle-wheel-driven steamship, worked out in collaboration with Gottfried Leibniz, that it stole his work, and created a mythical story of how two British 'Newtonian' heroes, Saveryand Newcomen, invented the steam engine, for the sole purpose of raising water from coal mines –a myth that has persisted in the history books until today."

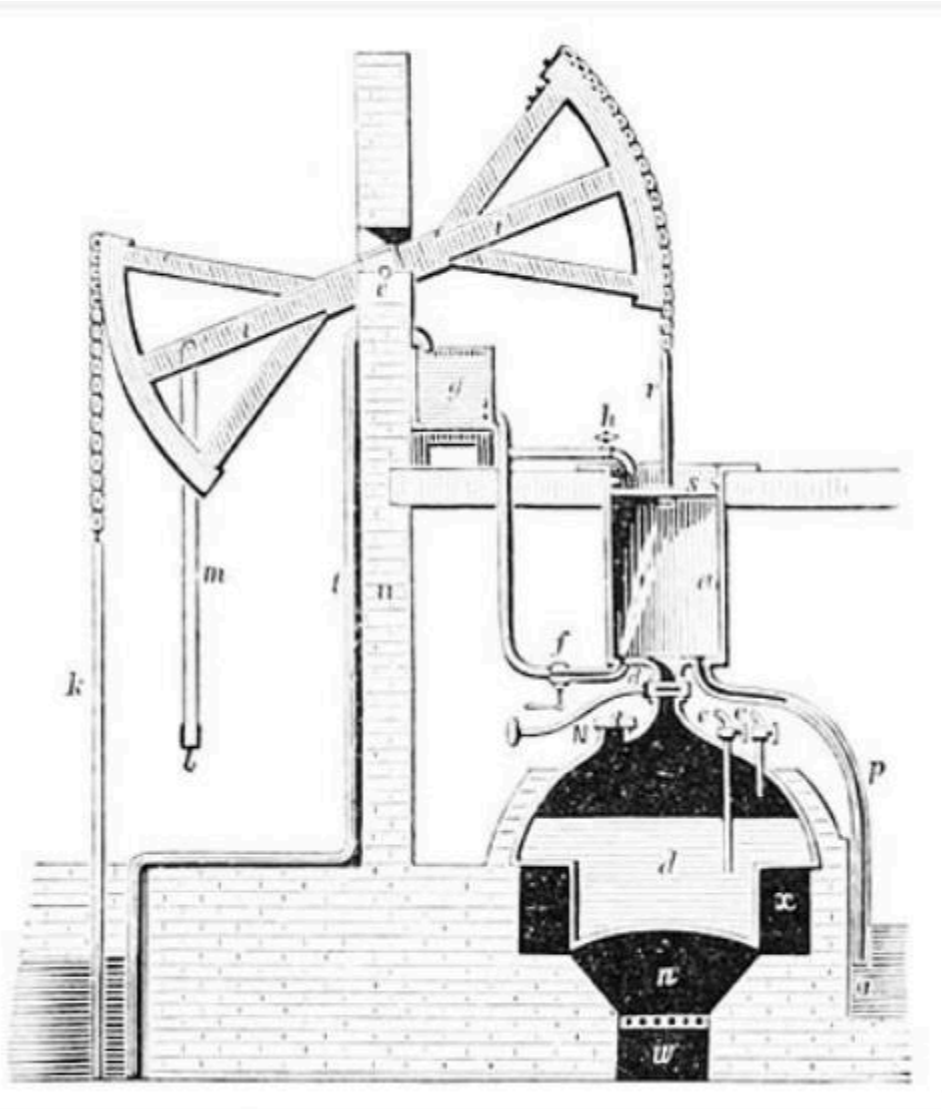


The‘Miner’s Friend’ wasn’t a steam engine in the modern sense of the word, but it was a step on the way.

1700-1799

c1705

BLACKSMITHTHOMASNewcomenand his assistant John Caley, a plumber, were working on a steam pump to extract water from copper and tin mines in the South-West. Whether or not they knew it, the Devonshire duo combined Savery'spump with Papin's piston to produce an atmospheric engine – the world's first practicable steam engine. It was far more powerful than any of its predecessors,thanks to a lucky accident. A steam-filled cylinder split; cold water that ran down the outside of the cylinder to cool the steam and create a vacuum got into the cylinder. As a result the pressure dropped so fast that the chain connecting the piston to the pumping beam it snapped. Theidea stuck…



Thomas Newcomen (blacksmith) and JohnCalley (plumber) made what they called a fire engine and we call a steam engine.

1707

PAPIN COLLABORATED on another steam engine, based on Savery's design but using steam pressure rather than atmospheric pressure. However this major advance stalled. In 1877 in the Scientific American Prof Charles Joy reported on a trip to Germany where he had seen papers confirming that in 1707 Papin asked Leibnitz to help him win the consent of the Hanoverian Government to navigate the river Weser with a sidewheel steamboat. The letter, dated 7 July 1707, included the claim that "the new invention will enable one or two men to accomplish more effect than several hundred oarsmen." Joy wrote: "A mob of boatmen, who thought they saw in the embryo ship the ruin of their business, attacked the vessel at night and utterly destroyed it. Papin narrowly escaped with his life, and fled to England, where he endured great hardships and poverty, and all traces of him were soon lost, so that it is uncertain in what country he finally died or where he was buried." The professor added: "If Papin had been permitted to navigate the Weser with his ship, and to carry it to London, as was his intention, it is possible that we should have had steamboats 100 years earlier than they were given to us by Fulton. After the lapse of 100 years from the date of Papin's invention, when the first steamboat was put upon the river Rhine, the vessel was fired into by concealed marksmen on shore, and navigation was more dangerous than it is now on the upper waters of the Missouri in times of Indian hostility."

1709

ABRAHAM DARBY began smelting iron using coke. Charcoal, which had been used to produce iron since Roman times, was in short supply; coal had been tried but its sulphur content made the iron brittle. Darby bought a derelict ironworks in Coalbrookdale to put his theories to the test – his success ensured iron would be plentiful and cheap, just when British industry needed it.

 From 1709 Abraham Darby used this charcoal-fired furnace in Coalbrookdale to cast a range of iron goods.

1712

MINDFUL OF the patent held by Thomas Savery covering “all imagined” uses of steam power, Thomas Newcomen teamed up with him to install the world’s first commercial steam engine. It was used to extract water from a coalmine near Dudley, West Midlands so fuel was no problem. The menage a trois of coal, steam and iron would open the floodgates to the industrial revolution which would give Great Britain its time as a Great Power. What started in Dudley would transform that part on England’s green and pleasant land into the smokey powerhouse that became known as the Black Country.

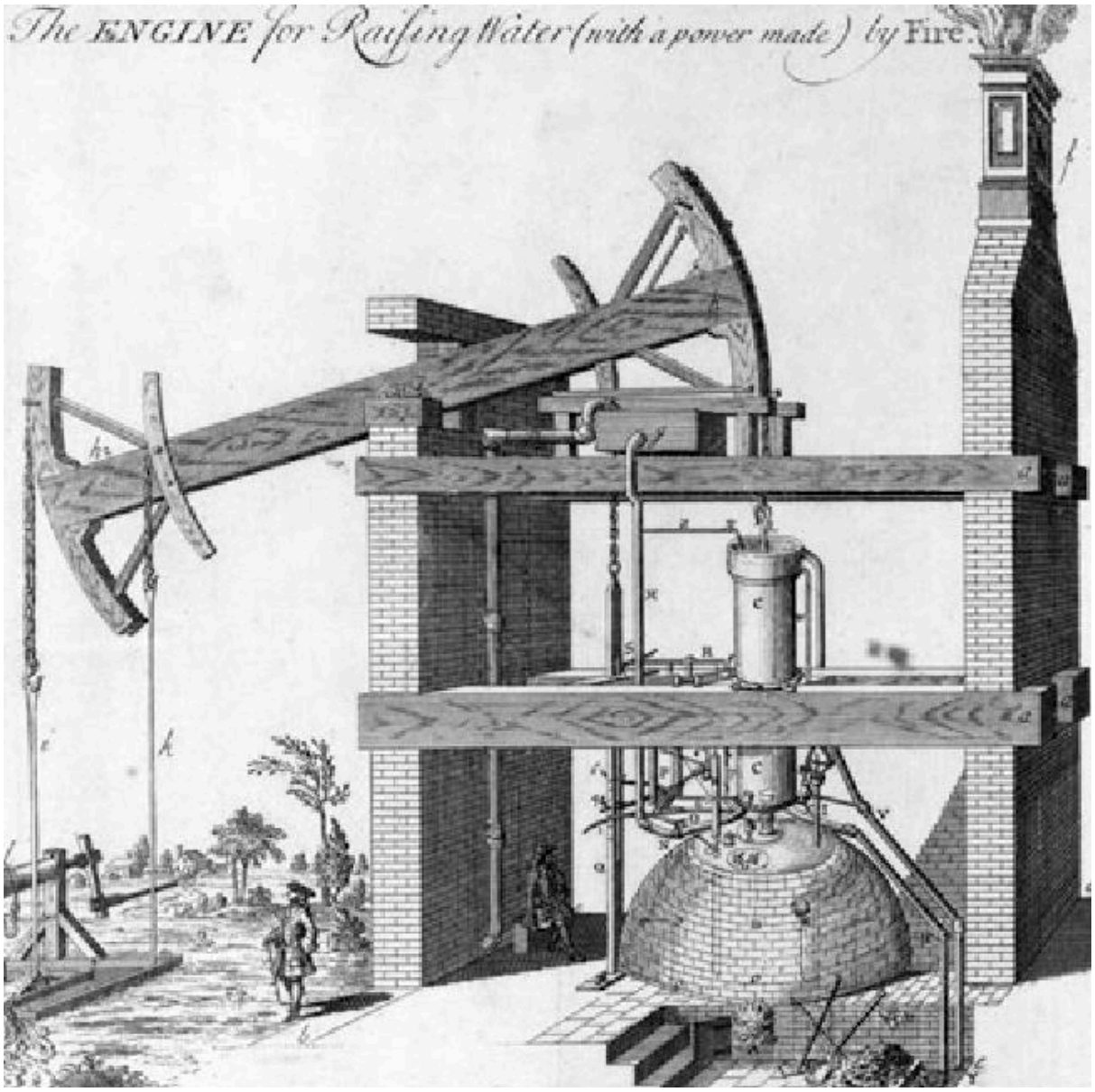
1713

HUMPHREYPOTTER,aladpaid to manually operate the valves of a Newcomen engine, rigged up a system of cords to automatically open and close the operating valves. This brought high-speed engines a step closer. YoungPotter also made himself redundant, but as his job title was cock-boy this was doubtless a merciful release.

A FRENCHMANnamedDuQuet designed two carriages incorporating small windmills. One powered its wheels via ratchet bars and pinions; the other had two pairs of legs to push it along.

1718

HENRYBEIGHTONdesigneda more reliable version of Potter's operating system and installed a Newcomen engine incoporporating his improvements at at Oxclose Colliery, near Washington, County Durham.



Henry Beighton tidied up the automatic valve system that led to high-speed engines –

and made this rather fine engravingof the engine Newcomen installed in Griff, near Nuneaton, Warks.

DESAGULIERSINTRODUCEDanimproved version of the Savery engine complete with safety valves.

1720

GERMANPHYSISISTJacobLeupoldstarted to work on the manuscript of Theatri Machinarum, the first systematic analysis of mechanical engineering. It included, decades ahead of its time, a design for a high-pressure non-condensing steam engine in which two cylinders alternately received steam and vented to the atmosphere. He attributed the concept to Papin.

THEATRUM MACHINARUM GENERALE.

Schau-Platz

Des Grundes Mechanischer Wissenschafften,

Deutliche Anleitung

Zur Mechanic oder Bewegungs-Kunst,

Die Fünff einfachen Röß-Zeuge und die dabey nöthigen Lehr-Sätze

äusserlichen Kräffte,

Alles mit viel nützlichen Anmerckungen

Inventionibus und Machinen vermehret, und mit vielen Figuren

Jacob Leupold, Planizia Mitnico,

Mathematico und Mechanico, Königl. Preuß. Commercien-Rath,

Zu finden bey dem Autore und Joh. Friedr. Gleditschens seel. Sohn.

Jacob Leupold's book on mechanical engineering helped spread the knowledge that would in time change the world.

1726

DRSTEPHENHALESHalespublished his Vegetable Statics, in which he described experiments for the production of "elastic fluids from a greatnumber of substances". He wrote: "From the distillation of 158 grains of Newcastle coal I gained 180 cubic inches of air which weighed 51 grains…"Amysterious phenomenon had become a

scientific process and the gas that lit British homes would fuel British internal combustion engines. Oddly enough the good doctor seemed to have taken little interest in the inflammability of coal gas.

1733

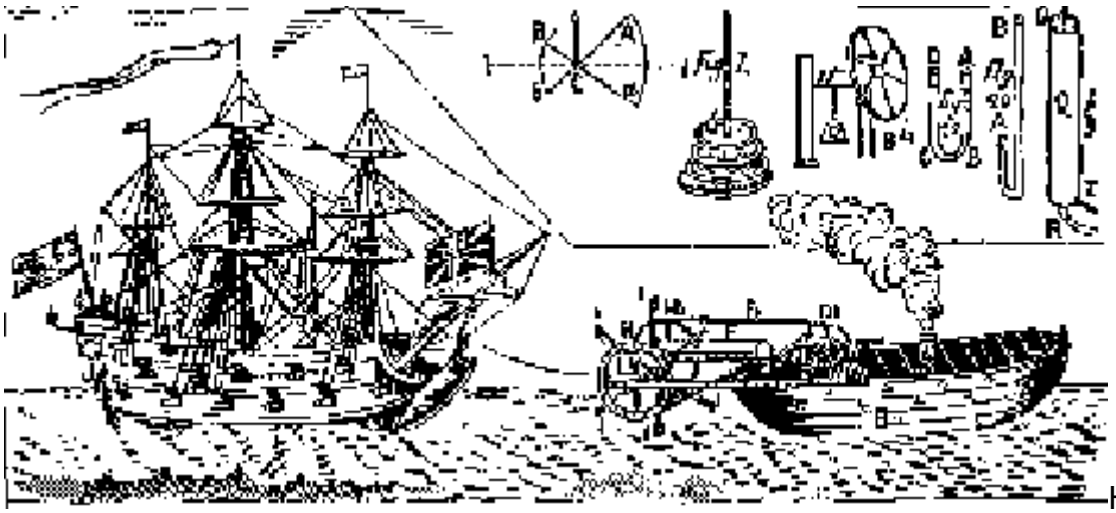
NEWCOMEN'Spatentexpired, by which time about 100 of his engines had been built.

1736

RUBBERBOUNCEDinto Europe, courtesy of French astronomer Charles Marie de la Condamine who came across locals wearing waterproof shoes while in Peru to measure an arc of the meridian. Fitting was no problem; they simply stood in pools of liquid rubber and left it to set. As well as being of great use when building motor cycles rubber also makes jolly amusing novelty dog chews.

A bike needs rubber and so, sometimes, does a Labrador.

JONATHANHULLSpatented a paddle steamer for use as a tug, powered by a Newcomen engine which would use a ratchet action to produce a rotary motion.


Hulls was way ahead of his time with plans for a steam tug.

1738

WILLIAMCHAMPIONproduced metallic zinc from calamine ore, clever chap. He heated the ore in a sealed container, allowing him to capture the zinc. vapour and condense it. This process also suited to large-scale production of brass; Champion's Zinc and Brass Works duly became one of the biggest industrial centres in Europe.

1739

THEROYALSOCIETY'SPhilosophical Transactions contain An Extract from a Letter by the RevDr JohnClayton in which he describes "the spirit of coal": a gas that could readily be distilled, stored and ignited at will. He reported: "I got some coal, and distilled it in a retort over an open fire. At first there came only phlegm, afterwards a black oil, and then, likewise a spirit arose…whichissued out caught fire at the flame of the candle…Ikept this spirit in bladders a considerable time; and when I had a mind to divert strangers or friends, I have frequently taken one of these bladders and pricked a hole therein with a pin, and compressing gently the bladder near the flame of a candle till it once took fire."

1740

HOROLOGISTBENJAMINHuntsmandeveloped the crucible steel technique and opened a manufactory in Sheffield to make a remarkably pure steel for clock and watch springs. Local cutlers reckoned his steel was too hard for their needs until they found their Continental competitors were using it to excellent effect. Huntsman's process facilitated steel manufacture on an industrial scale – no wonder they named a pub after him.


Ben Hunstsman's Crucible steel manufacturing equipment looked pretty basic, but it allowed steel to be made on an industrial scale.

1745

JOHN HARRISON, also a horologist and maybe the finest of them all, invented a practicable caged-roller bearing (and the bi-metallic strip) during his lifelong pursuit of the £20,000 Longitude Prize. This was launched after a fleet of British men o' war foundered because of inaccurate navigation with the loss of thousands of lives. Harrison developed a series of ground-breaking time-keepers which helped give the Royal Navy command of the seas in good time to protect our trade routes. (Is anyone surprised to hear that Parliament tried to rip him off? It took direct intervention by King George III to extract the dosh.) Besides his precision engineering Harrison deserves a place in any history of motor cycling because he made the first accurate, portable timepieces. And accurate clocks played a critical part in the motor cycle sport that in turn improved the breed.

GERMAN CLERIC Ewald Georg von Kleist and Dutch scientist Pieter van Musschenbroek of Leyden independently developed an electrical capacitor that came to known as a

Leyden Jar. It comprised a water-filled glass bottle with a metal spike through the stopper.

1748

BENJAMIN FRANKLIN (still technically a Brit, as the American colonies would not rebel against the Crown for another 30 years) coined the term “battery” to describe an array of Leyden jars (capacitors). He used the extra power for a range of experiments, including electrifying wine glasses. This must have been a bit of a shock for his victims, who could have had no idea where the pain came from. That Ben, what a zany sense of humour!

Benjamin Franklin coined the military term ‘battery’ for an array of primitive capacitors.

A LOCKWORK CARRIAGE was driven in Paris by versatile inventor Jacques de Vaucanson, probably. His main claim to fame was a mechanical duck that ate and pooed. No, really.

1759

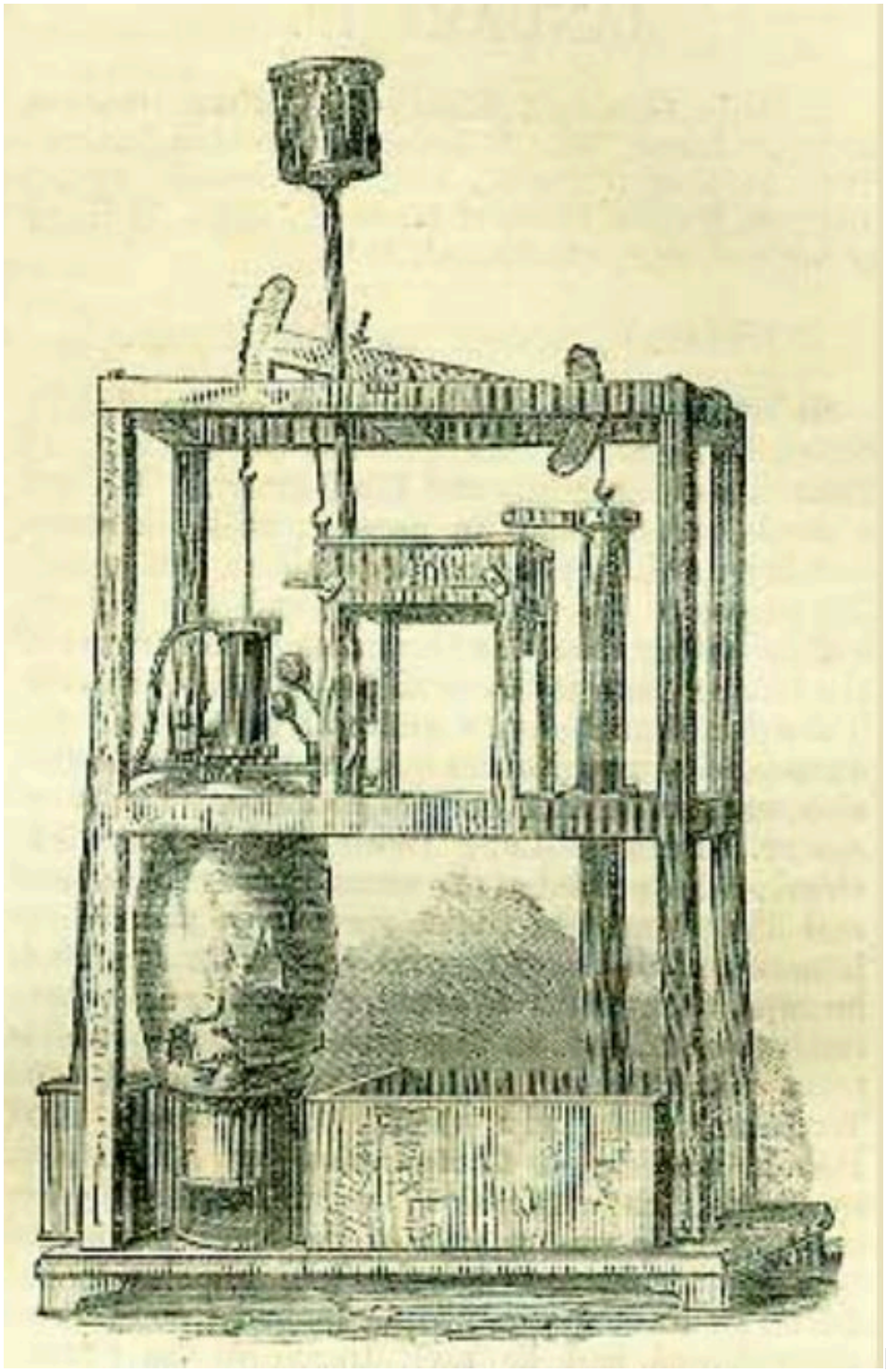
DOCTORROBISONofGlasgow University introduced James Watt to the concept of steam engines and suggested that they might be used to propel carriages. Watt built working models using tin cylinders and pistons attached to driving wheels by a system of gears.

1760

SWISSCLERGYMANJHGenevoisproposed to mount small windmills on a sail-driven cart to wind springs that would provide power when the wind failed or was in the wrong direction. The idea might have been inspired by DuQuet's windmill-powered cart back in 1713-14. Genevois also had plans for spring powered marine engines; in this case the springs would be compressed by a steam or gunpowder engine.

1763

JAMESWATTwassent a Newcomen steam engine to repair and found a way to make it more efficient. He produced a steam engine that cooled the used steam in a condenser, slashing running costs.



Newcomen made it, Watt improved it. Steam engines paved the way for I/C engines; they also powered the first motor cycles,

1765

BRUMMYBUSINESSMANMatthewBoulton opened the Soho Manufactory engineering works in Handsworth. This site would be at the heart of the industrial revolution.

STEAMTRANSPORTenthusiastErasmus Darwin (grandfather of Charles) looked to the future when he wrote:

Soon shall they 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 fields 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 cloud.

1767

DR RICHARDWATSON, later the Bishop of Leadoff, published his Chemical Essays. His description of the distillation of coal to produce flammable gas was widely read.

1769

FRENCHARMYengineer Nicolas-Joseph Cugnot designed a self-propelled vehicle based on a model he had made six years before; it was built at the Paris Arsenal by a mechanic naned Brezin. The fardier a vapeur (steam dray) had a top speed of 4mph, or 2mph towing a canon, running on two iron-rimmed wheels at the back and one at the front. It had to stop every 10 minutes to rebuild steam pressurebut still caused the world's first RTCwhen it wrecked a garden wall. So chapeaux off pour le garcon Cugnot. It was crude, but it worked: all the evidence suggests that he was the first human being to move across the face of the earth by the power of an engine.

Not only did Cugnot's fardier a vapeur gun carriage use pressurised steam; he also

worked out how to convert up-and-down power from its two 13in-diameter cylinders into rotary power, using a ratchet-and-pawl system.

JOHNSMEATONexperimented with Newcomen engines and built improved engines with a much longer stroke delivering up to 80hp.

FRANCISMOOREwasgranted a patent (No 921, dated 14 March) for “machines or engines, made of wood, iron, brass, copper or other metal, to be wrought or put in motion by fire, water or air, with a small assistance of horses or manual labour, which will be very useful in agriculture, carriage of persons, goods and navigation, by causing ships, boats, barges and other vessels to proceed with more swiftness”.

1770

CUGNOTBUILTa four-seat passenger version of his steam trike. Here’s a ‘what-if’ for you: say Boney had grasped its potential. Given the resources of the Empire and 20 years to work in, could Cugnot have developed self-propelled guns to use against ‘perfidious Albion’? Let’s be glad Cugnot didn’t do it better, while applauding him lustily for doing it at all.

JESSERAMSDENdevelopedascrew-cutting lathe, which he used to make other more accurate lathes.

1773

ENGINEERWATTteamed up with entrepreneur Boulton. For the next 11 years Boulton’s manufactory produced and sold Watt’s steam engines, mainly to colliery owners. Size for size they were four times more powerful than Newcomen engines.

1775

ABOUT600 NEWCOMENengines were working throughout the UK in mines, water pumping stations and ironworks. Another 1,000 were in action by 1800, many of them in mills and factories as the industrial revolution gathered pace. Several dozen improved Saveryengines were also built.

WATTAND BOULTONentered into a formal partnership; Watt’s patent was extended by Act of Parliament for 25 years until 1800.

1779

MATTHEWWASBROUGHofBristol adapted a Newcomen engine for Brummy manufacturer James Pickard with a crank and flywheel to produce rotary motion. This was just what was needed to power Pickard’s machinery and, in due course, the machines that made parts for motorcycles. Good old Matt, says I.

Matthew Wasborough put the steam engine into a spin.

1780

ALLESANDROVOLTAmadea toy pistol in which an electric spark exploded a mixture of hydrogen and air to fire a cork.

RICHARDTREVITHICKbuilta double-acting high-pressure engine with a crank, for Cook's Kitchen Mine. This was known as the Puffer, from the noise that it made, and it soon came into general use in Cornwall and South Wales as a successful rival to Watt's low-pressure steam vacuum engine.

A FRENCHMANnamedDallery built a steam carriage that ran on the streets of Amien. It is said to have featured a boat shaped body and what could be the first use of a multi-tube boiler.

1781

JONATHANHORNBLOWERpatentedatwo-cylinder ‘compound’ engine which was more efficient than Watt’s single-acting designs but similar enough to his double-acting system that Boulton and Watt were able to have the patent overturned by the courts in 1799.

1784

Bolton, Watt and Murdoch played a critical role in the pre-history f the motor cycle.

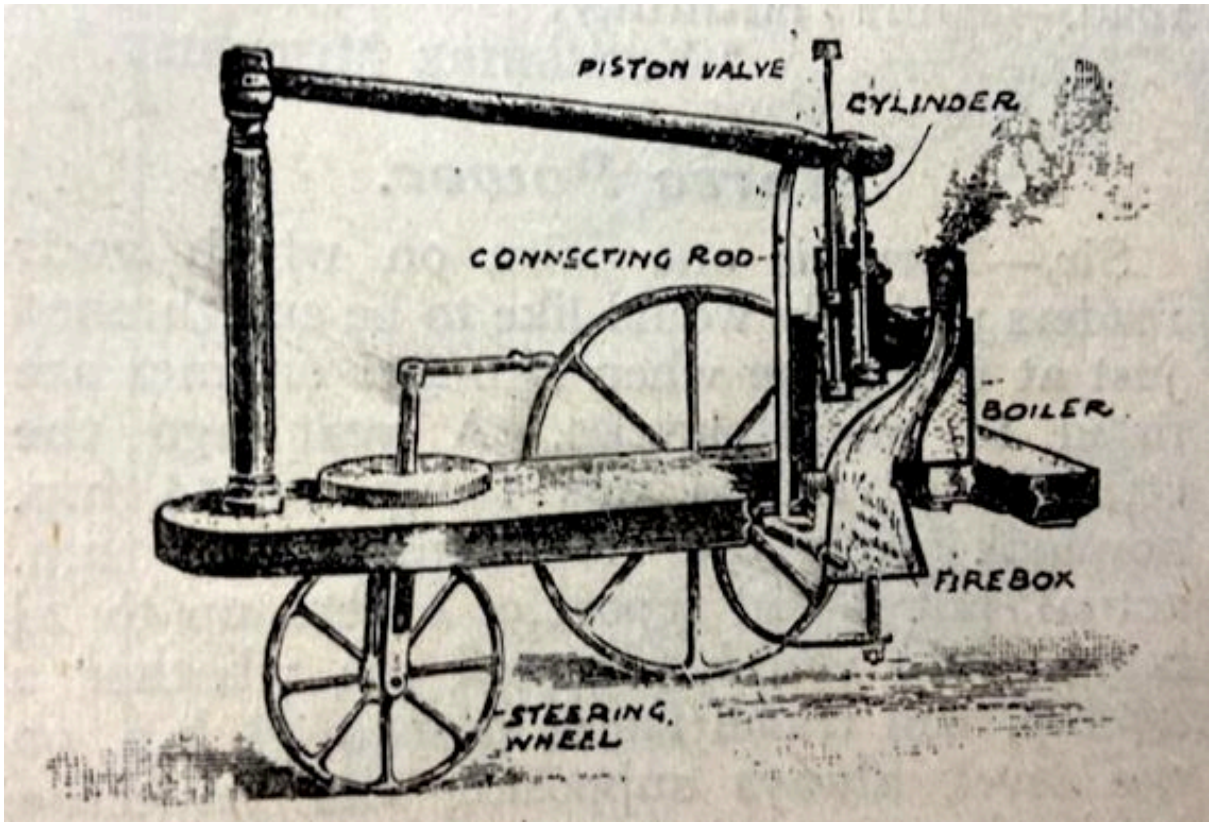
SCOTTISHENGINEERWilliamMurdock walked 300 miles to ask for a job at Boulton and Watt’s manufactory and he was working there when JamesWatt patented the sun-and-planet system that converted linear motion to rotating motion, allowing steam power to be used to “produce a continued Rotative or Circular Motion round an Axis or Centre, and thereby to give Motion to the Wheels of Mills or other Machines”…suchas self-propelled vehicles. Thereis conclusive evidence that it was Murdock’s idea. So it’s hardly surprising that he became interested in steam-powered road vehicles and he translated that dream into reality with a working model. It was only a couple of feet long but fast enough to outpace Murdoch when he tried it out. At which point the runaway steamer freaked out the local vicar who thought it was the devil and took to his heels. Murdock clearly planned to build a full sized steam locomotive but Watt forbade him

from diverting his energies away from maintaining and improving the company's steam engines; ironically Murdock was also required to help his boss take legal action against anyone who infringed Boulton and Watt patents. Richard Trevithick, who was to build Britain's first steam-powered roadster, was shown the model in action in about 1790 and worked with Murdock. His full-sized steamer (1801 in case you were wondering) was clearly inspired by the Murdock design. Murdock also developed the production and storage of coal gas to generate light. In time gas would also be used to power internal combustion engines. Here's a nice postscript: a century of so later Murdock's model steamer ended up next to Symmington's model steamer on show in, of all places, Melbourne.

Redruth, 2004: a team of enthusiasts known as The Murdock Boys set out to finish the job and build a working steam locomotive based on William Murdock's model (or,

maybe, on the full-sized model that took to the streets of Redruth late in 1784). It took them three years and here she is: The Murdock Flyer. Yes, she moves under her own steam. William would have been pleased.

PS: WHILE WORKING MY WAY through the first (1902) volume of Motor Cycling I came across a report that the original Murdock model was on show in London. You can read all about it in 1902 but the story included a detailed description of the model and a slightly different story about Watts' reaction to Murdock's experiments. Motor Cycling dated the model to 1781 "as nearly as can possibly be ascertained"; but the story fits in neatly here so, plucked from the 1902 report…"The dimensions of the little machine are: Height 14in, length 19in, and extreme width over the driving wheels 7in. It is constructed as follows: The frame or base consists of an oblong board mounted upon three wheels, two driving wheels at the rear connected by a cranked axle, and a single steering wheel arranged under the board in front, and provided with a swivelling fork and steering handle. The boiler is a rectangular vessel of brazed copper, 3⅜in high, 4¼in long, and 3⅛in wide. A flue passes through. it, contracting from a circular chamber which forms the fire box. A spirit lamp is arranged to burn within the fire box. The cylinder of the engine is mounted on the top of the boiler, and the lower part passes into it and is surrounded by the steam. The piston rod is attached to the end of the pivotted beam, and just forward of the piston rod connection is the connecting rod working the crank. An ingenious steam valve is devised for alternately raising and depressing the piston. It is really a piston valve with two pistons working freely, yet pressure-proof in the valve cylinder. The space between the pistons is in constant communication with the boiler, and the steam is admitted by two ports, and is so devised that when the piston valve is up the steam enters the upper port and drives down the piston while the exhaust steam from the underside discharges from the cylinder from the lower port into the air through a tube connecting the two pistons of the valve. A safety valve is let into the boiler close to the cylinder; it is held down by a little tongue of metal, and this acts very efficiently. The first experiment with the little engine was made



Murdock's runaway model gave the local vicar a diabolical thrill. This is the illustration that Motor Cycling published in 1902.

at Murdock's own boom at Redruth, when it easily hauled a loaded wagon round the room. The second experiment was made out of doors, on which occasion, small though the engine was, it ran so fast that the inventor could not keep pace with it. When Watt was informed of Murdock's experiments he feared that they might interfere with his regular duties, and advised their discontinuance. He afterwards said that if Murdock was resolved to continue them, the firm of Boulton and Watt would advance £100, and would establish a locomotive engine business, with Murdock as a partner, if within a year Murdock succeeded in making an engine capable of drawing a postchaise carrying two persons besides the driver, with fuel for four hours and water for two hours, at the rate of four miles per hour. From 1786, however, Murdock, as well as Watt, dropped all further speculation on the subject of road locomotion, although persuaded of its practicability, and it was left to others to work out the problem of the locomotive." NB There is good evidence that Murdock ran a full-size carriage known as The Flyer on the streets of Redruth. He knew that low-pressure engines would be too heavy for road vehicles, so he invented the high pressure steam engine for them.
The Flyer incorporated a multiple-shaft crank that Murdock also invented for the purpose—it's still used in modern internal combustion engines. To be able to see, his spare time being in the evening, Murdock illuminated his house with gas that he'd extracted from coal, also putting a lamp outside, thus making Cross Street, Cambourne the first street in the world to be lit by artificial light. Local legend has it that Murdock

built several working models of the Flyer, and it is said that he used to travel from mine to mine in the full sized version which had a portable gas light. And, before moving on to other things (not least further development of gas lighting) Murdock demonstrated the Flyer to his next-door-neighbour, Richard Trevithick. Captain Dick was clearly impressed, as you'll see in 1801.

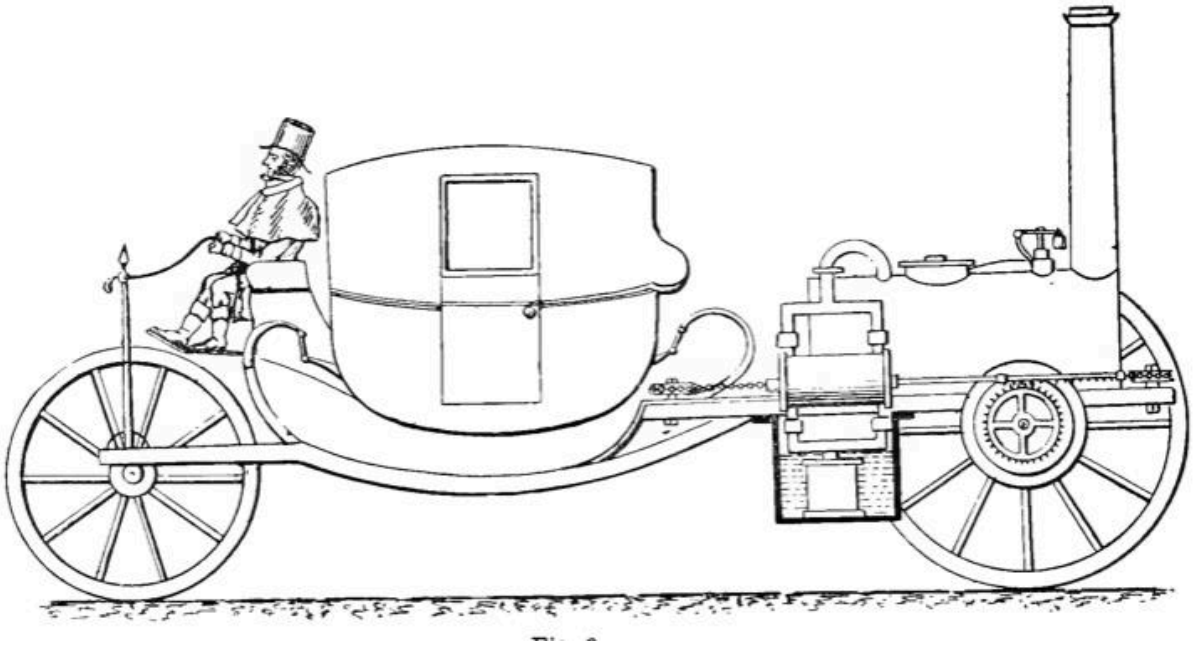
HENRY CORT developed a faster way of converting brittle pig iron into wrought iron suitable for making tools. Instead of hammering and re-heating the pig iron Cort heated it with coke, stirred it with rods and passed it between rollers. This cut the time needed to convert a ton of pig iron from 12 hours to 45 minutes. Costs of iron fell as supplies increased, giving another useful boost to the industrial revolution.

LORD DUNDONALD, father of dashing naval hero Sir Thomas Cochrane, patented a novel process for manufacturing mineral tar and travelled the country with his 'philosophical fire works' which, according to a contemporary report, "were deemed a great curiosity".

1786

IT WAS A BAD year for steam transport pioneers. When Oliver Evans, sometimes dubbed 'The Watt of America' petitioned Pennsylvania congressmen for exclusive rights to run 'steam carriages' in the state they decided the application "savoured too much of insanity to deserve notice".

JAMES WATT WROTE: "I wish William [Murdock] could be brought to do as we do, to mind the business in hand and let such as [Henry] Symington and Sadler throw away their time and money in hunting shadows." It would be another 15 years before Richard Trevithick built a full sized steamer. Watt used his patent on steam transport to clamp down on other pioneers. However Henry's son William (who had built a steam boast, at Leadhills, Scotland in 1763) collaborated with his dad to completed a working model of a steam carriage . The manager of the Warlockhead lead mine, where Symington Snr was chief engineer, was said to be "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." It was well received but the state of the roads and logistics problems led William to abandon further development.

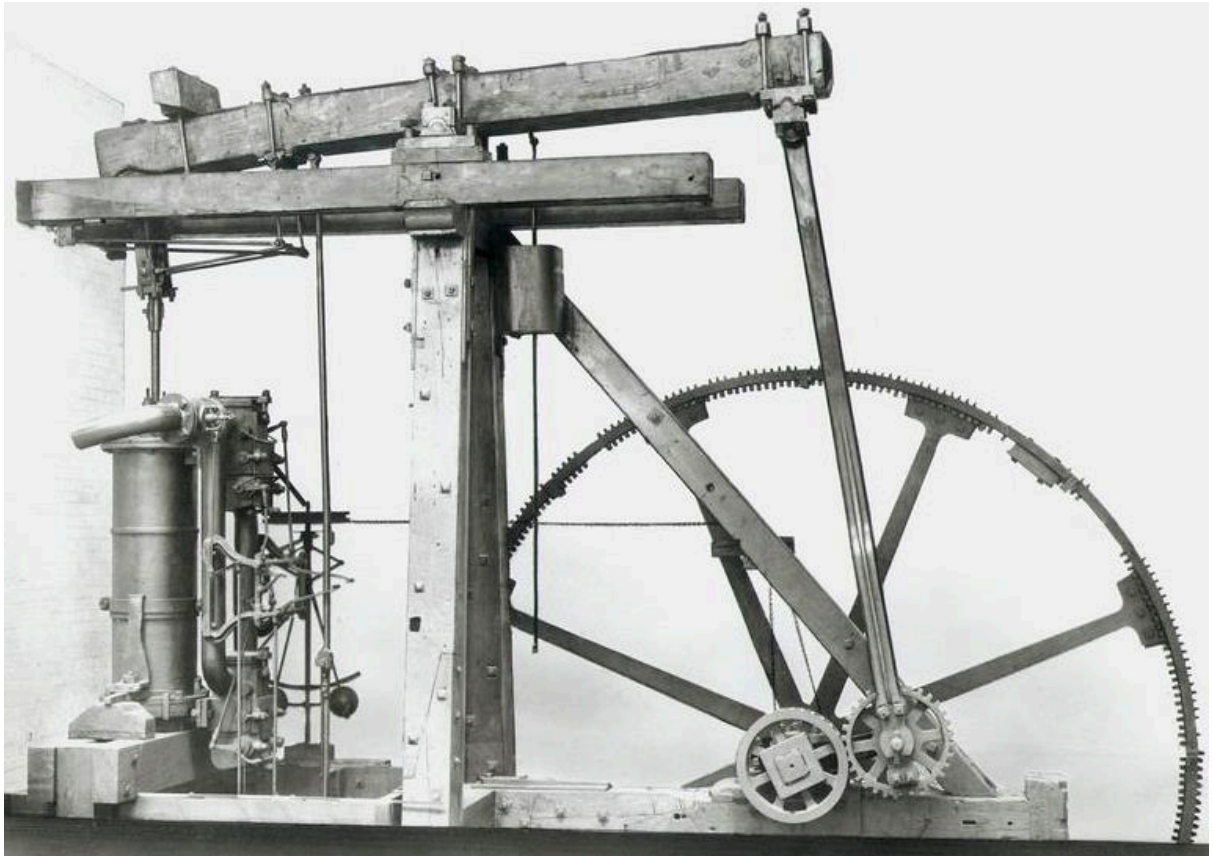


Symington's steamer worked; pity it wasn't developed into a full-size vehicle.

JAMES SADLER of Oxford (who two years earlier had made a 170ft hot-air balloon to become the first English aeronaut, making a six-mile flight and ascending to more than 3,000ft) was working on a steam-powered carriage. Boulton and Watt threatened Sadler with legal action for infringing Watt's patent covering the application of steam power for the propulsion of road vehicles. Undaunted Sadler went on (in 1791) to patent a rotary steam engine and gave public performances of 'philosophical fire-works' in Oxford Town Hall.

1788

A SEMINAL WATT engine known as the Lap Engine was installed at Boulton's Manufactory. It boasted Watt's parallel motion valve gear and centrifugal governor, which is still in use today. The Lap Engine was designed to drive lapping and polishing machinery. But Pickard had patented the crank-and-flywheel system so Watt extracted the all-important rotary power via a sun-and-planet set-up. They built engines to last: it remained in action until the factory ceased production in 1858.

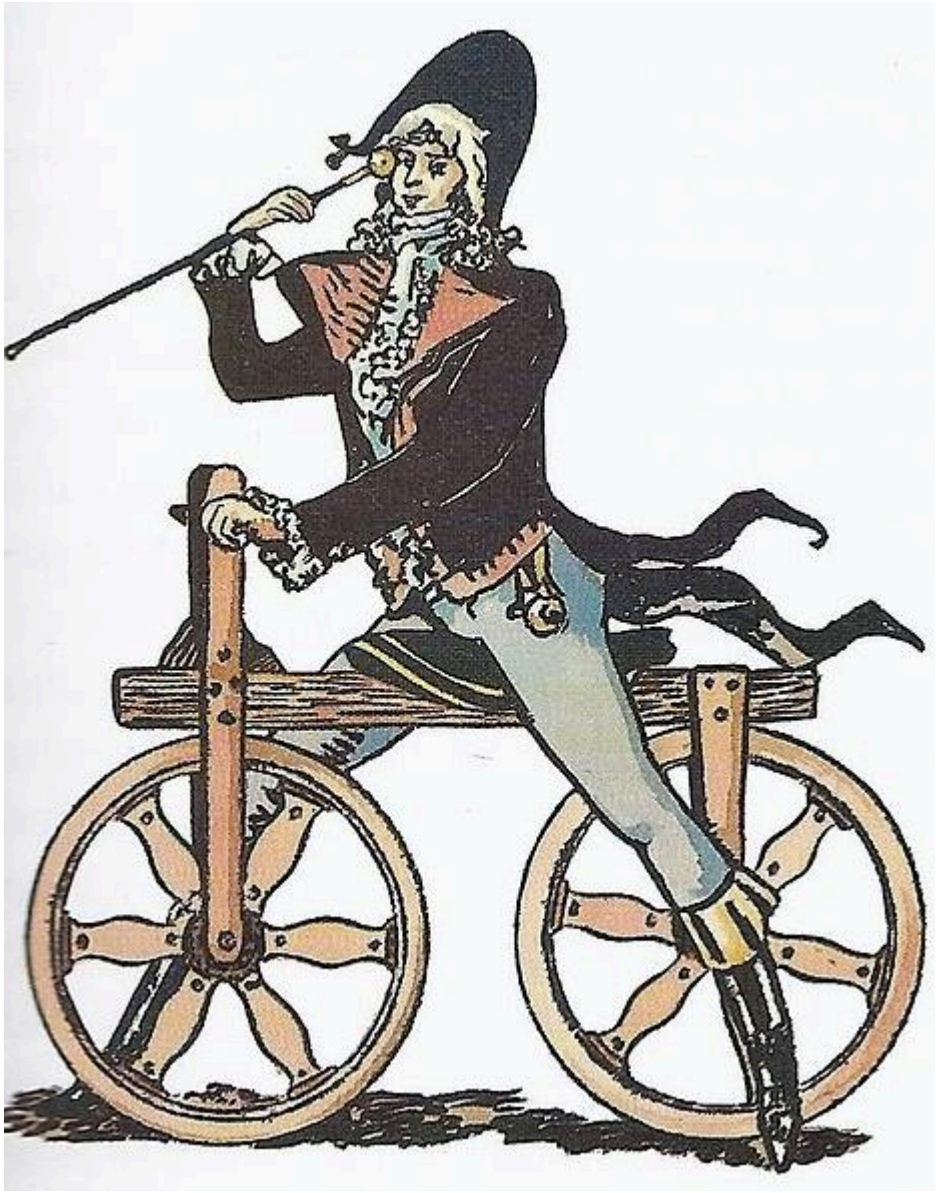


Watt's 'Lap Engine' used a sun-and-planet arrangement to avoid patent problems.

1791

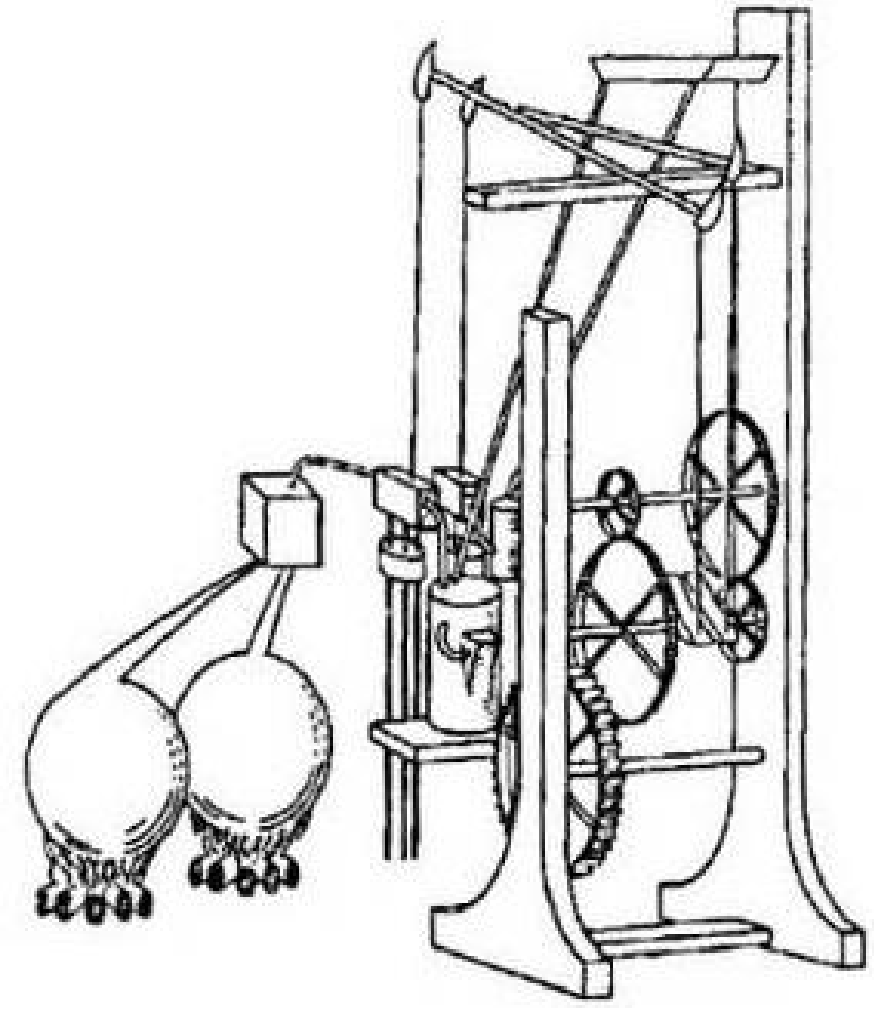
COMTE DE SIVRAC produced a two-wheeled rolling chassis which he called cheval de bois, or wooden horse and gave it an outing the gardens of the Palais Royal in Paris. It became known as the celerifere which translates as 'fast-goer' though it probably wasn't. Judging by contemporary drawings it lacked pedals, brakes or steering, but you have to start somewhere. These clumsy machines became increasingly popular among the sporting set of Paris. Clubs were formed and races were run along the Champs Elysees.

Twowheels and a frame: the celerifere.



In the 1790ps French dandies were staging cekerifere races in Paris.

FOLLOWINGAcentury devoted to the development of steam engines John Barber patented “an engine for using inflammable air for the purpose of producing motion”. Gas, produced by heating wood, coal or oil in a retort, was cooled in a receiver, mixed with air and pumped into a vessel called the Exploder. Here it was ignited; the resulting stream of flame drove the vanes of a paddle wheel. Not exactly advanced technology (compare it with Hero’s aeolipile of 60AD) but this was the world’s first gas engine—and how cool would it have looked at night!



This original sketch from Barber's patent application depicts the first gas engine.

THESEARCHfornew fuels continued: Robert Street patented the use of oil as "a means of producing motive power by explosion".

CHROMIUMWASextractedfrom lead chromate by Louis Vauquelain; it would be in demand for the production of stainless steel and, of course, as a shiny, corrosion resistant surface on motor cycle components. Chrome polish came later.

1792

THEFIRSThousesand offices were being lit by coal gas, in Redruth, Cornwall.

1794

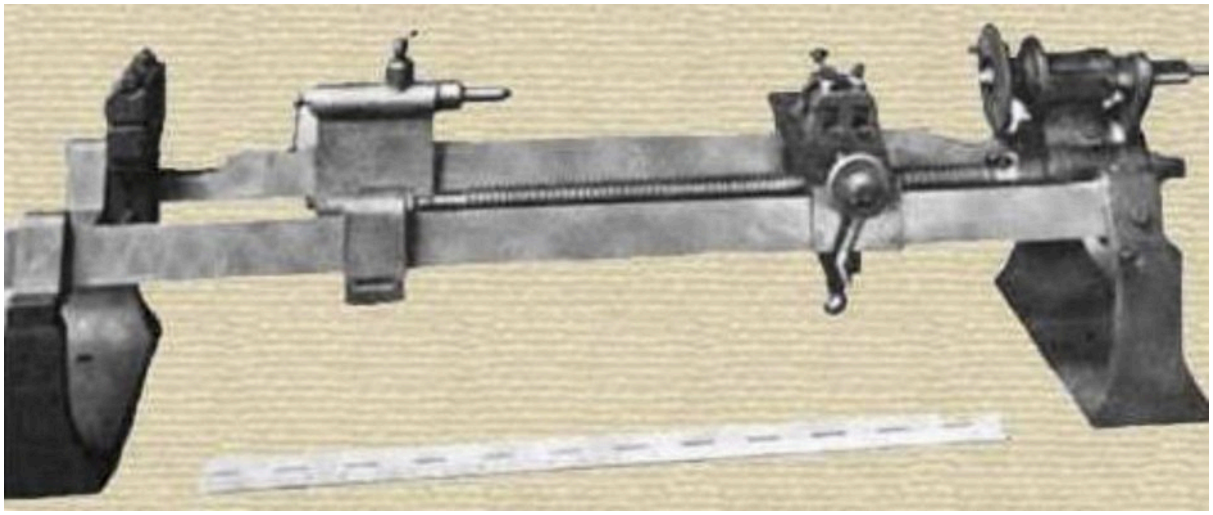
IRONMASTERPHILLIPVaughanof Carmarthen patented a ballrace.

ROBERTSTREETdesignedagas-fuelled engine with a cylinder and piston—but, two years after those wiley Cornish folk started to light their hovels with coal gas, Street's 'inflammable vapour' was obtained by sprinkling turpentine at the bottom of a cylinder which was heated by a furnace. A hand-operated air pump was then used to charge the cylinder with air, causing the piston to rise about 25% of its stroke. Heat from the

furnace ignited the fuel/air mixture driving the piston to the upper end of the cylinder, which was water-cooled. The power stroke lifted one end of a rocking-beam pump to remove water from a mine. As cylinder pressure and temperature fell, so did the piston.

1797

THE MODERN 'slide rest' lathe, capable of cutting threads with great precision, was invented by Henry Maudslay. Instead of being manipulated by hand, the cutting tool was clamped solidly in a tool post carried on a slide rest movable along accurately finished guides on the bed of the machine. For many years the slide rest was known as 'Maudslay's Go-Cart'." His techniques had significant influence on a number of great engineers including Joseph Whitworth.

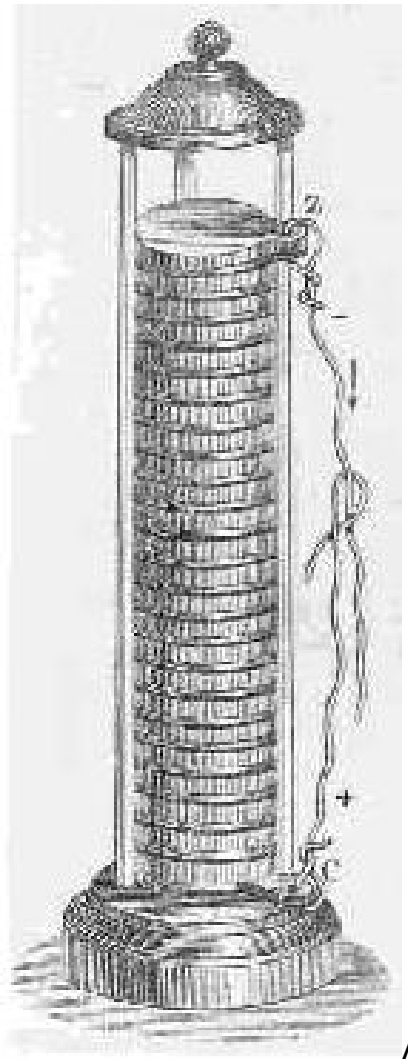


Maudslay's first screw cutting lathe pointed the way to the mass-produced fasteners that hold our bikes together.

OVER THE POND, one Samuel Morey from New Hampshire took a group of politicians for a ride in his paddle steamer. They chose to back Fulton's steamship instead, leading Morey to growl: "Blast his belly! He stole my patent!" Morey takes no further part in our story but, fuelled by bitterness, he slogged away for the next 30 years and came up with a number of clever gadgets.

1799

ALESSANDRO VOLTA made the first electrical battery, known as a Voltaic Cell. It comprised alternating zinc and silver discs, separated by brine-soaked cloth. He built the pile, which contained up to 30 disks, in imitation of the electric organ of the torpedo fish. Volta's development of the first continuous and reproducible source of electrical current was an important step in the study of electromagnetism and the development of electrical equipment such as magnetos, alternators and dynamos.



Alessandro Volta's Voltaic Cell, the ancestor of every battery on the planet.

RICHARD TREVITHICK built this first high-pressure engine at Dolcoath tin mine in Cornwall.

GEORGE MEDHURST patented an "improved aeolian engine" powered by compressed air. He dreamed of air-driven stage coaches relying on roadside 'compressor stations'. Later Medhurst would promote "a new system for the conveyance for goods and passengers…with the velocity of sixty miles in an hour…without the aid of horses or any animal power".

1800-1809

1800

WATT'SPATENTexpired.Bythis time about 450 Watt engines and more than 1,500 Newcomen engines had been built in the UK.

TREVITHICKHADcompleteda working model steam locomotive and began building the real thing.

SIRGEORGEMEDHURTdrewup plans for a fleet of coaches to be run on compressed air.

1801

FRENCHMANPHILLIPELebonpatented, but didn't build, a double acting gas engine with explosions of coal gas, ignited by electric spark, on both sides of the piston. As well as turning the crankshaft, the conrod powered two pumps which compressed the gas and air before they entered the cylinder. Lebon died early; some historians reckon his untimely death delayed the invention of the internal combustion engine for 50 years.

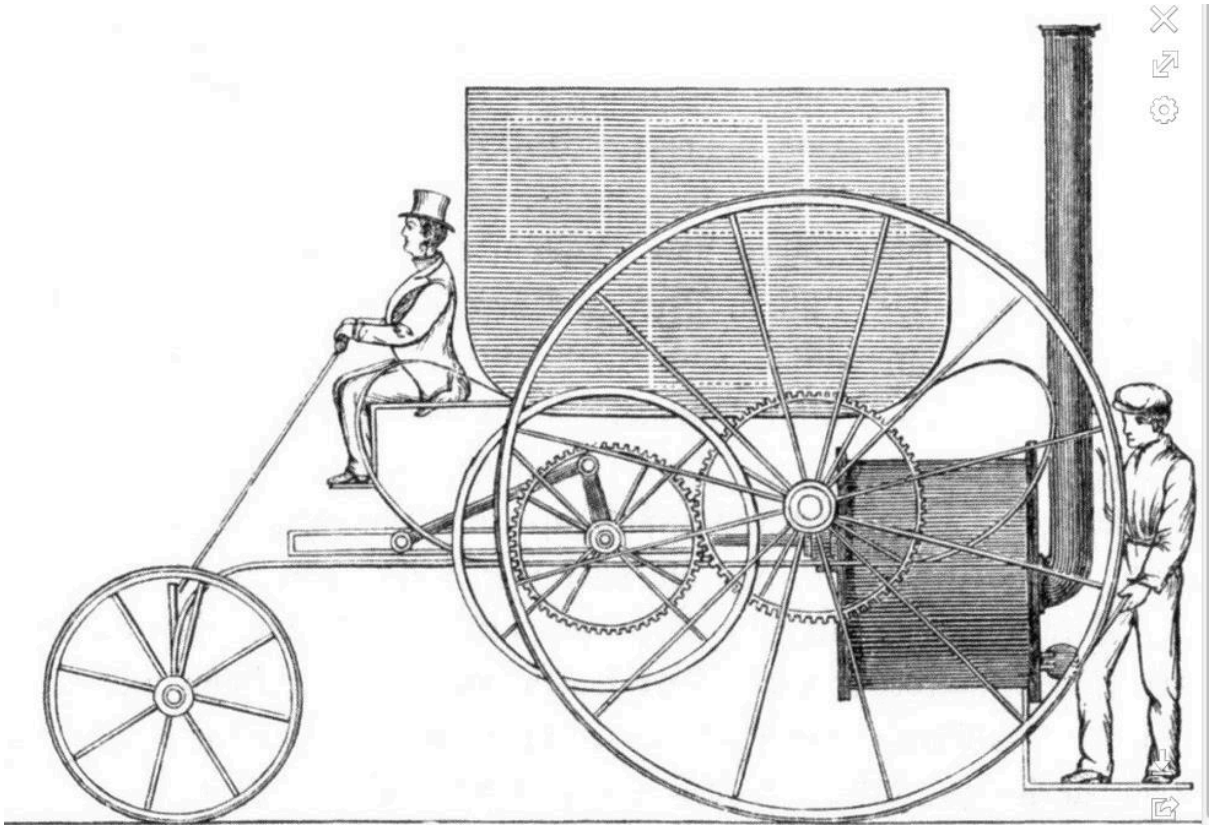
ANOTHERFRENCHMANnamedCardinet patented a taper roller bearing.

RICHARDTREVITHICKwentfora run up Camborne Hill on his high-pressure steam trike which he called Puffing Devil. It was Britain's first road vehicle (…probably—thereare stories of that William Murdock building a full sized version of his Flyer in 1784…inany case the Cornish boys done the business). A pal of Trevithick'swrote: "Upon Christmas Eve,coming on evening, Captain Dick got up steam out in the high road, just outside the shop [John Tyack's blacksmith shop where the vehicle was built]. When we see'd that Captain Dick was agoing to turn on the steam, we jumped as many as we could, maybe seven or eight of us. 'Twas a stiffish hill, but she went off like a little bird." Thenext run was made a few days later, as recalled by one Davies Giddy: "The Travelling Engine took its departure from Camborne Church Town for Tehidy on the 28th December, where I was waiting to receive it. Thecarriage however broke down after travelling about three or four hundred yards. The carriage was forced under some shelter and the Parties adjourned to the Hotel & comforted their Hearts with a Roast Goose & proper drinks, when, forgetful of the Engine, its Water boiled away, the Iron became red hot, and nothing that was combustible remained either of the Engine or the house." So the trike broke down, Dick and his mates left the engine running, pigged out, got pissed and left it to self-destruct. Makesyou proud to be British. Trevithick was also a noted wrestler, built and ran Britain's first steam railway (albeit as a fairground ride) and could "hurl a sledgehammer over an engine shed" –which would have been at least as tall as a two-storey house. What a geezer.

 Christmas Eve 1801 and Captain Dick Trevithick and his mates rode the first self-propelled wheeled vehicle in history.

1803

HAVINGBEENgranted a patent in 1802, in partnership with his cousin Andrew Vivian, Trevithick made a second steam carriage which he drove to London, via Plymouth, scaring the hell out of the population. A contemporary reporter claimed “A toll-gate keeper was so frightened at the appearance of the sputtering, smoke-spitting thing of fearsome mien that, trembling in every limb and with teeth chattering, he threw aside the toll-gate with the scared exclamation, ‘No noth-nothing to pay. My de-dear Mr Devil, do drive on as fast as you can. Nothing to pay!’.”Trevithick also wrote of the advantages to be gained from incorporating a multi-speed transmission.



Trevithick's London Steam carriage took to the road in 1803.

1804

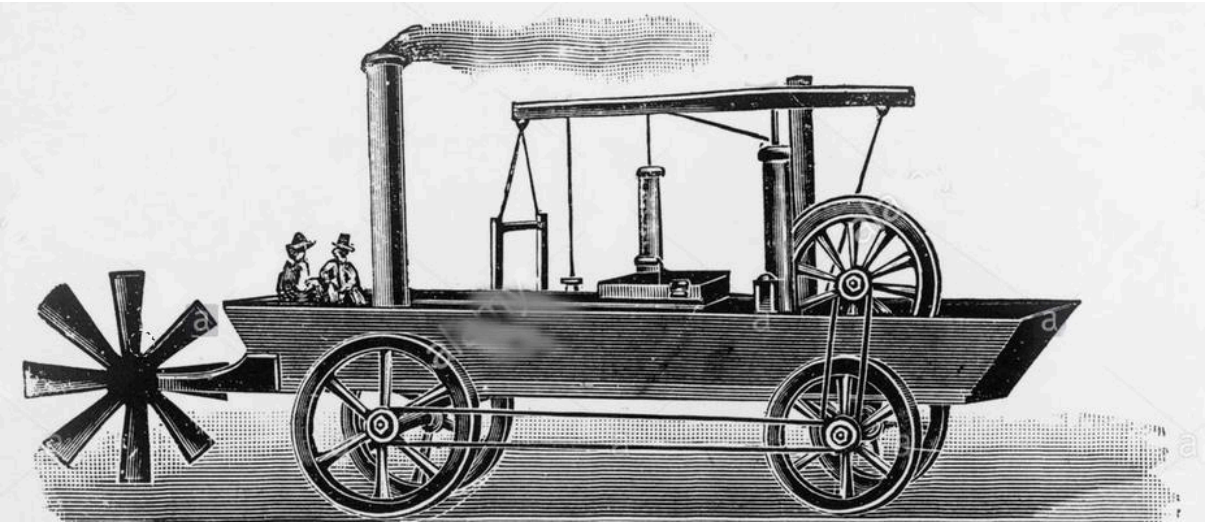
TREVITHICKBUILTthefirst-ever steam locomotive to run along a track, at the Penydarren Ironworks in Wales. It pulled five cars loaded with ten tons of iron and 70 workers for nine miles at 5mph.

1805

NELSON'SVICTORYatTrafalgar gave Britain global domination of the world's oceans. For the next century the PaxBritannica facilitated imports of raw materials and exports of manufactured goods. And in due course those exports would include Colonial Model motorcycles for the Empire and beyond.

IN THEUSAOliver Evans built the Oruktor Amphibolis ("amphibious digger"), a steam-powered, flat-bottomed dredger for the port of Philadelphia. It was 30ft long, 12ft wide and weighed 17 tons. He later claimed to have driven it 1½ miles to the dock, adding: "When she was launched we fixed a simple wheel at her stern to propel her through the water by the engine…weconcluded that if the power had been applied to give the paddle wheel the proper motion we could have stemmed the tide of the Delaware." Note the "if". Over the years increasingly wild claims were made in magazines and books, and by Evans himself, for what many Americans still believe was the first powered vehicle on the continent. The stories continue to this day. However, no designs for the machine survive, and later analysis of Evans' descriptions suggests that the 5hp

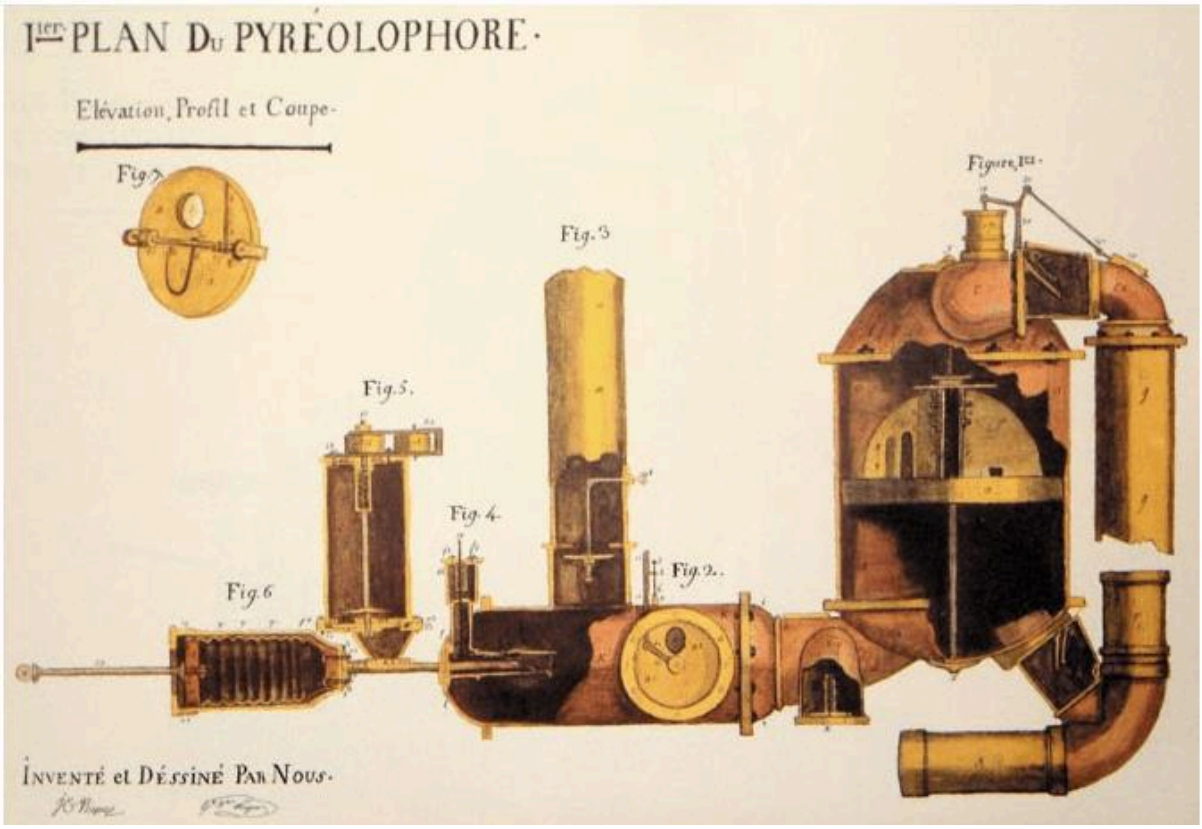
high-pressure engine was not powerful enough to move the vehicle either on land or water. The Oruktor was a flop. The city council finally gave up on the project in late 1808. It paid Evans what he claimed he was owed, and in June 1809 it sold the machine for parts. It got $31.10 back for its $4,000 investment.



The Oruktor Amphibolis has gained in stature over the year—whylet the truth get in the way of a good story?

1806

IN NAPOLEONIC France brothers Claude and Joseph Niépce built a reciprocating engine they called the Pyreolophore; it's generally accepted as the world's first internal combustion engine. The Pyreolophore was fuelled by coal dust and lycopodium which, as you doubtless know, is a powder of club moss spore, (they subsequently used coal mixed with resin and experimented with a liquid fuel similar to paraffin using a type of fuel injection) with flame ignition. It ran at 12rpm and was used to power a boat upstream on the River Saône (by expelling exhaust gas), after which Napoleon Bonaparte granted them a 10-year patent.



Here's the original plan of the Pyrelophore, as drawn by the Niépce brothers. Hey presto, internal combustion.

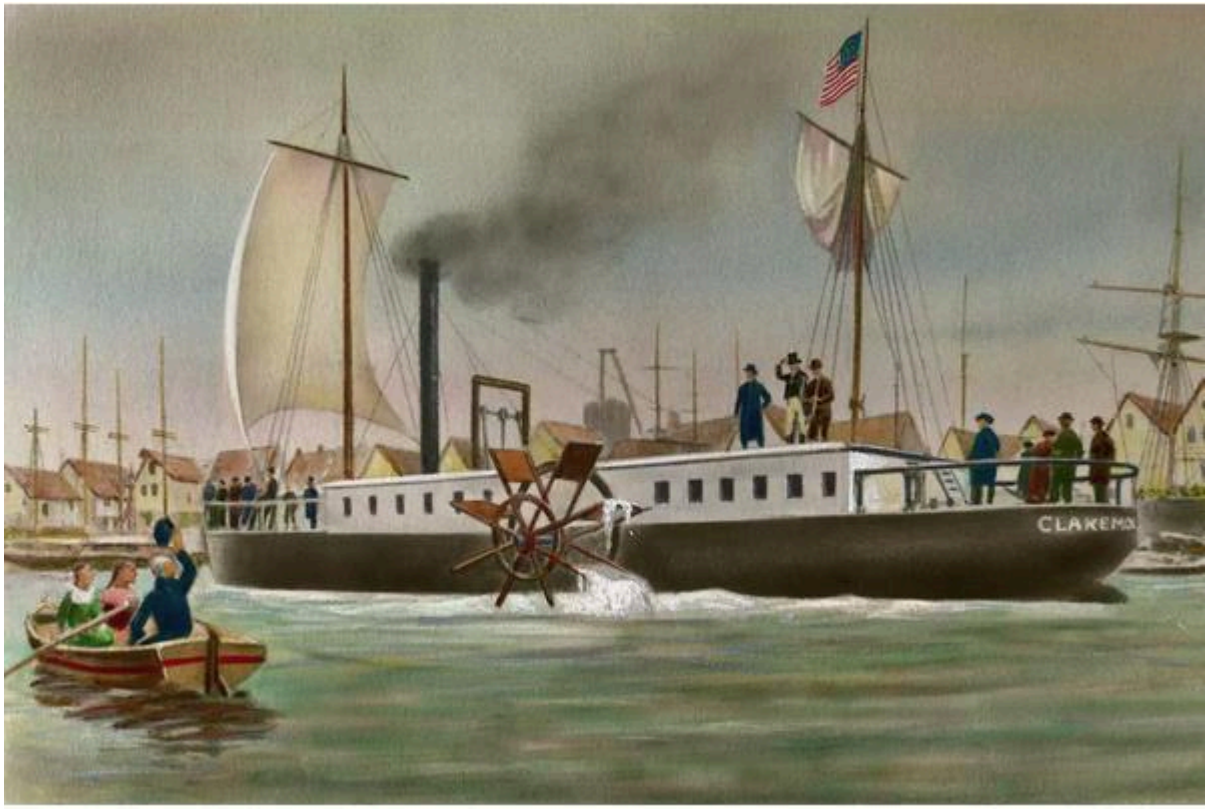
IT'S THAT MAN Trevithick again: this time he set up a circular track in London's Torrington Square, installed a steam loco similar to the one he'd run at Penydarren in 1804, named it the Catch-me-who-can and ran it as a fairground ride.

A PATENT was granted to John William Loyd for "anti-friction rollers or wheels to assist all sorts of carriage wheels".

1807

FRANÇOIS ISAAC de Rivaz retired from the Swiss army and spent his time designing an internal combustion engine that was fuelled by hydrogen and oxygen. He used the new fangled electricIty to extract the hydrogen from water and then ignited it with a spark from a Voltaic Cell. He had to open a valve manually for each stroke of the engine so credit to him for managing 2mph.

Dawn of a new age: DeRivazdrove an automobile.



American enginer Robert Fulton designed and operated the world's first commercially successful steamboat. The Clermont made its historic first run on the Hudson River; 12ft paddle wheels were driven by a 24hp steam engine designed and built by James Watt.

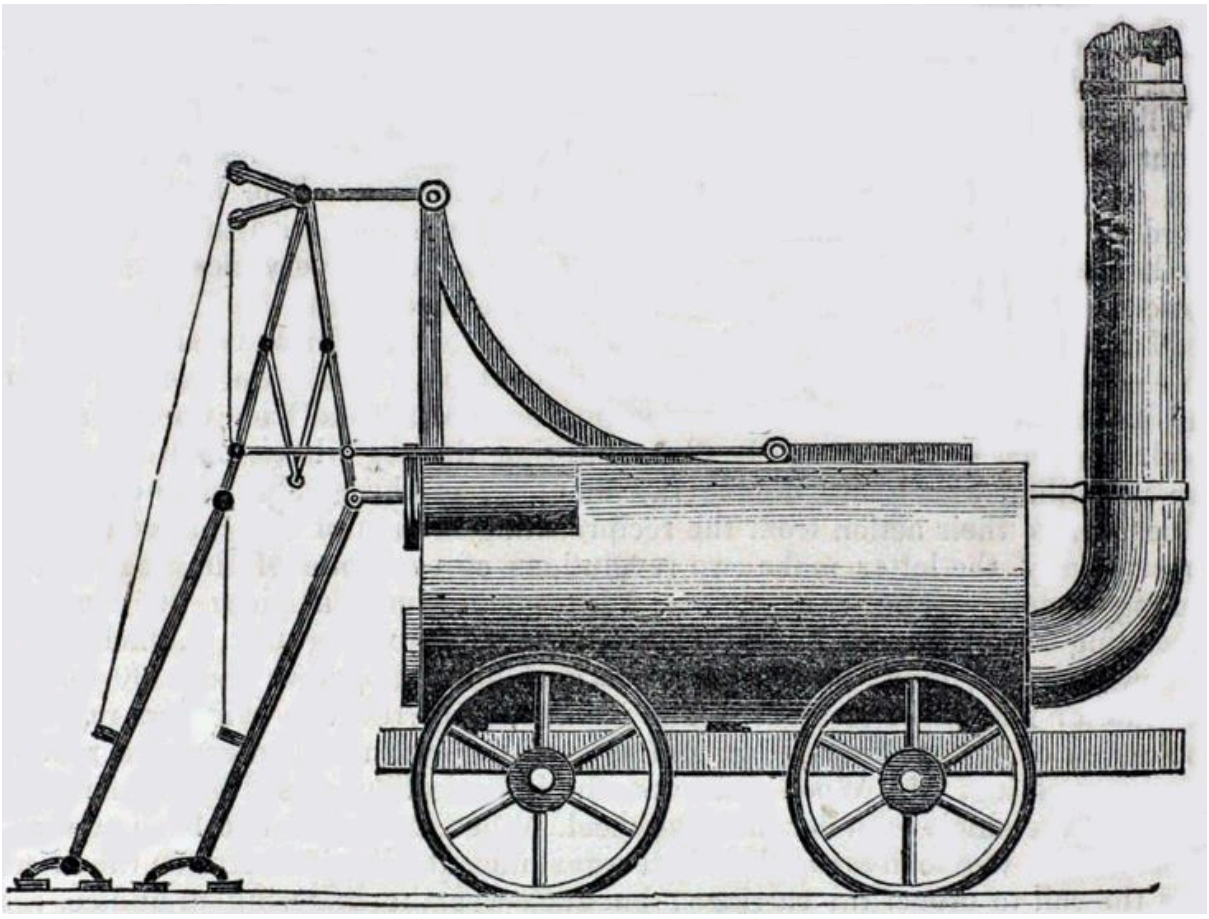
1809

SIRHUMPHRYDavyinvented the first electric light by connecting two wires to a battery and attaching a charcoal strip between the other ends of the wires. The charged carbon glowed, making the first arc lamp. A bit clumsy for a motorcycle but OKto light a large workshop. (Thegreatman had produced the world's first electric light seven years before, but the platinum filament burned out too quickly to be of practical use—andthe previous year he had established the existence of aluminium and named it.)

1810-1819

1814

SCOTTISHENGINEERWilliamBrunton, formerly superintendent of engine manufacturing at Boulton & Watts' Soho Manufactory, built a steam carriage called The Mechanical Traveller. It was also described as a steam horse, because while it was mounted on wheels it was propelled by two legs (called propellers) ending in broad, spiked feet. It took steps of 26in and weighed in at less than 2½ tonnes. Throughout the winter of 1814 The Mechanical Traveller earned its keep at the Newbottle Colliery, trudging up and down a 1:36 slope at 2½mph; it was said to have the tractive power of four horses. Brunton relied on his wrought iron boiler to handle a pressure of over 400psi—the following year it blew up, killing 13 people.



The Mechanical Traveller, aka the iron horse, more than a century before Ariel used the legend cheval de fer.

ASIF ONE walking steamer wasn't enough, Thomas Tindall of Scarborough patented a hybrid with a steerable wheel up front, four legs to move it along and two wheels at the back which could be powered for tackling hills or hauling heavy loads. It also featured a windmill, driven by exhaust steam as well as the wind, for extra power.

1815

JOSEFBOZEKofPraguebuilt a steam carriage. Bozek sat in front, a copper boiler at his feet, steering the vehicle with a tiller. Although the two-cylinder, ½hp, steam engine produced very little power and the limited boiler capacity necessitated frequent stops it ran well enough for its inventor to persevere. He staged a public demo as a fund raiser but there was a thunderstorm and in the confusion someone stole the gate money. This upset Bozekso much that he gave up on road transport to concentrate on horology.

This is a contemporary image of Bozek's steamer in action.

For the bicentenary of Bozek's demo run this replica was built and driven in Prague.

1816

CONCERNED BY THE DEATHS and injuries caused by exploding steam engines Reverend Robert Stirling came up with a hot-air engine. Rotation was caused by heat differentials as air passed between various parts of the engine. It might well have been safer than a steamer, but developed a meagre 2hp.

1817

BARON KARL Friedrich Christian Ludwig Drais Von Sauerbronn, an officer in the Prussian army (with a name like that what else could he be?) designed and built a two-wheeler which he called the draisine (often frenchified to draisienne). It was similar to the celerifere but Von Sauerbronn fitted steering, which had to be A Good Thing. Joseph Niépce (inventor of the Pyreolophore engine in 1806) uprated his hobby horse with an adjustable seating position and called it a velocipede—the name stuck. Mind you the French are still producing hobby horses for nippers which are marketed as Draisines so that name stuck too.

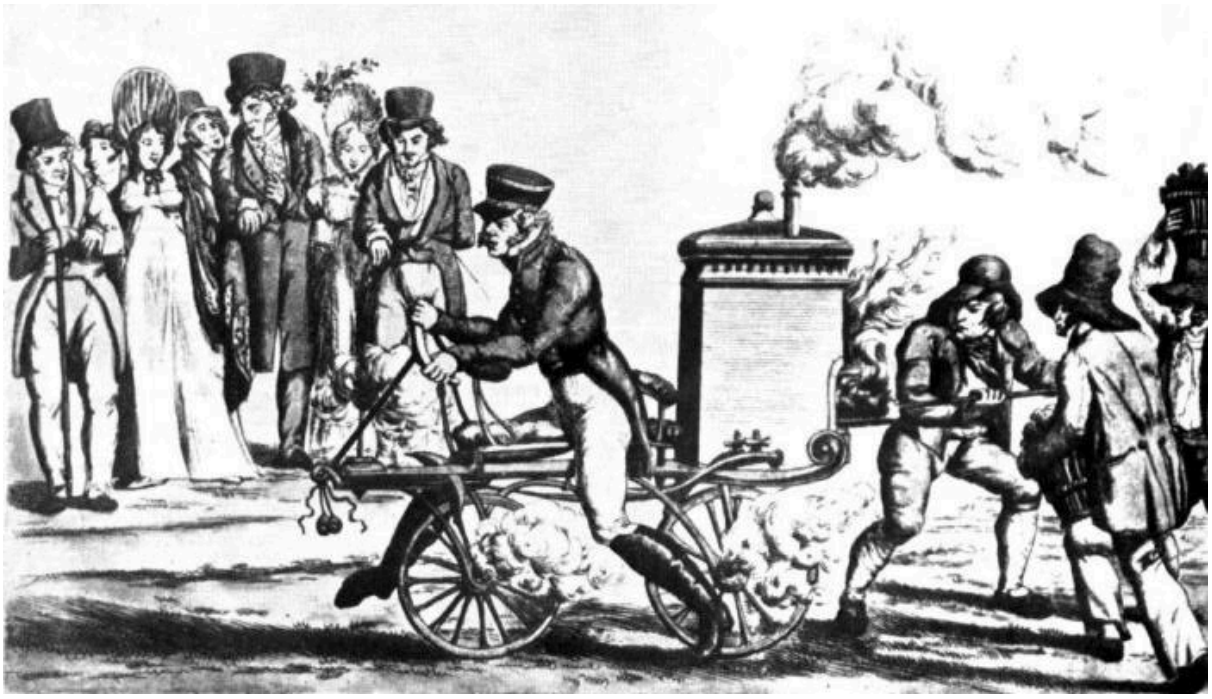
Von Sauerbronnon his draisine followed, in 2003, by enthusiasts on reconstructed draisines on a memorial run in Mannheim.

Karl strutting his stuff: legend has it that he once managed the 16 miles from Karlsruhe to Schwetzingen in just over an hour; he could avarege7mph on the flat.

Cobbles, tight trousers, iron-shod wooden wheels, no suspension…but an important stage in the evolution of the motor cycle and therefore A Good Thing.

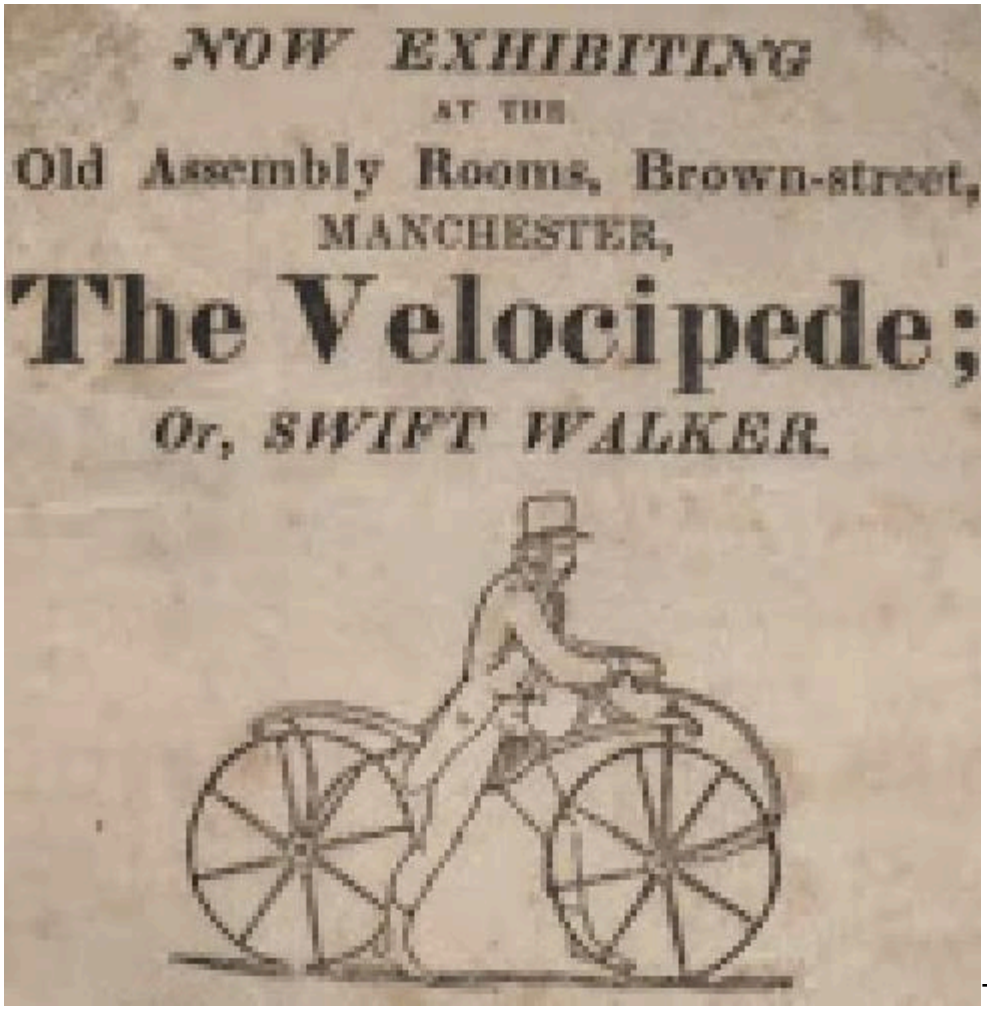
1818

ACCORDINGTOCONTEMPORARYnewspapers a draisine hobbyhorse fitted with some kind of steam turbine driving both wheels was demonstrated in the Luxembourg Gardens in Paris on 5 April. And who could resist a vehicle called a Vocipedraisiavaporianna?



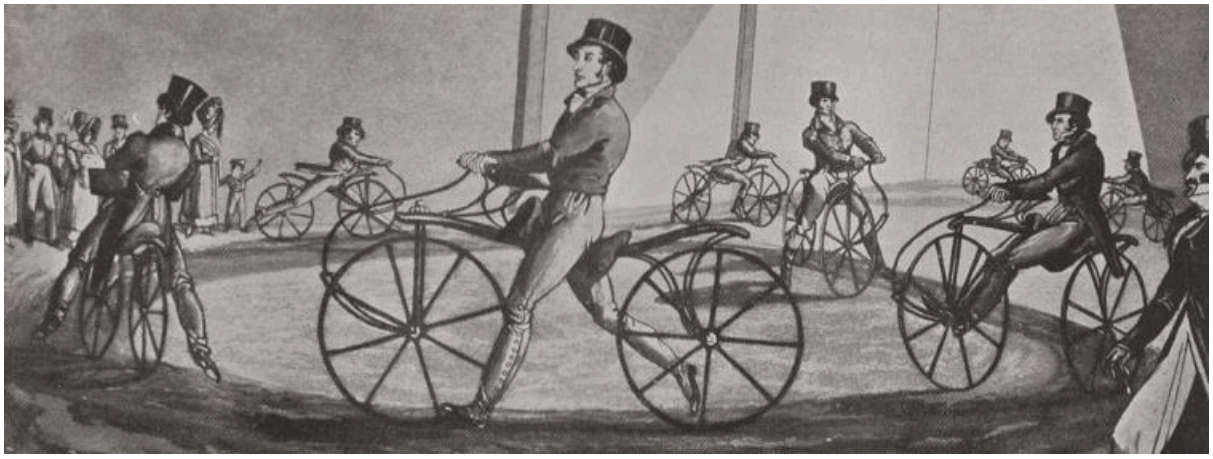
“Zut alors! C’est un Vocipedraisiavaporiannaist!” The illustration may be mostly the artist’s imagination but it seems a two-wheeled steamer was built in 1818 that might have been power-assisted.

ENGLANDFOLLOWEDGermany and France into the bicycle age courtesy of London coachbuilder Denis Johnson who, like Joseph Niépce, built an improved version of the draisine which he called ‘the pedestrian’s curricle’. As well as an



The curricle toured the country.

adjustable saddle Johnson incorporated an elbow rest. Still no brakes, let alone any form of suspension, but it had an elbow rest. Go figure. The curricle featured an elegantly curved wooden frame, allowing the use of larger wooden wheels. Several parts were made of metal, which allowed the vehicle to be lighter than the continental version. Thanks to Niépce it was formally referred to as a 'velocipede', but as Regency dandies started to hurtle about on them nicknames abounded, including dandy-horse, hobby-horse, pedestrian's accelerator, swift walker and, possibly the most accurate description, boneshaker. Johnson made at least 320 velocipedes, opened riding schools in the Strand and Soho and introduced a dropped-frame ladies' version. His son John Johnson toured England displaying the machines and giving riding lessons; destinations included Bristol, Bath, Manchester, Leeds, Birmingham and Liverpool. Despite all this energetic advertising the hobby-horse craze was over within a year.



Youngdandies were taught to handle their new toys in riding schools.

Long before there were open-frame ladies' motor cycles to suit plucky Edwardian gels there were open-frame ladies velocipedes to suit plucky Regency gels.


A contemporary caricaturist's view of the dandy-horse craze, entitled "Hobby-Horse Fair".

RUDOLHACKERMANN, British agent for German carriage builder Georg Lankensperger, patented the carriage steering system that Lankensperger had designed the previous year. Ackerman (as it's now spelt) steering's geometric arrangement of linkages solves the problem of wheels on the inside and outside of a turn tending to trace out circles of different radii. It is relevant to our story as many early 'passenger motor cycles' were forecars with two wheels up front. In recent years this layout has made a minor comeback.

1819

DAVIDGORDON, who was working with William Murdock in the Soho works, experimented with compressed air for road locomotives. He also established a society of gentlemen with the idea of forming a company to run a mail coach and other carriages by "a high-pressure steam engine, a gas vacuum or pneumatic engine supplied with portable gas".

LEEDSCUTLERJohnBaynesscorned steam in favour of manpower with treadle-operated legs to push a carriage along in the same way as the Mechanical Traveller.

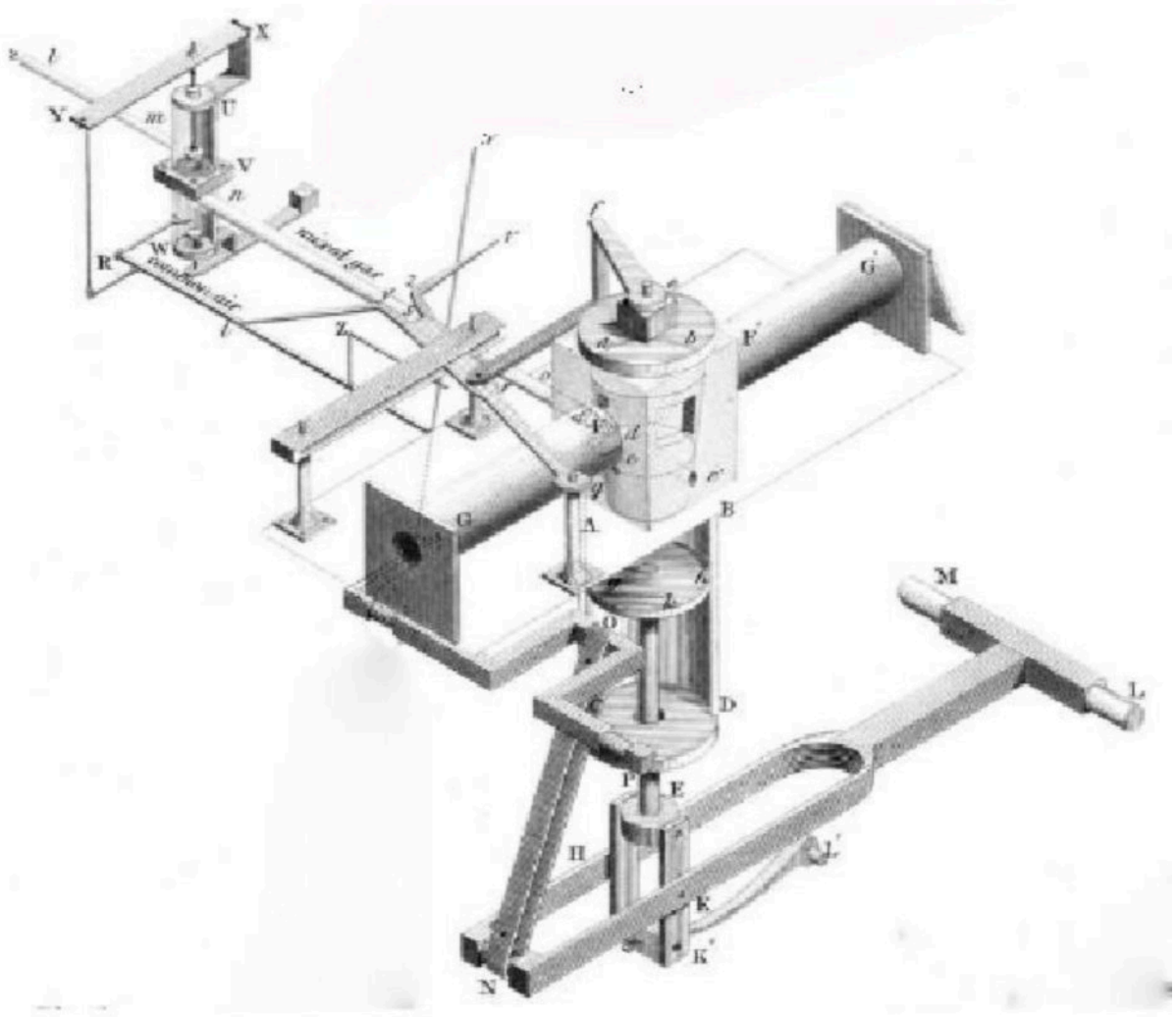
A LONDONcoachbuilder named Birch [is it me or does sound like the first line of a limerick?] designed and built a three-wheeler he called a 'Manivelociter' which was propelled by a brawny volunteer at the rear moving long hand-operated levers while a driver up front sat back and enjoyed the ride. You can bet Birch took the driving seat. Maybe the lever-mover complained because he quickly built the 'Trivector' which carried three, all of whom did a share of the work. And there was plenty of work to go

round: the Trivector with its 5ft driving wheels weighed 700lb. It worked though, completing the 54 miles from London to Brighton in seven hours

1820-1829

1820

THEREVW CECIL presented a paper to the Cambridge Philosophical Society with the snappy title: On the application of hydrogen gas to produce a moving power in machinery; with a description of an engine which is moved by pressure of the atmosphere upon a vacuum caused by explosions of hydrogen gas and atmospheric air. But while it operated "according to the explosion vacuum method…in much the same manner as in the common steam-engine", the hydrogen engine would "be capable of acting in any place, without the delay and labour of preparation". At 60rpm, he added, "the explosions take place with perfect regularity".



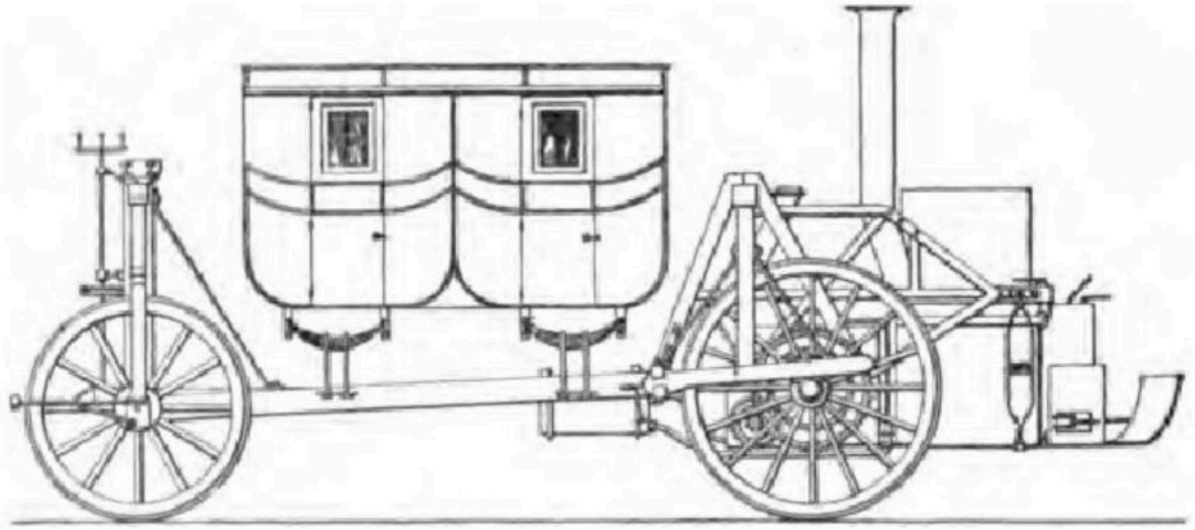
Cecil reckoned his gas engine would run smoothly at 60rpm.

1821

DAVIDGORDON took out a patent for "improvements in wheel carriages". His ideas included mounting the engine inside a sort of giant hamster wheel in the form of a cylinder 9ft in diameter and 5ft long. Teeth round the internal circumference meshed

with the running wheels of an engine much like Trevithick's. This caused the wheels of the carriage to climb up the internal rack of the large cylinder, making the cylinder roll forward, propelling the vehicle by means of side rods. Obvious when you come to think of it.

JULIUSGRIFFITHSofBrompton had a carriage built by the locksmith firm Bramah. It was designed to carry three tons at 5mph and was patented in England, Austria and the USA. It was also a flop, otherwise it might have been the first commerical vehicle.



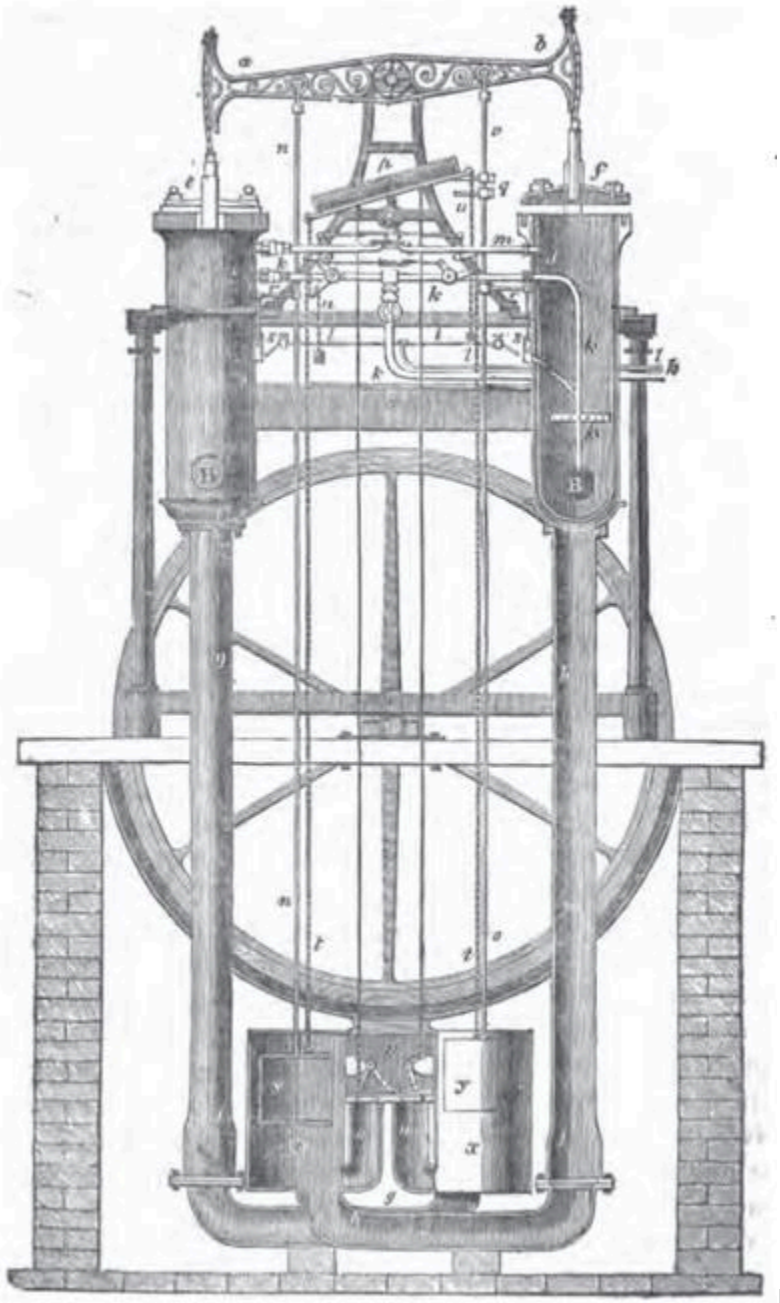
The Bramah was a brave attempt at a CV with a three-ton payload.

1822

GOLDSWORTHYGURNEY, later to earn fame as a pioneer of steam-powered PSVs, built what was probably the first engine to run on ammonia. He claimed: "Elementary power is capable of being applied to propel carriages along common roads with great political advantage, and the floating knowledge of the day places the object within reach." He was said to have used his amonia engine to power "a little locomotive".

1823

SAMUELBROWNpatented a gas engine adapted from Newcomen's athmospheric engine. Like Cecil's engine it relied on burning gas to expel the air from a vertical cylinder, but cold water was injected to "condense the flame and produce a vacuum". Mechanics Magazine reported that one of his multi-cylinder engines had raised 300 gallons of water 15ft on a cubic foot of gas.



Brown's engine was a steam engine fuelled by gas.

BRITISHINVENTOR(andqualified doctor) Sir Goldsworth Gurney, inspired by his chum and fellow Cornishman Richard Trevithick, built a model steam carriage; as we'll see he would have an illustrious record with the real thing.

Goldworthy Gurney built an exquisite model steam carriage before progressingto greater things.

MACINTOSHUSEDrubber gum to waterproof cotton–and we all need waterproof riding gear.

1824

WALTERHANCOCKbeganto work on the first of a series of steam-powered coaches.

T BURSTALLOFEdinburghand JHill of London teamed up to patent and build an innovative steam coach featuring the 'flash boiler' technology which made later steam cars practicable. It was also the first vehicle to boast four-wheel drive—notdirectly relevant to our story but still damned clever.

MOREFEET!DavidGordon built a coach he called The Comet featuring a modified version of William Brunton's walking-carriage design; there was a view at the time that wheels alone would not have enough friction. As with Brunton's walker, three wheels took the weight of the vehicle while six legspushed it along, much like a nipper on a scooter. [Exactly 124 years later Corvair would build the B36 bomber with six propellors and four jets; a USAFwagdescribed it as "six turning, four burning". A Georgianwag might have remarked that The Comet had "three rolling, six strolling"] . Innovations

included a rotary drive to the legs, described a ‘propellers’, for a smoother action. The propellers were formed of iron gas-tubes, filled with wood, to combine lightness with strength. According to a contemporary description: “To the lower ends of these propelling rods were attached the feet, of the form of segments of circles, and made on their under side like a short and very stiff brush of whale-bone, supported by intermixed iron teeth. These feet pressed against the ground in regular succession, by a kind of rolling, circular motion, without digging it up.” It took more than six years of experiments with four walking carriages to convince Gordon that wheels beat legs. Pity though; instead of mopeds we might have had been riding bipeds.

The Comet:: “Three rollin’, six strollin’.”

The B36: "Six turnin' four burnin'."

WILLIAM JAMES built a 20-seat steam coach featuring a double-cylinder engine on each rear wheel. This gave each driving wheel an independent source so power and speed could be varied for turning corners. Its turning radius was said to be less than 10ft—considerably more nimble than a 21st century minibus.

1825

GREAT DANE HANS Christian Orsted produced tiny amounts of aluminium (8% of the planet's crust is made of aluminium; not a lot of people know that). It's lighter than cast iron, of course, but as Ariel VB owners will know, the other difference is that iron heads don't warp. Orsted was also a pioneer in the field of electromagnetism, which led to magnetos, dynamos, alternators, starter motors, regulators and solenoids. Nice one Hans.

GURNEY PATENTED and built a full-size version of his walking carriage and drove it up Windmill Hill, near Kilburn in North London. It weighed 1½ tons, had 21 seats and was rated at 12hp. The legs were found to be superfluous so he removed them.

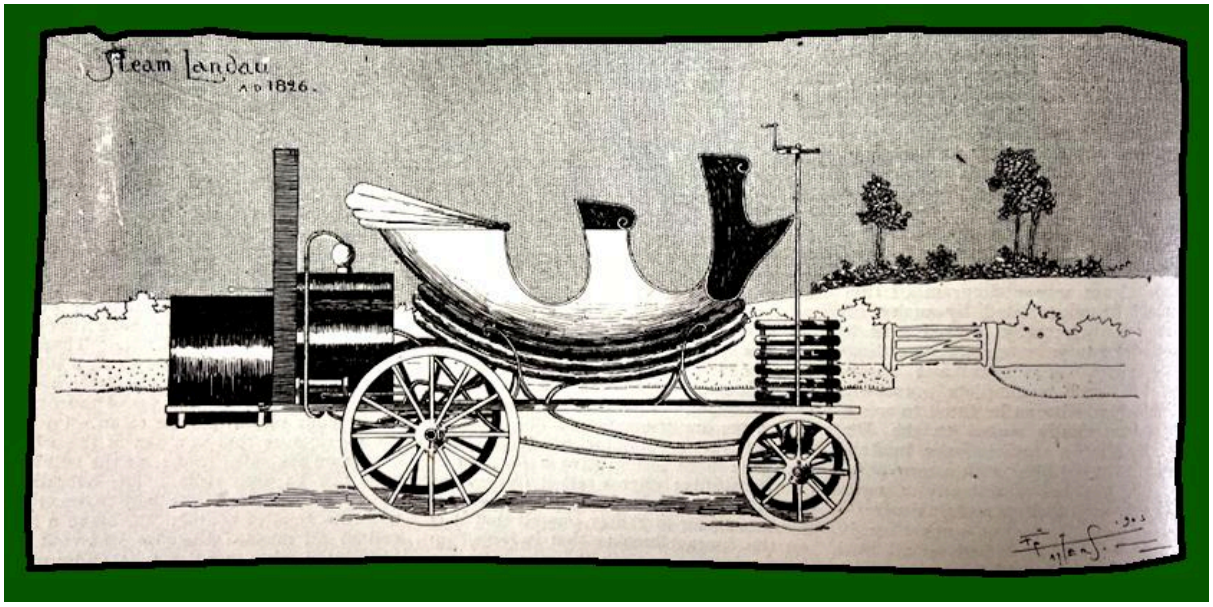
JAW HITFIELD OF Bedlington Ironworks reported that one of Sam Brown's gas engine was fitted into a carriage with 5ft wheels, a wheelbase of 6ft 3in, a track of 4ft 6in and a tare, including gas and water, of a ton. The bore/stroke were 12x24in. In May this carriage climbed the steepest part of Shooter's Hill in South-East London ("a gradient of more than 13in in 12ft") "with considerable ease"

SAMUEL BROWN fitted his 'gas-vacuum' engine to a carriage which climbed Shooter's Hill in South-East London "to the satisfaction of numerous spectators".

1826

SAMUEL MOREY patented an internal combustion 'explosive engine'. It was fuelled by a gas/air mixture via a carburettor and featured cam-driven poppet valves with tappets, a crank and a flywheel. He also experimented with spark ignition but failed to find backing to develop his dream of "drawing carriages on good roads and railways and particularly for giving what seems to be much wanted direction and velocity to balloons".

This is a replica of the Morey engine, built a century later.



Published in the Motor's 1903 Xmas issue: "Peeps at at Past Steam Landau 1826."

1827

THEBROTHERSJohnsonofPhiladelphia built a carriage with a bottle-shaped boiler, 8ft wooden rear driving wheels and much smaller front wheels. It worked well but "was sometimes altogether unmanageable" and caused considerable damage to local buildings.

MESSRSPOCOCKandViney attached kites to a light gig and rode in it from Bristol to London but they carried a pony on a platform at the rear "to make the carriage available when the wind did not serve". Theyclaimed to have regularly topped 20mph.

FRIEDRICHWÕHLERmadealuminium by reacting potassium with anhydrous aluminium chloride.

HANCOCKPATENTEDasteam boiler incorporating separate chambers of thin metal which could split rather than explode, a safety measure for operators and passengers alike.

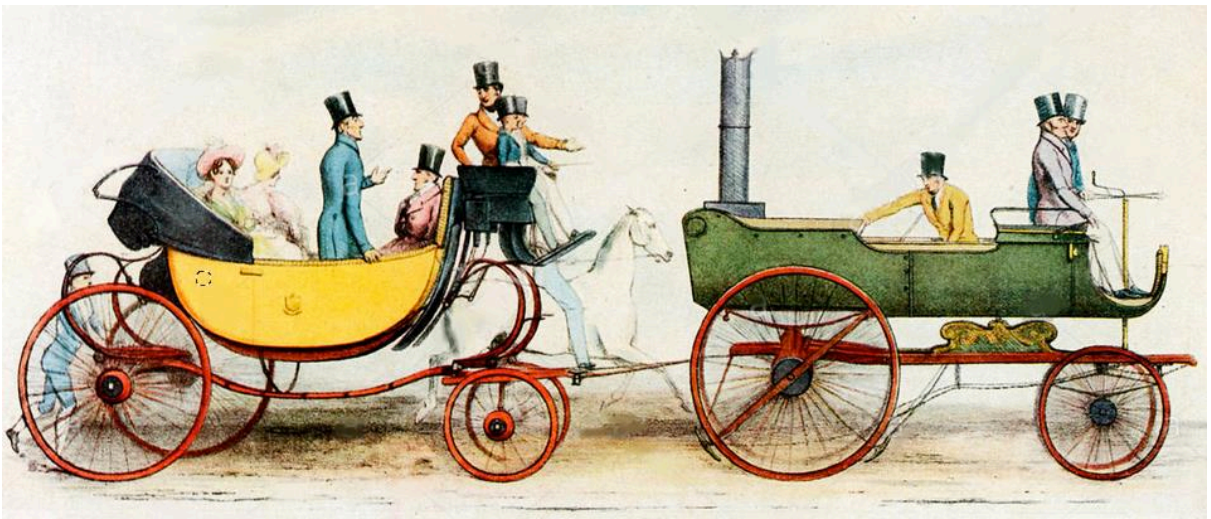
1828

THEWESTERNTIMESreported:"We were much gratified a day or two ago by witnessing a novel exhibition on the Hammersmith road of a large carriage propelled by a Gas Vacuum Engine, which rolled along with great ease, at the rate of seven miles per hour. Therewere several gentlemen in and upon it, who appeared quite satisfied of its power and safety. The public are indebted to Samuel Brown, Esq of Brompton, for this valuable discovery, who has been indefatigable in his exertions to bring it to its present state of perfection!'

1829

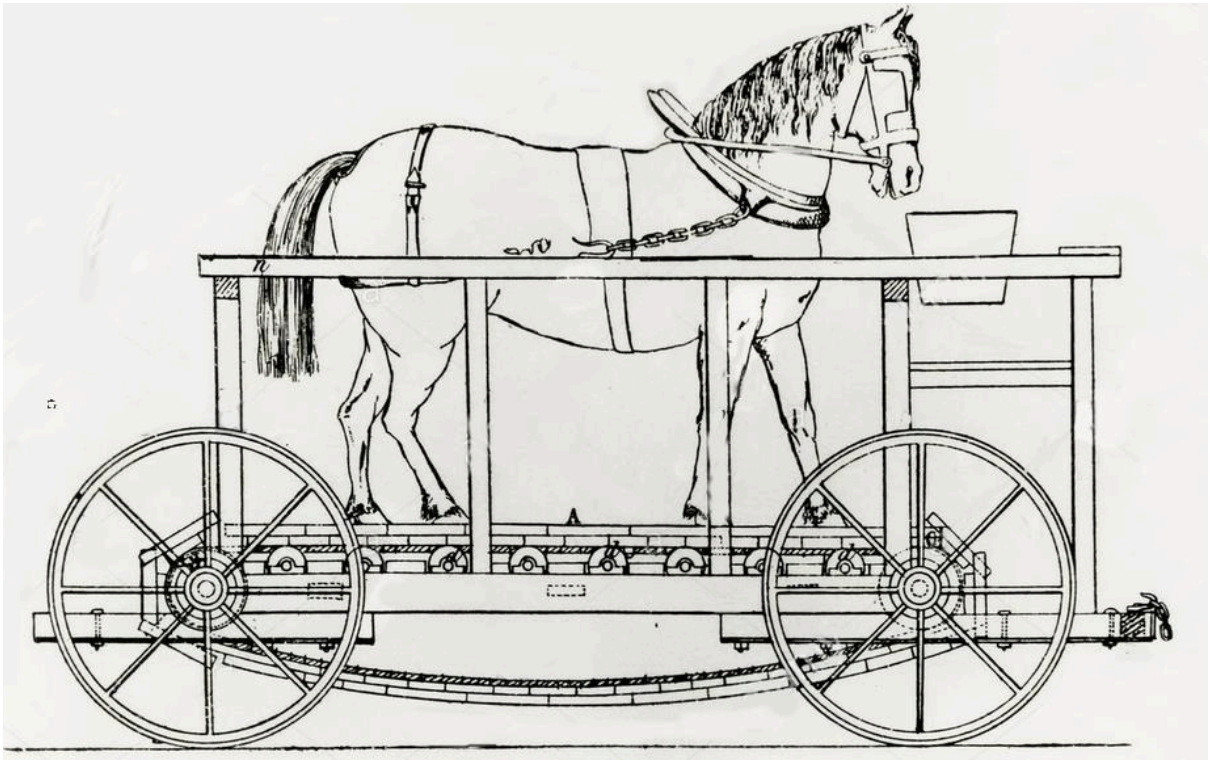
IN FEBRUARY 1829 Gurney drove one of his steam carriages 212 miles from London to Bath and back at an average of 15mph. Gurney's pioneering run was made at the request of the Quartermaster General of the army who clearly grasped the advantage of moving troops and equipment at high speed. Gurney boosted the power of his engines with a high-pressure steam jet. The 'Gurney Jet' was applied to Stephenson's Rocket locomotive for the Rainhill Trials on the Liverpool and Manchester Railway in October 1829, and to steam carriages. Stevenson also claimed responsibility for Brandreth's Cyclopede, powered by a horse on a conveyor belt, that competed at Rainhill but only managed 6mph.

Gurney launched an ambitious coach service from London to Bath, averaging 15mph.



This splendid print was published in 1829 with an equally splendid caption: "A Sketch of Mr Gurney's new steam carriage. As it appeared at Hounslow on the 12th of August,

with a Barouche attached, containing the Duke of Wellington and other Persons of Distinction."

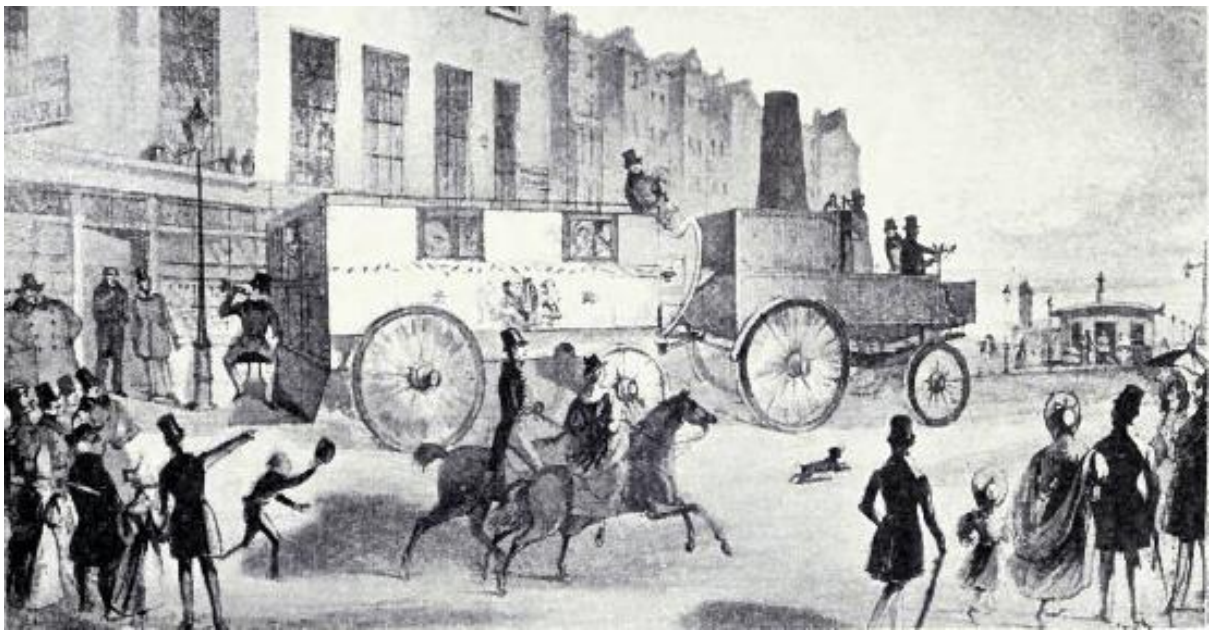


As well as the all-conquering Rocket, Robert Stephenson entered the 1hp Cyclopede in the Rainhill trials.

1830-1839

1830

SIRCHARLESDANCE,who was Goldsworthy Gurney's financial backer and built coaches for himself, ran steamers successfully from London to Holyhead, from Birmingham to Bristol, from Gloucester to Cheltenham and from London to Brighton. In four months Dance's carriages carried 2,666 passengers and covered 3,644 miles "without an accident or delay of consequence". It was a brave attempt to establish a reliable steam-powered public transport system.

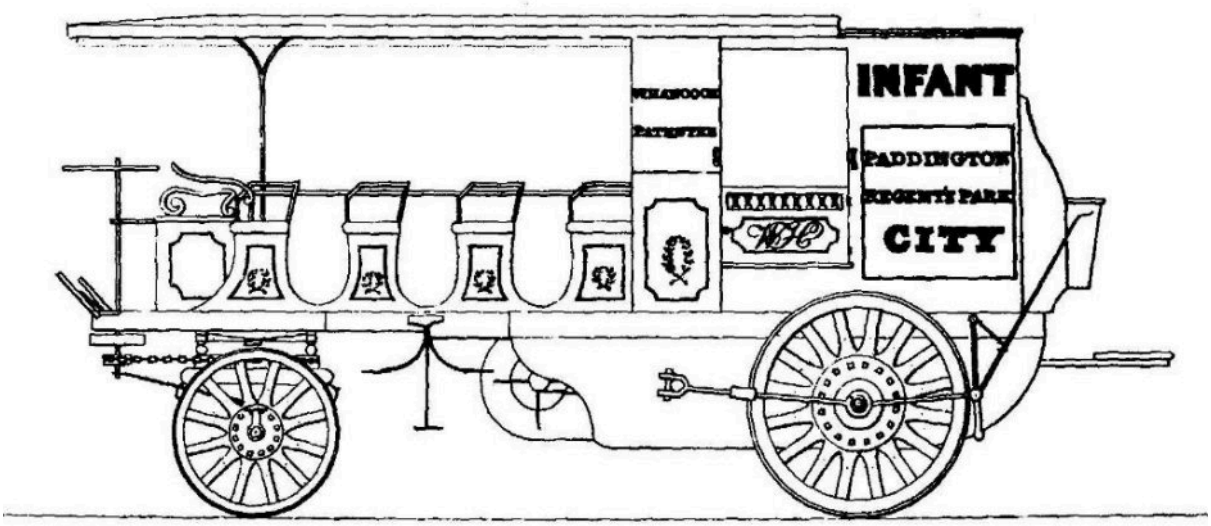


Dance's steam waggon and drag sets off on its daily five-hour run from The Strand to Brighton.

INVENTIVECHAPSwithout access to steam engines were still turning our manpowered contraptions. One such, named Julien, produced a treadmill-driven trike; a duo named Bramley & Parker came up with a trike in which the rear rider laid back working treadles with his feet and crank-handles with his hands while the pilot steered but was also reuired to operate treadles and cranks. Rural postieds were being issued with dandy-horses and if they'd seen Bramley & Parker rumbling by they must have counted their blessings.

1831

HANCOCK'S's10-SEATInfant plied its trade between Stratford and the West End. He claimed his motive was not profit but a bid to win public support for steam PSVs.



The appropriately named Infant was Hancock's first successful PSV.

MICHAELFARADAYdiscoveredhow to make electricity from magnetism. Later developments were to be of great use to motorcyclists, despite occasional lack of reliability leading to dark mutterings that JoeLucas's slogan should be "Don't go out at night."

SUMMERS&OGLEbuilt a three-pot steamer that made a run from Southampton to London at an averageof 25mph. One observer rightly remarked: "This achievement is at once scarcely credible and terrifying to contemplate."

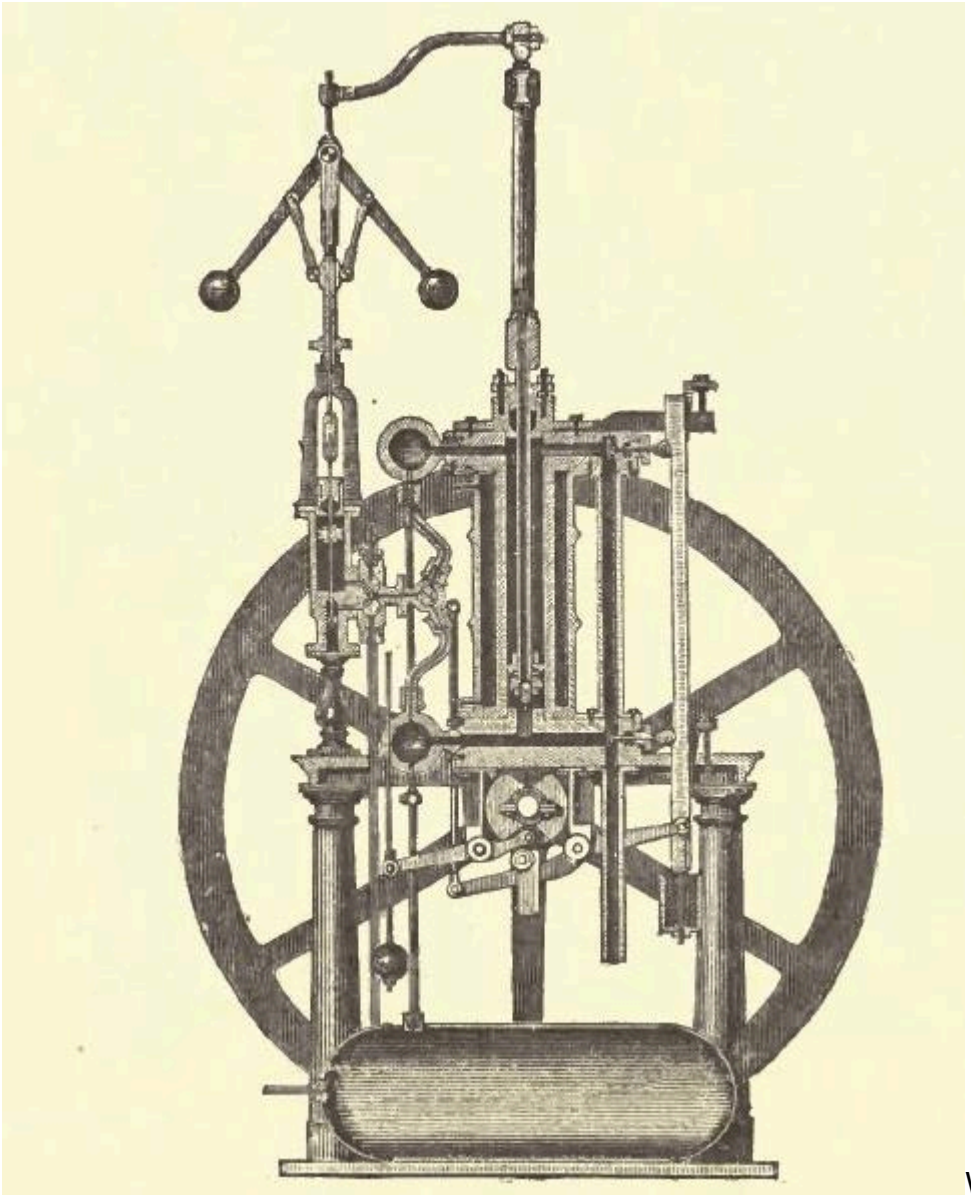
1832

FOUROF SAMBrown's gas-fueled engines were hard at work powering pumps at Croydon, Soham, Cambs, and EagleLodge, Old Brompton.

1833

LEMUELW WRIGHTpatented a gas engine. Half a century later Dugald Clerk, inventor of the two-stroke engine, reviewed Wright's design: "The drawingsare very complete and the details are carefully worked out. Theexplosion of a mixture of inflammable gas and air acts directly upon the piston, which acts through a connecting rod upon a crank-shaft. Theengine is double-acting, the piston receivingtwo impulses for every revolution of the crank-shaft. In appearance it resembles a high pressuresteam engine of the kind known as the table pattern. Thegas and air are supplied to the motor cylinder from separate pumps through two reservoirs, at a pressure a few pounds above atmosphere, the gases (gas and air) enter spherical spaces at the ends of the motor cylinder, partly displacing the previous contents, and are ignited while the piston is crossing the dead centre. Theexplosion pushes the piston up or down through its whole stroke; at the end of the stroke the exhaust valve opens and the products of combustion are discharged during the return, excepting the portion remaining in the spaces not

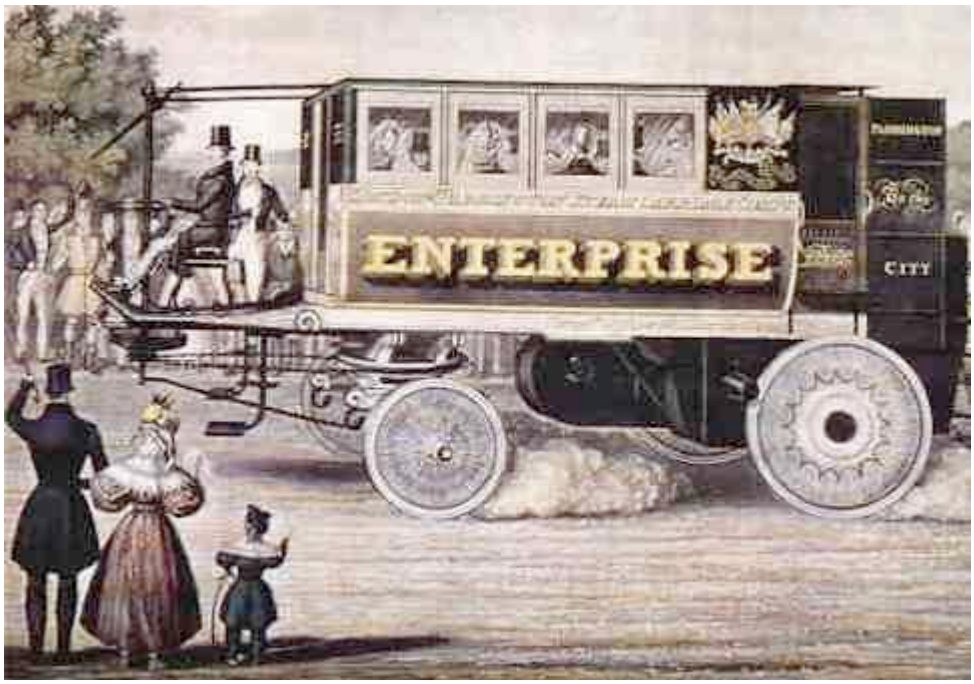
entered by the piston. The ignition is managed by an external flame and touch-hole…Both cylinder and piston are water-jacketed, as would have been necessary in a double-acting gas engine to preserve the working parts from damage from the intense heat of the explosion. This is the earliest drawing in which this detail is properly shown."



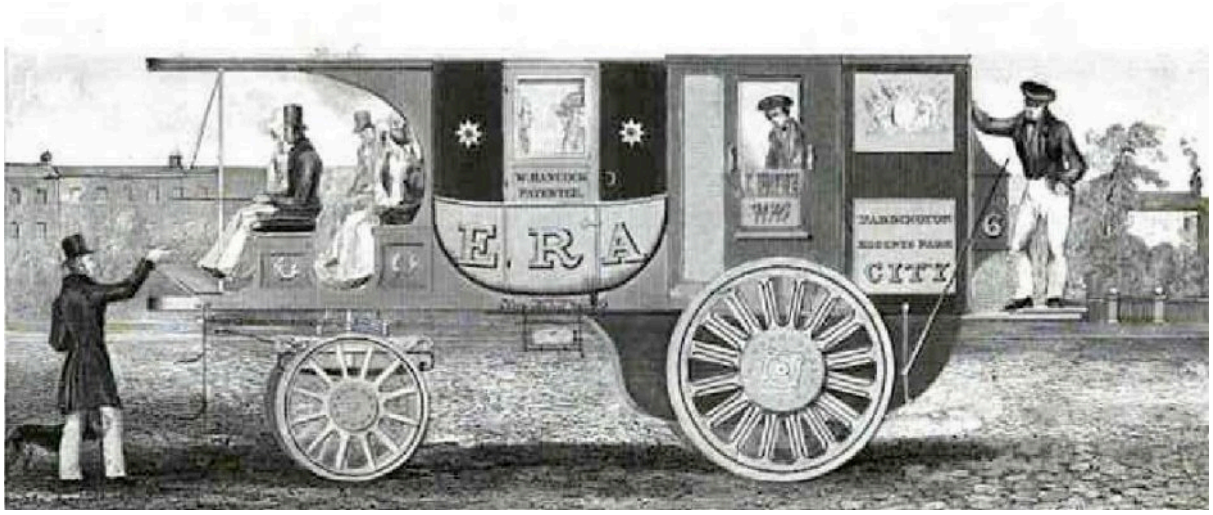
Wright patented a two-stroke double acting gas engine.

GOLDSWORTHY GURNEY's great rival Hancock was keeping busy: his carriage Enterprise was carrying passengers in the metropolis for the London and Paddington Steam Car Company—the first regular steam carriage service; Enterprise was the first mechanically propelled vehicle specially designed for omnibus work. Clever design features included a centrifugal blower fan driven from the rear axle which was used to force air into the firebox. Enterprise was soon joined by the 22-seat Automaton and Era, until Era was renamed Erin and sent on a promotional tour

round Dublin. There were even plans for paved roads to suit long-distance, high-speed powered road transport.



Enterprise was one of a series of successful coaches designed by Walter Hancock.



Era, renamed Erin, crossed the Irish Sea to promote steam-powered passenger transport. It featured a two-speed gearbox.

COLONELFRANCISMaceroni, following a spell as aide de camp to the King of Naples and military service with the Turks, teamed up with John Squire, a former employee of Sir Goldsworthy Gurney, to patent a vertical tubular boiler which was a rapid generator and capable of a working pressure of 150psi developing 30hp. They used it to power a 14-seat steam carriage and set up a service between Paddington and Edgware. A contemporary writer described it as "a fine specimen of indomitable perseverance" which cruised at 16mph. Over the course of a few weeks it covered 1,700 miles required no repairs.

YORKSHIREMANISAACBrownmadea wooden horse that hauled a gig over a mile in six minutes and a scheme was proposed to set up a public transport system using ‘manumotive engines’ – men sweating on treadles.

BYYEAR’SENDup to 20 ‘drags and carriages’ were built or under construction. Steam transport companies were opening up throughout the country. Alexander Gordon published a Proposal for Appropriating for the Public Purse the Vast Revenue that will Arise Annually from Internal Elemental Transit.

1834

THEREFRIGERATORwasinvented, which would become A Good Thing for freezing interference-fit bearings (though proper British beer should, of course, be kept well away from fridges).

RICHARDROBERTSdrovehissteam carriage with 40 passengers on board at an average of 20mph.

THESTEAMCARRIAGECompanyofScotland ran a fleet of six steam coaches until one crashed and its boiler blew up, killing five passengers. The Court of Session banned all steamers from Scottish roads.

MACERONISTEAMcarriages ran in Paris and Belgium.

1835

JAMESBOWMANLindsaydemonstrated an electric light at a public meeting in Dundee. With it, he claimed, he could “read a book at a distance of one-and-a-half feet”.

THEHIGHWAYSActput highways under the control of parish surveyors, who became legally responsible for keeping them in good repair. It also introduced fines for various traffic offences—and required all traffic to keep to the left.

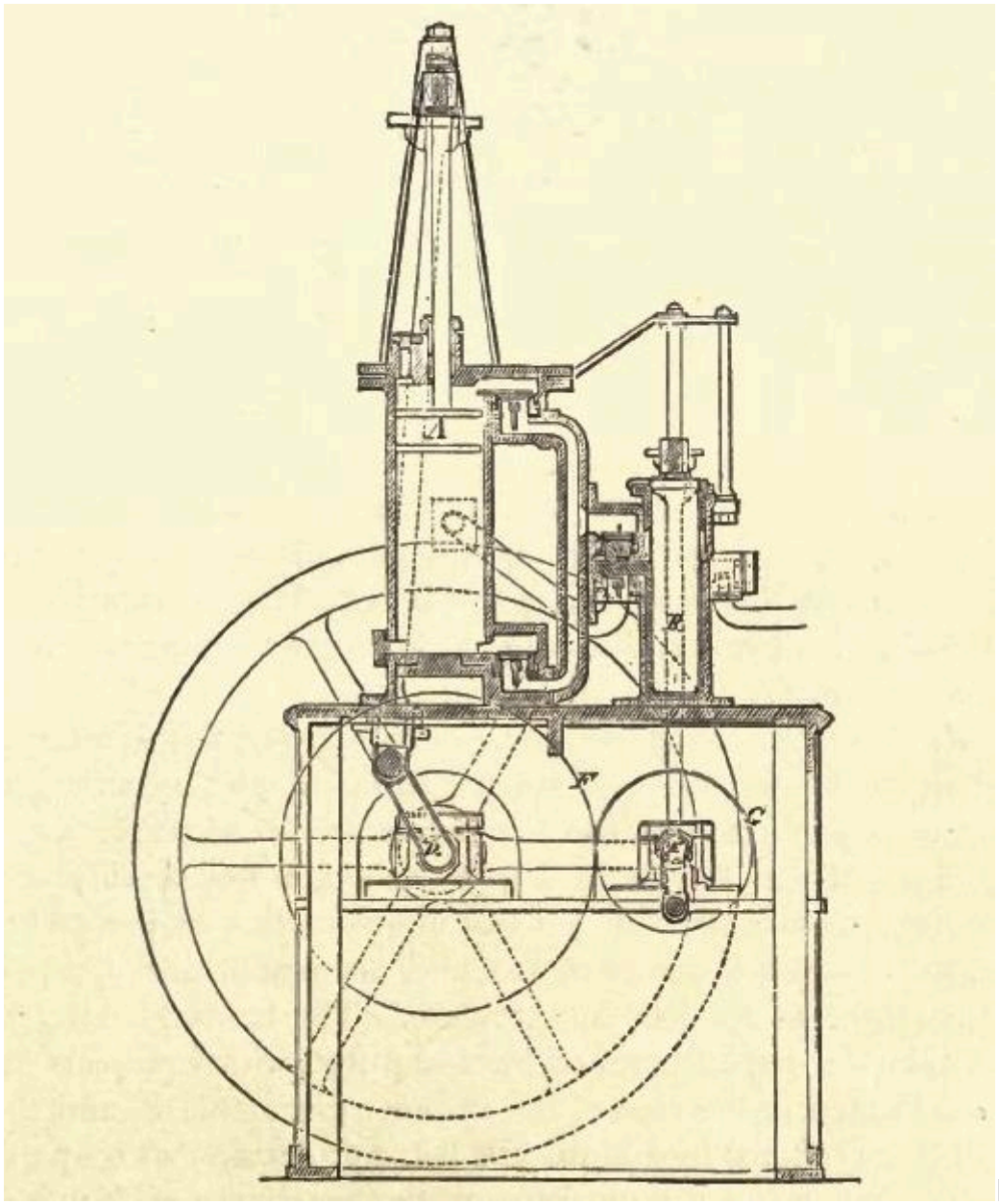
1836

TOFIGHTBACKagainst the crippling tolls and other hostile moves from the horsey set Gurney promoted “An act to repeal such portions of all acts as impose prohibitory tolls on steam carriages, and to substitute other tolls on a equitable footing with horse carriages”. MPs passed the law but the Lords blocked it. Dance suspended operations, Gurney gave up on steam. Hancock showed what steamers could do by running all his carriages on regular routes round Stratford and Islington for a 20-week period. The fleet made 712 trips, covering 4,200 miles and carrying 12,761 passengers.

1838

A PATENTWASgrantedto Englishman William Barnet for the first recorded suggestion of in-cylinder compression in his two-stroke double-acting gas engine . His flame-ignition system survived into 20th century. Lebon had described an engine using compression in

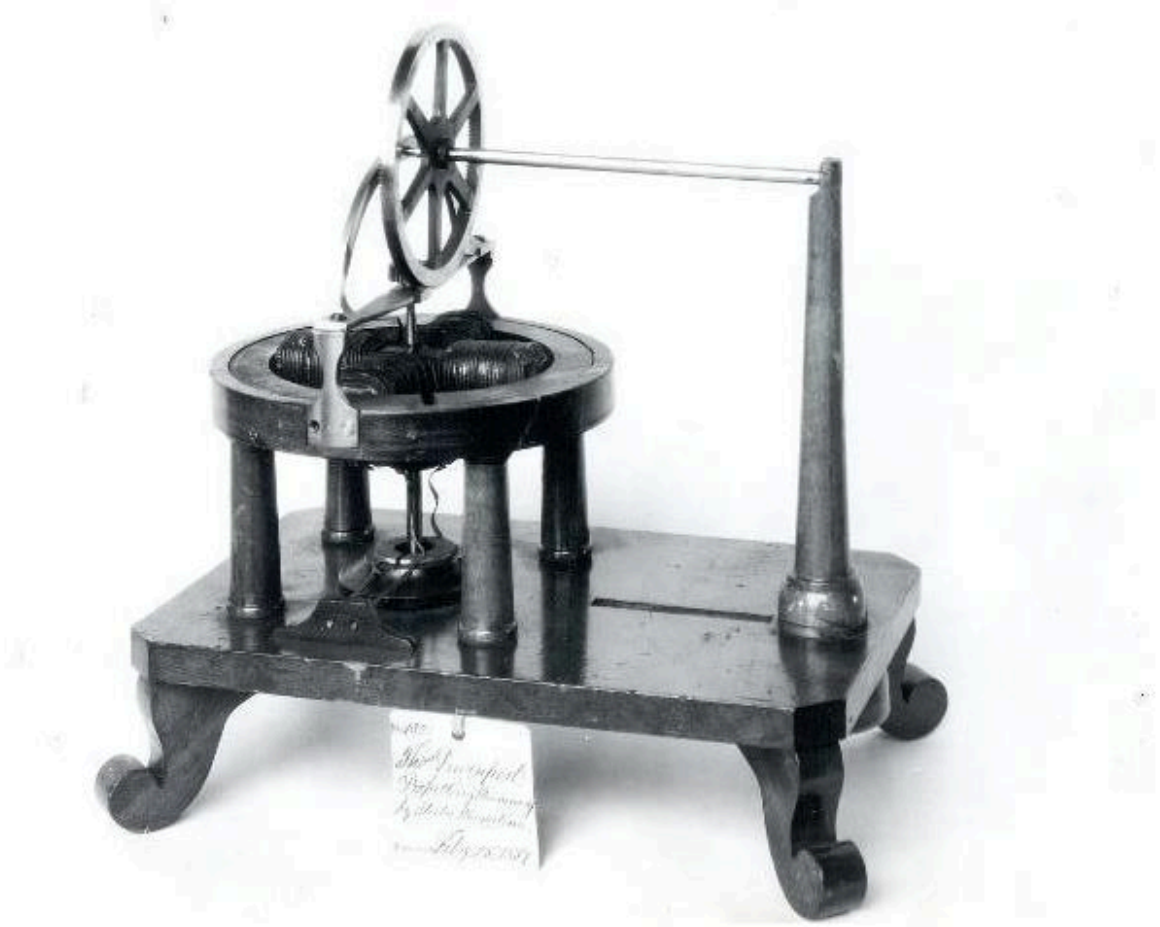
1799, but Barnett's system was different enough to be considered as new technology. Dugald Clarke, who later reviewed engine patents on the internal combustion engine, wrote: "Of these patents, by far the most important is Barnett's."



Barnett's double-action two stroke gas engine was a direct ancestor of the two-stroke and four-stroke engines that would power motor cycles.

AMERICANBLACKSMITHThomasDavenport made four electromagnets from which he built what we today know as a DC motor, complete with a brush and commutator, using his wife's silk wedding dress to insulate the wires. After many difficulties he patented the motor and used it to power a small model of a train and some of the machines in his workshop, drawing his sparks from Voltaic cells. He later worked on an electric printing press, electric telegraph and electric piano. Davenport even used his motor to operate a

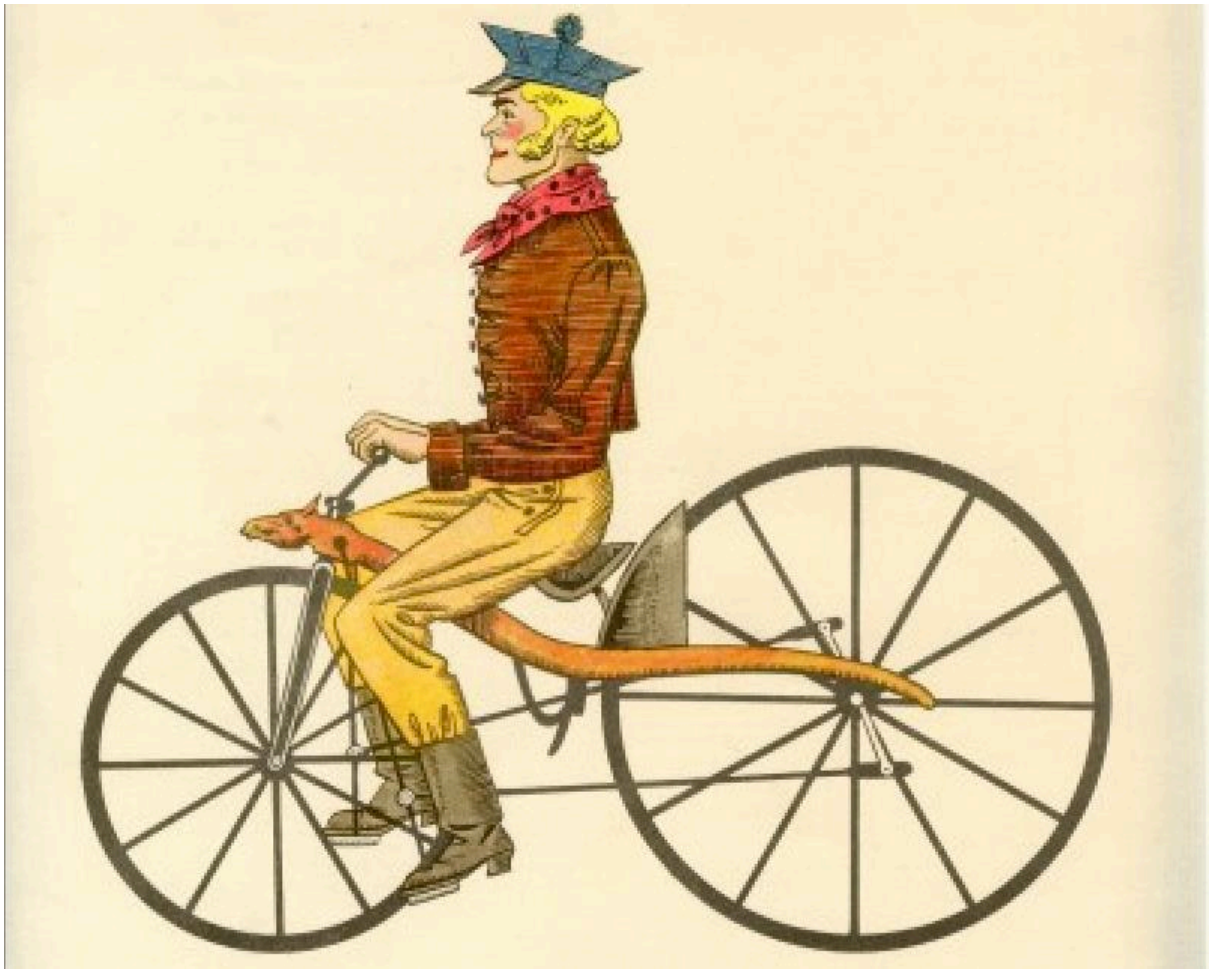
small car, this perhaps being the first electric car in history. In due course his pioneering work led to starter motors and electric motor cycles.



Blacksmith Thomas Davenport electric motor

1839

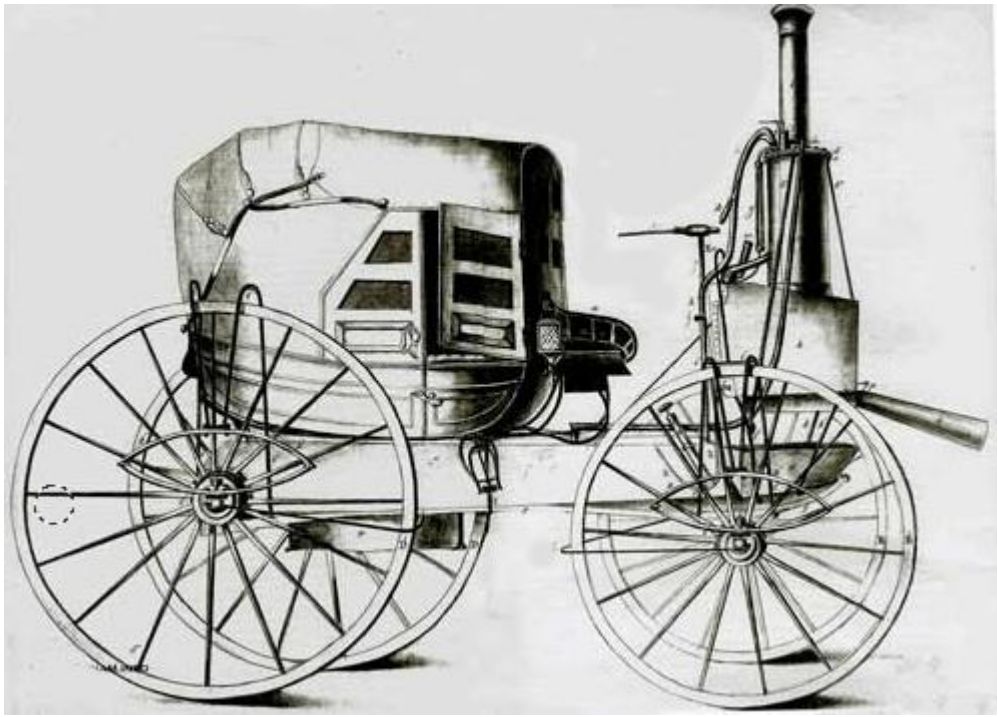
DRIVINGLEVERSandpedals were added to a draisine by Scottish blacksmith Kirkpatrick Macmillan. The machine was propelled by a downward and forward thrust of the foot, allowing the rider to cover ground without getting his feet dirty. The bike was heavy and propelling it was a demanding task but is said to have regularly treadled 14 miles from his home to Dumfries in less than an hour. And in June 1842 he reportedly rode 68 miles into Glasgow in two days and was fined five shillings for causing a slight injury to a small girl who ran across his path (this is confirmed by a local newspaper story which spoke of "a gentleman from Dumfriesshire…bestride a velocipede…of ingenious design". That, at least, is what the history books tell us. The first public showing of the treadle-operated velocipede was at the 1896 Stanley show. But that exhibit, it has since emerged, was made in 1869 by Scottish cartwright Thomas McCall. Which doesn't mean Macmillan didn't invent it and in any case it was only a bicycle so it doesn't really matter.



Macmillan Kirkpatrick was treadling along before there were any motor cycles to hold up.

ROBERTANDERSONofAberdeenbuilt an electric vehicle, showing that the Scotch can be almost as innovative as the English.

DUTCHMANSIBRANDUSStratinghand his chum Theodorus van Swinderen built and drove a steam car round the streets of Groningen. Remarkably within a few months they went on to make use of Faraday'sdiscoveries to produce an 'electromagnetic cart'.



First steam…

…thenelectricity. An astonishing double.

1840-1849

1840

IN PARISA30hp eight-wheeler designed by a M Dietz cruised the boulevards at a comfortable 10mph towing a carriage full of excited Frenchmen. The two rear driving wheels were rigidly mounted but the rest seem to have had some kind of independent suspension—the Academy of Sciences and Industry reported that “the six smaller wheels rose and fell according to the irregularity of the road”. However in Britainthe development of steam-powered road vehicles had lost impetus and the heavy road tolls imposed by the Turnpike Acts, as well as dirty tricks including roadblocks, had forced inventors away from steam-powered roadsters (the railways were flourishing). As a reminder of what might have been Robert Hancock left us with some statistics of his operations. His steamers had carried 12,761 passengers for 4,200 miles, including 143 round trips from the City to Paddington, 525 trips from the City to Islington, and 44 to Stratford. His PSVsaveraged5hr 17min service a day; the nine-mile round trip from Moorgate to Paddington typically took 1hr 10min. Hancock continued working with steam and supplied a light engine (similar to his steam roadsters) to the Eastern Counties Railway. The landed gentry had won, railways would rule the Victorian roost and the devlopment of powered road transport was set back by half a century.

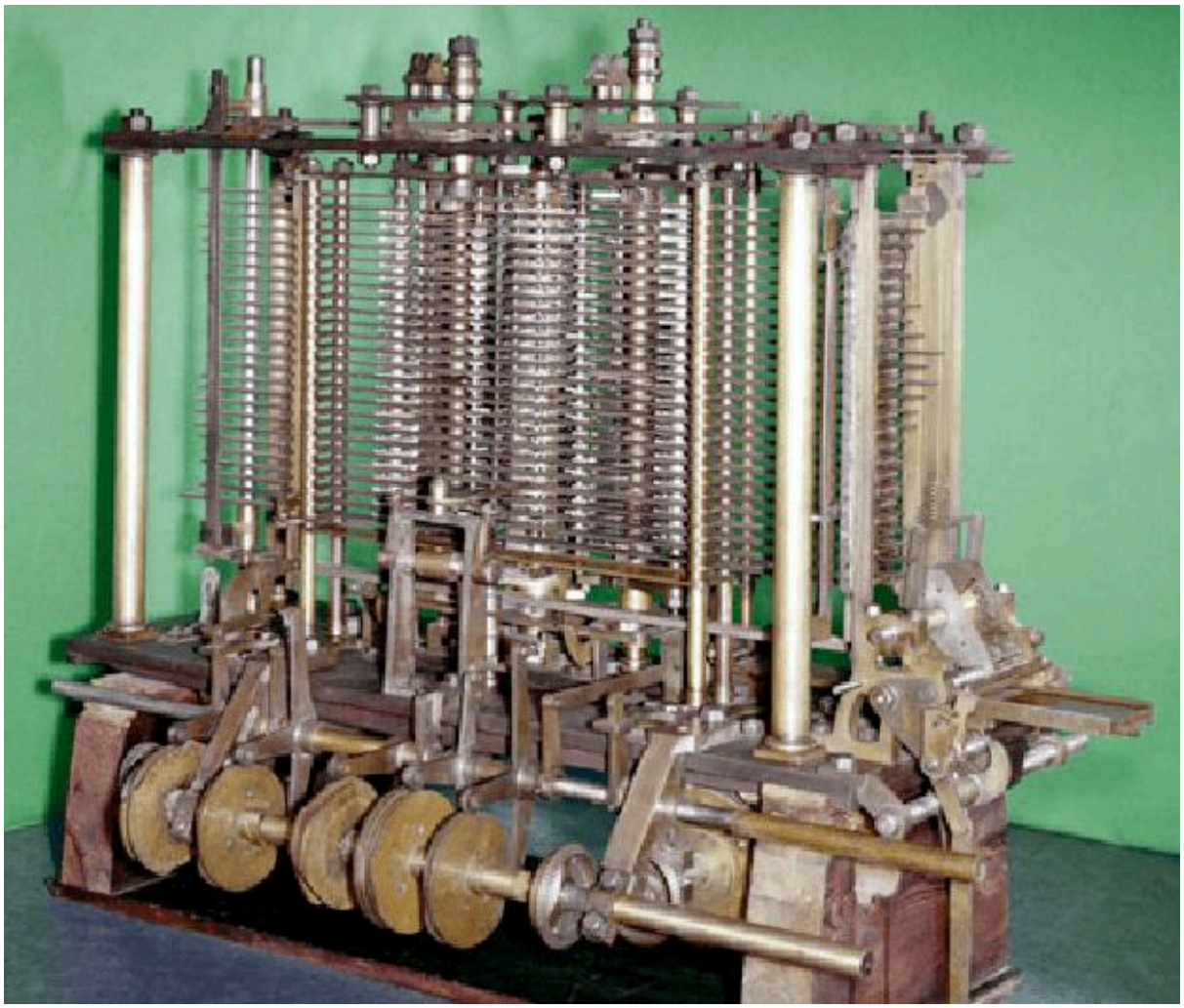
With the demise of the steam roadster dreams of coal-powered traffic faded away.

The brave experiment of steam roadsters had been reduced to the butt of jokes. In this contemporary cartoon the drivers of the horsedrawn coach are saying: “Blown up by God and not one soul left behind”…“Well they will have their hobbies”. The kite-drawn coach and airships in the background indicate that steamers were seen as just one more fad. The horsey set had won; the evolution of powered passenger vehicles stalled for 50 years.

1841

SIR JOSEPH Whitworth proposed standardised nuts and bolts. We’re so used to picking up bits that fit that it’s hard to imagine how different it was before Whitworth did his bit. He was granted a great many patents, covering everything from fire arms (he was a pacifist, but business is business) to knitting machines. As a result Whitworth became exceedingly rich – in later years he wintered on the French Riviera – and he collected honours ranging from honorary degrees to medals from France, Brazil and Spain. But what makes him so important to motorcyclists, and indeed to industry at large, is the accuracy he achieved. When he made a ruler measuring in 32nds of an inch it was scorned as “a curiosity…an unnecessary refinement”. Every bolt had a unique nut made to fit it but every Whitworth nut would fit every Whitworth bolt. He developed the work of Henry Maudslay to achieve measurements to within a millionth of an inch. Whitworth gave (well, sold) British manufacturers reliable, accurate machine tools as well as nuts and bolts with the thread form that bears his name. His measuring gauges and fasteners were formally adopted by the Board of Trade in 1880, which was perfect timing for the birth of the new industry. The vast majority of British motor cycles would be held

together by Whitworth nuts and bolts. Thanks to him proprietary parts would fit. Thanks to him manufacturing costs would fall to make motor cycles affordable. Thanks, Sir Joe.



Joseph Whitworth was working at the Joseph Clements works when they were attempting to assemble the Babbage 'calculating engine' This task demanded unheard of levels of accuracy. The training he got there inspired his later work. And the engine would lead to electronic computers, without which your bike would still get its sparks from a nice simple magneto.

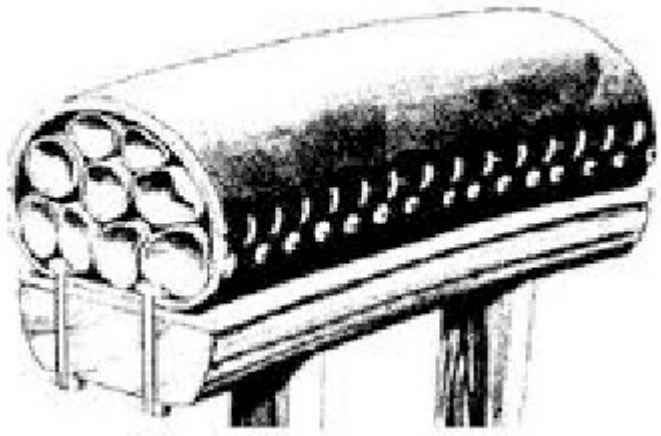
1844

THOMAS HANCOCK, while working for Charles Macintosh & Co, patented vulcanised rubber, from which the first tyres were made in good time for the first punctures.

1845

ROBERT WILLIAM Thompson, a former employee of railway pioneer Stephenson, patented a pneumatic tyre. It comprised a hollow tube (he called it an "elastic belt") made of canvas bonded with a rubber solution. It was encased in leather strips bolted to the wheel rim and inflated via a pipe passing through the wheel rim. A horsedrawn carriage did more than 1,000 miles in six months on a single set of these leather tyres;

production problems and repressive legislation killed off Thompson's venture but he went on to build successful heavy steamers. It was not until 1888 that John Boyd Dunlop re-invented the pneumatic tyres we rely on today.



Robert Thompson came up with pneumatic tyres.

WHILE THEY were waiting for proper pneumatic tyres to arrive travellers on London Road, Nottingham could console themselves with a trip on the first application of Tarmacadam.

1848

CHROMIUM WAS used for electroplating, but chrome plate woyld only became widespread following the development of an improved process in 1924.

AN EMIGREE named Von Rathen built a carriage powered by compressed-air and took it for a drive on the streets of Putney.

1849

WALTER HUNT, of New York, NY, patented the safety pin, which is ideal for emergency repairs to riding gear and has also been known to secure the clevis pin on a plunger A10 rear brake rod.

RUSSIAN ENGINEER FN Semyenov used a cable tool to drill an oil well, paving the way to plentiful supplies of lubes and petrol and also helping to make a lot of money for a lot of Arabs and Texans.

THE FIRST SELF-propelled and steerable steam traction engine was built by Robert Willis. 'Portable' engines had been about for a few years but they had relied on horses to move them. How horses gripped the steering wheel with their hooves remains a mystery.

1850-1859

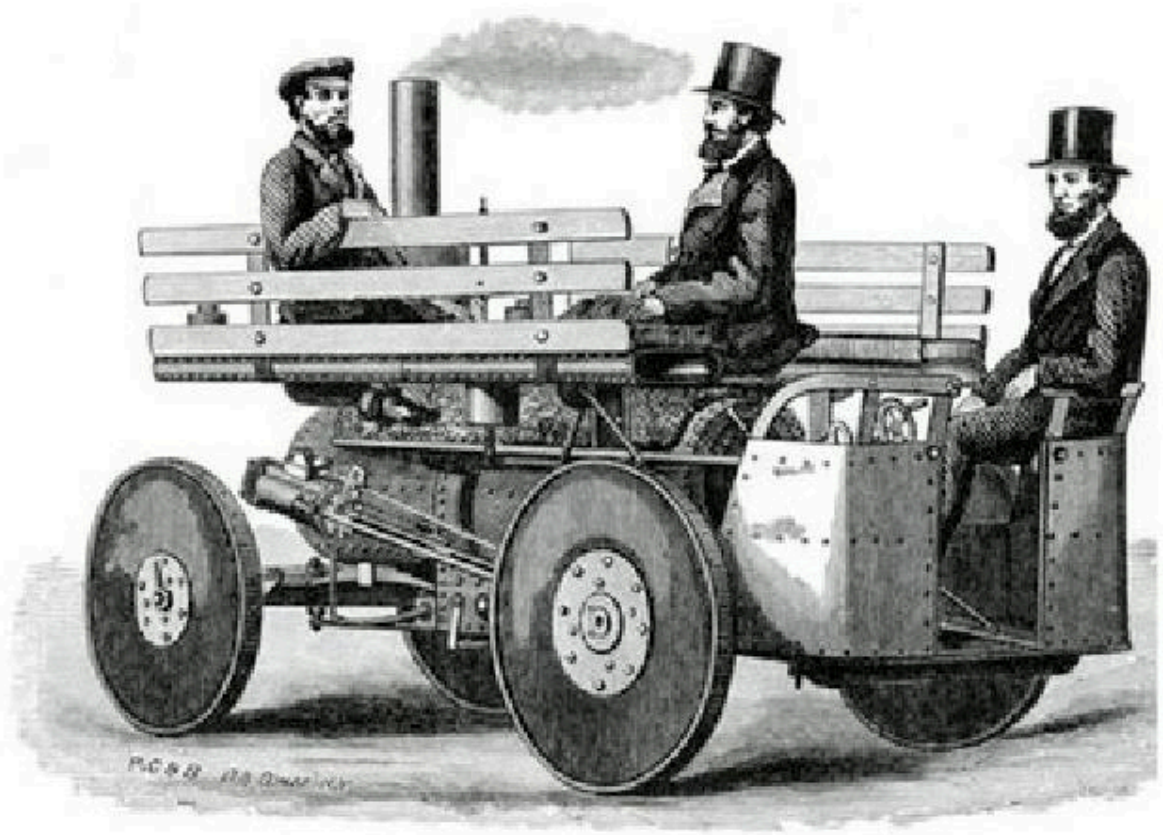
1850

STEAMDRIVENtraction engines were hauling passenger coaches in Paris and Bordeauxyears after the British road transport industry had been crippled by discriminatory legislation. Continental designers, unhampered by public prejudice and draconian legislation, took over Britain's lead in the field of road transport. Theywould hold onto that lead well into the petrol era. But not to worry; we caught up.

A SUBMARINEtelegraphcable was laid between Dover and Calais; the water was kept out by gutta percha (a form of rubber). And you can't run a motorcycle in British weather without waterproof wiring, can you?

1853

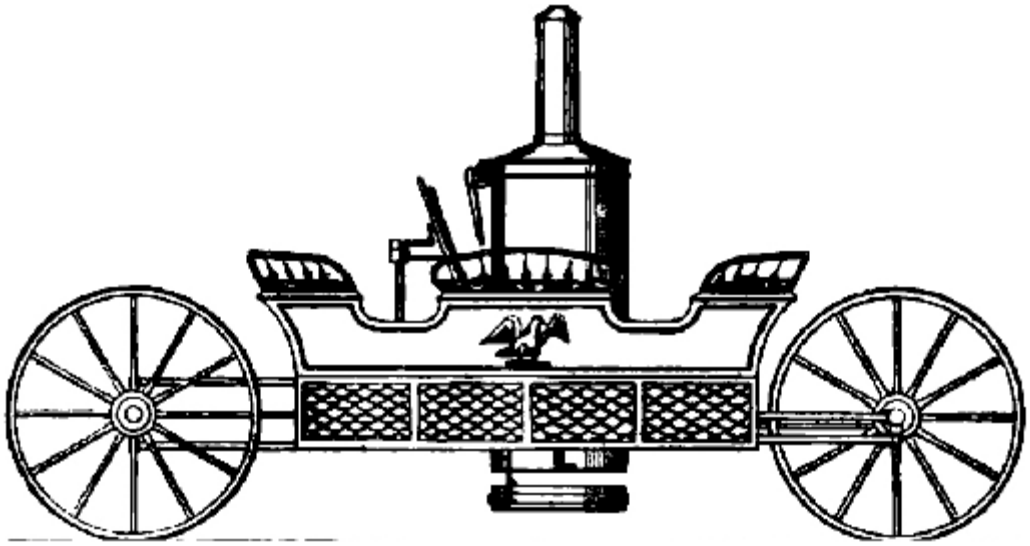
RICHARDDUDGEON,who had emigrated from Scotland to the USA, built an eight-seat steam carriage which was exhibited at industrial show in New York. It was destroyed when the exhibition hall burned down so Dudgeon started again and built another. Water tanks were mounted under the seats and passengers rested their feet on the boiler, so presumably heating was no problem, except in the summer. It had a cruising speed of 30mph and was more like a car than a coach. The USAwas not affected by the anti-steam prejudice that blighted British designers and operators.



Dudgeon's eight-seater could do 30mph; clearly a useful bit of kit.

1854

IN THEUSAJKFisher of New York built a small steam carriage that could do 15mph on smooth surfaces but was too flimsy for rough roads. Right vehicle, wrong place, wrong time.



Fisher's steam car worked well but only on smooth roads—and there weren't many of those in Europe, let alone the USA.

HENRISAINTE-CLAIREDevillemade aluminium in bulk. It had cost more than gold or platinum but the price dropped by 90% within 10 years. Mind you, it was still too expensive for widespread use.

FATHEREUGENIOBarsantiof the Piarist Fathers of Scolopi and hydraulic engineer Felice Matteucci patented a hydrogen engine in London (they chose London as Italian law offered little patent protection). A prototype was built in the 1860s, leading some Italians to claim Barsanti and Matteucci invented the internal combustion engine. Schifezza!

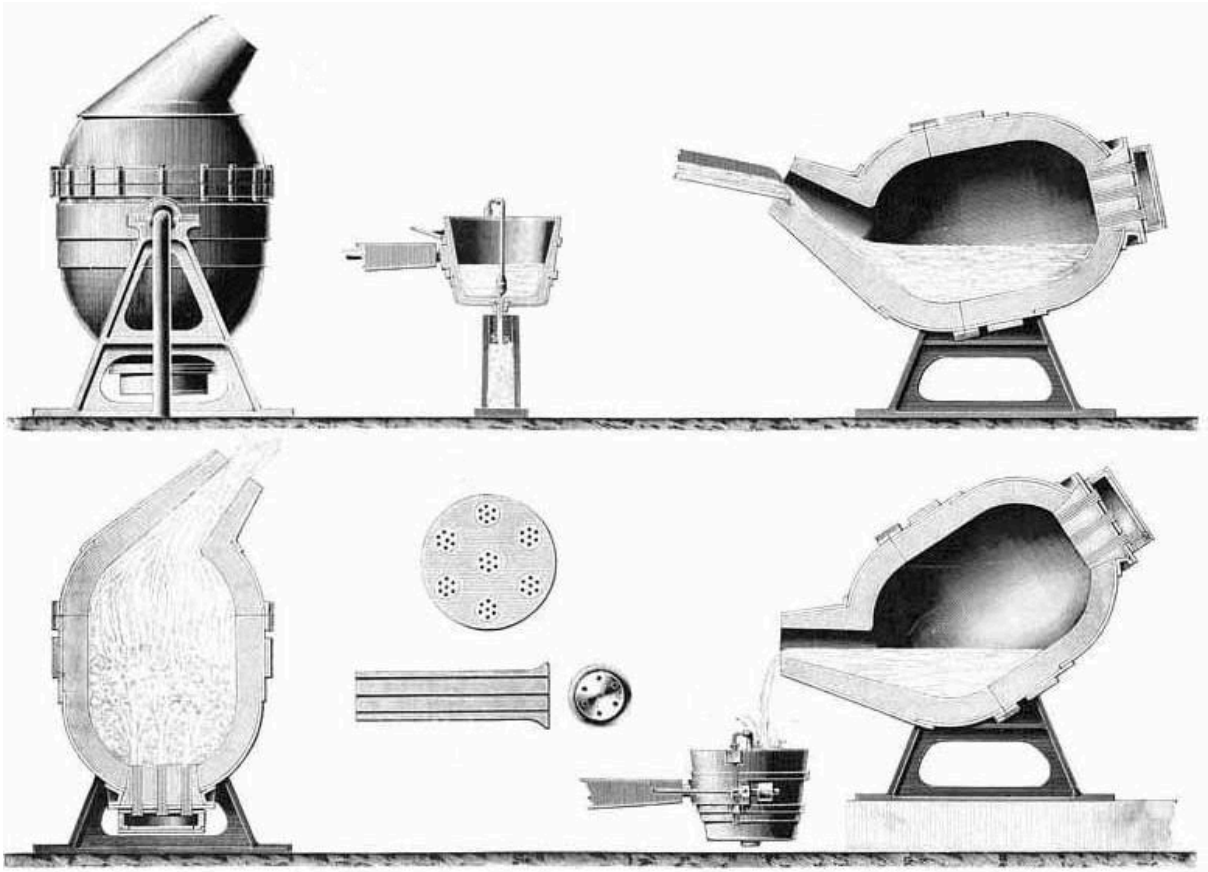
 The Barsanti engine was a pukka internal combustion rig running on hydrogen.

JOHN RAMSBOTTOM developed split piston rings which maintained a seal by outward spring tension on the cylinder wall. He later became president of the Institute of Mechanical Engineers.

AUSTRIAN ABRAHAM Shreiner built a distillation plant to produce petrol from crude oil as a fuel for lighting. Petrol was also used as a cleaning fluid.

GERMAN MDAVIDSON took to the streets of Darmstadt in a cart powered by an electric motor. Battery technology was too primitive to make it practicable.

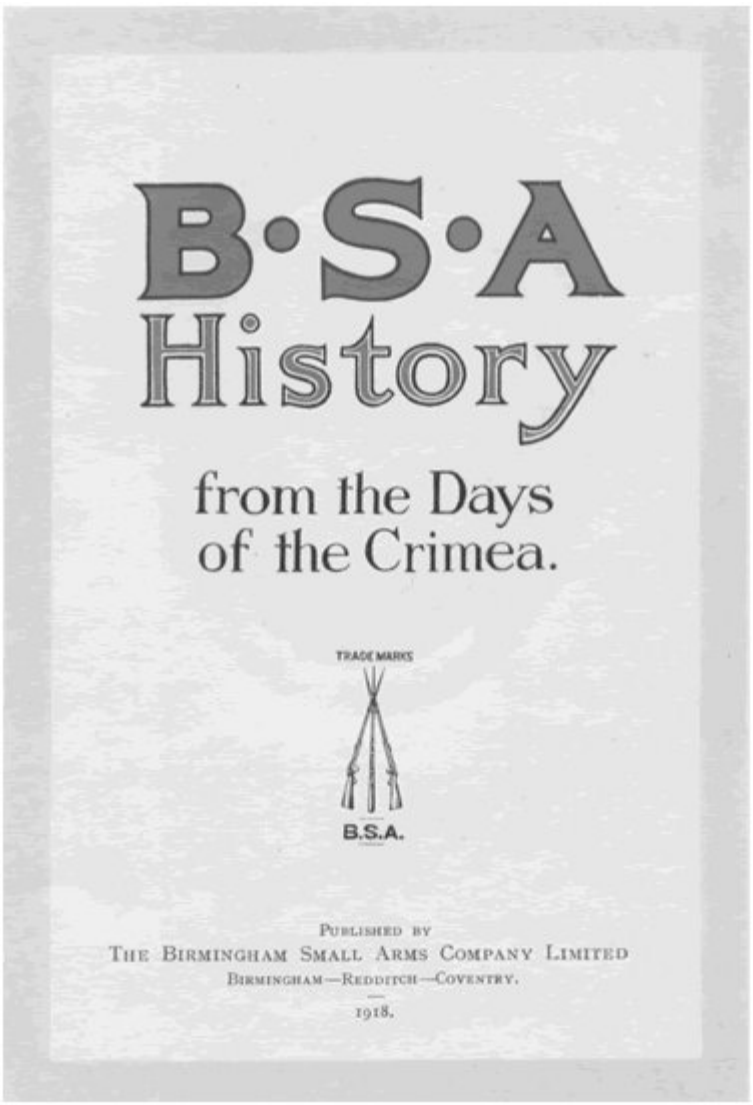
The first steam engine in Japan was a 1-in-4 model presented to the Shogun by Commodore Perry of the US navy.



The Bessemer converter was invented, making steel cheaper and stronger.

1855

BIRMINGHAM GUN MAKERS were called upon by the Government to furnish arms for use in the Crimea. The consortium they set up was called Birmingham Small Arms and, as all right thinking motorcyclists know, BSA, as well as becoming at its prime the largest motorcycle manufacturer in the world, produced some of the best motorcycles. NB Modern histories cite 1861/2 as the launch date. The 1855 date is taken from B.S.A. History from the Days of the Crimea to the Great War, published by BSA in 1916. The BSA factory opened in 1862, which might account for the later date.



Even the date of BSA's own history is misleading. This edition is clearly dated 1918 but its publication was announced in August 1916.

1858

THESTEAMCOACHESofthe 1830s had been killed off by the horsey set and railways ruled the roost. But after a couple of decades a few exceptionally rich enthusiasts decided they'd like horseless carriages. The Marquis of Stafford engaged one Thomas Rickett to produce a steamer. The Engineer reported: "Lord Stafford and party made another trip with the steam carriage from Buckingham to Wolverton. His lordship drove and steered, and although the roads were very heavy, they were not more than an hour in running the nine miles to Old Wolverton. His lordship has repeatedly said that it is guided with the greatest ease and precision. It was designed by Mr Rickett to run ten miles an hour. One mile in five minutes has been attained, at which it was perfectly steady, the centre of gravity being not more than 2ft from the ground. A few days afterwards this little engine started from Messrs. Hayes's Works, Stoney Stratford, with a party consisting of the Marquis of Stafford, Lord Alfred Paget, and two Hungarian

noblemen. They proceeded through the town of Stoney Stratford at a rapid pace, and after a short trip returned to the Wolverton railway station. The trip was in all respects successful, and shows, beyond a doubt, that steam locomotion for common roads is practicable."

1860-1869

1860

A WELCOME ARRIVAL for linoleum, which is easy to clean following essential indoor maintenance.

JEAN-JOSEPH Etienne Lenoir and Pierre-Constant Hugon built engines fuelled by coal gas (available as a by-product of coke ovens). Lenoir's engines, with Ruhmkorff coil-and-battery ignition, were the first internal combustion engines to win commercial success. Hugon relied on flame ignition. Lenoir set up a company in Paris to develop his engines, and used one to power a three-wheeled carriage which he dubbed the Hippomobile.

The Hippomobile was so named because its hydrogen fuel was made by Electrolyzing water. Lenoir adapted his engines for other fuels such as coal gas; he built and sold about 400 of them.

FRENCHMAN Gaston Plante invented the rechargeable lead-acid battery.

THEY FOUND oil in the USA. Black gold…Texas tea…

1861

EXPERIMENTSSHOWEDthat'town' gas gave more power than hydrogen, and that compressing the gas/air mix would give faster, more powerful combustion.

DRAISIENNEMANUFACTURERSFrenchmanPierre Michaux and his sons Ernest and Henri fitted cranks and pedals to the front wheel: Michaux Snr said it was "like turning the handle on grindstone". Theyalso fitted a 'spoon' rear brake operated by a twistgrip. So now we had a lightweight two-wheel rolling chassis with pedals, brakes (well, a brake) and steering, all ready for an engine.

The Michaux bike: a draisine with pedals, brakes, steering and a sprung seat.

PARLIAMENTREPLACEDlocaltollswith a nationwide fee of £2 for a steamer compared with three bob (15p) for a horsedrawn wagon and introduced a 10mph national speed limit, falling to 5mph in towns and villages. In response to the increasing use of heavy traction engines, the law also restricted the size and weight of engines and imposed limits on axle weights.

BUCKS-BASEDRICKETTSbridgedthegap between the last of the steam carriages and the first petrol-engined cars. Its little steamers had room for three passengerswith a stoker behind the boiler and could cruise at 10mph. TheEarl of Caithnes had one and put it to good use; he covered 150 miles in two days in mountainous country from Invernes to Barogell Castle.

Rickett's lightweight steamers were no mere toys –one did 150 miles in two days.

WO CARRETTDESIGNEDathree-wheeled'steam pleasure carriage' for mill owner George Salt. It boasted a differential and was described by Engineering magazine as "probably the most remarkable locomotive ever made". Salt was put off by the new speed limit and flogged his trike to a hooligan called Frederick Hodges who dubbed itFly-by-Knight and clocked up 800 miles, mostly at night. According to Engineering, he "did fly, and no mistake, through the Kentish villages when most honest people were in their beds". During an eventful 800 miles Salt picked up six speeding summonses in as many weeks; one for doing 30mph—three times the national limit. In a bid to fool the cops he modified Fly-by-Knight to resemble a fire engine and dressed his passengers in uniform, including brass helmets. But he finally accepted defeat and converted it again, to a slow-speed traction engine. Engineering concluded: "But the Fly-by-Night was a good job, and deserved a worthier career."

Tearaway Fred Hodges and the Fly-by-Knight—"a remarkable locomotive".

1862

FRENCHMANALPHONSEdeRochas published a booklet in which he established the four prerequisites for an economical 'explosion engine'. It amounted to a description of the four-strike cycle 14 years before Dr Otto independently re-invented it, but de Rochas never ventured beyond the theoretical stage.

THEGREATInternational Exhibition in London featured a display of Parkesine, a predecessor of celluloid (cellulose nitrate). The plastics industry was born in good time to be of service to motorcyclists.

YARROW&HILDITCHof Islington designed a steam-driven road carriage. TW Cowan of Greenwich built one under licence and, for a short time, ran it as a once-a-week PSV between Greenwich and Bromley. The steamer was shown at the International Exhibition, where it attracted a good deal of attention.

For a glorious few weeks denizens of Bromley could catch a late-night steamer home after a night on the tiles on Greenwich.

1863

READINGIRONWORKSbuiltmore than 100 Lenoir gas engines. Lenoir demonstrated a second three-wheeled “experimental road carriage” powered by a 2,543cc engine rated at 1½hp. Fuel was “a light volatile hydrocarbon, vaporised by a surface evaporating device”, which sounds suspiciously like a petrol-fuelled car with a surface carburettor some 20 years before the Germans, or even Butler. It completed an 11km run from Paris to Joinville-le-Pont and back in about three hours. The Hippomobile MkII attracted the attention of Tsar Alexander II so one was sent to Russia, where it promptly vanished.

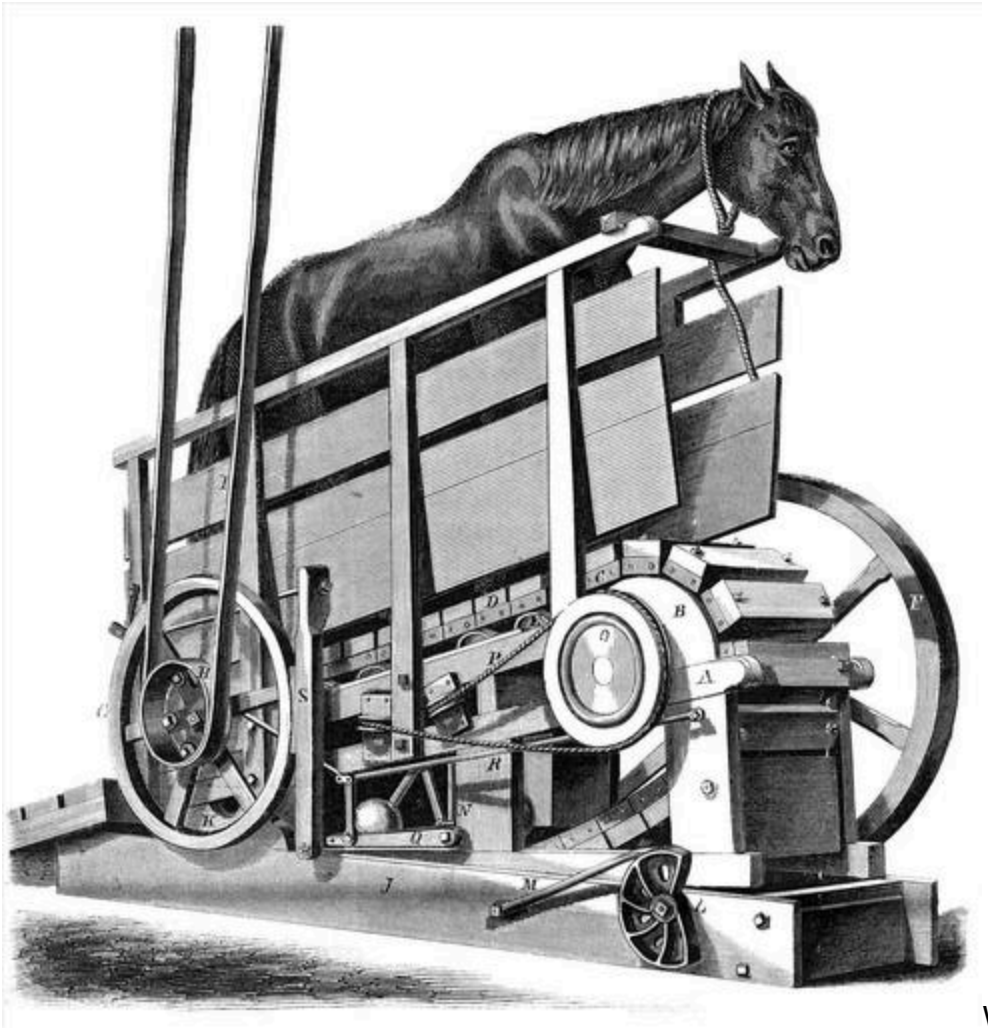
SCIENTIFICAMERICANdescribedtests of an internal combustion vehicle that weighed just 300kg and did 20mph.

1864

POWERFROMPetrol!German inventor Siegfried Marcus, while living in Austria, built a single-cylinder two-stroke engine running on petrol, complete with a spray carburettor and low-tension magneto. He rigged it to drive the rear wheels of a cart and drove it for a couple of hundred yards. He was not happy with his first attempt, dismantled it and built a more sophisticated version which he exhibited atthe Vienna Exhibition. [An extremely honourable mention to the petrolheads who ran the Viennese museum where Siegfried’s automobile was subsequently deposited. When the Nazis came to power they ordered the car and all records of its existence to be destroyed because Siegfried Marcus was Jewish. Marcus was removed from German encyclopedias as the inventor of the modern car, under a directive from the German Ministry for Propagandaduring World War II. His name was replaced with the names of Daimler and Benz. The museum staff risked their lives by defying the Nazis’ orders; they bricked up the car and associated paperwork in the cellar. It, and one must hope they, survived the war; it was restored and is still on show.]. Marcus held 131 patents in 16 countries; they includeed

“Improvements to relay magnets”, “Device for mixing of fuel with air”, “Improved gas engine”, and “Electrical igniting device for gas engines”.

This is the second in a series of petrol-fuelled automobiles built by Siegfried Marcus. It still looks pretty crude; starting involved lifting the back of the cart off the deck and spinning the wheels.



While Herr Marcus was breaking new ground with his powered cart farmers in the USA were being tempted with a 1hp engine.

1865

DESPITE THE CRIPPLING legislation small, reliable steam engines led to a resurgence in steam coaches running a number of scheduled routes. One foolhardy operator boasted "14mph at 3d a mile", which must have attracted the attention of the cops (don't forget the national speed limit was 10mph).

THE EARL OF CAITHNESS used a Ricketts steam carriage (see 1858) to tour the Highlands. He reported: "I may state that such a feat as going over the Ord of Caithness has never before been accomplished by steam, as I believe we rose one thousand feet in about five miles. The Ord is one of the largest and steepest hills in Scotland; the turns in the road are very sharp. All this I got over without trouble. There is, I am confident, no difficulty in driving a steam carriage on a common road. It is cheap, and on a level I got as much as nineteen miles an hour." The nobility clearly had no truck with speed limits.

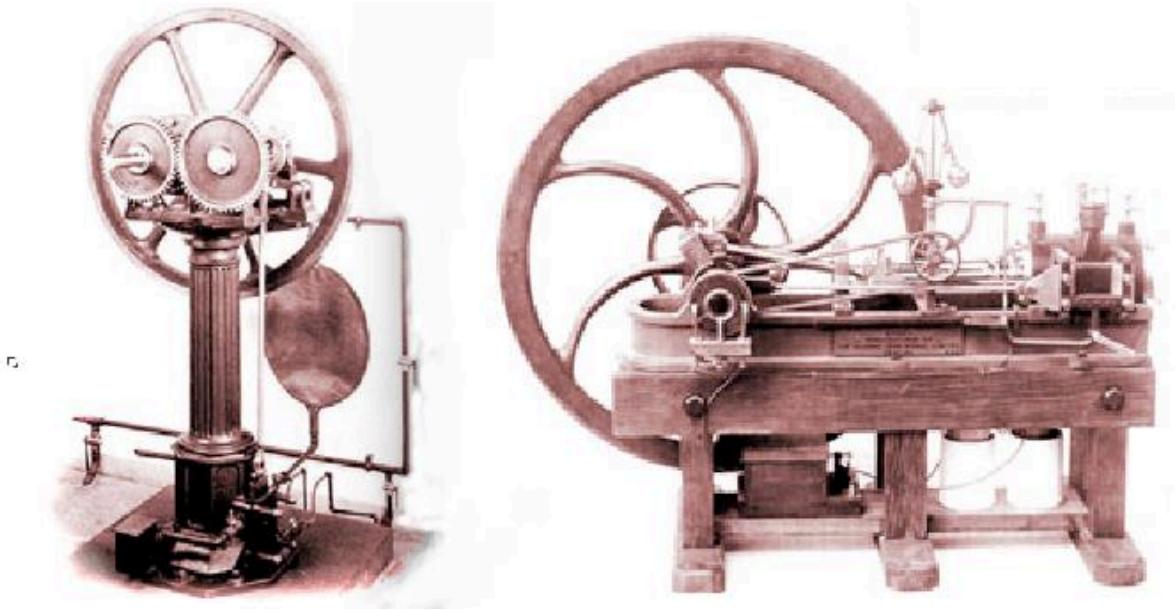
AS IF THE LAW wasn't already draconian enough Britain introduced the Locomotives on Highways Act, better known as the Red Flag Act, which imposed a speed limit of 4mph

in the country and 2mph in towns. Everyroadgoing vehicle required a minimum crew of three, one of whom “shall precede such Locomotive on foot by not less than sixty yards and shall carry a red flag constantly displayed, and shall warn drivers of horses and riders…and shall signal the [locomotive] driver when it is necessary to stop and assist horses, and carriages drawn by horses, passing said locomotive.” The Red Flag Act was designed to regulate the use of heavy traction engines hauling heavy loads but it had a crippling effect on the development of lighter motor vehicles.

The red flag rule was designed to protect horses from heavy steam locos; car drivers understandably pushed their luck. Here a nipper with a tiny flag meets the letter, if not the spirit, of the despised law.

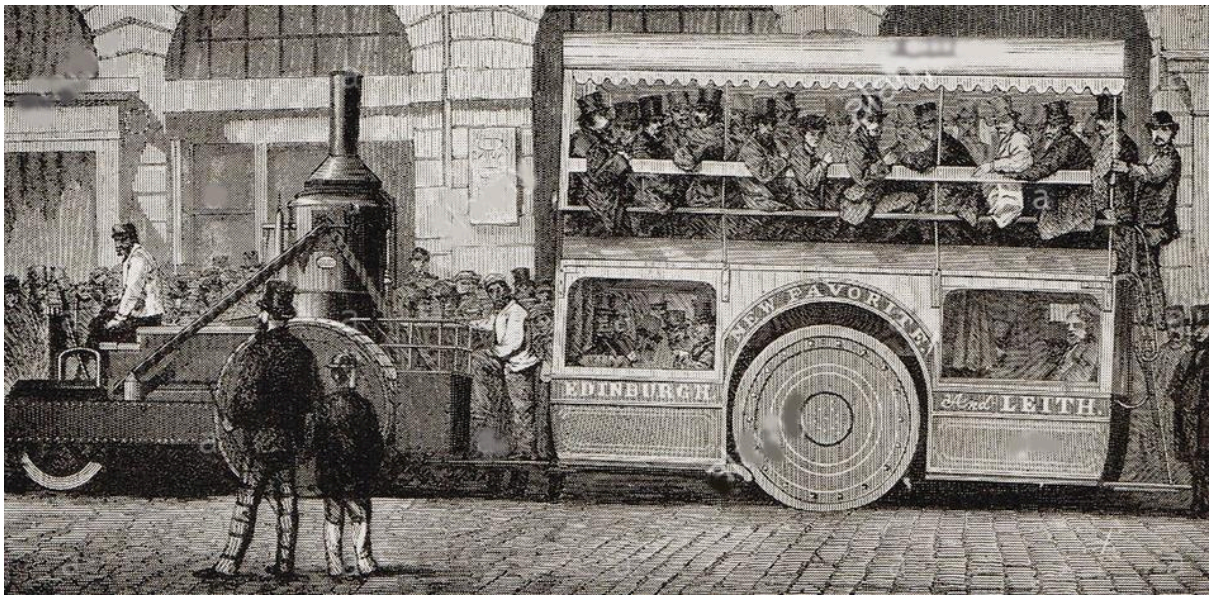
1867

THEOTTO-LANGENengine,designed and manufactured by Nicolaus Otto and Eugene Langen at their factory in Cologne, beat the Lenoir engine to win the Grand Prize at the Paris Exposition of 1867 as the most efficient gas engine.



The Otto & Langen gas engine (right) beat the Lenoir engine to win the prize for the efficiency at the Paris Show.

ROBERTTHOMSON(whohad patented a pneumatic tyre in 1846) built a number of road steamers shod with solid Indiarubber tyres. Theywere heavy traction engines, but some were geared high to suit passenger services (though they were also effectively crippled by the red flag rule).



Robert Thomson's steamer, running on 5in-thick rubber tyres, could haul loads up to 40 tons, or omnibuses, up Edinburgh hills.

INEVITABLY,WHENTWOenthusiasts met, they raced—and to hell with the Red Flag Act! TheEngineer reported: "On Monday morning, the 26th instant [August], in accordance with previous arrangement, two road steam carriages, one made by Mr Isaac W Boulton, of Ashton-under-Lyne, [and driven by Thomas Boulton] having only one 4¼in cylinder 9in stroke, the other, made by Messrs Daniel Adamson and Co, of

Newton Moor, having two cylinders 6in diameter, 10in stroke, started from Ashton-under-Lyne at 4.30am for the show ground at Old Trafford, a distance of over eight miles. The larger engine, made by Messrs Adamson and Co, is a very well-constructed engine, and had a good quarter of a mile start of the smaller machine. The little one, with five passengers upon it, passed the other in the first mile, and kept a good lead of it all the way, arriving at Old Trafford under the hour, having to go steady through Manchester. The engine made by Mr Boulton ran the first four miles in sixteen minutes. The running of both engines is considered very good. On arrival at Old Trafford they tested their turning qualities, and both engines turned complete circles of 27ft diameter, both to right and left, frequently." Thomas Boulton wrote: "…the distance was over ninety miles in one day without a stoppage except for water. I believe this to be the longest continuous run on record ever accomplished by any road locomotive within twenty-four hours." However The Engineer reported: "In this Mr Boulton was mistaken. We have stated in a previous article that Hill ran from London to Hastings and back in one day, a distance of 128 miles…Two speeds were obtained by means of two trains of spur gearing between the crank shaft and the counter shaft, the motion of the counter shaft was transmitted to the axle by a pitch chain, the ratios of the gearing were 6½ to 1 and 11 to 1. During the trip recorded above, six persons were carried all the distance, and sometimes there were eight and ten passengers."

WESTERNERS LIVING IN JAPAN set up the first horse drawn stagecoach company in Japan. Before long traffic laws were passed. These included bans on drink-driving, nudity and flying kites on the public highway.

1868

Finally…the first (steam)-powered two wheelers! There's a surprising amount of confusion over who did it first but to keep the story moving along let's call it a dead heat.

IN FRANCE, between 1867 and 1871 velocipe manufacturer Pierre Michaux teamed up with steam engineer Louis Gillaume Perreaux to develop the velo-a-vapeur. Belts ran from the remarkably compact alcohol-fuelled steam engine to pulleys on each side of the rear wheel (with pedals on the front wheel). The saddle was mounted just over the boiler, it was claimed to do 9mph and there were no brakes.

The Michaux-Perreaux steam-powered draisine.

IN THE USA, between 1867 and 1869 Sylvester Roper was touring the fairs and circuses with another steam-powered velocipede. It's not clear if his first example used an adapted velocipede frame, a home-made iron frame or a hickory wood frame built by showmen Hanlon Brothers, who made and demonstrated boneshakers at fairs. In any case Roper's steam bike had a rigid, forged iron fork and handlebars that twisted one way to open the throttle and t'other to slow down by applying a spoon brake on the front wheel; drive was by locomotive-style conrods and cranks to the rear wheel. An enthusiast by the name of WW Austin is variously recorded as a rider, promoter and owner of Roper steamers. However, in 1910 the US magazine Motorcycle Illustrated reported: "It was away back in 1868 that a new Englander, WW Austin, of

Wintrope, Mass, attached a coal-burning steam engine to his bicycle or, as it was then called, velocipede, and thus produced the first American-built motorcycle."

Sylvester Roper lived and died on his steam-powered velocipedes.

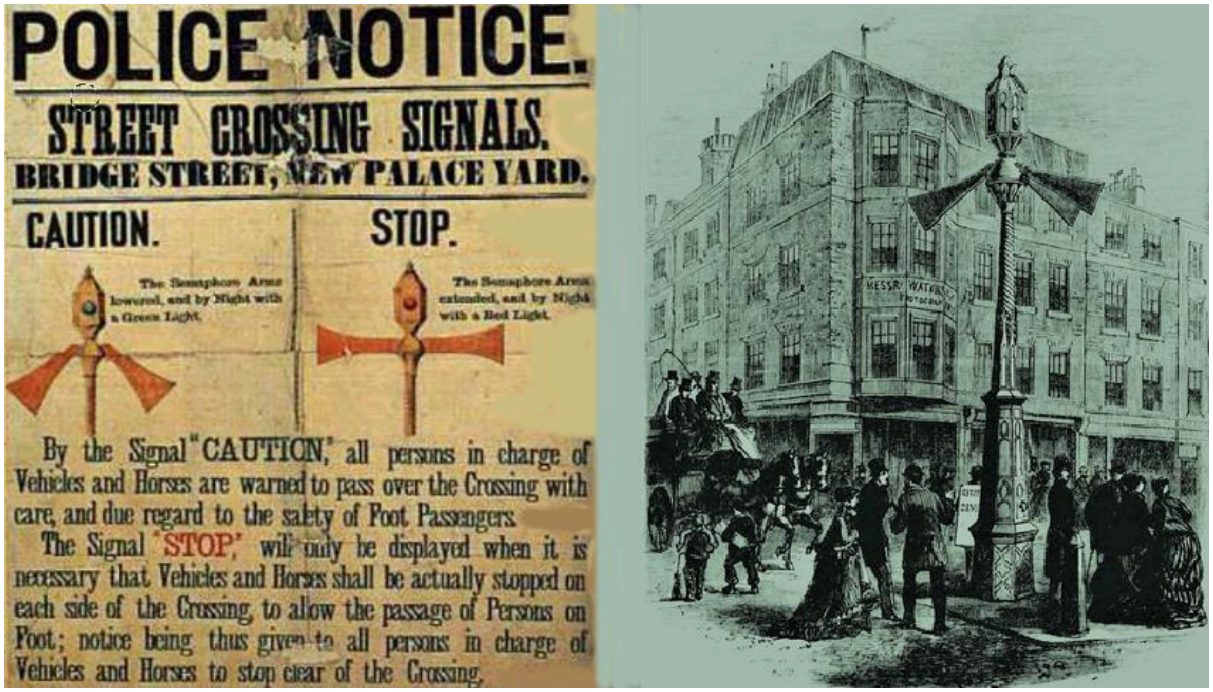
NEW YORKER William van Anden fitted pedals to the front wheel of a velocipede a la Michaux; it boasted a free-wheel mechanism and a rear brake controlled by a twistgrip.

NOTTINGHAM BLACKSMITH Thomas Humber built a velocipede based on a picture in a letter about a Parisian machine that was published in the English Mechanic magazine. He incorporated improvements such as (solid) rubber tyres and ball bearings. It was the beginning of a pioneering career in bicycles and motor cycles.

BACK IN BLIGHTY Crossley Bros of Manchester signed a deal to make Otto and Langen gas engines; Crossley developed a number of improvements.

THE WORD "bicycle" was coined for a velocipede shod with (solid) rubber tyres. So we got motorised bicycles, then motor-bicycles and eventually motor cycles rather than motorised velocipedes, motor-velocipedes and motorpedes. And that's why we have the dismal appellation "biker" rather than the rather jolly "pedder".

RAILWAY SIGNALLING Engineer JP Knight installed the world's first traffic lights outside the Houses of Parliament to control a chaotic junction (two MPs had been badly injured and a traffic policeman killed at this spot). The 20ft-high red/green gas lights were not bright enough by daytime so semaphore paddles were added to the top. However a few months after the signal was erected a gas leak caused an explosion at the base of the semaphore, injuring the police operator. This, combined with constant breakdowns and the signal's lack of effect, led to its removal.



Instructions were displayed prominently to explain the use of the new device.

1870-1879

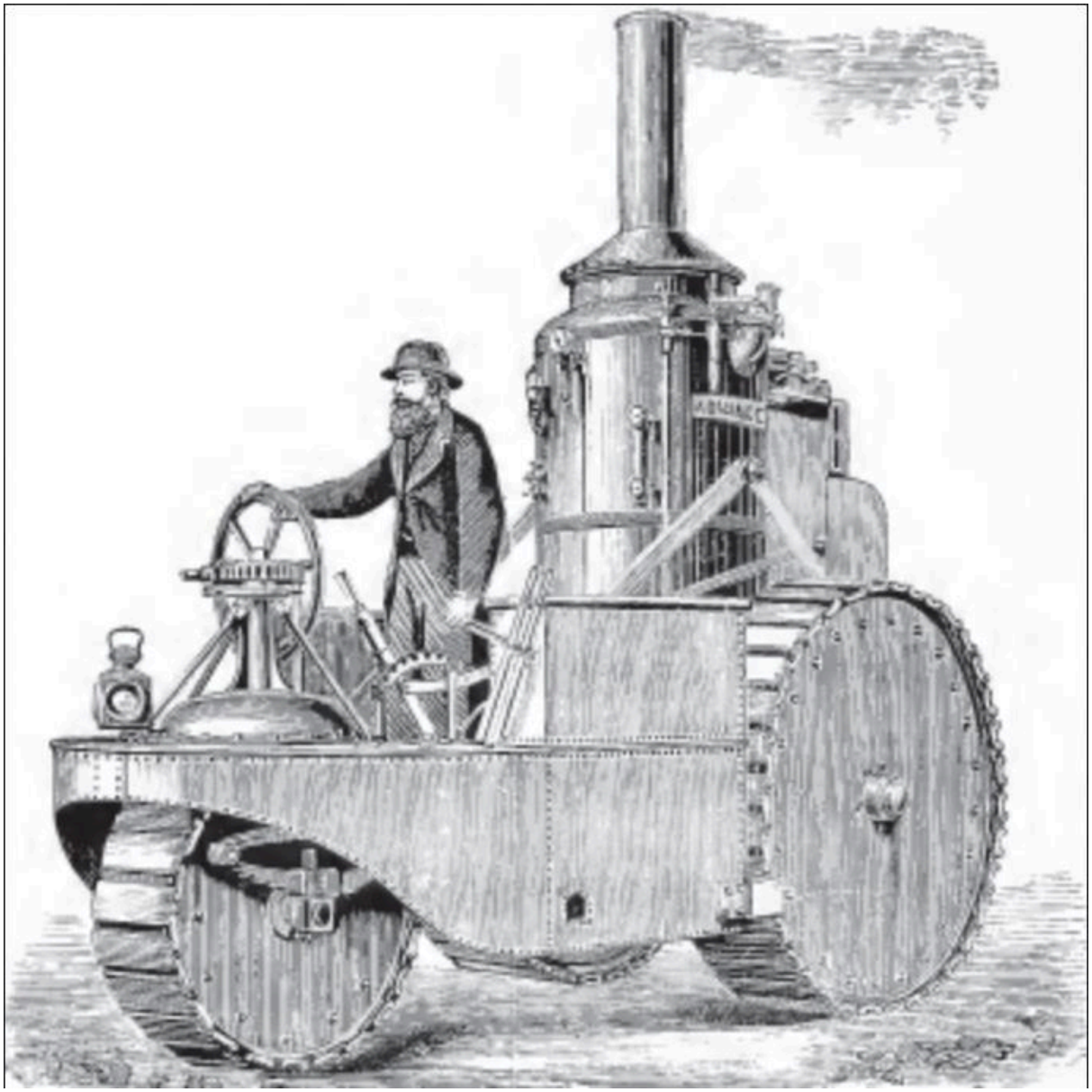
1870

JULIUSHOCKmade an engine which “took in a charge of air and light petroleum spray” but relied on a flame jet for ignition.

JAMESBEGANtomake bicycles in Birmingham.

AMERICANDRJWCarhart, professor of physics at Wisconsin State University, and the JI Case Company built a steam car that won a 200-mile race.

CARLESS,BLAGDON&CO,a chemical company based in Hackney Wick, came up with a solvent which was commonly used to remove nits. It was marketed as ‘Petrol’.



Robey & Co produced a steamer dubbed the Advance which hauled an 'omnibus' trailer carrying 45 passengers at 6mph over a route including sharp bends and a 1 in 9 acclivity.

1871

RW THOMPSON, WHO HAD cut his steam teeth working for the Stephensons, built a series of steamers but when demand exceeded his production capacity he called in another locomotion pioneer, Messrs Ransomes, Sims & Jefferies of Ipswich. This firm, which dated back to the 18th century, built a roadster called the Chenab (one of a batch destined for India) and sent it under its own steam to the Royal Show at Wolverhampton. Its stablemate, the Ravee, was driven from Ipswich to Edinburgh and back, covering 866 miles at an average of just over 6mph with an occasional sprint at 20mph.

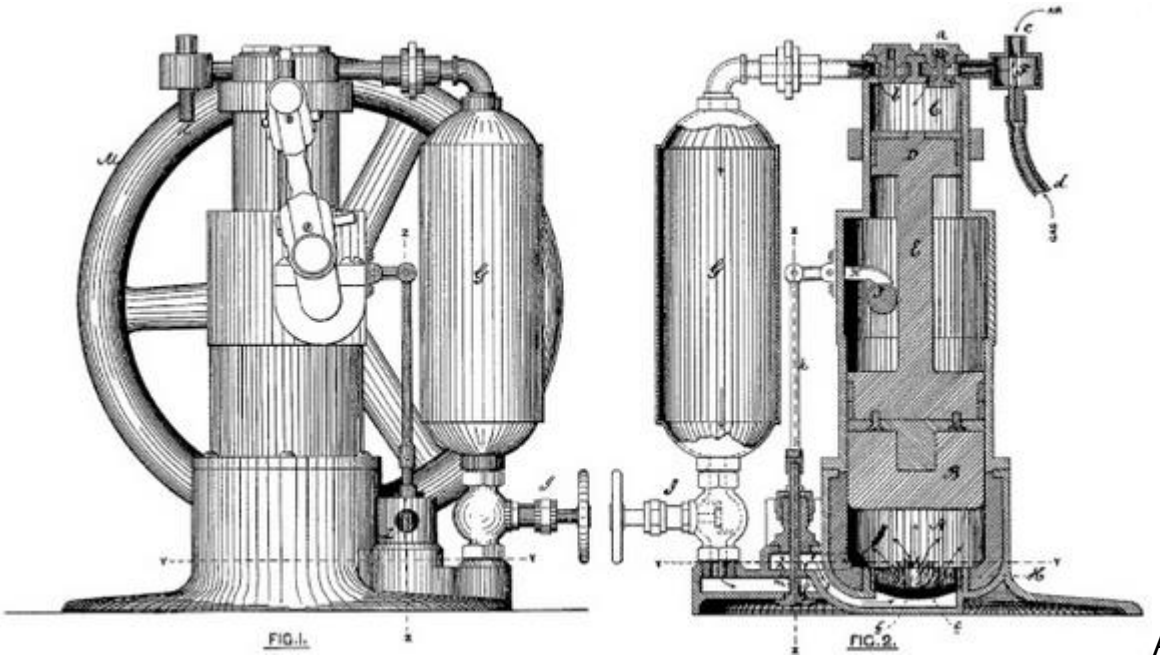
A STEAM-DRIVEN MOTOR CAR made by Messrs. Tange Bros, Birmingham was designed for use in India, as UK legislation prohibiting the use of motorcars did not apply there. It

featured a vertical boiler and side cylinders driving direct. The driver sat in front and stoker also was required. It boasted a foot brake, side lamps and a light canvas awning. The car might be better described as a charabanc as it was an eight-seater; the makers claimed a top speed of 25mph and boasted it could climb any gradient with the greatest ease. It was priced at £800.

Indian law allowed the use of motorcars; this one was claimed to do 25mph.

1872

GEORGE BRAYTON OF Boston, Mass patented the first in a series of internal combustion 'hydro-carbon engines'; they were fuelled by gas or vapourised fuel oil such as naptha. Ignition was by flame and engine pressure was about 45psi. They became known as Brayton Ready Motors because, unlike 'external combustion' steam engines these engines were available for immediate use. They worked on the constant-pressure Brayton cycle; pressure in the engine's cylinder was maintained by the continued combustion of injected fuel as the piston moved down on its power stroke. This system is used in gas turbines and jet engines and is similar to the Diesel cycle. Over the next few years Ready Motors were built from 2.25lit (1hp, 408kg) to 19.3lit (10hp, 1.8 tonnes). They worked in factories as stationery engines, and powered boats, PSVs, automobiles and the Holland 1, the USA's first submarine. These engines played a critical role in the development of the modern internal combustion engine. Hundreds were made; six still exist.



As shown in the 1872 patent drawing, gas and air were drawn into a cylinder, compressed by a piston and stored in a reservoir whence it was released into a second cylinder, being ignited by flame as it passed through a wire gauze.

1873

AMEDEEBOLLEEofLe Mans built the first of a series of advanced steam cars.

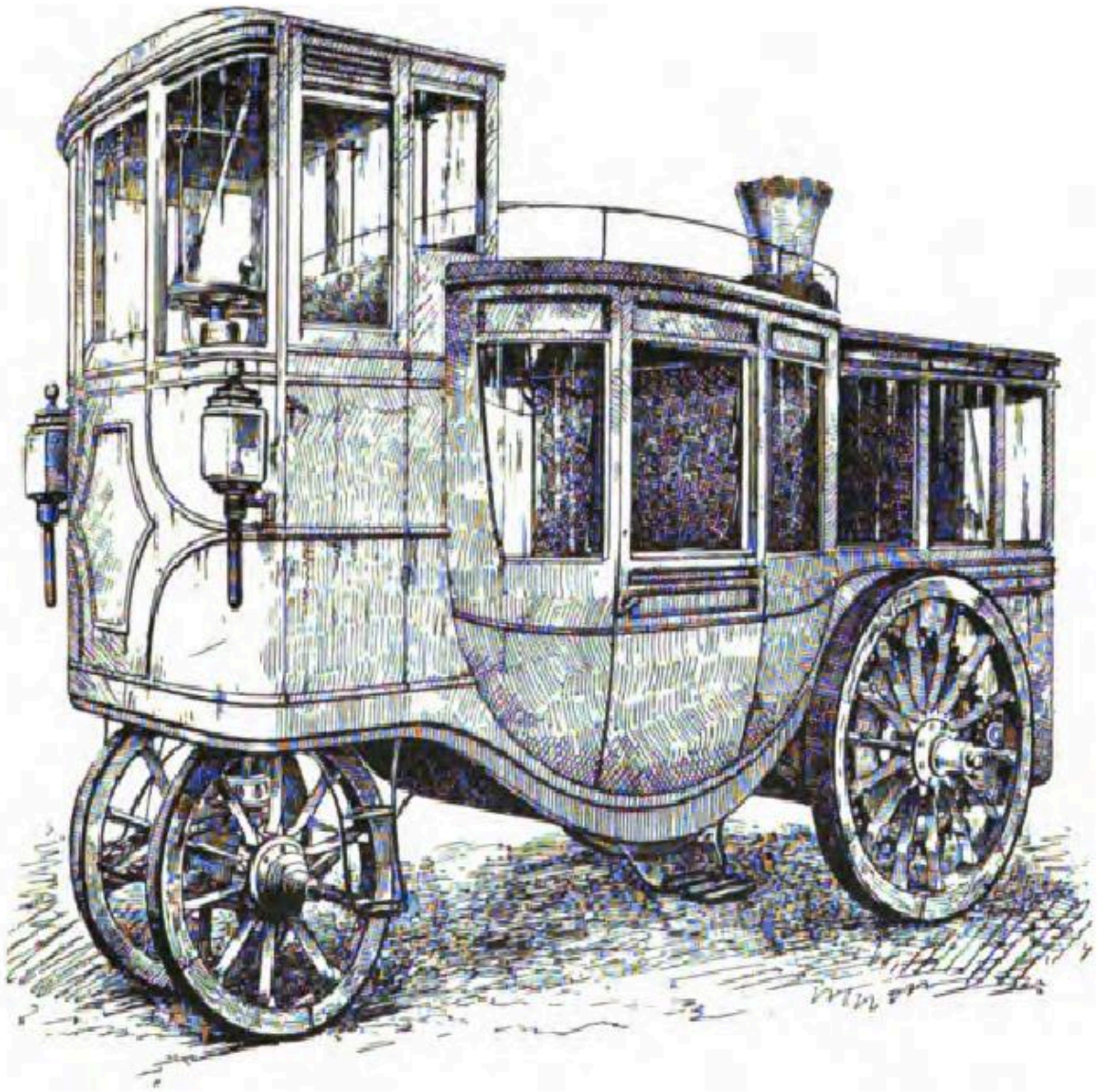
IN WESTLONDONEH Levaux proposed a clockwork car that would be wound up by roadside engines. A number of 2hp engines were built but the weight of the steel springs killed the scheme.

BELGIANZENOBEGramme opened a dynamo factory.

LOUISERRANIand Richard Anders of Liege patented a 'hydrocarbon liquid' engine.

SIEGFRIEDMARKUS,whowemet in 1864, exhibited an improved version of his petrol-fuelled car at the Vienna Exhibition.

1874



Despite all the obstacles steam carriages were still being made and this Randolph is about as advanced as they got. It tackled crowded Glasgow streets with a turning circle of just 40ft and a stopping distance of 15ft, albeit from a speed of just 6mph on the flat. Up to 10 passengers were carried in comfort; the driver's cab offered better protection than steam trucks made 50 years later. There was no visible smoke and it even boasted a silencer. However Randolph did not see a market for 'private carriages'. Strictly speaking this late-model steam PSV is not an integral part of the motor cycle story but it looks to cool to leave out.

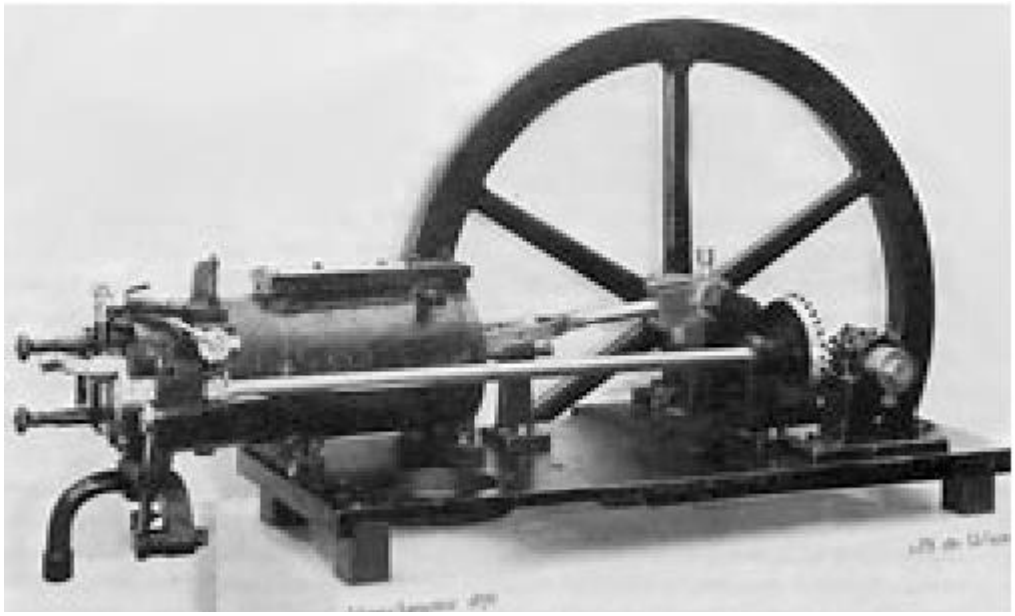
JOHN HENRY Knight, an amateur inventor from Farnham, Surrey, built a steam trike, or "voiturette".

MESSRS BAYLISS, Thomas and Slaughter teamed up to make bicycles in Coventry under the trade name Excelsior.

TRACTIONENGINEbuilders Brown & May of Devizes, Wilts developed a steam truck with a four-ton payload and chain drive via a differential. It was a bit of a blind alley, as loaded traction engines were simply too heavy for contemporary roads but nonetheless it was a truck. And without trucks how would motorcycles and spares parts reach the dealers?

1876

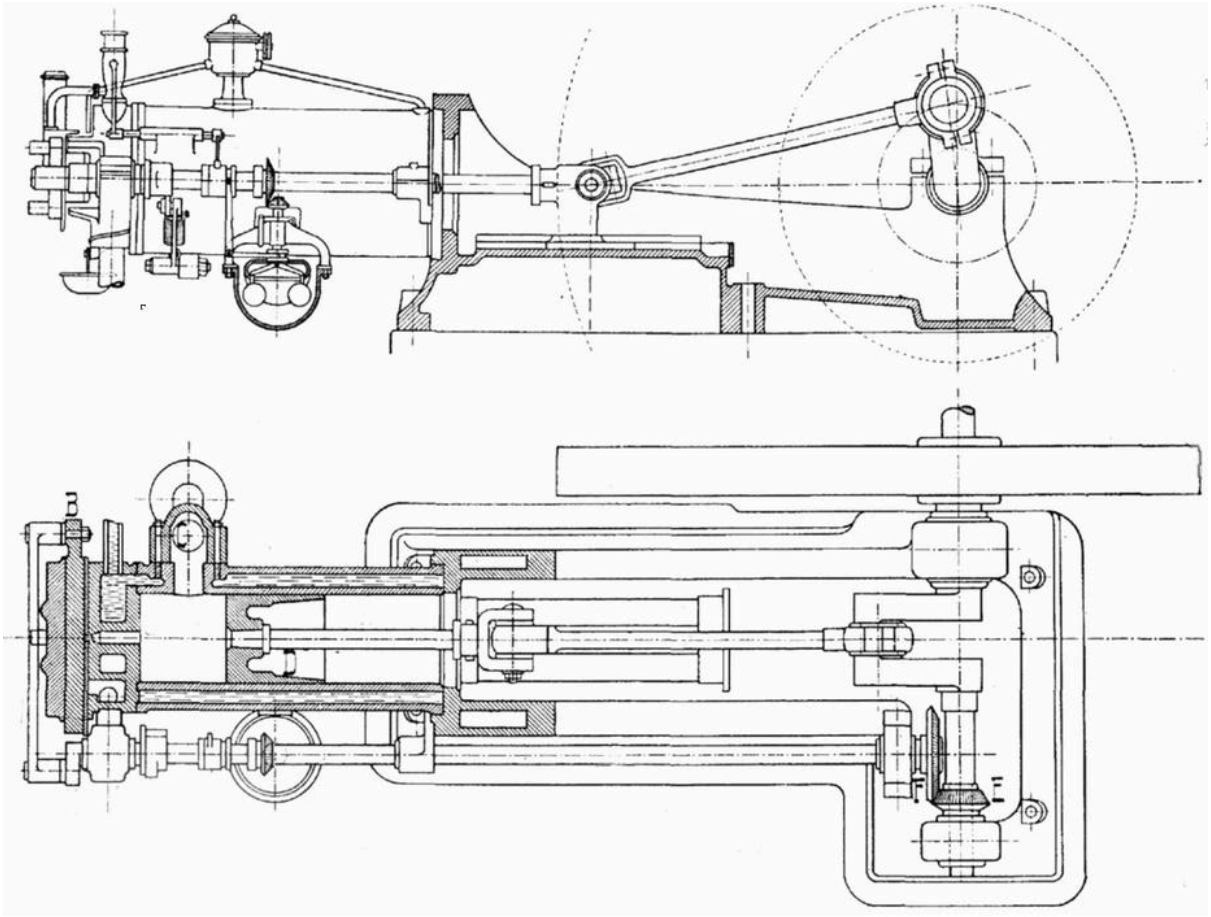
OTTO-LANGEN&COcontinued to develop their four-stroke gas engine; by 1876 their Deutz company had built 2,700 of them. Early models were notoriously noisy and the vibration could damage foundations but they were more fuel efficient than steam engines. In its final form the 'Otto Silent' gas engine is the ancestor of countless modern four-strokes. It was developed with the help of technical manager Willhelm Maybach who brought in a young gunsmith called Gottleib Daimler. As the engines were made smaller and smoother Maybach and Daimler realised that with a portable liquid fuel they could be made small enough to propel road going vehicles and laid their plans accordingly.



The Otto-Langen'silent' is the ancestor of modern four-strokes.

1877

OTTO-LANGEN&Coand the Crossley Brothers, Francis and William, jointly patented the four-stroke cycle: induction, compression, ignition, exhaust. All together now, "Suck! Squeeze! Bang! Blow!"



This timeline started at the Big Bang and we've arrived: "SUCK! SQUEEZE!BANG! BLOW!"

MRMEEKOFToward & Co, Newcastle upon Tyne, built a lightweight steam trike that was more like a bike than a coach; it worked well.

GEORGLIECKFELDofthe Hanover Machine Works, modified a two-stroke opposed/piston engine patented by Ferdinand Kindermann into a four-stroke. The Kindermann-Lieckfeld engine ran on 'town gas'. The patent, granted to Lieckfeld's boss Conrad Krauss, also covered a friction clutch, cam-operated inlet valve and a reverse gear.

1878

BRITAIN'S'REDFlag' Act was revised to do away with the red flag, but every road going self-propelled vehicle still had to be preceded by a man to warn drivers of horse-powered vehicles. This was despite a parliamentary committee report in 1873 which strongly recommended the removal of all restrictions on vehicles under six tons, which would have put them on equal terms with horsedrawn transport.

SHOZOKAWASAKIset up the Kawasaki Tsukiji Shipyard in Tokyo.

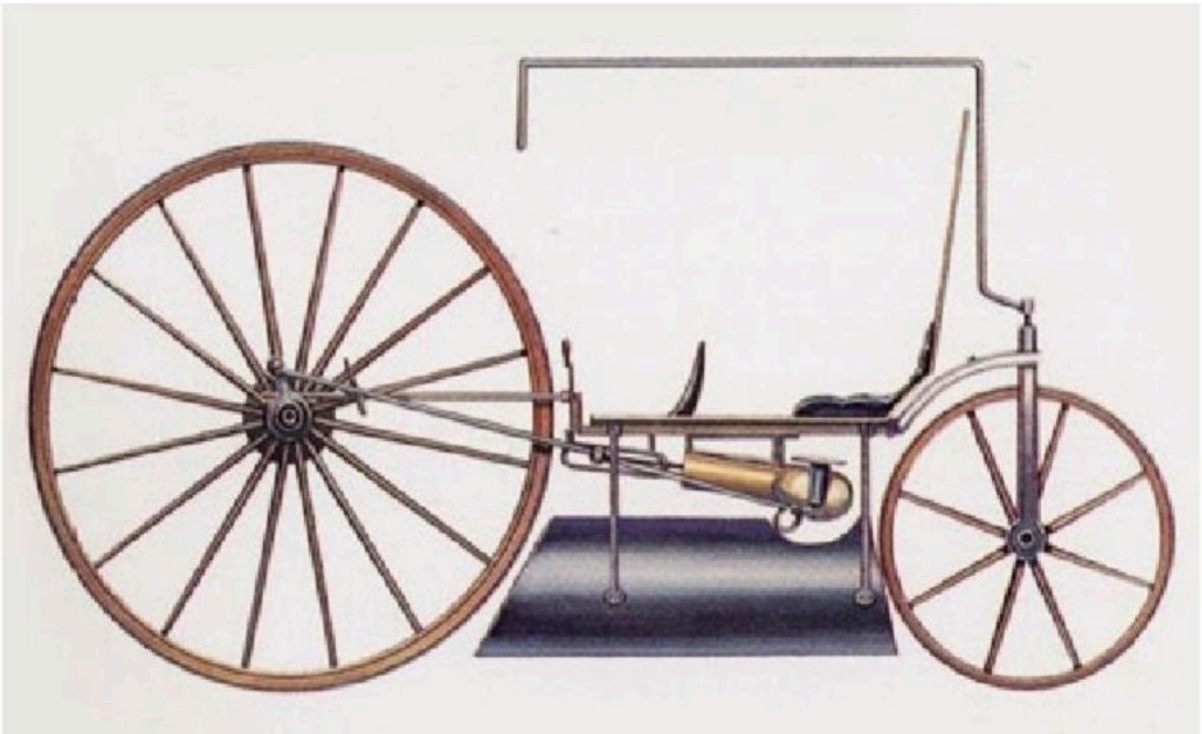
DUGALDCLERKbeganwork on his own engine designs after modifying a Brayton engine (see 1872). He later wrote: "This Brayton engine provided my first experience of an

engine operated on the compression principle…I saw at that time, after making this test, that the Braytonengine could be altered with but little trouble to operate as an explosion engine, exploding under compression…Ithen proceeded to alter the Brayton engine. The first alteration consisted in rearranging the inlet valve and providing a spark plug to ignite the mixture electrically. The electrical ignition was made by a built-up spark plug, similar to the Lenoir engine, with the construction of which I had become at this time familiar…Thisexperiment proved that the Brayton engine, working as an ordinary engine, gave more power than working in the ordinary flame method…"

1879

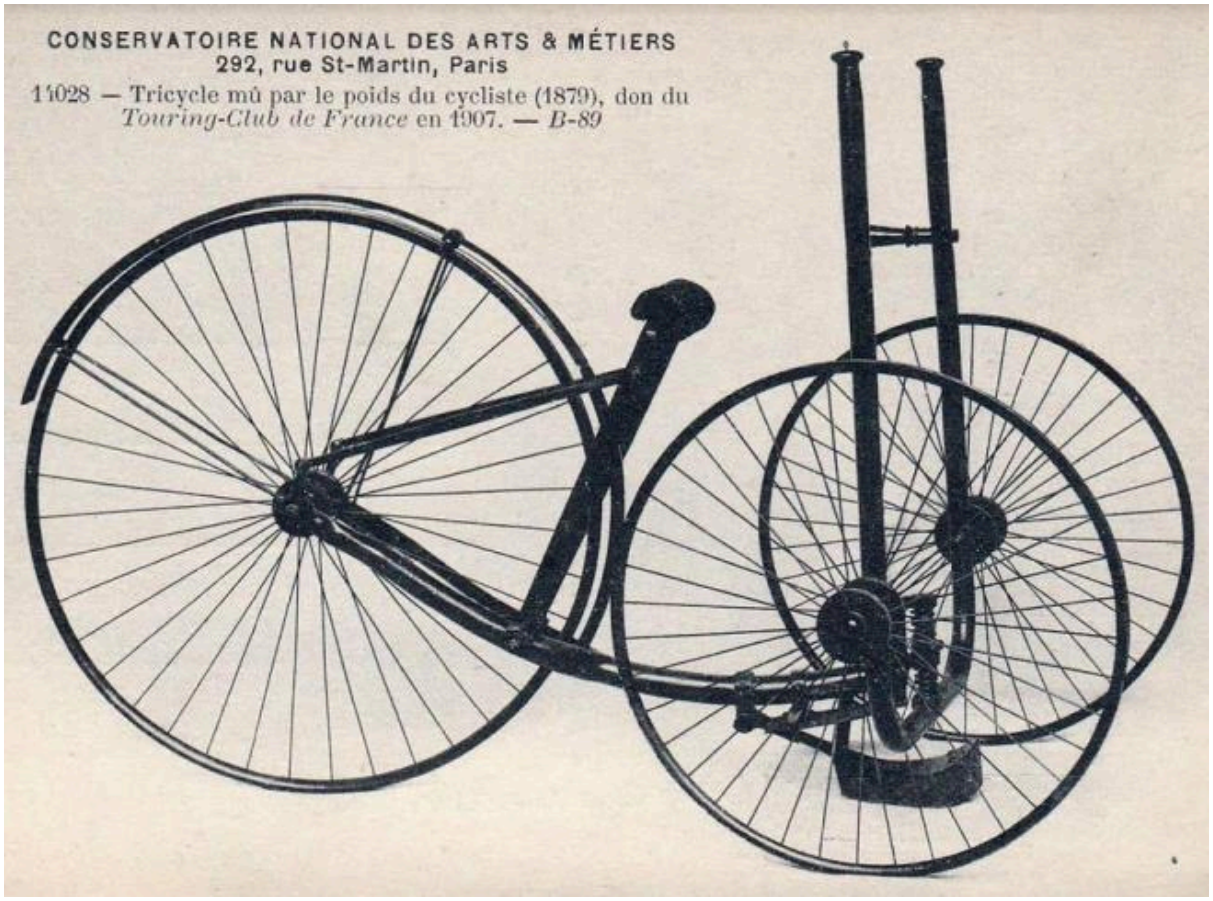
KARLBENZpatented a two-stroke engine which he had designed the previous year. His other patents included spark ignition using a battery, the spark plug, the carburettor and the clutch.

ITALIANGUISEPPEMurnigotti of Bergamo patented a motore atmosferico al velocipede with a ½hp four-stroke parallel twin fuelled by coal gas and driving the front wheel via conrods. Steering was by tiller to the rear wheel so it's probably A Good Thing it was never built.



The Murnigotti is one trike that was best left on the drawing board.

EDOUARDDELAMARE-Debouttevilleof Rouen invented a 'universal machine' capable of cutting, milling, drilling and turning.



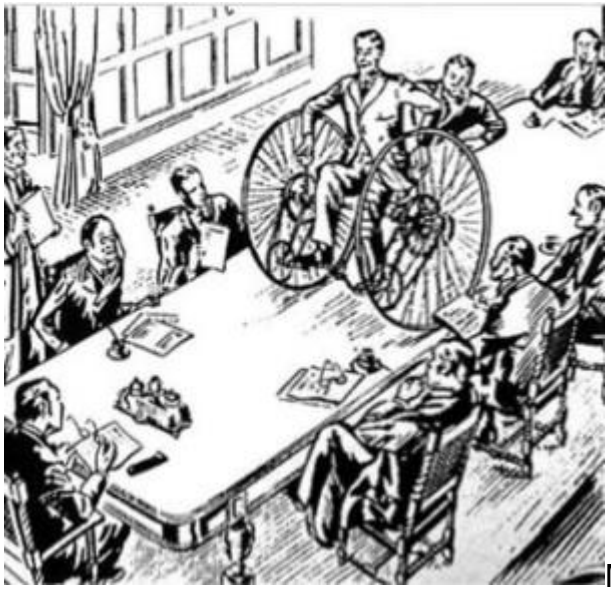
No, it hasn't got an engine. But this French tricycle was powered by the weight of the driver who presumably rode with a horsey-style rising trot. So it does reflect the urge towards an easier mode of transport which led in turn to motor cycling.

1880-1889

1880

LICKFIELDCONVERTEDaWittig & Hees 3hp single-cylinder two-stroke stationary gas engine to petrol and mounted it on a railway chassis to create a petrol-driven vehicle five years ahead of Daimler/Maybach and Benz.

BSAHAD JUSTre-opened following a year-long closure caused by a lack of government orders for armaments and a huge government sale of used rifles that flooded the market, depriving BSAof foreign sales. The factory was back in action to fill a new government order but, wary of ever again putting all its eggsin one basket, the BSA board was anxious to diversify. At which point BSAheard from an East Anglian firm that held the patent on a radical form of bicycle with its wheels side by side. Before long its inventor, ECFOtto (no, not 'four-stroke' Otto, this was another Otto) was demonstrating the stability of his 'dicycle' to the BSAdirectors by riding it up and down the boardroom table. According to a


Mr Otto, convincing the Beezaboard of his dicycle's stability.

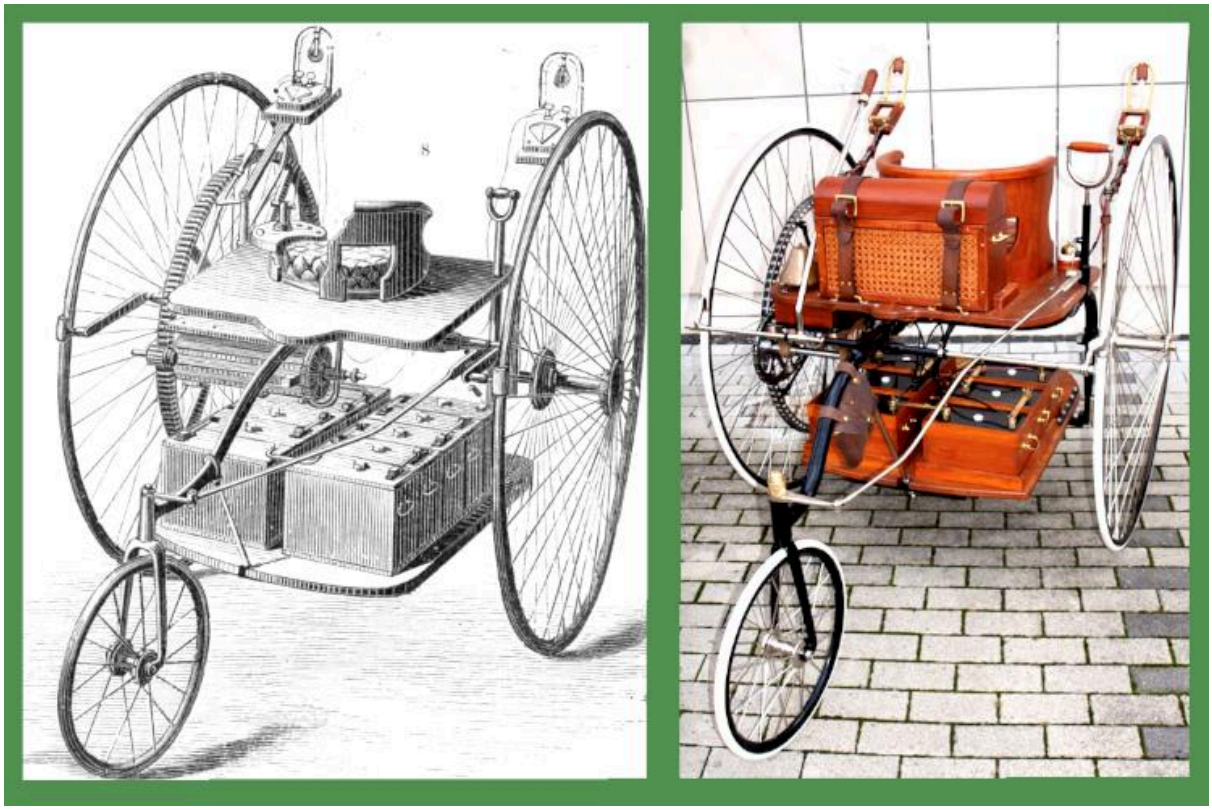
contemporary report: "He finished by riding down the stairs and onto the roadway, disappearing in the direction of Birmingham at what can only be described as 'a reckless pace'." There must be an Otto cycle joke in there somewhere but I can't be bothered. BSA went on to produce more conventional bicycles and some of the best motor cycles in the world. And in a way they owed it all to two Mr Ottos.

IN THE USA George A Long patented and built a trike powered by a petrol-fuelled 90deg V-twin steam engine. It featured two-speed rear-wheel friction drive, spoon brakes on the front wheels and sprung seats. He used for a few years after which it was stripped down and the components scattered. But in 1946, when Long was 96, he got together with steam enthusiast John Bateman and helped him reassemble the trike which is now on display in the Smithsonian Instotute where it is listed as "oldest completely operable self-propelled road vehicle in the museum".

Long's trike was dismantled after some years of use but the bits were discovered in 1946 by an enthusiast named Bacon who rebuilt it. He also recommisioned an even older Roper Steam cycle and gave them both to the Smithsonian. Raise a glass to Mr Bacon.

1881

ENGLISHENGINEERSWilliam Ayrton and John Perry acquired one of the new Starley tricycles and fitted an electric motor and battery pack to power the front wheels. It had a range of 25 miles and a top speed of 8mph. Frenchman Gustav Trouvé fitted a Coventry tricycle with an electric motor as a showpiece for the opening of the Paris Electricity Trade Show. Winches lowered lead plates into the acid of open-topped batteries to control the vehicle's speed.



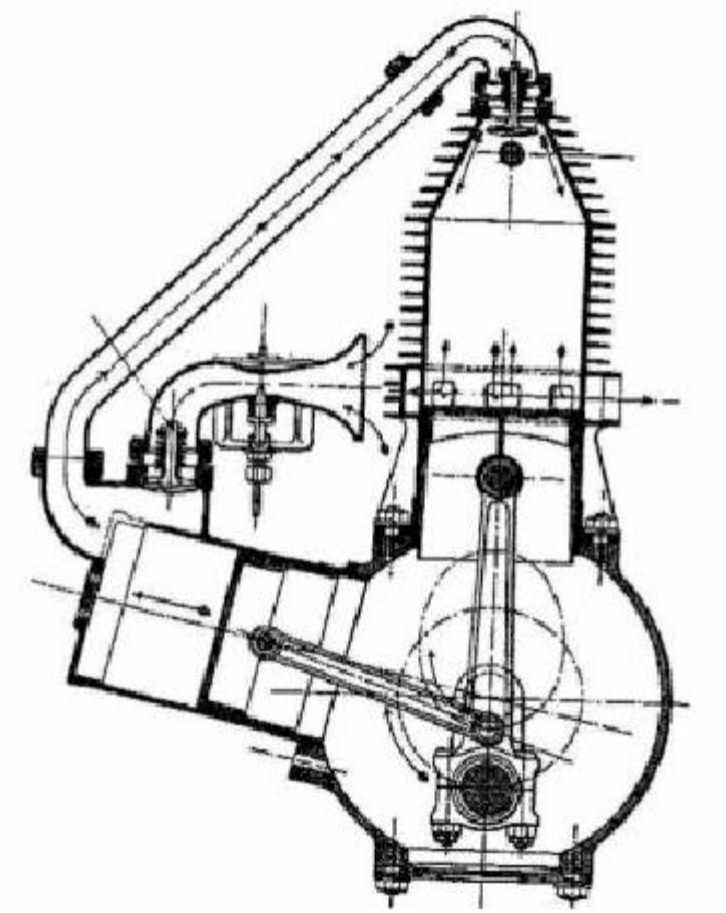
The Ayrton-Perry tadpole trike caused a stir when they took it for a spin along London's Victoria Street. (Right) The Autovision Museum in Baden-Württemberg, Germany has produced a working replica with a 0.5kW electric motor and 54V/7.5Ah batteries.

CHARLES LINFORD patented a 'six-stroke' cycle (inlet/compression/explosion/exhaust/drawing in air/expelling air). It seemed a formidable rival to the Otto until the Court of Appeal found in favour of Otto's patent and against Linford's. Various six-stroke designs have surfaced ever since but as none of them have powered motor cycles they play no further part in our story.

THE 'SAFETY bicycle' arrived with wheels of nearly equal size (giving the rider a more gentle landing after a tumble, hence the name) and with pedals attached to a sprocket driving the rear wheel via gears and a chain. So we're nearly there.

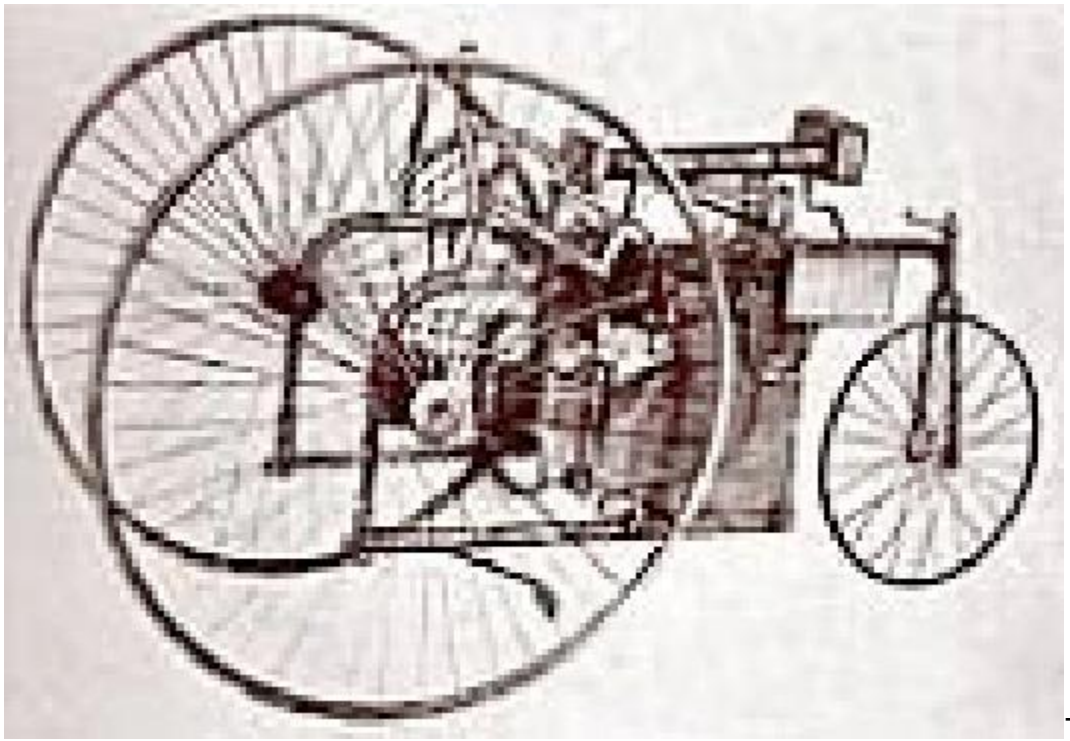
SCOTT DUGALD Clerk patented a form of two-stroke engine he had been working on for two years, having started by modifying a Brayton Ready Motor (see 1878). Unlike the crankcase-compression system which would become the industry standard Clerk's design featured a separate charging cylinder with exhaust and inlet valves in the cylinder head operated by a camshaft, just like a four-stroke. Following the power stroke both valves opened and a supercharger forced fresh air into the cylinder to replace or scavenges the exhaust gas (as no fuel or lubricant was added to this inlet air the loss through the exhaust manifold was not a problem). Fuel was injected as the piston neared top dead centre on the compression stroke; ignition was by compression, as in a diesel engine. Clerk wrote: "The Clerk engine at present in the market was the first to

succeed in introducing compression of this type, combined with ignition at every revolution; many attempts had previously been made by other inventors, including Mr Otto and the Messrs Crossley, but all had failed in producing a marketable engine. It is only recently that the Messrs Crossley have made the Otto engine in its twin form and so succeeded in getting impulse at every turn." Having secured his place in the history books Clerk did not rest on his laurels; he became Director of Engineering Research for the Admiralty and a Fellow of the Royal Society.



Clerk's two-stroke engine relied on a separate charging cylinder rather than the later pressurised crankcase.

THE PARKYNS-BATEMAN trike featured a twin-cylinder double-acting petrol-fuelled steam engine attached to a Cheylesmore pedal tricycle. It ran well at the Stanley Show and orders flowed in. Then, in a test case, Bateman's sponsor, Sir Thomas Parkyns, was fined a shilling for "improperly riding" his machine (eg at more than walking speed). He appealed, on the grounds that lightweight trikes didn't exist when the red flag law came in. The Appeal Court rejected this defence and British vehicle development ground to a halt until the Light Locomotive Act of 1896. Wheel World magazine commented that British legislation had "cruelly and unnecessarily clipped the wings of many a lover of rapid locomotion".

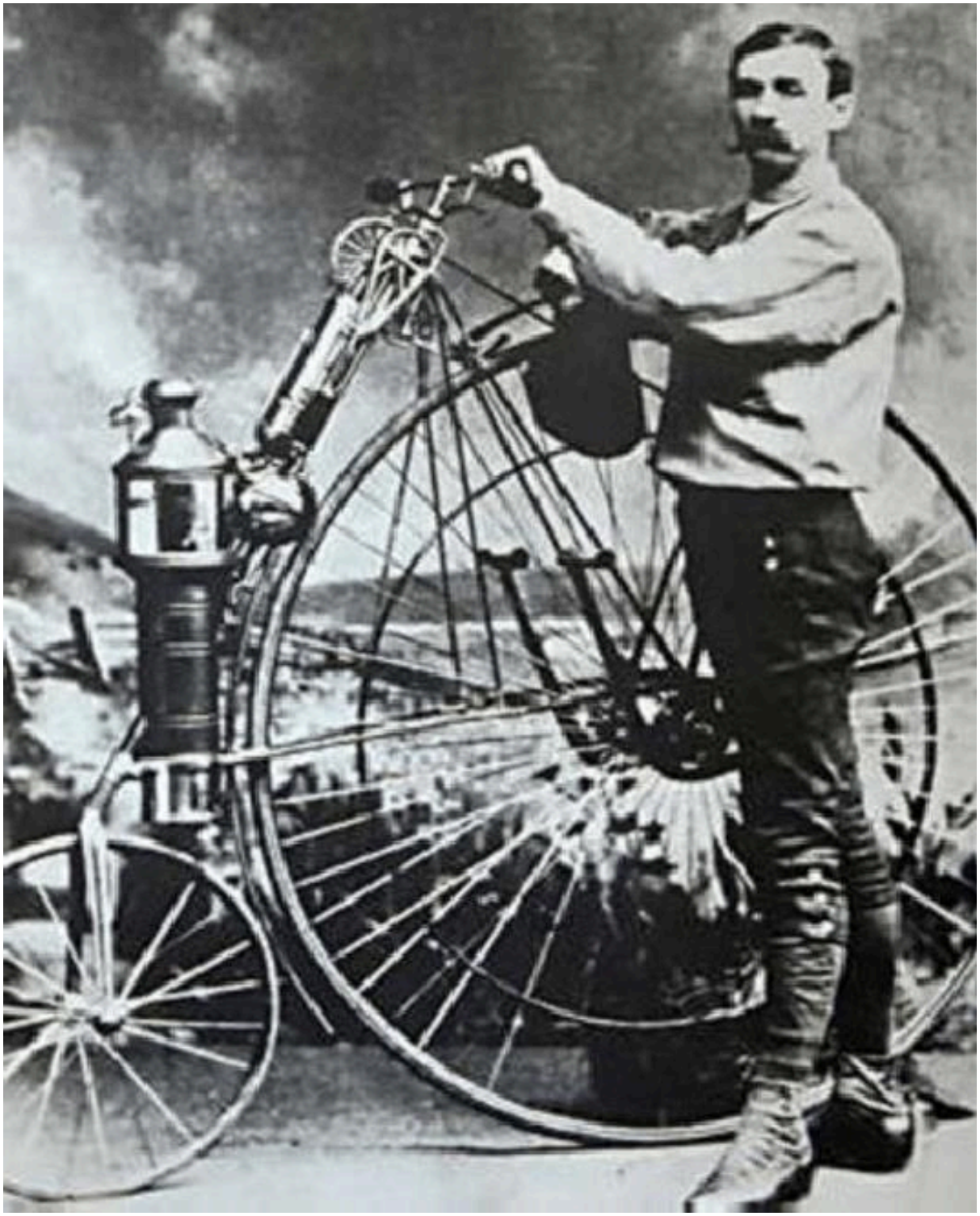


The Parkyns-Batemantrike was the first vehicle in England to run on petrol, albeit as fuel for its steam engine.

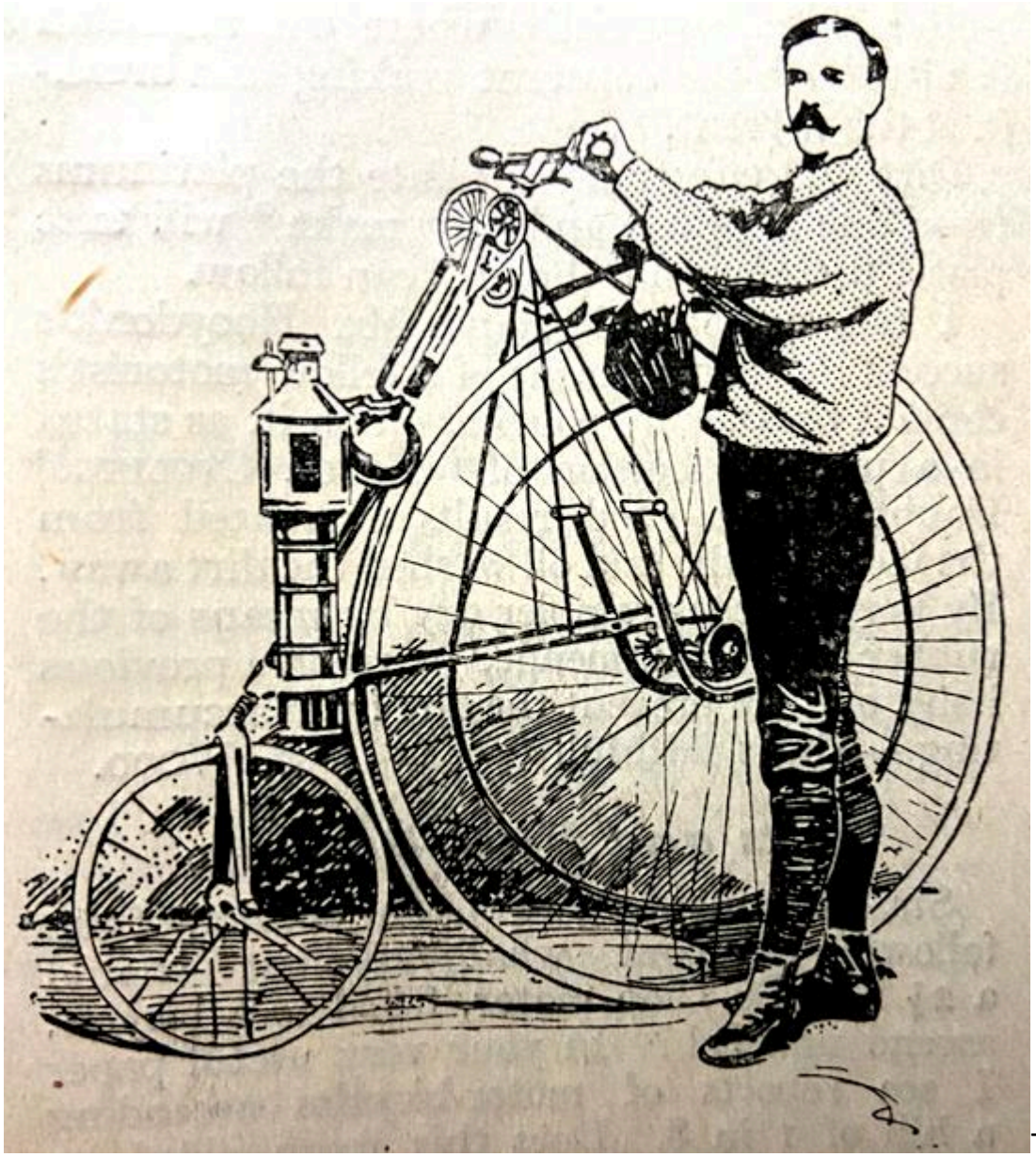
THE METAL detector was invented. Great for finding a missing split link in long grass, if you happen to have one with you.

FROM A LIGHT light hearted prediction penned in The Wheelman's Almanack and Diary: "Why you were asking me the other day, Ted, as you were pumping compressed air into your bicycle engine, if it was a fact that my fastest pace on country roads was only fourteen miles an hour, thirty years ago. Certainly, and a good pace too, and above the average…But now one can purchase a Godiva Gas Phantom for two pounds, guaranteed to go thirty miles an hour; or an American Air Cleaver propelled by bottled sunlight at over thirty miles an hour. Or again, that what-do-you-call-it? That one-wheeled Coventry Machinist Electric Roller, ten feet high, which can be driven fifty miles an hour. No, no Ted, a change has come o'er the scene. When I was your age it took me an hour and a half to go to Sunderland and back by train. You did it in one hour on your Armstrong Athmospheric Roadster. When I think of all this I cannot help wondering what we shall get to: I suppose we shall fly!"

LUCIUS D COPELAND of Arizona made a compact steam engine and fitted it into the large rear wheel of a Columbia 'farthing-penny' (in other words it was a penny farther but the other way round). It did a reputed 12mph and must have taken a lot of nerve to ride.



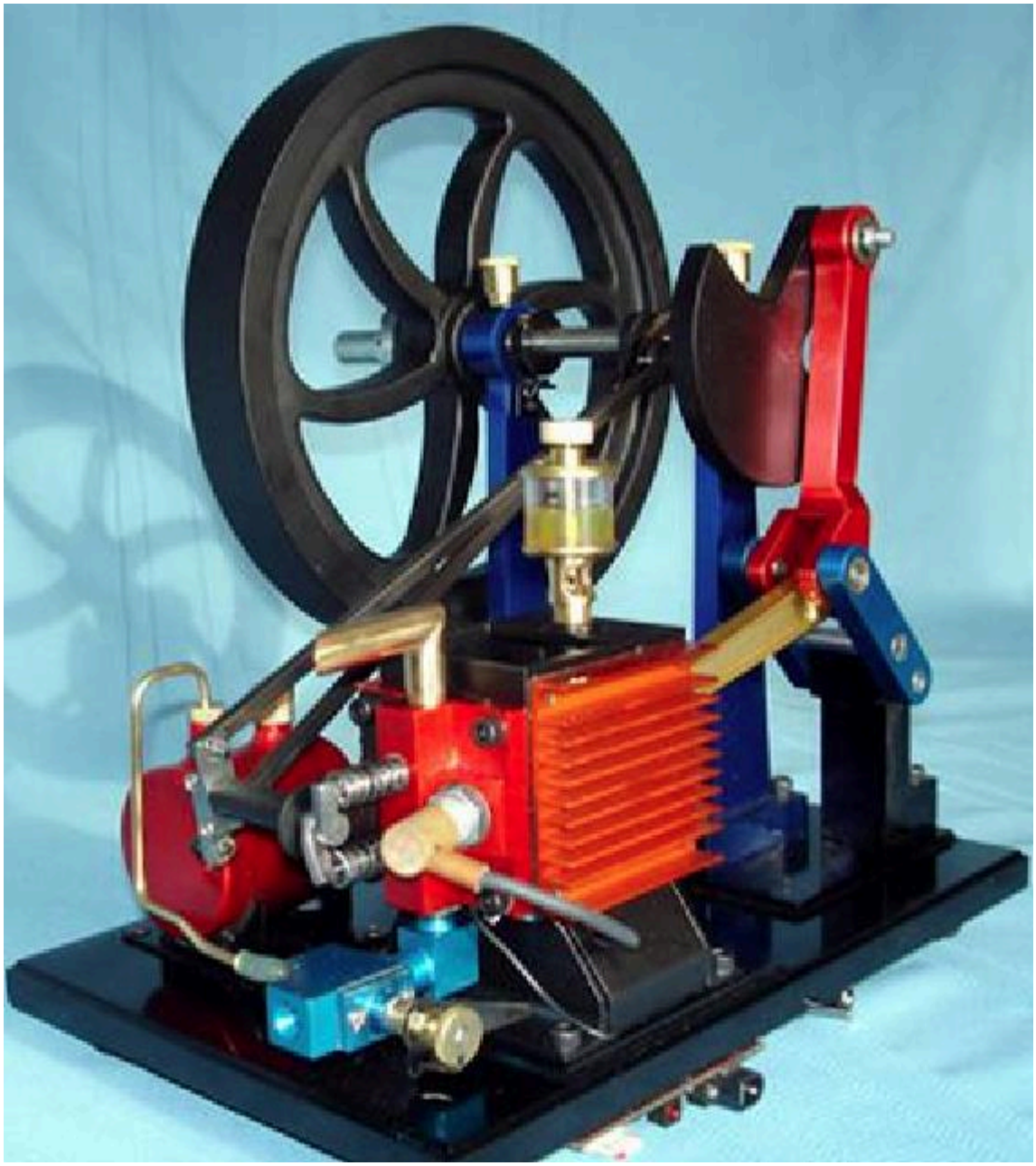
Copeland’s steam farthing-penny must have been a real handful—his backers subsequently insisted on a third wheel.


This etching of the Copeland photo was published in 1902; good innit?

Gustave Trouvéelectrified a Starley Coventry 'lever tricycle' just as Starley was converting from levers to pedal power

1882

JAMESATKINSONpatentedthe Atkinson-cycle 'differential' engine which avoided problems with the Otto cycle patents; it was, and is, more thermally efficient than the Otto cycle. The main difference between the two is the Atkinson's uneven strokes with a short compression stroke and a longer expansion stroke. Atkinson produced



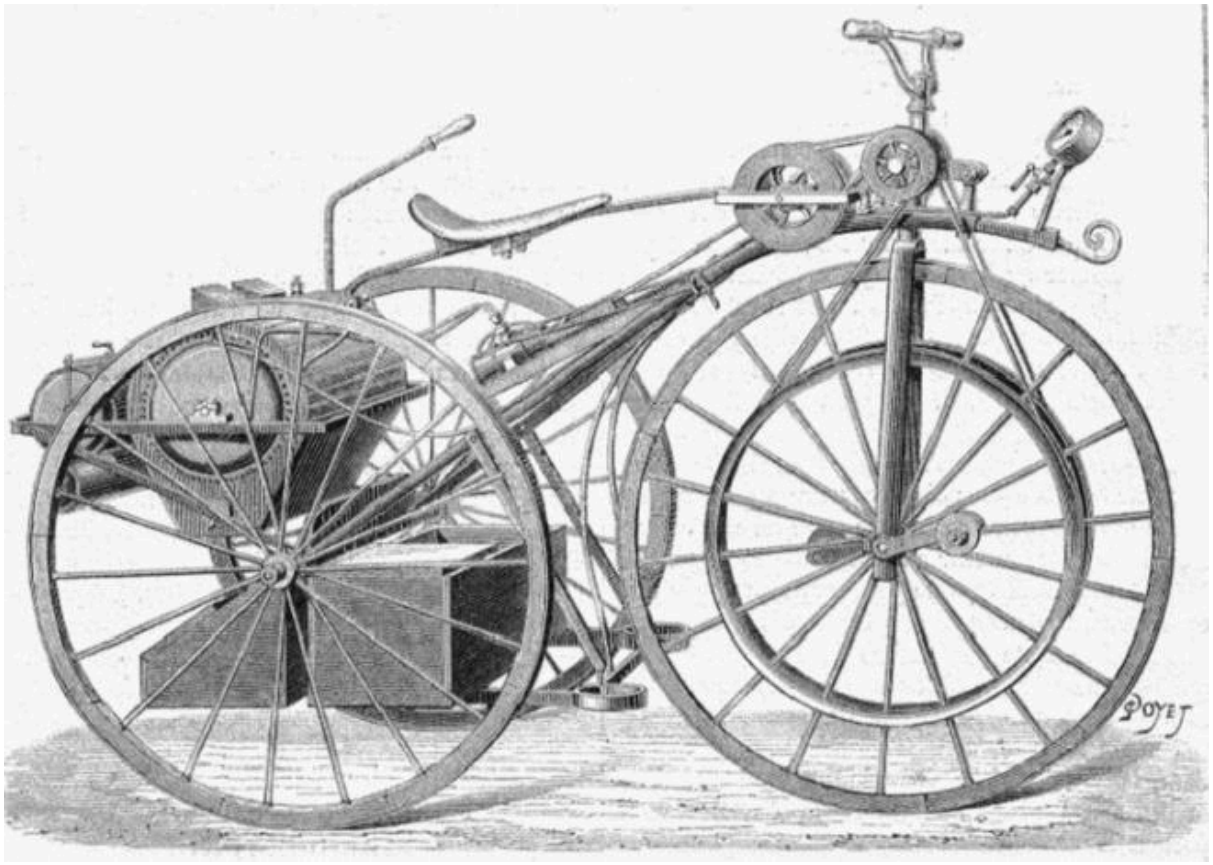
After more than a century, Atkinson-cycle engines are back in production.

three designs. The 'differential' engine, used opposed pistons. The 'cycle' engine used an over-center arm to create four piston strokes in one crankshaft revolution. The 'utilite' engine had the intake, compression, power, and exhaust strokes in a single turn of the crankshaft; this avoided infringing patents covering Otto-cycle engines. The Atkinson cycle has an expansion stroke that is longer than the compression stroke to deliver greater thermal efficiency than an Otto-cycle engine. Atkinson's engines were produced by the British Gas Engine Company and licensed to other overseas manufacturers. Towards the end of the 20th century enthusiasts made working models from the original drawings and the Atkinson cycle has made a comeback in the 21st century, notably in hybrid cars but not, at the time of writing, in motorcycles.

PROFESSORSAYRTONandPerrybuilt an electric tricycle based on a pedal trike. The motor and battery weighed 45lb and 100lb respectively.

THEMARQUISJULES-Albertde Dion annoyed his mum and dad by going into trade. He teamed up with Parisian engineers GeorgeBouton and Bouton's brother-in-law Charles Trepardouxto manufacture steam engines.

GOTTLEIBDAIMLERandWilhelm Maybach were respectively director and plant engineer at Gasmotoren Fabrik Deutz (formerly NA Otto & Cie), the world's largest engine manufacturer. Theyhad developed the 200rpm petrol engine that had made the company's name but Otto had no interest in making engines small enough to be used in vehicles so they moved to Cannstatt to work on a 'high-speed explosion engine'. The fuel they chose was a dry-cleaning fluid called petrol. Within a year Daimler patented his engine but first past the post was an Italian, Enrico Bernardi, who, on 5 August, patented a 122cc water-cooled four-stroke rated at a quarter of a horsepower. Bernardi named his 'motorice' after his daughter Pia. He must hasvedoted on her as the first use of the Motorice Piawas in Pia's sewing machine. Daiml;er was hard on his heels, patenting his engine on 16 December.



Some 15 years after his collaboration with PierreMichaux in the velo-a-vapeur steam-driven velocipede, Louis Perreauxcame up with a nifty steam trike.

1883

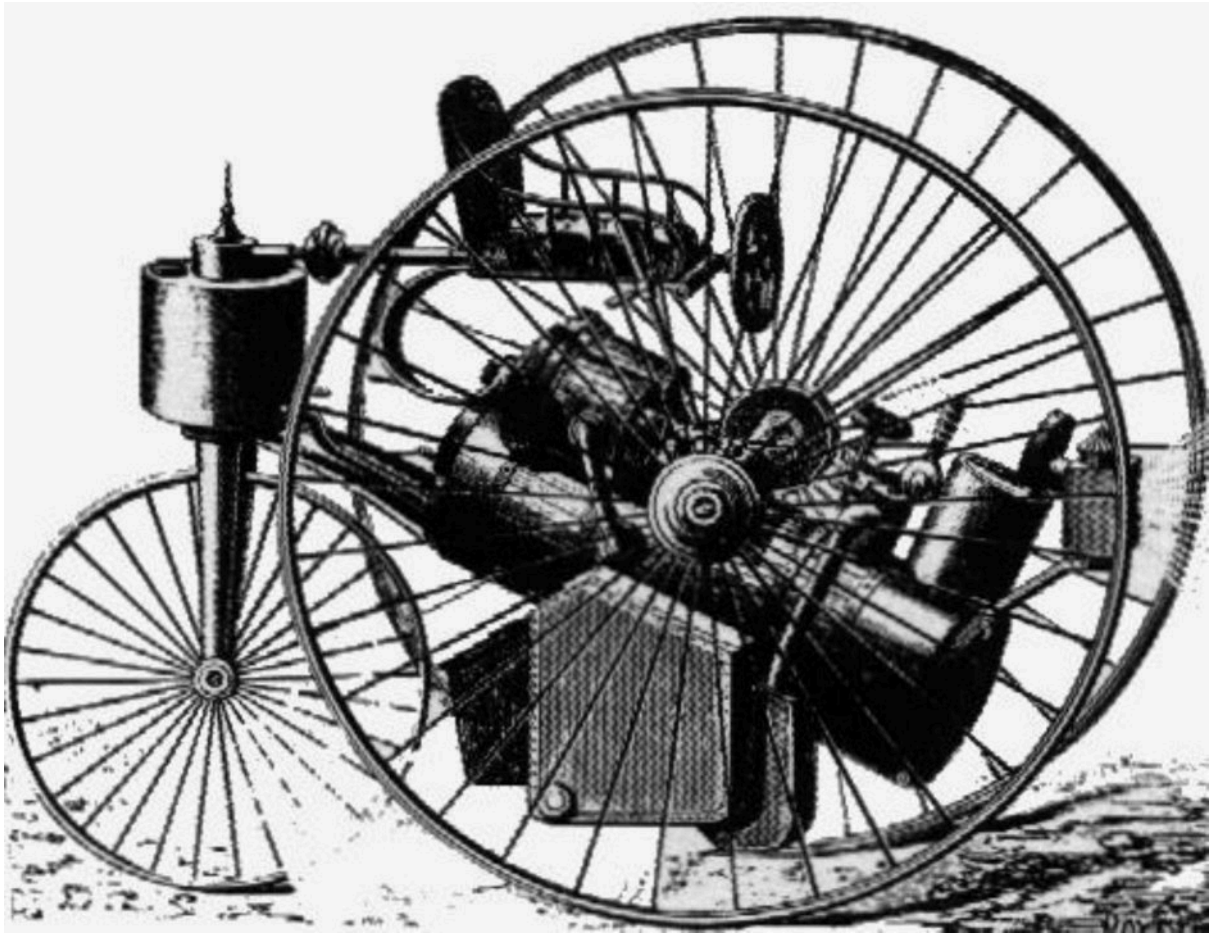
GOTTLEIBDAIMLERpatentedhis petrol engine on 16 December.

DELAMARE-DEBOUTTVILLEcameupwith a four-stroke engine that could be set up to run on gas or petrol.

ETIENNELENOIRdesigned a four-stroke engine for Parisian builder Rouart Freres, leading to a suit for patent infringement. Otto lost in the German and Frenchcourts because the four-stroke cycle had been conceived by Parisian Alphonse Beaus de Rochasin 1862. Thisdecision placed the Otto technology in the public domain which, in terms of the evolution of motorised bicycles, was A Good Thing.

SIEGFRIEDMARCUSpatentedhislow-voltage “magneto-electric ignition system”.

GERMANFRIEDRICHFischerfound a way to make ball bearings that were pefectly spherical; good news for engine designers.

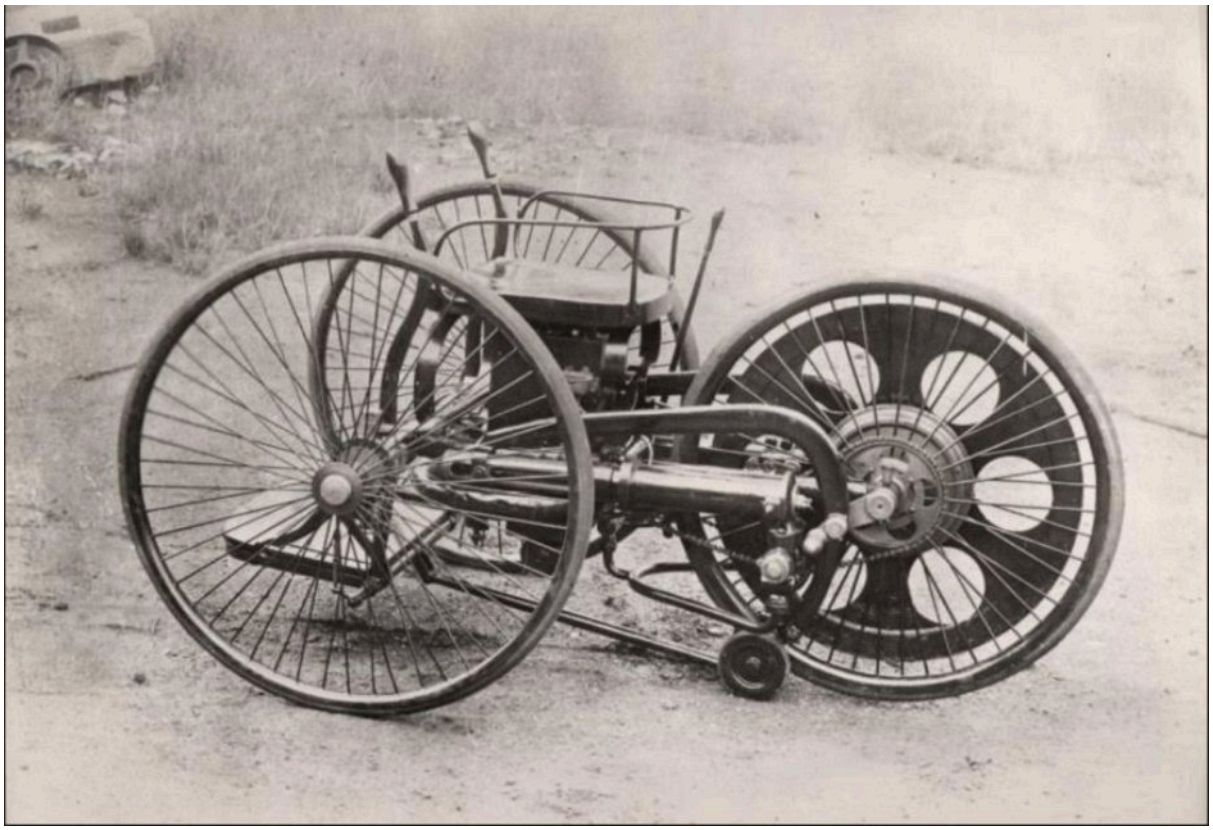


The Sauerbronn-Davis steam velocipede must have been a fearsome sight; judging by the size of the seat those wheels were about eight feet in diameter. The boiler was petrol fired; note the steering wheel in front of the seat.

1884

IN A BID FORFINANCIALBACKINGEdward Butler showed detailed plans for a petrol-engined trike at the Stanley Show. To avoid hassles with the Otto patent Butler built a

Clerk-style two-stroke engine. Butler's Velocycle was remarkably advanced, leading many pundits to cite it as the forerunner of the modern motorcycle, despite its third wheel and the fact that it wasn't built until after the usual candidate, the Daimler Einspur, was up and running. (Ixion, let it be said, saw the Velocycle as the first motor cycle and so should all right thinking Englishmen.)



Edward Butler's Velocycle is the English candidate for the world's first motor cycle.

SYLVESTERROPER(see1868)made another steam-powered bike but if the 1868 steamer had been a motorised velocipede this one, being the shape of a modern 'safety' bicycle could fairly be called a motor cycle.

LUCIUSCOPELAND(see1881) made another steam-powered velocipede; this time he fitted a 4hp steam engine fuelled by paraffin into a Star farthing-penny and demonstrated it at the Maricopa County Fair. Top speed was 15mph and it could run for an hour before needing more water. He went on to establish the Northrop Manufacturing Company in New Jersey and sensibly added a third wheel, calling his trike the Phaeton Moto-Cycle. It was demonstrated at the Smithsonian Institute.

THOMASHUMBERdevelopedand patented the 'safety bicycle' with a diamond-shaped frame and wheels of similar size, just in time for the arrival of lightweight engines to power them.

THOMASPARKER,whowas responsible for electrifying the London Underground, built an electric car. Many years later his great-grandson explained that problems with smoky

steam and gas engines in London turned Parker's thoughts towards finding a more eco-friendly alternative. How cool is that?

Having electrified the Tube Thomas Parker put his expertise into a quad.

IN FRANCE DELAMARE-Debouttevillepatented a twin-cylinder petrol engine and used it to drive a wagon.

ASDE ROCHAS had described the four-stroke cycle in 1862 Otto couldn't stop Daimler and Maybach using it. After two years' hard graft in Daimler's shed they produced a 462cc, 110lb, 600rpm vertical single 'high-speed' petrol engine developing 1.1hp at 650rpm. It featured hot-tube ignition, an automatic inlet valve and a surface carburettor.

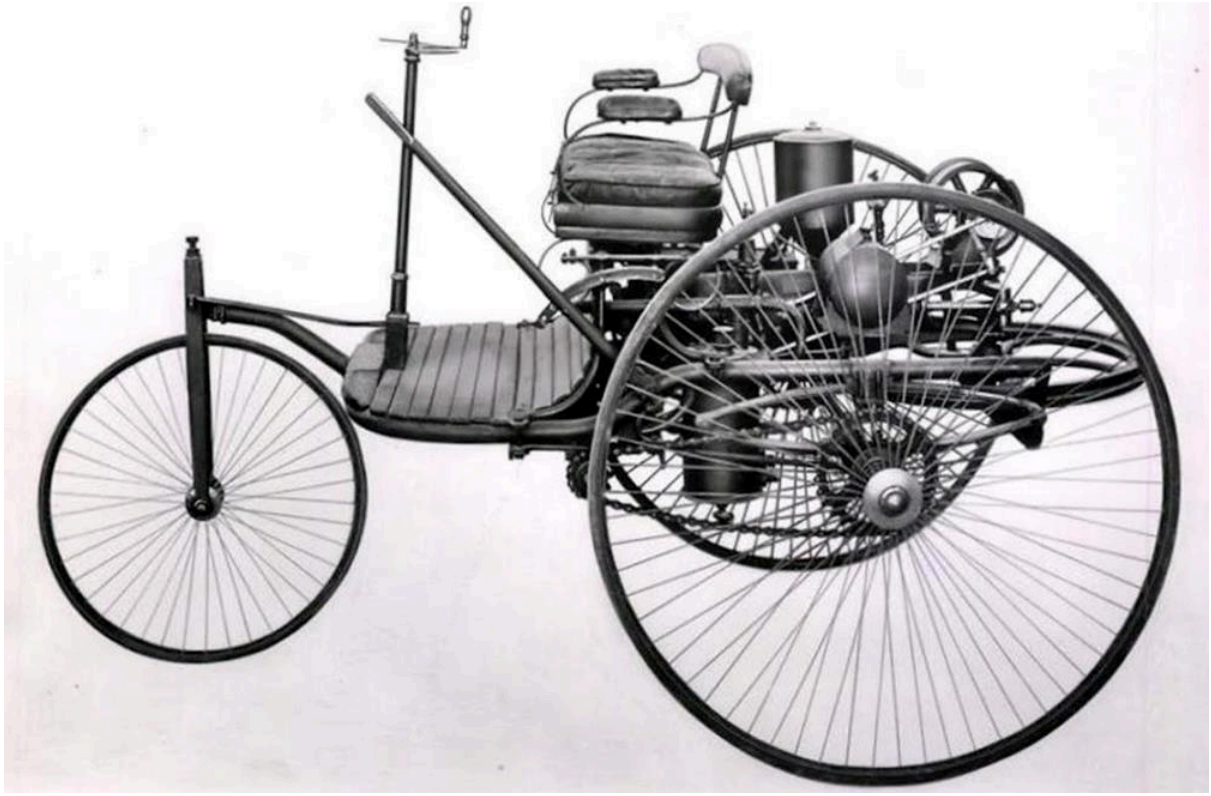
DAIMLER AND MAYBACH'S high-speed engine project bore fruit: a 264cc, 900rpm, ½hp vertical single known as the Grandfather Clock engine. It had a float metered carburretor, 'automatic' inlet valve and used hot tube ignition. It could also run on coal gas, used twin flywheels and had an aluminum crankcase.

Enrico Bernardi fitted his 122cc engine into a diminutive trike which his son rode round the streets of Quinzano.

Edward Callihan of Woonsocket, South Dakota built a paraffin-fuelled steam trike which could do 15mph, and it was robust enough to survive a 20 mile run over local tracks. Callihan later stripped the trike to use bits on other projects but went on to build a petrol-engined car. The local press noted that when he demonstrated his car to local townsfolk they were puzzled by the way he circled them non-stop for two hours till it ran out of fuel. The inventor confessed that he had mounted the shut-off switch out of reach from his position in the driver's seat.

1885

KARL BENZ COMPLETED his three-wheel 'patent motorwagen' a three-wheeler. Ixion drove one in 1898. The great man was impressed by the advanced transmission but concluded: "I refuse to accept it as a motor cycle." Fair enough, though to be fair Karl wasn't trying to build a motor cycle. A four-wheeler followed in 1891.



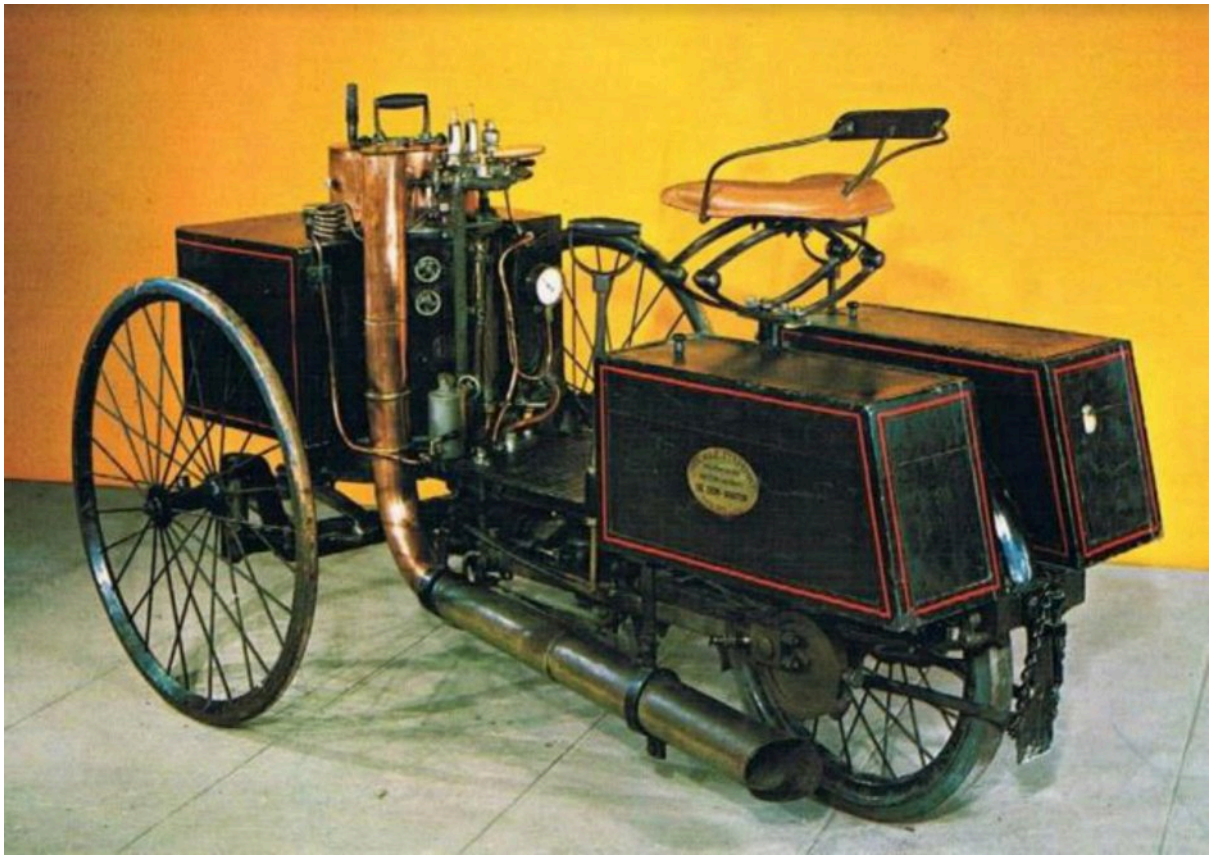
It didn’t take Benz long to add the fourth wheel.

Early in 1885 Benz drove his three-wheeled vehicle through the streets of Mannheim. It

featured electric ignition, a horizontal flywheel, belt drive through a differential and two chains to the wheels. Benz's four-stroke, water-cooled engine was rated at ¾hp.

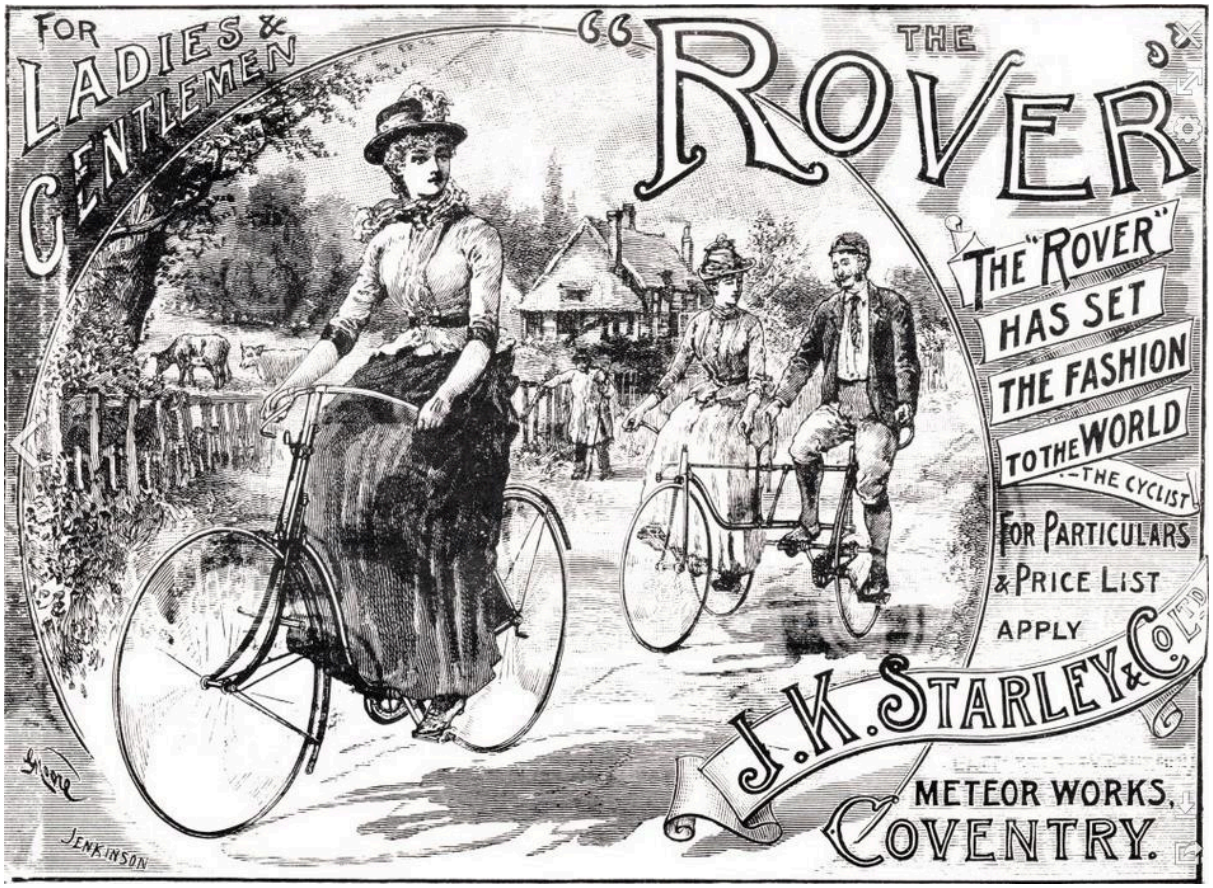
RUDOLPHDIESELSETup a workshop in Paris and began development work on a compression-ignition engine. The process would take more than a decade.

THEFIRSTMECHANICALpetrol pump was built by Sylvanus Bowser of Fort Wayne, Indiana for one JakeGumper, whose garage could thus be considered the forerunner of the myriad petrol stations around the planet. Presumably the petrol bowser was named after clever old Sylvanus. So what a pity it is that Jake'sbeen forgotten, else we might still be cursing ever rising fuel prices at the local gumper.



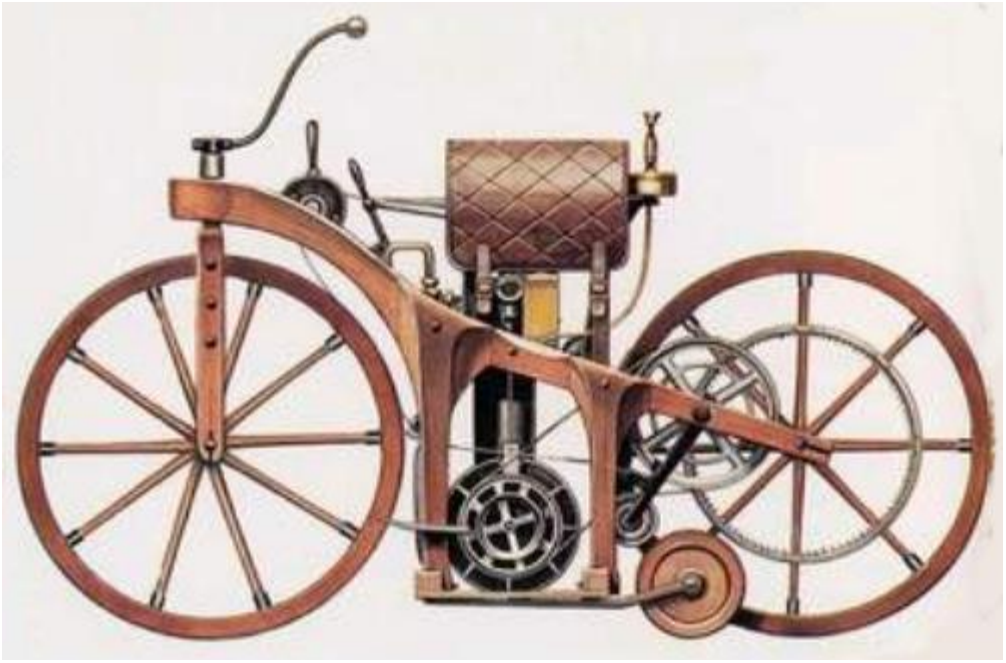
Messrs de Dion and Trepardouxbuilt a series of steam-powered trikes that stayed in production for several years, but de Dion was growing more interested in internal combustion.

JOHNKEMPStarley cut his teeth working with his uncle in Coventry building Ariel cycles. He subsequently teamed up with cycling enthusiast William Sutton using the brand Roverand in 1885 they launched the RoverSafety Bicycle with two similar-sized wheels, pedals and chain drive. All the bicycle lacked was an engine.

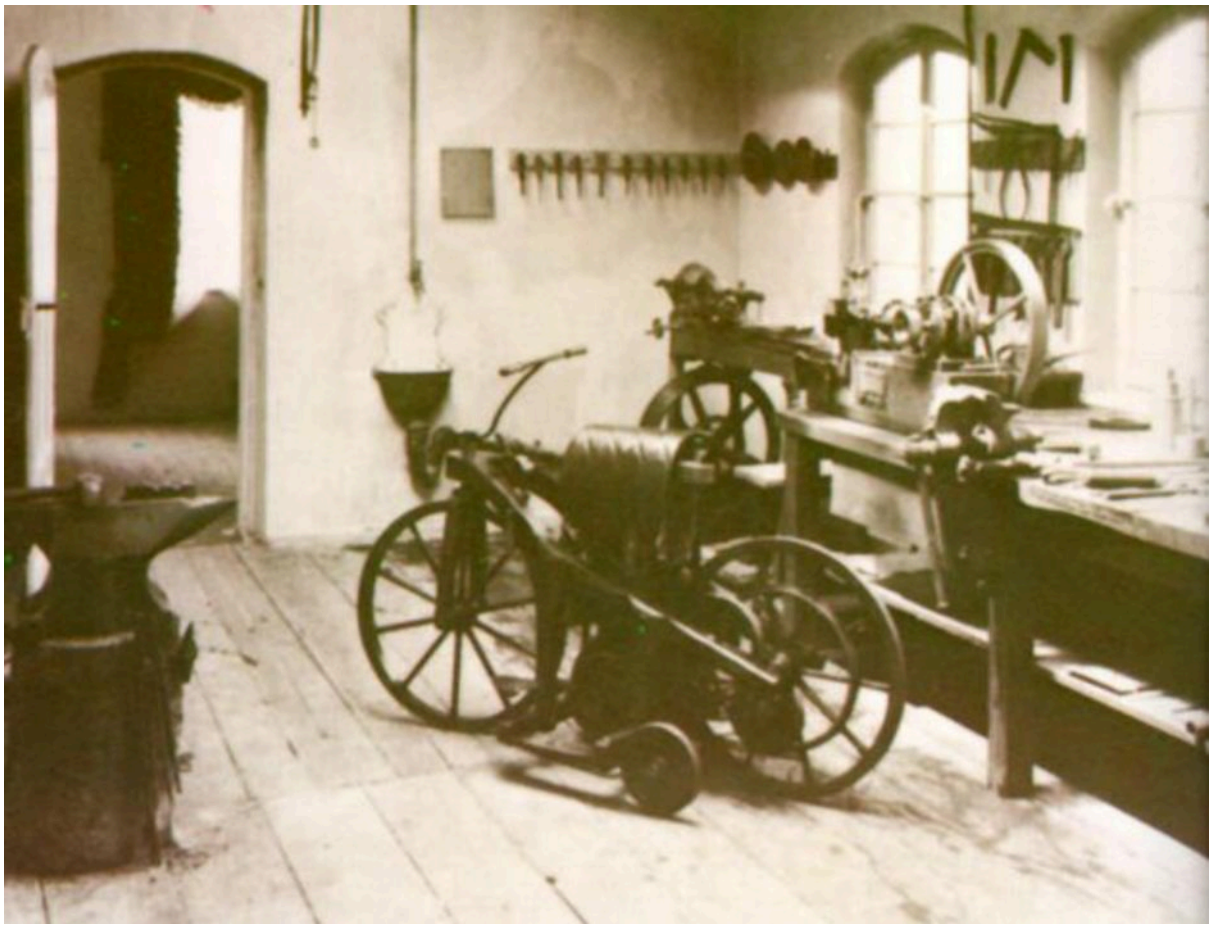


Cycling magazine said the Roverhad "set the pattern to the world" and this phrase was used in their advertising.

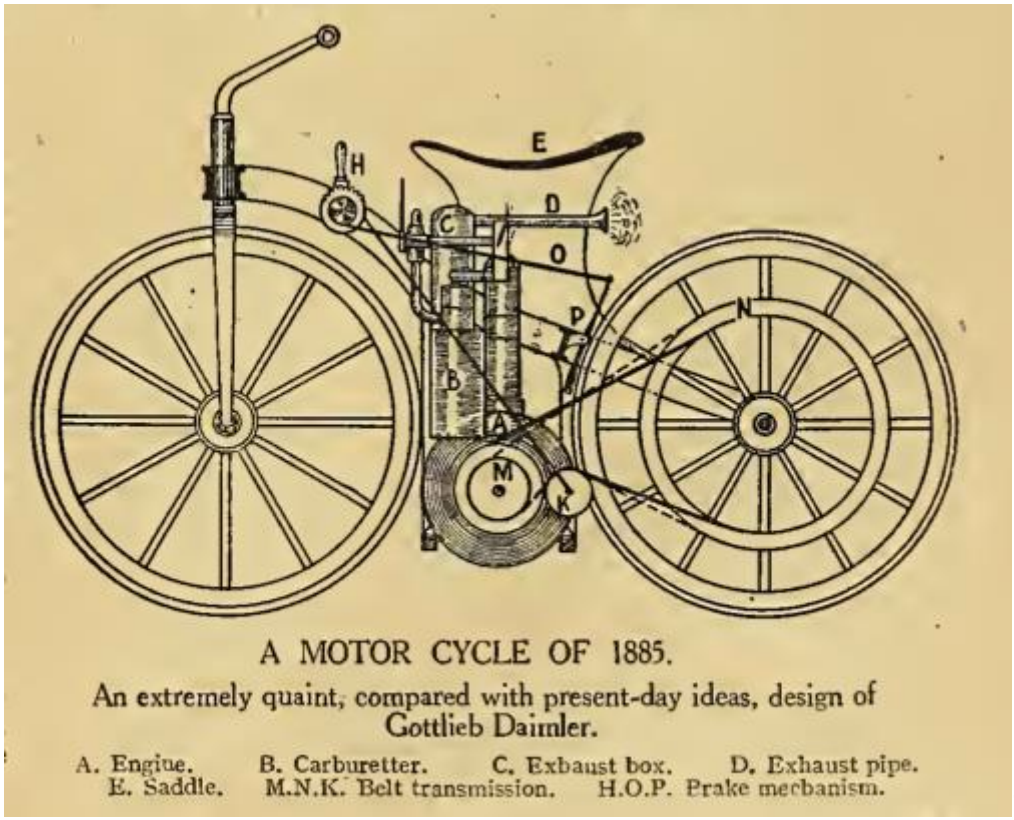
DAIMLERANDMAYBACHplanned to use their revolutionary 264cc engine to power a four-wheeler but initially knocked up a crude, wooden two-wheeled testbed (with outriggers) which they dubbed Einspur ('one-track'). Many motorcyclists have had one-track minds ever since. On 10 November Daimler's son Paul, 17, completed the first run on a petrol-engined motorcycle from Canstatt to Unterturkheim and back—about eight miles. ***Einspur*—aBluffers Guide:** The saddle was too high for the rider's feet to reach the ground and the lousy frame geometry made it unrideable so they fitted spring-loaded stabiliser wheels. The engine drove the rear wheel via a belt; a moveable pulley slackened the belt to serve as a kind of clutch, controlled by a twistgrip (as used by Roper and Michaux in 1869) which also controlled the rear brake. The heat of the engine set fire to the saddle, which must have attracted young Paul's undivided attention. But it did 8mph and is the ancestor of the millions of petrol-engined vehicles that have rolled, floated and flown ever since.



The Einspur was a short-lived testbed for a car engine, but here it is: the first motor cycle.



Here's the Einspur at home; this must be the first picture ever of a motor cycle in the workshop where it was built.



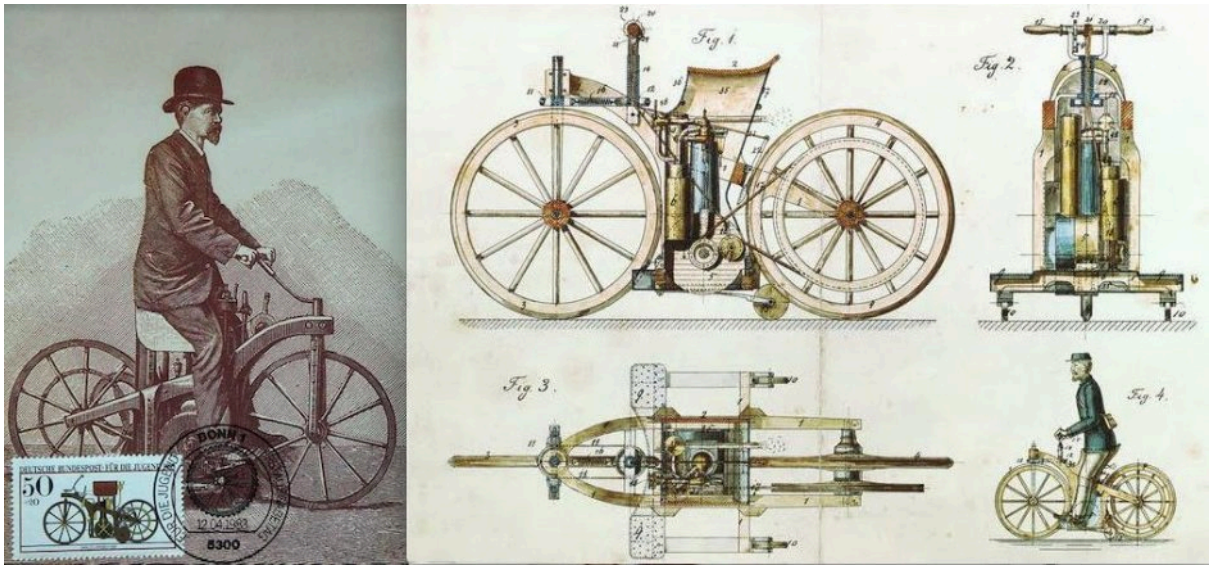
A MOTOR CYCLE OF 1885.

An extremely quaint, compared with present-day ideas, design of Gottlieb Daimler.

A. Engine. B. Carburetter. C. Exhaust box. D. Exhaust pipe.
E. Saddle. M.N.K. Belt transmission. H.O.P. Brake mechanism.

This rather fine diagram on the Einspur was produced in 1916 by a Swiss reader of The Motor Cycle, M Bensande of St Gall, and reproduced in that august organ.

To Daimler it was a testbed; to motor cyclists, it's a motor cycle.



Not surprisingly, the Einspur was commemorated by the Deutsches Bundespost. Right: These engineer's drawings are rather fine, nicht wahr?

WITHIN A YEAR Daimler and Maybach had discarded the Einspur in favour of twin-track vehicles. Nonetheless, if you ignore the stabilisers the Einspur had two wheels and an engine. As such it is generally accepted as the first motor cycle and with it this timeline moves from pre-history to history. To introduce that history you couldn't do better than the heading The Motor Cycle coined for the timeline in its Golden Anniversary issue:

Milestones of Progress

Happenings of Importance and Interest in the Motor Cycle Movement from its Early Days Up to the Present Time

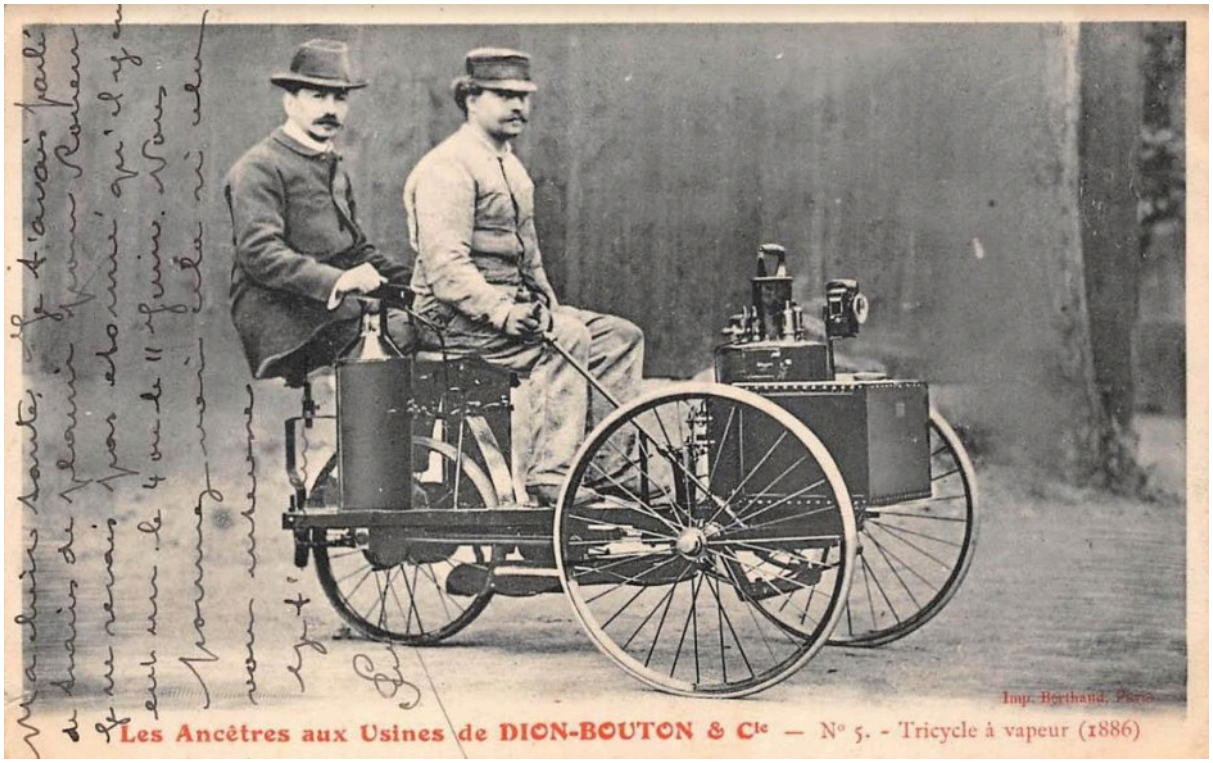
1886

MAYBACH DID SOME miles on the Einspur to evaluate innovations including a belt primary drive and gear-driven rear wheel with a two-speed transmission, though he had to stop to change gear.

THE MANNESMANN brothers patented machinery to make seamless, thick-walled steel tube from which sensible chaps would make motor cycle frames.

ROBERT BOSCH was asked to repair the low-tension magneto on a Daimler engine; he took the opportunity to copy it.

MESSRS DE DION, Bouton and Trepardoux had built some steam carriages, now they took in the right direction by shoehorning a steam engine into a Rudge tandem trike.



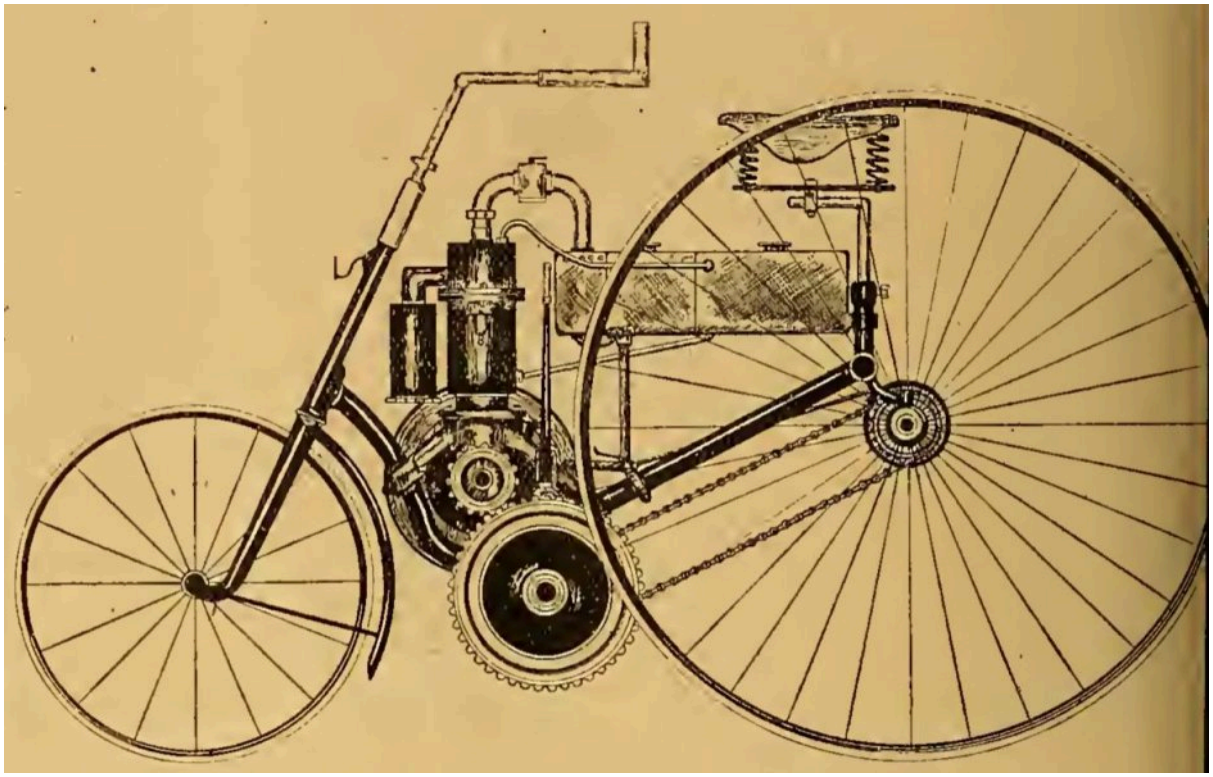
Before moving into the brave new world of petrol power Dion-Bouton produced some practicable steamers.

1887

EDWARDHUGHOWENbuilt a four-stroke chain-driven trike; 20 years later The Motor Cycle had no doubts about his achievement: “It is increasingly a difficult matter to unearth the early efforts of pioneers in an industry so widespread as that of petrol motor engineering. True, we have diversified relics left us—trophies, as it were, of a bygone age. But often, in consequence of the distaste of the more educated and retiring inventor for any kind of publicity or bruiting abroad of the results of his cogitations and labours, such relics are lost in the whirligig of time and destroyed, or replaced by some newly-wrought mechanism. Thus it is in the domain of practical workers, and, notwithstanding the fact that there are several claimants to the honour of having first brought forth the self-propelling ‘infant’ to become in turn the parent of the latter-day chariot of the roads, it is with patriotic satisfaction that we are enabled to furnish our readers with what is, in point of fact, the first illustrated description of an English-made motor vehicle, which saw the light twenty years since. We are, of course, aware of other mechanically-moved vehicles to which precedence may be given, in point of age, but, confining our attention to forerunners of the twentieth century petrol motor carriage, it is extremely doubtful whether even the late Gottlieb Daimler, who has been called “the father of the motor car”, produced at first a vehicle so remarkably in advance of its time as that which was constructed by Mr EH Owen. The vehicle was a front wheel steered tricycle. The motive power was supplied by a single-cylindered, vertical spirit engine working on the four-cycle principle, the ignition of the charge under compression being

effected by means of a lamp and hot tube. The admission valve, set in a removable chest at the flywheel side of the engine, was of the spring-controlled automatic pattern, while the exhaust valve was lifted by a cam on a short axle running at half the number of crankshaft revolutions. Upon an extension of the engine-shaft a spur pinion meshed with a large spur wheel beneath. Carried on the same shaft as this spur wheel was a chain wheel, which, by means of a central chain, transmitted the power direct to a second chain wheel fixed on the rear axle. Starting of the motor was effected by turning the rim of the exterior flywheel manually, during which operation the large spur wheel was allowed to run idle upon its shaft. Close to and working on the rim of the large spur wheel a calliper band brake, actuated by an upright hand lever, served to form a gradually engaging connection between spur wheel and chain wheel, so that they might run solid when desired. The driving axle was of the 'live' type, and provided with a bevel balance gear, together with a foot-operated band brake. The carburetting device consisted of a small spirit container, fed from a tank alongside, and having a wick feed to the inlet pipe of the motor. An adjustable mixing valve furnished the necessary air to the admission port of the engine which was also controlled thereby. A small circular iron canister, drilled with large holes at its lower end, formed the exhaust box. The engine was water-cooled by the natural circulation of that liquid through small pipes from a reservoir next to the tank. Splash lubrication was employed in the enclosed crank case, a ball valve drip feed oiler being also fitted to the cylinder. An elongated steering bar, footrest and the driver's saddle completed the equipment of the machine, the wheels of which, it is almost needless to add, were solid rubber tyred. Although twenty years have elapsed since this motor-driven tricycle was evolved, it embodied in advance the elements of the later De Dion and other makes of tricycles, with the exception of the method of transmission. Here was a clutch, the like of which is seen in the earlier French-made motor cars; a countershaft and chain driving transmission practically as in any present motor car; a live axle combined with a balance gear that has not yet been altered in principle. Here, too, was a wick carburetter differing only in details from that now employed in the Lanchester car. This precursor forestalled to no inconsiderable extent the very 'vitals' of automobile construction. It was easily capable of running at a respectable speed, despite the law of the period, and more or less frequent stoppages on account of difficulties connected principally with ignition, carburettion (or rather vaporisation), and water-circulating troubles, amongst lesser ills to which such a pioneer machine might not unnaturally be prone. In that period petrol as we know it today was, of course, unobtainable, and consequently it was necessary to employ benzine as fuel. One at least amongst our engineers was as much alive to the possibilities of road vehicles driven by the internal combustion engine as were the inventors of Continental countries. It shows us how we might have early led in the industry but for the restrictions of absurd legislation." In 1901 Owen set up the Automobile Transport Company in West Kensington making 3½hp 'voiturettes'. He then told the Motor Car Journal that he was "prepared to take orders for 9, 12, 16 or 24 hp

cars, with delivery in early 1902". Then he renamed the company the Twentieth Century Travel Co and renamed the cars Lococars. The company survived till 1935, changing its name four more times. There is no record of any cars being built. But in 1887 Edward Owen earned his place in the motor cycle hall of fame.



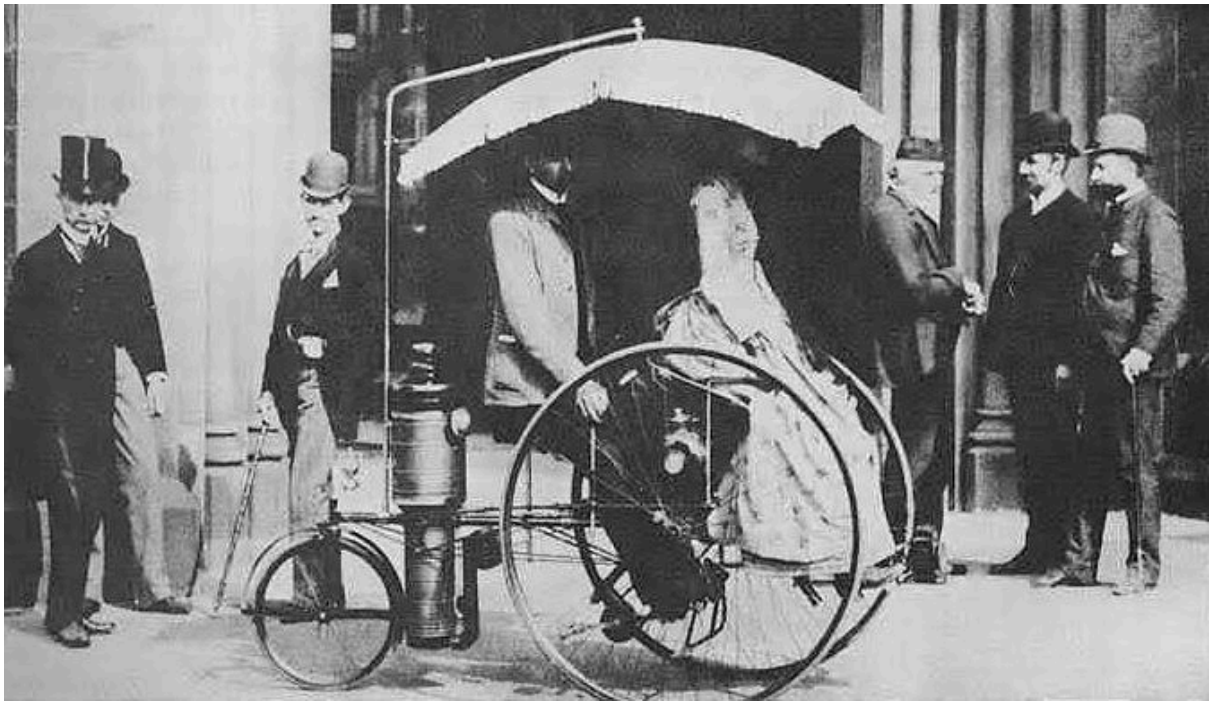
Almost forgotten by history, Edward Owen built Britain's first motor vehicle.

JOHN BOYD DUNLOP, while working as a vet, developed a practicable pneumatic tyre for his son's tricycle, paving the way for the first punctures.

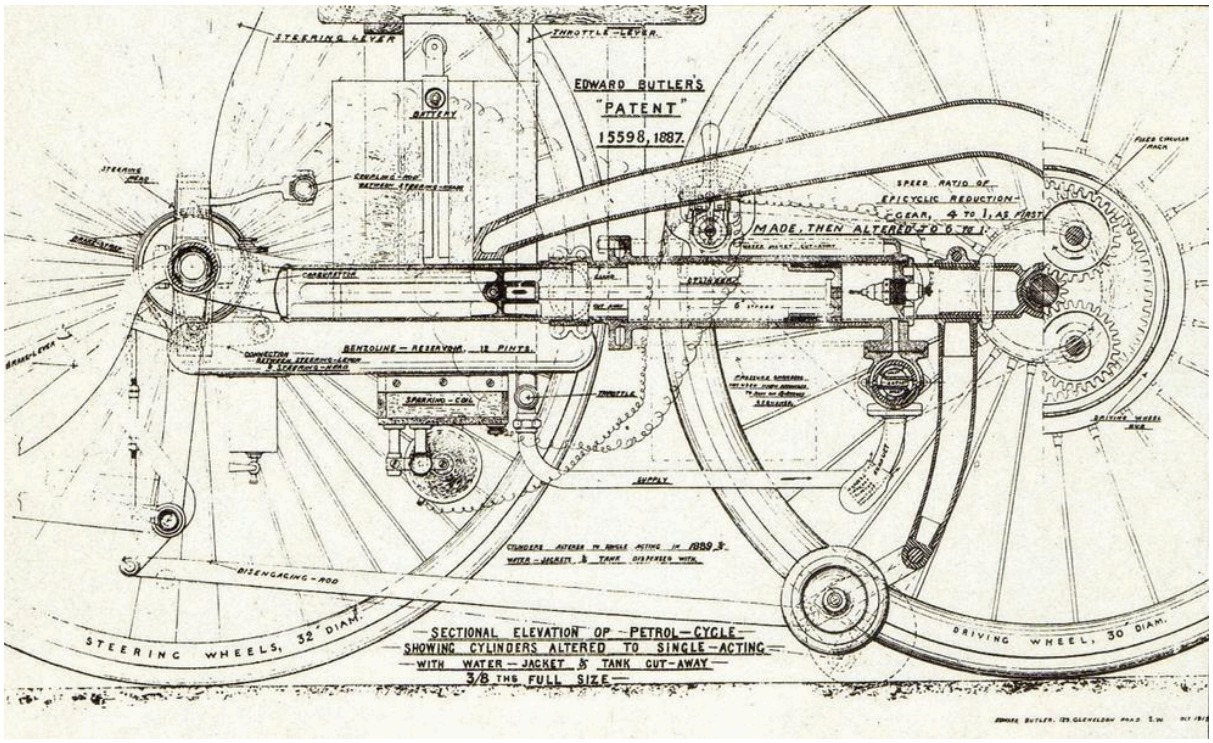
THREE YEARS AFTER EMIGRATING from Nuremberg to Coventry Siegfried Bettman teamed up with his fellow Nuremberger Mauritz Schulte, a trained engineer, to launch the Triumph Cycle Co, with backing from Dunlop.

JOHN MARSTON BEGAN MAKING bicycles in Wolverhampton. On the suggestion of his wife Ellen, he marketed them as Sunbeams; the company's Paul Street works were named Sunbeamland. Legend has it that the Sunbeam name was coined after Mrs Marston saw the first bicycle produced by her husband's firm and remarked how well its glossy paint reflected the sun.

LUCIUS COPELAND patented another steamer, this time a trike that looked somewhat less precarious than his lofty farthing-penny creation. He made room for a passenger and even fitted a rather stylish fabric roof. He went on to make about 200 'Paeton steamers'.



Compared with Copeland's precarious looking 'farthing-penny' steamer, his Phaeton-steamer looked eminently sensible. The great man is pictured with Ms Frances Benjamin Johnston at the Smithsonian Institution Building.



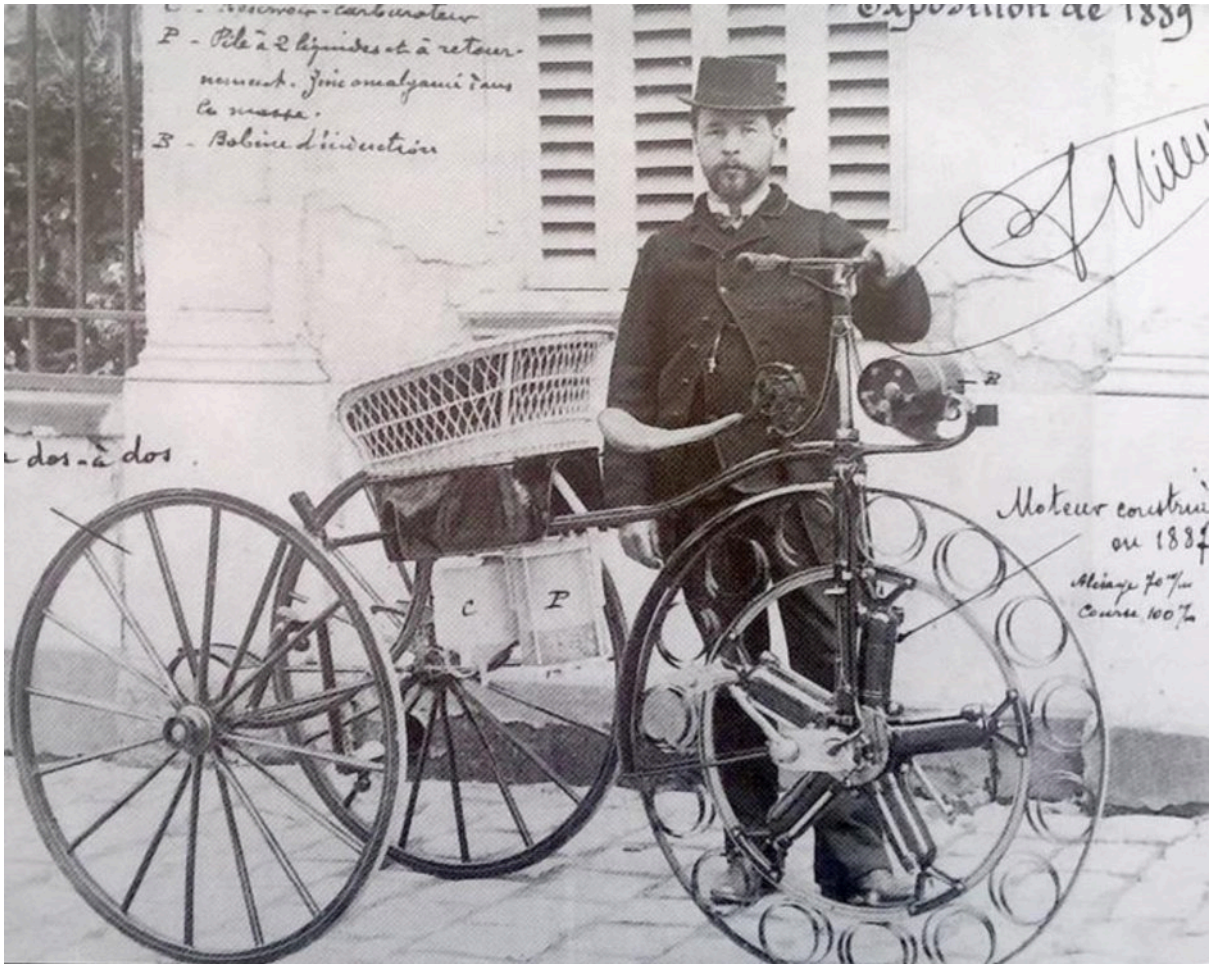
Edward Butler upgraded his 1884 provisional patent to a limited patent. The Velocycle was now called the Petrol-Cycle; the first use of the word 'petrol'.

1888

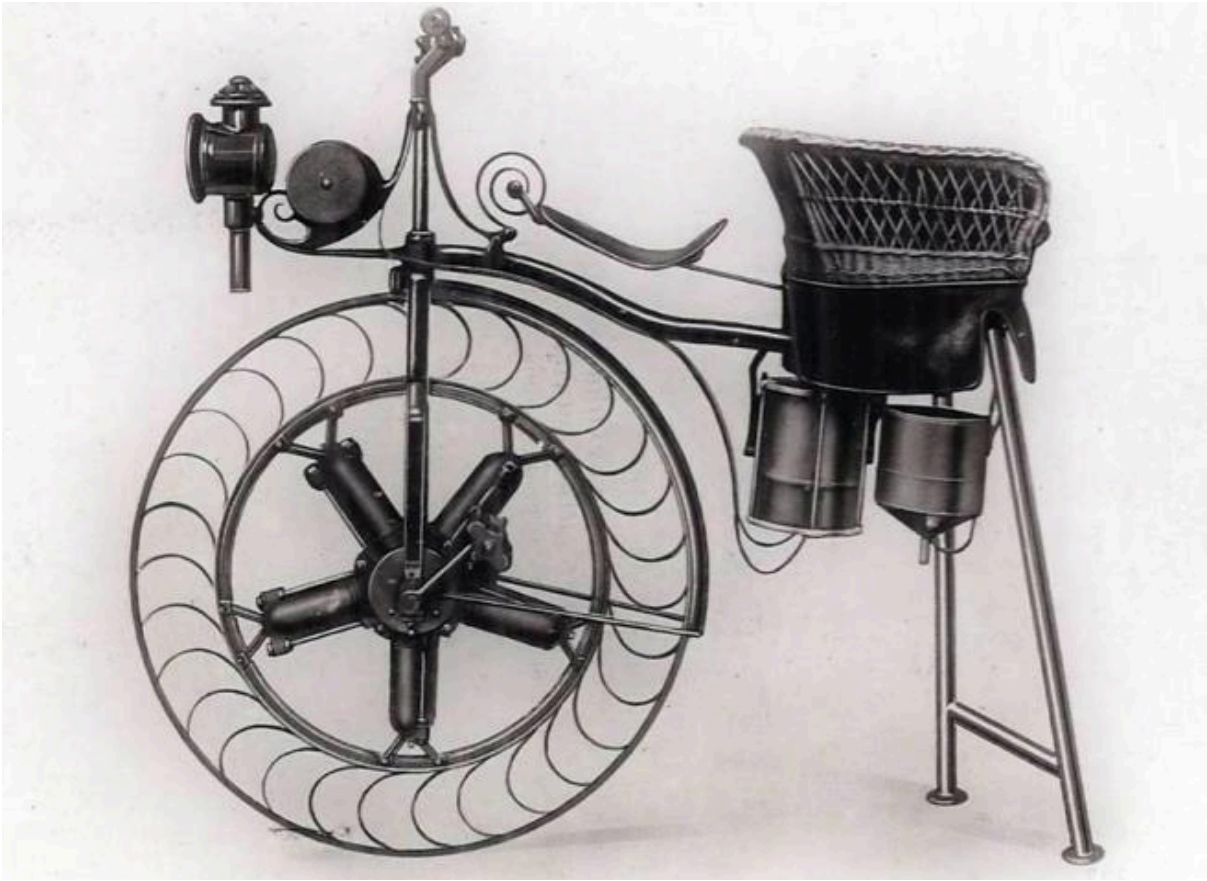
CROSSLEYBROSswitchedfrom slide valves to conical-seated valves controlled by a cam.

WESTERNERSLIVINGINJAPANsetup the first horsedrawn stagecoach company in Japan. Before long traffic laws were passed. Theseincluded bans on drink-driving, nudity and flying kites on the public highway.

FELIXMILLET,clearlynot one to do anything the easyway, built a five-cylinder 'stellar' rotary engine into the front wheel of a tricycle. Rotation was supposed to cool the engine, which lacked fins. However it did incorporate suspension into the front wheel, and was ahead of its time, probably too far.



Why use a single when you can build a five-pot radial into a sprung front wheel?



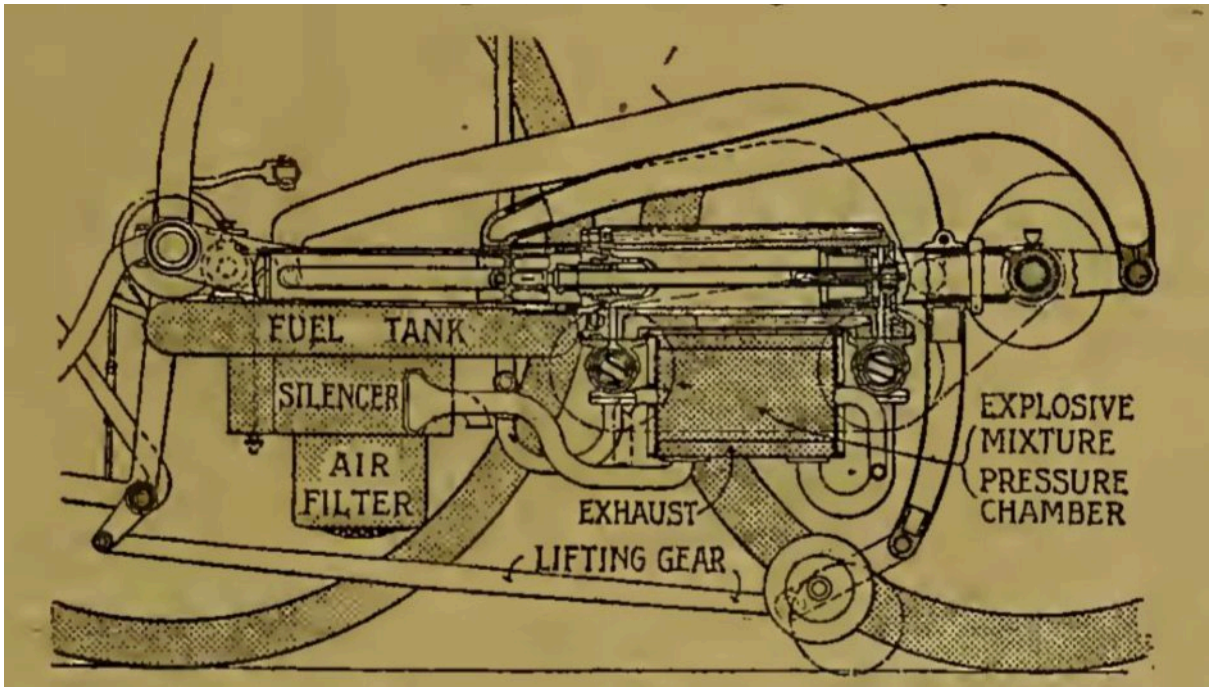
This seems to be a Millet trike with the back end removed.

FINALLY, EDWARD BUTLER found backers and began work on the Petrol-Cycle in the machine shop of torpedo-boat designer FB Shuttleworth. It was fabricated by the Merryweather Fire Engine Company in Greenwich. The Petro-cycle was originally powered by a Clerk-style two-stroke engine with magneto ignition but Butler converted the engine to a water-cooled four-stroke, replaced the magneto ignition with a battery and coil, and invented a spray carburretor he called the 'Inspirator' (Wilhelm Maybach wouldn't invent his spray carburetor until 1893). The 0.6hp (at 600rpm) four-stroke gave the Petrol-Cycle a top speed of 10mph. It boasted Ackermann steering, chain-activated rotary sleeve valves and float-fed carburettor. The water reservoir was built into the rear

Finally…EdwardButler got to ride his trike, and very comfortable it looks too.

mudguard (an idea adopted by Hilderbrand & Wolfmuller in 1894) and the engine was started using compressed air. Butlet wrote: “In this machine one gallon of petroleum or benzolene is designed to furnish sufficient power to accomplish a run of forty miles…both cylinders are supplied with explosive mixture by drawing air through an inspirator situated over an oil reservoir contain a supply of benzolene, or a similar petroleum product. A valve regulates the oil feed, and the mixture of air and oil spray formed in the atomizer is volatilized before distribution to the cylinders. The compressed charges are alternately ignited by an induced current of electricity passing across terminals fixed in the cylinder covers, the current being generated by a small single-fluid battery under the seat. Stopping and starting is effected by raising and lowering the driving wheel from the ground by a foot lever, the weight of this portion of the machine being then thrown upon small caster wheels…thecrank shaft is set in motion by a handle before the driver mounts to his seat. The speed of the motor is regulated by a throttle valve lever…steeringis effected by a pair of rocking handles actuating the front wheels, which move on separate pivots, and the brake is applied to both of these wheels by a foot lever. ” Years later Butler’s son recalled that his mum had taken a turn at the controls, making her the first member of the gentle sex to operate a motor vehicle, so raise a glass to the world’s first woman driver. Thirty years later The Motor Cycle reviewed Butler’s achievement: “A study of Mr Butler’s pioneer machine is

most interesting, and the mechanism needs very careful investigation if all its ingenuity is to be appreciated…From a pressure diagram before us, it is clear that a more perfect exhaust stroke is obtained than even in a four-stroke engine, while the charge is only transferred after the piston has reached the top of the stroke. The main advantages are perfect exhaust and perfect charge, so far as the working cylinder is concerned. The disadvantage of this principle would be an unduly high receiver pressure needed for the transfer. In all it appears to be a system which, if taken up again and modernised, might give good results, particularly as regards the thermal efficiency." Butler himself described his invention in detail: "There are two cylinders, one at each side of the driving wheel, and arranged acting away from the driving cranks, in order to work with an unusually long stroke and to have the front ends arranged as compressing pumps. The pistons are connected by rods to cross-heads, and these by return connecting rods of oval section tapered steel tubes to the cranks, which are at 180°. Each cylinder is self-contained, and draws in and compresses mixture at the front end into a pressure chamber arranged underneath, a jacket surrounding the pressure chamber being utilised to heat the mixture. The cylinders are 2¼in diameter by 8in stroke, and the mixture, compressed to from 15lb to 30lb per square inch, according to throttle opening, is admitted to the explosion end of the cylinders for 2½in of the power stroke, when it is cut off by the rotary valve and immediately ignited by a wipe contact spark, produced by a spring point extending some 3in from a plug screwed into the cylinder cover."When the motor was running at about 300rpm and with the throttle fully open the pressure was measured at 20-30lb for the first 2-3in of the stroke, rising to 100-120lb. after the



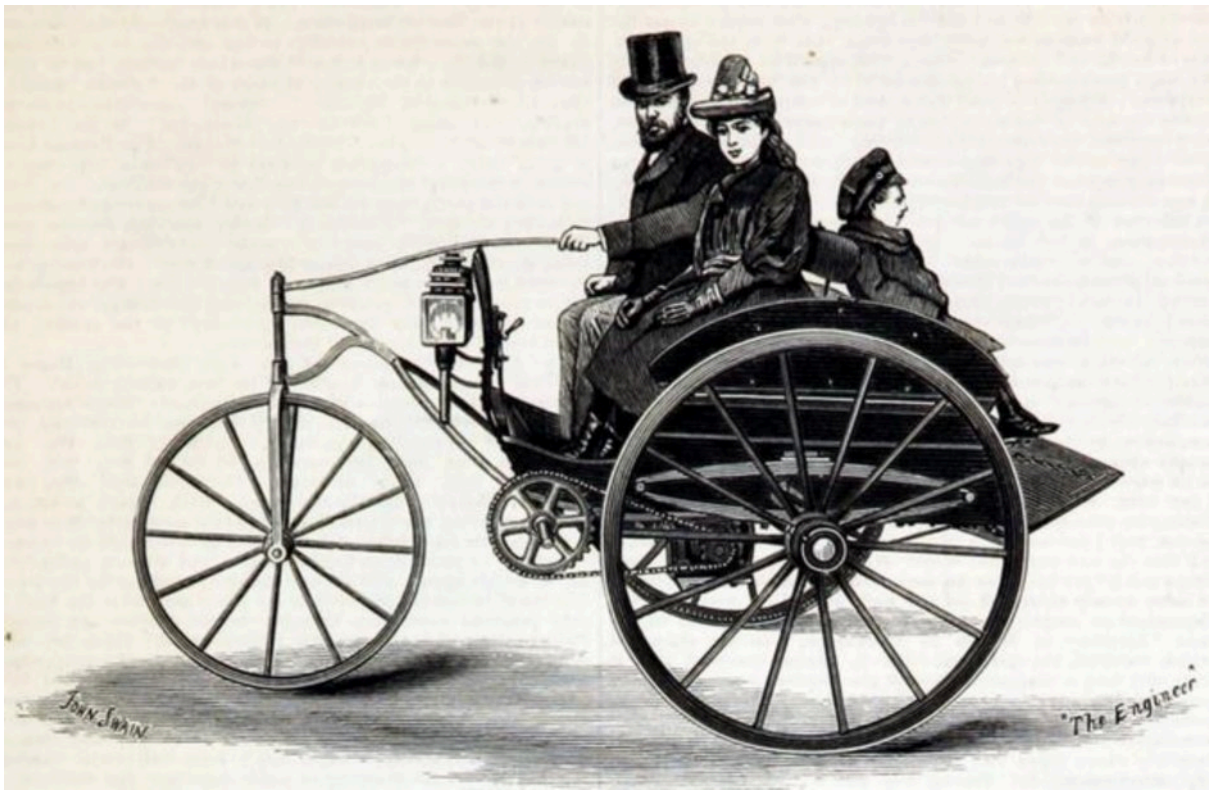
Edward Butler's engine: a spray carb, spark ignition and compressed air starting. It deserved, and deserves, greater recognition.

crank had moved to about 60° of the power stroke. Butler described the starting technique and the development process: "At each end of the cylinders there is a balanced tapered rotary valve driven at half speed by a sprocket wheel and chain. Between the rotary valves and the pressure chamber there are two plug throttles, and a third plug to control the admission of mixture from the carburetter to the compressing end of each cylinder. The purpose of the three plugs is to enable the motor to be used as a compressor while pushing it along the road for a hundred yards or so to charge up the cylinders, after which operation the plugs are moved round a few degrees to start the motor under air pressure with the driving wheel raised off the ground. Immediately on the chambers commencing to fire, the plugs are moved round to the third position to place the compressing ends into connection with the pressure chambers. In practice it was found that the motor would not work slowly enough to propel the car along unaided at the start, ie, when the driving wheel was lowered to the ground, and the car had to be pushed along at a running speed until both cylinders picked up. The motor, however, would run very satisfactorily with the driving wheel running on a pair of grooved pulleys when allowed to speed up to about 250-300rpm. The current for the ignition was at first obtained from a dynamo magneto, but as this took up so much of the available power a primary battery was substituted. At first a Bunsen nitric acid battery was used, then a bichromate of potash, and finally a silver-carbon plate battery known as the Shancheef, really a modification of the silver-copper Smee battery. The carburetter was placed forward, just over the petrol tank, and was within reach from the seat for adjust-ment of the petrol feed by a pin valve; this car-buretter had a jet feed and automatic air plug to maintain a constant mixture for different positions of the throttle and for varying speeds. In the trials Pratt's gasolene was used, although the motor would run on commercial benzolene, but did not start so quickly on the heavier spirit. After a considerable amount of experimental research with the motor arranged to work on a pressure admission two-stroke cycle this was decided to be unsatisfactory, and the motor was altered to work four-stroke, when the pressure chambers and the valves at the compressing end of the cylinders were cut out, and the valve at the explosion end altered to admit mixture at alternate forward strokes instead of at each stroke as formerly. An epicyclic transmission gear was also fitted in the hub of a new driving wheel, which now allowed the motor to speed up to 400-500rpm when running along the road at from eight to ten miles an hour. The four-stroke motor ran much better, and after being first started by a handle on one of the cranks, with the driving wheel raised from contact with the ground, the car could be quite easily started from the seat by a foot lever at the right-hand side of the footboard. This method, although seemingly strange, really worked very well, as the driving wheel could be let down quite gently with the toggle lever control. On the left side of the footboard was a second foot lever for the brakes on the front steering wheels. These were carried by stub axles swivelling in sockets, and were connected for the three wheels to focus to one point when steering in either direction. The cylinders were jacketed and connected by large pipes to a water

tank arranged over the driving wheel, which, although heavy, appeared to keep the cylinders from overheating. This little car, although of short wheelbase, and with wheels only 32in and 30in in diameter, weighed with oil and water 400lb. After being altered from two-stroke to four-stroke, the ignition was changed from wipe spark low-tension to high-tension, with a sparking coil and rotary distributer."

JKSTARLEYbuiltan electric trike which worked, but didn't get beyond the prototype stage. But at the same time he was perfecting his 1885 design, the RoverSafety cycle. It was the first 'modern' bicycle with a chain and equal sized wheels. All it needed was an engine…

MANUSVOLK,founder of the Brighton Electric Railway, built a 1hp, chain-drven 'electric dogcart' for the Sultan of Turkey.It weighed in at 11cwt, which implies a hefty battery pack. Nonetheless, Volk's claim of a 50-mile range at 10mph still seems optimistic.



Mr Volk's 'electric dogcart' was rather stylish—it certainly impressed the Sultan of Turkey.

WILLIAM'PIANO' Steinway, who had met Maybach at a US show in 1876, visited Canstatt and became exclusive agent for Daimler engines in the USAand Canada.

1889

JOSEPHDAYDESIGNEDacrankcase-scavenged engine, using the area below the piston as a charging pump, to avoid infringing Otto's four-stroke patents. He called it the

Valveless Two-Stroke Engine. It incorporated flap valves in the inlet port and the piston crown. One of his workmen, Fred Cock, subsequently replaced the flap valves with a piston-controlled inlet port to produce the classic piston-ported two stroke still in use today.

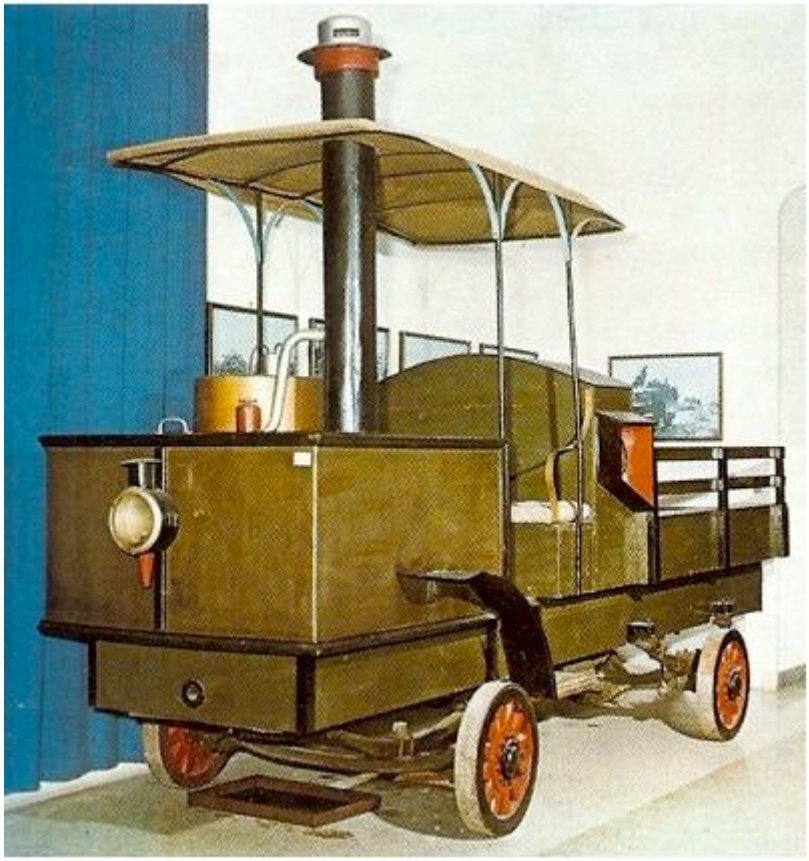
HEINRICH AND WILHELM Hildebrand, fed up with cycling up the hills of their native Bavaria, built a 1½hp steam-powered two-wheeler which could run on coke or petrol—an early example opf dual-duel technology. They Hildebrand boys subsequently teamed up with Alois Wolfmuller and switched to petrol power (if you can't wait skip forward to 1894) but the prototype steamer ended up in England (as you'll see when you get to 1896 and the Emancipation Run).

The brothers Hildebrand built themselves a steam-powered bicycle.

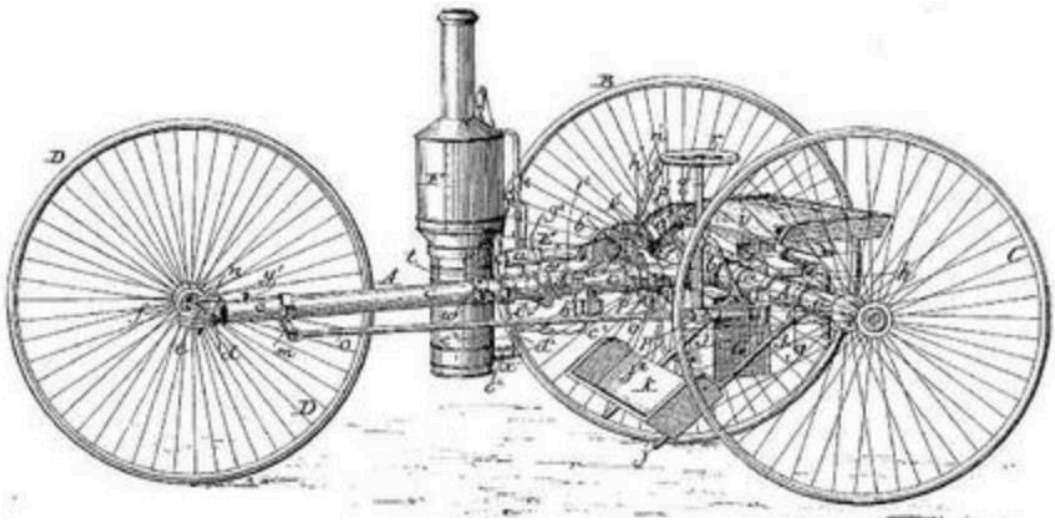
TRIUMPH MOVED from London to Coventry and began to make its own bicycles.

COMPTE DE DION'S Steam made a tidy steam tricar but he was becoming interested in internal combustion so he got Bouton and Trepardoux to convert one of their twin-cylinder compound steam engines into a two-stroke running on petrol.

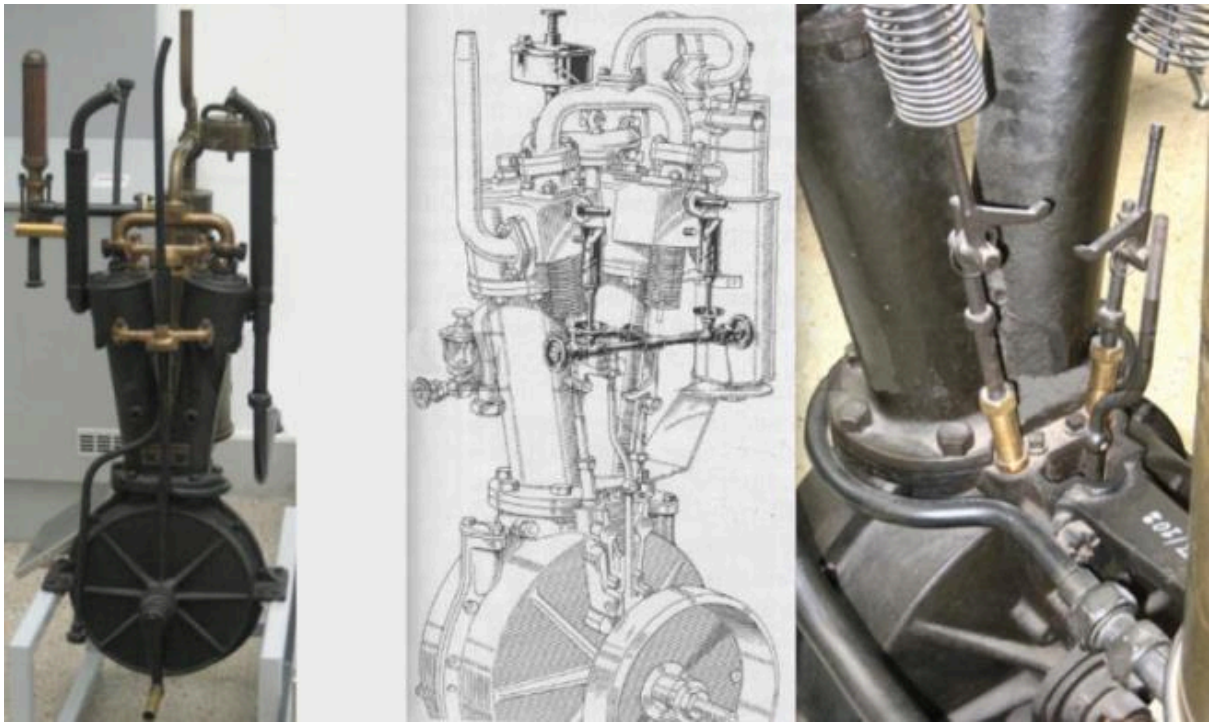
Le Compte de Dion looks tres chic on this late-model De Dion Trepardouxsteamer but at heart he had become a petrolhead.



As motor cycles and cars party company, and petrol ousts steam, wave a fond farewell to this oh-so-cute De Dion steam car.



Hezekiah Smith of New Jersey patented (but as far as anyone knows did not build) a steam trike. He did well enough with his manufactory to get into congress and buy himself a town, Shreweville, NJ, which he renamed Smithville. How weird is that?



Daimler-Benz patented a desmodromic valve system, for a car powered by a Panhard et Levassor V-twin. Surely you didn't think the first desmos were Dukes?

1890-1899

1890

IN THE FACE OF the 2/4mph urban/rural speed limit Edward Butler gave up on his Petrol-cycle. He wrote in the magazine The English Mechanic: "The authorities do not countenance its use on the roads, and I have abandoned in consequence any further development of it." It was a brave attempt that, had it not been scuppered by ridiculous legislation, would have put Britain at the forefront of the motor cycle (and automobile) revolution from the beginning.

KITCHEN GOODS specialist John Marston and Co expanded its output to include bicycles. As we'll see in 1912, this was A Good Thing for motorcyclists.

HERBERT AKROYD Stuart patented a compression-ignition engine, a clea189r three years ahead of that nice Mr Diesel.

KARL BAYER developed the large-scale production of aluminium from bauxite.

IN JAPAN EISUKE Miyata set up a gun factory where he also made Asahi bicycles, closely based on the British Cleveland.

1891

EADIEMANUFACTURINGrenamedits Townsend bicycles Enfields to mark an arms deal with the RoyalSmall Arms Factory in Enfield. TheEnfield Manufacturing Co, soon renamed RoyalEnfield, was set up to market them. In 1893 the firm adopted a familiar slogan: ‘Built Like a Gun—GoesLike a Bullet’.

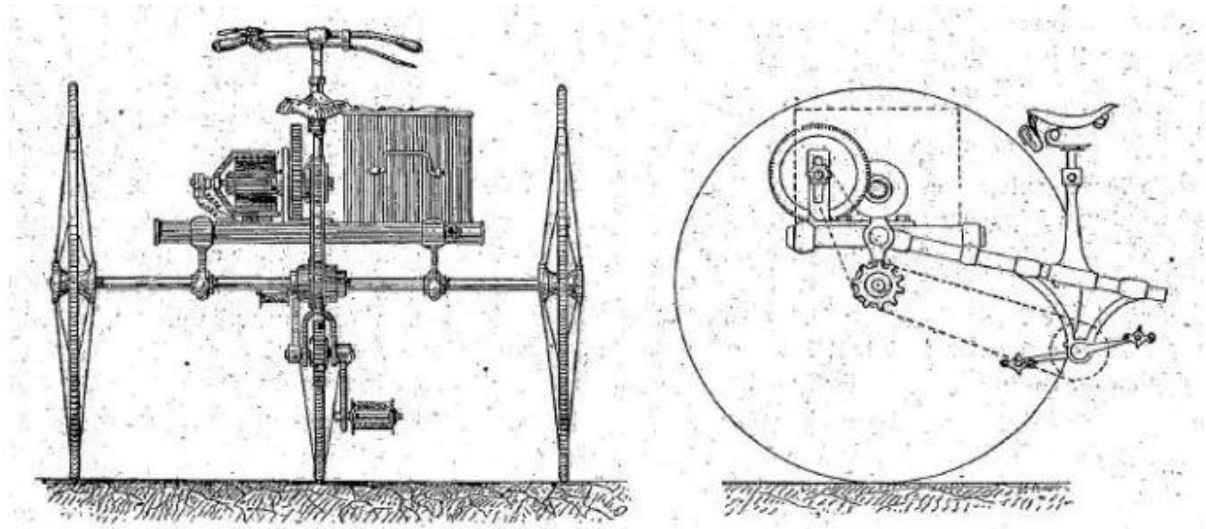
MAYBACHDEVELOPEDaspraycarburettor, though surface carbs would be more common for yearsto come.

When I came across this illustration (left) I assumed it was just a cartoonist’s whimsy. Not so. Thecentre pic shows Enrico Pecori of Como with his flat-twin, chain-driven steam trike. He only made one, but it survives(right) in the Italian National Motor Museum in Turin.

1892

HANSGEISENHOF,who had worked with Karl Benz, designed a two-stroke petrol engine for the Hildebrand brothers. Theyfitted it into a bicycle frame but it was gutless so he and Alois Wolfmuller built a 1,489cc, water-cooled four-stroke parallel twin that developed 2½hp at 240rpm. The weight of this engine snapped the frame so the brothers used the frame from their 1889 steamer.

RUDOLPHDIESELstarted development of a compression-ignition engine and was awarded a patent the following year.

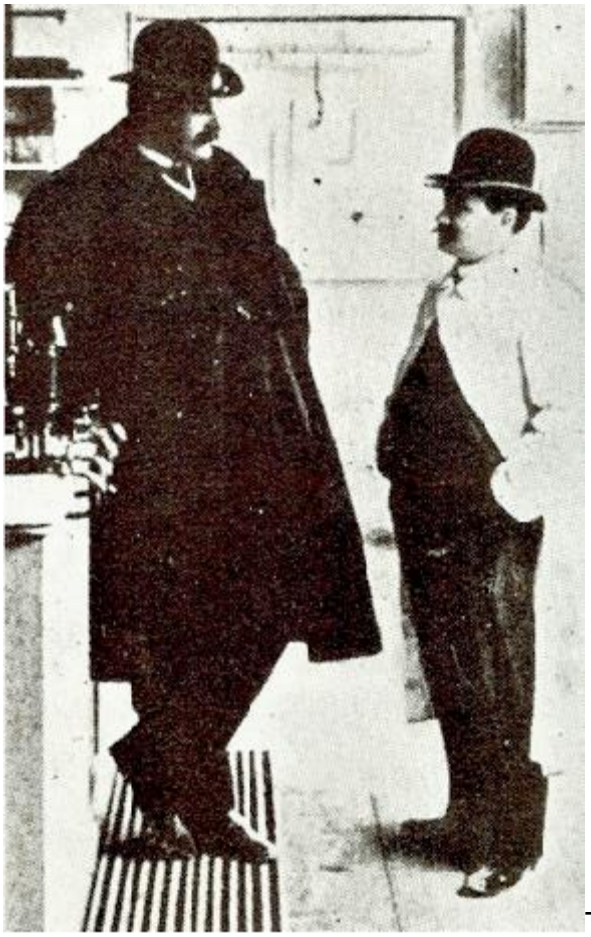


The Graffigny electric tricycle weighed 77kg and was said to cruise at 20km/h for up to five hours on a charge. However the weight of the huge battery pack made it unstable, leading to several crashes during test run.

JD ROOTSDEVELOPEDawater-cooled, two-stroke trike featuring shaft drive and exported its entire output to France to avoid Britain's bonkers legislation.

COMPTEALBERTEdeDion, Georges Bouton and Charles Trepardoux had been making successful steamers for a decade when, following a visit to the Paris Exposition where they saw the Daimler engines, De Dion and Bouton decided internal combustion was the coming thing and began serious work on a petrol engine at the expense of their steamer projects. Trepardoux,a confirmed steam-head ('vaporiste', en Francais), walked out in disgust with the parting shot, "How can a motor function on a series of explosions?" His departure must have caused a row in the family, particularly when De Dion and Bouton were proved right.

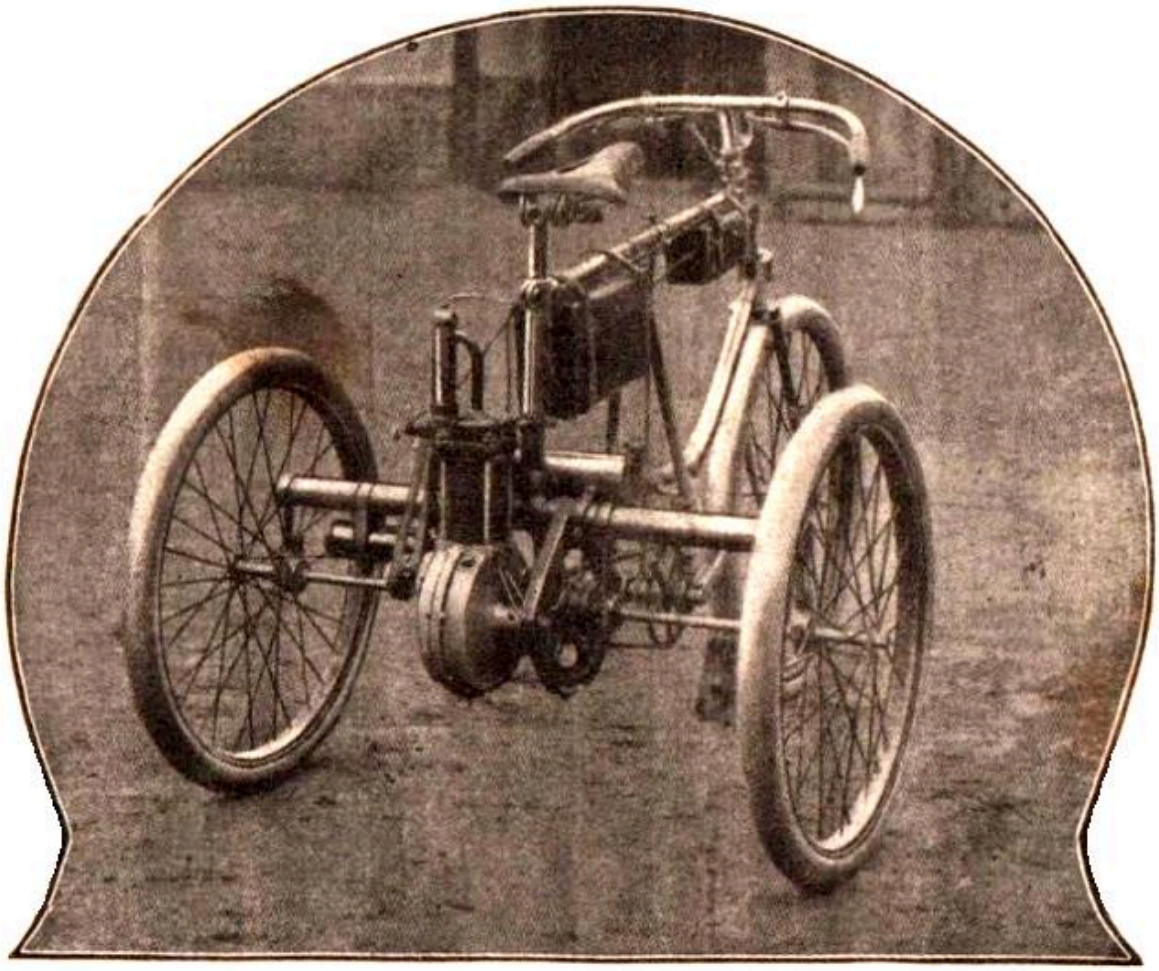
1893



The large, well heeled Compte de Dion and the small, talented Georges Bouton What a team!

GEORGES BOUTON produced a 138cc single inspired by the Daimler engine in the 1885 Einspur but he found that it ran much smoother at higher revs. So while the Daimler engine ran at 250rpm and the Daimler at 750rpm, the De Dion Bouton ran at 1,500-2,000rpm and in trials reached 3,500rpm. Instead of hot-tube ignition the new 'high-speed' engine had a 4V battery/coil system with a contact breaker. Unlike many later engines it also boasted a detachable cylinder head; power output was about ½hp. De Dion and Bouton mounted their engine at the back of a pedal-powered Decauville trike which became a great success, running on the new tyres being mass produced by brothers Andre and Edouard Michelin. They also sold De Dion Bouton engines to power motor cycles, trikes and even an airship. This was the practicable proprietary engine that, combined with the many safety bicycles coming onto the market, launched an industry and, let it be said, an obsession.

The De Dion Bouton engine was a winner.



I have no idea if this is a Decauville trike but it dates from 1895 and that's a DeDion engine and for its day this was about as good as it got.

ANGLO-GERMAN Frederick Simms, a pal of Daimler's, bought the British rights to Daimler engines.

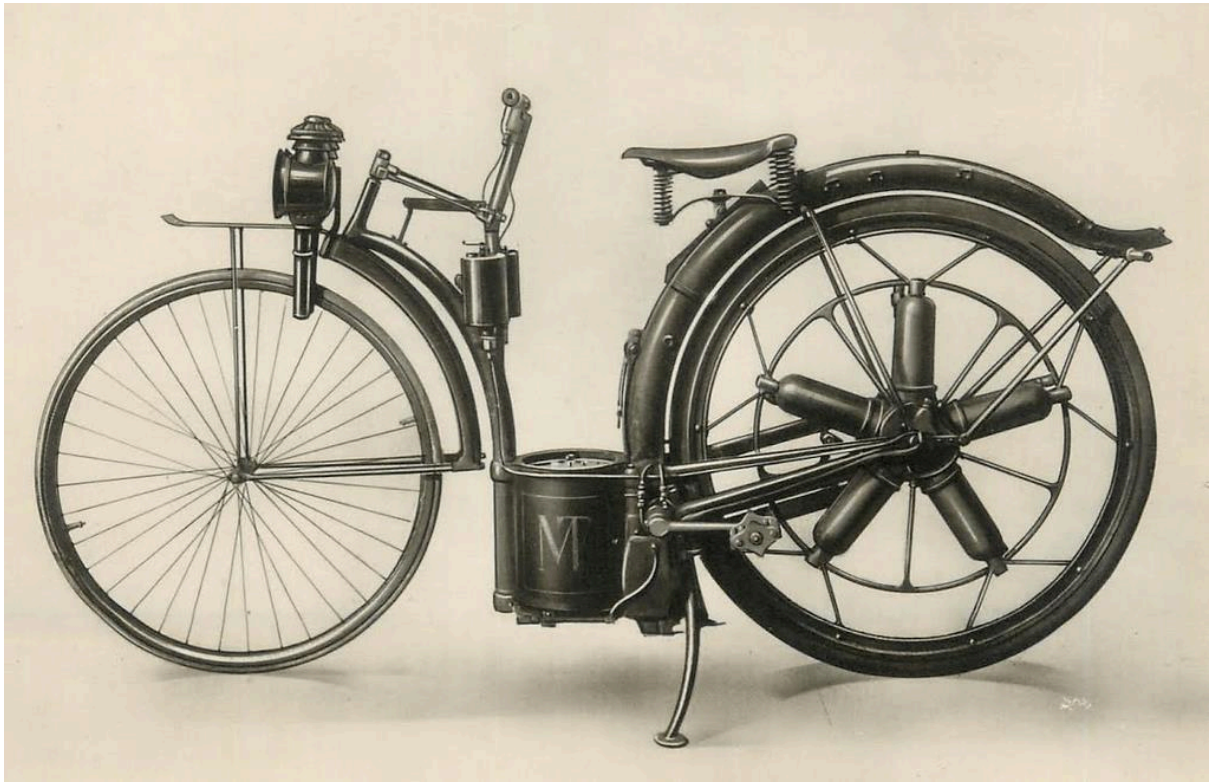
IN THE USA A bicycle was fitted with a rear-mounted horizontal twin two-stroke by one EJ Pennington – a second-rate designer but a first-class conman ('premier division' would be more accurate; he thought big. Take a look in the Galimaufrey for some of his scams).

A GERMAN CALLED von Mayenberg built a two-speed steamer with fuel for the burner carried inside the frame.

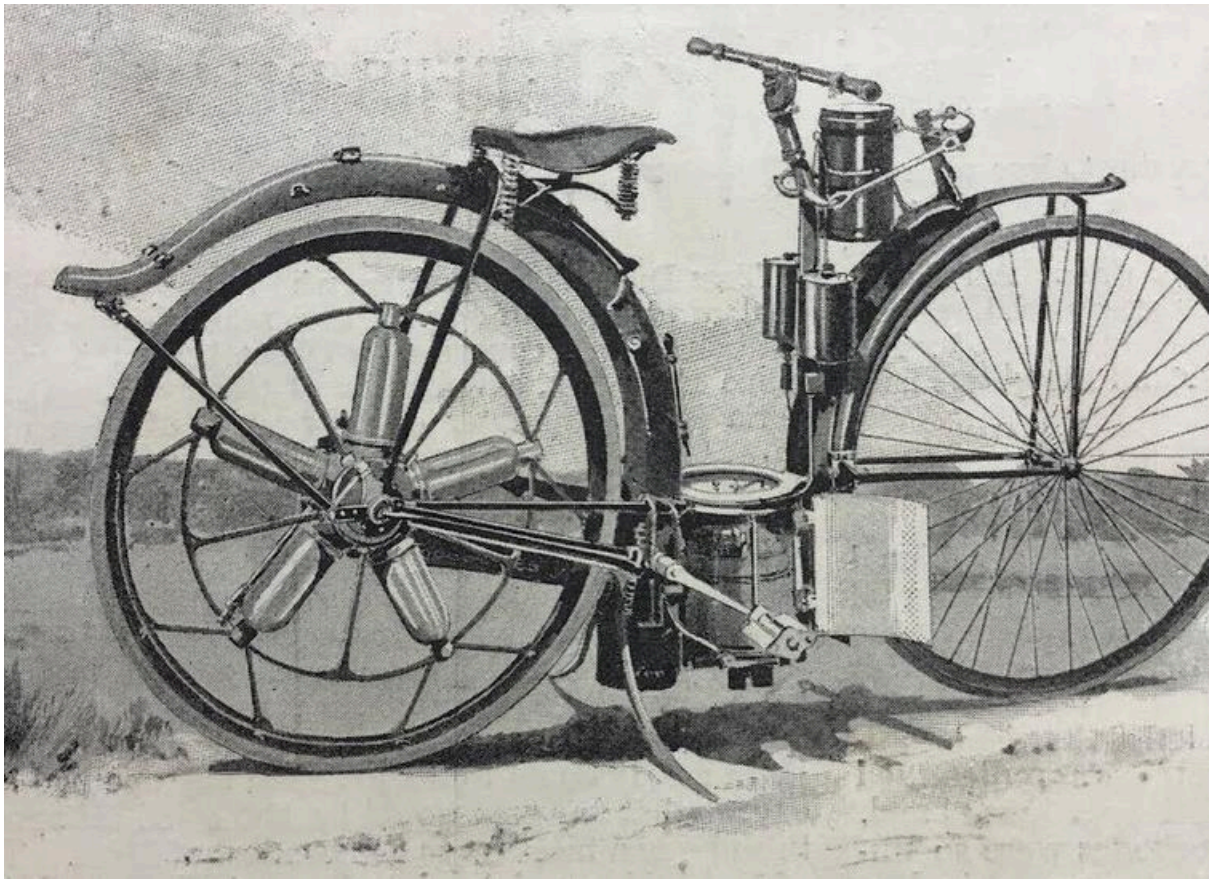
COTTON REINFORCING cords were moulded into bicycle tyres for tougher sidewalls.

HAVING POWERED A TRIKE with his five-pot radial engine in 1887, Félix Millet built a motor cycle. This time the engine was in the rear wheel; the crankshaft served as the wheel spindle. Revolutionary features included a clutch (operated by back-pedalling, which also applied a brake), a semi-automatic frame lubrication system, mechanically operated valves, what was probably the first motorcycle centre stand (well, yes, it was a

prop stand but it was in the middle) and an 'elastic' rear wheel which was an early attempt at suspension. The 1,924cc engine was rated at ¾hp at 180rpm giving a claimed top speed of 35mph. Fuel consumption was about 110mpg. Ignition was by a coil and lead-acid battery rather than the Hildebrand & Wolfmuller's hot tube. Fuel was carried in the rear mudguard; a surface carb and air filter were fitted between the wheels. Millet sold the rights to Alexandre Darraq who planned to put the bike into series production; it was one of 17 starters (out of 102 two, three and four-wheeled entries) in in the Paris-Rouen Trials, generally accepted as the world's first motoring contest. The Millet retired early in the race, production plans were dropped and Millet died in poverty.

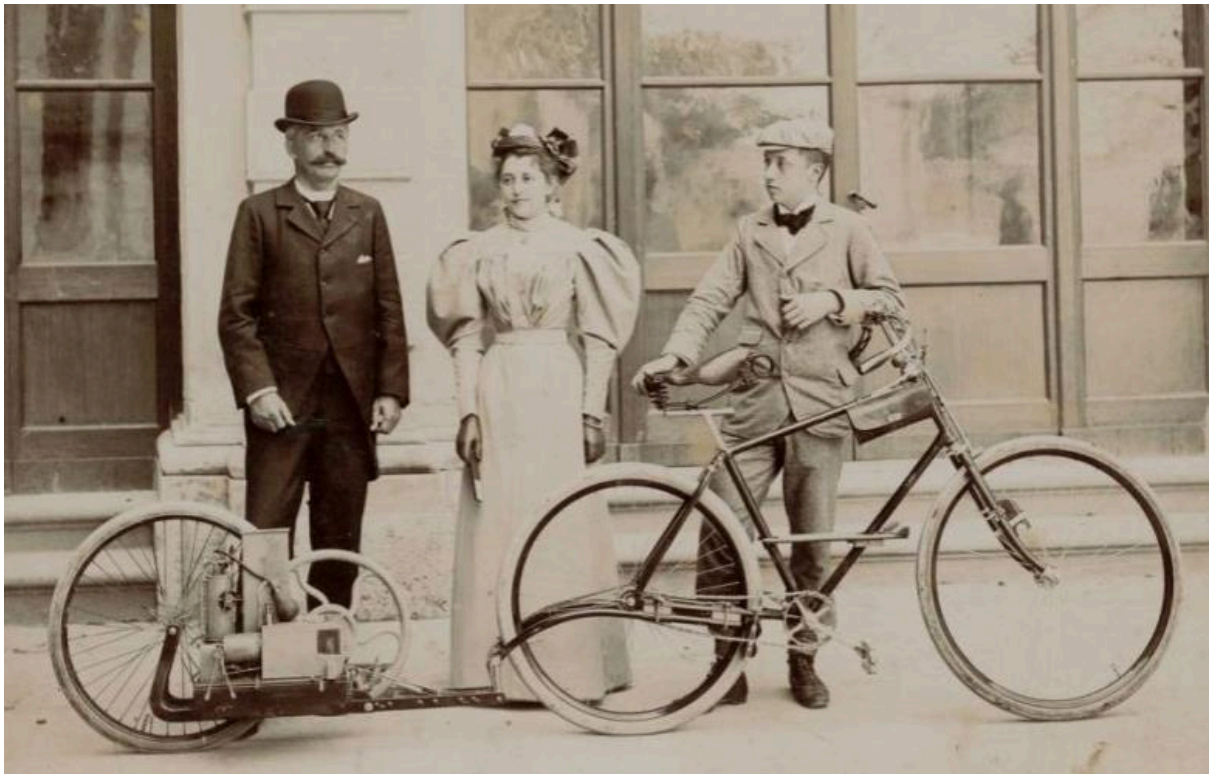


Millet's bike didn't make it into series production but with five cylinders and a claimed speed of 35mph it earned its place in history.

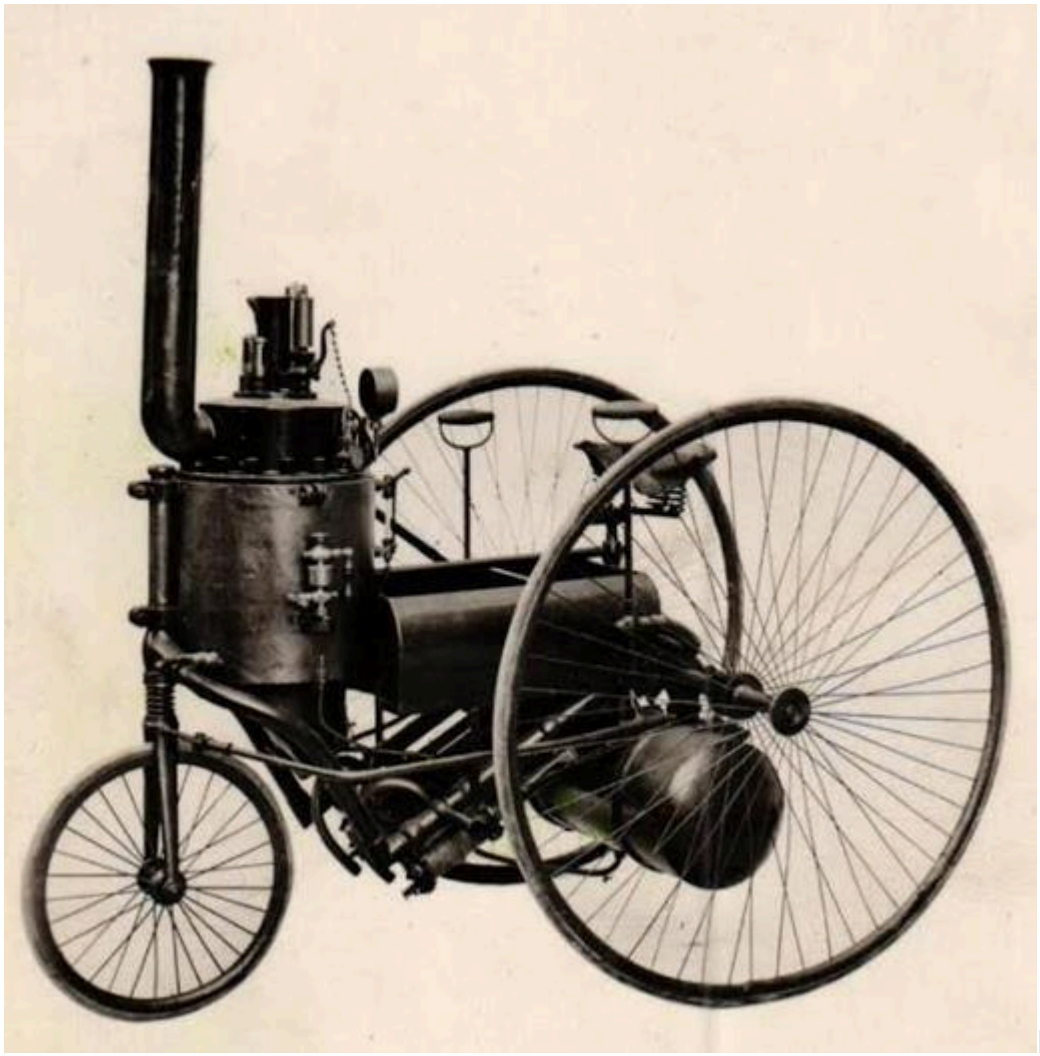


…andthis example has survived into the era of colour photography.

ENRICOBERNARDI,havingregistered the first patent for an Otto-cycle engine in 1882, also produced a petrol-powered two-wheeler, although in this case the engine was mounted in a trailer which pushed the bike.



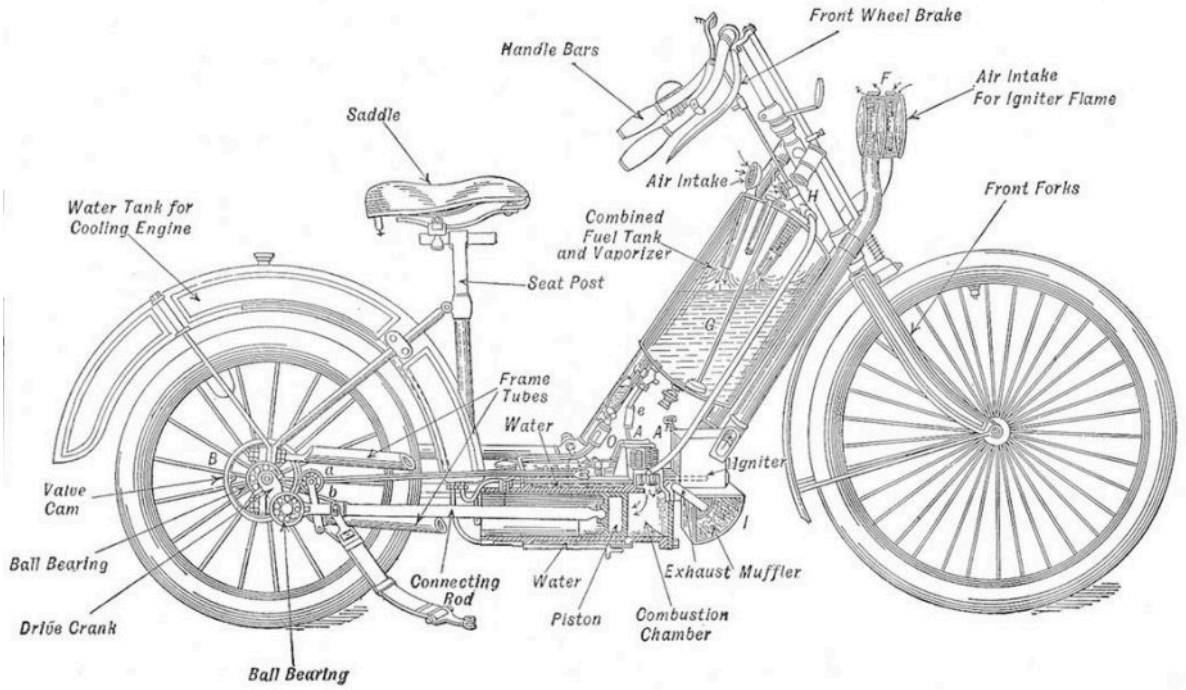
Enrico Bernardi with his daughter Pia, after whom he named his engine, and his son Lauro.



Petrol was clearly the road fuel of the future but this tidy steamer also appeared in 1893.

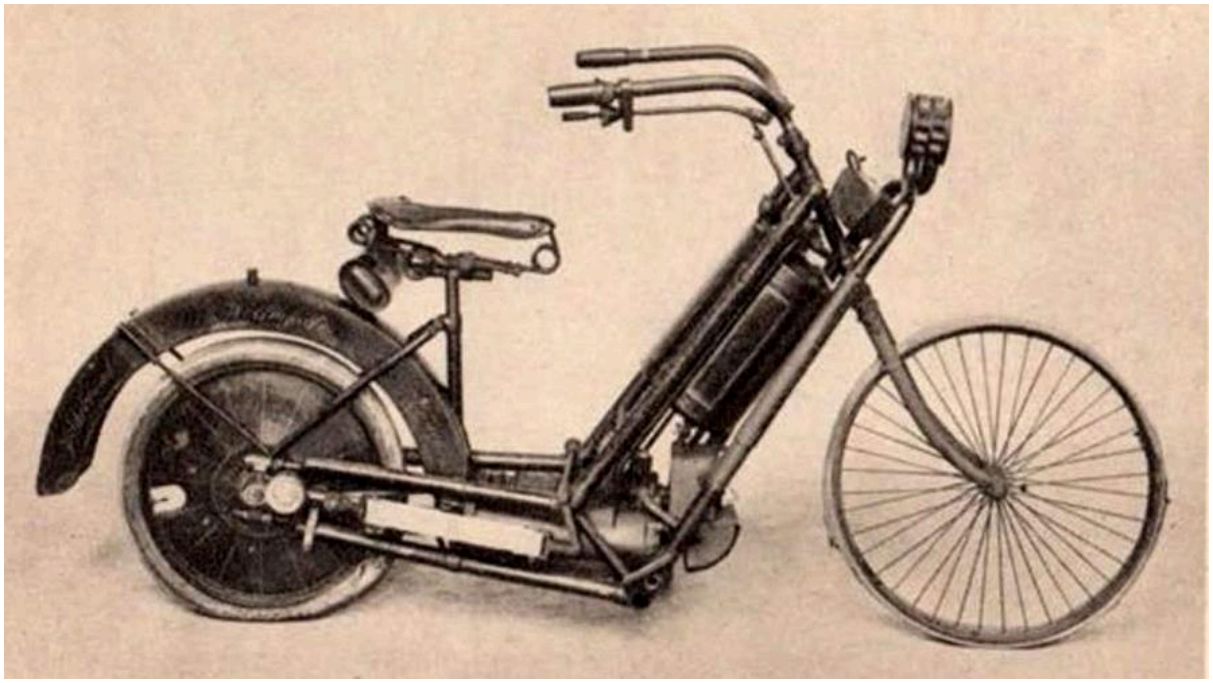
1894

HEINRICHHILDEBRANDandAlois Wolfmuller patented the bike they'd been working on since 1892: a 1,428cc/2½hp water-cooled four-stroke twin (with hot-tube ignition and surface 'bubbler' carb) which would become the first motor cycle to sport pneumatic tyres, thanks to a deal with Dunlop. Following steam-locomotive practice the conrods drove the rear wheel so there was no crankcase and no belt, chain or shaft rear drive. Neither was there a flywheel; instead elastic straps helped the pistons back down the barrels. Claimed top speed was 25mph; brakes comprised a steel 'spoon' pressing against the front tyre and a pedal operated 'sprag' rear brake—a lump of metal that could be forced down against the road surface as an anchor of last resort. It was the world's first motor cycle to go into series production, made in Munich by Motorfahrrad-Fabrik Hildebrand & Wolfmuller in a factory the brothers had purpose built for the project with 1,200 assembly workers; they also used many local engineering firms for components. 'Motorfahrrad' translates as 'motorcycle'; an early use of the term. They even sent a demo model to Paris in a bid to win export business.



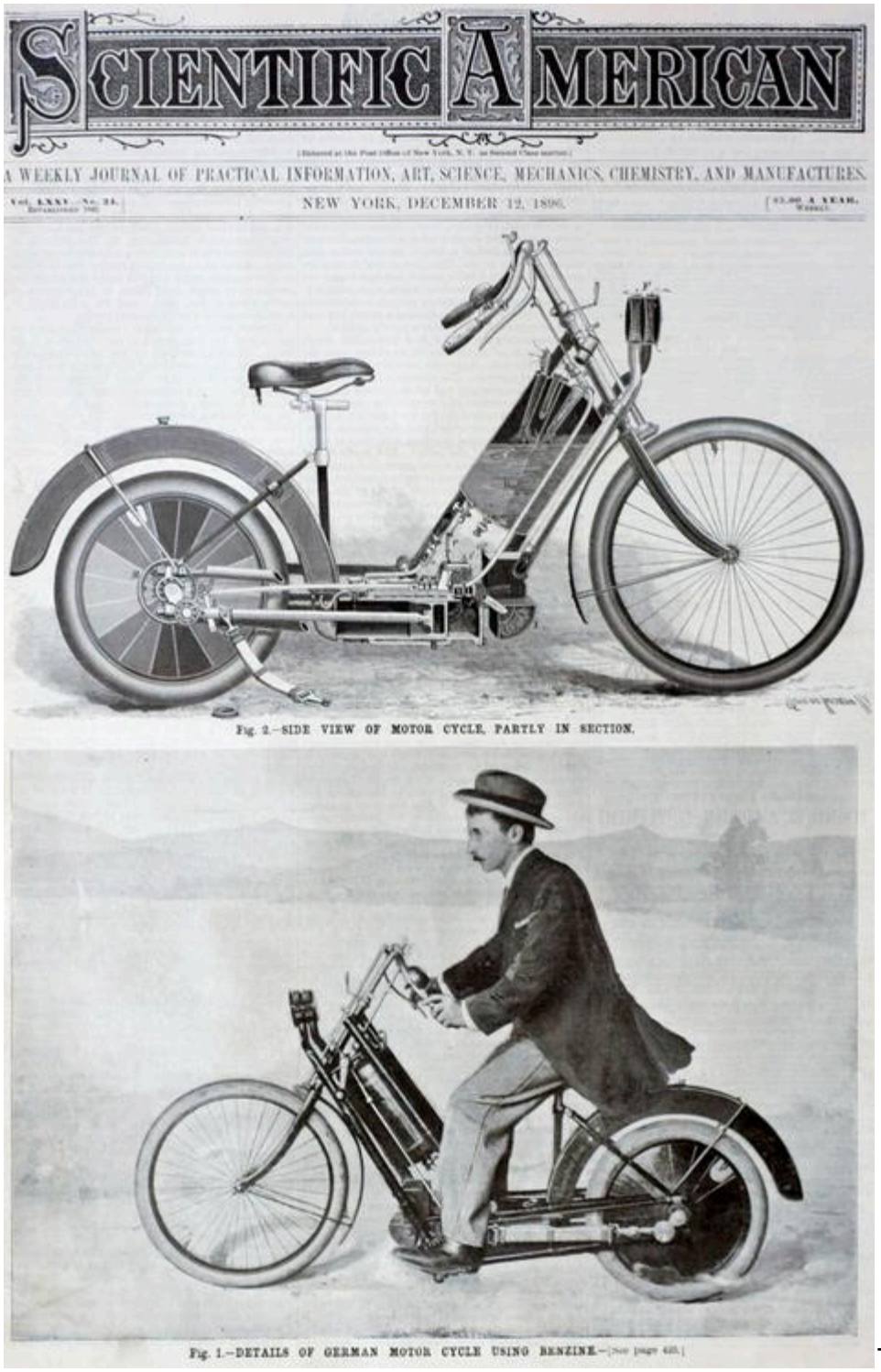
The first production bike: one noteworthy feature of the Hildebrand & Wolfmuller was the elastic strap (disconnected in this image) which helped with the return stroke.

The H&W was worlds away from the lightweight powered bicycles that would dominate the industry for years to come; pedals were conspicuously absent.



Here's a rare survivor…

…andhere's a replica which shows the world's first production motor cycle as it would have appeared to 19th century enthusiasts. About 2,000 were sold.



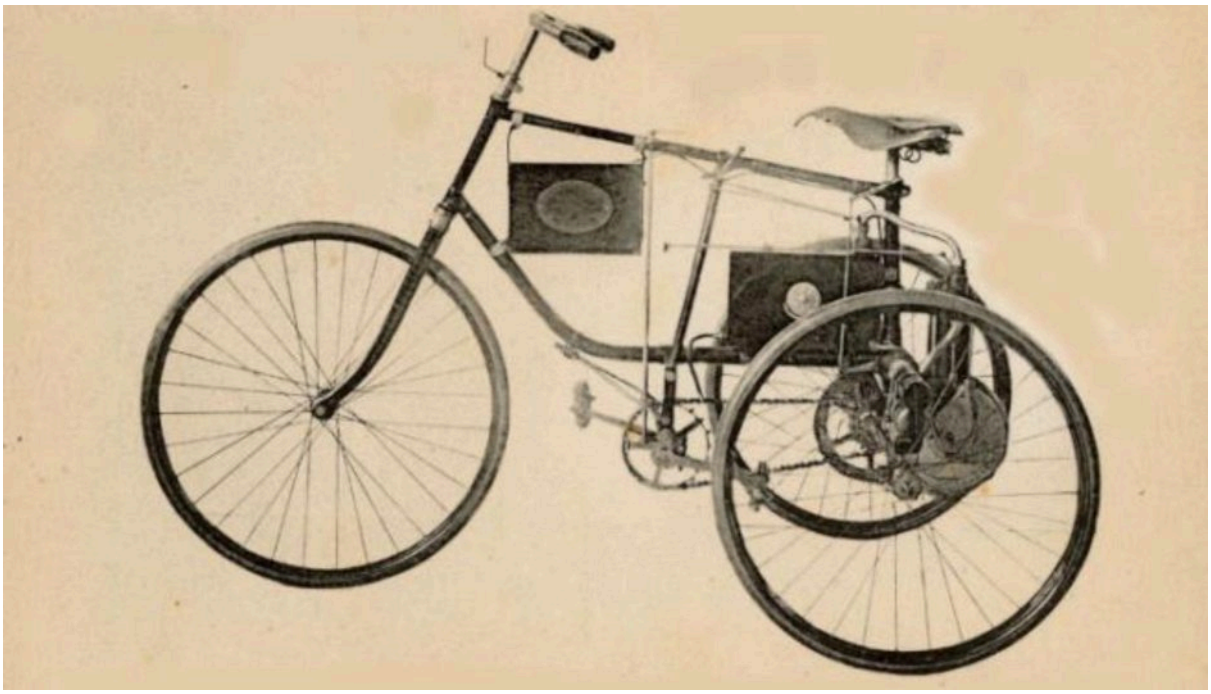
The colonials took a great interest in the ingenuity of Herren Hildebrand und Wolfmuller.

PROFESSOR ENRICO Bernadi of Verona built a four-stroke, water-cooled ohv 265cc single-cylinder engine and named it the Lauro. It was too bulky to fit in a bicycle frame so Bernadi mounted it in a monowheel trailer. The engine turned the trailer wheel and the trailer pushed the bike. Control was via a rubber bulb which controlled a carburettor diaphragm.

Barnadi's engine was too heavy for a bicycle frame, so he towed it. Or, more accurately, it pushed him.

HARRYLAWSON'SMotor Manufacturing Company (MMC) company bought the British rights to De Dion engines.

THEREWERE102two, three and four-wheeled entries for the Paris-Rouen Trials, the world's first motoring contest, of which 17 started. The following year there were about the same number of entrants for America's first race, from Chicago to Waukegan. Two made it to the start line so they re-ran the race but only six vehicles turned up.



The first generation of De Dion trikes hit the streets. The'swan neck' frame and forks were identical to contemporary pedal trikes; within a year they would be beefed up.

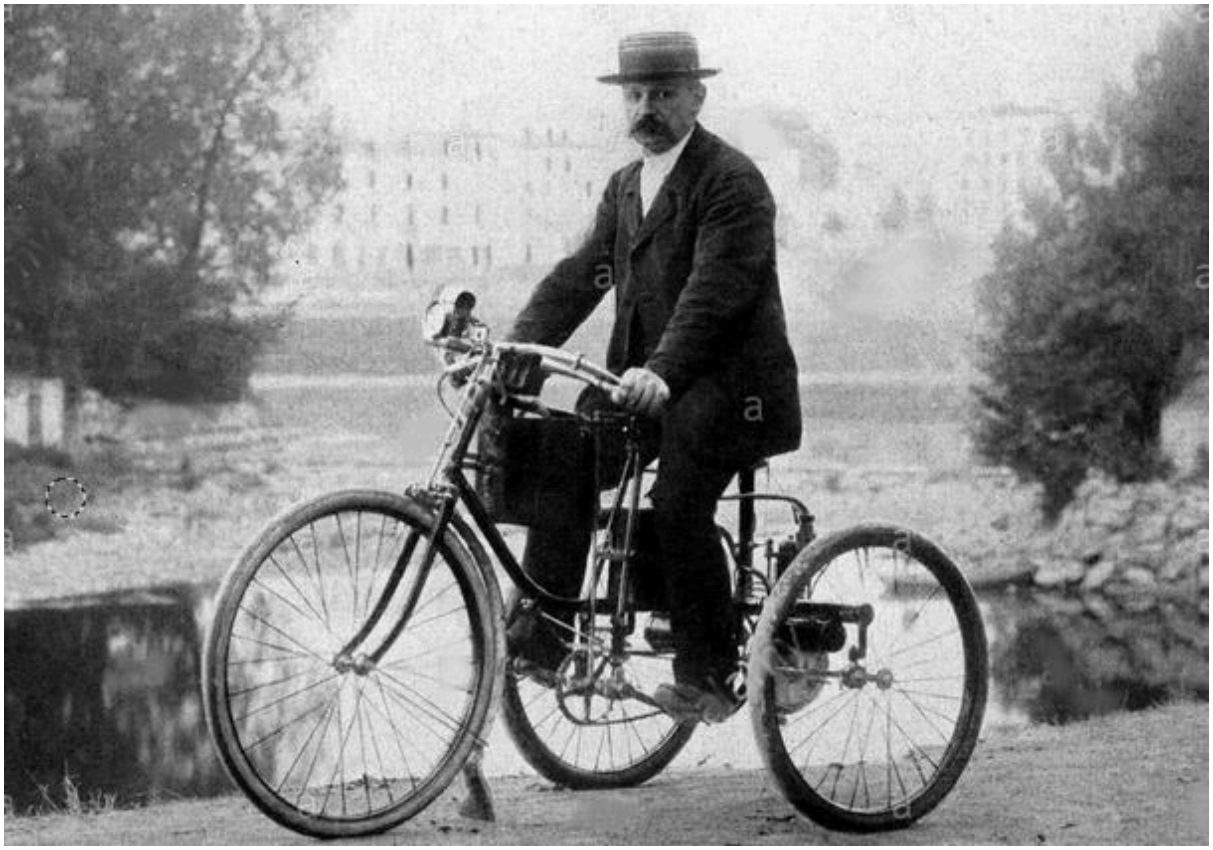
1895

JOHNKNIGHTBUILT"the first petroleum carriage for two people made in England". He was stopped for speeding up Castle Hill near Farnham, Surreyand collected the first English speeding ticket. His four sons all drove it until 1903 when the minimum driving

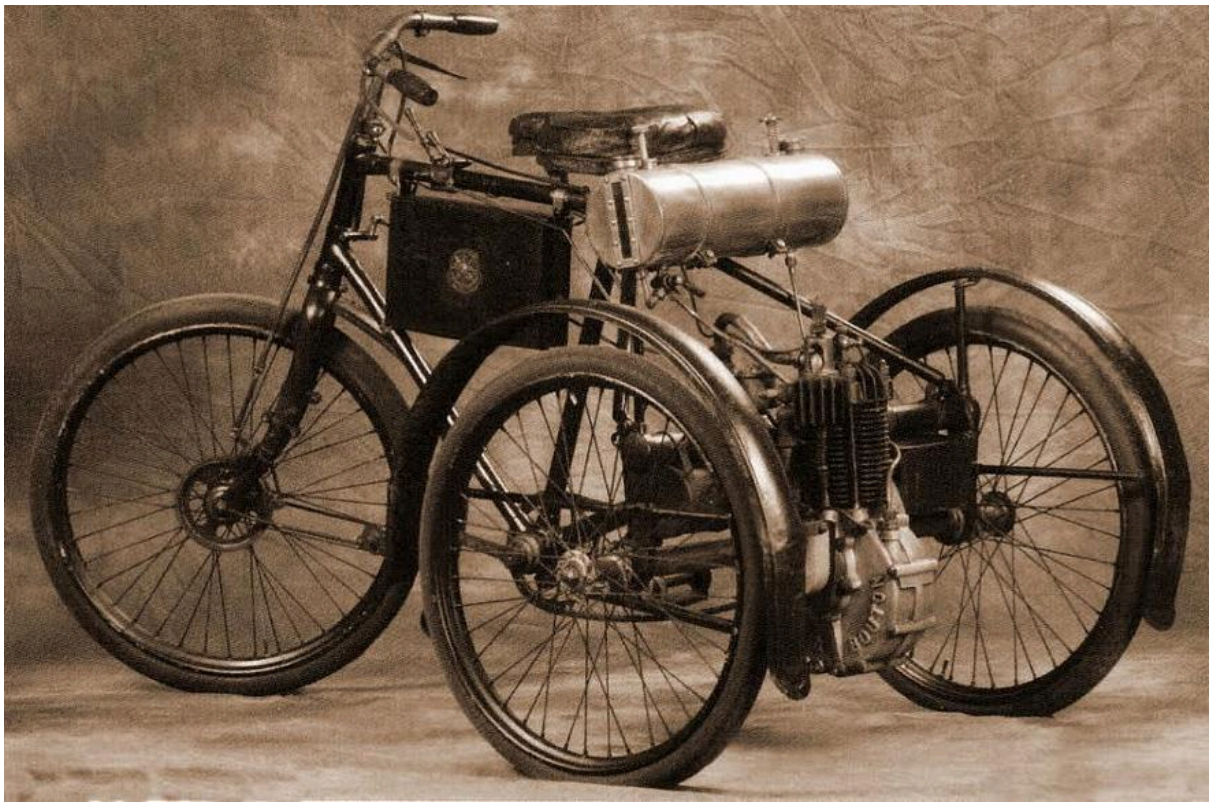
age of 17 was introduced—with Knight Snr's encouragement the lads got stuck in and built themselves a wooden-framed trike.

Mr Knight and one of his boys pose proudly with the formidable 'petroleum carriage'.

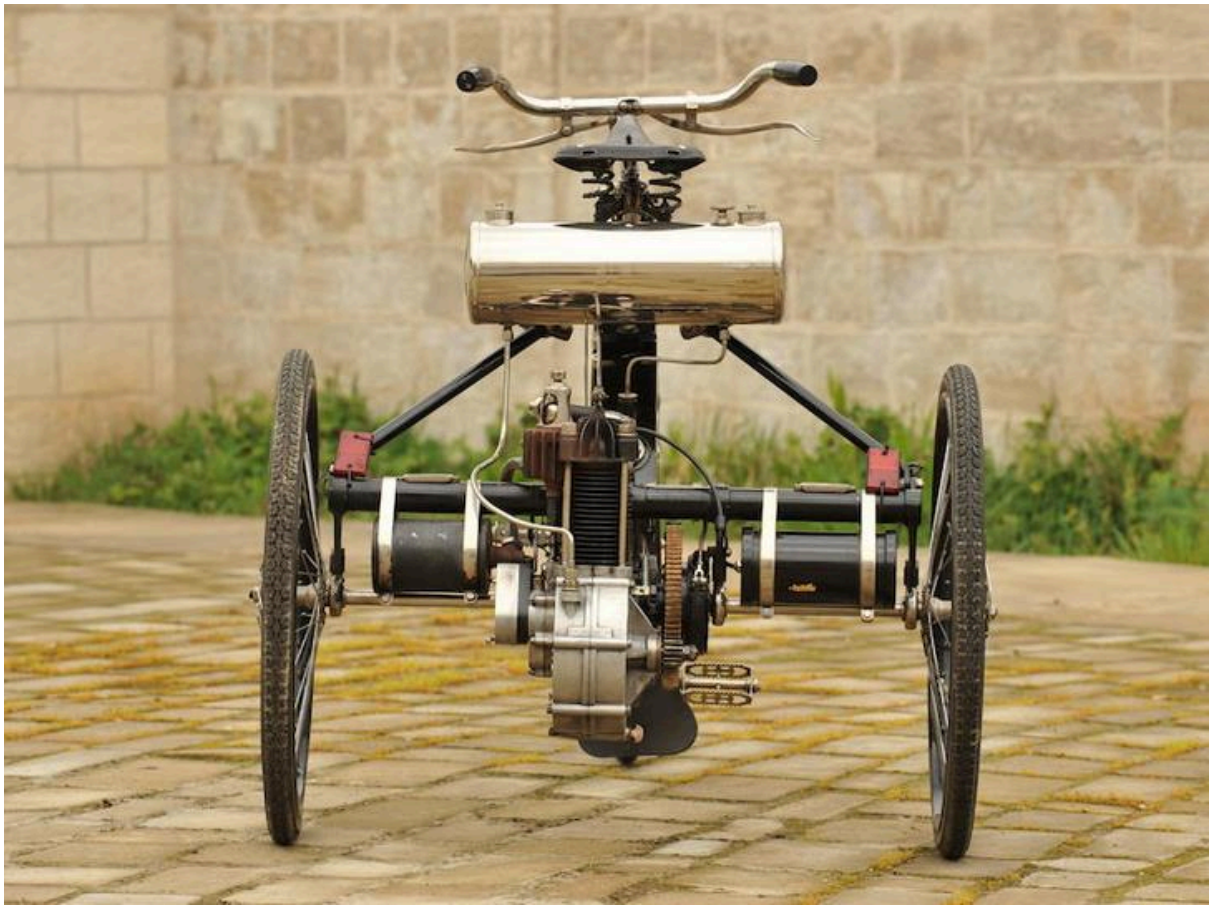
THE DE DION-BOUTON engine, enlarged to 185cc (1¼hp) and then to 211cc (1½hp), but still weighing less than 40lb including the battery and petrol tank, was mounted at the back of a Decauville pedal trike which was shod with the new tyres being mass produced by brothers Andre and Edouard Michelin. De Dion-Bouton were soon selling their own trikes and engines as fast as they could make them. The tricycle (with a 920mm track) was chosen because, according to the good count, "a bike appeared too fragile for this purpose". It would be the most successful motor vehicle in Europe until 1901, with about 15,000 copies sold,

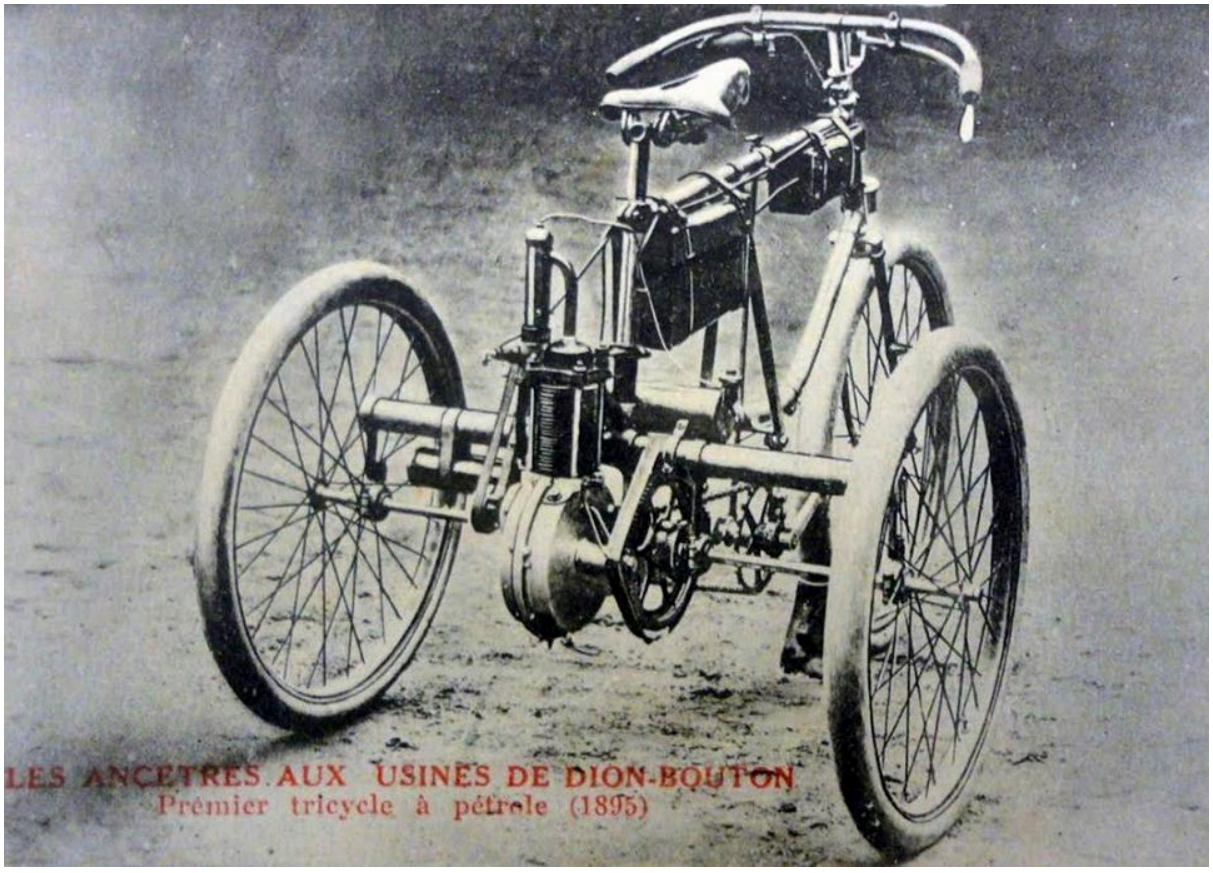


GeorgesBouton with the De Dion Bouton trike that took Europeby storm.



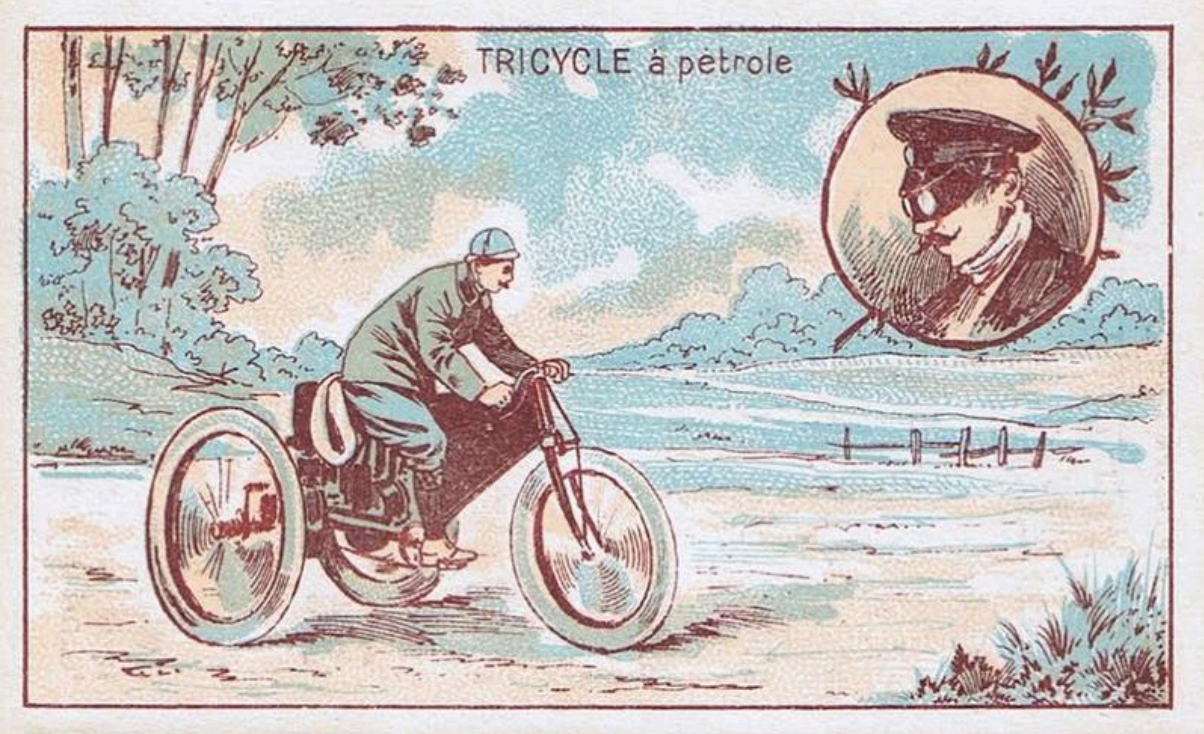
This survivor reminds us that the De Dion trikes quickly evolved into sturdy, practicable vehicles.





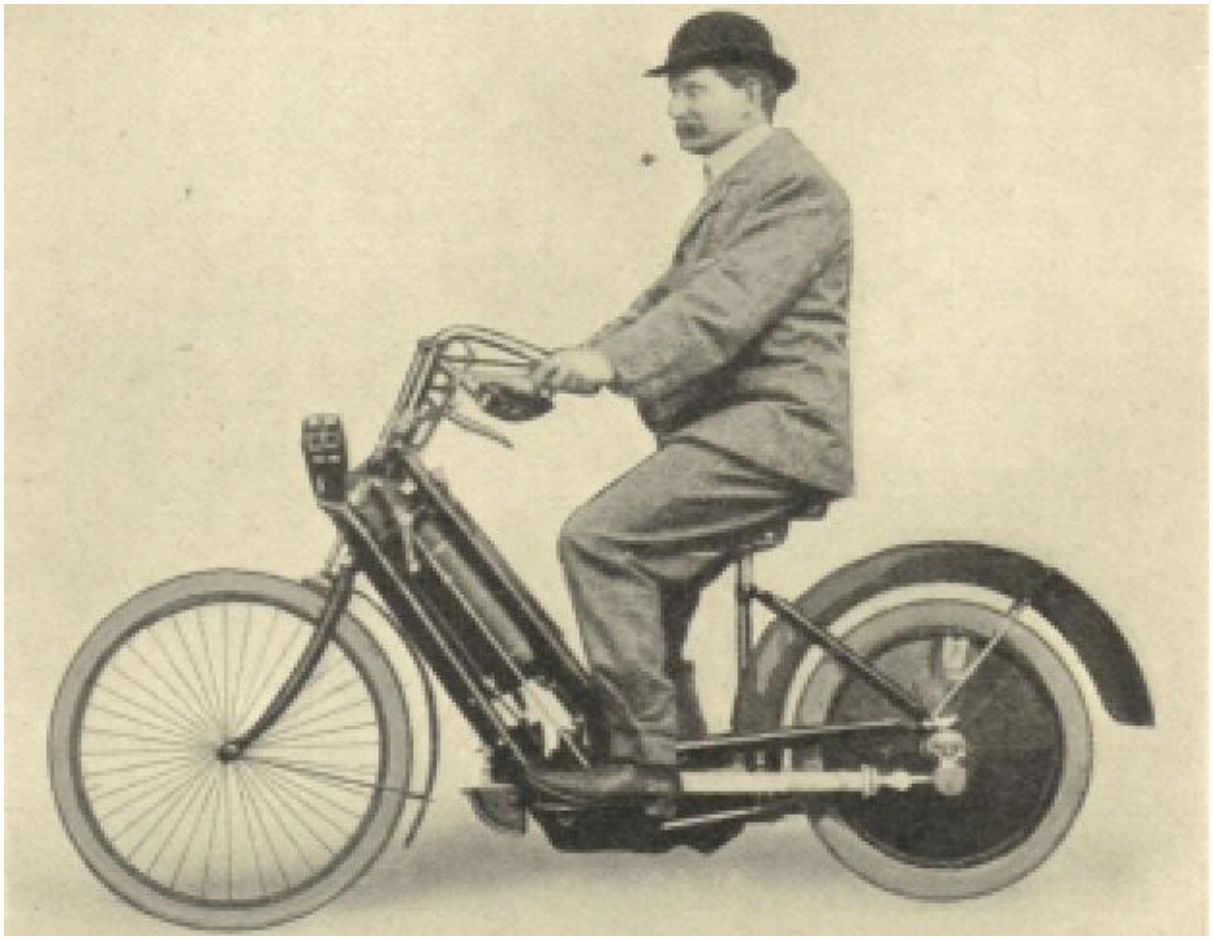
LES ANCETRES AUX USINES DE DION-BOUTON
Premier tricycle à pétrole (1895)

IT ALL LOOKS TRES JOLI but judging by the caption on this card, trikes were not universally popular in La Belle France…

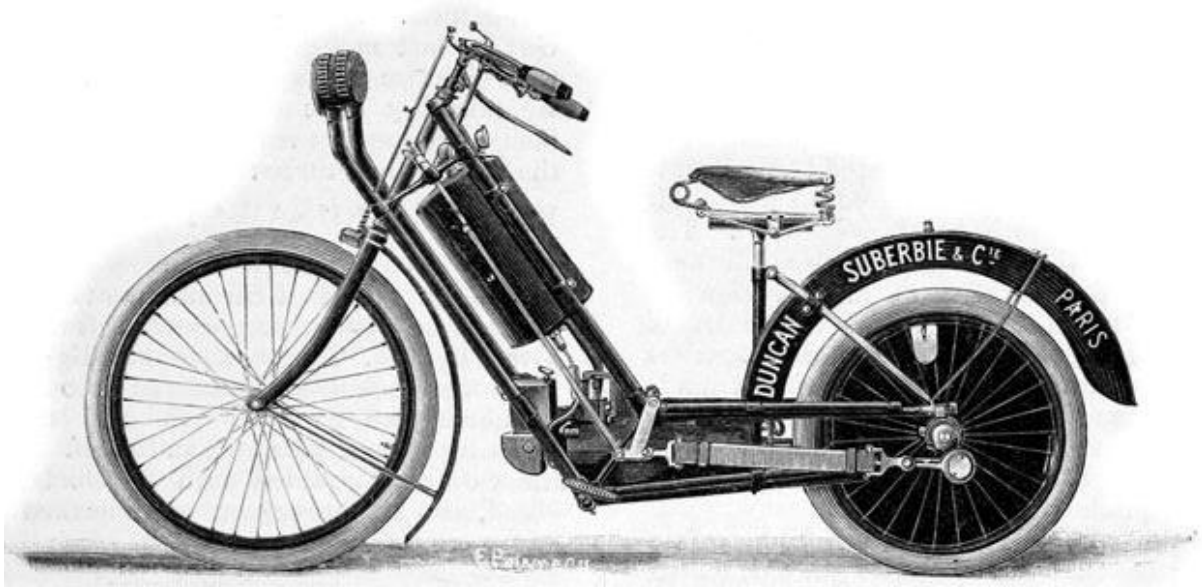


“Here is the fast but noisy petrol tricycle. It passes by, with a pace that is too often haphazard, crushing here and there the legs of dogs that are too indiscreet, jostling the passer-by who does not park quickly enough, raising a whirlwind of dust that fills the air- and our smells-with the unpleasant fumes of its oil. When it is stopped, it is there blowing, spitting, panting, shaking, like an apocalyptic monster, a fantastic animal that one finds hard to believe was born by progress. But the petrol tricycle is fading away, gradually replaced by the light carts or the automobiles, the powerful motors, powered by electricity or mineral spirits. Judging by the improvements which these last vehicles are receiving at every moment, the petroleum tricycle, with its nervous exhaustion for those who ride it, will soon have passed away and will be relegated to the pages of history, in the same way as the ancient wooden velocipede or the penny-farthing.”

SIEGFRIEDBETTMAN'Spartnerin Triumph, Mauritz Schulte, considered producing H&Wsunder licence. He imported one for testing but the idea went no further. However the French manufacturer Duncan-Superbie & Co produced bikes developed from H&Ws which they marketed as Petrolettes (presumably to mollify painful French memories of the 1870-1 Franco-Prussianwar). Wolfmuller took a brace of H&Ws to Italy for its first bike/car race; they came 2nd and 3rd over a rocky 62-mile course behind a Daimler car. Two Petrolettes were among the six bikes that entered the 732-mile Paris-Bordeaux-Paris race. None of them completed the course but a Petrolette, ridden by Georges Osmont, was the only two-wheeler to complete the first leg from Paris to Bordeaux, in 45 hours. The first car home was a Panhard et Lavossar (driven by Emile Levassor), in 48hr 48min, ahead of three Peugeots. However the first two finishers were ineligible for the cup as they were two-seaters and the rules called for at least three seats. A report for the French Institute of Civil Engineerspredicted that motorcycles would be no more than a curiosity.



Mauritz Schulte tries a Hildebrand & Wolfmuller for size; they were both German emigrees.



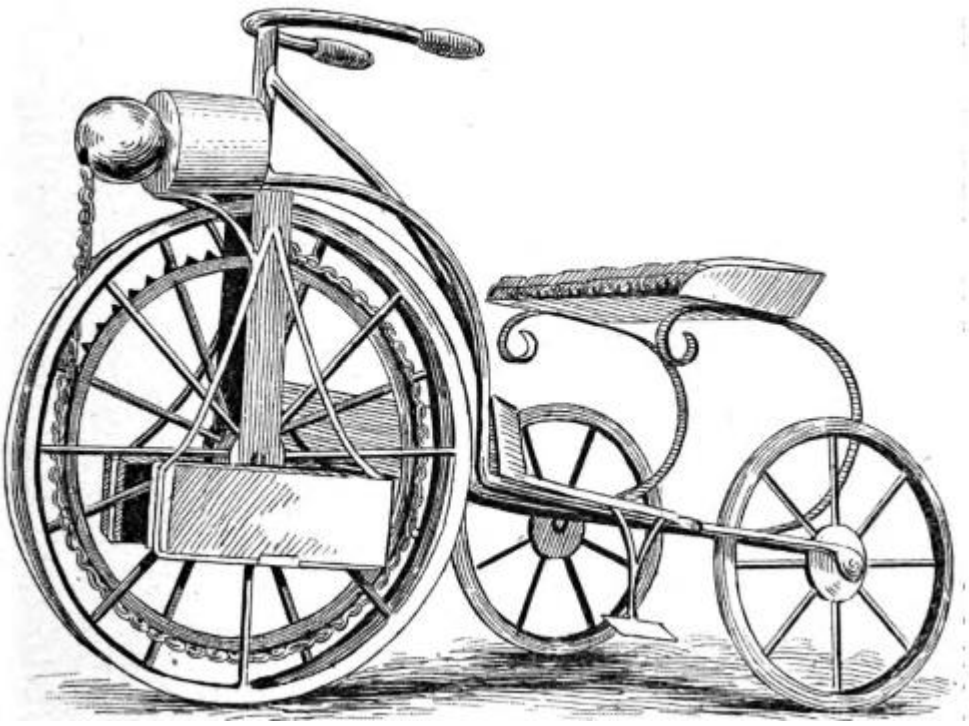
The Duncan and Suberbie Petrolette was clearly a Hildebrand and Wolfmuller in all but name. The French manufacturer sold up to 50 of them by year's end but they were troublesome and production ceased after little more than a year.

The first petrol drinker in Australia was a Hildebrand & Wolfmuller which came ashore at Brisbane at Xmas time. It outpaced its fuel—owner James Brunnich, has to wait for a supply of Benzole to arrive before he could ride the beast. Unsurprisingly crowds gathered to see the spectacle—cops had to divert horse-drawn traffic to clear a path. My thanks to Peter Whitaker of Australian Motor Cycle News for the pic; you can find the full yarn in AMCN.

THE HONOURABLE EVELYN ELLIS ordered a left-hand-drive motor car to be made to his own specifications from the Paris firm of Panhard-Levassor, powered by a 709cc Daimler engine developing 3½hp at 7000rpm. The car was driven from Paris to Le Havre, shipped to Southampton and by train to Micheldever station in Hampshire. From there, on 6 July, Ellis drove home. His passenger, Frederick Simms (who we'll be meeting again) described the journey in the Saturday Review: "We set forth at exactly 9.26am and made good progress on the well-made old London coaching road; it was delightful travelling on that fine summer morning. We were not without anxiety as to how the horses we might meet would behave towards their new rivals, but they took it very well and out of 133 horses we passed only two little ponies did not seem to appreciate the

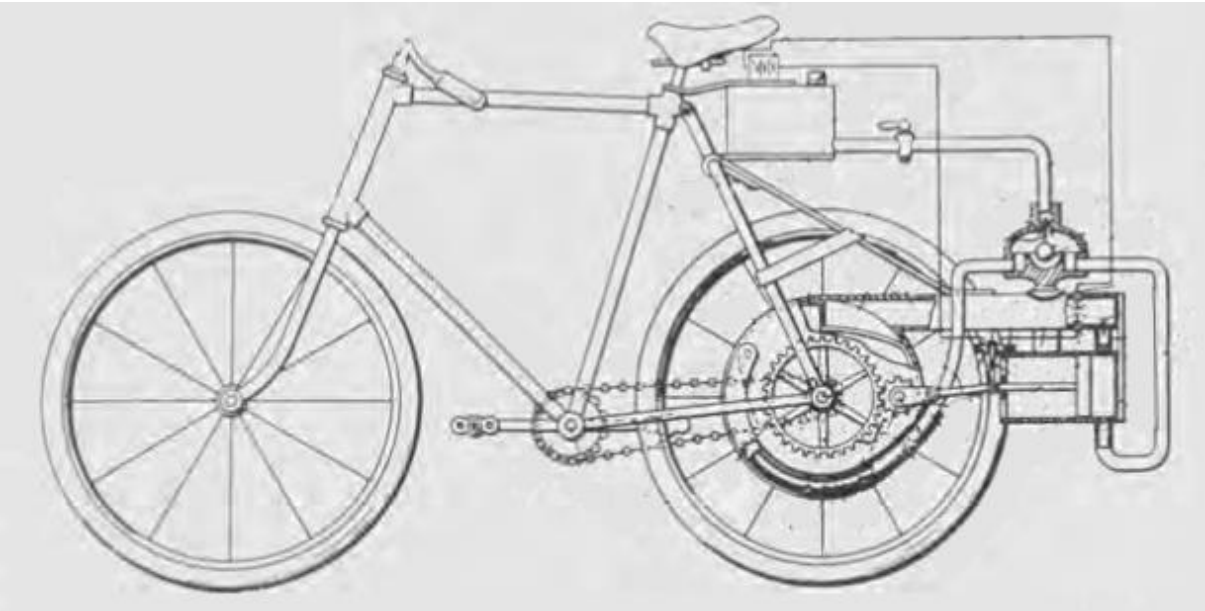
innovation. On our way we passed a great many vehicles of of all kinds (ie horse-drawn), as well as cyclists. It was a very pleasing sensation to go along the delightful roads towards Virginia Water at speeds varying from three to twenty miles per hour, and our iron horse behaved splendidly. There we took our luncheon and fed our engine with a little oil. Going down the steep hill leading to Windsor we arrived right in front of the entrance hall of Mr Ellis's house at Datchet at 5.40, thus completing our most enjoyable journey of 56 miles, the first ever made by a petroleum motor carriage in this country in 5 hours 32 minutes, exclusive of stoppages and at an average speed of 9.84 mph. In every place we passed through we were not unnaturally the objects of a great deal of curiosity. Whole villages turned out to behold, open mouthed, the new marvel of locomotion. The departure of coaches was delayed to enable their passengers to have a look at our horseless vehicle, while cyclists would stop to gaze enviously at us as we surmounted with ease some long hill." Ellis was deliberately testing the law that required all self-propelled vehicles on public roads to travel at no more than 4mph and to be preceded by a man waving a red flag. He was not arrested and, as we'll see, the Act was repealed in 1896.

A car in the motorcycle timeline? This is Evelyn Ellis in his Daimler following "the first journey ever made by a petroleum motor carriage in this country".



Charles H Barrows, of Willimantic, Conn invented a front-wheel driven electric trike. The batteries lived in two cabinets either side of the front wheel, powering a 2hp motor in front of the steering head. Top speed was claimed to be 20mph with a range of up to 150 miles.

THE CHICAGO Times-Herald coined the term 'moto-cycle' to supersede 'horseless carriage' when organising the first automobile race in the USA with $5,000 in prizes. There were 83 entrants but only six showed up on the day. After a gruelling 54-mile run a Duryea, built and driven by J Frank Duryea, crossed the line in 7hr 53min at an average speed of 7mph to win $2,000. Runner up, 90 minutes later, was a Benz—the rules stated: "In the event the first prize goes to a vehicle of foreign manufacture, the most successful American entry will receive this prize". The Sturges Electro Motocycle won $500 although it was abandoned after 12 miles. The GW Lewis Motocycle was awarded $150 "…for friction driving device and brake and a reduction gear for increasing speed."



New York surgeon Sumter Beauregard Battey patented a rotary engine for bicycles. The Horseless Age noted that his inventions had covered "a wide range of thought" and that he had "not neglected the now popular subject of motors for road vehicles". At the heart of Battey's engine was a "revoluble cylinder"—a rotor attached to the rear wheel. Next to this, and emptying into it, was a cylinder in which an explosive mixture was ignited. Combustion gases left the open end of the cylinder and moved into pockets in the rotor, giving motion to the wheel as a turbine. A second cylinder, enclosing a piston given motion by a crank on the wheel, served as a pump to supply vaporised fuel to the 'explosion chamber'.

I'M GRATEFULTO myamigo Francois for recording the first known motor cycle race (in 'Images of Yesteryear'). Italy was first past the post when two (sadly unidentified) bikes joined three cars in a 70-mile race from Turin to Asti and back. We don't know who won, or indeed if anyone completed the course—but they tried. Viva l'italia! Within weeks the French had a go when two bikes started in the ambitious 732-mile Paris-Bordeaux-Paris race. The winning car finished in 48 hours; neither bike survived the course.

Henry Heinz started mass production of tinned baked beans, in Pittsburgh, which, I'm led to believe, is in the colonies. If you've ever done a trad winter rally you'll know how important a hot bowl of baked beanz is to a chap's digestion, particularly if washed down with a decent pint of porter. The fact that HP sauce appears in the next paragraph indicates that there might, after all, be a guiding hand in charge of the universe.

1896

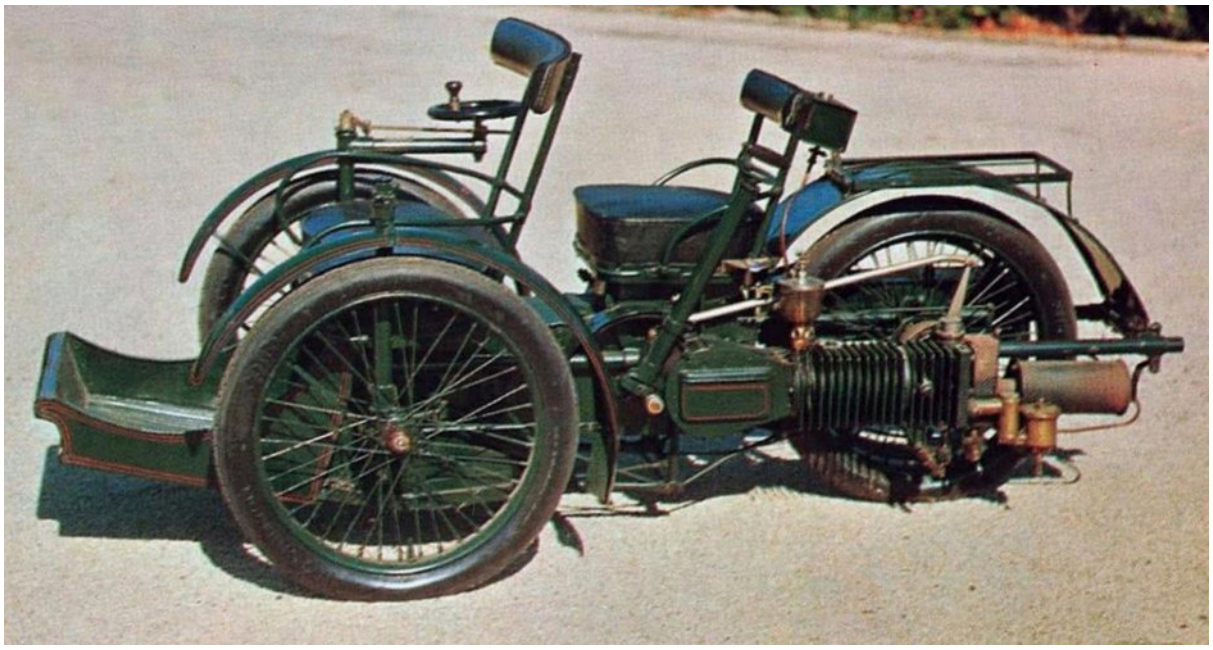
AT LAST! HP SAUCE ARRIVED to complement the bacon sandwiches (and baked beans) which have always sustained motorcyclists, courtesy of Fred Garton who cooked it up in his pickle factory in Basford, Nottingham. And now it's made overseas. Shameful.

Finally! Brown sauce arrived for the bacon sandwiches that have fuelled a myriad motor cycle projects.

EDWARDBUTLERsoldthe patent rights to his Petrol-Cycle to Harry Lawson, who manufactured its advanced engine to power boats, and broke up his machine for scrap but, as the RedFlagAct had been repealed, Butler and his wife were able to make at least one last ride in the Petrol-Cycle on the roads of Erith—hewrote of reaching a speed of 12mph—before selling it as 163 pounds of scrap metal. (Theweight of the machine was 280 pounds so maybe the “very compact motor” was salvaged.)

FROMTHEBENDIGOADVERTISER,inthe Aussie state of Victoria: “A new terror is to be added to our thoroughfares. This is to take the shape of a motorcycle, to be worked by oil and to be capable of a record pace. It is to be provided also with pedals so that the rider can first take his fill of exercise,then shield his feet from the pedals and enjoy all the pleasures of rapid locomotion. Nor is this all, the motor bicycle is to be built for either one of two passengers,to be followed by the motor tricycle, on which three people may find comfortable seats. The thoroughfares are dangerous enough as it is what, with trams and other conveyances and with bicycles shooting sharply round corners without even that pre-emptory tinkle of the bell that is popularly supposed to be one of the regulations for cycle traffic. But what will they be with the motorcycles. Then again, ‘horrors are likely to be piled on horrors’ head’ by the appearance of the electric motor, which is gaining so much popularity in the old country , but, thank heaven! it requires the passing of an Act of Parliament before these can be used on our public roads, and Parliament is not likely to enter on the consideration of fresh legislation for a long time to come. For which relief much!”

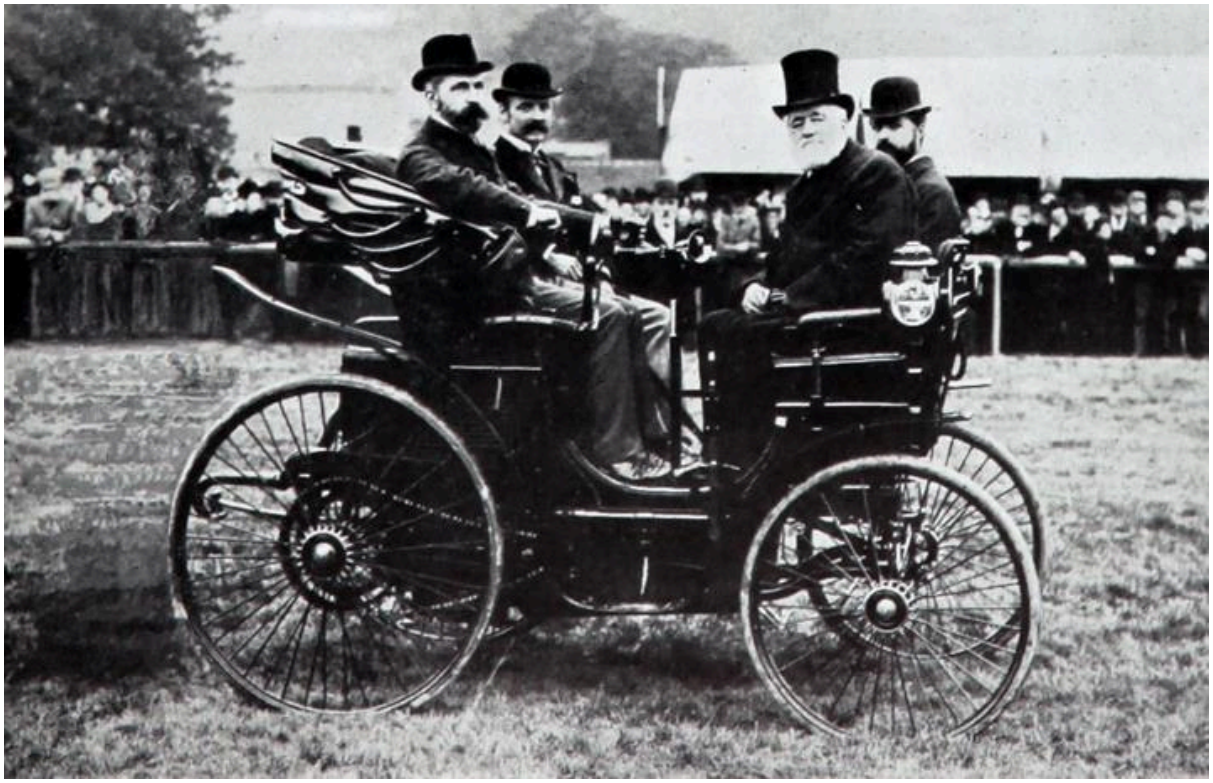
IN LE MANS LEON BOLLÉE and his dad, Amédéé, patented and built a 650cc 2½hp tricar marketed as the Voiturette—the passenger seat position earned it the nickname ‘Tue Belle-mère’, ‘Mother-in-law killer’. The border between motor cycles and automobiles was blurred but Bollée called his company Léon Bollée Automobiles and, although the Voiturette won the 1897 Paris-Dieppe and Paris-Trouville races, he switched his attention to four-pot four-wheelers.



The Bollée Voiturette was superseded by 4.6 and 8-litre four wheelers but surviving examples still appear in the Pioneer Run for veteran motor cycles.

WEALTHY ENTHUSIAST and Mayor of Tunbridge Wells Sir David Salomons co-hosted the first ever motor vehicle show with Frederick Simms. There was a grand total of five

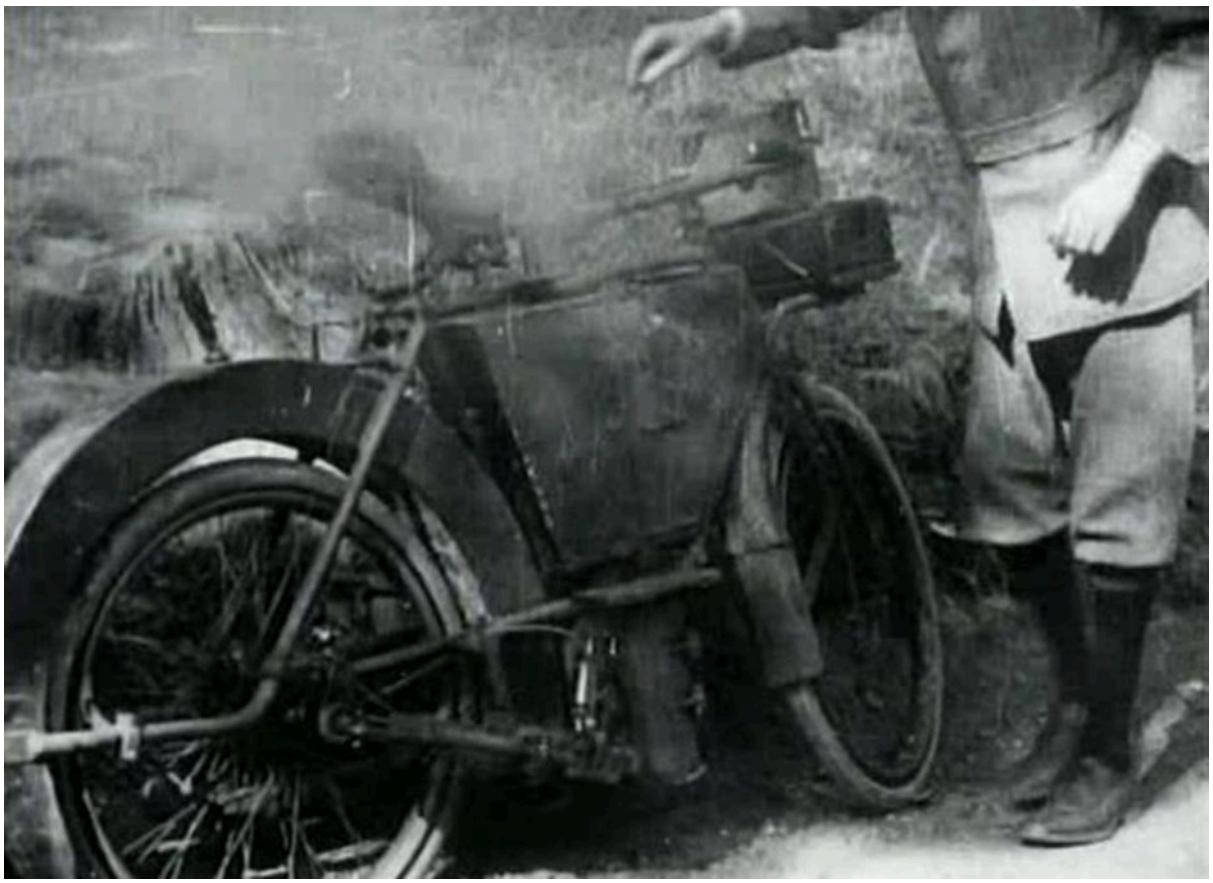
exhibits including two cars, a fire engine, a steam carriage and a trike. Among the spectators was one Harry JLawson who clearly saw a great future for petrol power —he bought the British rights to Daimler engines from Frederick Simms and made a serious attempt to dominate the nascent British industry.



Sir David Salomans IMechE (front left) on his Peugeot car (the second car in the country) at the gloriously named Tunbridge Wells Horseless Carriage Exhibition. He built his own electric trike in 1874 ("damage to clothes necessitated it being given up"), set up the Self-Propelled Traffic Association, was a founder member of the Automobile Club of France and the RAC and was at the heart of the campaign to repeal the red flag law. Nice one, Dave. We'll meet him again.

WITH THE REPEAL of the Locomotion Act the British speed limit was raised from 2mph in towns and 4mph in the country to a breathtaking 12mph. On 14 November this was marked by the Emancipation Run from the Hotel Metropole in Whitehall to its namesake in Brighton. Lord Winchelsea symbolically ripped a red flag in two at the start. A De Dion-engined Beeston trike assembled in Austria (to avoid local import duty) was the only British trike to complete the run (three Bollee trikes were specially imported from France for the event). Two Beestons were subsequently sent to Sandringham where one was ridden by the Duke of York, later George V. A Monsieur Lormont entered a steam-powered bike as the Dalifol, and therby hangs a tale. He worked for the Hildebrand brothers who were busy with the Hildebrand & Wolfmuller petrol-powered motor cycle, and his steamer was actually the Hildebrand steamer (which you might have read about in 1889). The Dalifol/Hidebrand failed to make it all the way to Brighton and was abandoned at Southern Railways' Newhaven depot, and there it stayed for the next 44

years. In 1940, finally accepting that M Lormont wasn't coming back, the railwaymen donated the steamer to the Science Museum of London. It was exhibited as 'the Brighton Steamer' until 1956 when Heinrich L Hildebrand, son of Heinrich Hildebrand, identified it as the prototype built in 1889 by his father and uncle. Charles Jarrott, who was on the run, recalled: "The effect of the run on the public was curious. They had come to believe that on that identical day a great revolution was going to take place. Horses were to be superseded forthwith, and only the marvellous motor vehicles about which they had read so much in the papers for months previously would be seen upon the road. No one seemed to be very clear as to how this extraordinary change was to take place suddenly; nevertheless, there was the idea that the change was to be a rapid one. But after the procession to Brighton everybody, including even horse dealers and saddlers, relapsed into placid contentment, and felt secure that the good old-fashioned animal used by our forefathers was in no danger of being displaced. It was, however, the beginning of the movement, and the start in England of the great modern era of mechanical traction on the road."



This photo isn't blurry—this is the Dalifol/Hildebrand and, being a steamer, it's steaming.

Programme of the First Legal Run

OF THE

New Automotor Carriages in England

AN ILLUSTRATED SOUVENIR OF THE EVENT

PUBLISHED BY

Circulates amongst Makers and Users of Autocars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

NOVEMBER 14, 1896. SOUVENIR NUMBER, ONE PENNY.

The Emancipation Run attracted huge crowds, keen to see vehicles roaring away at an unheard off 12mph. “Get your motor running, get out on the highway, looking for adventure…”

A Beeston was the only trike to complete the Emancipation Run. This example was owned by Mr Johnson, MD of the Bristol Motor Company.

THE FIRST LONDON show for "horseless carriages" was held at the Imperial Institute in South Kensington under the auspices of Harry Lawson's Motor Car Club.

BAYLISS THOMAS and Co of Coventry had been making penny-farthings since 1874; the firm became Britain's first motorcycle manufacturer, fitting De Dion engines over the front wheel of the safety bicycles. It was marketed under the Excelsior banner.

A PATENT IN the name of Gustav Mees mentioned desmodromic valves. Instead of springs, vales were to be closed, as well as opened, by cams.

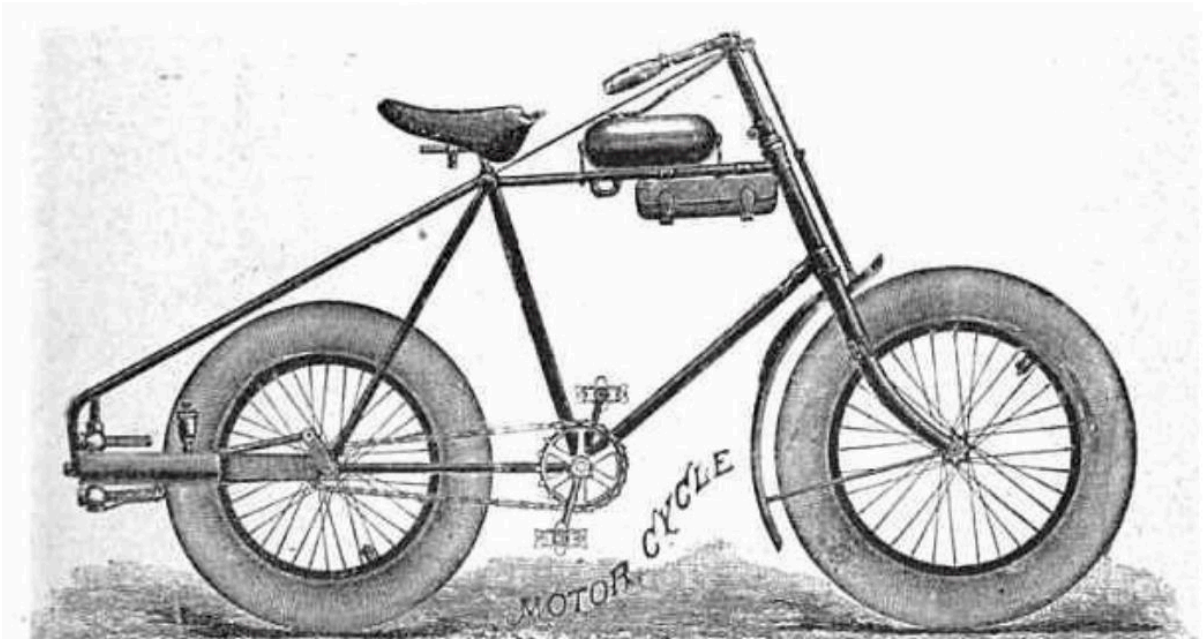
THE 1½HP ENGINE ON the Munich-made Heinle & Wegelin replaced the downtube years before Joah Phelon (of P&M) patented the idea. It also had one of the first Bosch mags and shaft drive. Evidently a pillion seat could be fitted; trailers were offered to carry people or luggage and an ambulance version was available. One was driven on the streets of London

Heinle & Wegelin were in business from 1890-1903; this example has survived to find a home in the Deutsches Museum in Munich.

LUDWIGRUB,A Munich shoemaker, designed the Heigel-Wegulin, a shaft-drive motor cycle which used the engine and fuel tank as part of the (conventional bicycle) frame. Advanced features included a mechanically operated inlet valve. It went into production and was exhibited in Britain but high production costs killed it off.

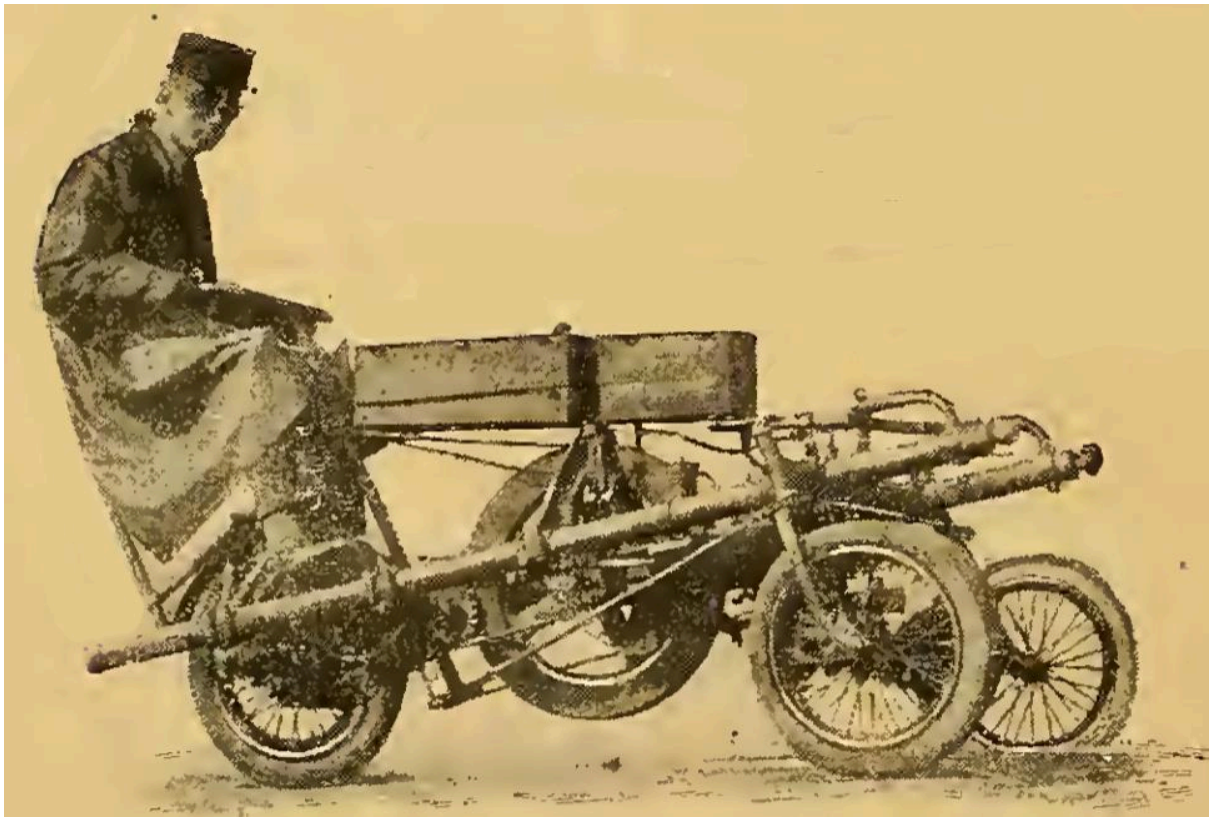
The Heigel-Wegulin's one-lunger clearly had enough power to propel a trike, trailer and family though with only a single speed hills must have been a problem.

THECOVENTRYMOTORCompany(part of the Harry Lawson empire) began to produce motorcycles on the same site as Beeston and Humber. The Autocar reported: "The first practical motor cycle built in this country was completed last week when Messrs Humber and Co finished a bicycle fitted with a Pennington 2hp motor, made at their works in Coventry [and displayed it at the Horseless Carriages Exhibition]. The machine was…tried in the presence of witnesses, and the speed developed was said to have varied from 30-40mph." Which goes to show how much they knew, because the Kane-Pennington (it was funded by Thomas Kane of Racine, Wisconsin and based on Kane's patent) would have seized after a few hundred yards for lack of cooling fins, and was a pile of junk despite its "long-mingling spark" and "inpenetrable" balloon tyres. Pennington came to England at the invitation of Humber boss Harry Lawson—a sharp cookie in his own right—and relieved him of £100,000 for the rights to this hopeless engine and some other dodgy patents. Pennington's story is a fascinating one which is covered in the Gallimaufry in all its grisly detail. In truth he had little to do with the evolution of the motor cycle and everything to do with conning lots of people out of lots of money on both sides of the Atlantic. His vehicles were praised to the skies in Autocar; but the launch editor of Autocar was later sacked for "undisclosed financial dealings" with Pennington. Meanwhile Humber produced its own 3hp engine which, fitted to Humber's pioneering diamond-framed safety bicycle, made Humber the country's first motor cycle manufacturer.

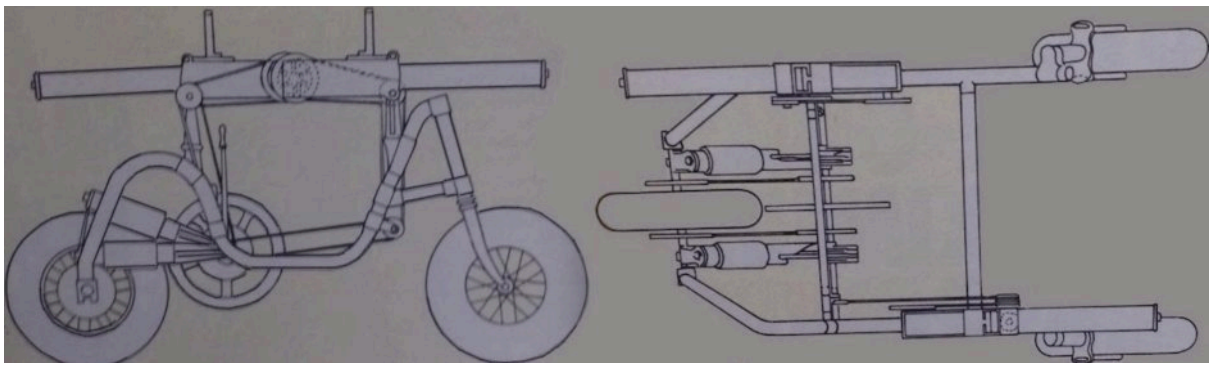


Great claims were made for the Kane-Penningtonmotor cycle; greatclaims being Pennington's speciality. When Compte De Dion requested a test run Pennington agreed…aslong as the test was conducted indoors, on a flat wooden floor. De Dion declined.

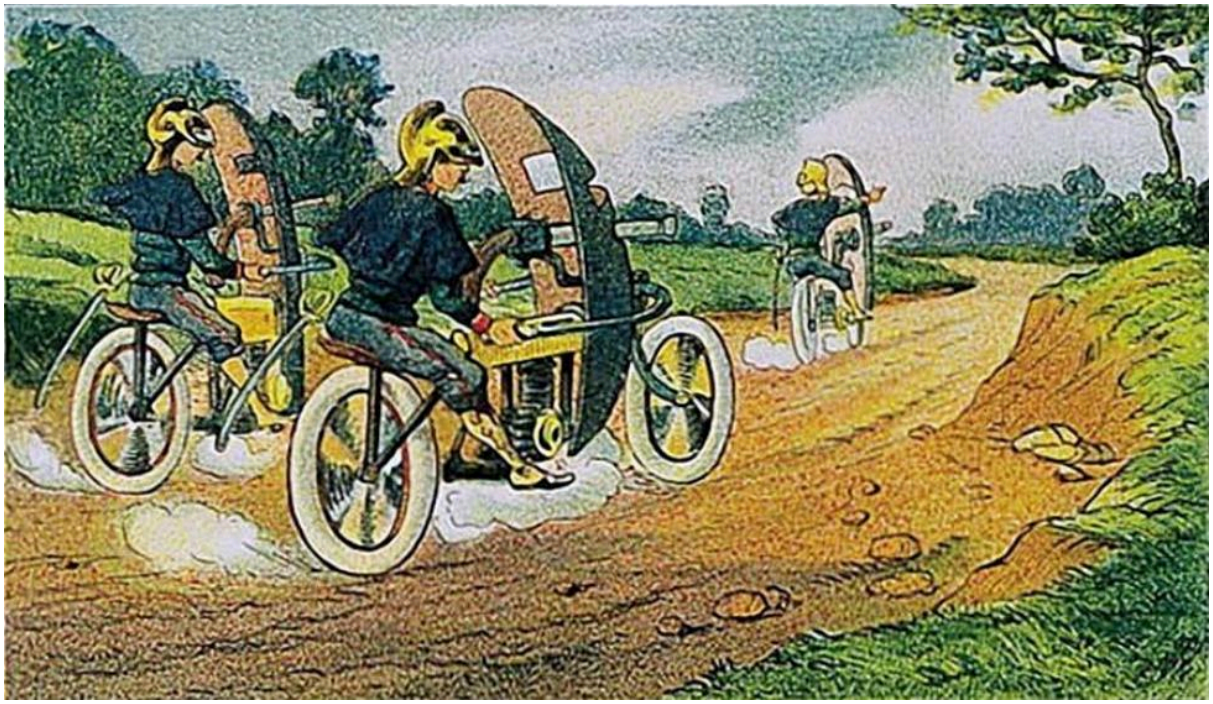
During a demo run across a field the Kane-Penningtomhopped a few inches into the air, inspiring Penningtonto commission this advertising poster.



The Blue 'Un published this pic in 1922—they hadn't forgotten Pennington: "Born 1896! One of the original Pennington motors built 1896, for the patents of which no less than £80,000 was paid."



Pennington even came up with plans for a trike armed with not one but two machines guns pointing front and back. It was to be driven by two 'oil motors' and via a series of chains, the motors would also operate the guns.



…andas this illustration in a French magazine shows, he wasn't the only designer with visions of motorised cavalry.

MAJOR(LATERBRIGADIER-GENERAL)HenryCapel Lofft Holden of the Royal Engineers produced the world's first four-pot motor cycle. Its water-cooled 1,047cc engine developed a claimed 3hp at 400rpm. Like the Hildebrand and Wolfmuller (and indeed the 'opeless Pennington) railway-style conrods drove the rear wheel; the exhaust was routed through the fuel tank because, as we all know, warm petrol vapourises quicker. Top speed was about 25mph. The Holden was built around a modified Crypto Bantam bicycle frame. The Crypto Bantam was a development of the penny farthing with gearing built in to the front hub to allow a smaller front wheel. It was soon replaced by the safety cycle.

Like the Hildebrand & Wolfmuller the Holden's conrods drove the rear wheel directly.

This Holden is preserved in a Scottish museum.

The Holden four is clearly a motor cycle rather than a motorised bicycle. This contemporary sales brochure makes fascinating reading…

A NEW DEPARTURE.

THE

"HOLDEN" MOTOR BICYCLE.

A 3 b.h.p. water-cooled, direct-driving, four-cylindered, reciprocating actioned, automatic motor bicycle.

Starts easily—no pedalling required.
Automatic lubrication—a great economy in oil.
Complete control with a touch of the finger.
Plenty of power for hill-climbing (unassisted)
Petrol supply the only limit of a run.
No heating—no plug troubles—no worry

Sole Manufacturers:

THE MOTOR TRACTION CO., Ltd.

WORKS

27, Walnut Tree Walk, Kennington Road, S.E.

Telephone No. 1234 Hop.

THE

"Holden" Motor Bicycle.

All motor bicycles at present on the market are driven by high-speed, single-cylinder, air-cooled motors of small power. These motors are fitted into, but usually form no actual part of, the frame. They look awkward, and are not applied to the best mechanical advantage.

To develop any considerable speed of the bicycle these motors must be run at from 1,500 to 2,000 revolutions a minute, and belt or band driving must be used, as chains and gears would be too noisy. Belts and bands need constant adjustment, especially in wet weather.

Such high rates of speed necessarily involve disintegrating vibration and very heavy wear, as seen by the breaking of exhaust valves and other parts, and although motor bicycles have been for so short a period in the hands of the public, there are plenty of users who have had experience of their unreliability.

All experienced motor users are aware that slow-running motors are much more reliable in every way. A slow-running motor will out-wear a high-speed one, can be lubricated much more effectively, is in every way more satisfactory in use, and in the long run is a vastly cheaper purchase even if its first cost is two or three times that of the small-power, high-speed motor.

The "Holden" four-cylindered, water-cooled 3 h.p. motor is certainly a new departure as applied to the bicycle, and all the objections to motors at

present in use on bicycles are in it met and remedied. The "Holden" motor bicycle running at 500 revolutions attains the same speed as that reached by smaller power motors running at from 1,500 to 2,000 revolutions.

The four cylinders are *fired in succession*, so that at 500 revolutions a minute each cylinder is *only fired 250 times.*

There are two explosions, push and pull  , to each revolution.

These points alone would carry much weight in favour of this motor, but it has a further point, unique in its application to motor bicycles.

IT IS WATER-COOLED,

and this without the use of any pump or similar contrivance.

The air-cooled motor heats when slowed down at a hill, and its power is thereby reduced just when it is most wanted, whilst the heating may result in the burning of valves, the seizing or locking of parts, and inevitable breakage. A slow-moving, water-cooled motor developing 3 h.p., fitted successfully and practically to a bicycle, is a decided advance on anything yet seen in this line.

The "Holden" motor is horizontal, and as applied to the bicycle forms a part of the frame—in marked contrast to the single-cylinder motors "spatch-cocked" on to, or into, the frame in varying and more or less inconvenient positions.

The action of the motor is reciprocal and continuous, every stroke being a working one. Each piston thrust makes compression in the opposite cylinder in turn, thus an air (and gas) cushion absorbs the jar, and the motor runs with great smoothness (that is, absence of vibration) and very little noise, whilst the actual tests show that there is less power lost than in other engines.

The driving is direct, all belts, bands, chains, and gears being eliminated, thus avoiding complications—no breaking or slipping when wet, as with bands or belts, and no noise.

The method of lubrication is absolutely automatic, and one charge of about one-eighth pint is sufficient for a run of a hundred miles. The loss of time and the trouble of lubricating are done away with; the rider has not even to turn on the lubricant when starting. It is just as well to note that the "Holden" lubricator effects a considerable saving in lubricating oil, which, as motorists know, is an expensive item in their list of requisites.

The motor is wholly controlled without removing the hands from the handles.

The method of ignition is electric. Only one coil and one battery are employed for all four cylinders.

Carburation is simple and effective, and will work with petrol of 720 sp. gr. if necessary. The carburettor is automatically closed when the engine is not running, so there is no danger, and no waste of petrol from evaporation.

The slow speed, lessening of the vibration, and coolness of the water-cooled cylinders, reduce sparking plug troubles to a minimum. If any failure occurs with the plug of a single-cylinder motor it is quite disabled, whereas the "Holden" motor would continue to propel the cycle—of course, at reduced speed—although only one of the four cylinders remained in working order. Thus, with the chances of sparking plug failure much reduced, the rider of a "Holden" bicycle has still a working engine even when a failure which would stop a single-cylindered motor has occurred.

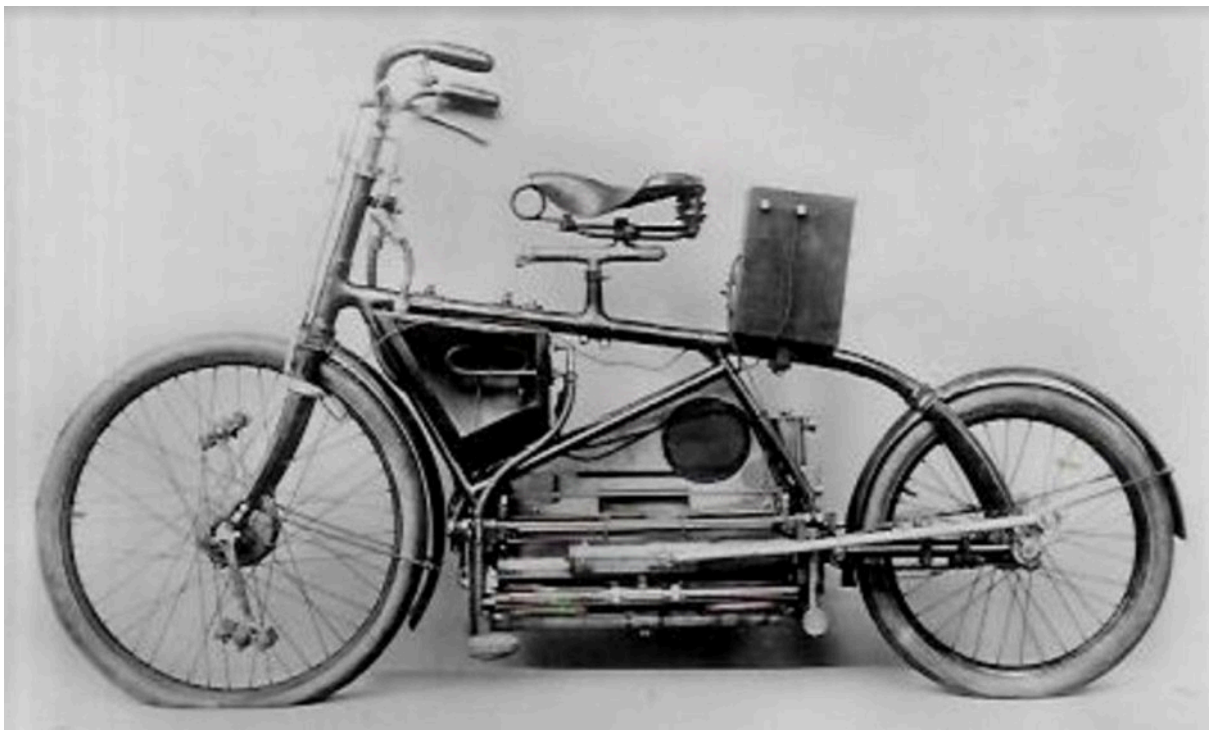
With water cooling and automatic lubrication the "Holden" motor bicycle can be run until the petrol tank is exhausted.

One notable point is the ease with which the motor starts—quite a revelation to those who have seen other motor users trying to do so. The rider walks beside the bicycle, and, pulling the "switch trigger" with his right hand, mounts from the foot-plate exactly as a bicycle rider mounts from the pedal. So certain is the starting that a rider can mount in the middle of a steep hill and ride up. There is no necessity to pedal to start the machine.

The machine is a powerful hill-climber, and under perfect control down hill. The weight is kept low down; the saddle is also low, so that the feet rest easily on the foot-plates. There are no pedals in the way of the rider, who can step off on either side, thus making it a peculiarly safe machine. When being wheeled the pulling of a small lever on the handle-bar opens all the valves, and the machine runs as easily as any other cycle of its weight. The fact that the "Holden" motor has been successfully fitted to a bicycle demonstrates that it can be fitted to any other type of wheeled vehicle.

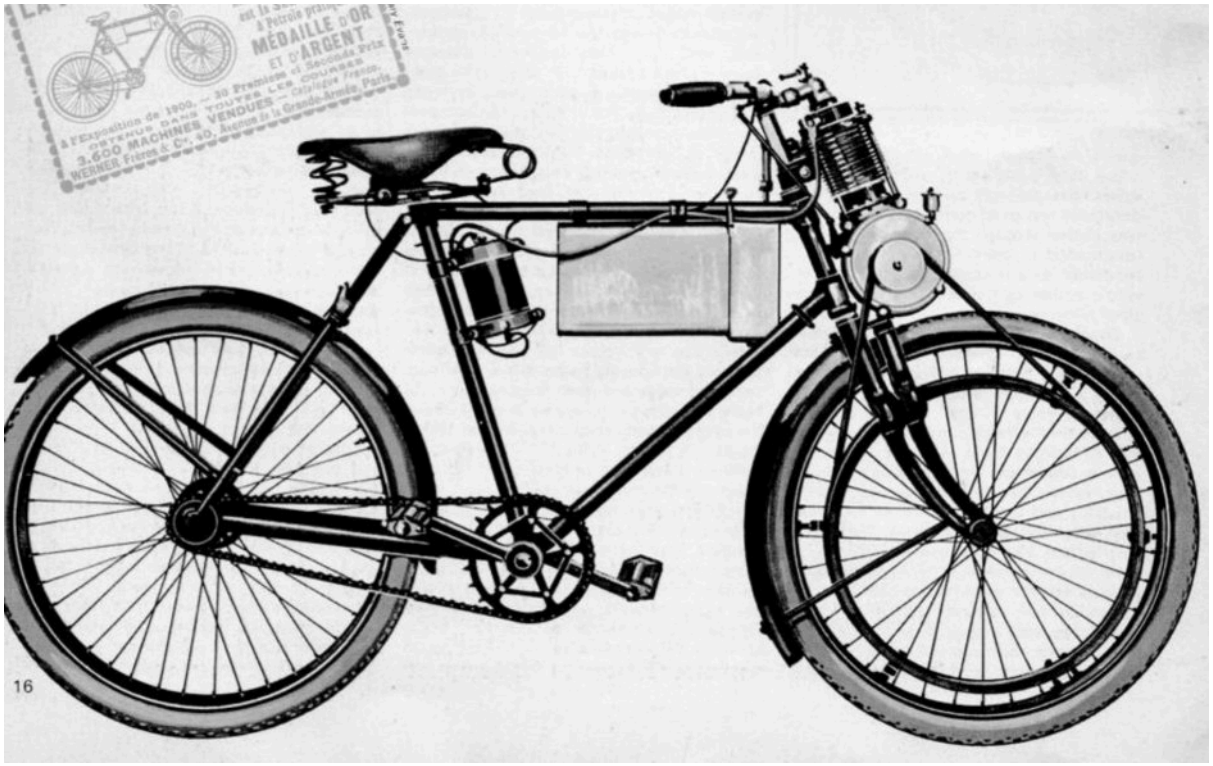
The "Holden" motor bicycle will wear well, is thoroughly reliable, and practical in every way.

PRICE £75 NET.



ERWINROSSThomasof Buffalo, NY added De Dion engine kits to his output of Cleveland bicycles.

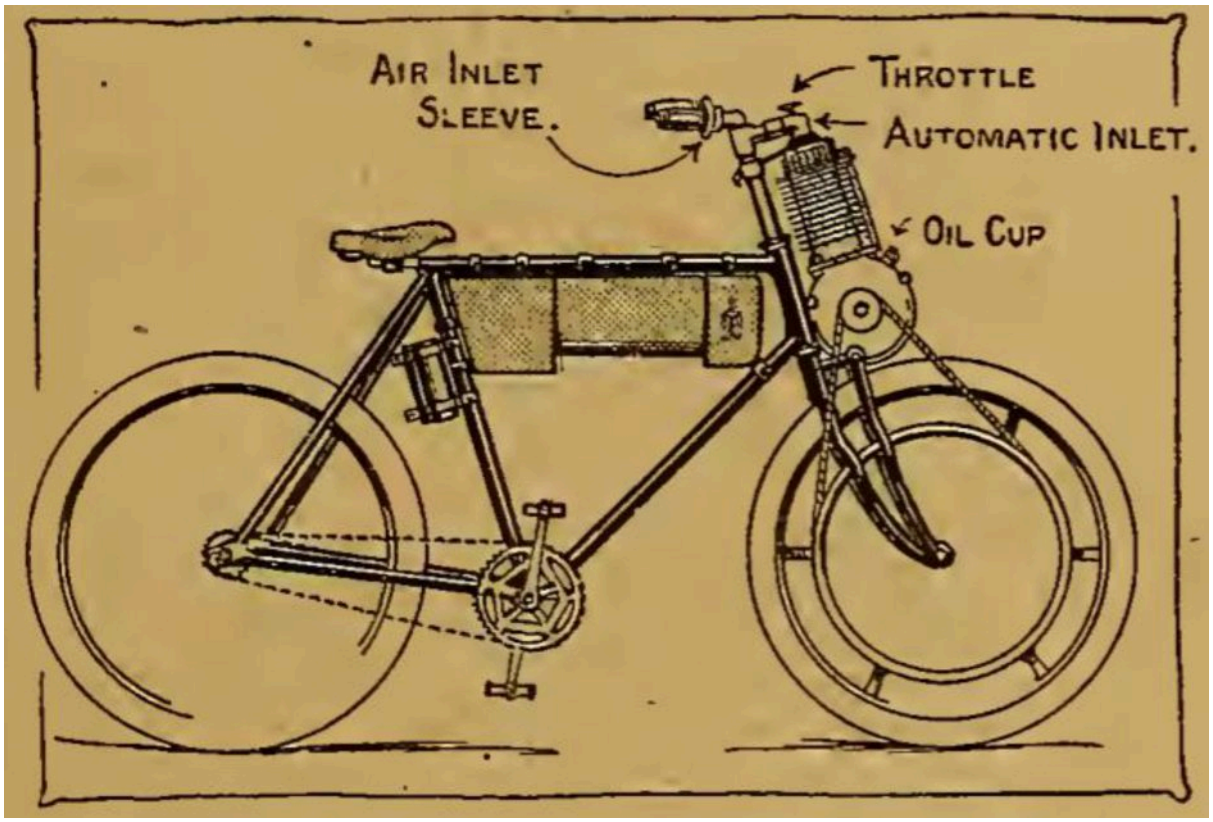
IN PARISHIPPOLYTELabitte built a tidy little 198cc ¾hp engine and offered it to Russian emigrees Michel and EugeneWerner to replace the electric motors that powered the kinetoscopes (film projectors) they were importing from the Edison company. Michel fitted one over the front wheel of a bicycle as a publicity stunt. It drove the front wheel via a twisted rawhide belt that slipped hopelessly in the rain. It was top heavy and, when it skidded on wet, greasycobblestones, tended to burst into flames because of the spirit burner that heated its hot-tube ignition. But there wasn't much competition and a dozen had been sold within a few months.



It was thrown together as a publicity stunt for the movie business, but the Werner offered many pioneers their first taste of motorised bicycling.

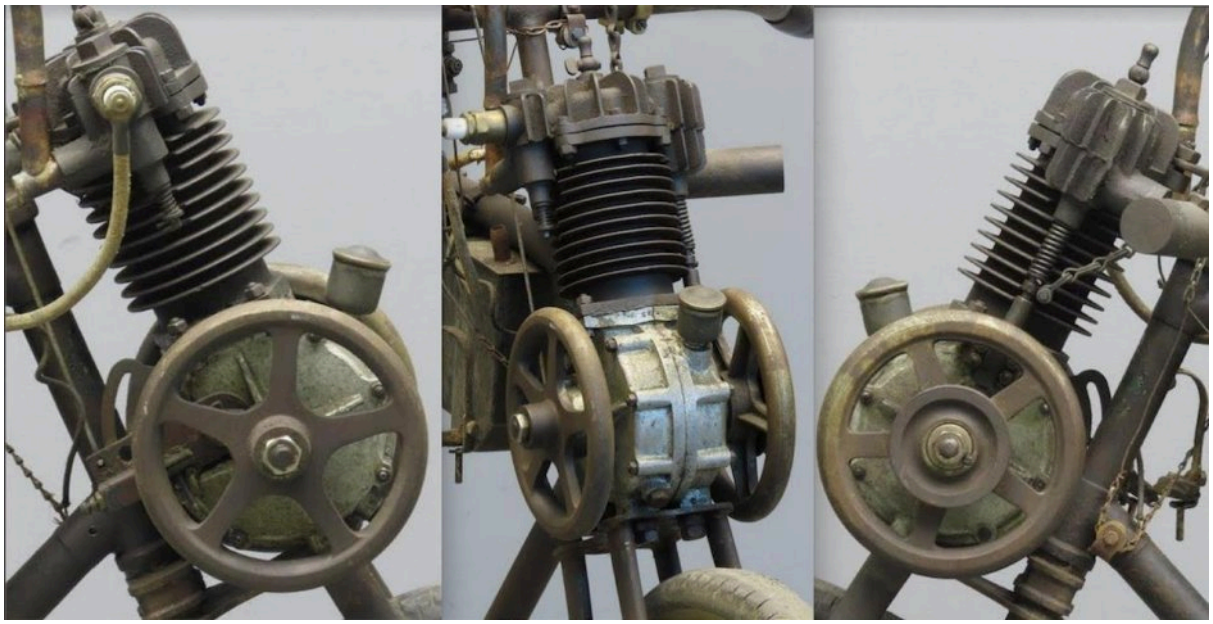
HERE'SATREAT,datingfrom the early years of the 20th century—the nearest thing you'll find to a roadtest of a first generation over-the-front-wheel Werner: "She cost me thirty shillings, did my 1½hp front- drive Werner, back in 1903, and I shall never be able to buy so much fun for the money again. A schoolboy is not over plentifully supplied with cash (or should not be), and the indulgent cycle-maker who let me have her accepted half-crown instalments, at irregular intervals. Eventhen she was a wondrous antique, but her tyres (French racing Dunlops) were thoroughly good, her frame strong enough for a modern twdn, and her engine was a splendid job. Thatwas a proud moment when, after an overhaul lasting weeks (needless to say the price included the right to do all the necessary tinkering in the seller's workshop), we bore her down the steps. I had done my best to transform her into the outward semblance of a speed monster: the saddle had been removed, and a rickety luggage-carrier intended for a cycle substituted, liberally padded on top, the exhaust arrangements and pedalling gear

scrapped, and in the place of the latter a piece of broomstick (wrapped with inner tube to conceal its domestic origin) did duty for footrests. (One had to mount gingerly.) I sat astride her in the road, regarding thef engine with affection and pride. Please remember that I was sixteen, she was my very own (for had not the first half-crown been paid?), and I had never been on a power-driven machine before. The kindly cycle-maker and his apprentices pushed lustily. We swayed down the road in wide arcs. She fired. Oh, irrecoverable moment! Never was such a bark as that baby engine possessed. They lodged complaints in the Maida Vale flats about me, because I would run up and down half the day wondering if it wasn't really possible to do something in the way of tuning on a surface carburetter. Little Werner and I careered down the road, keep- ing an eye out for people who might know us, and be impressed. We rounded the first comer successfully, but on straightening up side-slipped on a tramline, and went down with a slam. (That was her first naughty trick, and her last: with the engine over the front wheel the little machine steered perfectly, and could be ridden 'hands off'.) I recovered my steed: a little acid spilt from the accumulator and some petrol (tenpence a gallon, so it didn't matter) was all that was lost, and we ran soberly round the houses back to where the expectant staff awaited us. That was the beginning of a jolly time. A man named Arthur Cummings, who was very prominent as a speed exponent on the 70×70 class, used to haunt Paddington track near by. I



A contemporary sketch of the first-generation Werner that was a schoolboy's dream…

Here's a rare survivors…



…andhere's the engine that made it all possible.

showed him the Werner. He was too well-mannered to laugh, and took her and my efforts to make her do thirty miles an hour seriously. We bought a drill, and started to tune her. The air intake to the engine was governed by a revolving sleeve on the handle-bar, and the neat mixture was led from a surface carburetter forward of the tank up the head column to the handle-bar lug, where the engine was bolted on. Drive was by twisted round belt (and some of you think a V belt is troublesome!) to a pulley on the

front wheel, and you carried your oil in a little glass cup on the crank case. Coil and accumulator conspired together to defeat dull care: one or the other or both always needed attention. The band brake on the back wheel was splendidly efficient—until one day it broke; after that I remember I used to stop by dragging my feet on the ground and using the compression. (There is undeniably a special providence for mechanically-minded schoolboys). We removed the gauze from the induction pipe, and while this ran her consumption up terribly, it was worth it. I ran her to Brighton and back in days when none ventured on pedalless machines, and she took everything except the last stretch of Handcross. There her proud owner had to slip off and run; but she was forgiven, for it was a plucky climb for an engine aged and so small. By this time we were regular habitues (sixpence admission) at Paddington track. One day we borrowed a back wheel from a racing push-cycle, with a fabric-sided tyre about the diameter of a lead pencil, and a slender wood rim and cobweb spokes. We inserted this in the back forks, gave Werner an extra swig of oil, and issued a formal challenge to a neighbouring youth who owned a wheezy 3hp Kelecom. It was a Homeric struggle. I flattened myself along the top bar until I could flatten no more, sprayed with hot oil, and unutterably happy because the dreaded Kelecom was well behind. It was a famous victory, but as she crossed the line poor Werner seized. Her piston had gone. We disembowelled a worn-out Yankee 'Thomas' that we had access to. Some brisk work with a file, and the old rings, and the little engine was got going again—a thought metallic in the exhaust at speed, but serviceable. I always feared it was the drilling we did on that piston: we used much enthusiasm on the job, but little discretion. Poor little 'bus. I suppose her rusty bones are lying in some forgotten corner. Still, I think in her time she gave a keener pleasure than my little opposed twin, now waiting in the shed, eager and twice as speedy, can ever give." **RHB**.

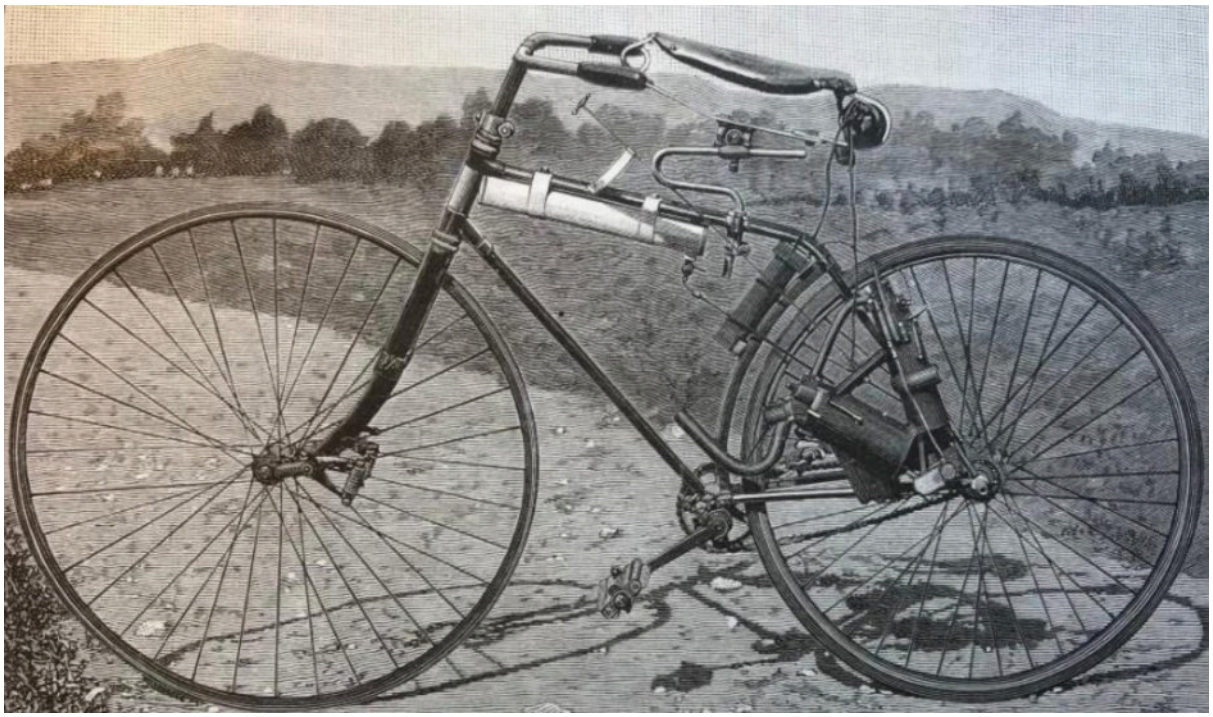
Pictured in this Dunlop ad on her De Dion trike is vaudeville actress Ellen Jouanny at the Championnat des Chauffeuses, a race meeting for showbiz folk staged at the Longchamps racecourse in Paris.

BICYCLEMANUFACTURERAlexanderLeutner & Co of Riga produced five trikes powered by De Dion Boutin engines. Leutner was a motoring pioneer: he comp[eted in the first motor race in St Petersburg, in the 1890s, had tested-driven a Hildebrand and Wolfmuller and was chums with Gottlieb Daimler, who had visited him in Riga. He had studied in Lyon, Aachen and Coventry.

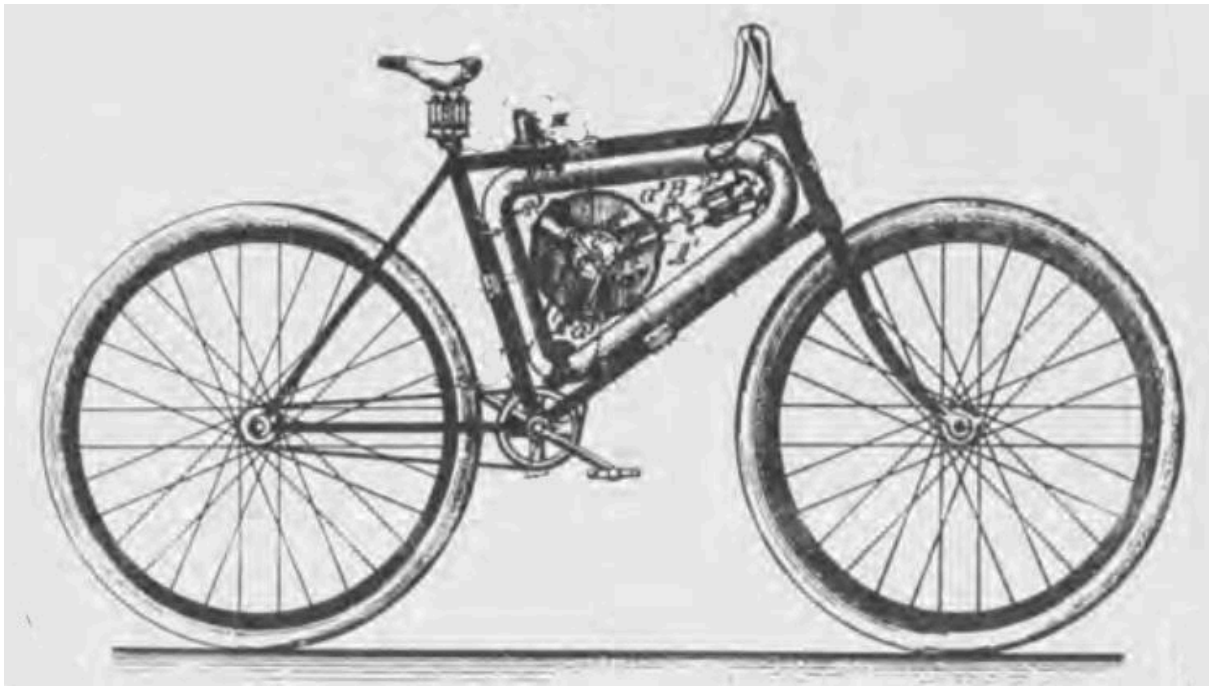
A HILDEBRAND&Wolfmuller made a demo run in Tokyo—the first motor cycle to be seen in Japan. But that year its German and French operations collapsed. H&Ws had been sold at below cost price, they were unreliable and buyers demanded their money

back. An H&W was raced at the Crystal Palace where it was said to have reached 27mph, but only on level ground. Major weaknesses were a tendency to skid and problems climbing even gentle slopes.

IN THE 171-MILE race from Bordeaux to Agen and back a De Dion trike came 4th, ahead of a Hildebrand & Wolfmuller. In a race from Paris to Mantes six De Dions finished 1-2-3-4-6-8 (with a Hildebrand & Wolfmuller 7th). De Dion started to sell engines to all comers.



A Stateside pioneer recorded by Scientific American was the "Hopkins gasoline motor cycle" which seems to feature a two-stroke engine and rudimentary front suspension. The rolling chassis is a Pope 'Columbia' bicycle, and Pope went on to produce motor cycles of its own but there's no evidence that the Hopkins went into production.



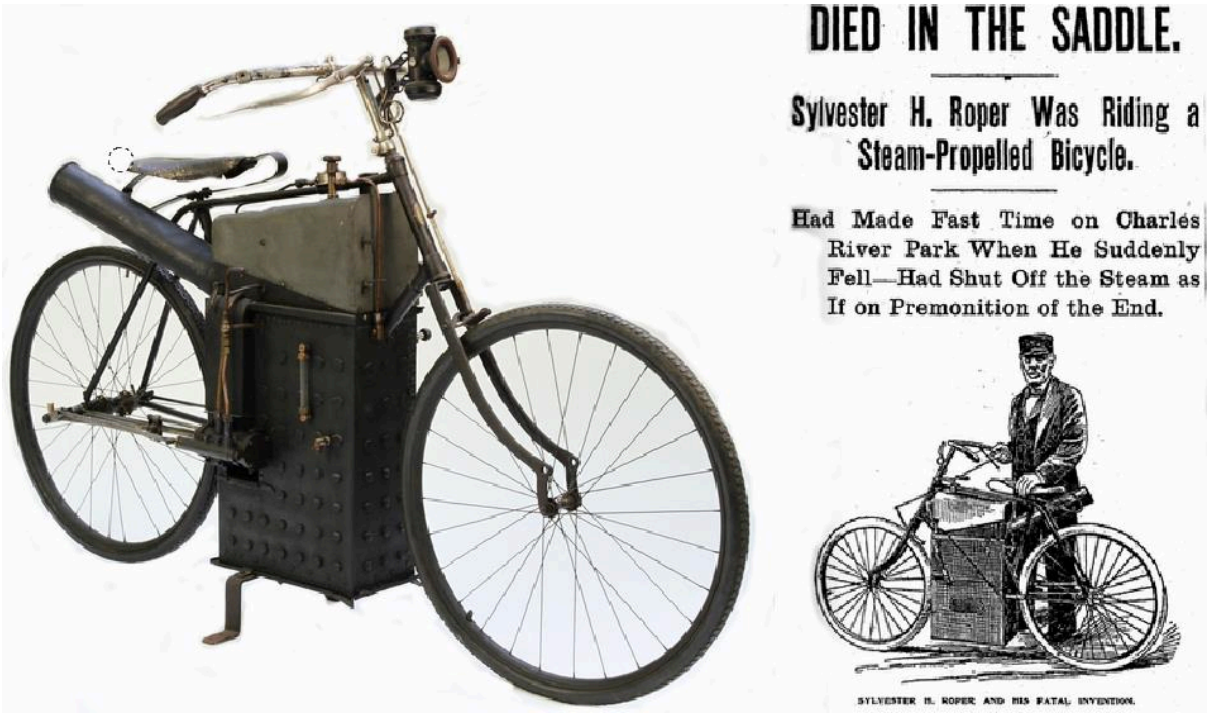
Two New Yorkers, Joseph Raders and Edward Dickerson Jnr, patented “bicycles having mechanical means assisting in their propulsion”, using compressed air periodically to supplement a cyclist’s efforts. The mechanism combined an air compressor built into the saddle with a second compressor powered from the pedal crank. The compressed air was to be stored within a tank; by moving a valve, the rider directed the air to three cylinders that were connected with the crank. An interesting idea, but it never left the drawing board.

The Marks clearly did progress further than the drawing board. Its 90cc four-stroke engine was rated at ½hp; overall weight was 91lb—it’s said to be the first motor cycle to be produced in the USA. Designer Roy Marks (who was clearly influenced by De Dion)

moved from Toledo, Ohio to San Fracisco where he put it into production as the California; read all about it in 1901.

PEUGEOT, HAVING made steam cars since 1889, began to make petrol engines of its own design.

NO SOONER HAD petrol-engined motor cycles appeared than they were used as 'pacers' for racing bicycles (you'll find a fine selection of pacers at the start of the picture melange). Those pioneer petrol burners were unreliable so Colonel Albert Pope, the man behind Pope Columbia bicycles, decided to try steam. He commissioned Sylvester Roper, now 72, to build him a steam-powered pacer in a modified Columbia bicycle frame (you'll find details of Roper's first steamer back in 1868). Roper duly fitted an improved steam engine rated at 8hp; all-up weight was 150lb with a range of some 25 miles. Its range was only seven miles but the reckoned it could 'climb any hill and outrun any horse'. American Machinist magazine reported: "The exhaust from the stack was entirely invisible so far as steam was concerned; a slight noise was perceptible, but not to any disagreeable extent." Roper was asked to demonstrate his 'self propeller' at the Charles River velodrome, a banked concrete bicycle racing track. Having paced the racing cyclists he raced against them and was timed at over 40mph. Sad to say at this point he was seen to swerve off the track. He was found to have suffered a heart attack and died in the saddle.



DIED IN THE SADDLE.

Sylvester H. Roper Was Riding a Steam-Propelled Bicycle.

Had Made Fast Time on Charles River Park When He Suddenly Fell—Had Shut Off the Steam as If on Premonition of the End.

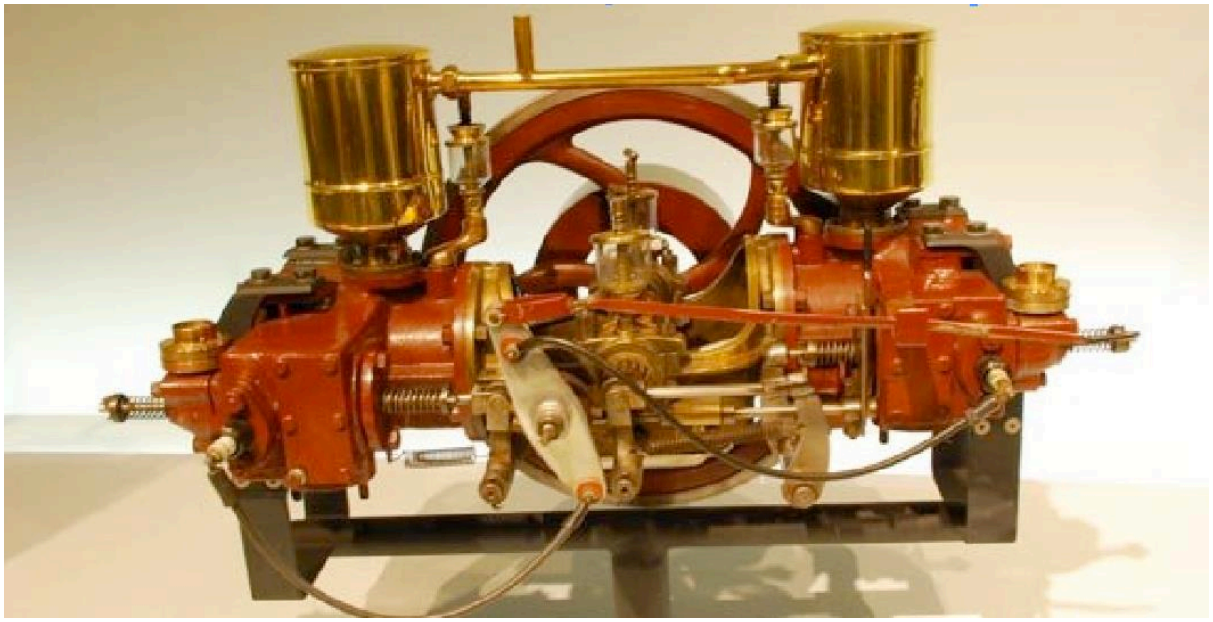
SYLVESTER H. ROPER AND HIS FATAL INVENTION.

Sylvester Roper's revamped steamer might well have been the fastest motor cycle on the planet.

FROM A DAILY newspaper: "The 'horseless carriage' race from Bordeaux to Paris, which was held recently, displayed how remarkably electricity and other motive-powers for

light vehicles have progressed. Never had such a novel sight been witnessed, and the interest taken in the event shows plainly how people regard the importance of modern appliances for speed purposes. The petroleum motor bicycle was one of the vehicles entered for competition, and by no means the least interesting. Many people consider that the motor-driven cycle is the cycle pf the future, while others assert that the physical exertion necessary for propulsion purposes gives the real charm to cycling. Be that as it may, the motor bicycle is an accomplished fact."

The end of the Paris-Marseilles-Paris race. "Collomb's arrival on a Dion Bouton tricycle. He completed the 1,690 kilometre course at an average speed of over 23km/h."

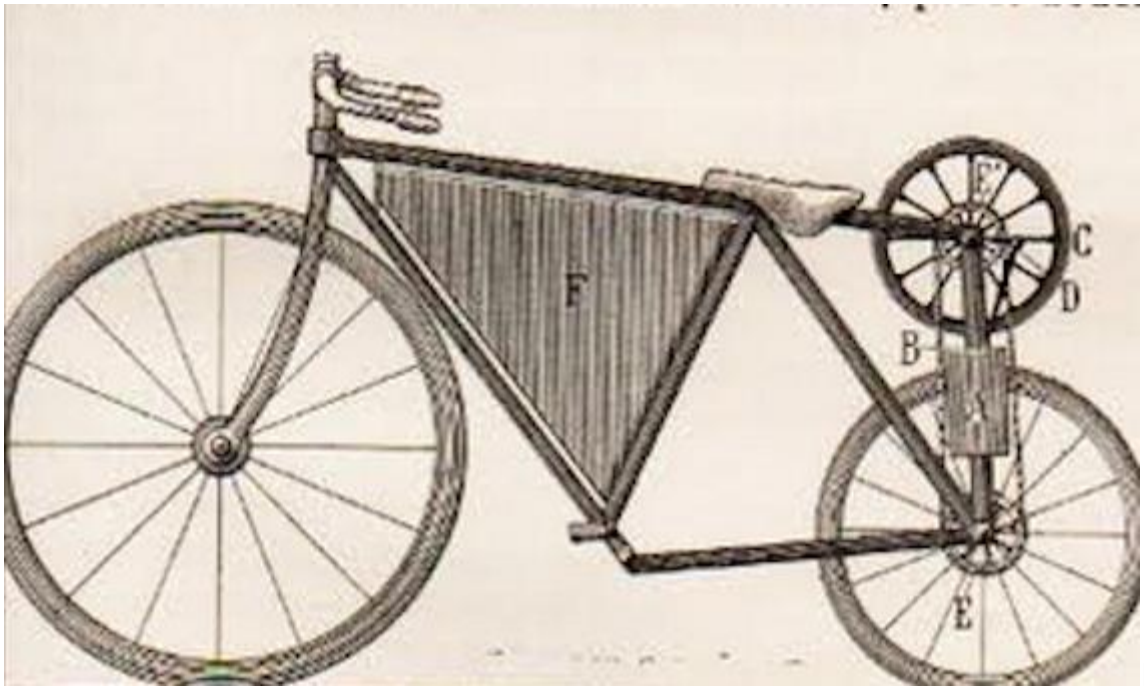


Karl Benz patented a flat twin ‘boxer’ engine: a configuration that would power some great bikes.

IRISHMAN ERNEST MORNINGTON BOWDEN was granted a patent for the ‘Bowden mechanism’. Thanks for the cables, Ernie.

LLOYDS ISSUED the first motor insurance policy.

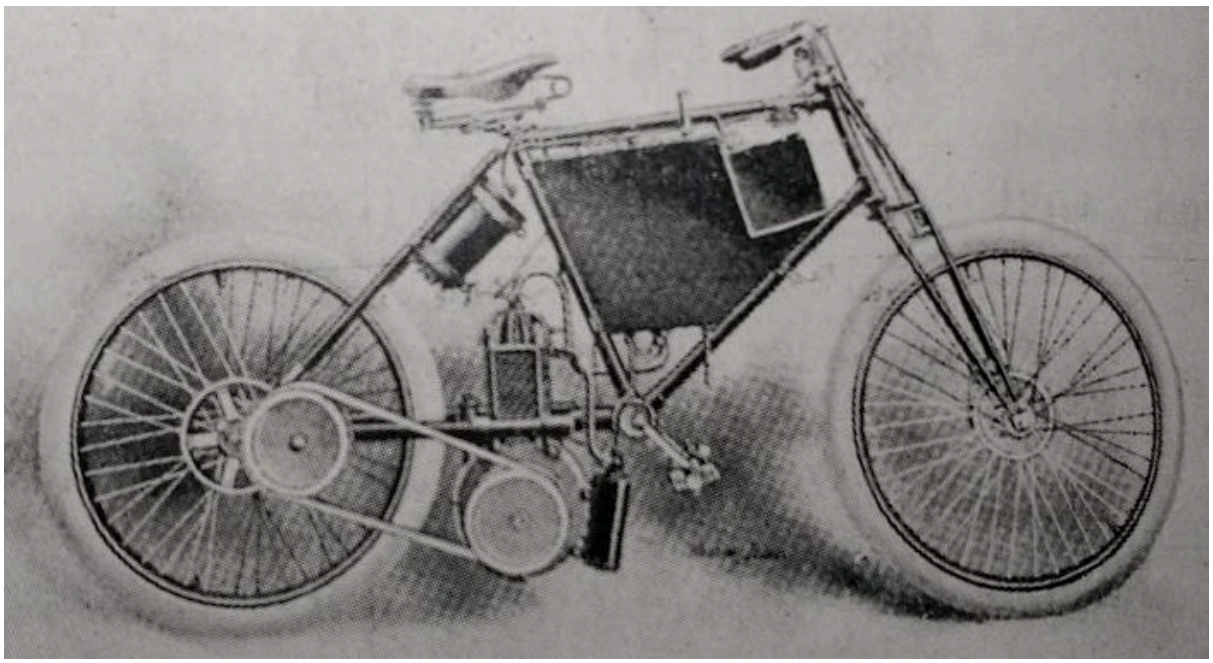
THE GENEVA STEAM bicycle was made by the Geneva Cycle Company, of Geneva in Ohio. The naptha-fired steam engine was based on a design by Lucius Copeland. A modern replica was found to be capable of 12mph, but maintaining a head of steam at that speed was not easy.



No details survive of this French concept but someone was clearly dreaming of a motorised bicycle.

1897

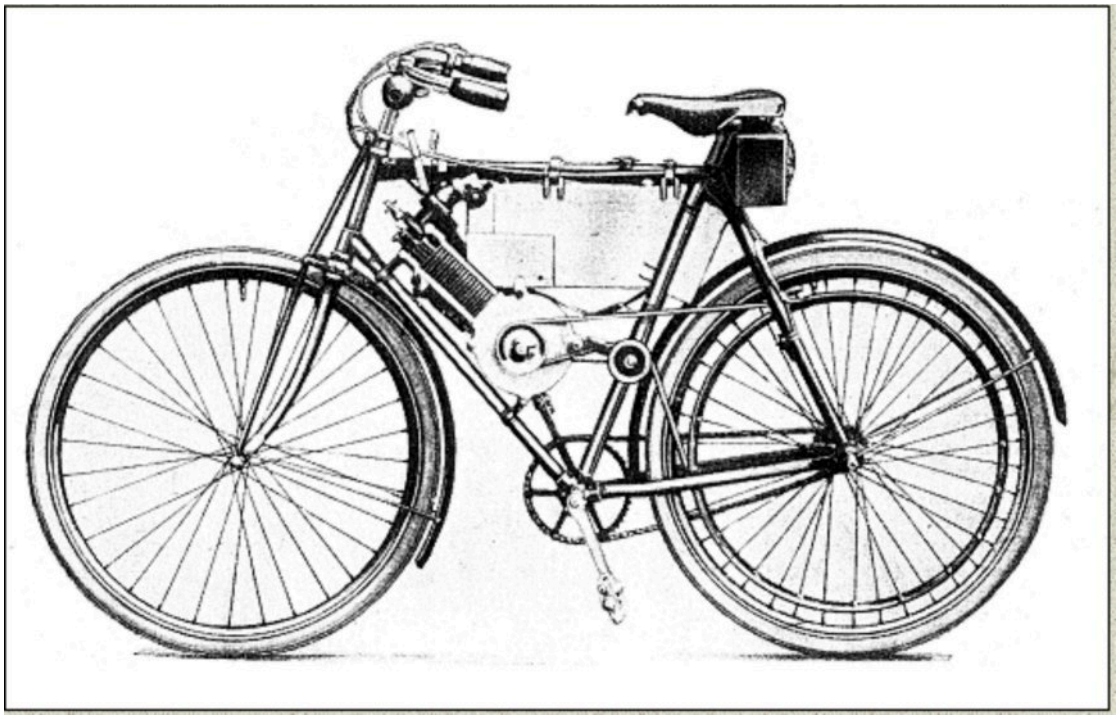
THE FIRST 'MOTOR BICYCLE' race in England took place at Sheen House. Charles Jarrott rode against HO Duncan, both on 1¾hp De Dions. They had to be push-started; the pedals were used purely as footrests. There was no adjustment on the flat drivebelts which had to be smeared with "a gluey sticky form of compound" to ensure grip.



Two De Dions took part in the first English race.

FREDERICKSIMMSsenta De Dion-Bouton trike to Robert Bosch to be fitted with a magneto. This led to the development of the high-voltage mag; Simms set up a UK Bosch agency (and LATERhelped set up what would become the RAC).

IN 1899 THESTEVENSBROTHERS,George,Jack, Joe, and Harry set up the Stevens Motor Manufacturing Company in Wolverhampton to produce petrol engines. Harry was interested in powered transport and fitted a US-made Mitchell engine that had been acquired for use as a stationary engine into a BSAbicycle that was lying around the works. Ignition was by accumulator and trembler coil; a metal rim was fitted to the rear wheel for a belt drive. Theengine wasn't too reliable but it attracted the attention of their neighbour William Clark, who ran the Wearwell Cycle Company. Believing they could improve on the Mitchell, the Stevensboys had some castings made by a firm in Derby and, in their sparetime, made a reliable, efficient (for its day) 1¾hp engine incorporating a carburettor made from an old mustard tin. Stevensalready supplied Clark with spokes and fasteners; before long they were also supplying him with engines.

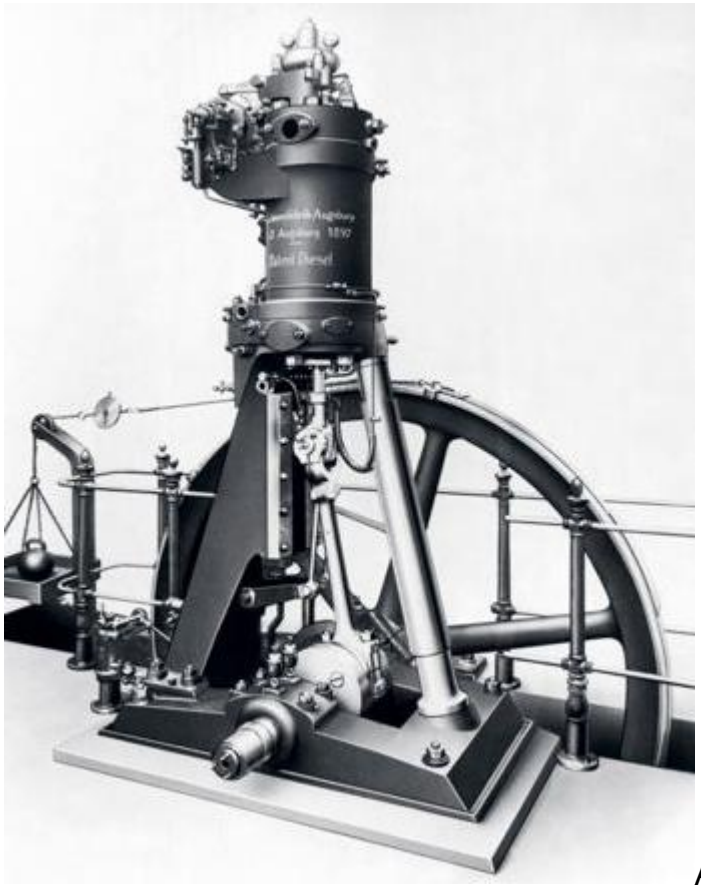


Progenitor of the AJSmotor cycle: the Stevensbrothers bolted a Mitchell engine into a BSAbicycle.

BEESTONSWEREAMONGeightmotor cycles and trikes at the Stanley Show. This marque was among several owned by the ever-confident Harry Lawson. TheAutocar reported: "Recognising the uselessnessof the motor bicycle for generaluse the company does not propose to continue their manufacture in large quantities."

IN LONDONA DUNLOPRubber engineer, Arthur Hertschmann, built an air-cooled four-stroke vertical twin and bolted it into a bicycle frame with separate inclined cylinders

clamped to either side of the downtube. It featured chain drive and ram-air cooling with a cowling over the head.



After 13 years of dogged development work Rudolph Diesel's third test engine, a 19.6-lire four-stroke compression-ignition one-lunger, developed 20hp at 172rpm with an efficiency rating of 26.2%. Diesel-powered motor cycles have always been a minority interest, but a number of companies still make them.

Labre & Lamaudiere of Paris developed a 64cc clip-on four-stroke engine with battery/spark ignition that span up to 2,000rpm.

After spending a couple of years making bicycles Eduardo Bianchi designed a lightweight engine to power his cycles and also imported De Dion trikes. Italy was in the motor cycle game.

IN THE USA Hiram Maxim (of machine gun fame) built a petrol trike while working for Colonel Albert Pope, the country's leading cycle manufacturer. When he showed it to Pope the Colonel snorted: "You can't get people to sit over an explosion." Three years later he would be making motor cycles.

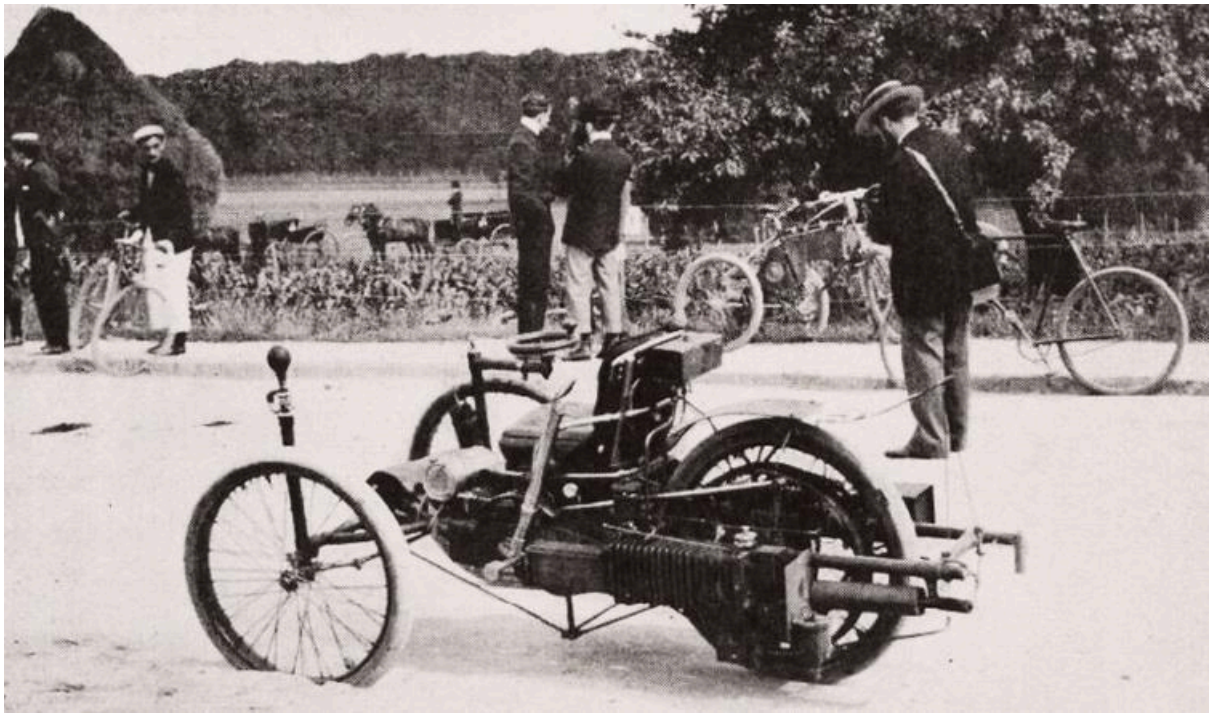
Hiram Maxim built a trike. Unfortunately he also made high effective WMDs.

THEHOLLEYBROTHERS,Earl,16, and George, 19, of Bradford, Pennsylvania, built a trike using a single-cylinder engine of their own design and manufacture. Theycalled it the Runabout and proceeded to top 30mph.

THEREWASSOmuch interest in the Werner Brothers' petrol-powered bicycle that they bought some bicycles from the Hozier company of Glasgow, fitted engines and marketed them as Motocyclettes. Harry Lawson paid £4,000 for the UKmanufacturing rights—a much better deal than he got from Pennington.

Chenard-Walcker went on to become successful manufacturers of cars and CVs but this tricar could fairly be described as a forecar from the days when the line between cars and bikes was blurred.

THEFIRSTCOUPEdesMotocycles was a five-lap/100km race between Saint-Germain and Ecquevilly about 20 three-wheelers entered, along with an un-named “bicyclette” ridden by a M Simon; alas it failed to finish. Most of the trikes used De Dion engines—De Dion offered a trike to the winner. Other prizes included a bronze from a local property developer named Dufayel and 100 litres of Motonaphta (petrol). However a handful of riders turned up on Léon Bollée trikes which took four of the first five places. First home 2hr 46min 17sec was Léon Bollée himself who presumably took home a De Dion. Evidently the two ends of the road between Saint-Germain and Ecquevilly ended in hairpin bends The reporter of La France Automobile reported: “They (the Léon Bollées) arrived at full speed on the right-hand side of the road and abruptly locked their brakes at the same time as they gave their front wheels the sharpest possible angle to the left. In this movement, the rear wheel was brutally driven away by the acquired speed, it was driven onto the ground, and the car was straightened out by itself. This is the controlled skid that is well known to tricycle drivers!”



Before he began wasting his time developing four-pot four wheelers, Léon Bollée produced a tadpole trike that wiped the floor with the De Dions at the Coupe des Motocycles.

THE STADE-VÉLODROME in the Parc des Princes in Paris was christened by motor cycle races. Gaston Rivierre on a De Dion-Bouton won the first series and posted the best time of the day at 40.8km/h.

1898

"TWO OR THREE YEARS AGO," according to the Chicago-based The Cycle Age And Trade Review, "the general appearance and use of the motorcycle the world over seemed an immediate certainty. Oddly enough, this anticipation has been abundantly realized in some countries, while in others it has been almost wholly disappointed. In France the motorcycle has 'arrived', and is seen everywhere; large establishments exclusively devoted to its manufacture are running day and night and are yet months behind their orders. The principal type of motorcycle adopted in France is that driven by the gasoline engine; there are several makers, but there is no material difference in the 'petrole' engines. Then in France, there are a number of builders of steam driven motorcycles, The Companie General, Decanville-Serpollet, Dion et Bouton, Le Blant, Societe des Chaudieres Scotte, and Weidknecht, who are doing heavy work, mainly in the omnibus and goods-carrying lines. There are no less than 47 different firms and companies and individuals manufacturing 'petrole' motorcycles in France, many of them having large plants, and all full of orders, most of them declining to fix day of delivery, and the customers paying each other premiums for early-filled orders. There are also nine concerns which supply electrically driven carriages, making a total of over sixty motorcycle builders in France, and the French nation seems to be falling over itself

in its eagerness to buy the product of these makers. The Winton motor carriage company at Cleveland are offering motorcycles with gasoline motors. The Fierce-Crouch Engine Company, New Brighton, Pa, have placed their gas engines in two motorcycles and say that the lightness of their engines and several other advantageous features make them peculiarly suitable for motorcycle service. But neither in England or America is the gasoline motor driven motorcycle received with anything like universal approval. They are hot, they are not exactly quiet, they want a lot of cold water, although they are said to emit 'very little' in the way of disagreeable odours. There are only a very few gas engine driven motorcycles in the hands of purchasers in America, perhaps not more than ten or fifteen all told. So far, all of the gasoline or gas engine driven motorcycles are practically identical so far as the motive power is concerned. There are small detail differences in the engines, but nothing radical or generic to distinguish one from the other. They are all explosion engines, using a mixture of air and gas which is very much compressed and then fired in the engine cylinder or an extension of the engine cylinder, by an electric spark or by a red hot tube. All of these gas engines operate on what is known as the 'Otto-Cycle', that is to say that the cylinder and piston perform several entirely different acts, and these acts recur in a fixed sequence. Thus one stroke outward of the piston draws into the single-acting cylinder, a mixture of gas and air, the following inward stroke of the piston compresses this charge at the expense of power stored up in the fly-wheel, and at the end of this inward stroke the charge is fired and creates a pressure of about 170lbs to the square inch, which drives the piston outward in its effective or working stroke, at the end of which the cylinder is filled with burned vapour which is inert, and is pushed out of the cylinder at the next inward stroke of the piston, which completes the 'cycle' invented by Dr Otto, an eminent German improver of the gas engine, and bearing his name. There are thus three strokes of the gas engine which do not help turn the crank shaft, so that the engine is idle three-fourths off the time, and if only a single cylinder is used, the crank shaft obtains a turning impulse only during one-half of each alternate revolution. If two cylinders are used in one vehicle then the crankshaft has a turning impulse given it during one-half of every revolution it makes, and if four cylinders are employed then the crankshaft receives two turning impulses during each revolution, same as the ordinary single-cylinder steam engine. The cycle' makes a single cylinder gas engine a very unsteady driver, and hence calls for a large and heavy flywheel. The gas engine was first applied to carriages in any notable way by Daimler, a German who ran a little pleasure railway from the little town where he lived to a little lake…Now that Dr. Otto's patents have expired, the gas engine is free to the world, and there are no patents of controlling effect in the art…There are constant rumours of the formation of motorcycle companies, but the foregoing about covers the American motorcycle industry, so far as it has a tangible existence. The English are making an effort to place the steam-engine driven motorcycle in front, and this form of motor has undeniable advantages for general heavy work. It does not now seem likely that the petroleum or gasoline engine driven motorcycle is to

have any great use in either England or America until the engine has been very materially improved. Americans want machines that are nice in every way; silent, clean, and without bad smells…For three-quarters of a century the best of mechanical talent has directed its efforts towards the improvement of the steam boiler without finding any radical or fundamental advantage…there seems to be no prospect of anything new in the steam way that will make the steam motorcycle desirable for anything except heavy freight work. With the gas engine we have unlimited power at our disposal. We can carry a large amount of gas-producing materials, and the air is everywhere with us. We can mix air with a little gas and squeeze this mixture pretty hard, and fire it off and so obtain all the power we want, and obtain it in a controllable form. Having the power, it seems beyond dispute that we shall sooner or later find out how to use it. We shall find some elements which we can place between this force generated by explosion and the wheels of our vehicles which will be wholly satisfactory. The power, the living force, is in our hands now. We shall learn how to use it."

WERNER BROS SOLD more than 300 Motocyclettes, including a number in Britain via Harry Lawson's Motor Manufacturing Co (MMC). Lawson also had the rights to De Dion's tricycle, which Humber made for him.


Eventhe wheel stand on this MMC-Wernerisa work of art.

“One of a first batch of three Werner motocyclettes imported into England, and consisting of an ordinary type of pedal cycle with stiffened frame and front forks. The motor is a single-cylinder air-cooled with tube ignition, and designated as ¾hp. It is attached by’ clips to the crown of the front forks and to the stem of the handle-bars, moving with the latter.” Its rider, one PercyRichardson, later reported: “The ultimate fate of this motor bicycle was that it became a martyr to the cause of the present motor ‘bus services in London, as on its last day of this life it skidded under a horse ‘bus, taking me with it, and, as usual in those days, burst into flames. As it was found impossible to get it out from under the ‘bus, the passengers and horses were taken off, and the bicycle and ‘bus just burnt themselves merrily out.”

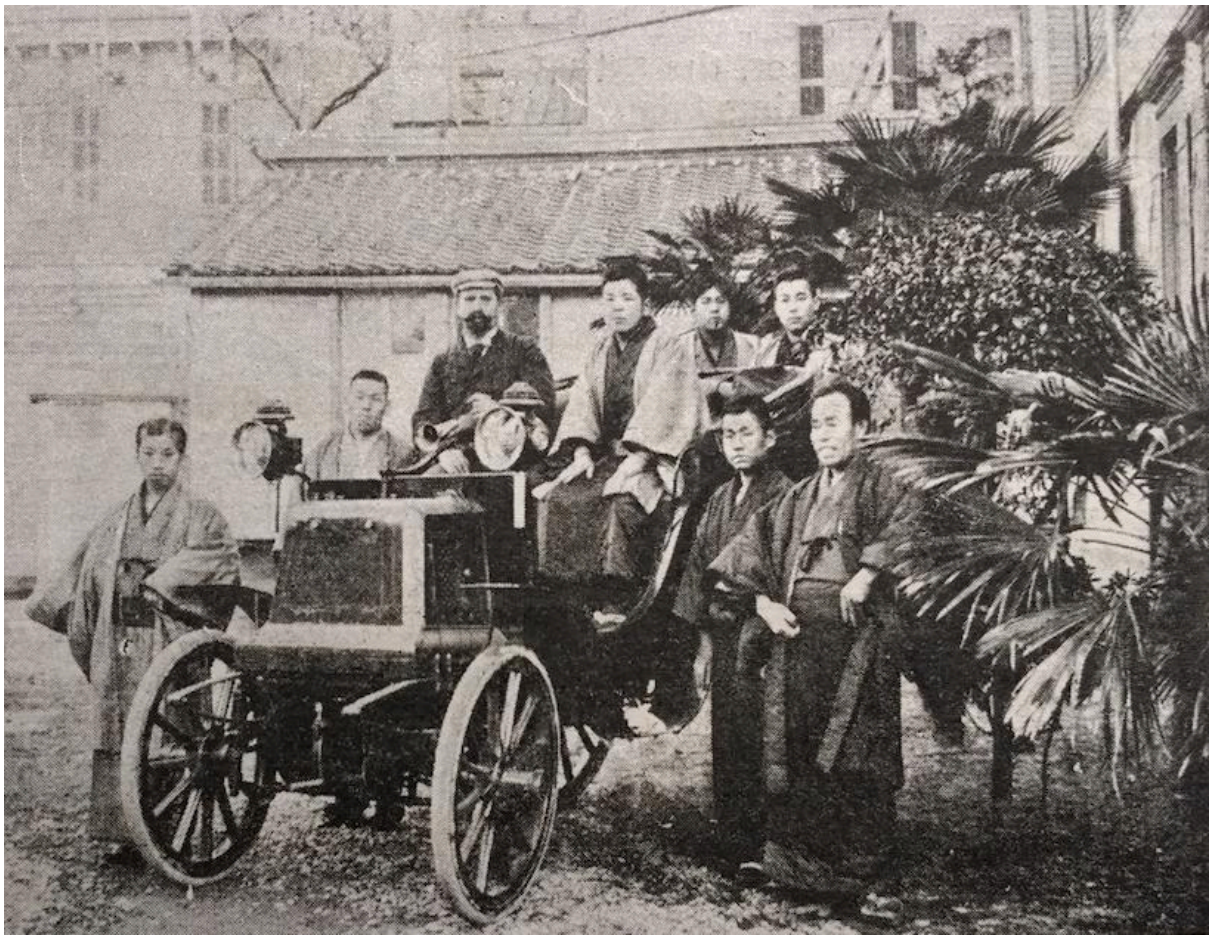
CARRIAGEBUILDERHenryTimken developed a tapered roller bearing sturdy enough to be used in wheel hubs.

ELMERSPERRYOFCleveland,USAbuilt an electric car with disc brakes – the brake pads were applied by electromagnets.

IN GERMANY'SFIRSTrace,overthe 36 miles from Berlin to Potsdam, a Beeston-Humber trike took the flag ahead of a Daimler car and a Clement trike. Harry Lawson launched a Beeston motor cycle using a strengthened bicycle frams. It was powered by a 346cc De Dion engine mounted low, just behind the pedalling gear. Triumph considered making it under licence, but no agreement was reached. Siegfried Bettman also negotiated to make Humber motor cycles but failed to come to an agreement.

JULESTRUFFAULTmadesprungforks for his bicycle; they were quickly adapted to suit motorcycles.

JAMESLANSDOWNENortonbegan making bicycle parts, primarily chains.



The first car was brought into Japan by M Thevenet, a French engineer who was constructing railways in Tokyo.

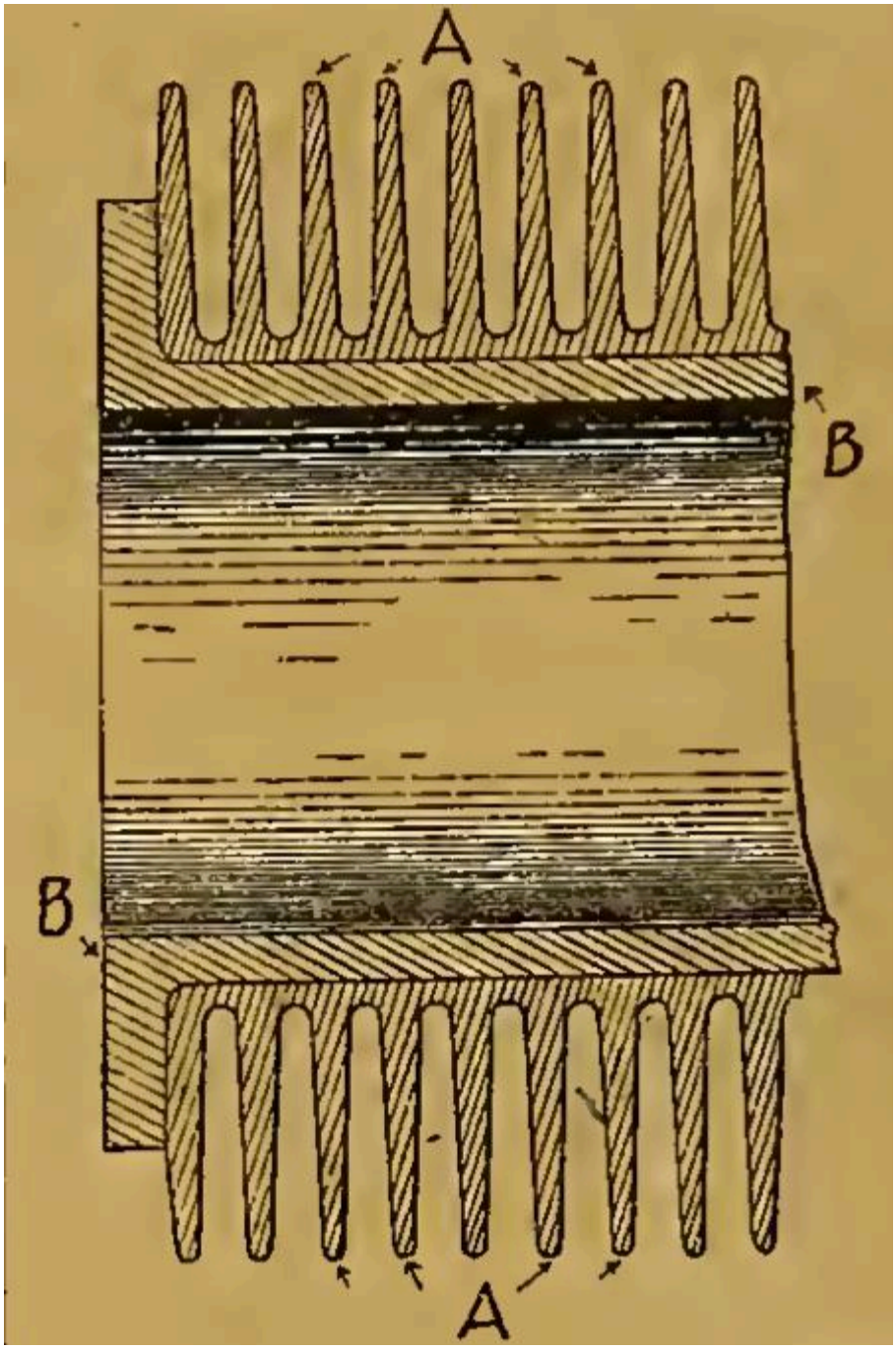
THESCOTTISHREFEREEREPORTED:"Averyinteresting interview with Mr SF Edge, the manager of the Dunlop Pneumatic TyreCo, appears on the subject of motor cycles in this week's Cycle. Mr Edgewas first introduced to the motor cycle somewhere in the spring of last year, since which time in company with Mrs Edgehe has travelled over 4,000 miles in his motette. Regardingbreak-downs to motorcycles, Mr Edgeaffirms that

this has been much exaggerated. Asked whether he thought the motor-cycle would supersede the present type of cycle, Mr Edge gave it as his opinion that it will not, on account of the expense, but added that motor-cycling will doubtless become a popular sport just as yachting."

PEUGEOT EXHIBITED a prototype De Dion-engined Peugeot bicycle at the Paris Salon in 1898, but the first motorised cycles to leave the factory were trikes with De Dion-Bouton engines.

GLOBAL PRODUCTION of aluminium had risen from 15 tonnes in 1885 to several thousand tonnes.

ROBERT AYTON OF COVENTRY lodged a patent covering "Improvements in or relating to radiating devices for heating or cooling purposes…According to this invention I provide the tube, cylinder, or other body from which heat is to be radiated, with a partial or total covering constructed of a metal having a higher conductivity than the metal of which the tube or cylinder itself is composed. Thus in applying the invention to the cylinder of an internal combustion engine, the cylinder may be provided with a conductive covering or with wings or gills constructed of aluminium, silver, or some alloy of these or other metals, whose heat conductivity is considerably greater than that of the iron or steel of which the cylinder is composed…" It was an idea ahead of its time so Ayton did not profit from his patent but he did build and race his own bike in the first (1907) TT. He used a Riley Engine and finished 7th.



This is the original drawing in Robert Ayton's patent specification of 12 August: "A.—Cooling gills of some metal having a high heat conductivity. B.—Cylinder.

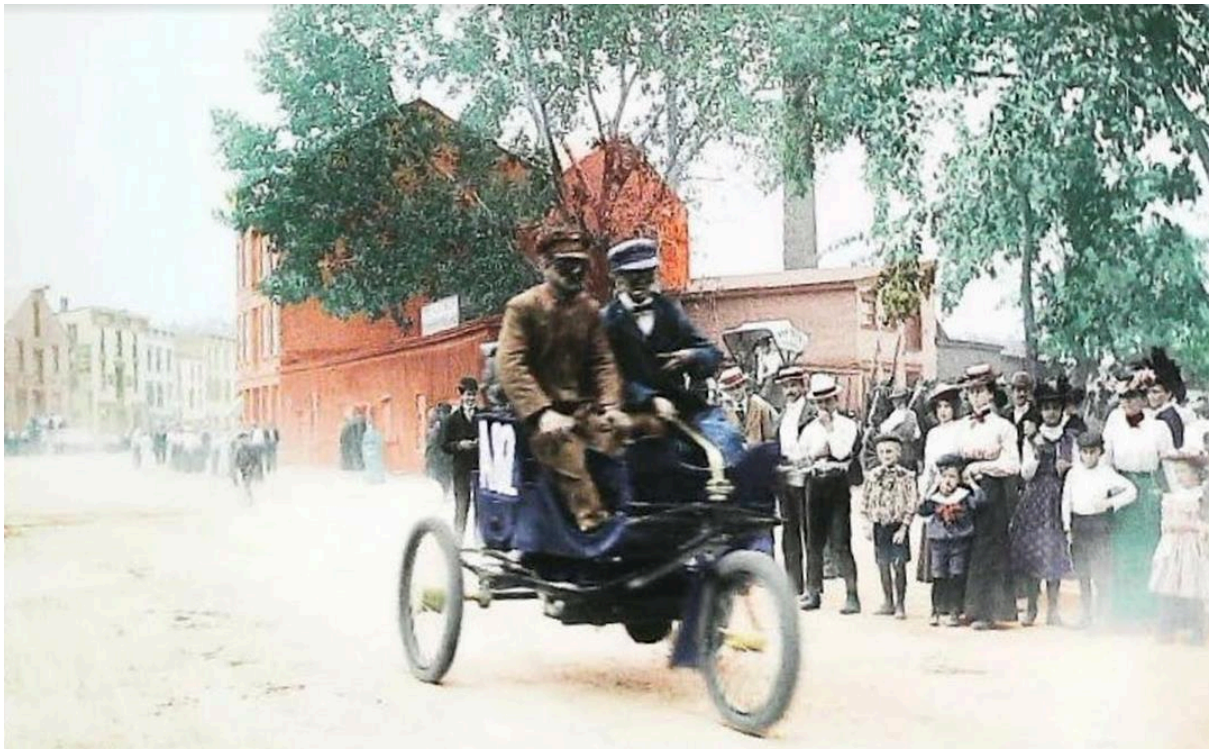
THESCHRADERvalvestemwas patented to facilitate inner tube inflation; we're still using it today.

ANDREEBOUDEVILLEdevelopeda high-tension magneto in Paris, but it lacked a condenser.

DUTCH(EYESINK),Belgian(Sarolea) and Italian (Figini) motor cycles went into production.

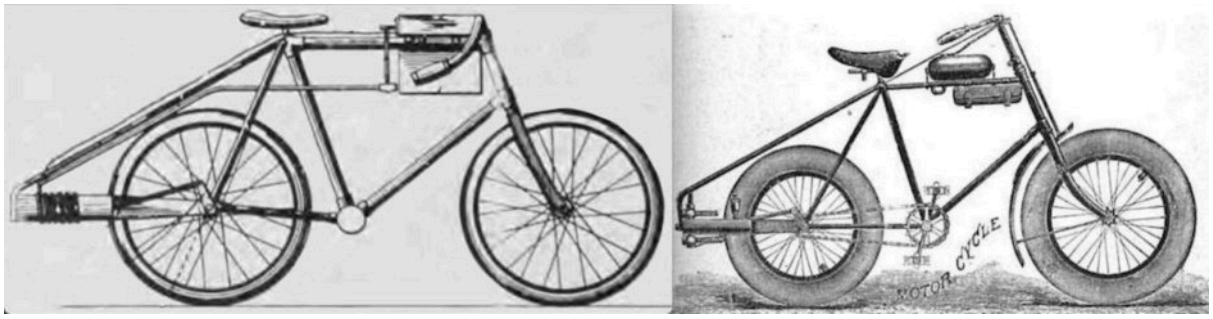
HENRIFOURNIERTOOKthefirst bicycle pacing machines to the United States. A young French Canadian named JakeDe Rosier became infatuated with the motorised machines and, after much persuasion, convinced Fournier to let him ride one. Fournier was impressed enough to hire De Rosier to ride for him in the Paris races. We'll meet Jake again.

Henri Fournier displaying oodles of fin de siècle sangfroid.



No details to hand for this nicely colourised snap of a tricar which, judging by the spectators, is engaged in some sort of sporting event.

WILLIAM R. BULLIS of Chatham, Massachusetts patented a twin-cylinder two-stroke engine equipped with poppet valves; the inlet valves were automatic. The fuel pipes were to be coiled round the cylinders to cool the engine while utilising its heat to vaporise fuel. The ignition was to be actuated by a fitting on the tops of the pistons. The Horseless Age reported that Bullis's engine had been fitted to a "railroad velocipede with most satisfactory results" as it produced "unusual power". Bullis's patent drawing bore an uncanny similarity to the twin made by that arch fraudster Joel Pennington in 1896. (Scroll back up, unless you've just been there; or read more about the scoundrel in the gallimaufry.)



Bullis left, Pennington, right. Surely no coincidence?

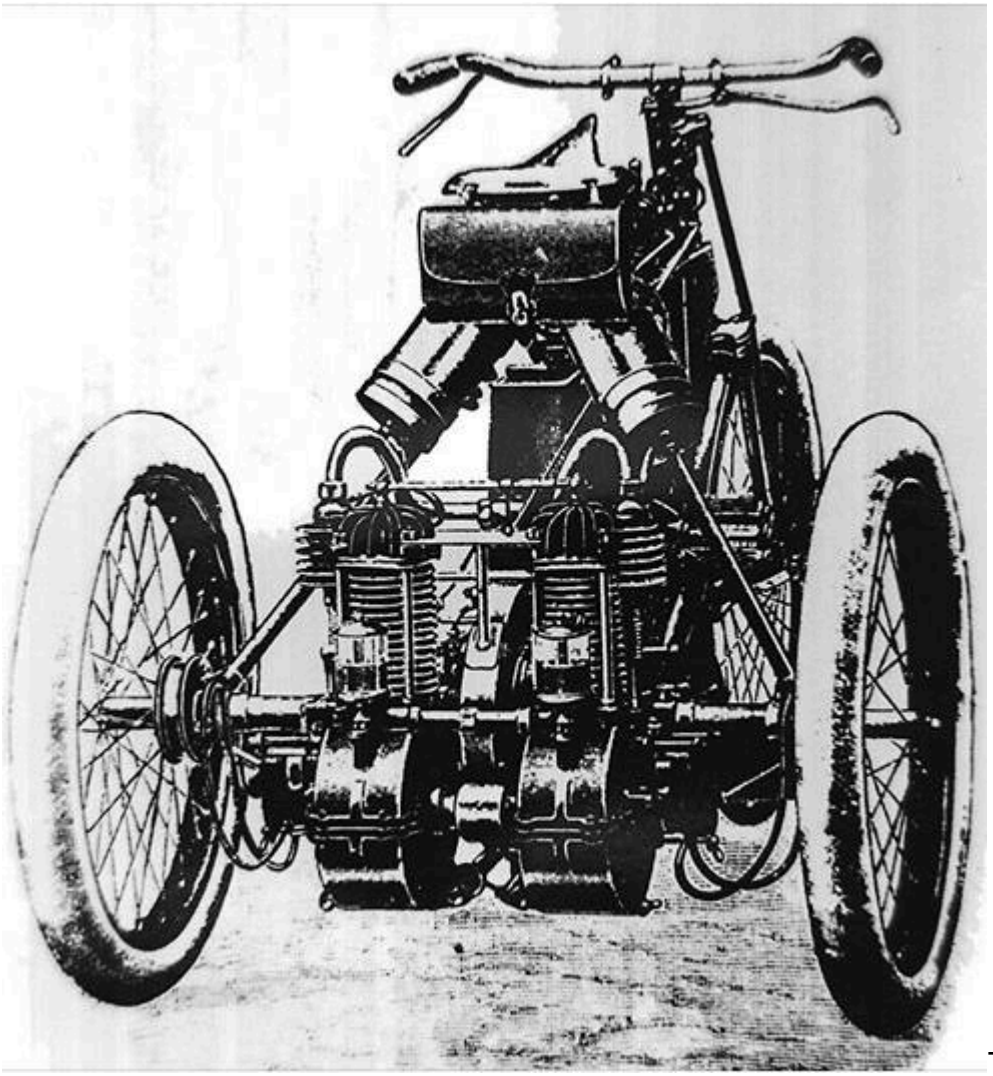
Charles Osmont, pictured on his formidable De Dion Bouton, was the most successful trike racer in France.

This beautifully restored 1898 De Dion-Bouton trike was rated at 1¾hp.

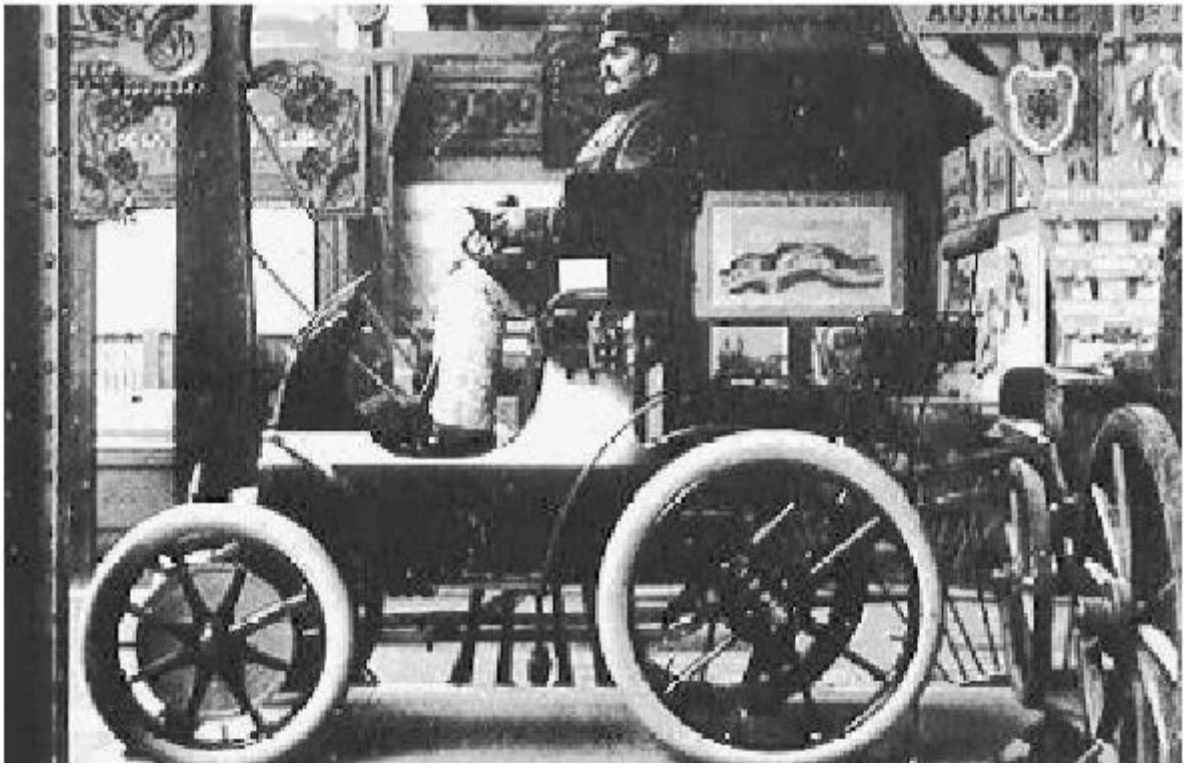
“A MOTOR-CYCLE’SMISBEHAVIOUR.Beforethe Chester magistrates yesterday, Mr Henry Burton Webb, manager of the Rock Ferry Cycle Company, was charged with a breach of the Locomotive and Highways Act. It appeared that Mr Webb arrived in the city from Shrewsburywith his motorcycle. At Chester the machine failed for want of oil. He bought a quantity of benzine, and was proceeding to examine the cycle with a light when the benzine exploded. The flames went as high as the houses, and a boy named Whitley was severely burnt. The inspector of petroleum stated that benzine flashed of its own accord at a temperature of 51°. The defence was that the people flocked round to see the machine, and that the affair was purely an accident. The Bench said they considered the explosion was quite unintentional. At the same time there had not been reasonable care taken, and they inflicted a fine of 20s and costs.”—Westminster Gazette

1899

PRINETTI&STUCCIofMilan, who had been making sewing machines since 1882 and bicycles since 1892, began making Tipo 1 trikes (and quads) using not one but two De Dion engines. They were designed by Ettore Bugati who drove a Tipo 1 to victory in a number of road races. Carlo Maserati built a bike on which he also won several races (yes, THATBugatti and THATMaserati).



The Prinetti & Stucci trike: one De Dion engine good; two De Dion engines better!



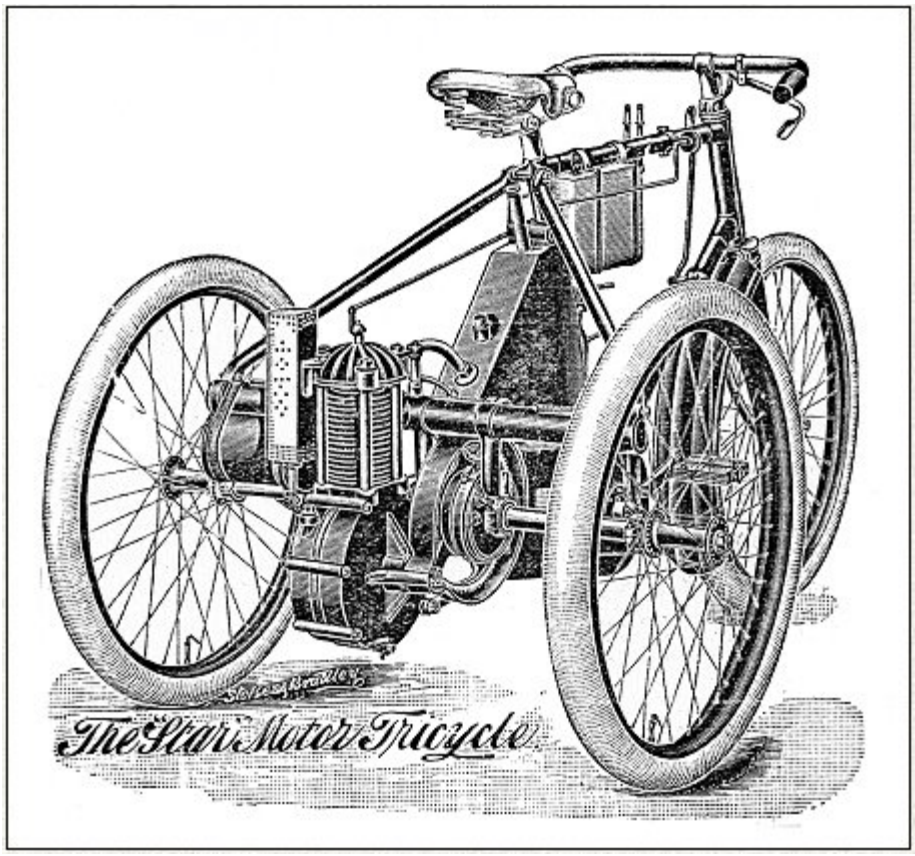
Ferdinand Porsche designed a car for Lohne with electric motors powering each wheel (yes, THAT Porsche).

THE COLLIER Brothers put Woolwich on the map with the first Matchless.

WITH DE DION concentrating on trikes and quads the relatively crude Werner had the market to itself. Harry Lawson's Motor Traction Company bought the UK rights to the Motocyclette for £4,000; the Werners replaced its hot-tube ignition with a trembler coil. MTC also bought the rights to the four-cylinder Holden. Raleigh fitted 1½hp De Dion engines into its trikes. De Dion-style engines were built under licence by Fafnir in Germany, Laurin and Klement in what is now the Czech Republic and MMC in England. Other firms simply built their own versions; they included Aster, Buchet and Clement in France, Sarolea in Belgium and ZL in Switzerland. Also in Switzerland Henri and Armand Dufaux made an engine to power bicycles. It came in its own subframe which was said to look like an engine in a bag so they called it the Motosacoche, which translates as "engine in a bag".

Ariel started production of De Dion-engined trikes.

An advert for Automoto in the magazine La Vie Au Grand Air proclaimed: “This is the machine which Ducom chose for his Paris-Brest record.” It was rated at 2hp @ 1,500rpm; the engine weighed 26kg.



The Star Cycle Company of Wolverhampton produced its first motorised cycle in 1899 in the form of the De Dion-engined Star Motor Tricycle.


SPECIAL FRAME FOR MOTOR TRICYCLE.

CONSTRUCTED TO CARRY 1¾ H.P. DE DION MOTOR.

Marketed to meet the demand for a thoroughly reliable frame by makers who prefer to build their own motor tricycles. The following are some of its special features:

The motor is easily attached.

All gears and bearings completely cased in and perfectly dustproof.

Chain stationary except when pedalling.

Front and rear band brakes.

Electrical connection to handle-bar switch to left handle.

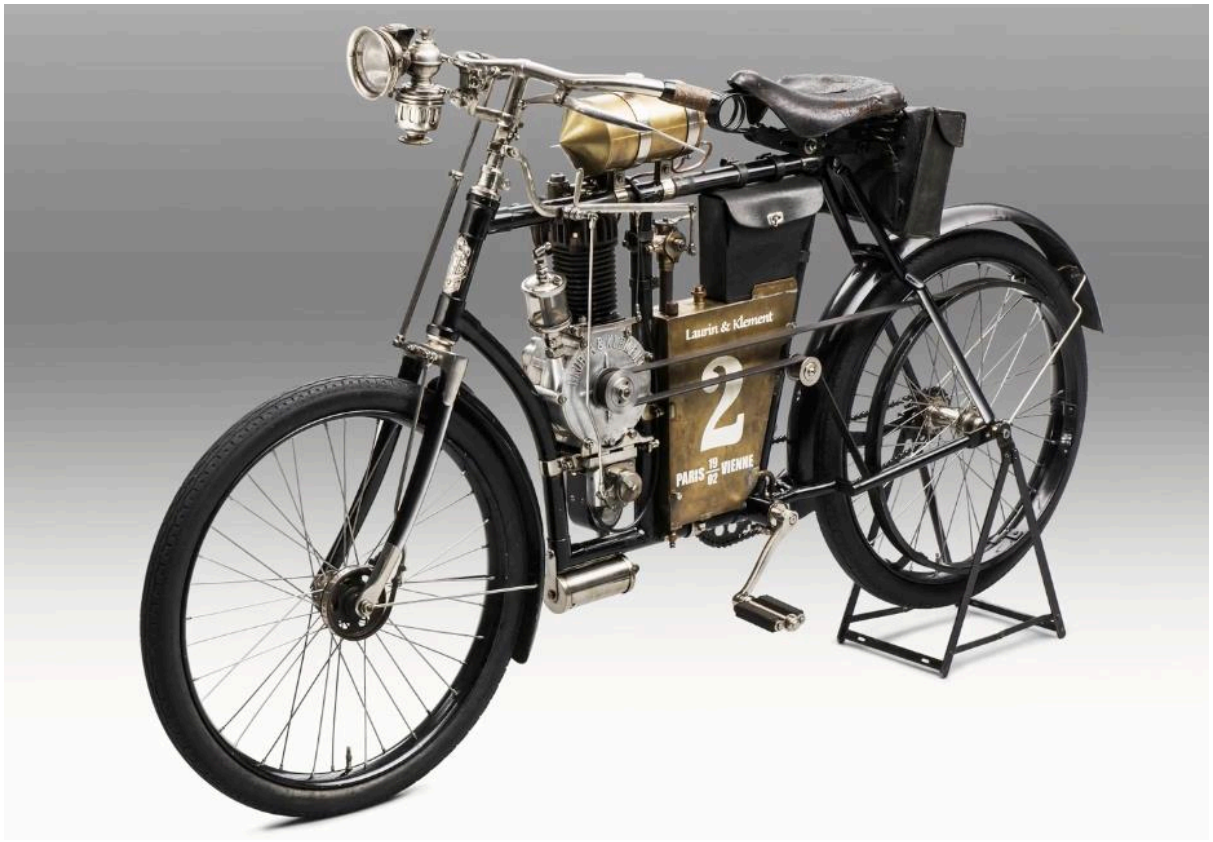
This frame is supplied highly nickel-plated and enamelled ready in every respect for wheels to be built and motor attached, and in conjunction with a De Dion motor (which we can supply) makes a motor machine second to none.

PRICE (to the trade only) ON APPLICATION. Can be supplied from stock, no waiting.

To the Trade.—Have you our complete List of motors and fittings? If not, write to us for one. Retail buyers should refer to last week's *Autocar* for illustration of our complete machine, Price £75.

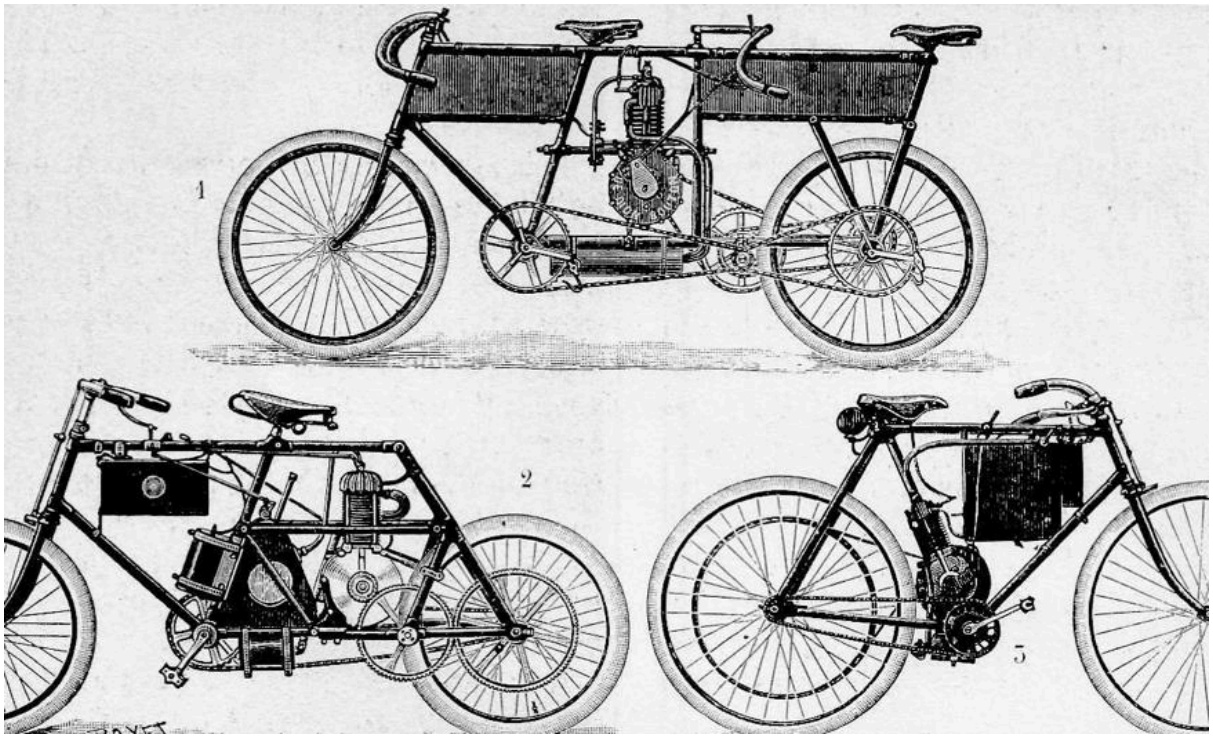
BROWN BROTHERS, LTD, Great Eastern Street, LONDON, E.C.

Brown Bros offered a pedal trike designed to take a De Dion engine, allowing bicycle shops to enter the motor trade.

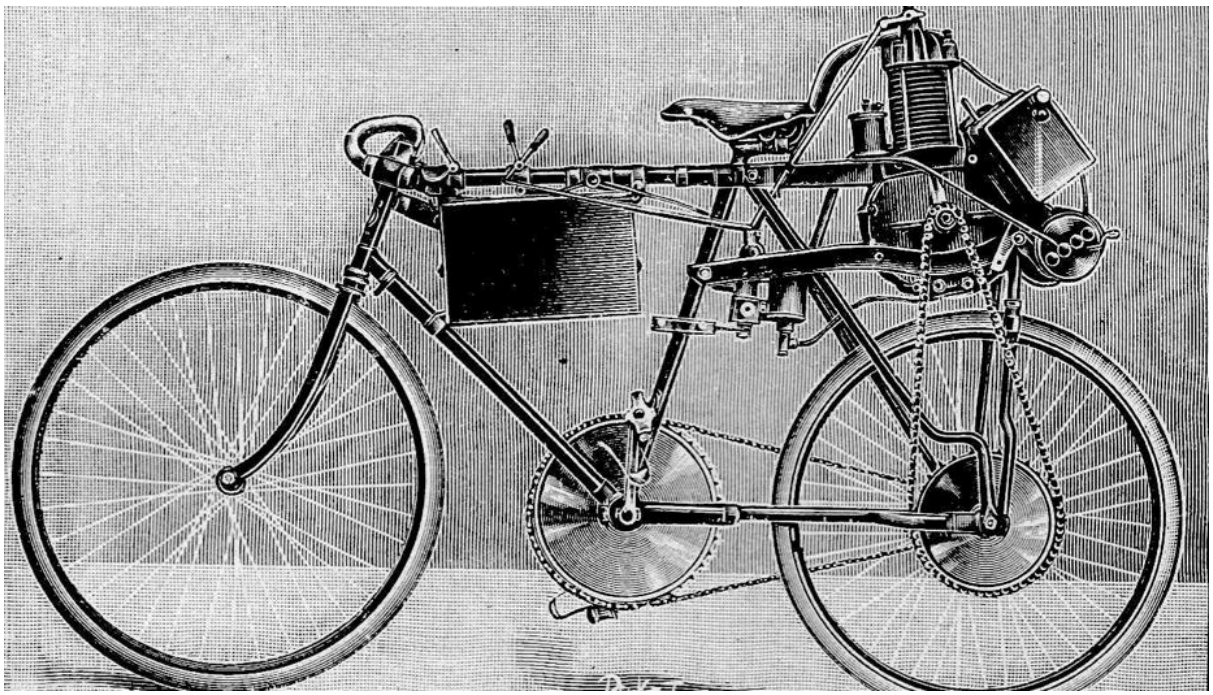


Czechs Václav Laurin and Václav Klement, who had been making bicycles since 1895, fitted a 1¾ hp 240cc De Dion-style engine to produce the Slavia with a claimed top speed of 25mph. It stayed in production for five years with a total output of 540. This example survives in the Skoda museum (Skoda bought L&Kin 1925).

FORANYONEPLANNINGan Easter run The Autocar listed petrol suppliers—there were four in London and 29 elsewhere in England, including a chemist and a grocer.



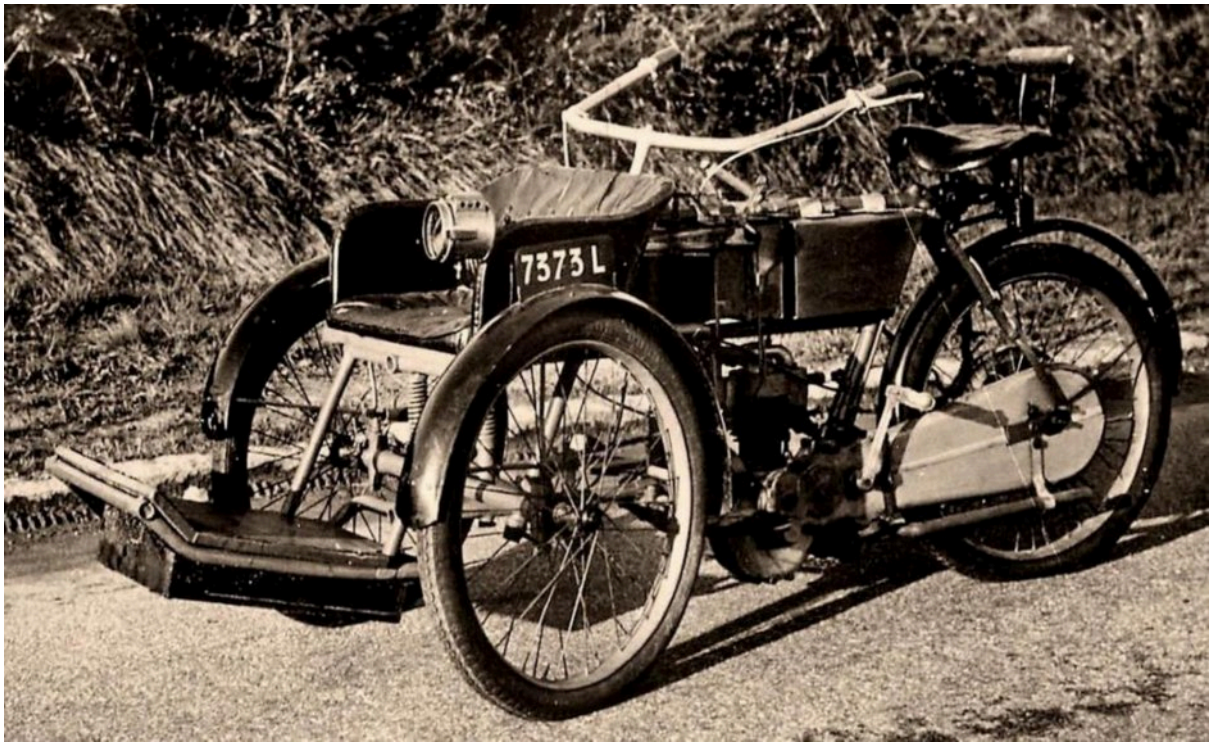
Once 'clip-on' proprietary engines became available lots of bicycle manufacturers wanted to fit them, but no-one was quite sure where. Top, Richard-Choubersytandem with all-chain drive; Above left, gear driven Giradot; Above right, the belt-drive Lamaudiere et Labre,



Bolt-the-engine-anywhere-it-fits dept: The designer of the wonderfully Heath-Robinson Boyer clearly thought it made a good backrest.

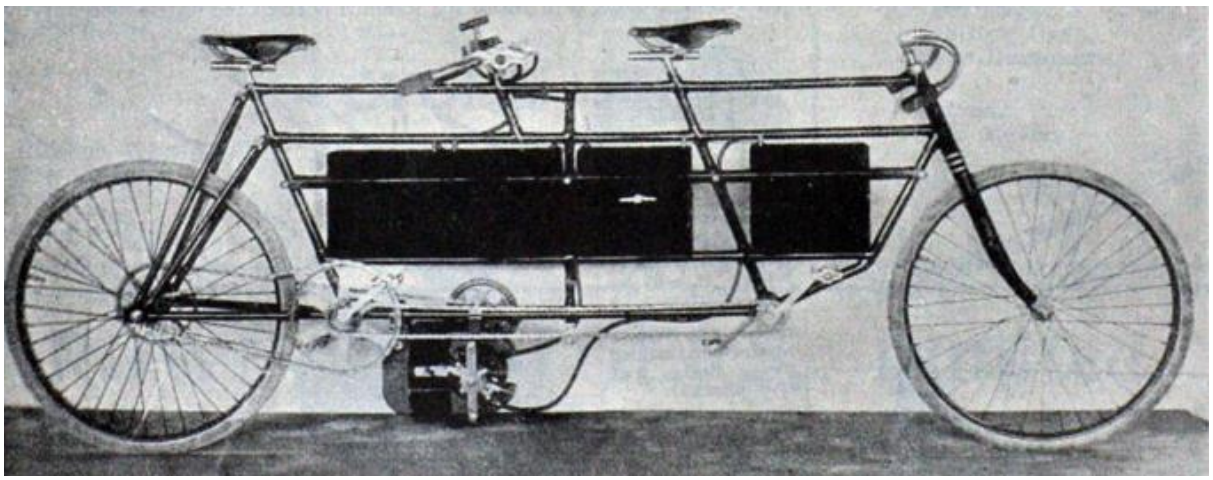
IN THE US THE Marsh Brothers, WT and AR, built the 1hp single-cylinder Marsh Motor Bicycle.

IN FRANCE Paul Bruneau launched a business making motorised bicycles and tricycles.



Paul Bruneau made a practicable forecar.

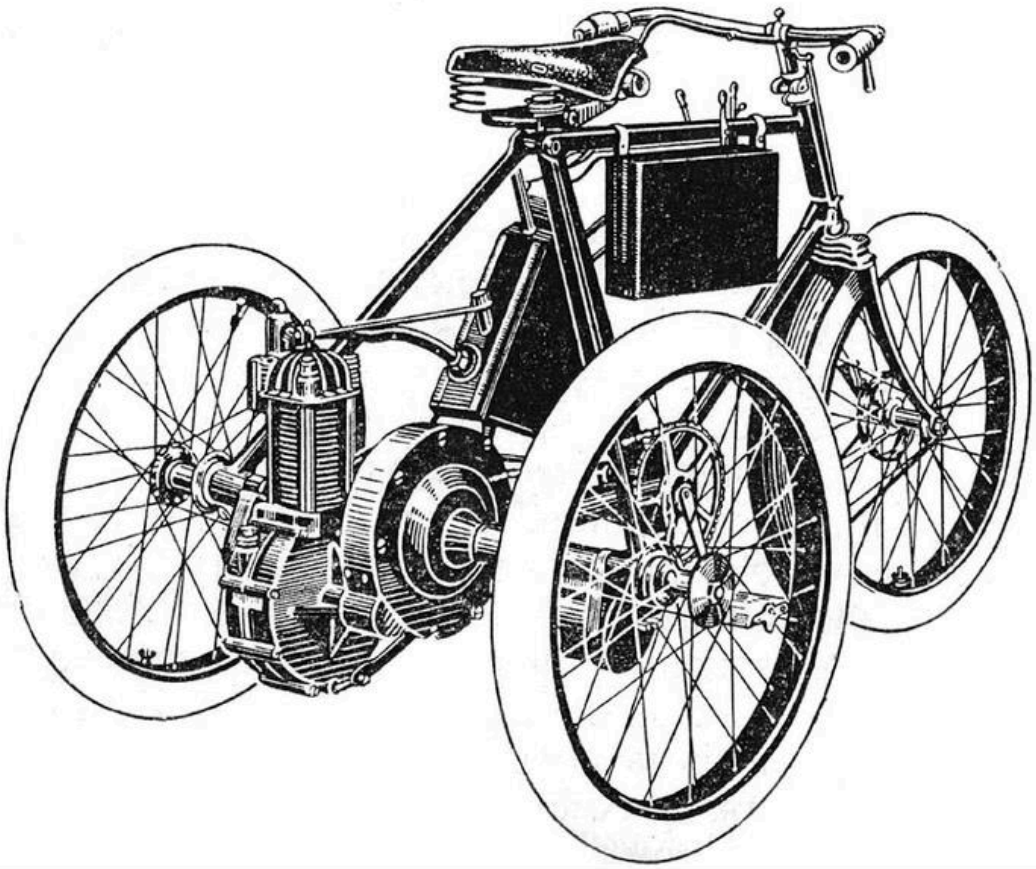
HUMBER CONSTRUCTED a tandem, driven by a battery-powered electric motor. Although its life was short—petrol-engined pacers were faster—it proved to be useful on racing tracks where it was used for cycle pacing. A ladies' bicycle, modified to carry an engine behind the seat tube, was also produced, along with a forecar known as the Olympia Tandem. This was based on the Pennington design, with the engine hung behind the rear wheel. None of these models were produced beyond 1899.



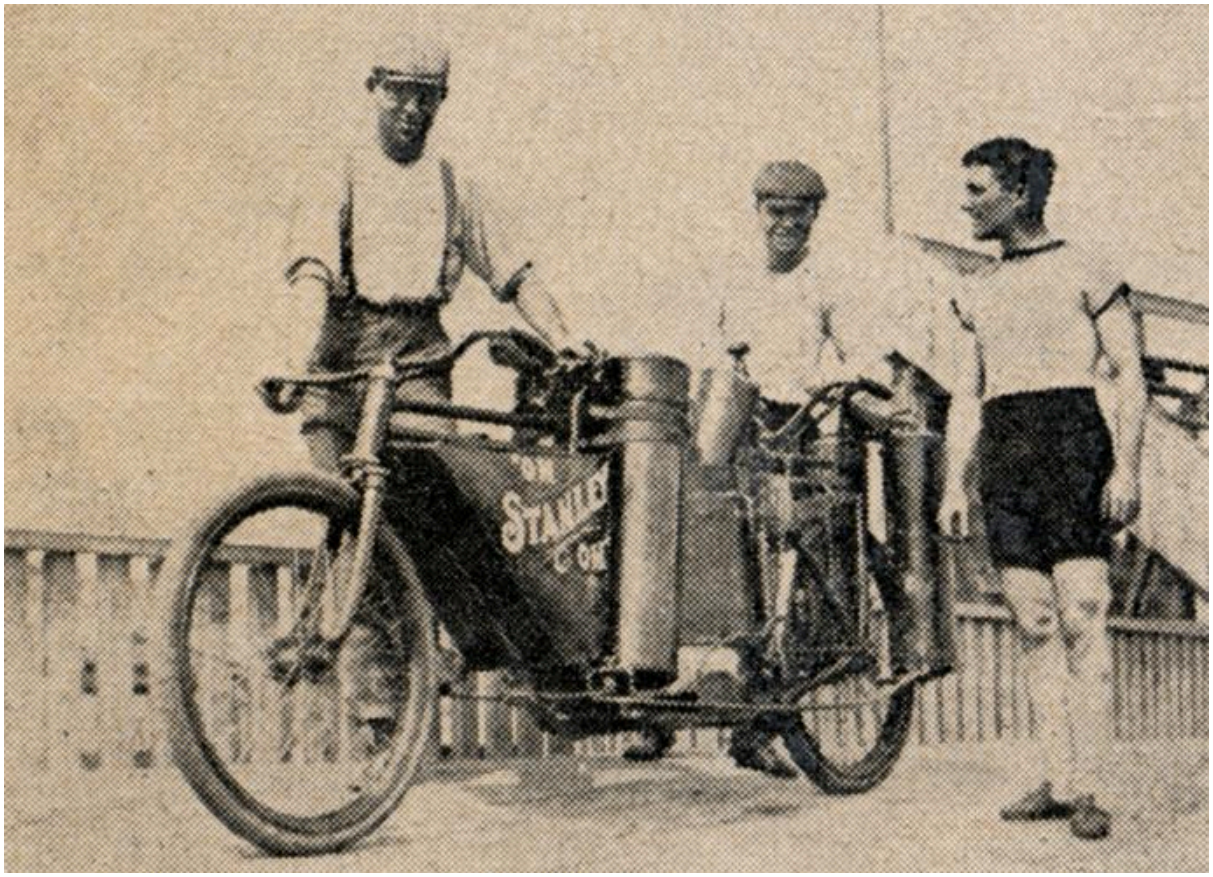
Humber's 1hp electric tandem cycle pacer was said to have managed 40mph on a velodrome.

FOLLOWING A FACT finding tour of France, Germany and England, or to be more precise, Coventry, German emigree Alexander Leitner returned home to Riga, Latvia to

set up as a bicycle manufacturer. He prospered. Then, having tried and being unimpressed by a Hildebrand & Wolfmuller, Leitner saw some De Dion trikes in St Petersburg and produced half a dozen, using a reinforced version of his existing pedal tricycle.



De Dion trikes were successful throughout Europe; a batch were produced in Riga, Latvia.



The Stanley twins built a pacing bicycle for champion racer Eddie McDuffee. It helped him set a machine-paced mile record of 1min 32sec at the Buttonwood track in New Bedford.

JOHN HARRIS OF CLEVELAND, OHIO was using an oxy-fuel process in an attempt to make synthetic rubies and sapphires when he accidentally cut through a steel plate. He developed the process and established the Harris Calorific Company to manufacture and sell oxy-acetylene welding and cutting equipment.

JOHN PERRY, DSC, FRS, PROFESSOR OF MECHANICS and Mathematics in the Royal College of Science, Vice-President of the Institution of Electrical Engineers, Vice-President of the Physical Society, wrote a prophetic essay on the evolution of engines and energy sources: "Watt was jubilant if his cylinder was not more than an inch untrue in its bore…the limits of error now allowed by Messrs Willans and Robinson are 0.05mm, and there is less error allowed in other parts of an engine (the metric system of measurement is in use in these excellent shops; its introduction has given no trouble whatsoever). in 1629, the Italian architect Giovanni Branca conceived Branca engine that operated on the same principle as today's impulse turbines, but it remained at the conceptual stage and never saw practical use. Why! the very engine of Branca, almost without improvement, has lately been brought into use, and already competes in economy with the very best steam engines of equal power. There is a great deal of virtue in a revolving wheel. It may go at great speed, and yet not shake the framework which supports it, even when this framework is light. The very earliest engine, that of Hero, was

really a revolving wheel, a reaction turbine, and as I write this (April, 1897) I have received a letter from a friend in Newcastle to say he had just been out on the new Parsons' turbine steam boat, and that it proves to be the very fastest boat that has ever gone through the water, although only 100ft long. And furthermore, at much smaller speeds, the very best other boats vibrate so much that a man in the stern can hardly keep himself upright, even when holding on hard, whereas at its highest speed the Turbinia has no vibration. When Aladdin first discovered the power at his command it is remarkable how conservative he was in his notions. He made the genie bring him silver dishes, because he started in the silver dish line, and there is one of the most interesting of lessons in the fact that although each of his silver dishes was worth sixty pieces of gold, he sold each of them for one piece of gold over and over again. Aladdin's imagination had to be stirred by a violent emotion before he could make the genius work in other ways for him. Even at his best I believe that Aladdin never took full advantage of the power of the wonderful lamp. His finest palace was probably just an ordinary house, made very large and stuck over with precious stones, as vulgar as Milan Cathedral. The engineer, far more than Aladdin, needs to have his imagination developed, because Aladdin's power was unlimited, whereas, great as the stores of Nature are, they are not all for the engineer to develop. It is possible that future scientific men may discover some way of developing them, but so far as we can see there is no great store of energy available for man which is in any way comparable with coal. For the past 20 years I have lifted up my voice occasionally in the hearing of a not unbelieving but a half-hearted generation, to warn men of the time to come, when their great stores of energy will be exhausted. The chancery law of England is destroying invention in all but small details; but if I am right in my beliefs, it would be worth while for our government to hand over a few millions of money to its best scientific men, telling them to squander it in all sorts of experiments, in an intense search for some method by which instead of only from one-twelfth to one-hundredth of the energy of coal being utilised, nine-tenths of it might be utilised. If I am right, almost all the social and political questions which excite us now will be of small importance on the future of the human race, for the wild competition of nations and people for luxuries must gradually during the next 400 years become a struggle for mere existence. Quite common men live now in houses furnished with luxuries of which no potentate of the Middle Ages could dream. I think it to be evident that very much the greater part of all that goes to make up our civilisation is directly or indirectly to be traced to our utilisation of coal, and it is just as evident that when our stores of coal get exhausted the greater part of all this wealth and evidence of civilisation must disappear. The world will not be left in its old state. The old state was like that of an earnest poor young man with great hopes, the new state will be that of the spendthrift, whose fortune has gone but whose expensive habits remain. Then will come the time of great struggle for Niagara by all the civilised nations of the earth; the water power of the West of Ireland will form a new centre of civilisation, as will the hills of Switzerland and all places of high tide round the coasts of the world. Then will be the

time when men will try to utilise the stores of energy which now seem to be insignificant or hopelessly out of our reach: the direct radiation from the sun or the internal heat of the earth. I am sure that the mind of no engineer ought ever to be quite free from this incubus that we are wasting our coal with enormous rapidity: that a heat engine is essentially uneconomical. But this book is altogether about heat engines, and when in future I shall speak of the economy of a steam engine, I shall compare it not with that of the perfect engine about which we know so much, but of which not one cheap specimen has yet been made, and not even with the most perfect heat engine imaginable but with the perfect steam engine. In Great Britain an annoying defect may remain unreformed for a century, but let it be called a nuisance by a chancery court and reform is very rapid. Large steam engines are now working in towns: not merely in the slums, but in the districts inhabited by rich people. We are first told that really we must produce no smoke, and instantly we use mechanical stokers or better grates and flues, and we refrain from forcing the fires, and get rid of smoke, although for 100 years every engineer has declared the thing impossible. There is a vast difference between being asked to try to get rid of a nuisance and being told by the policeman that we must stop working if we create a nuisance. We find it necessary to use non-condensing engines in towns because condensation water is expensive; and of course our blast pipe becomes an organ-pipe nuisance; we find that all window frames within half a mile are really microphones. We have remedied this defect of our engines because the only alternative was to stop working. There is a defect that is put up with in locomotives and in ships which is ever so much worse in a large town, and it has been declared to be a nuisance. Consequently every young station engineer has already acquired an astonishing amount of cunning in diagnosing it and mitigating its effects. It is the vibration produced by reciprocating engines. Of course the only real remedy is the use of a steam or gas turbine, sure to be applied in the long run; but capital has given momentum in the direction of reciprocating engine manufacture, and a complete change towards turbine manufacture must be slow."

Trikesruled the motor cycling roost at the end of the century. Theseenthusiasts, pictured at the start of a run in Belvès,in the Dordogne,are all on three-wheelers…

…howeverquads also had their afficianados and this 294cc De Dion forecar certainly looks purposeful.

THECRITÉRIUMDESMotocyclettes is said to be the first race to have been run exclusively for motor cycles. It ran from Etampes to Chartres and back over a distance of 100km; EugèneLabitte won on a Pernoo motorcyclette, powered by the 1¼hpLabitte engine he produced.

I don't know how many Pernoos were produced but at least one has survived, to be sold at auction in Paris in 2018 for nigh on 48,000 Euros. You'd think they'd have included a front tyre.

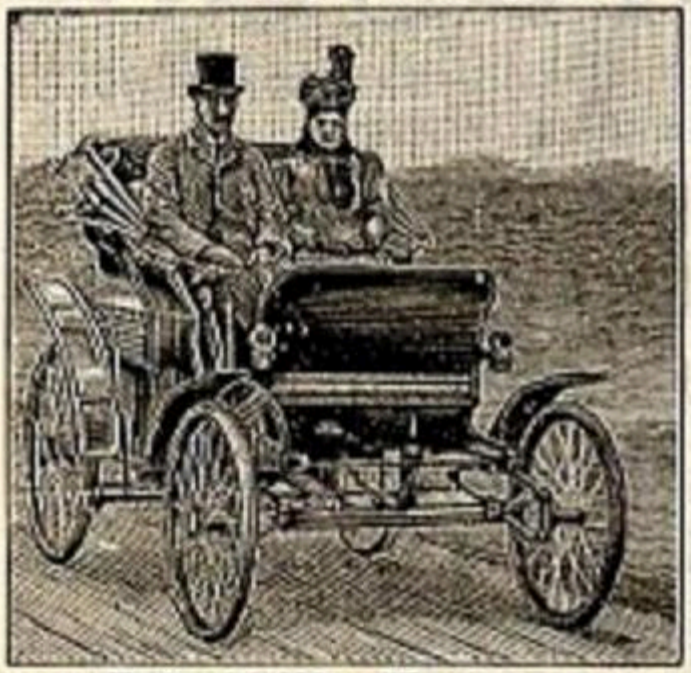
"PARIS, BEING AT PRESENT without any cycle races, seems to be taking kindly to motorcycle contests. One of these was held on Sunday last at the Parc des Princes cycle track, the competitors being Corré and Osmont, who both rode petroleum tricycles. The match was of six hours duration, and Osmont won, covering 236 kilometres, leaving Corré (the old-time cyclist) a long way behind."—Cycling

Now then. This picture shows trike ace GeorgesOsmont, looking particularly cool with a Gaulois drooping nonchalantly, and a rider named Tarte. Theyare listed as coming 2nd and 3rd in 'Le Criterium des Motocyclettes'. But the Criterium is described as the first race for two wheelers. Maybe there was a class for trikes; in any case three-wheelers were often refered to as motor cycles.

…and, still toking on his Gaulois, here's Osmont on the start/finish line with his De Dion trike and, in his customary bowler, the imposing figure of Compte De Dion himself.

THEFIRSTMEETINGofthe Tour de France Automobile was held, with 19 cars and 25 motorcycles starting a course of seven stages over 2,216km.

DISPENSE WITH A HORSE



Price $1,000. No Agents.

and save the expense, care and anxiety of keeping it. To run a motor carriage costs about ½ cent a mile.

THE WINTON MOTOR CARRIAGE

is the best vehicle of its kind that is made. It is handsomely, strongly and yet lightly constructed and elegantly finished. Easily managed. Speed from 3 to 20 miles an hour. The hydrocarbon motor is simple and powerful. No odor, no vibration. Suspension Wire Wheels. Pneumatic Tires. Ball Bearings. ☞ *Send for Catalogue.*

THE WINTON MOTOR CARRIAGE CO., Cleveland, Ohio.

Yes, an ad for a car. Here's why: The company was launched by Scottish immigrant Alexander Winton, sold its first car in 1898 and, in 1903, a Winton was the first motorised vehicle to cross the USA. Now Winton had two partners, and one of them was called Thomas Henderson who had a son who designed a four-cylinder motor cycle that in 1912-13 was the first bike to be ridden round the world. It's a funny old world, innit?