Ford, Cars, and a New Revolution: Crash Course History of Science #28

Crash Course: History of Science
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Historians looked at a bunch of changes in technical systems and called it the Industrial
Revolution…
But historians love to debate each other.
So some of them pointed out that the first half of this revolution looks a lot different
from the second.
Basically, the First Industrial Revolution ramped up around 1800.
It started in Britain, ran on steam, trains, and factories, and led to lots of scientific
discoveries by individual researchers such as Volta, Faraday, and Maxwell.
The Second Industrial Revolution resulted from the industrialization of electricity
and mass manufacturing.
It happened around 1900, started in the United States and ran on electricity, cars, and communication
technologies.
And it led to technological inventions owned by corporations such as the various Edison
companies and everyone's favorite Orwellian corporate work camp, Ford Motor.
[Intro Music Plays]
Whatever terms you use, the world at the end of the nineteenth century looked very differently
than it did at the beginning.
For one, lots of people could now see at night because of electricity.
For two, the scale of industry—and even what the word even meant—had changed.
For example, German-American engineer John Augustus Roebling lobbied for
the 486-meter long Brooklyn Bridge, connecting Manhattan to Long Island.
His son, Washington, oversaw construction until 1870, when he was seriously injured.
Then, Washington's wife and co-chief engineer, Emily Roebling, oversaw construction through
the bridge's completion in 1883.
Meanwhile, in Paris, the wrought-iron Eiffel Tower, completed in 1889, created a metaphorical
bridge into the future… and a literal bridge to nowhere,
It's not a bridge.
And three, and one of the most iconic, scale-shifting, nineteenth-century American inventions was
the cheap automobile and the new, more efficient factory system that created it.
Karl Benz invented the practical automobile in 1885.
But cars in the late 1800s were super expensive.
So most people moved around on ships or trains between cities, and on horses within them.
There was just one problem: biology.
Horses got sick, died, and got into accidents causing traffic jams.
Plus, cities couldn't figure out how to clear away their manure fast enough.
In fact, New York City hosted the first professional conference on urban planning in 1898, and
the theme was horse poop management.
Which probably was a respectable job!
As the saying I just made up goes, 'tis better to manage than to shovel.
Anyway.
People loved the idea of cars, if only they worked better…
Enter Henry Ford, a famous inventor who modeled his life on Edison's…
A Progressive vegetarian who helped invent social welfare…
And a racist who helped invent social engineering, inspiring Adolf Hitler.
It's safe to say that Ford's legacy is… complicated.
Ford was raised in Michigan and, in 1879, became an apprentice machinist.
Then in 1891, Ford joined the Edison Illuminating Company in Detroit.
He became chief engineer only two years later, working on the side on experimental projects
such as the "quadricycle."
Which—why is that not a thing I can buy!?
Ford loved Edison, the company and the man.
He saw Edison's corporate research on lights, phonographs, and movies in New Jersey and
thought—YES! GOOD!
I'm going to do that, but bigger, for cars.
So in 1903, Ford co-founded the Ford Motor Company.
When Ford got started, there were many small auto companies turning out gas, electric,
and even steam-powered cars.
In fact, electric cars were popular!
But all of these cars were still expensive and unreliable, and there were no standard
car parts.
Ford set out to change all of that.
Vroom, Vroom ThoughtBubble.
In the early years, Ford Motor was a small-scale operation that carried out mostly experimental
work.
They had no uniform process for manufacturing cars.
Ford's team learned a lot, and drummed up a lot of public interest.
The Ford 999, for example, broke the land speed record, covering a mile in only 39 seconds.
But Ford wanted a car that was affordable, easy to operate, and tough.
He pushed his team, and in 1908, they released the Model T. and this car changed the world.
In the first month, only eleven Model Ts were produced.
But two years later, in 1910, Ford produced 10,000.
In 1914, the year the first World War broke out, the company shipped 250,000.
And in 1916, Ford sold nearly 500,000 cars—each for less than half the 1914 price!
Then, in 1927, Ford produced fifteen million cars, plus tractors and lots of other machines.
These large production numbers highlight the phrase most often associated with Ford: mass
production.
This style of production meant specialization and standardization.
The Ford plants at Highland Park and River Rouge only produced one thing—the Model
T.
These plants used Ford's special business technique, the assembly line.
So they could assemble a car from raw materials in only twenty eight hours.
Using sheet metal, they could assemble a Model T in one hour.
Without robots or computers!
You could even visit and see this happen, because Ford loved watching people experience
how his cars came to life.
So Ford succeeded thanks to unskilled labor and a modular system that anyone could learn
a single part of.
That was the core idea of his assembly-line philosophy, "Fordism": build sophistication
into the product, making it modular, using standardized parts.
And take skill out of the work involved.
Just weld some parts and—presto, you're ready zoom past horses and put all those poop managers out of business.
Thanks Thoughtbuble!
Ford hoped Model Ts would protect his version of a small-town, American utopia: now, country

doctors and lawyers could drive around, just like rich British and German dudes!
He also hoped that it would keep farmers on the farm.
Well, white farmers, anyway.
And he wanted to spur an entire industry of small-scale entrepreneurs who could augment
and repair his cars.
He even published a Model T repair catalog to help them.
The irony was that, with his growing company, Ford Motor created an environment hostile
to small automobile entrepreneurs.
It was expensive to invest in an assembly-line factory.
And Ford had a problem.
Working on an assembly line was awfully boring, so he faced a three hundred percent turnover
rate.
He also had twenty seven million dollars in cold profits that he could reinvest.
So he came up with a solution: double his workers' pay to a whopping five dollars
per day.
This sounded great: in fact, it caused riots when it was announced, as people tried to
get these amazing jobs.
In reality, only white men were even eligible to earn the whole five dollars.
African-Americans earned twenty percent less, and women were mostly ineligible.
But Ford worried that simply paying people more wasn't enough.
He wanted to educate his workers to become model citizens.
So he stipulated that they could earn this new wage only if they met certain conditions:
one, they had to work for six months.
Two, they had to be clean-living: sober, "thrifty," possessed of "good moral habits," and
involved in civic life.
And three, they had to swear off all involvement with union activity.
Ford even went so far as to set up the Ford Sociological Department, which conducted inspections
of his workers.
In his mind, he wasn't just producing cars: he was producing Americans.
The Sociological Department had images of what a worker's house was supposed to look
like.
They inspected these homes and then published before-and-after photos to show worker compliance
with the company's rules.
Ford felt this was his duty.
He hated the trends he was seeing in industrial society.
Ford viewed immigrants, especially Jewish immigrants, and the corporations that employed
them as serious threats to democracy.
In the late 1920s and '30s, Ford turned to focus on his social goals.
He wanted Americans to learn "not from the school books but from life."
So he opened a museum dedicated to Thomas Edison.
And then another one all about Ford Motor.
Then Ford went really overboard.
He relocated the homes or workshops of famous inventors and recreated others, organizing
them into a whole town, called Greenfield Village, with no regard to geographic accuracy.
Greenfield is a mishmashed paradise for a historian of technology.
To this day, you can visit Edison's Menlo Park laboratory, the Wright brothers' bicycle
shop, and George Washington Carver's house.
Ford Motor kept operating his museums and Greenfield Village after he died, updating
the museums to showcase all kinds of innovations.
What were the short-term effects of scaling up the auto industry?
Well, this also meant scaling up the infrastructure of roads, gas stations, and mechanic shops
that could keep motorists a-motoring.
Cars also increased access to national parks.
More people were moving to cities, and the US government was starting to protect wild
spaces from development.
Cars allowed people living in cities to get out to these spaces, generating new interest
in nature with a capital N.
This led to research on the scientific management of forests and influenced the young discipline
of ecology, which we'll get to in a later episode.
In terms of economics, other car manufacturers emulated the Fordist assembly-line method.
While Ford concentrated on producing as many Model Ts as possible, General Motors created
many different models, giving Americans more options.
By the middle of the century, only three companies—the "Big 3," Ford, GM, and Chrysler—dominated
the American auto market, pushing out small, regional manufacturers.
And Ford's company became a symbol for the transformative power of American industry—and
for the tensions between the owners of large corporations and the workers running them.
Industrialists felt that their workers had freedom, as non-unionized contractors, and
that large corporations were the natural result of innovation.
Workers, on the other hand, didn't feel free.
They worked long hours and often had little choice, as with Ford Motor, as to where (and
even how!) they lived.
They came together, forming unions, in order to negotiate for better labor conditions.
Finally, scientists and engineers professionalized a lot over the course of the 1800s.
The American Medical Association, for example, was founded in 1847.
And Wyoming became the first state to legally license engineers, in 1907.
Increasingly, being a doctor or engineer wasn't something you could just do.
You needed university training, financial backing, and professional licensing.
And corporations such as the Edison companies and Ford Motor offered paths for professionals
to follow, shaping what it was that scientists and engineers did all day, and why they did those things.
Today, many people claim there has been a Third Industrial Revolution, tied to digital
information technologies, and even a Fourth, current one, tied to Internet-connected automation.
Before we get to those stories, however, we have the entire twentieth century to get through!
Next time—bust out your old records: it's the birth of mass media!
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