THE HENRY FORD

COLLECTING INNOVATION TODAY

TRANSCRIPT OF A VIDEO ORAL HISTORY

INTERVIEW WITH TRANSPORTATION CURATOR

BOB CASEY

ON HENRY FORD

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BARRY HURD:

01:01:01;28 Okay. Ford didn't invent the car, didn't invent the assembly line. But, you know, when you think about, why is he considered one of the greatest innovators of all time?

BOB CASEY:

01:01:12;08 That question, if Ford didn't invent the car or the assembly line, why is he an innovator? That really gets to the whole difference between an inventor and an innovator. Lots of other people had worked on cars. Lots of other people were actually building and selling cars before Henry Ford.

01:01:31;15 His great innovation was to be able to build a car in high volumes at low prices that people would want to buy. And, by making the car available to lots of people, not just a relatively wealthy elite, he turned it from an invention that was kind of a toy for the rich people into an innovation that became a practical transportation device for millions, literally.

BARRY HURD:

01:02:00;22 So, for, an invention to become an innovation, it has to influence a large, what, what's your take on that?

BOB CASEY:

01:02:07;23 I believe that, the fundamental difference between an invention and an innovation is an invention is something new and interesting. An innovation is something new and interesting that gets widely adopted. And if you, if you can't get it widely adopted, it may be cool, but it's not an innovation. 'Cause it's not really affecting the lives of very many people.

BARRY HURD:

01:02:30;28 Tell us a little bit about Ford's working method. Did he plan things out like an engineer? Did he tinker? Did he, what, how did that work?

BOB CASEY:

01:02:39;24 It appears, and Henry Ford didn't talk much about his working method. It, you all, you have to get it from other people who talked about it, or just from looking at the records of what he did. It appears that he thought about things a lot, I mean, noodled about them a lot. But he was very much a hands-on guy.

01:03:00;13 He didn't do drawings. There are hardly any drawings of Henry Ford's that are surviving. So, he wasn't sketching things out. He

seems to have thought about things and then he'd make things. And in his later years, or, excuse me. As he became part of, the running of a company, he wasn't making things so much himself. He was having other people make things, models and, often wooden models and things like that.

01:03:33;01 But Ford liked to see things in 3-D. And, and I think he actually liked to touch things and get his hands around them. So, at a certain point, he had to start making things, or at least having his associates make stuff so he could see how it works, put it together, basically prototype it and then modify it and change it.

BARRY HURD:

01:03:54;21 There's a sort of romantic story that, somebody gave him a pocket watch. And he took it apart, put it together and soon was fixing watches. Is, was that really, his initial, machine-age sort of.

BOB CASEY:

01:04:08;22 Well, Henry Ford had started taking things apart and sometimes putting them back together as a small child. I mean, the story goes is that the other kids in the Ford family would want to hide their toys because Henry would take 'em all apart. And as a

young kid, he didn't necessarily always get them back together.

01:04:26;26 But, very early, he developed this desire to find out why things work. And, the story's apparently true, that when he was 13 years old, he got a watch for his birthday. And he took it apart. And unlike most kids who would do that, he actually was able to put it back together. And the watch, was essentially like a textbook. It was, it was teaching him about machinery and gears and friction and pivots and all of this kind of thing.

01:04:55;05 And that's how he learned; was doing stuff. So, that watch story is true. And then, he took other watches apart. And ultimately, as a young kid, when he first went to Detroit, he had an evening job, working in a jewelry store, fixing watches.

BARRY HURD:

01:05:16;08 Now, take me a little bit through this, I mean, when he got to where we think of him as innovative in the car industry, he was already, past his prime as a youth. But what did he do for his first, several, you know, decades before he really got into this.

BOB CASEY:

01:05:29;02 People don't realize that Henry Ford was kind of a late bloomer. He was almost 40 years old when he founded Ford Motor Company. And Ford was the third company he tried to found. He left home, when he was 16. He went to Detroit. He didn't want to be a farmer. His, he grew up on a farm. He didn't want to be a farmer. He was interested in machinery. He went to Detroit.

01:05:54;28 He got a job in a machine shop. He was apprenticed as a machinist. He got fired from a couple of jobs. He, sometimes he left on his own. But, he was always learning. He was doing stuff, learning how to be a machinist, learning how to, work on steam engines. He'd actually gotten acquainted with a steam engineer, as a young boy and learned about steam engines. And so, built up this store of practical knowledge.

01:06:28;15 Came back to the farm and, again, really wasn't a farmer. Didn't like the farming. A pivotal point in his life was when a neighbor had a steam engine that he was using for threshing. And the guy he'd hired to operate it couldn't really get it to run properly. Henry was about 19 then. Henry went out and got the steam

engine working properly. He had a wonderful line. He said, as, describing the whole experience, he said, "Getting a grip on the engine, I got a grip on myself."

01:07:04;03 And it was, it was sort of his introduction to the world of adults. And all of a sudden, he could do something that all these experienced farmers couldn't do. And he went on and ran that engine for the rest of the summer. And so, he was building up this practical knowledge. When he got married, his father gave him the use of 40 acres on the farm. Henry didn't farm it. It was wooded land. So, he cut all the timber off, milled it all up, sold it. And then, when, as he put it, the timber was all cut, he was ready to go back to Detroit, 'cause he'd gotten himself a job in town.

BARRY HURD:

01:07:42;17 Now, was this when he got the job at Edison Illuminating and…

BOB CASEY:

01:07:45;29 He, Henry had, unbeknownst to Clara, his wife, he had gotten himself a job, with the Detroit Edison Illuminating Company as a night engineer. In other words, he was gonna be working at the electricity company, where they generated the electricity. And the

interesting [thing] about Ford is that he didn't know that much about electricity.

01:08:10;27 He was one of these people who didn't take a job because he knew how to do it. He often took jobs because he didn't know how to do them, and they were opportunities to learn. It's a very gutsy way to learn. But, so, he really didn't know that much about electricity. But this was a way to learn. And he had enough self-confidence that he believed, he knew about steam engines, he could learn about the electricity part.

BARRY HURD:

01:08:59;20 Intense curiosity, which a lot of our innovators have told us there was something they're just interested, interested in something.

BOB CASEY:

01:09:07;24 Henry Ford had a wide curiosity, which is why once he'd got the automobile company up and running, and really being the biggest automobile company in the world, his attention actually began to wander. That's why this place is here, because he got curious about the past. And he was curious about farming, even though he didn't want to be a farmer himself. And this is why he ended

up in, helping Berry College in Georgia. And, he had, a very wide range of curiosity about a lot of things.

BARRY HURD:

01:09:44;06 If we were to say, what were his radical innovations versus some of his more incremental innovations, how would you respond to that?

BOB CASEY:

01:09:53;24 I would say that the cheap, abundant automobile, first of all, was a radical innovation in that it, it had a transforming effect on society. At least one scholar has said that the Model T is the only truly, at least one scholar has said, that the Model T is the only truly revolutionary automobile ever built. Because the thing it did could only be done once, create this vast market for the automobile.

01:10:22;28 The assembly line was a radical approach to manufacturing. The assembly line on scale, the complexity that Ford did it, that was radical. The five-dollar day was enormously radical. So, those are, those are really significant things, that happened in a fairly short space of years. And, that would be a career for anybody.

BARRY HURD:

01:10:50;07 What about the more incremental or maybe the less radical innovations?

BOB CASEY:

01:10:55;12 The, certainly in the automobile field, there are things like his V-8 engine, which was, a major breakthrough. He didn't invent the V-8 engine, but he devised a way to make it light and cheap enough to put it in a car like a Ford. You know, things like that. A lot of his work in farming wasn't necessarily that radical and earth-shaking.

01:11:25;15 But he was, he struggled for a long time to develop uses for soybeans, for instance. The soybean really didn't become this important agricultural product until after World War II, until after Henry was gone. But he, that was one area where he was, he kept looking. And he never got the, he never got the really radical breakthrough that he was hoping for. But he kept pushing things. And I would say that other people were able to take advantage of the work that he'd done, prior to World War II.

BARRY HURD:

01:11:59;03 Taking us back, a little chronologically about how he tinkered around. He got this engine going. He got some people interested in it. They tried to start a company. I mean, what's sort of the chronology, quickly, of how he went from…

BARRY HURD:

01:12:15;21 We're just trying to get the key, sort of the timeline, leading up from, you know, when he was out in the shop until we have the Model T, maybe.

BOB CASEY:

01:12:22;20 While Henry Ford was working for the Edison Electric Illuminating Company, he also began his efforts towards building an automobile. Some time, he claimed 1893, it could have been 1896, he built his first gasoline engine. And it was a simple one-cylinder thing. It was sort of proof of concept, can I do this?

01:12:49;09 He then began working on his first automobile, which was finished in 1896, a little two-cylinder car. He then built another one in 1898. And then he actually quit his job. And tried to start an automobile company; did start an automobile company, called the Detroit Automobile Company. That failed. He started another

company called the Henry Ford Company. He and his financial backers got into a disagreement. And they agreed to part company.

01:13:23;15 He then started his third automobile company. He's now almost 40 years old. His third automobile company is the Ford Motor Company. And he went through a series of cars there, fairly conventional cars, in many cases, similar to what other people were building. From 1903, when they started the company, through 1906, he finally hit it big with a car called the Model N Ford. And it became the best-selling car in the country.

01:13:54;09 While the Model N was being a success, he started work on another car, which became the Model T. And that was a significant improvement on the Model N. And that became the car that really transformed him, transformed his company, transformed, if not the world, certainly the United States.

BARRY HURD:

01:14:15;23 What was it about the car that had such a transformative effect?

BOB CASEY:

01:14:20;19 The Model T, first of all, was a highly capable car. You have to understand, at, before World War I, American roads were probably the worst in the industrialized world. They were bloody awful. Hardly any of 'em were paved. And the paving that did exist was usually gravel. Most American roads were just dirt paths until it rained. Then they were mud paths.

01:14:50;26 And they were full of ruts and bumps and curves. And you needed a car that could handle this. One way to do that was to build a big, tough, strong car that would resist all the bumps. The other way was to build a car that would kind of flex and skitter over the bumps. That was Ford's way. So, the Model T was designed to handle these awful roads. It was designed to be inexpensive. And when it came out, it was $850, which was amazingly inexpensive for the amount of car you got.

01:15:27;03 And then he devised ways to drive the price way, way down. So, it became, it was capable of handling the terrible roads. By lowering the price he made it more and more available. It was a full five-passenger car, so it could seat a whole family. And it

seemed to have tapped into something in the American psyche about this, this love of movement, of freedom, of power, of owning something that was powerful. And what had once been a rich man's toy, now everybody could buy one.

01:16:05;28 And they sold, literally, by the millions. They, the sales just kind of ramped up and up and up. At their peak, they were selling two million Model T's a year. And it, not only did it make Henry Ford rich, but really, it transformed the automobile from a kind of, really, from a recreation device to a practical transportation device.

BARRY HURD:

01:16:32;04 Now, what do we know about Ford as a promoter. Sometimes these innovators, it turns out they're great marketeers. They can get up in front of groups and make compelling speeches. Take us back to that time when he was trying to get the word out. I know he did a lot of things in racing. How was he as that?

BOB CASEY:

01:16:49;02 Ford is kind of an odd personality. There are very few films of him. The ones that do exist depict a fairly boring guy. He's got a

flat Midwestern voice. And he's, he seems to be a terrible public speaker. It seems, however, in small groups, he was extraordinarily persuasive, whether he was trying to raise money, whether he was trying to induce people to come and work for him or get them enthused about some new idea.

01:17:24;10 He also actually seemed to have been very good with newspaper reporters, not so much when cameras came in. But with talking to reporters, he had a good eye for, or a good, he had a good way with quips. And so, when he, for instance, when he was building racing cars and basically he was between failed companies. And he was trying to get, raise money, and get new backers.

01:17:53;20 And, and he, he won a race in Detroit in 1901. He's pretty vocal. And the newspapers are recording what he says. And it, you know, he sounds pretty good. And so, there's something about him that especially, apparently in small groups and one-on-one, that was compelling. Something that doesn't come across in those few surviving, films and, and sound recordings of him.

BARRY HURD:

01:18:23;10 You, you think in order to, to take your invention or discoveries and really turn them into innovations, you have to be a natural salesperson or have the charisma, whether in small or large groups. There's this commonality amongst, amongst the people we've talked to with that.

BOB CASEY:

01:18:35;15 I think that, to be an innovator, as opposed to an inventor, I think you need to be able to sell your inventions to either large numbers of people directly, or you need to be able to sell the people who can finance the building and marketing of these things. You also need to have a feel for your potential market.

01:18:57;25 And Henry Ford, seemed to feel in his bones this, latent desire that people had for an automobile. He believed deeply that there was a really big market for these things. And he turned out to be right. And, you have to be right about a potential market. Otherwise, you'll, you won't sell very many of anything.

BARRY HURD:

01:19:22;13 Well, in addition to, inventing, he, didn't he, have, like, a philosophy of the way people should live their lives? And

somehow this, the car was tied up in that? Is that what “Fordism” was about, or?

BOB CASEY:

01:19:32;13 Well, Henry Ford's philosophy about the way you should live your life actually ended up being in conflict with what he had done. He was a pretty simple guy. And he appreciated mobility. He appreciated speed. Apparently, he was a pretty fast driver, himself.

BARRY HURD:

01:20:03;12 What is “Fordism”? Tell me about that.

BOB CASEY:

01:20:07;26 I'm not sure that Henry Ford, himself, ever used the term "Fordism." I think it, it was, it came from other people. But it's really a production and marketing approach. Build lots of something. Build it cheaply. Design a process that allows something to be built cheaply.

BARRY HURD:

01:20:44;20 Tell us, what was “Fordism”?

BOB CASEY:

01:20:48;07 I'm not sure Henry Ford, himself, ever used that term very much.

It was one that was applied by other people, observers. But in essence, “Fordism” implies very large production of things, of consumer goods, sold at low prices. Standardized goods, a production system that, is highly automated, but also depends upon workers doing pretty simple tasks to put these things together.

01:21:21;23 It also implies the ability to sell these things to lots of people. What Ford did say is that mass production and mass consumption go hand in hand. So, if you're gonna make all this stuff, you have to have the methods to distribute it, to convince people to buy it and get it out to them. And so, that sort of very large-scale production of low-prices goods and large-scale mass consumption and distribution, in essence, that's “Fordism”.

BARRY HURD:

01:21:52;03 Should he get any credit for, the rise of the middle class?

BOB CASEY:

01:21:58;06 Henry Ford, should get credit, I think, for an expansion of the middle class. I mean, America is a place that, for a long time, has had a healthy middle class, compared to Europe. What Ford was

able to do, with his famous $5 day, was open up relatively high-paid jobs to low-skilled people who never thought that they would have high-paid jobs. And thus, be able to expand the middle class. Give an avenue where lots of people who didn't think they could get there could get to the middle class.

BARRY HURD:

01:22:35;27 Let me ask you this. He invents the car, with people, build the car. The dealer network, was he involved in all of that? And his ideas, I mean, any innovations there?

BOB CASEY:

01:22:48;11 Henry Ford wasn't much involved in the development of the sales network, the dealer network. In the early days of the Ford Motor Company, up through 1915, he had a partner named James Couzens. And Couzens is one of the unsung heroes of Ford Motor Company. While Henry was concentrating on the engineering and the production side, Couzens was the businessman.

01:23:12;17 And Couzens was setting up the accounting procedures and all of that. But he was also the guy who setup the first dealer network. And wrote a lot of the early ads. Couzens was the guy who was

marketing the product. They also hired someone named Norval Hawkins.

01:23:36;03 First came to them as an accountant. Actually, he was auditing the books. And they were so impressed by him. And it's not clear whether Couzens hired him or Ford hired him. But if both of 'em hadn't agreed, he wouldn't have been hired. And Hawkins was a master salesman. And he really appreciated how much, he, appreciated the emotional side of selling. He said, "You don't sell goods. You sell ideas about goods. And the automobile is rich with ideas."

01:24:07;28 And he sold those ideas. And they're the same ideas we use today. It's adventure. It's style. It's power. It's convenience. It's modernity. All of these things, Norval Hawkins was selling 'em. And Hawkins then expanded that dealer network that Couzens had started. So, between them, Hawkins and Couzens were really the guys that pushed the marketing side of Ford.

BARRY HURD:

01:24:33;26 You know, there's this classic quote, "If you could have any color

you want, as long as it's black." But in fact, weren't the Model T's different colors and something else required 'em to make them all black?

BOB CASEY:

01:24:45;10 The early Model T's were different colors. We have a red one here. It's a 1909 Model T. It's red. That was the color of touring cars. And some of the different body styles came in different colors, very early on. And then they settled on a dark green. Then they settled on a dark blue. And eventually, about 1914 or so, they settled on black.

01:25:09;26 There's several reasons for that. One is, it's just cheaper to buy a whole bunch of one color of paint than to buy a bunch of different colors. And it simplifies your production process. "I'm not switching colors, I don't need different lines. Everything's black." Black was the cheapest paint you could buy. It was made with carbon black. That's the pigment in it. That was pretty cheap.

01:25:35;17 Black was also a durable paint, which was very important if you're running on these terrible dirt roads. So, Ford eventually

standardized on the black. And, all Model T's were not black. Only about 11 and a half million of 'em were. And then, very late in the Model T's lifecycle, they went back to colors, because other car companies were selling cars in colors. And to compete, Ford had to go back to selling colors.

BARRY HURD:

01:26:03;20 So, it wasn't just, it's sometimes used as an example of how stubborn he could be. But it's really more than that, this color thing, isn't it?

BOB CASEY:

01:26:08;22 It's much more than that. There are very practical reasons for using the black. One of the myths is that black dried faster, so that's why they used it. In fact, there's no evidence that black dried any, measurably faster than the very dark blue or the very dark green they were using. Dark colors are gonna dry faster. They're, dark colors absorb heat more. But black, dark blue, dark green, not much to choose among them. But black had other advantages. And that's why they settled on it.

BARRY HURD:

02:00:48;15 Let's talk a little bit about the risk and failure ratio with these

innovators. I mean, you've got to take some big risks to win, but you also are going to have some big failures. How does Ford fit into that?

BOB CASEY:

02:00:59;21 Henry Ford had a number of failures. He had two companies that essentially failed, the second company actually went on to be successful, but only after he left. He had some early cars that didn't sell well, the Ford Model B, the Ford Model K. They were not sales triumphs.

02:01:25;21 He had some, innovations that he tried to do. He had this, what he called the X-Engine. It was an eight-cylinder engine with the cylinders in the shape of an X. They worked on that thing for years and it never worked out.

02:01:45;21 But, failure was not something that he was afraid of, in fact, he has a, slightly awkwardly phrased line, but he says, "Failure is only an opportunity to, more intelligently begin again." Basically, his thought was, "If I fail and I can analyze the failure and figure it out why I failed, why, then maybe I can be a success."

02:02:13;18 "But if I don't try, then I'll never be a success. I'll never achieve anything." And so, failure was not something that he was particularly afraid of. And you look at the record of any innovative person. They've all got stuff that just didn't work out. But, if they don't keep trying, they're not gonna find the one that does work out. So, that was Ford's philosophy and, he simply was not afraid to try something and fail.

BARRY HURD:

02:02:47;14 Now, he couldn't do this all by himself. But he had an ability to attract great talent, did he not?

BOB CASEY:

02:02:53;09 I think one of the unappreciated talents of Henry Ford is his ability to attract good people. To recognize talent, and then get them to work for him. And he, you see this as a kid. He's one of these kids who says an, has an idea, and, gets his friends to work on it. And, and build it, when he was building the Quadricycle, his first car, he was drawing in several friends.

02:03:24;06 And there's an oral history interview from one of the guys who

worked on it. He says, "I never saw Mr. Ford do anything. He was always doing the directing." So, he had the ideas. He knew what he wanted. At his best, he would keep the project moving in the direction he wanted. But if somebody else came up with a good idea, he was ready to incorporate it. Later in his life, he got less and less amenable to incorporating other people's ideas and he became less successful. But, at his best, he had these ideas. He attracted good people. And then he would keep them focused. But he would let them use their talents to improve his project.

BARRY HURD:

02:04:12;06 And he wasn't afraid to adapt somebody's idea like the assembly line, what's the story behind that?

BOB CASEY:

02:04:17;20 The assembly line is one of those things that, again, Henry Ford didn't invent. And it's, you're hard-pressed to figure out who invented the assembly line, you see, early, if you look at it. Okay. If you begin to study older industries prior to the automobile industry, you see people building tin cans on an assembly line. Now, building a tin can's a fairly simple thing to do. You know, bins, tin, solder it, put a top and a bottom on it. But there's

actually, something that looks very much like an assembly line to build that. And other industries were using things like that. The Waltham Watch people. They didn't quite have a full-blown assembly line, but they were cranking out a lot of watches, with a bunch of people assembling them.

02:05:12;19 One of the things that was apparently very influential, however, was not so much an assembly operation, but a disassembly operation. Ford or some of his engineers, it's hard to tell who, maybe both, went to, or certainly read about the slaughterhouses in Chicago where you'd take the carcass of a cow or a hog and you'd hang it up on a moving conveyor. And it moved down a row and the meat-cutters hacked pieces of it off, and disassembled the thing.

02:05:47;21 Somebody said, "What if we turn that idea around? What if we put something we need to make on some kind of moving conveyor and move it past workers and add pieces?" And that was the, that seems to have been the genesis of the assembly line. And they started out small on subassemblies before they got to the whole

chassis.

02:06:12;03 But that was a case of, there's not really any evidence that Henry Ford said, "Boys, what we need is some kind of assembly line." But he'd so imbued his people with this obsession of speeding up production and lowering cost, that they were constantly looking for better ways to do it. And they hit on this assembly line idea and then developed it, and perfected it.

BARRY HURD:

02:06:43;05 Well, that speed up, lower cost is an innovative idea right there, isn't it?

BOB CASEY:

02:06:48;04 That whole idea of make it faster, better, cheaper. That's if that idea itself isn't innovative, that's one of the ways that you drive innovation, is to keep saying, "I want to make it faster, better and cheaper."

BARRY HURD:

02:07:07;08 Now, what about a lot of these innovators we've talked, or whatever they're building, even if it's not either streamlining, they're making it lighter, they're always looking for that basic

essence. Is that one of the, sort of, innovative principles that we can draw from Ford?

BOB CASEY:

02:07:19;28 Well, Ford was, a bug on light-weight and simplicity, and for him, it went beyond efficiency. There was an aesthetic dimension to that, he said, one of his lines is, "The most beautiful things in the world are the things from which all unnecessary weight has been eliminated." He didn't say the most efficient things. He didn't say the most cost-effective things. He said the most beautiful things.

02:07:49;08 But part of the beauty of taking the weight out of a product like a car is, I can make it simpler. I need less power to run it. I need less material to build it, his Model T, for instance, weighed 1,200 pounds, if you were making 1,000 of them a day, you need to move at least 1,200,000 pounds of material through your factory.

02:08:19;04 If it weighed 1,700 pounds, there's another half million pounds of stuff I got to move through the factory. But by making, keeping the car light, I simplify the whole process and I make it, a more efficient car for my customer. So, he both saw all the advantages

of simplicity and light-weight, but he kind of internalized 'em and they became, really kind of aesthetic principles to him.

BARRY HURD:

02:08:45;16 If we had a group of, let's say, high school kids or even young people starting out, and we're trying to talk to 'em about innovation, what would be the three or four basic principles, and if it's a fair question, that we could draw out of, Henry Ford and his history?

BOB CASEY:

02:09:00;02 You mean principles of innovation?

BARRY HURD:

02:09:01;08 Innovation. Yeah, I mean, if we were, in, general principles that we can learn from him?

BOB CASEY:

02:09:09;14 Gee, trying to boil innovation down into principles is difficult. But if you use Ford as one example, one way to be an innovator, is to have an idea for something that if people don't need it, it's something they'll want, in fact, most of our, the products that become widely adopted aren't so much filling a need as they are filling an unrecognized desire, which is what the automobile did.

02:09:48;09 So, have, if you can come up with an idea for something that people will want, that's a good thing, you have to be a good judge of talent 'cause you can't do any of this yourself. You may have the ideas, but you're gonna need lots of people who are good at things that you're not good at. So, you need to be able to recognize talent.

02:10:13;17 You need to be able to delegate, which in his later life, Henry Ford did less and less, and that he became less successful. But when he was most successful, he was able to delegate a lot of authority to people. You need to be a salesman, if you're not Lee Iacocca out there saying, if you can find a better car, buy it, you're at least, you can at least walk into a room full of potential financial backers, and make the case and show them why you have a dynamite idea. And you can make them a lot of money, so, those are some of the things that go into being a successful innovator.

BARRY HURD:

02:10:49;24 What about just passion and belief in what you're doing that it's right? He must have been driven by something?

BOB CASEY:

02:10:54;28 Every innovator has to believe absolutely in what they're doing. And has to be willing to fail, and, and stick with their belief, Ford easily could have said, "Oh, this whole car business is really not for me. I'm going to go back and be an engineer again." But he wouldn't do it. He would keep pushing.

02:11:17;23 And then when he got into the business, he kept pushing and kept looking for ways to improve things, he had a passion for the business. And any innovator has got to have a passion for their ideas. Some are all over the map and they have lots of different ideas. But if you get one in your head, you've got to have a passion for that idea. And you have to push it, either to failure, and be willing to ultimately say, "Oh, maybe it wasn't such a good idea, but I got eight more that I can try." Or, you push it all the way to success.

BARRY HURD:

02:11:52;14 Great answer.

BARRY HURD:

02:12:01;25 Did Ford have a process of innovation and, if so, how would you

describe it?

BOB CASEY:

02:12:07;12 He never wrote anything down about his process. But, his process seems to be, first of all, to have an idea. And who knows where the idea comes from. But to have an idea to do something. When he wanted, for instance, to build his first horseless carriage, he started with building a little engine, a little one-cylinder engine.

02:12:36;10 And then once he sort of got the sense of how that might work, then he went on to design the car, he borrowed freely from information that was in magazines, and so, he didn't invent this engine for the Quadricycle, his first car, out of whole cloth. He borrowed from that, but he modified things, he made improvements. He brought in his friends and had them help him. And they contributed ideas.

02:13:04;05 But he had the vision. And his first car was small and light, lighter than the typical horseless carriage that other inventors were building at the time, he got it built. He tested it. It worked. Then he improved it. Actually, he hired another guy and helped rebuild

the whole Quadricycle.

02:13:27;27 So, the one that he first ran in 1896, in the middle of the year, is actually very different than the car we see today, he changed it a fair amount. And then he sort of learned as much as he could from that, and sold it. He built another car and sort of repeated the process. You see this process writ larger when he's designing the Model T. He gets a group of guys together. They go off in a room. Model T's much more complicated. They actually do drawings on a blackboard.

02:14:01;11 But they also build a lot of parts. Sometimes they build model things out of wood. Sometimes it's out of metal. They try things. They assemble things. They test subassemblies before they build the whole car. They take an existing model and chassis and they modify it.

02:14:20;03 But it's an incremental process of very much cut and try. It's not let's draw it out and build it. It's let's build some pieces and try that, and build some more and try that. So that by the time you

get the thing together, the individual pieces have all been kind of tested out. This plays out in something big like the assembly line where they started very small, assembling flywheel magnetos. And worked out a lot of kinks on that process. Then they said, "Well, let's go on to something bigger. Let's try engines or let's try rear axles." Worked out the kinks on that.

02:15:02;01 And then they finally said, "What, could we try the whole car?" And so, it's a very incremental process where you have an idea. You move towards the idea. You draw on your associates. You draw on other people's ideas. And you work these things out, kind of, a bit at a time, so that by the time you get to the final process, you've learned a whole lot and you're not trying things that are brand new. They're ideas, many of which have been worked out and tried and you've found the flaws and moved on.

BARRY HURD:

02:15:43;08 So, it sounds like he even actually created an environment in the process that, to go after innovative products?

BOB CASEY:

02:15:48;14 I, what Ford, at its best, Ford Motor Company did create an

environment where innovation was valued and encouraged. Interestingly, what happened with the Model T is that once they got the Model T up and running, Henry Ford seemed to have decided that that was pretty much the perfect car. And so, now, the innovations were in the way you built it. Not in the car itself.

02:16:13;02 And so, they made enormous improvements in the production process. And they made all kinds of detailed changes to the Model T to make it easier to produce. But fundamentally, they weren't making any changes in the car which is why after a number of years, the rest of the industry passed him by. And he didn't want to believe that. He became so focused on improving the production process that he didn't realize that the product had a finite life, as well.

BARRY HURD:

02:16:45;07 So, it's also, but you can take this process and apply it to different problems, once you've got a trained group and teamwork going on, and leadership and…?

BOB CASEY:

02:16:51;27 Henry Ford took that process and he did apply it to other things,

he applied it to the development of soybean products. You see him building small labs and then larger production processes. And attempting to develop soybeans.

02:17:09;22 He was doing a lot of kind of experimental work in farming. He was trying to work that out, you see it when he developed the Ford's new tractor. It's a similar kind of thing. You build the prototypes and you, eventually, you build these things on assembly lines. You see it when he got into building airplanes, he was using an outside engineer there, but again, they were trying things, and working out not only the design of the airplane itself, but the production processes for the airplane. Because they were making all-metal airplanes which were at that time, on the cutting edge. And so they had to, they had to work out these processes to make the airplanes.

BARRY HURD:

02:17:53;09 And what about the classic story that when World War II came along, he was able to like transform the, this process into building these, you know, the armaments?

BOB CASEY:

02:18:02;03 Well, what Ford had developed was this team of people who could do great stuff, he was not alone, however. There were lots of industries that had, by this time, people had figured out Henry Ford's process. And other people were applying it, sometimes more effectively than Ford was.

02:18:28;03 So, the automobile industry, for instance, was able to transform itself from making cars into making things like Jeeps which are not, you wouldn't think, wouldn't be that big a transformation. But into making airplanes, into making machine guns and anti-aircraft guns and things like that, which are really pretty different, or complete aircraft engines, which were much more complicated than the engines that they were building for automobiles.

02:18:59;08 But the companies had by that time this depth of engineering knowledge and manufacturing knowledge that they could apply it to these problems. And either build things from scratch or take engines, aircraft engines that were being hand-built in England, and take that Rolls-Royce design and bring it over here. And adapt it for mass production and churn them out by the

thousands.

BARRY HURD:

02:19:27;05 Okay, let's stop for a second. Great answer. I've got a million other things I'd like…

BARRY HURD:

02:19:35;03 Bob, tell us, on this new auto exhibit, we have these six fantastic cars. Now, what are they all about?

BOB CASEY:

02:19:40;05 In 1903, Ford Model A is an example of the first car that Ford Motor Company built. And it's not significantly different than cars that a lot of companies are building. It's a horseless carriage. It really does look like a carriage, minus the horses.

02:19:56;10 It’s got a little two-cylinder engine. It's mounted under the seat. Which mounts, the thing means the car is pretty high off the ground. The axle, the rear axle is driven by a chain. Kind of a glorified bicycle chain. But the only thing that makes this car a little bit surprising is that it has a steering wheel where some of these horseless carriage makers are still using tillers. But even the steering wheel, that's coming in. So, Henry Ford's first Ford

Motor Company car is basically what everybody else is building. And his challenge is going to be to build something different.

BARRY HURD:

02:20:42;10 So, what's the next one here?

BOB CASEY:

02:20:56;01 In 1905, Henry Ford built a car called the Model B. And it was his first attempt to build a car like the new approach to cars that was coming out of Europe. Henry's Model A, and the Model C and the Model F, which were very similar, were truly horseless carriages. The engine is under the seat.

02:21:21;15 In Europe, they were building cars where the engine was put out front, which allowed the car to be lower, easier for the passengers to get in and out of. Allowed the engine to be bigger because now it wasn't buried down underneath the car, so it could be more powerful. The lower car also handled better. You could go faster. And if you could string the passengers out behind the engine, maybe you could add more people.

02:21:48;10 So, Henry Ford tried building one of these cars in 1905. He called

it the Model B. And it was not a bad car. However, it cost $2,000. And it didn't sell very well. And so it was going in the right direction. He was now away from the horseless carriage and he was building modern-style cars. But $2,000 was way too expensive to be able to build cars in any kind of volume.

BARRY HURD:

02:22:12;14 And what about this black one that's next to the other ones.

BOB CASEY:

02:22:15;14 Okay, well, we'll get to that. The Model S is the next one.

BARRY HURD:

02:22:19;09 Oh, I'm sorry, right, okay, I was, yeah, looking in the wrong place.

BOB CASEY:

02:22:26;03 Henry Ford continued to build these European-style cars, but he was looking for a way to make them cheaper. He, actually in 1906, built two different new cars. One was called the Model K which was even bigger than the Model B and cost $500 more. And sold even poor, and more poorly.

02:22:43;29 But he also built a car called the Model N, which was a little, light

car, four cylinders, sold for $600. Became the best-selling car in the country. Ah, he was on to something. He made some improvements on that car, like the Model S that we have here on exhibit.

02:23:03;25 And he also called one the Model, R, which was, came before the Model S and was a little bit fancier. Cost a little bit more. But basically, they were small cars that would seat only two, maybe three people. They were not family cars. They sold well, but he wanted to build a car that people could put their family in. So, he was still looking for something that would be better.

02:23:33;15 In 1908, well, let me back up. In 1907, Henry Ford set out to design a new car. By the middle of 1908, he had that car designed. He had a prototype of that car running. In October, it was ready to go for sale. He called that car, the Model T. And this was the car that he'd really been wanting to build his whole, ever since he built his first car. Let me make that a little smoother.

02:24:01;24 This was the car Henry Ford had really been aiming for ever since he built his first Quadricycle. This car had a four-cylinder engine, mounted up front. It could seat five people. It was rugged. It was capable. It could drive over the crummy American roads. It was relatively powerful. And it could be had for $850, which wasn't cheap, but was cheaper than any other car that could do what the Model T could do. The Model T was the best automotive value on the market. What Ford set out then to do is drive the price down and ramp the production up.

02:24:53;13 Once the Model T appeared in 1908, Henry Ford really set his sights on improving the production system. He developed a whole new plant at Highland Park, Michigan. A brand-new modern plant. In that plant, they eventually developed the modern assembly line, as we think of it, the way we still build cars today, and before the Model T was out of production, they'd sold 15 million of 'em.

02:25:24;07 However, by about 1920, the other car makers were beginning to catch up to Henry Ford. And he didn't want to believe it. He didn't want his Model T to go away. And it was only after

declining sales convinced him that his customers were going away, that he finally decided, I've got to build something new.

02:25:52;11 In 1928, Henry Ford came out with his new car, his replacement for the Model T. And he decided that it was so different, he would go all the way back to the beginning of the alphabet and call it the Model A. And the Model A was a very modern car for 1928. It's a pretty car. It's styled much better than the Model T, but it's not, it wasn't the revolution that the Model T was.

02:26:24;11 The only things on the Model A that are really different, they used safety glass in the windshield. Ford wasn't the first to do it but they were the first to put it on an inexpensive car. They used hydraulic shock absorbers. Again, not a first in the industry. The first on an inexpensive car. And they also used an all-steel body. Not the first, again. But it's interesting that, today, if you go to an old car show, you'll see tons of Model A Fords. You'll see very few Chevrolets. Even though between 1928 and 1931, Chevrolet sold as many cars as Ford did. Chevrolet still used wood in their bodies. They haven't survived. So, the Model A was a very good

car. But it wasn't a world beater. And by 1931, Chevrolet was passing it in sales and Ford had to do something else.

BARRY HURD:

02:27:24;13 So, these six cars, are these actual models or are they replicas?

BOB CASEY:

02:27:28;24 No, they're, they'll be the real thing. They're the real, they're real cars.

BARRY HURD:

02:27:31;13 Well, tell me that. Pretend they're there and tell me that. Say, these are actual, the actual six?

BOB CASEY:

02:27:35;27 Well, you're gonna, if you're standing there in a kiosk, you're gonna see them. They're gonna be there.

BARRY HURD:

02:27:41;05 Oh, okay.

BOB CASEY:

02:27:41;04 Right in front of you.

BOB CASEY:

02:27:48;08 Do you want to hear about the V-8?

BARRY HURD:

02:27:48;09 Oh, I'm sorry, I thought that was the end. There's….

BOB CASEY:

02:27:48;10 Sorry.

BARRY HURD:

02:27:48;11 We only went through five, sorry. Sorry.

BOB CASEY:

02:27:56;00 Henry Ford's replacement for the Model A was a car with a V-8 engine. In 1929, Chevrolet had come out with a six-cylinder engine which was two cylinders more than Ford's four-cylinder engine. And so, Henry basically decided, well, Chevy, I'll see your six and I'll raise you two. I'll make an eight-cylinder engine, but I'll make a V-8 engine. And the big trick there was making a V-8, again, light enough and cheap enough for a Ford.

02:28:24;08 Ford didn't invent the V-8 engine. What they did do is cast the V-8 block in one piece, which was a very difficult thing to do. But by doing that, they could make it light, they could make it cheap, they could make lots of them. And the Ford then had the kind of power that was only available in more expensive cars.

02:28:44;28 Eventually, everybody learned how to cast V-8 engines in one piece. But Ford was, was the people who, broke the ground. And the Ford V-8 became kind of, a symbol of Ford Motor Company and became one of the most famous engines of all time.

BARRY HURD:

03:00:51;24 Bob, tell us the story about the first engine again.

BOB CASEY:

03:00:56;29 This is actually one of the most remarkable artifacts we have in our collection. It's, amazing because Henry Ford built it with his own hands. This is the first gasoline engine that Henry Ford built. It was an experiment. He was trying to learn how to build a horseless carriage. And, he built this in his workshop, out behind the house that he and his wife, Clara, were renting on Bagley Avenue in Detroit. Henry said that he did this in 1893, although he didn't build his first car till 1896. It's probably more likely that he built this in 1896, and then went right on to building the car. But, the story is that he got it built around Christmas time, or at least in the winter, and he hadn't run it yet, 'cause it needed electricity to power it. And, he brought it in to Clara Ford's kitchen, where they had an electric light hanging from the ceiling.

And, he put it on the kitchen sink.

BARRY HURD:

03:02:44;20 Is this something that's not on display normally?

BOB CASEY:

03:02:46;06 It's not on display normally.

JUDY ENDELMAN:

03:02:47;15 Yeah, let's put that in.

BARRY HURD:

03:02:48;05 Say, "Here's a little secret, something that's not on display. It's one of the most important artifacts of Henry Ford's innovative career in the museum," or something like that.

BOB CASEY:

03:02:55;11 Okay.

BOB CASEY:

03:03:04;07 This machine in front of me is not normally on display here, at Henry Ford Museum. But, this museum might not be here without this machine. This is Henry Ford's first gasoline engine. It was an experiment. He was trying to figure out how to build a horseless carriage, and first he had to figure out how to build a gasoline engine.

03:03:28;03 Henry said he built this in 1893. Although, since he didn't build his first car till 1896, it's probably more likely that he built this in very early 1896, and then went on to build a car. The story is that he was out in his workshop, which was behind the house that Henry Ford and his wife Clara were renting and, you know, on Bagley Avenue in Detroit, and he worked on this engine.

03:03:55;24 And, he was ready to try to test it. He needed electricity to make the engine run. So, he brought it into the house, brought it into Clara Ford's kitchen, where there was an electric light bulb hanging overhead, and he clamped this thing to her kitchen sink, just as we've clamped it to this table here. And, he wired it up to an electric light that was overhead, wired it up to what was his sparkplug.

03:04:21;13 And, he had Clara spoon gasoline into this rudimentary carburetor, and he spun the flywheel here, and the thing sputtered and coughed, and fired up and ran, probably spewing flame out the exhaust here. And, he didn't run it for very long.

But, that's all he needed. He knew now that he had sort of mastered the rudiments of internal combustion engines, and he could go on to build something bigger, and he could put it in a vehicle, and he could make progress towards his horseless carriage.

BARRY HURD:

03:04:58;02 Say that last part. And include in it, what did he from this…?

BOB CASEY:

03:05:01;27 He knew then that he had mastered the rudiments of an internal combustion engine, that he could go on to build a bigger one, that he could put it in a horseless carriage, and he could make progress towards his goal of building an automobile.

BARRY HURD:

03:05:18;14 Do it one more time. We'll use that last phrase, it's…

BOB CASEY:

03:05:22;14 It's, yeah, it's kind of fumbling around.

BARRY HURD:

03:05:24;12 You made progress with.

BOB CASEY:

03:05:25;10 Yeah.

BARRY HURD:

03:05:25;19 Go ahead.

BOB CASEY:

03:05:28;08 He knew then that he had mastered the rudiments of the internal combustion engine, that he could go on to build a bigger one, that he could put it in a vehicle, and he could make progress towards building a horseless carriage.

BARRY HURD:

03:05:47;06 All right. Now you wanna, like, yeah, now, we're gonna do, point out the cars. Are you gonna go from left to right, is that where you…?

BOB CASEY:

03:05:57;07 Actually, I think I oughta start up at the front because the gas goes in here and the piston and everything. And, finally you get down here and it spins the crank and spins the wheel.

BARRY HURD:

03:06:56;29 How's this thing work?

BOB CASEY:

03:06:57;29 Oh, let me see, this little engine is made up of a lot of common parts that you can find lying around most any shop. The cylinder

here is made out of a piece of pipe. What we would think of as perhaps the combustion chamber on a model, on what we would think of as perhaps the combustion chamber on a modern engine, is actually another pipe fitting, it's a pipe tee.

03:07:38;21 The intake valve over here is another plumbing fitting, it's a check valve. And so, when the piston descends in the cylinder, creates a vacuum, this valve opens up. It lets in fuel and air from, well, it doesn't look like a carburetor, but that's what it did. This is actually a lubricator from something like a steam engine. It would be used to supply oil to parts on a steam engine. Henry Ford adapted it to this engine, to his gasoline engine.

03:08:14;13 Clara Ford would drip gasoline through a hole in the top of this thing. And, there's another hole that would allow gasoline to fall down. And, as the piston is going down, it pulls the gasoline down, pulls air in, pulls it through the valve, and sucks it into the engine. This thing is effectively the spark plug. It would be hooked up to a light bulb upstairs, this thing is effectively the sparkplug. It would be hooked up to a light bulb, hanging from

the ceiling. That's how they, electricity was supplied.

03:08:47;03 And inside, connected to this connecting rod, is a piston, just like in a modern engine. But, the piston has a little piece of spring steel on the end of it. And, the sparkplug actually has a wire sticking down into the combustion chamber. And, when they come together, they make the circuit. And when the piston descends, they break the circuit, and you get a spark. And, the gasoline mixture explodes, and drives the piston down.

03:09:21;04 As the piston drives down, it moves this crank, spins the flywheel. But, there's also over here a couple of gears that actually drive a little cam, just like the modern camshaft on an engine. This is a pushrod, and it comes back up here to another plumbing fitting. It's a globe valve. And, the pushrod comes open. It's another plumbing fitting. It's a globe valve.

03:09:48;05 The pushrod pushes the valve inside open. The piston comes back up and forces the burnt fuel and air mixture out. And then, you're ready to complete the cycle. It's an agglomeration of

found parts. But, it's actually, when you look at it, it's a very clever piece of work.

BARRY HURD:

03:10:13;02 Good.

BARRY HURD:

03:10:16;13 Just tell me what this whole thing you told us about the relationship between Ford and his wife.

BOB CASEY:

03:10:22;02 Ah.

BARRY HURD:

03:10:24;26 Whenever you're ready.

BOB CASEY:

03:10:27;07 Henry Ford used to call his wife, Clara, “the believer” because she believed in him. She believed in what he was trying to do. And, I suspect that that belief was somewhat tried by this thing. Imagine, you're trying to fix dinner, and your husband comes rushing in, and says, "Let me try this out," and you don't even know, you ain't even sure what it is.

03:10:48;17 And, he sticks it on your sink, and he hooks it up to electricity,

and he asks you to drip gasoline in it. And then, he fires it up and it starts making this racket and shooting flame out of here. A lotta wives would've said, "Get that thing outta my house, and you can go with it." Clara didn't do that. Clara believed that what Henry was doing was worthwhile, was gonna lead to something good. And so, she let him put this thing on her kitchen sink, and let him try it out. She really was the believer.

BARRY HURD:

03:11:20;25 And then, just tell me how this was his, one of his first groups of engines. Tell me a little bit about that. He changed time? He now knew. Whenever you're ready.

BOB CASEY:

03:11:33;24 By building this engine and making it run, Henry Ford now knew that he knew something about the rudiments of internal combustion engines. And, he felt he could now go on and build a bigger one. And, he could put that engine in what he was really trying to build, a horseless carriage.

BARRY HURD:

03:11:54;01 Yeah, that's the end.

BARRY HURD:

03:12:03;27 All right, what's the story?

BOB CASEY:

03:12:06;08 This engine is a wonderful agglomeration of a lot of things that you might find lying around a shop. The cylinder here is a piece of pipe. And, what we would think of today as the combustion chamber on this engine, is another piece of pipe, or actually, it's a pipe fitting, a pipe tee.

01:12:26;28 On this side, is, this is the intake side of the engine. This is a check valve, another plumbing fitting. And, this is a lubricator from a steam engine. It would, normally, oil would be in it. It would drip oil on parts of the steam engine that need to be lubricated. This was effectively the carburetor. Henry drilled a hole in the top of it. Clara would drip oil, Clara would drip gasoline through the hole into this thing. There's another hole down near the bottom of this internal pipe.

03:13:02;25 And, as the piston descended in the cylinder, it would suck the gasoline down through this pipe fitting, it's another it's, an elbow, what pipe fitters call a straight L. And, there's holes drilled in

here. Air would be sucked in as well, and you, so, you'd get this, mixture of gasoline and air, and it would go through the check valve, into the combustion chamber.

03:13:30;13 This is a homemade sparkplug, which would be wired up to a light bulb, providing the electricity. Inside here is a piston that's on this connecting rod. And, it was just, apparently a piece of brass plug, probably a piece of brass bar that Henry Ford had cut off and machined down.

03:13:51;26 And, on the end of the piston was a piece of spring steel. And, down inside from the sparkplug was a wire. And, when the piston came up, the spring steel touched the wire and it completed the circuit, the electrical circuit. When the piston descended, it broke the circuit, and you got a spark. And, this mixture of gasoline and air that had been sucked in exploded, drove the piston down, spun the crank, spun the, flywheel.

03:14:26;00 It also spun a gear here that meshed with another gear. These two gears, Henry found them off of some machine, who knows

where. And, there's actually a little cam, there's actually a little cam that he made here. Looks like it was hand-filed, that drives this pushrod that comes up to yet another plumbing fitting. It's a globe valve. And, as the pushrod would force the globe valve open, and as the piston came back up, it would force this burned fuel air mixture out.

03:15:04;18 And then you were ready to start the cycle all over again, bring in more fuel and air, and keep the engine running. It's in, on one level, it's actually very crude. On another level, it's very ingenious. And, you can really appreciate Henry, putting this thing together from pieces that he'd found, and building his first gasoline engine.

BARRY HURD:

03:15:30;17 Okay, nice.

JUDY ENDELMAN:

03:17:53;01 Oh, you know what? You might wanna mention that ….

BOB CASEY:

03:15:53;01 Yeah, I could do that.

BARRY HURD:

03:15:55;20 Yeah, and, so do.

BOB CASEY:

03:16:21;00 This is probably one of the most important artifacts we have here. It's not normally on display, but without it, there might not be any Henry Ford Museum. This is Henry Ford's first gasoline engine. He built it, he says in 1893, probably it was 1896 because right after he built this engine, he started work on his first car, which he finished in 1896.

03:16:51;19 But, he had been out at his shop on, behind the house that, where he and his wife Clara lived, on Bagley Avenue in Detroit. He'd built this engine and he wanted to test it. And so, he brought it into the house, into the kitchen, where there was electricity, 'cause he needed electricity to make the engine run.

03:17:12;03 And, he clamped it to Clara's kitchen sink 'cause the electricity was, their light bulb was in the kitchen. And, he got ready to fire this engine. Now, their young son, Edsel Ford, is asleep in the bedroom in the house. And, Henry is gonna fire up, this noisy gasoline engine. He hooks the thing up, the sparkplug, he hooks

it up to the electric light. He has Clara spoon gasoline into this little hole.

03:17:46;01 And, he spins the flywheel, and the thing coughs and sputters and sparks, and finally catches. And, the engine starts to whir, and it makes a clatter, and flame is shooting out of the exhaust valve here. And, the engine run. And, by all reports, Edsel didn't even wake up. But, Henry shut it down, fairly quickly. It taught him what he needed to know. He had mastered the rudiments of the internal combustion engine. He could now go on to build a bigger one, and use that engine to power a horseless carriage.

BARRY HURD:

03:18:25;07 That's good. Very nice.