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THE AUTOMOTIVE INDUSTRY

by  
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I want to apologize for not having brought any prepared speech. I had no idea how far I would have to go and furthermore, I am not very handy at writing speeches. So I thought I would bring along a few facts pertaining to the motor car business and let you prompt me if I don't cover what you would like to hear.

I think perhaps it would be best if I started out to give you a brief outline of the way in which the motor car industry is running now. History of course is valuable, but I think the newspapers have carried a sufficient amount of information to tell you what happened in the depression, so I shall dwell very little on that question, and perhaps only in this way: the depression brought to the automobile industry what we might call the refinement stage. I consider the first state the experimental stage. The cars that went to the public at that time were not finished by any means. The automobile companies were experimenting on the public. When you bought a motor car on the strength of what the agent told you, you could be sure that you had to discount at least 50% of what he said. Time went on and as public demand became more insistent the cars got better, naturally. The industry had more money to spend on tools and machinery, and the mechanics became more skilled. We learned to look for trouble before it got to the public. You probably remember that there were something like ninety-seven motor car companies operating and making

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cars at the low point of the experimental stage. Then the war came along with the prosperity subsequent thereto and we entered the mass production stage in motor cars. With what we learned during the war about quantity production, plus the amount of money we had to spend after the war for facilities, and also due to the facilities left by the Army and Navy for the manufacture of motor cars, we got into the mass production stage and in 1929 we had five and a half million cars. Then the depression came along and hit us first of all. It started by hitting the high priced cars in the industry and finally operated down to the low priced car with the net result that the facilities which we had to produce six million motor cars at the outside were forced to content themselves with something like a million four hundred thousand. That meant only one thing. It meant that we had to take inventory and see what was left. The natural thing was to start with the low priced car because that was the first avenue open to volume, so we started to refine the lowest priced car, with the net result that in four years every low priced car in the industry was equal in performance to the former medium priced cars, meaning cars costing \$1,000 or over, in everything but size, and due to the fact that materials and labor were both coming down at the same time, the average weight of the low priced car went up about 400 pounds. This was necessary in order to support the higher performance ratio that had been built in the car. Consequently, in 1932 and 1933 you could buy in the lowest priced car everything you could get in the moderate priced car three years before. The result was that volume jumped. The motor car manufacturers were willing to operate at a very small profit; we had nearly all lost money during 1932 -- in

fact there was only one that broke even -- the company I represent. We were all anxious to put our best foot forward and somehow the motor car industry has been credited with starting the wheels going. In a while I will show you in round figures an increase of 40% in three consecutive years. That made it possible for the industry to get started again, to put men back to work, and even the advent of the NRA had no effect on the sale of motor cars. It did throw in front of us more difficulties in dealing with the men which perhaps I shall dwell on a little later, but in the main we are in this position today -- that the year 1935 will be either the third or fourth highest in the history of the industry. The total cars finished will be somewhere between 3,850,000 and 4,000,000 cars. It is our hope that during the coming year, 1936, we shall be able to register a small increase but we hope it won't be necessary to run the production up to the 1929 level because we don't believe the market can digest that number of cars. If we run more cars than are actually sound in quantity we would have to go through another digestive year.

The average life of a car is figured around eight and one-quarter years. Up to two or three years ago we figured seven years but with better roads and better quality of cars it seems sound to estimate around eight and one-quarter years. We feel that sound progress without attempting to high-roll the production of motor cars will help to stabilize our industry. The greatest drawback to our industry from a manufacturing standpoint has been the fact that there is a selling peak in the motor car business which is reached during the months of April and May. During these months we sell 15% of the year's volume per month. In the slowest months of the year -- November and December -- we sell

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between 4 and 5% of the year's volume. Consequently, it is very hard for us to carry on inventory because you know a load of motor cars is like a load of hay -- it is hard to find room for them.

We have attempted something this year never attempted before and which has for its object the leveling out of the employment curve in the automobile industry. We have set the announcement date of motor cars forward two months -- from January 1st to November 1st -- first, because we were trying to help the overall load of the employment for the year, and second, because the selling season in the automobile business really starts about March 1st and if we have from November 1st to March 1st to build up the dealers' stock, we will be able to go after the job more leisurely and produce a better car. The reason is that the time has gone by when the motor car industry can experiment on the public. Due to the competition, there is only one thing that counts in the motor car business today, and that is quality of product and length of service, so we hope it will be possible to persuade a certain number of buyers to get their cars a little earlier this year. If we could at least increase the sales ratio in the slow winter months by 2% and take that off the high months, we would be able to stabilize our employment to a figure that might be conservatively stated as 25%. Where do we have to go to get this done? To the Sales Department. They will immediately get out a lot of literature saying it is time to get a car that will protect you from the weather and you ought to get a new car in the winter time. That is fine so far as the buyer is concerned; he gets everything we say he will get, but in the transaction a used car enters and that is another problem, and the only way we can help the turnover

in used car sales is by having as many people employed as is possible. As soon as shops begin to lay people off, down goes the used car business; as soon as they put them on, up goes the business. Therefore, we are not only trying to help the general situation, but trying to help our own business. In spite of all the artful inventions that have been made to convince the customer that the selling price of the new car is low, the most important thing to the customer is "what do I get for my used car?", so the science of selling cars today is being able to gauge accurately what you can do with the used car.

I have certain facts here that apply to the industry, such as production figures over the different years, but there are a lot of things we don't know about the industry so I shall be forced to quote General Motors figures -- the figures for General Motors as a whole. In doing that I would recommend that you use the factor of 40% as representing the facilities of the corporation versus the facilities of the industry. I think that is fair. Also, any figures that I have do not include tire manufacture. We are not engaged in that and no motor car company to my knowledge is engaged in the making of tires. The automobile industry today is largely self-contained. Naturally, some manufacturers go further down the line of parts manufacturing than others but the individual suppliers who are working for these companies more or less align themselves and can be considered part of the set-up even if they employ their own capital.

The number of men employed in the industry today can be roughly estimated at a little over five million. The latest figures we have show five million sixty-five thousand. This includes all men employed in the manufacturing, sales, service, road construction, and truck and bus driving.

If you separate out of that the men employed in the manufacturing of motor cars, we find that somewhere around 500,000 would be a fair figure, except if you include men employed in the making of service parts. That will probably add 50,000; so we can say today that a total of 550,000 men are engaged in the making of motor cars and parts. This is from statistics gathered in connection with the code investigation we had and it might be a little higher today because actually the number of men employed by the General Motors Corporation is somewhere around 200,000 -- in fact the exact figure is 198,705. That was my last report. I might explain that I get a weekly report from every plant in the United States, showing the number of men employed, the average number of hours worked, and the average wages paid in any one of our fifty-odd plants. Those 198,705 work on an average of 42.7 hours and draw on an average of 72 cents per hour, men and women. The wages today in the automobile industry are at an all-time high. They are at least 10% over the level of 1929. This has been done in order to compensate the men for the short hours which we agree to maintain under the code.

The industry can be easily organized for any kind of emergency. You only have a few units to deal with -- few and very concentrated. They have always prided themselves on being used to any kind of emergency. In talking about the industry I shall separate it into three parts, primary manufacture, secondary manufacture, and assembly and finish. By primary manufacture I refer to foundry and forging equipments; by secondary manufacture I refer to machining, stamping, and polishing equipments; by assembling we mean welding and body and car assembling. Most of the bigger units control their own primary manufacture and some of them support

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motor car units that are not able themselves to make the investment. We have in existence very good jobbing foundries that can handle all kinds of equipment; we have some very good forging plants. I refer particularly to one near Chicago whose equipment is of the highest order and who can turn out work fully on a par with that we turn out.

Our tool room facilities are large. Some of the bigger companies are able to control all their own tool work; the smaller companies have to depend on jobbing shops in the location. The automobile business is fairly highly concentrated; you can find everything you are looking for within three hundred miles of Detroit. The laboratory facilities are very large and complete in all the larger companies of the industry. Naturally, with the progress that has been made in the manufacture of low priced motor cars it was necessary to do a large amount of research and experimental work and the large companies, and even some of the smaller companies have been willing to spend money to get into the laboratories men and equipment required to keep ahead of the manufacture nearly all the time. In other words, in our case particularly, each car unit has its own engineering department and laboratory; each parts manufacturing unit has its own engineering department. We maintain a central research laboratory housing 1500 people engaged in the problems of 1936 -- not 1938. The car engineering department is responsible for the current product and in our research we try to confine ourselves to the things that will be ahead two or three years hence. In addition to that, most of the larger companies have an outdoor laboratory -- in our case, called the Proving Ground. Here we have some 1200 acres of ground on which every kind of road has been duplicated, so far as we were able. We start with the

cobblestone blocks of Europe -- the so-called Belgian block -- two or three miles of that; mud road; dirt road, washboard road (meaning a road with transverse ridges) good gravel, medium gravel, and bad gravel; concrete; grades running from 3 to 24%. We have a track capable of sustaining speed of from 80 to 90 miles an hour, and incidentally, we are about to rebuild it because a couple of fellows have gone over the side due to the fact that the cars have passed the 90 mile clip. The reason we went so far in speed was that in the higher priced cars we must have something to offer that stands them out from the lower priced cars. Consequently, performance is about the only feature that we can offer aside from luxury and some size.

I mentioned a minute ago the set-up within the Corporation. I think this set-up is paralleled by other corporations that make more than one car. Each car division within the Corporation, Cadillac, Buick, Oldsmobile, Pontiac, and Chevrolet, has a complete and independent set-up. They control their own car; they control the manufacture and sale of their own car; they control the progress that their own car is scheduled to make from year to year. We also have a large number of accessory and parts manufacturing plants which will serve any one of the car manufacturing units on a competitive basis, it being understood that any car unit has a right to purchase outside if it can get a better deal than that offered by the Corporation company. In Detroit we maintain an operating staff of which I am the head; it is not very large, and we have no record keeping. Whenever we want any figures we get them from the divisions. It consists of a salesman (we are naturally all Vice Presidents) engineer, manufacturer and statistician. We also have a lawyer (we had to have that)

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but these five people do not have more than one hundred fifty people working for them altogether -- in order that we might not centralize operations in Detroit. We want each parts division and each car division to progress on the merit of the service it can render the public. That is the fundamental policy of General Motors, and I am quite sure that other companies use the same system, with the exception of one.

You probably know as much about the product as I do. The lowest priced car will weigh about 2000 pounds curb weight -- meaning unfilled. They go up to 5500 pounds -- the most luxurious. And, incidentally, I might mention that it is hard to get the performance operation of these cars up to where it should be in comparison with the low priced car of the same type. It is easier to take a little car and make it as fast as the big one than to take a big car and make it as fast as the small one.

You have probably noticed the influence of style on cars. After we ran the gauntlet of gadgets we found that the purchase within the family represented quite a difference if the purchase ran as high as six or seven hundred dollars and we had to appeal to the lady of the house to get some distance with the present vehicle. The result was that somebody advocated the expression "streamlining" the cars and tried to convince the masculine member of the family that these beautiful lines were necessary and worth their weight in gold because they saved gas. I would like to publicly puncture that statement. I don't suppose I have to tell you gentlemen at what point the aerodynamic propensities would effect gas saving. I would like to puncture the idea that it saves gas at all until we get way up in speed where we can't operate a car without

climbing a fence. The style features have a tendency to make people look for a new car before the old car is used up and it has this advantage; that the old car rapidly drops in price after it has been turned in and it makes it possible for a man to get a reasonably good piece of transportation for a couple of hundred dollars where he would not be able to afford a new car at its new value. The tendency is this; that while theoretically we get the streets cluttered up with a lot of junk, at the same time it does this for the working man; it increases the radius of his working area exactly five times. When I was on the bench and worked I found that six miles was the limit I could travel every day to and from my work, and work the then customary ten hours. It is quite common today, and I speak from experience, to find men in our plants who think nothing of traveling thirty miles back and forth every day, so in bringing the used car within reach of the working man we have increased his working area and in that way helped eliminate a lot of labor shortages and migration.

Another thing that helps us in the motor car business, is that obsolescence in other regards is beginning to set in. If I could explain to you the range in service parts we have to carry in order to take care of models 10 and 11 years old, you would realize that a good many people are able to run their motor cars much more than eight and one-quarter years, and I would like to say this for the motor car manufacturer; there is not a part that you can possibly think of or need but that there is a manufacturer in business who can get it promptly somewhere. There even exists in Detroit a company that has purchased all the obsolete parts of cars, the manufacturers of which have gone out of business, and it is doing a land office business in parts. Another feature is the so-called scrap years -- those

that buy wrecks. They have developed quite a system of saving parts that are worn least and are selling them to the working man and the man who cannot afford to spend very much for car upkeep. They have become quite a competitive factor in the parts business because it is a question of economics -- not of selling force.

The principal items in a motor car are steel first, iron second, then glass, rubber, lead and carbon. The sources for these are all found in and around Detroit or within a night's run from Detroit. Rubber, of course, we have to store in order to protect ourselves. The approximate yearly requirement of rubber in the United States is around 450,000 tons, and you will find that not only do the rubber companies carry a large stock but some of the manufacturing companies carry a large supply at all times so as to be protected in case of overseas trouble which would hit the rubber business first of all.

It might interest you to know that for 20,000 cars -- a day's supply -- we require 32,390 tons of material. It is split about this way: Steel 20,497 tons; (this is per day for 20,000 cars) iron 6,200 tons; copper 258 tons; lead 252 tons; rubber composition 126 tons; glass 603 tons; paint and lacquer 221 tons; rubber 549 tons; lumber 1472 tons; body fabric 840 tons; small rubber parts 157 tons; and a number of small items such as brass, tin, lead, porcelain, chemicals, paper, cork, asbestos and graphite -- all running daily into about 100 tons.

In the making of a motor car it is naturally important that we realize -- if, for instance, we are running about 8,000 cars a day -- that we must handle 12,000 tons of material through that plant in the shortest

possible time with the least possible scrap, so in the motor car business the conveyor has been introduced. A good many people think the conveyor is something like the whip of a slave driver; that all you have to do when you want to get more work out of the men is to fix the rheostat so that we get more feet per minute and presto! All down the line we get a lot more work. That is about the biggest fish tale I have ever heard. I have worked with conveyors ever since they were introduced and they are nothing more than beasts of burden. They have no function in the manufacture of any article except to act as a stock carrier. I should also like to state that speed per se means nothing. The only thing that counts in manufacture is accuracy. Years ago when it was my privilege to assemble the first motor cars in a plant not used to manufacturing them, the first thing I did was to take all the hammers and files I could find and lock them up. From then on we got some good motor cars.

I should like also to recall to you that only a few years ago, Mr. Leland, then head of Cadillac Company, sent to England some Cadillac cars and before an assembly of engineers took them apart and mixed them up and rebuilt three Cadillac cars from whatever parts were at hand to the great amazement of all European manufacturers who said it could not be done. Incidentally it is only fair to say that today there is no European manufacturer that does not employ the American system of interchangeability of parts; there is not a manufacturer who will consent to any filing or fitting when the assembly takes place. Speed has nothing to do with the finishing of work --- I would like to make that strong. Once in a while we get a speed artist in the organization but he does not last long. He will be finishing them outside in the rain instead of

instead of inside under the roof. A short time ago I had occasion to take a man through one of our plants about a half hour before closing time when the fatigue period ought to be at its peak, and when we got through he said he could not see any evidence of anyone looking strained or depressed. I told him we had no place for that in the automobile business. When you consider that we have to make something that when finished is to be operated by anybody without any test and sometimes without experience, we can't afford to take chances on the workmanship because it might fall apart before you get it out of the shop. I should like you to feel that the accuracy ratio within the automobile business, considering the amount of tonnage we handle, is as great as that of any other business. When the time comes that you want a job done, you don't need to be worried about the limits. The automobile industry will set the limits. Today in making piston pins the limit is 1/6 of a thousandth and I think that is close enough for anybody.

In the manufacture of motor cars we have developed a number of processes due to the fact that we can handle large quantities of each piece. There is within the industry a lot of material available for you gentlemen if you care to investigate it. I would like to say -- and I think I speak for the industry -- that we are happy to receive you into the factories at any time if you should want to study any particular branch of the work. There is not a year goes by in which we are not forced to discard machinery of one kind or another for machinery that is more efficient -- not so much on account of quantity as on account of quality. For instance, in gear cutting we are about to remodel practically all gear cutting machinery within the industry because we have found that there is but

little use for the straight tooth gear. All our machinery will be adapted for helical and advance type spiral bevel gears and you will find in a very short time that there will be within the industry sufficient equipment to handle that kind of thing.

I should like to say further that if you have within your organization a problem which you would like to have us work on, even if the necessity is not present at the moment for getting it out, we would be perfectly willing to consult with you and give you the benefit of whatever experience we might have had. During the New York automobile show I was visited by a professor from one of our leading educational institutions. We talked a while and finally he deplored the fact that a professor was so loaded with formulae and so tied up in the school room that he did not have a chance to see things in practice and apply them to what he saw. He received an annual pass to our Proving Ground and Research Laboratory by return mail.

I brought with me some figures showing the size of some of the machinery we have, thinking you might be interested in knowing the range of some of the equipment. In the foundries of General Motors, meaning only those controlled by ourselves, we have an hourly capacity of 220 tons. The maximum size of the flask is  $43\frac{1}{2} \times 30\frac{1}{2} \times 22$ , and we can make a larger flask. In forging our hourly capacity is 66 tons. We can handle a bar at the moment up to  $4\frac{5}{16}$  diameter. There again we could probably handle a bigger bar if it were required, but we know we can handle this and how many we can make an hour. In hammer equipment we have 221 units

running from 12,000 pounds maximum to 800 pounds minimum. In pressed metal our hourly capacity is 259 tons. We can handle a sheet 100 x 172 of a thickness up to 50/1000ths. We can handle a heavier sheet in a smaller size up to 5/32nds. In lathe equipment we have available 1330 lathes. We can swing from 48" down to 3 $\frac{1}{2}$ " with the major portion swinging from 14" to 19". The point that I should like to make in connection with this is a very important one from my point of view. I had some experience during the last war in working for the Government and, incidentally, the experience was a very pleasant one. We had no difficulties that amounted to anything but I found a good many cases where, if the job had been left to us to work out, we could have done it somewhat cheaper than where the specifications almost prescribed the number of operations in a piece. Should the occasion come where you want work done by the automobile manufacturer, if you will give us your drawings and your specifications and allow us to dig in and work on it ourselves we might find a way of doing it which will be of advantage to both of us. While we are naturally perfectly willing to have you come in and watch progress of the work, I think in tool making we have certain advantages due to being in constant touch with the tool room and the advice we could give you would be of great benefit from a cost standpoint and the standpoint of deliveries. As an example, I can tell you a story on myself. I was making some airplane stampings, and, of course, tool makers during the war were as scarce as hen's teeth; to get a job which required one set of tools costing some fifty or sixty thousand dollars with an order for a piece amounting to about five thousand dollars was rather poor business, but we started to make these tools and you know in stamping tools you make the finishing die first, then you develop operations and make the blanking die last. In this particular instance, every time we would get

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the job half done there would be a change in the finished shape and finally I thought I had spent enough of the Government's money so I hopped on a train and went down to see the man in charge. I said, "I don't want to be discourteous in this, but I have a lot of men working and you keep giving me a change of about a 32nd of an inch", and he said, "Young man, we would love to stand still with you, but the Germans won't let us". I had thought if I could get hold of the chap who was making the changes and show him the disadvantages we could save him a lot of money and ourselves a lot of hours. We don't think we know it all; in fact, we are just beginning to learn, but I do think that so far as tool making is concerned, we can be of some value in helping the draftsmen or engineering plans.

There is no change made on any General Motors car by the engineer before the Engineering Department has been in touch with the manufacturing man and determined that this change is made in the best way from the manufacturing standpoint. This started quite a few years ago when we had a cylinder head to make and the bosses were five different heights which meant that we had to spot face each boss individually. The fellow in the shop wanted to know why in Hades we could not make the bosses all the same height and we looked into and did not see why we could not and we saved a lot of money. So, as a result, no change is made by the engineer without a conference with the shop man; it saves a lot of argument.

I think I should mention, perhaps, that the power requirements in connection with the automobile manufacturing business, reduced to a very rough figure, is about  $1\frac{1}{2}$  tons per car expressed in coal. Wherever

water power is available that would change the ratio somewhat, but I have information the power requirements are about as I have said, expressed in terms of coal.

When it comes to labor, here again I would like to clarify some of the opinions that exist with reference to labor in the automobile business. We were about the first business to set up a shop where the piece traveled progressively until it was finished. The old fashioned shops would have all milling machines in one place and the stuff was carted around in boxes and invariably lost on the way. We have to give credit to someone in Mr. Ford's shop for inventing the system of setting the machines up in accordance with the job. With the larger production we set up machines in rotation so that the job would travel progressively from one line to another and come out finished. That had a great deal to do with the increase in quantity of work we were able to get per man. There is one axiom that must be remembered in connection with the work in the shop; every time you put something on the floor you have to bend down to do it and if you keep your work off the floor you keep the flow steady and instill in the force a desire to get it finished. In laying out the shop one must be sure not to time it wrong so one man has a lot to do and the other little. The distribution of minutes per operation must be fair. The fairer it is, the steadier the flow from the end of the line.

It has been said that any man can go into an automobile factory and learn an operation within a few days. That is true, but it depends upon what kind of operation it is. That we can teach him a simple drill

press operation is true but there is a certain skill in manufacture that the average man does not see. I can assure you that within the ranks of the automobile mechanic are men who in their line are fully as skilled as the old craftsmen. There are such things as specialists. I shall never forget the time many years ago that I took an Englishman through the factory. We came to a fellow who was grinding crank pins and the foreign gentleman said to me, "How close do you grind them?" I told him within  $1/1000$ th. He said, "May I speak to the man?" Well, the man could not speak English, but he could grind crank pins. He could not tell you how good he was but he could produce. I think we are prone to think the factory is a hopper where you put a man in and grind him out perhaps a little the worse for wear, but you will find we have plenty of skill in our shops. Of course, with the stoppage of immigration we have no language troubles any more. The language is universal, and flowery.

The main requisite for a steady labor group is wages. In this country of ours there is no possible way, insofar as labor is concerned, in which you could have a grand argument without a dispute about wages and the real reason why the industry has resisted to some extent the old union methods of organisation is that it is very hard to get an argument about wages. The men were making more money than anyone else would pay. The industry feels it is to its interest to pay the men well; it feels the higher the wage level goes across the country the more people will be able to use motor cars and the more that will help the motor car to become the universal tool in everybody's box when it comes to getting to work and getting home again. In Chevrolet we had a few disputes -- they were settled without disturbance. We settled it by shutting the door and saying, "What is it that you want? Let's talk it over. We will give you everything we

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can", and we managed to get away with it pretty well. We have, of course, within our factories a force of employees who have been with us for years and who realize that all of us are willing to do everything we can for the men on a comparative basis. We don't want to stand out as having raised the entire wage level in the country; we want to pay what everybody else pays and a little more. We want to give the best working conditions we know how to give. So far as safety and health and anything that helps working conditions, we want it as fast as we can get it. Consequently, even though we might have flare-ups in the industry, I think you will find that if you place a job with us you can pretty well count that we will have it produced at the time you want it.

I have a note here about housing activities. That was, of course, quite a question during the last war but with the motor car in more general use we don't find the housing question one of very great importance. The house builders are right up with us if housing facilities are required. I think there will be no necessity of planning for that in your figures. Any expansion of that kind can be taken care of by the industry itself without any help from anyone.

It might interest you to know that in the costing of the automobile, we found in the beginning that when we attempted to undertake this coordination the greatest drawback to a uniform system of cost keeping was grouping the different parts. Some one would have the clutch in the transmission group and another would have it in the motor group. We assigned a man from the central office to go around and coordinate the grouping which would come under the cost system with the result that today

we got a uniform cost analysis of each car each month. When I think back to the last war and remember the variation of opinion as to how cost was to be kept, I think this is quite significant. here is a page of figures on the industry, available each month. If we tried to make a rather elaborate cost system we would be unable to cope with it ourselves and I trust when the time comes that your cost system will be so simple that it will be standard all the way through.

I feel I am exhausting my time. I want to express my appreciation of the attention you are giving me. I really did not think I could fill more than a half hour. I should like to quote you some figures in which you might be interested. I shall start with the total production of cars and trucks in the United States and Canada. There are so few Canadian cars manufactured and as quite a large portion are shipped into the United States that we keep the totals together.

1928 = 4,600,000  
1929 = 5,600,000  
1930 = 5,500,000  
1931 = 2,472,000

1932 = 1,481,000 That was the hardest year. It took a tremendous amount of managing to keep the sheriff from the door.

1933 = 1,900,000  
1934 = 2,875,000  
1935 = between 3,852,000 and 4,000,000

Our automobile industry has been like a rubber ball. The problem before the industry now is not to let it go haywire, but to try to level it out. I have some figures on trucks. The truck registrations this year are going to be the highest they have ever been.

1928 - 341,000  
1929 - 526,000  
1930 - 410,000  
1931 - 315,000  
1932 - 180,000  
1933 - 245,000  
1934 - 403,000  
1935 - probably close to 600,000 --- nearly all in the light

truck.

1 ton & under = 84%  
 $1\frac{1}{2}$  to 2 tons = 82%  
3 to  $4\frac{1}{2}$  tons = 2.4%  
5 tons & over = 9/10ths of 1%

Manufacture has practically settled itself around the  $1\frac{1}{2}$  ton truck.

This must be the most economical unit or people would not buy it to that extent.

In operating within the corporation you might be interested to know how we lay out the year's work. In November of each year the Executive Committee of the Corporation meets and sets up what we call an index for the following year. In other words, we call in the Manager of Chevrolet or Buick and say, "How many cars do you think you can sell this coming year? How many cars do you want to manufacture? What do you need in the matter of equipment and money to accomplish this?" We agree on what is called the index figure and that is set up on a monthly basis. From then on the Manager checks progressively against the index figure. If he finds he has not got cars enough he asks for an increase in the index; if he has too many we decrease. We do it on a progressive basis so as to make variations in the curve as small as possible. In this way each Manager runs his own show and we have the advantage of a man having the organization with him rather than attempting to interfere from the central staff, and in this way hurting his efficiency. I presume that it is

unknown in the Army -- this attempt to centralize without having responsibility tacked on to the particular question.

It might interest you to know that every morning at nine o'clock we know how many cars have been assembled in every factory in the United States. The factory submits a monthly budget; if the figures are black we are ahead; you know what happens when they are red.

In other words, we have a daily contact with every factory in the United States. We do not prescribe operations of the factory; we check the figures submitted against the actual result. The industry, as you know, is wholly responsible financially. There is hardly any debt in any company and the credit is first rate. Even small companies operate at a rapid turnover and pretty much on a cash basis. I think you will find that should the time come when you need additional facilities, the industry will be perfectly competent to take care of it without a great deal of assistance, unless you set it to making something entirely different from what we can do now. That would be a different problem.

The trade organization we have is the American Automobile Manufacturers' Association; we interchange patents and information. We have no union, but we have a clearing house where any one of the members can find out what another member is doing if he wants to. The information is free and can be furnished within 24 hours.

I think that covers what I have to say. Thank you very much for your courtesy in listening to me so patiently. I shall do my best to answer any questions.

Discussion [14]  
following 23.  
Mr. Knudsen  
address

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Q - Will you give us a little picture of just what would be involved in conversion of some of the facilities to war-time work? "Automobiles" For example, in our program of motorization and mechanization, not a very large part of the present production of Chevrolets could be classed as essential in its present form and it might be desirable to convert some of that facility to the production of something heavy like the four-wheel drive truck. What would be involved in that and how long would it take before mass production were back?

A - The first question to come up would be, "Could we utilize the motor to the higher gear ratio?" If you should make an entirely new motor it would take about seven months to tool up. If you could use the present motor and reduce the changes to the rear axle we could probably reduce that time to four months, I would say. If you have to make an entirely new motor with different centers and crank centers, we would have to have new heads for our lathes and boring machines, and that takes the greater part of the time. A motor with an entirely new center - that would take from eight to nine months.

Q - Could you give us any idea of the percentage of cost that goes into overhead, labor, power, etc. ?

A - Are you talking about the labor burden or all burden?

Q - Labor = material = power, or any similar breakdown. What part is labor?

A - Of course, when you get down to it - that is all labor, and this ratio would vary tremendously in the different companies, depending upon whether it were a primary or secondary manufacturer. Chevrolet is a primary manufacturing company -- Cadillac is a secondary manufacturing company; Oldsmobile is secondary; Buick is primary. In Oldsmobile or Cadillac the total labor ratio is around 200%; it is lower in Chevrolet.

Q - I understand the Ford Motor Company is a completely vertically integrated organization and General Motors is not. Ford owns its raw materials and General Motors buys most of their products. Which in your opinion is best?

A - I would say that it depends entirely on how much money you are willing expend in plant. I was working for Mr. Ford when the blast furnaces were built and I think at the time, with war-time prices for iron, the blast furnaces looked like a good investment, but within three years of that date we were able to buy iron for about half and I don't think on that basis it was a good investment. We, of course, buy pig iron from people who have ore mines and coal mines and who we know are responsible, but if it ever came to a point where we thought we could not buy iron cheap enough we would acquire coal properties and build furnaces, but at the moment we don't feel like duplicating existing facilities as it seems an uneconomic thing to do. Mr. Ford built up for production and maybe he was justified. He once told me to find out how much the furnaces were costing him and I said, "How much did you expect to spend?" He said, "Twelve million dollars". I told him he had spent nineteen and was committed for five more.

Q - Does the General Motors Corporation make any effort to centralize or control the purchase of material for the various companies?

A - No; we do have some of the raw materials. We carry heavy stocks of copper; pig iron, lead, and rubber which we buy centrally because there is no difference in the requirements of basic material by the different divisions.

Q - With the number of automobiles on the streets and the number of units the industry expects to produce, does the industry give any thought to the possibility of the exhaustion of gasoline or petroleum and is there any substitute that you consider useful or any different type of engine?

A - We are working on the Diesel engine but so far the progress made in fuel has kept step with what we can do in motors. In fact, the gasoline is responsible for most of the improvements. We owe a debt to the Petroleum Institute which gives us much better gas and enables us to run compression up. The compression ratio is 50% higher than in 1928. If we keep on at that rate we will need less gas and the motors will get smaller.

Q - I have a question that may sound very elementary and the explanation to which may be so simple that I may be embarrassed. I check it up to personal curiosity. The Washington papers will advertise an automobile with the approval of the manufacturer, and they will say, "At Flint, Michigan, \$665." I can't go to Flint, Michigan, and buy that for \$665. I can't buy it in New Jersey for \$665., so it would seem to me that there is a little misrepresentation in the advertising and I have always been curious to know what type of psychology the automobile

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manufacturer employs.

A - It is a natural consequence of the weight of the item involved. You will remember that a few years ago there was a shoe made by Douglas and you could get it anywhere in the United States at the same price. The most ardent advocate for the uniform delivered automobile price has to admit that we have to penalize the fellow that lives near to the plant in order to take care of the fellow who lives far away. When you buy an automobile there are certain taxes you have to pay and there does not seem any reason why we should hide that fact that the Government taxes the automobile business. That should be kept before us.

Q - The point is that \$665 is no indication to me that that is the price at Flint or Washington.

A - If you go to Flint and demand your legal rights I think you will get them.

Q - How important is the agreement to cross-license patents the Automobile Manufacturers Association has today? Will that be renewed?

A - I don't think there is any dissatisfaction among the manufacturers; you never heard of one automobile company suing another. In fact, we had one grand chance and did not take it.

Q - You mentioned something about production varying in different parts of the year. Is it too early to draw an inference as to what the automobile show has done compared with January, for instance?

A - I can tell you the results of the New York show. We will have the figures from all the shows before very long. The net result of the New York Show was that the attendance in Grand Central Palace was down 20%. The attendance at the Waldorf-Astoria, which was free, was down 10% but the actual purchase orders were up 85%. We got almost twice as many orders from a smaller number of people, so we do not know yet what the effect of the sales in November is going to be on January and February but there is no question in my mind but what the curve will be changed over my other year. So far the demand for cars has been marvelous, but you can't change the people's buying habits in one year and we are waiting to see. From the standpoint of employment it is going to help a lot. If the public does not want it we will have to change the date of the show.

Q - What do you think the market in automobiles is going to be ten years from now; what will be the price of the low cars?

A - The price of the low priced car today is 14 cents per pound net to the dealers. Now I hope ten years from now there will be fewer pounds in them but I don't think they will cost less than 14 cents per pound. I hope we will learn to put less iron and a little more brains in the automobiles but I don't think if you have to maintain weight they will be much cheaper. When you think about the price of steel, and rubber, and cloth, we have just about hit the dead line. If we should get inflation it will be 14 cents on the basis of 1926.

Q - All over the country we are having a campaign of safety. What is the thought of the industry on the question of safety?

A - We feel that the problem of safety in the operation of a vehicle is one under the control of the driver. In other words, if you have an engine in your basement of 250 horsepower and you want a man to run it, that man has got to have an examination to get a license to run it. That engine never moves from its base but that man has to have an examination every three years. But you take a motor car of 250 horsepower and give it to some kid without an examination and let him climb a tree with it. I think the first thing to do is to observe a reasonable amount of care in the granting of licenses. You probably know there are 13 states in the United States that do not require any license at all. There should be certain laws insuring a certain amount of care in granting licenses. The next thing is that this money we have been taxed for roads should be spent on roads. You have a forty mile road and a sixty mile car. In the city of Detroit we had a safety campaign and there were 200 people in front of the Judge every day. I can sit in the dining room of the General Motors Building and see how the speed has been cut down. I heard a good expression of it by Professor McKintrie. He compared automobile travel to football; he said you had a fellow who was making a forward pass incomplete. He attacked it from the standpoint of appealing to the sportsmanship of the American. Last year at the World's Fair we had a show in Chicago and we opened the exhibition with a dinner and there were people there from all walks of life. We got through about ten thirty and Mr. Sloan and I went back to the Hotel on Wacker Drive. We went from 51st Street to Jackson Boulevard -- about one and one-half miles. There were four lanes going south and four north and there was not a single break in that line. I could not help thinking what would have happened if

you had had horses and carriages; four lanes going north and four going south in an unbroken line for a mile and a half or two miles. If you get a fellow with a load on, it is too bad. If you can educate people it would be simple to reduce accidents.

General Gibbons: I would like to ask how many units General Motors comprise in its factories and assembly plants.

A - About 52 - 52 buildings.

Q - Are they located all over the United States?

A - Yes sir.

General Schull: I would like to ask if I am correct in understanding that five million people gain their livelihood from the automobile industry?

A - Yes, directly and indirectly. The figure I gave is 1935 but according to this there are 1,121,000 employed in the sales and servicing of automobiles; 330,000 on road construction which is a direct result of the automobiles; 2,600,000 driving automobiles for hire; and in manufacturing we have a little over 500,000 actually employed in the factories, parts industry, etc. We have 200,000 people in General Motors alone. The book gives the total not segregated, as 5,065,000.

Colonel Taylor: I should like very much to repeat that first question, which is an important one to us, and I would like to use the blackboard. (Makes diagram on board) In your assembly line where you start with the frame coming in and assemble the different units -- I want to ask if, in your Chevrolet plant we wanted to produce four wheel

drive vehicles, how long would it take your plant to set up for them? You raised the question as to what motor would come in. Am I correct in my idea that you run 1, 2, 3, 4 or more motors in your assembly line in a single day? These motors are fixed by specifications that you get up for sale. If, coming in were X and Y motors not gotten up by Chevrolet they would require forms and if one required R.F.A. some of these units would come in. If, in meeting these specifications from some outside purchaser they described a motor available for purchase, how long would it take to throw your manufacture over to that?

A - The assembly would not take long. If you did not require a new motor it would not take long. The assembly plant changes would not mean anything. I was talking about setting up a complete motor where castings, forgings, and machinings would be on an entirely different basis.

General Hughest I would like to ask Mr. Knudsen if he has noticed any difference in the efficiency of labor since 1929 -- the efficiency of labor in your plants.

A - Yes; when we started up again we found a lot of the men had gotten soft -- the men working in the foundry and forge shops. It took three or four months before they were back in shape. We can always see it in the first aid room in back aches and ear aches because the men had been idle for so long. Some of the agitation for collective bargaining had something to do with it. It was heartily accepted at first; some of them thought it was something by which you collected something.

That has been straightened out. You probably know that the birth rate increased during the lay-off. I think the efficiency is as good as before; the economic pressure is a little greater.

Q - How is the turnover?

A - Quite an improvement over last year. That helps us tremendously. If you get a couple of hundred thousand more cars to make, that helps level out employment. Men are looking for steady jobs now. In 1929 we had a number of people who did not work more than three months a year, and they are the ones I now call the unemployables. We had a number of people who were able in two or three months to bring their budgets up to what they wanted and now they are being paid by the Government, full time.

General Tschappat: I want to say that I appreciate very much having heard Mr. Knudsen's talk and the discussion.