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THE AUTOMOTIVE INDUSTRY
by
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THE AUTOMOTIVE INDUSTRY

I am very happy to be here again. I think I ought to introduce my companion, Mr L. P. Fisher. Mr. Fisher is the fourth of the famous Fisher Brothers. He is now on the staff in General Motors and was for many years the head of the Cadillac Division of the General Motors Corporation, so he knows very well the subject of automobiles and especially Fisher bodies.

When I was here last year I talked more or less extemporaneously - I had prepared no speech - and Colonel Quenton told me I could deliver the same talk I delivered last year if I came down here this year. I will try to go over some of the things that I said last year and supplement them by what has happened in the meantime.

I told you last year about the automobile, its history, and the stage that we were then in. I told you that the automobile was first in the experimental stage - the public paid for the experiment - and that it afterwards got into the development stage, where we just multiplied everything we had on the basis of four times four is sixteen and six times six is thirty six. We finally hit 1929 and a crash. We had reached at that time a total production in the industry of 5,600,000 motor cars, and we went down and down every year after until we hit a low in 1932 of a million, four. We planned for five million, six, and had an output of one million, four. You can imagine the difficulties which the Automobile Industry were confronted with at the time, but happily we had no debt. Practically all the automobile companies operate on a cash basis, consequently, we did not have very much debt except current debts to meet. We started to improve our product, particularly in the low price-field. The net result of it was that the output went up from 2 million, four in 1932 to a million, nine in 1933, and to two million, eight in 1934. I forecasted in this meeting last year that the output was going to be between three million, eight and four million. I was wrong by over a hundred thousand cars because we actually made four million, one hundred thousand motor cars in 1935. This is, of course, the entire industry, you understand. As far as possible I shall use figures for the entire industry, and where I do not have industry figures I will use General Motors figures, which amount to about forty-three per cent of the total. In 1936 - we are so close now that I do not have to guess, I can tell you what we are going to make - we are going to make

four million, five hundred twenty thousand automobiles in the entire industry in the United States.

The most outstanding thing of this year's output is that the truck production is at an all time high. Trucks this year will amount to six hundred twelve thousand, which is the high figure for all time, as against five hundred thousand last year. Truck production is naturally mostly in the smaller sizes, from one-half ton to one and one-half tons. I want to make the statement right here that anything that the country might ever need in the way of small trucks you gentlemen do not need to bother about at all. When it comes to bigger trucks and special designs, we have to talk with you and see how far we can adapt the present units of the car to your requirements.

We have gotten to the point where the cars consist of four units front axle, rotor, transmission, and rear axle. The frame is really only a few pieces of iron that can be gotten together very rapidly. These four units represent the heart of the motor car, and they are the ones that cost the most to change.

You will also remember that I spoke to you last year about our attempt to straighten out the seasonal curve in the automobile business. In 1934, when we were down here on the labor argument during the Code - the so-called Henderson Report was made at the time - the only thing that could be judged with any kind of fact was that the automobile industry had a production curve that was altogether too seasonal for the welfare of the employment curve. The industry agreed then with President Roosevelt that we would try to equalize the load a little better. In speculating on how that could be done, we decided to move the announcement date of the automobile show up sixty days. The automobile show was set for January first and the selling season in the automobile business starts March first consequently, during the two first months of production we had to get enough cars not only to take care of the current demands by the customers but also a sufficient stock to start the dealers off on the 1st of March, because we could not possibly gain anything from March 1st until July 1st. In other words, the full capacity of the industry was taken up. (That can best be illustrated this way The ordinary selling ratio - calling the entire curve a hundred per cent - showed from three one-half to four per cent in January and February and reached a high of fourteen per cent in May.) We decided then to try this, and 1936 is the first complete model year in which this scheme has been operated. This is what has

happened: We did not have enough cars to begin with. We only estimated our requirements, and we lost some business during the months of September and October. We did not figure that the public demand for cars would hold up within thirty days in the face of a new model, there always having been so much interest in either dress changes or chassis changes every year practically since 1922. So these are the results. The selling ratio in the month of November was increased from five to nine per cent, the selling ratios in January and February were increased to six per cent and six and one-half per cent respectively, and the peak in May was reduced from fourteen to twelve per cent, so the public unconsciously gave us some help in leveling out the production curve. As far as employment is concerned, these are the actual figures for the year compiled by the American Automobile Manufacturers Association. The fluctuation range in employment, meaning the difference between the peak and the shut down period for model changes, was reduced from one hundred three per cent to forty-one per cent. The variation in employment for nine months amounted to nine per cent maximum. In other words, during the production months the maximum variation between the high and low in man hours work was nine per cent. The labor turnover was reduced fifty per cent. The steady workers, meaning workers that have work all the year around, increased from fifty-one per cent to sixty-nine per cent. The average annual income is up four hundred sixty-nine dollars for every man that worked in the industry, and this includes all quits and discharges. The income of the steady worker reached fourteen hundred ninety dollars, which is the highest since 1929. Other industries during this same period averaged eleven hundred forty dollars to its steady workers per year more than anybody else. These figures represent the entire industry except the Ford Motor Company, which does not supply figures for comparison with other people except over the telephone once in a while. The general wage level for the average worker has increased fifty per cent from the low of 1933 - January 1st, 1933 was the low point in wages.

I have here some figures that I thought you might be interested in. Naturally, wages are a very touchy subject at the moment because we are almost constantly in hot water in some plant or another with the demand for wages way beyond what those of the locality are and way beyond what any comparable industry pays anywhere. The average hourly rate, and now I have to quote General Motors, which probably was on par with the rest of the industry, to 109,000 people employed in General Motors on the 1st of January, 1933, was 53.7¢ per hour;

by 1934, 148,000 people got 63¢ an hour, by 1935, 157,000 people got 70.8¢ per hour, by 1936, January 1st, 194,000 people got 72.3¢ per hour, and by the 1st of January, 1937, 228,000 people in General Motors will receive 76 to 77½¢ an hour. I would like you to remember that at the same time there was no increase in the automobile prices, and the problem of management under these conditions becomes, naturally, a severe one for the executives in the shops.

When we come to material, you know in an automobile you have to figure a ton and a half of material to be handled every day you operate per car. I can tell you this frankly, that during eight days of December, which are the last figures I had before I left, General Motors has manufactured and shipped 82,000 automobiles. In other words, we are running at the rate of ten thousand cars a day - 228,000 men working. Concerning material, I go back only a year, so that you may understand how important it is for us to see that the cars do not get too heavy. Pig iron from January, '36 to January, '37 has gone up a dollar a ton base point. Rubber within a year has gone up six cents a pound. This is a commodity we get from abroad. It is one of two commodities that we have to have from abroad, the other one being tin. Cotton has remained stationary. Copper has gone from nine and a quarter to ten fifty. I remember very well that in 1933 I contracted for ten million pounds of rubber at four cents. You can see what happens to the commodity range when prices begin going up, and I do not think we have reached the top yet. Zinc has gone up fifty cents a hundred, lead seventy cents a hundred, tin three one-half cents a pound, and steel anywhere from four to eleven dollars a ton. I only tell you this to make you understand how important it is that we keep our eyes on both sides of the picture.

The material picture is perhaps the most important one due to the fact that there is so much more material produced by outside people in comparison to the work that we actually do after we get it. We are not in the raw material business at all. We have always stuck to the policy that we will cast, forge, stamp, finish, and assemble automobiles. We do not care to go into the primary manufacturing business, feeling that if we went into that we would obsolete a lot of facilities that exist in the United States. You gentlemen know it is only a short time since steel had any kind of an operating ratio, and that applies to copper and other raw materials as well. Whether we will be forced for protective purposes to do anything of the sort, I do not know. It represents an enormous investment - the average blast furnace set up, with an ordinary mill and

facilities for making ingots and billets will cost somewhere around fifteen, sixteen, eighteen million dollars, so whether it is good business to step out into that field or not I do not know. I have held back on even recommending it to the Board of Directors because I felt we ought to employ our facilities in the country to the full extent before we put any more money in bricks and mortar.

I told you that in 1929 we made 5,600,000 cars. At that time the trading ratio for used cars was a little over one to one. Consequently, when we made 5,600,000 cars we had to move eleven million two. We had to move the used cars along with the new cars. We had to find a customer for them. Today the ratio is practically two to one. In other words, every time we sell one new car we have to dispose of two used cars, either to another buyer or to the scrap room. Consequently, if we were going to attempt to make five million, six cars a year in the United States we would have to move sixteen million, eight hundred thousand automobiles. That is, sixteen million, eight hundred thousand owners would have to trade their cars for another one in one year. Now there are according to our record, somewhere around twenty-eight million owners in the United States, and you can imagine what a commercial and physical job that would be to get sixteen million, eight of those people to move their cars once a year. It just could not be done. Consequently, we hope that we can establish present output in order to retain this better employment curve. We hope we can retain production around four million, seven to four million, eight. There might be some slight variation over the year, but we feel that that can be done.

Of course, you know the automobile business is highly competitive. We have given the public something new every year, we have given them something better, we have tried to hold the prices down, and we are still going to try to hold the prices down. If once we get going up in price, for every fifty dollars we add to the price per motor car we lose a hundred thousand customers. I found that out in Chevrolet in olden years when material prices were not staple, and I had to go up in price. Every time we did it we lost customers. Consequently, we are here between Scylla and Charybdis on one side, the price, labor and material going up on the other side. We have output to look out for because if we lose two of three hundred thousand cars we have to absorb the burden on the smaller quantity.

I suppose I ought to tell you something about labor. We are confronted with an entirely new thing in labor disputes. You know of the Labor Board and President Roosevelt's attempt to get some Parliamentary or mediation means of settling labor disputes, but unfortunately it did not work. Representatives are selected under the auspices of the Automobile Labor Board, and they are still sitting, but they haven't got very much of a standing because the N.R.A. went out and with it the Automobile Labor Board, and now most anybody can set up in business and start a board of its own. This is about what we are confronted with. The most serious thing about it is the thing that started over in France last summer. I talked to Mr. Penhard when I was there six weeks ago and he told me how it all started. The thing really originated in Turin, in Italy in 1921 when, under Communist movement the workmen took possession of the Fiat Company, fired all the officers of the company, and said that they were going to run the place. However, it only lasted two weeks. They ran out of material and did not know where to get any more material, so that thing fell by its own weight, and, of course, you know Mussolini stepped in and from then on there wasn't any more talk about stoppage of any sort.

Last summer in France - in Paris, and Paris is France, nowadays you hardly ever hear of much going on outside of Paris except in the north, up where the coal mines are, and Paris has always been a hot spot for most any kind of fun - I talked with Mr. Penhard. He said that on a certain given day the men locked the boss up in the front office. I know all the French manufacturers - I do not know whether you gentlemen know any of them or not - but Mr. Renault is a very hot tempered gentleman and I can just imagine what happened to him when they locked him up in the front office, but that is what they did - and the staff was given the opportunity of either staying with the men or being locked up too. The men stayed right in the factory, food was brought in, and finally Mr. Blum, who is the Premier, was charged with settling the strike. Now, Mr. Blum is elected to his post by the Socialist vote, but there are not quite enough to go around so he has to depend on the Communist vote to give him his majority. In a French Chamber you can vote any one out with a vote - one vote down and out goes the minister. So poor Mr. Blum had to give the Communists anything they wanted or he would be out of a job. The net result was that he settled the strike on a basis of forty-eight hours' pay for forty hours' work and two weeks' vacation with pay at most any time the employees wanted it. Right after came the difficulties of the franc and he was forced to devalue the franc sixty

per cent, which shot the list price of the automobile right up in the sky. When I was there Mr. Panhard was making six cars a day with six thousand men. I said to him "How long is this going to keep up?" "Well", he said, "I have a government order for trucks and tractors and I get a check every week for the payroll and when that stops I stop." Also, he said a very significant thing "If you don't look out that might happen to you one of these days." Of course, that did not make any impression on me, but I certainly could see the effect of it in the automobile show in Paris. It was terrible. I have gone to the show in Paris practically every other year since the war - 1921, '23, '25, '27, etc., and I have never seen a show in Paris as poor as this particular show was. There was nothing new. There were a few paint jobs and a few gadgets but absolutely nothing new, and heretofore when you went to France you could always see some mechanical development, however crude, showing they were progressive over there. You could see that they were stunned by what had happened.

The last time I was over there I called to see Mr. Citroen. Mr. Citroen died ninety days after that. He went into bankruptcy thirty days after we went through his plant. He was wrestling with another problem at that time. He had produced a front wheel drive car which did not strike the public fancy very well and he had committed himself for so many motor cars that he had no choice but to make them whether the public liked them or not, consequently, the Michelin Company had to take them over and are still running the place, with assistance from the government. I only tell you this because I see in Europe (perhaps with the exception of England, and I will tell you something about that in a little while) a tendency to organize the business after a fashion with a political control behind it. I have yet to see one that worked out satisfactorily. Of course, when war comes and there is a constant demand for a certain kind of article it is easy to organize a country for production because everybody is willing, but here you are organizing somebody that is not willing and that is where the difference comes in and that is where the failure comes in, gentlemen, as far as I can see it.

What we are dealing with here in the automobile picture today is the so called "sit down" strikes, where the men just sit down and say "We want to talk." That is a new one. I never heard that before. I have been on strike myself

in days gone by, but to sit down in a plant for a week! - I never thought of it that way before. Nevertheless, that is what is happening, and the worst part of it is that the economic losses that go with even a small strike of that sort are so tremendous that it staggers one. For instance, we had recently up in Detroit a concern that makes frames, called the Midland Steel Company, a branch of an older steel company in Cleveland, in which eighteen hundred people made up their minds for higher wages. Perhaps it was a justifiable demand, I could not say whether it was either good or bad. Of the eighteen hundred, eight hundred stayed in the plant and immediately became heroes to the rest of them. They stayed in there a week, and the first two or three days they had a regular picnic because the mothers and sweethearts brought them food and cigarettes and razors, and finally somebody produced a guitar, a phonograph and some records, and from then on the thing became a perfect masquerade. While this was going on, Chrysler who was getting his principal supply of frames from the plant, had to shut down and sixty thousand people lost from one to five day's pay. Eventually this thing was patched up with these chaps in the Midland getting seven or eight cents an hour more, but the comparative actual result with the economic loss that actually took place is staggering, and the men that were running the strike had no conception whatsoever of what other questions of economics might be involved in their particular argument. All they could say was "If we get this we will go back to work." I think there is a distinct danger of that thing spreading over the United States unless we can find some means to stop it. I am not in a position to tell you what we are going to do to try to stop it if we have any idea. Some times it is better not to say what you are going to do until you have to do it because you might have to change your mind. However, I consider that a distinct danger because as the groups become larger their influence becomes greater and generally at the head of a group like that you find a man that is totally devoid of business experience, to whom a hundred thousand dollars would be his mental ceiling and he is playing with millions. He is like a baby who takes an alarm clock apart but cannot put it together again. It is really a very serious thing that all thinking people should ponder on to see what the answer is.

We are caught today between two movements one the industrial union, the other the trades union. I have no particular choice. I was brought up in the trades union and I do think that in a trades union there is some protection

for craft. I think if a man comes into your plant with a card saying he is a carpenter from the Carpenters' Union you are reasonably sure he is a carpenter, but if a man comes with a card from the industrial union he may be anything from a sweeper to a tool maker. There is absolutely no advantage of dealing with them on a card basis. Nevertheless, I think the best thing is to let the men find that out for themselves. We in General Motors take no position whatsoever. We have no objection to the men organizing any way they want to organize but we will not close the shop up. The only way we will close the shop up is when we close the front door, for the reason that I do not think we are far enough in the skill of negotiation, I do not think we have the right principle set up yet and I do not think we can afford to risk the stockholders' property being dissipated by inexperience. There is not any of us that have not worked in the plant and that do not know what the problems are, and we are willing to meet them on a sensible basis. The American production picture was built up on accuracy, it was built up on organization, just like the Army is. We had a certain number of non-commissioned officers. We cannot afford to let them lose their peace of mind because it is going to show up in the product. When men's minds are disturbed by anything the work is disturbed along with it, when men's minds are at ease their work shows it. We cannot afford to lose the pride in craft which made America what it is.

You have often heard people say that we in the automobile industry get a conveyor and put a lot of things together, and that really anybody can do it. Anybody cannot do it right. I can assure you that in such a thing as an automobile, or mechanical device of that sort, it is all important that the most menial task is performed with care in order that the finished article might go into the hands of a user that has not had very much experience in handling it, and, consequently, must be safeguarded against accident later on. We have a problem in the United States (and I do not speak of General Motors or the automobile industry in particular) in that we must not lose - I hope we have not lost it yet - the pride in craft, the pride in workmanship, the pride in accuracy.

Concerning the conveyor, a conveyor produces nothing. When I was an apprentice boy I was the conveyor. I had to drag the castings around to the man's bench who was going to work on it. The conveyor is only a beast of burden. Tools and gauges produce the result that you are looking for.

As far as our facilities are concerned, there has been quite a bit of money spent the last year. Perhaps I better read what we had in General Motors - or have you a record of the talk last year?

Colonel Jordan Yes sir.

Mr. Knudson Well then it can be found in that transcript. I gave some figures on the units, on the number of machines we had and the capacity of the machines. That has not changed very much during the last year. We have made some progress in this that we have increased tool room facilities pretty generally. In other words, nearly every manufacturer has increased his tool room facilities, which is a good thing for the future in case we should have to make something special. You know what I mean by the tool room - all the fixtures and dies are made for the parts that are manufactured down in the shop. Some progress has been made in tool making, particularly in dies that respond to two or three motions in a press, consequently get two or three operations done with one stroke. There has been some very nice progress made on that. Aside from that, the greatest progress in the machine shop has been made in broaching. You know what broaching is, where you take a knife and slice a piece off the casting. We have found that in casting we can broach up to thirty-six inches long and about ten inches wide, meaning the face of the piece. In some cases we have been able to broach two faces alternately. However, the piece itself has to be solidly designed because in box shapes the broaching produces too much spring. Take for instance the transmission case - we tried to broach that, both the sides and the face, and we found we had to go back to milling because the strain sprung the fixture. Even if we could hold it while we were doing the broaching, as soon as we took it out it sprung. However, cylinder heads are now being broached, and I have predicted that cylinder blocks will be faced that way instead of by milling. It is of course, faster and it is more uniform. It costs a little more for broaching, but the result, I think, is better.

Besides that, there has been quite a bit of progress made in drilling. By that I mean that we have three or four position drills, where we can with one setting up of the machine bore this way and this way and this way (demonstrating), and some very handy drills have been made that produce a very good job. Also, of course, a saving in time is made because

you only have to put the piece in there once to get three or four operations on it. The main thing to remember in connection with broaching is to have a flat surface. I think I told you last year that I remembered in the early days in Chevrolet that the fellows made a marvelous cylinder head but they had four different kinds of heights in the bosses, consequently, we had to spot face every one of them. We could not mill it, so we made them go over it again and sweep it clean. I do not know how much, but we certainly saved a lot of time because we could just go over it once. The same is true of holes - we have the holes lined up as far as possible in one direction. These are all simple two by four things, but they make a terrible lot of difference in a shop when you get them out there.

With reference to welding, a very great deal of progress has been made, both in flash welding and in spot welding. I think that before many years we are not going to have any more riveting. There isn't any reason why with spot welding we cannot make a solid job as we can with riveting - we do not have to poke a hole in and then put another piece in there. The reason that the advance in spot welding has been so great is that some Greek over in Paris invented a little device whereby the contact will not let go until the fusing point is reached. Our early trouble with spot welding, and I myself was very much against it, was that we never knew whether the weld was any good or not unless we tore it apart, but nowadays with the control we have on welding you can be sure that there has been a contact because the contact does not let go until the fusing point has been reached.

In body building welding has been a Godsend, because we can now make a joint, clean it off, and you never see it. It has been a very great help to the advancement in the manufacturing of the steel body. In the old days you know how we had to work around and try to get panels riveted and we had hard wood framing to deal with. A very funny thing has happened in connection with it. In the old days when you built up this wooden frame and put the steel pans around, it used to cause a great deal of variation - there had to be - and when there was any variation the fellows would get a wood rasp and scrub it off and put the stuff on. We cannot do that now because the whole body is steel, and incidentally it goes together better than the wooden frame did, so we have really done something.

Another thing I can report to you that has been quite a gain is that we made in our Saginaw Plant a kiln for malleables, and all the annealing is done without any outside air getting

to the price. We have succeeded in reducing the time of annealing malleables from a hundred hours two years ago to thirty hours today, and the product has not suffered at all. Tests have been made, and it is fully as good as the old hundred hour stuff. This has practically revolutionized the malleable business, and everybody that wants to get into this quick annealing process will have to spend money for kilns. It is a perfectly simple thing. We know years ago in the annealing of ordinary pieces in mufflers that when the air does not get to the piece during the heating process or the cooling process oxidation is cut down and the structure of the metal is of greater uniformity than it could be any other way. I think this is a real step of progress with these malleables, because if you have ever been confronted with getting malleables you know that the first thing a malleable manufacturer says is that it will take three weeks to get them. If you protested he would say "You know it takes a hundred hours to anneal them - we cannot do it any faster."

In going over our cars last year after we were all through, we patted ourselves on the back and thought we had produced a pleasing result, which I think we had. The industry generally produced some very nice looking cars, and we started out to get a lot of weight out of them, but, as usual when you forecast, the result was not quite up to expectation. We thought we might get a hundred pounds - we wound up with twenty-four. That is all we could do. We have learned from that that it is not a good thing to forecast a hundred pounds because there usually isn't a hundred pounds leeway since it makes the cars smaller and the public so far has not taken very kindly to small cars.

We have a factory in Germany that manufactures cars complete. It is called the Opel factory. We have one in England that is called the Vauxhall factory, which also manufactures complete cars, and both manufacture small cars with about a hundred cubic inch and from seventy-eight to ninety-six inch wheel base. Lately the trend abroad is to make them a little bigger, so from now on they are going to have the problem of making theirs bigger while we are trying to make ours smaller so as to meet the increase in the price of materials. Maybe one of these days we will meet in the middle

I remember well that in 1923 I was sent over to Europe to look at small cars. The then most popular car was made by the now Sir Herbert Austin, called the Austin Car. I went down to the salesroom and they received me very courteously.

I had known Sir Herbert from the time that he tried to make tractors over in England during the war and could not make cluster gears. I looked the cars over and decided there wasn't any market for them in the United States. In the United States everything is bigger -- railway cars are bigger, streetcars are bigger, homes are bigger, chairs are bigger (everybody sits down and stretches their legs), and I thought the motor car without these things was not going to get very far. Of course, I was interested in Chevrolet, and we went from a hundred to a hundred twelve inch wheel base in about ten years. I remember seeing a gentleman in England, right down in front on the Strand. He was evidently going out that night because he had evening clothes on and a tall hat. He was riding in a roadster, and when he sat down here was the body line (indicating) and his knees were sticking up, and it was raining, but he did not seem to mind that at all. Of course, a vehicle like that would be impossible in the United States. People would not look at it.

Finally, Mr. Austin came over here to make a few cars. He came to me in Detroit and wanted some help to get a man to run his factory. He said "What do you think of it?" I said "Sir Herbert, I think your car is too small for the United States", and it proved that it was too small for the time anyway, because he produced in one year the greatest loss per unit ever produced in an American automobile factory. Then he shut down. You have to feel your way. People do not like sudden changes. I think we have a motor car now with almost enough speed. If you want any more speed all you can use it for is to wrap yourself around a telegraph pole.

Our job this year has been to improve the performance at low speed. In other words, the so called "get away" that everybody is so interested in. All through the whole line of cars produced by the industry you will find that the cubic feet per ton mile have gone up about seven or eight in the last two years, meaning that the performance ratio has been increased. The top speed has not gone up very much, and I do not think will go up very much more. I think from now on the people are going to call for more economy and more comfort. I think our engineers will have to work on that problem rather than try to speed them up a little more.

We have also gained this last year in measuring instruments. We are constantly, through cooperation of the sciences, getting more and better instruments, which Mr.

Yettering has taken under his wing. He is reproducing in a practical way so we can use them out in the plant for gauging purposes. I was up to see him the other day and he had a new one, an invisible ray machine, where you can push the piece by hand and if the piece isn't up to measurements the light flickers. He was standing there looking at it. I said "That is a nice machine." He said "Yes, it cost a hundred and ten thousand dollars. Isn't it terrible that we have to spend a hundred and ten thousand dollars to get something through a quarter inch of skull."

There has been a great deal of machinery replaced during the last year, and I have got to give the machine tool industry credit. They finally got around to the point where they are making spindles heavier and frames stiffer so that we can get more of a chip off the job than we could before. It is very interesting to see (did any of you go to the machine tool show in Cleveland?) how they are squaring up their machines and enclosing them, stiffening up the bearings and finishing up the spindles better. It speaks well for the future, in this respect that nearly all of it is a little bit oversize, so if we want to use it for a little bigger piece - I am referring to future uses by you gentlemen - we will not have to go out and get special machinery for it. I think we will be able to handle most anything that comes along.

I have heard something about a unit plan of making one vehicle for the Army, where you would want different plants to make units, say motors, axles, and transmissions, etc., and ship them to a central point to be assembled. That can be done, there isn't any question about it, providing the drawings are finished. Before the drawings are sent out to the plants they should be thoroughly examined, not only ^{by} the suppliers themselves but by the shopmen, so that there will not be any differences of opinion after you get it into the shop as to how the stuff is going to be routed. In other words, if we are going to have a cooperative manufacturing set-up the routing, and that is the most important part of all the operations, should be laid out before the job goes into the shop and it should be laid out in conjunction with the gentleman that is bossing the job from down here. Also, when it comes to the assembling of your unit, the assembler must have charge. There must be a boss on the job. The assembler, the man you decide to assign the assembling to, must be boss of the job. He must say whether the units are right or wrong, he must have the rejection privilege. If you do not do this the thing is going to fail. To repeat, the routing must be decided on, the routing must be

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agreed upon, and the assembler must be the boss.

We are carrying on some experimental work for the Government now, mostly in aircraft engines. There is one thing I ought to bring out in connection with this which is very important, and that is when a firm undertakes an experimental job for the Government there ought to be one amount set up for the experimental work and another amount set up for the units, if any are ordered. We, for instance, have at the moment an order for some airplane engines that were specified to deliver seven hundred horsepower. After we delivered the seven hundred horsepower it was raised to a thousand. After it was raised to a thousand we were asked to produce eleven hundred and fifty takeoff. We have now a promised contract for ten engines, and we have almost seven hundred thousand dollars set up to one side that we do not know whether we are ever going to get or not. Now the General Motors Corporation, of course, can stand a thing like that, but if you are going to get the best brains in the country and small manufacturers in on it the small manufacturer is going to go broke before he gets started - on that kind of a basis. I think if the Government wants an experimental job carried on, let them set aside a certain sum, let them check what is going on and see if progress is being made, then when the device is accepted talk about how many are wanted and what they can be made for. With the deferred expense we are up against, when the price finally comes up, everybody holds up their hands in horror at the cost, high, of course, is not all true cost because it carries the development expense.

Probably you will be interested in hearing about Diesels. We are spending a lot of time and a lot of money on Diesels. I suppose you know of the railway engine set-up, which is eight by ten with an eight, twelve and sixteen cylinder set-up producing about eight hundred, twelve hundred, and sixteen hundred horsepower, sixteen being submarine engines, the twelve hundred and eight hundred being railway engines. Also, we are working on eight one-half and ten one-half, which ought to go up in power maybe another five or six horsepower per cylinder. In aircraft we are working on one cylinder, six by six one-half, and so far have succeeded in getting about eighty-two horsepower out of it. In the motor car business, when you want to make a motor, the best thing to do is to make one cylinder, see how much you can get out of that, and after you have the result thoroughly established from the fuel and temperature standpoint put more cylinders up and run them in series. If the first result is correct the series result will not vary except for blunders in the mechanics of the thing.

The scientific result is pretty well established and can be carried through.

I told you about the aircraft motor down in Indianapolis, five one-half by six, twelve cylinder, and we are now up to a thousand and eleven hundred fifty take off. In small Diesel motors getting into the commercial picture, (the truck picture) we have one three five one-half, five three-quarters, four cylinder, five hundred thirty-six cubic inches, and we are getting two hundred ten horsepower out of it, a little over fifty horsepower per cylinder. We are also building smaller ones, four one-half by five, three cylinder, two hundred thirty-eight cubic inches, and are now getting about eighty horsepower.

The weight of these engines, of course, is way beyond what a gasoline engine is today. We cannot possibly match the weight on account of higher pressures, but still ten pounds per horsepower does not seem to be out of reason, and the more experience we get with them the more we might be able to gain on that weight ratio. I would say today that ten pounds per horsepower on the small motor is possible plus .45 pounds of fuel per horsepower hour, and that is the rate we are working with now. The main point of difference in the Diesel engine today is, of course, the two cycle, four cycle argument that is going on all over the world, about half the world sticking to two cycle and the other half sticking to four cycle. We have so far conducted practically all of our experiments on two cycle because of the lower weight we can obtain by exchanging the blower for half the cylinders. That is about the ticket.

I suppose I ought to tell you something about Europe. Going to Europe as a pure civilian, I am like a bus man on a holiday, I walk through factories. We have two assembling plants in Scandinavia and we have two plants in Germany, a car plant and a truck plant. We have no factory in France, but, as I told you before, we have a factory in England, and every other year I take a trip over there, mostly to get something else to look at for a while. It gets to be pretty stoney after a couple of years looking at the same thing. So this year we went over on the S. S. Queen Mary. We went to Southampton, on up to Harwich without stopping in London, and then to Denmark, which is my native country. We have an assembly plant there. Denmark is at the present time on a quota basis - you have to get an import permit for anything you want to import and an export permit for anything you want to export, and it is a very significant fact that the country seems to be getting along all right. For instance, we can import three

thousand motor cars to be sold in Denmark, we have another thousand that go to Poland, and two thousand to Norway, consequently, six thousand motor cars are the limit - we cannot get another one. Other manufacturers are in the same position. Ford gets three thousand - he has an assembly plant over there - Mr Chrysler gets sixteen hundred.

The repair parts business is marvelous, because the minute you cannot replace very many cars and have to run the old ones the business of repair parts is very certain, and, it being good, the business man, frugal in every way, takes the number of cars he can get and figures out how much money he could have made if he had more cars coming in and that is the price per car. I can remember Mr. Lewis when we were down here on the Code saying "Why, we did not figure out how many motor cars we were going to make and divide them by twelve and then make so many a month." He must have learned it over there.

Of course, very much has been said because England has diverted a good deal of their buying in victuals to Argentina and Australia. The late King made his trip down to Buenos Aires and helped to fix up some swell contracts for meat from Buenos Aires to England, and little Denmark over there was getting the worst of it. I called on the Prime Minister and on the Minister of Commerce but they were not interested in motor cars at all, just nothing doing. The Minister of Commerce told me that he was very much concerned because four million dollars of money from Denmark had to be paid for gasoline every year, and he looked at me as if it were something terrible. That is General Motors' payroll for three days. However, you have to admit that they have to live their own lives and do the best they can, but the fellow that pays is the consumer every time.

We went down to Germany - to Berlin first. The order in Germany is marvelous. I have been going to Germany now every year since the war and I have never seen it look more orderly than it did this time. It has never been very bad, but the order that existed everywhere was outstanding. Down in the shop everybody does this to you (demonstrating), from the kid to the manager. He sticks his arm out like this (demonstrating), and I caught myself doing it. To give you an idea of the amount of control that existed there, we have quite a factory down at Russelsheim, near Wiesbaden. We have twenty thousand people employed down there, making about a hundred thousand motor cars a year. You will remember that Mr. Hitler took the tax off motor cars to help the unemployment situation, feeling that if he took the tax off motor cars more unemployed

would be absorbed and the result would be better financially, and it is. How long it will keep on I do not know, but so far the result is all on the credit side. Of course, we have been making money on a hundred thousand motor cars a year. If you can't make money on a hundred thousand motor cars a year you better shut up shop. But, we can't get any money out. Whenever you leave Germany you get your ticket to go on a German line, and ten marks are all you can take. You cannot get any money out at all. Consequently, we have been expanding our facilities foundries, forging and stamping plants, and finally we built a truck plant. This truck plant was built with the consent of the government and is located thirty miles from Berlin. The designs were approved by the government, so it can be utilized for any little thing that they might be short of at the moment in the military line. They are building about one hundred fifty to two hundred cars a day there now and they just recently started.

As I told you, the order in Germany is marvelous. There is no looseness anywhere. In Berlin, if you walk down Unten den Linden - they have taken the trees out (so you cannot say "under the Linden trees" any more) and made a beautiful boulevard there - such things as beggars, bums, or street walkers are not seen. It is clean as a house, too, wherever you go. You could walk anywhere in Germany with perfect safety. The Brown Shirts are around just looking for somebody to beat up. Just notify him in any kind of time and he will be right over there and clean the situation up. Down in the plant we had a labor dispute about a year and a half ago. All the labor is in one group and all the employers in another group. Some fellow comes down from Berlin, listens to the story, both sides, makes a decision, and that decision stands. In one instance the men did not like it so well. He said "There is a train leaves here tomorrow. Do you want to get on it?" No. They did not want to get on it. They went back to work. You, of course, know where the train was headed for - a concentration camp some where. Efficiency - My God! Whether the people are happy or not I do not know. They are certainly not starving. I was in the hospital in Berlin four years ago for a month and everybody had sort of a pinched look on their faces, but they are not starving any more. They certainly look fine, and all the reports I could get were that Hitler certainly is a marvel of the twentieth century. Here comes an itinerant house painter from a foreign country that gets control of sixty-seven million people in four years. That is the marvel of the twentieth century as far as

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I am concerned - all due to two things the radio and the moving picture.

In Germany I called on some of the dealers. They were quite satisfied, business was good. Of course, the only thing Germany misses terribly is the export business. They had a marvelous export business previous to the war, and about the most stupid thing they could do was to start that war right at that time because their export business walked right out of the window over night, and they have had a terrible time to get it back. They are now working down the Danube River, down to the Black Sea with all these Balkan countries, trying to make long term agreements for their exchange of commodities - grain against metals and manufactured goods, etc. It seems, ascertained from people I talked with, that they have seen a new light in the diplomatic service, that they are now going to get men of the aggressive type in London, business men, well educated, young, and not bound by any traditions of any sort, and I think that is about the only thing that will get them any part of the business back. They are horribly short of rubber and copper and cotton. While I was there Mr. Hitler issued a statement that in four years they were going to be independent of rubber. I think he was merely whistling - I do not think there was any foundation for it. However, that is the greatest drawback to Germany's manufacturing problems today. In chemistry we know that they are as good as anybody in the world. America is the only country that surpasses them in chemical research. Their machines, and, of course, we have all German machines in the plant over there, are not anywhere near as good as ours. They are not as solidly made. Nevertheless, they are learning. Every so often they get a machine from over here and then we see a Chinese copy of it the first thing you know. They are willing to learn.

I told you pretty well about France. The condition over there is, of course, all messed up because France feels that the rebels are going to win in Spain, which seems to be practically sure. They will then have Fascism to the south, Fascism to the east, meaning Mussolini, Fascism to the North, in Germany, and they have a pretty little Fascist organization of their own. The Croix de feu was dissolved on order of the Premier three months ago, but it is open talk in Paris that they are still very much in evidence and smuggling arms from Switzerland so as to watch their chance and one of these days take a crack at it. When you try to analyze the difficulties the world over with Fascism and things like that, I

think the reason for it can be found in this that people are beginning to be sick of parliamentarism or they cannot understand it. I remember that in 1931 when I came back from Germany there were sixteen parties in the German Reichstag at that time and it was quite possible for them to maneuver around so that the minority could control certain issues. I think that is what has hurt parliamentarism in the eyes of the people of the world. When you come to a depression over there of some sort that brings about bodily want along with mental unrest the net result is a dictator coming up. I do not care who he is, he will come up.

France was dead. I have never seen Paris like that. There weren't any people on the streets at night. There were a few squabbles up on the boulevard every so often about nothing in particular, nobody was hurt very badly - you know the Frenchmen make a lot of noise but seldom is anybody killed - but there is uneasiness. I have a friend over there and I went to his house at night for dinner. He said "It does not look right. We do not know what is going to happen or when it is going to happen, but something is going to happen." Everybody thinks that when the Spanish issue is over the pressure will be put on France, and, of course, there are plenty of munitions to be made. During my stay in Paris they had a rehearsal as to what to do in case of an air raid. They have set up sirens all over the town on things that look like mail boxes. At a certain time at night they blow them and as soon as they do that all lights should be put out and all motor cars stopped for five minutes or so until they gave you the release again. It only goes to show what is in the minds of everybody over there - they're scared stiff of airplanes. It is quite comprehensible that they should be scared of airplanes. Over in London they are scared stiff. Why? It takes only forty-five minutes to go from Paris to London, it takes two and three-quarters hours to go from Berlin to London, it takes four and a quarter hours (and this is ordinary bombing plane flying) to go from Rome to London. That is why everything is messed up. Airplanes! Airplanes! Airplanes! That is all they think about, and bombs to go with them. It was demonstrated during this Spanish rebellion that the people are scared stiff of something dropping on them from above. They just run like the dickens. They have no means of meeting it, they dive for the cellars as soon as it happens.

In France the parliamentary set-up is very bad, as I tried to explain to you a little while ago. The manufacturers have no illusions. They say "We will have to have a crash one of these days." I do not think the present set-up will be able to work out of the difficulties. I think they will have to have a different one and there will have to be a certain amount of

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discipline in it. Coming back on the French boat I talked to the French skipper. He is a nice fellow, about fifty-four years old, going to retire at fifty-five. They all retire in the French line at fifty-five. I asked him. "How are your sailors?"

"They are all right when I get them away from the dock. When I get them out in the sea they do not bother me a terrible lot." I said: "I understand that down at Marseilles they hoisted the red flag."

"Well", he said, "let me get them out here and I can handle them."

From there we went to England. England was going just like Saturday night. If there is one thing an Englishman loves to do it is to dress up, and he is the best looking man dressed up that I have ever seen any where in my life. All the restaurants were going full speed, and during the day people were on the streets - millions of them - and in every store you came into business was good. The underlying cause of it is munitions. That is taking up the slack. I know the three big manufacturers over there and, as one usually does when one goes to luncheon or to a tea or something we met some fellow who alleged to have an inside in the government. He said "We are making airplanes, we are making lots of them and making good ones. If we can make any better ones we are going to make them, because Italy bluffed us once and they are not going to do it again." That is fear against some outside force. The three big motor car manufacturers Morris, Austin, and Hamborg have an individual contract each, for separate buildings in separate locations, built as close to the ground as possible, in which to make airplanes. They are not going to make the same plane. They got into a terrible squabble about that because Morris, the biggest manufacturer, said it could not be done, so each one makes complete planes, feeling that there is more safety in having three plants make complete planes than to have an arrangement whereby the loss of one plant might upset the whole picture. I tell you this because it sounded pretty practical to me and because they are going to build them so low down in the ground - they are going to excavate practically the whole factory - that it will not be noticeable from the top.

You might be interested in knowing that the forty hour week we agreed to try down here in Washington in 1934 has been accomplished this way. In 1933 the average hours per man was 41.9 a week, in 1934, due to the original Code arrangement of

36 hours, the average was 35 hours per man, in 1935 it was 39.2 - that was a little closer to it - and in 1936 the average for ten months is 40.5. We are pretty sure, when the other two months come in, to wind up with about 40.2 or .3, taking the shut down period into consideration.

I think the picture is good today. There is one thing you cannot help, and that is feeling good when you come back from a trip to Europe, and, as you know, the best thing about going on a trip is coming back. When you come into Sandy Hook and remember that it is twenty-three or twenty-four or twenty-five hundred miles to the nearest land, it makes you feel awful good, after listening to all this talk about air raids over in London, to think that we have everything in this country but rubber and tin - those are practically the only things we have to import. We have, I think, as good equipment and as good designers as I have been able to see any where in the world, and I think we have every reason to feel proud of our position. Whatever might happen abroad, this country is so well situated, is so balanced, and has such an enormous amount of common sense scattered all over its area, that one feels awfully proud of being a part of it. I can assure you gentlemen that if there is anything the automobile industry can do for you at any time it is necessary it will be done very promptly. Thank you very much.

THE ARMY INDUSTRIAL COLLEGE
Washington, D C.

DISCUSSION FOLLOWING LECTURE BY Mr. W. S. KNUDSON

"THE AUTOMOTIVE INDUSTRY"

December 12, 1936

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Colonel Jordan: Mr. Knudsen, when you were here last year you spoke about the shortage of trained mechanics and about the introduction of apprentice schools. Would you say something about that to the Class, please, sir?

Mr. Knudsen: I overlooked that. With the specialists gaining the upper hand in the industry, we have found that the old, all-around mechanic was gradually dying off on us and young ones were not being made fast enough, so we set up a program providing for five per cent obsolescence per year in important mechanical trades, and all our plants now have apprentices working in the trades of machinist, tool maker, welder, electrician, and torch solderer, which are some of the most skilled. The torch solderer compares to the old tin smith, welder to the blacksmith. We found that with the technique in welding machinery we had to have an entirely new sort of electrician. The ordinary journeyman electrician did not know which end to start from, because it is an entirely new design. We have had to develop new electricians, especially for hooking up electric welding machines. I am sure every factory in the industry is working on that same problem, trying to get a definite basis. For instance, a three year course or a four year course, and men coagulated into industry that have learned the trade.

Q. Mr. Knudsen, what is the status of a fully streamlined body, or the teardrop type of automobile?

A. The status of it?

Q. Yes. Can anything be done to develop it or put it before the public?

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A. We try to go as far as we can. The streamlined body is getting a little more streamlined every year, but you can feed it to the public only so fast. Some people do not like it. You no doubt recall that two or three years ago one manufacturer went a little too far and the public did not take to it. Therefore, we have to develop it gradually. I predicted that during the next three years the trend will be to still more streamlining.

Q. I would like to ask a question, Mr. Knudsen, which is a little aside from the general subject of your talk - the matter of organization in the industry. In industry in general, as we understand it, there seems to be a tendency toward a general policy of centralized control and decentralized operation. That is the way it is commonly termed here, I do not know whether you use the same terms or not. We are particularly interested in procurement - that is purchase, I expect you would call it. There has been considerable discussion as to the relative advantages of centralized procurement as against decentralized procurement. As I understand your position in the General Motors Company, I think it would be very interesting to hear from you what you think about the advantages of centralized procurement and to what extent you employ that method of procuring. In other words, do you attempt in your central organization, that is, your head or top organization, to do the buying for all of your plants? Do you buy any of the material for all of the plants, or do you decentralize it to the individual plants?

A. We in General Motors operate on the decentralized basis. We have five car divisions and we have twenty odd accessory divisions,

and each plant is a unit in itself and does its own buying. The only thing that I might handle in the central office is the thing that does not change specifications but can be used universally, for instance, rubber. I might watch the rubber market (and you know to watch the rubber market is to watch the sterling market besides the rubber market, you all know that). Rubber can be delivered without any change in specifications. In other words, it is a base material. There have been times when I have bought some copper on a low price, but generally we do not do that. The only place where we centralize is in working on problems that are not solved. Take, for instance, Mr. Kettering's research - that is probably five and six years ahead of anything that we can use in the shop. He could not give us some of the stuff he has over there now because it is not far enough ahead. He is working on principles, not on any finished article. In your case, for instance in case of war, as far as the Government is concerned I think you must commandeer the materials you are short of. That is essential, because you might be short a quantity of an article that might upset your whole program. I heard something about manganese during the war, that there was a shortage of it. You had to get it; nobody else ought to have any of it until you got yours so you could keep the whole picture going. I imagine if all our divisions were short of one metal, for instance, tin, if we could not get any tin and I saw the program being held up for tin I suppose I would hop out on a train some where to see if I could not pick up some tin. That would be my job. However, as long as the divisions can handle their own affairs we believe it for the best, for the

simple reason that a push button job can get too big. Suppose I sat back in Detroit with seventy-eight push buttons and tried to run that-----?

Q. Do you care to say anything about the progress of the industry in Russia, or do you know anything about Russia? You did not say anything about Russia.

A. I do not know a thing about Russia.

Q. Does anybody else?

A. I have the feeling that Russia has reached a point where she just cannot talk any more. Of course, in Germany you hear a lot about them; and hear something in France and something up in Denmark. As far as I can understand, the result has not been at all in any direction that would justify the claims that were made for it. The people are still living on a very low standard, and I also hear that the quality of their stuff is terrible. In 1932 - we were down in the Ford plant in Detroit - a fellow took a contract to go over there. He stayed there over two years. Then he came back and wanted his job back, and we were glad to give it to him because he was a good man. On Saturday afternoon (Louis Peterson was his name - a heavy fellow, six feet two, three, or four in height) he came to my office and spent the afternoon telling me of his experiences over there. The entire thing was like a funny page. They haven't any organization, and are short non-commissioned officers. They have a lot of generals, but they are short skilled men. That can come only through time, you see. He said that the thing he was most scared of was that he did not do very much work. We usually run six hundred crank shafts a day in Chevrolet and if they made twenty.

over there a day that was good. Half of the time they did not have any steel. He said his worst fear was that if he left the hammer with the steam on somebody would come along, touch the ~~steam~~^{trip} and it would hit metal on metal and spoil the hammer. The fact that he could take a watch, lay it down and break the crystal - which any old hammer man could do - without spoiling the watch, made him a ~~god~~^{god} to them. He did not have to do any work at all. He came back fat and healthy, but he said he would never go over there again. I think what they need over there is a bunch of good foremen and a bunch of good toolste~~rs~~^{rs} and a bunch of good mechanics, and it is going to take a long time to get them. Before the revolution most of the textile workers in Russia were English; most of the mechanics in Russia were Germans; and all the pipe fitters were Danish, I know that, and when they chased all of them out it left a gap that it will take a certain number of years to fill. They can come over here and buy tools and dies, that is fine, but they do not know what to do to fix them when they break. This fellow said that they have thousands and thousands of dollars worth of machinery standing around over there waiting for parts from the United States. They might as well not have it over there. I have a notion that they have not been exactly honest in their statements, and, of course, these things have a way of coming to the surface after while. I do not look upon Russia as any potential factor in the world's commercial market. What they can do in a military way, I do not know. They have always been good, even before the revolution, when it comes to standing up and getting shot at. They have always been awfully good at that.

Colonel Jordan: Mr. Fisher, will you not say something to us, sir? We want to hear from you. We appreciate your position in General Motors and would like very much to have you say something to us.

Mr. Fisher: As Mr. Knudsen said, I am on the Staff in the Corporation and my job is the designing and the product side of the corporation - the body picture, the designing, all the details of comfort that go with the cars, and, of course, that is a very interesting job today.

As Mr. Knudsen has said, we are in a very highly competitive business. Competition is very keen; it gives us a real job every day. I was interested in what the gentleman asked about streamlining. As Mr. Knudsen said, we are trying to develop streamlining as fast as the public will absorb it. I am sure we are going to go farther than we are today. As you all know, the streamlining we have done so far does not affect the performance of the car, especially at low speeds; at high speeds it does somewhat, there is some economy but not very much. A fact in streamlining is that when we get streamlining we lose too many other things that the public are more interested in than they are in streamlining - for instance, carrying space for luggage. Apparently we just cannot get enough of that today in a motor car. Luggage capacity seems to be one of the most important things that the public wants today in a motor car. A year ago we thought we had plenty of room; we gave more room again this year; and I think next year we will give them more room. The more luggage space we put into one of these cars the less streamlining we are going to get, as we see it today. In one of our divisions this year we thought

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we could eliminate trunks, that the public would go to all of these plain back jobs. The plain back job on the present model has as much room as the model of last year with the trunk, but the public said: "No. We do not want any plain back models." The additional trunk space in the trunk job is what they wanted. So, in building these cars we have to build them the way the public would like to have them built. What is creating this big market today, making the public change from year to year, is the fact that new things are being added to the cars. This carrying space, in my opinion, is one of the things that has made more people turn in their old cars than anything we have done. As we go on there will be new developments in chassis. There has been a tremendous improvement, especially in steering and in handling, in the cars this year. As you all know, this safety factor in the motor car is getting to be more important every day, especially with these high speeds and the way the public are driving. Therefore, I think that the industry as a whole will center its efforts in the future more on better steering, more safety, better brakes, and everything that goes with that sort of thing. In my opinion, the problem for the industry in the future is going to be to make more and better and safer motor cars. If we do not, I am sure the states are going to legislate and perhaps put governors on these cars, which would be a terrible thing. So, I repeat, the job the industry has today is to make more and better and safer motor cars. There has been a tremendous improvement in these cars from the product of even a year ago or two years ago, not only in the General Motors cars but in the industry as a whole. The engineers in the automobile industry

have done a tremendous job in the last three years in this respect, and I am sure we are all working (our competitors are working the same as we are) to make better motor cars, and if we do that we are going to sell more motor cars. I thank you.

Colonel Jordan: Mr. Knudsen, I want to tell you, sir that all the gentlemen in this Class have visited your Chevrolet plant at Baltimore. We were taken through the plant, shown everything, and could not have been treated more royally. It was a wonderful day in the history of the school.

Mr. Knudsen: We will be glad to show you any plant you may wish to see. We have a new assembling plant building now at *Linden*, New Jersey, and have just finished one out on the Coast, and when you look at these new assembling plants you realize that they can be used for most anything that comes along.

Colonel Jordan: General Hughes, would you like to say something?

General Hughes: I would like to ask Mr. Knudsen one question: In your commercial production over in Germany, does the government restrict the design of your cars in order to make them available for special military uses?

A. No, not yet, General Hughes. Hitler has an idea of what he calls a *Volkswagen* which he wants to have made cooperatively between the manufacturers over there. The *Volkswagen* is a small car with just a box body and a driver's seat. I presume he wanted to use them in connection with these marvelous roads he has built over there. I forgot to tell you about these roads. *Automobile* The Chamber of Commerce in

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Germany has put an engineer on the job to design this *Volkswagen*
which was going to be the motor car and was supposed to sell for twelve
hundred marks. I presume that the design of that was scheduled to be
used in connection with military movement. We make trucks in Germany up
to two ton sizes, one hundred fifty-seven inch wheel base, etc.. They
look them all over and they have all the drawings of them, but they
haven't asked us to change anything. The only thing they asked us to do
when we located that plant was to put it in a particular place, within
striking distance of Berlin. I hope that answers your question. Whenever
we have a new chassis we send the drawing to the government; they look
it over and file it away, but they have not asked us to change anything.

These auto lanes, I suppose you have read about them, now run
through Germany both ways. There are four car lanes with a strip of
grass in the middle, and there are no cross roads, either overpass or
underpass - you can go as fast as you like. Before they get through they
will have them all over Germany. They are built by the unemployed, you
see, and I imagine they are there to facilitate troop movement from east
to west and from north to south. You can spoil a railway with a bomb
from a plane, but you cannot spoil these roads so easily. You may drop
a bomb on a concrete highway, but they can detour around. I presume that
is what the idea is. They are marvelous things. We could well afford to
look at them