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The Automotive Industry
by
Mr. W. S. Knudsen
President, General Motors Corporation

The Army Industrial College
December 10, 1937

Good morning, Gentlemen -

It is again a pleasure to be here to address you and try to tell you what progress, if any, we have made since I was here the last time.

The model year of 1937 started on November 11, 1936 with the automobile show in New York. In accordance with prearranged plans, we started with subnormal stocks in the field of new cars and normal stocks of used cars, and with every indication of a good year for automobile sales. Prices and wages were rising but with a good volume in sight the industry went along without raising prices, figuring on the volume to make up for it. The decision to change models earlier seemed justifiable for sales in November and December were well above the previous experience in both new and used cars. It became quite evident, however, that we were not going to have clear sailing. The election being over, labor, feeling that it had been granted a new magna charta in the shape of the Wagner Act, began an organizing campaign all over the country, which particularly in the State of Michigan had no previous parallel in the history of the United States. The Federation had a split with the C.I.O., Committee for Industrial Organization, and this latter

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one making a bid for the industrial union with no organization to carry on the work left the automobile industry with a rather difficult problem to deal with for the first six months of 1937. The problem is still with us. It is to some extent working itself out. As I pointed out last year when I was here with you, the industrial union is a new thought born of a desire to organize quickly and presents problems which can only be worked out after trial and error. The old union practice was well established before and could perhaps have been brought into action but for the fact that a race started between the two major unions to see which could get the greatest number of members in the shortest possible time.

It was generally conceded that the Wagner Act would be declared unconstitutional and there was no use waiting for the decision. It was generally conceded that wages in the automobile industry were higher than those in civil industry but the old axiom to get more money was necessary to make the campaign a success. The five largest automobile companies that were promptly attacked, General Motors being the initial one, through the medium of the sit down strike were forced to sign a non-exclusive agreement for collective bargaining, mainly through State and Federal Government pressure. In order to get the extremely large number of people who were out of work back to work again the Corporation chose not to carry the fight but to try to go along with the law as it stood at the time. At the peak of the strike we had 135,000 people idle out

of 255,000, and naturally you can realize it is quite a pressure on any one to feel that so many homes are without a pay check for any great length of time. These men were not on strike but they were made idle through strikes in key plants such as unit manufacturing plants and body manufacturing plants which successively would shut down the assembly plants on account of shortage of materials. The maximum number of people we had out were 135,000. Forty-four days' production was lost; the wage loss was somewhere around \$33,000,000.00; we are not speaking at all about the corporate loss, which really did not matter at the time, because the point of greatest importance was the men. However, we signed, as I told you, an agreement and wages were increased again; shop committees were privileged to handle grievances, and the agreement contained clauses specifying a negotiation procedure before strikes.

With the success of the move in the automobile industry a perfect mess of sit down strikes developed in Detroit and vicinity, often engineered by people who had no connection whatever with the business. However, public opinion finally rose up against the procedure and it died out almost as quickly as it started.

You will remember when I was here last year I told you about my visit to France and that my friend, a French manufacturer, told me about the sit down strike over there. He said: "You better look out, it will happen to you." I laughed at him and said that it could not happen - I found out that it could and that there was no use getting excited about it, but for a while it was rather distressing because naturally the average man, in whatever station of

life he is, rather depends on the law to look out for his interests, and in Michigan the law was a little rusty for a month or so. In fact, in one town the only thing you could be arrested for was parking on the wrong side of the street.

In our case it became quite evident that the procedure agreed to to prevent strikes had little effect on the actual recourse. With the new found power the organizers and union officials had a terrible time keeping the locals from getting out of hand and we had strike after strike, of course all small ones, until June. In June we notified them that unless these unauthorized strikes were stopped (we had over two hundred of them of various durations - it sounded bad in the papers but of course you know we have 78 plants - of from twenty minutes to five days, but two hundred violations of contracts were quite possible in our case) we would not negotiate with them any further. The reason we did that in June was because under the original agreement there was no provision for any negotiation until June 11. The original agreement had to stand from March 11 until June 11 without change but on June 11 they had the right to ask for change and when they asked for change we told them we would not have anything to do with it until they gave us assurance against unauthorized strikes. Public opinion had risen up in arms about it and there was really nothing else for them to do. Then "Wild Cat", an awfully good name, took hold. They naturally had to do something about it and they did. It took them until September 16 to get the final sanctions put on paper, a lot of negotiations about

and and or and yes, etc., but finally on September 16 we got the sanctions, and since then we have been running fairly well, with one or two exceptions. With those two exceptions the organization has stepped up, punished the perpetrators, not our employees but the employees of the union, and we have promptly taken care of our own. I think the net result of the strikes and our actions since has been that the sit down strike has gone by the board as far as the United States is concerned. I think popular opinion generally has taken a stand against it. We will not be bothered with that any more to any great extent.

With all the trials and tribulations we have had, business continued very good and by September 1st it was possible for us to show that we had made up the loss through the strike and were 15,000 cars to the good for the eight months. It looks now as if the year is going to wind up a little more than last year as far as General Motors is concerned. I will dwell a little more on that later. We will be ahead of last year in the production of cars.

In the meantime the Wagner Act has been held constitutional and we are bound by the law. I do not want to dwell upon the provisions of the act, only to state that if it fails to stop strikes it will be ineffective as a help to the labor of the country. We naturally hope that if we must have labor organizations to deal with and we have no particular objection to them; that the organization will be responsible to keep their contracts, otherwise they will fail as a method of collective bargaining. The preliminary

difficulties appearing on the surface are first, for young and inexperienced organizations to draw the line of demarkation between the functions of management and the functions of the organization. The second difficulty is that the seniority, such as advocated by the organization, more or less ties a man to his job whether he likes it or not and it is supposed to give him what has been called a "moral right" to partnership than the capitalistic system, with his labor the sole investment in the enterprise. Seniority has been recognized in the industry from the outset. In the past it was based more on skill and good service, but it introduces now a lot of problems as to whether it is departmental, occupational, or plant wide, and the men themselves do not know which way they want to go. However, I have the opinion that it will work out in accordance with occupation. It can not be plant wide in the factory with various trades employed, mainly because we have a continuous production and recognize the manual skill of the men. The old story that a man can be trained in an automobile factory, in any operation, in three days, three weeks, or three months is a lot of nonsense as far as the more accurate operations are concerned.

With reference to the workmen's investment, thru the medium of his job, in a plant, that is a new theory and of course to my mind has a little taste of Moscow in it. I fully recognize that a good workman is an asset to any industrial enterprise and should be rewarded well for his effort. I can not consistently discard the age old master, servant relationship or discard the obligation

of capital to assume the risk of the enterprise. I feel that if a concern is prosperous the advance gained should be distributed to the consumer, the merchandiser, the workman, and the stockholder in correct proportions; otherwise the capitalistic system is dead and when that dies industry is due for a good case of paralysis, such as has been the case in every country which has undertaken the collective system of industrial production.

A friend of mine who lives over here in Fredericksburg recently visited Premier Mussolini in Italy, and Mussolini was quick to point out what they had to do in Turin in a factory where the workers wanted to take over the plant. They took it over only to find out that they did not know what to do with it after they got it. I believe Russia's experience is something like that also, although something might be said for the idea of taking the managers out and shooting them rather than worrying them to death. So much for the labor situation.

To sum up, the industry has no objection to collective bargaining by law or otherwise, but any reasonable man will agree that contracts unless made between responsible parties are only so much paper and one must also agree that if contracts will not stop strikes they are not worth much.

As for the efficiency of the factory, that is down - if I should make a flat guess I would say about ten per cent. It is coming back, however, and I am glad of it for the reason that when it does come back it refutes all the old claims of speed up and stretch

out in a proper manner. To give an example, in a certain assembly plant body builders on one operation decided to slow up. This held up the entire line. The fact that other plants were performing the same operation with ease did not enter into it. The plant was scheduled to make 35 cars an hour and it would only make 30. The plant was on piece work. Consequently, the management decreed that if 30 cars an hour were all they would make the entire force would be reclassified on a 30 car basis and some 300 men would be laid off. Well, the 300 put such pressure on those who were holding up the production that they went back to work and the plant is now making 35 cars an hour, and it will continue to make 35 cars an hour. That method of dealing with the situation was very effective in this particular case because there was not any foundation for complaint. As far as the quality is concerned we have been most successful. From the start we took the position that whatever the cost was the quality of workmanship had to be maintained and where labor trouble affected the quality, the work must stop until the prescribed standard was obtained. It is only fair to say that sabotage, such as was feared in the beginning, did not show itself, and it is to the credit of the factory executive organization that they could control the inspection one hundred per cent. For your information I think I could state here as my personal opinion that men will not resort to sabotage in labor disputes where wages do not enter into the argument unless a political issue is involved. By that I mean war. It is comforting to know that the inspection system is strong enough to

handle it in any case.

There is no use of trying to discard or hide the fact that business is off. We know that. That has nothing to do with my appearance before you. However, I thought that you might be interested in a theory which some of us have to the effect that the recession, so-called, in business is more or less due to a too rapid increase in prices. Originally I had some big charts; I thought it would be rather cumbersome to have big charts in here so I photographed them down to smaller charts. They all show the same thing, however - that prices in the early part of 1937 took a sudden rise, and, as far as commodities are concerned, dropped. Here, for instance, (displaying chart for Tin) was the position of this line on the 1st of January 1937; it reached a maximum in March of 62¢ a pound from 22¢ at the low. See the hop up and the drop. Here is lead - 3 3/4¢; but the hop up occurred, too, right after January 1st. Here is rubber - rubber has gone from 4¢ in 1923 to 24 1/2¢ in February or March of 1936 and is now back to 14 1/2¢. Here is cotton - cotton showed an all time high in February 1937 and is now down to 7 1/2¢. Pig iron - there is a straight line price for pig iron - this for publicity purposes. Bessemer, open hearth steel mills, automobile sheet - (displaying charts). Here is the old football, copper. You see in every case prices rose very rapidly in the first part of 1937 due to a feeling that base prices could go up and the product prices stay the same. That can be handled for a little while but only until the facts of a situation come back and hit you in the face. Here is labor. Notice

the sudden rise in 1937. These are the average wages for the industry; these are not General Motors figures. We have today in General Motors increased wages 25% over 1936. At the same time we are faced with a material increase of around 13%. The overall increase made it necessary for us to raise our prices; and the prices were increased 8 $\frac{1}{2}$ %. There was no way for us to recover the entire amount of the cost increase we had been subjected to, and business is off. I bring this up to give you a suggestion: if you need any metal buy it when prices are low - it will keep the market rather steady. I think the charts demonstrate in a way the fallacy of the theory that we can increase the cost of base materials and wages without increasing the cost of the finished product. In a receding material market you can give people better products for less money but when everything starts going up prices are bound to rise and when prices rise too fast the average buyer keeps his hand in his pocket and all we can do is work toward getting him into the frame of mind where he feels he is getting his money's worth again. He might be getting it right now but if you have not convinced him of it your business will be off until you do.

The registration of passenger cars in the United States for 1937 will be the highest since 1929. In other words, it will be 3,700,000 as against 3,500,000 last year. I am now speaking of passenger cars. Cars and trucks in the United States will run 5,100,000 this year, which is two or three hundred thousand over

last year; last year the number was 4,600,000, almost a half million over, mostly trucks. The truck position has been increased so that trucks for 1937 will reach an all time high.

With reference to the mechanical aspects of the industry, I have not much to report to you this year. The year has been one of consolidating what we had planned last year. The only place where I can say some real progress has been made has been in finishing gear teeth. Some progress has been made there, and the so-called hypoid gear which now is used in most rear axles was developed successfully with practically no trouble. Another development we have had has been the so-called automatic transmission, which you probably have seen advertised. It is still in the stage of development. We have spent quite a lot of money trying to get the plants up to make it in quantity but so far they have only been able to make three or four hundred a day. The job is in a "productive engineering stage", as we say. In other words, we know how to make it right but we do not know how to make it quick.

So far as the industry itself is concerned, I have not very much to tell you this year over what I told you last year. There has been a lot of expansion going on in the industry during the last year, and possibly you are interested in that. For instance, the total sales of machine tools for ten months of 1937 are \$125,500,000.00, of which General Motors bought \$21,700,000.00 worth. This is naturally of interest to you because it is new equipment right up to standard; it does the work and takes the place

of equipment which is more or less obsolete or represents expansion in our present facilities. In addition to this \$21,000,000.00 worth of machine tools we have bought other tools such as are not included in the records of the Machine Tool Association, namely mostly presses and sheet metal machinery, about \$9,000,000.00 worth. Of the total equipment purchases in General Motors during the last five years machine tools were 52%. In addition to that we have put in a lot of equipment for carrying purposes: conveyors, and special equipment for finishing.

We have a fairly good record to hand you of expansion. Here, for instance, is what we have done during the last year: In Chevrolet at Tonawanda we have put in 860,000 square feet of floor space. I want to tell you that all this floor space we are putting in is all one story stuff, with spans from forty to sixty feet. With "an eye to the future and an ear to the ground", as we say in General Motors, these buildings can be utilized for most anything you will want later on. In Buick at Flint we put in 200,000 square feet of floor space; down in Anderson, 200,000; Delco, Rochester, 400,000; Harrison at Lockport, 200,000; Dayton, the Inland Manufacturing Company, 200,000; and other plants in Dayton 250,000. We built a new Diesel plant up in Detroit with 483,000 feet in it, and we built an assembly plant in Linden, New Jersey, with a million feet in it. All together we have put in four one-half million feet of floor space during the last year - 1937. I do not tell you this to brag about it. Naturally in a manufacturing

business such as ours we have to be sure to be there when the public will buy the cars and the capacity is needed. It is good business but at the same time it has been built in such a way that it could be used for any purpose that might come up later on.

The Industry's production of trucks for 1937 will be 852,000. That goes to show that we are coming more and more to rapid transit of smaller quantities of material. The railroads will be used for the longer hauls of heavy quantity. We have had quite a reaction to the Diesel trains, as you well know, and the railroads are already beginning to talk about freight trains run by Diesel engines, which will necessitate their being changed somewhat so as to give them better starting pull. Over in Chicago (I do not know whether any of you gentlemen have seen it) we have a plant now that is capable of putting out 4 motors a month of capacity type variety and twelve to fifteen switching locomotives. About the only thing I can say about the business is that we do not have to take any old locomotives in trade.

On the tool designing end of it, some new angles are coming up all the time. We are gradually learning to make standard forms and use inserts when model changes are necessary. We have not gone very far yet on that score but I am sure they can be developed within the next year or so where we can make forms that will fit the presses or fit the machines and when we get a drawing we will be able to make small inserts that will do the work rather than to start from the ground with a great big piece of cast iron or cast

steel, which has caused a terrible over supply in our shops of obsolete castiron. I think we will find a way in tool design to get after that and with inserts manage to make what is needed. If we can get at times some indication of what you are thinking about it might actually be possible for us to make standard forms for the machines that would take other things. It is rather difficult to illustrate it to you without a drawing but you can understand how it might be possible to make a box form, just as in the old days we made a box jig for a drill press and put the bushing in, so we can make up whatever shape you might want.

Welding is still going ahead, getting more and more efficient every day. You look at an automobile body and you can not tell where the joint is. It has simply been flash welded, ground off, and wiped with solder. That means that you take the solder and a torch and wipe the joint off after it is made. We are making some little progress in cutting. Cutting speed, as you know, today is simply a matter of keeping a tool cold. It is not a matter of speed any more - it is a matter of heat. Some of the experiments made in research have shown some progress along that line.

In the motor cars themselves the performance ratio is about where we need to have it. I do not think we ought to go up very much - cubic feet per ton about 122, 123, and I think that from now on we will have to work on comfort for the driver rather than more performance. The element of fatigue is coming more and more to the front. Where so many people are driving, for instance in the cities,

it is extremely necessary for us to study ways and means of having fatigue reduced to a minimum. We are naturally concerned with the number of accidents that are taking place. We are somewhat at sea as to how to attack the problem. The Automobile Manufacturers' Association is supporting the national safety movement on a highway with both money and technicians. The development of motor cars of all metal bodies has made it considerably safer than it was before, and safety glass has done something, but the element of driver fatigue I think is today the greatest cause of accidents.

You can not help sometimes wondering just how we got this way. I was over in Chicago at the time of the World's Fair. We had an exhibit over there a few years ago, and one night Mr. Sloan and I drove home on the outer drive, Jackson Boulevard, about three or four miles, and there were four lanes of cars going north and four going south packed solid from Jackson Avenue, which is down town, to 31st Street where the exhibit was. I said: "What do you suppose would happen if those were all horses and buggies going this way? One would have a fit and what a pile we would have out there!" With all these thousands of motor cars going one way or the other, the only element in it that I do not like is that we make an engine that will travel 70 miles an hour and give that to a person who under ordinary circumstances could not pass the examination for running a 40 H.P. engine standing perfectly still. We have a problem there that we are working on and I think the more we can put the driver at ease the better is the overall result going to be. As far as putting more

speed into the cars is concerned, it could only be used to wrap the car around a tree or a telegraph pole. I think acceleration of from ten to twenty-five miles per hour in about five seconds is fast enough for anybody.

The other developments of course have been that we got a little bigger and a little heavier car, which was wrong. We have to back off again because if we make the car bigger, more comfortable, by and by the engine gets too small; if we make the engine a little bigger, then the car gets too small. I think we have pretty nearly reached (I do not want to sound old fashioned) the performance ratio, and the inside body dimensions required in the average motor car. If we get that, and we are practically there now, then we can put our attention to making the car more livable. You might be interested in a story. I walked past a used car lot where they were selling used cars and I heard a brand new expression. The salesman had a prospect in there and he was trying to sell him a certain car (modesty forbids me to say which car it was). His final argument was: "Well, brother, here she is - \$325.00 with music and heat" - the radio and the heat. That in a way gives you the trend of things.

I do not think that I have anything more that I can talk about directly. I would rather have you ask me some questions. Maybe I can and maybe I can not answer them.

Colonel Jordan: Gentlemen, Mr. Knudsen said that he would be very glad to answer questions from the class and he didn't put any limit on what you gentlemen could ask him. He said if he couldn't answer your questions he would tell you so. Are there any questions?

Q. I would like to ask if it is now the policy of General Motors to decentralize and get out of the Detroit area?

A. It is the policy of General Motors to decentralize when we have to expand. For instance we have 46,000 men in Flint, a city of 170,000 people. We think it better to put the next expansion where the people are, rather than to bring more people to Flint. It is a social problem, we being the only manufacturer in Flint aside from the du Pont Company and a couple of smaller foundry and body factories. In an expansion program the plant will be taken where the people are, rather than the people brought where the plant is. I will argue that question with you if you want me to.

Q. Earlier in your talk, sir, you spoke about the small amount of trouble that occurred in your plant after certain agreements had been negotiated. You said that the employees of the Motor Corporation were punished by you. What recourse under this labor Act does the employer have whereby he can punish?

A. He can either discharge or lay off the men. That can be done without the N. L. R. B. giving its approval. We certainly are not going to wait for them. He can come back after and tell us we did

wrong. As far as the discipline of the plant is concerned whenever this happens and we take action, we don't wait for anybody. In other words, here is an unauthorized strike that shut the plant down. We are not going to stand for three or four hundred men throwing thousands out of work. We are looking out for the employees just as much as for our side. We have a case before an Arbitration Board in Detroit at the moment, or rather before an Umpire, Professor Hotchkiss, formerly of the Armour Institute, where six men took another man and put him in a barrel of tar to be used for coating roofs. They put him in a barrell and covered him up about to the knees in order to show that he wasn't the right kind of a fellow. They were discharged last June. The Union first tried to get us to put them back and forget the whole thing and they tried to get us to reduce the penalty. Under the agreement it went all the way up and now it is before this Umpire. The only thing the Umpire can do is say whether the men are guilty or innocent. If they are innocent of course under the Wagner Act we will have to put them back and pay them for the time lost. If guilty they stay discharged. There cannot be any question of the penalty. In any case where they go before the National Labor Relations Board and make a complaint, we have to answer the complaint. But to go there first would take too long and cause too much of an upset.

Q. Do you think the passage of the proposed wages and hour bill would help to improve the situation between labor and the industry?

A. I don't know. As far as I am concerned, the wages and hour

bill in its present form is far below our standard of wages and wouldn't affect us at all.

Q. Don't you think that being a Federal bill it might improve the position of the manufacturer showing that the manufacturer is going farther than legislation had anticipated was necessary.

A. I will frankly say I don't know. Wages have never been one of our worries in the automobile industry. We have always paid higher than anybody else. We have never had any trouble getting all the labor we wanted. Now whether setting the wage for certain areas isn't going to interfere with competition in the industry I don't know. I will give you an instance. When we were down here on the code negotiations in 1934, one motor manufacturer, a little manufacturer over here in North Carolina, protested the minimum rate that the automobile code carried for common labor, which was 40¢. He said he couldn't possibly live unless he paid 32¢. Well, he only made a handful of trucks a year so it didn't make any difference to us. But say he had been making 5,000 trucks a day he would have put us in the hole up in Michigan and there would probably have been some talk about it. As it were, he was so small a manufacturer that we didn't protest at all. We said, "All right. Let him have whatever he wants". When you get into bigger units and bigger operations it is difficult to set wages. You can't set them nationally. You have to set them by areas, and I am a little doubtful as to whether it would work out. I haven't objected to any bill that pays anybody 40¢ an hour. It is perfectly all right with me.

Q. A few years ago we used to hear quite a bit about a factory to the farm movement. Has General Motors considered that at all?

A. It has been existent the last ten years and it still exists. Just as soon as we get a lay-off the fellows beat it back to the farm. That is not the farm movement you are talking about, where a fellow has his own farm. We have a great many people up in Michigan that came from farms around Michigan and Indiana and even as far down as Missouri and Tennessee, and they go back as soon as the lay-off starts; so there is such a thing now. But there is another one. You know with the automobile a chap can travel thirty miles a day without any trouble back and forth to his work, and a good many of our men have small farms outside of the area where the factory is located. They make our very best steady workmen because they are not subject to the variances in the cost of living which are quite sharp in a city. The man who has a small place out in the country knows how to manage better. I know a good many cases where three or four of them live in the same neighborhood on small places outside and they go together in the morning and back together in the afternoon after the shift is over. They split the cost of transportation. Does that answer your question?

Q. Well, I think it covered it pretty well. There was some argument, as I understand it, in favor of small industrial units placed in rural communities.

A. There are two things that will cause us to place plants in other communities. One is naturally the freight rate. The other one

is the nearness of the source of material for the manufactured article. Mr. Ford has put up a few small plants around. We have some but they do not involve a lot of men. They are more of a convenience than an economic unit. You might be interested in what I have here. This chart shows all the plants and here are all the men, by weeks. Every week I know how many men we have in each plant. I keep track of that so as to know that labor is spread with justice and with some sense. We don't lay off a whole lot of people some place and put them back another place. This has been going on for years. Every week I get the number of men who work in each plant and I check them over and then I have another sheet that shows the number of hours they work because I knew way back in Chevrolet days that if the average earnings of the men were \$750 a year, like in 1932, it was awfully bad. If they were \$950 they were fair; if they were \$1150 they were satisfactory; and if \$1400 they were good, like they were in 1928 and 1929. This year they will be around \$1500 or a little over. We have kept track of all these things all these years. People don't think we do. There are certain things that I must know; how many men, how much wages they are getting. Now on the other side: what sort of inventory, \$285,000,000 worth of inventory; how many cars in the dealers' hands; how many selling every ten days. I know. It comes into my desk. How many used cars have you got? How many selling? These are perfectly natural things that are essential in order to know what is going on in the business. Everybody knows. We tell everybody. A great deal has been said about us trying to move from one place to

another on account of labor troubles. You can't run away from that. If you move to one place so that you can't have trouble the labor trouble moves to the new place. It is only a question of time. Why run away from your own shadow? The thing has to be worked out. But I do think there is an argument that if you over expand in a small community that that is not scientific; it is not economically right to do that. I think it ideal for communities to have an age curve. It is a good many years since I first worked with that; so many people at 18 years, 22 years, up to 70 years, and strike a curve like an arc. If you could have an employment curve to match that, that would be the ideal condition in a community, if you understand what I mean. For instance, here is a curve beginning with the age in any community, any town, any small city, or big city, we have so many people of these different ages. If you could have an employment curve that matches that, that is ideal. If the employment curve is high and it is low here (indicating on drawing) that is not very efficient; but if industry would take care of the employment about on a basis of the age curve, then industry has done its duty, as I see it.

Q. Do you try to enforce that in all your plants?

A. It is a long way from us. A lot of conversation has been made about us firing men at forty years of age. I am a shining example of that. It is a lot of nonsense. If any of you gentlemen have run a plant -- probably you have -- you know that the middle aged men are the balance in a plant. That is the way we used to do it when I was

young. A little information as to quality gets across to the younger men in their very quiet and efficient manner. There can't be any old men for the business is only twenty-five years old. You know that elderly men do not, as a rule, enter a new business if they are reasonably satisfied where they are. But wait ten years and we will have plenty of men -- they will all get forty about the same time, as far as I can dope it out now from the charts.

Commander Dunham: Mr. Knudsen, is there any theoretical saturation for the number of passenger cars for our present population?

A. I hope not. I haven't any scientific figures on the subject. There are some but I can't remember for the moment what they are because every time you see a new chart there is a new quantity. Back in Chevrolet days we had a man by the name of R. H. Grant. He used to sell Chevrolet cars, and naturally in 1929 we had a few too many cars; everybody did. I can remember Mr. Ford telling me back in 1921 that we would never make 4,000 cars a day again in the United States. So I don't think that we know how many cars the country can absorb. We only know that every so often they get too many and we have to digest them for a while. If the roads are handled to take care of the traffic in an orderly manner then I think we can handle 35,000,000 cars in the United States. That is personal opinion. I think some day when the scientists get around to it they will probably get somewhere around there. I haven't anything to base it on but I sort of feel that it will be that many, if the population doesn't increase at an abnormal rate. I think 35,000,000 is where we will be. We have about 29,000,000.

Without at all trying to prescribe legislation that anybody should have, I think we should get a law throwing some of these old junk cars off the street when they are positively dangerous to drive. Some of them are dangerous and most of the accidents that take place are caused by cars that are not in first class condition.

Captain Burgess: Mr. Knudsen, do you see much possibility for a greater use of plastics in motor cars, particularly in bodies?

A. There has been some progress made. Of course we have got to make it durable, solid. You know that plastics crack when you drop them on the floor. You can't have that. But as the compounds are worked out chemically I don't see any reason why we couldn't use them. Of course you have the advantage there that there is less finish because it can be cast to size.

Q. Do you think they could use them in the manufacture of airplanes in the fuselage?

A. I think they could use them, after the compound is worked out. I have seen some development on these dash parts recently. It seems to indicate that you can get a pretty high tensile out of it. How it will stand in the vibration which you would get in a plane would have to be subject to test. They have been able to cast to size with very little finish.

Q. Is the present trend in tooling in the automotive industry toward more special purpose machines or for general purpose machines to obtain changeability.

A. You will find both schools of thought have their adherents.

I for one would rather have multi-purpose machines and take care of the job with a jig. In changing models often a great deal of obsolescence is set up because single purpose machines were made obsolete before they were worn out. In talking to gentlemen from Washington from time to time it would seem also to be proven best to go to the standard machine group and try to have them make the jigs for us, try to make the jigs fit the job. I would be for that for business reasons. I can remember a good many years ago we had a machine to make pistons on and it cost \$130,000 and made a good piston when it was running, but it was in the tool room most of the time. Being short of pistons I sent over to Cleveland and got a bunch of lathes costing \$600 apiece, and I was getting pistons. The boss wanted to know who ordered those and then what I did it for. Somebody thought the ax was going to fall right away. I said, "Well, here is this darn thing. You can make a lot of pistons when it is running but nobody can keep it running." He ordered the special machine thrown out of the yard and scrapped. There is a balance there that you want to maintain in your plant. For machines holding a larger number of pieces on a progressive basis I think they are fine.

Q. What is the possibility of the Diesel engine replacing the gasoline in the ordinary touring car for private use?

A. The only thing that is wrong with that is the weight. So far we haven't been able to make a Diesel engine at the weight for passenger cars, about six pounds per horsepower. Nobody has been able to make a Diesel engine to run that and of course we have to

build the car on the engine. The Diesel engine must be at a lighter weight. I think perhaps it might come in time but we are not anywhere near it.

Q. I noticed in the press a few days ago a statement by Mr. Sloan to the effect that their foreign business is encouraging, that is, it has expanded. I was wondering if that was possibly due to these reciprocal trade agreements which Secretary Hull is negotiating and if you expect some substantial expansion in your foreign business?

A. I think that the reciprocal trade agreements helped. I don't see how we can ever have foreign trade if we build fences around all the countries, and say we will only trade for money. You know we can't do that. Our foreign trade from American sources has been very good this year, but how long it will keep up I don't know. I talked to a man yesterday who has charge of the overseas operation and he says he still had good prospects for buys on American cars. We make 150,000 cars a year in Germany and England. For the 1938 calendar year I think the American source is around 157,000 or 158,000.

Q. We haven't entered into a reciprocal trade agreement with Germany yet but perhaps we will eventually. In making it, however, would they be willing, do you suppose, to allow you to manufacture cars in the United States and ship them to Germany?

A. I don't think so. It is doubtful. You probably know that the Chancellor over there is advocating the manufacture of a car which will hold four passengers and sell for 1200 marks. He hired one of

our men to go over there to work on the thing. However, we have seen the car as it has been designed and if he is going to make it for 1200 marks he will have to pin a little something on each car that goes out.

Q. I saw your cars come into the Near East especially from Germany in competition with the cheaper cars of Italy and France and England particularly. Of course you are getting on rather successfully.

A. About 26,000 cars this year.

Q. Of course I think a little depends on who you put out of business in your reciprocal trade agreements. I happen to be pretty well identified with the business of farming and we purchase a good many automobiles in this country if we can keep up the purchasing power of the farmers, and perhaps the way to do it is to give them a subsidy out of the treasury. Anyway we mustn't put them out of business in order to sell more automobiles to each of them, must we?

A. On the other hand, you can't ask a fellow to buy everything from you on the gold basis.

Q. I don't entirely agree that they can't do some buying over here. I am not convinced that when they sell that they always buy automobiles and that they don't buy stocks when they are cheap and sell when they are high.

Q. I would like to ask to what extent you are able to control your activities in certain countries of the Orient, Manchuria and Japan to be specific, whether or not in view of legislation or rules

over there in recent years requiring certain control in their hands you are handicapped to any great extent? Are you tied down by such rules?

A. Of course we are subject to the war regulations, but ordinarily we are not bothered very much. If there is a quota that is all we can get, but generally we try to live with people as well as we can. We are not bothered very much.

Q. I understood that they insisted on 51% of the control of your plants over there.

A. A private party in Japan had such a proposition a year or so ago and one of our men went over there, but the deal fell through. There is no such deal now. We had a similar proposal from Russia at one time. It was a little difficult for us to consider a capitalist going in partnership with a bolshevist.

Q. I wanted to ask a question that relates to some extent to the depression. Did your plant reduce inventories in raw materials because of the rise in price of raw materials as this price rise that you spoke of came along?

A. No, sir; unfortunately no. The only way we can reduce inventory is by selling the car. We can't hold a fire sale of materials.

Q. The other question I had to ask was, you bought a large amount of machine tools and made a very considerable plant expansion in 1936. Does that represent perhaps your need for quite a number of years in the way of plant expansions so that you won't have a continuous demand?

A. We don't know. You see it is the old story about which comes first, the chicken or the egg. The only thing I know is that when business demands that we expand our facilities then we have to do it whether business is off before we get done or not. After we get started we have to finish. We figure that if the standard work week in America is going to be forty hours, as it seems to be at the time, we would need expansion to take care of our work, especially if the market is going on for 5,000,000 cars.

Q. Mr. Knudsen, would you care to give us your opinion respecting the benefit of the public interest of compulsory liability insurance to be carried by owners of private passenger vehicles?

A. Well, of course the only information I know of that might be of interest to you is that up in Massachusetts it is carried now and I was up there and spoke a month or so ago. I didn't get the best reaction to the way it was working but I couldn't pose as knowing what I am talking about. I am sorry I cannot answer your question. I don't know. I heard some question about the efficiency of the operation in Massachusetts, but please do not take this as anything. I do not know.

Q. Has General Motors made any plans to go into the production of airplanes when quantity production of airplanes is warranted by conditions?

A. The only airplane operation we have at the moment is North American Aviation -- you know Kindleberger. Then the Allison Engineering Company. That is the entire activity as far as we are concerned

within General Motors, and we have only a stock interest in North American Aviation. As far as buildings, I think we can go into production. I don't see any reason why we couldn't handle it. We would be glad to.

Q. Mr. Knudsen, how long, in your opinion, do you think this present recession will last?

Colonel Jordan: That is the greatest confidence I have ever seen displayed.

A. I certainly thank you for the compliment. But I will say this, that I hope it won't be long.

Q. In a factory with a labor contract wherein seniority by departments is the determination for lay-off, how would you suggest handling the situation where a department becomes obsolete?

A. The minute that the department becomes obsolete in its entirety, seniority becomes plant-wide on the basis of such work as the man can perform and the going rate for that work.

Captain Burgess: Last year we had the pleasure of hearing from Mr. Fisher on the forecast of the body. I am wondering if he is here in the audience if he would give us his viewpoint.

Colonel Jordan: Gentlemen, this is Mr. L. P. Fisher, Vice President of General Motors Corporation.

Mr. Fisher: A year ago I had the pleasure of coming down here

and being with Mr. Knudsen and I certainly enjoyed it. Mr. Knudsen said to me the other night on the train, "Would you like to go down to Washington with me when I talk to the class?". I said that I certainly would like to, so here I am. You know, sitting here and seeing the interest and seeing the problems of the corporation and outside of the corporation interests you men have, it kind of got me back to a year ago last winter. Mr. Knudsen, Mr. Grant and I were on one of our usual field trips that we make in the winter. We go out and call on the dealers and make about a two and half or three weeks' trip. We try to find out all about our products, of things we do and things we should do, the dealers' relations with the factory and what not, and we were in Fort Worth, Texas. Our friend, Mr. Amon Carter, who owns a newspaper there, has a ranch outside of Fort Worth - what we call a farm in Detroit - and we got out to his ranch and he had two or three old cars out there, 1902 and 1904. He had two Cadillacs and four Buicks, and he wanted us to take a ride in them to his house. Some of you, I suppose, remember those cars; open; no windshields; and they had a tonneau, as they called them, with a door where you got into the back of the car. They put dusters on us and goggles and what not - we were just like they were in 1902 after driving out in some of the modern cars. It was a marvellous contrast in the progress that the industry has made and that was so plain that it just startled you.

I remember way back. I came to Detroit when I was fourteen years old and went to work as a blacksmith's helper in running a drill press so I have seen this industry in full. That was thirty-three

years ago - I didn't mean to tell my age. I remember how we organized Fisher Body Company in 1906. Three years later we organized the Fisher Closed Body Car Company. My brother Fred took the position that sooner or later the people would not want to ride in open cars. Well, that was a sales proposition job, to get the people at that time running these big companies interested in closed bodies. I remember one day that Mr. Ford was down. At that time he spent most of his time in the plant and I guess he still does. At that time we had gotten our first order from the Cadillac Company for 150 closed bodies which were at that time open limousines. The fronts were open and the chauffeur sat out in front. Naturally we were trying to develop more business, so my brother Fred had Mr. Ford down. I remember as though it were yesterday. Mr. Ford sat with brother Fred on one of these trestles arguing about these closed bodies. Mr. Ford took the position that nobody would ride around in one of those show cases and he had no interest at all. About six months later we built a coupe for his son Edsel, who was then a boy, and sent it down to him with our compliments. Edsel drove this car and eventually we got an order from the Ford Motor Company for 40 bodies, I think it was, with the understanding that if they couldn't sell them we would take them back. Well, the result was that they sold these 40 bodies to all the executives in the Ford Motor Company, and nobody else got one. They were built out of aluminum and I even remember the price, \$400. It was the same thing with Buick. Mr. Chrysler at that time was President and General Manager of the Buick and I remember that Fred and I went up to Flint at that time on a street

car. He tried to interest Mr. Chrysler in putting some closed models on the Buick chassis, but Mr. Chrysler said, "Oh, hell, there is nothing to it." At that time Dick Collins, who later was the General Manager of the Cadillac, was sales manager. He got interested and before we left there we got an order from Buick for four hundred closed bodies, of which two hundred and fifty were coupes and one hundred and fifty sedans, with the same understanding that if they couldn't sell them we would take them back. That is how we got Buick started in the closed body business. Later on the Hudson came along. Previous to that we had some Chalmers business, and today there are no open cars built, except just a few for export. About 12,000 a year are built, mostly for export. We call those closed cars the cabriolet, that is, a folding top job.

Of course today I am on Mr. Knudsen's staff dealing with engineering, the products, and especially the appearance of these motor cars. Our job is to anticipate what the public would like in appearance of cars. Now this year the industry made very little change, as you know, and we are having a reaction from the public that we didn't change the cars more. One of our cars of the corporation we changed too much, and the public says we moved too far forward. And so that is what we are dealing with today. We have got to decide how far we can move. The public, you know, just moves so fast and it is a great responsibility in a corporation where the appearance of the cars means so much, especially in the market we have today where you can go in and buy any car you want and get delivery, as we say, yesterday. A year ago you

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could sell anything that was on wheels. It made no difference how it looked; you could sell it.

If there are any questions that any of you men would like to ask me in regard to the product, our product, -- you know, everybody would like to build his own motor car. They all have their own ideas, how it ought to look and steer, how the brakes ought to work. A few years ago when I was President of Cadillac we brought out the synchro-mesh transmission. My idea was to call it the "safety transmission". Well, their counsel and all the contact that I could get in the corporation said, "Don't use the word 'safety' in advertising." That is only a few years ago. They were afraid to deal with the word "safety" in advertising. The idea was that they didn't want the public to get afraid to drive an automobile. Now today we are dealing with safety. In practically every automobile advertisement that you see today the word "safety" appears in some form or other. So our biggest job today, as I see it, with all the legislation and the safety highways and all, is to make these cars more safe than they are today. Whether it is brakes or steering or vision, that is our problem, as I see it, in the future car. I think Mr. Knudsen said that with performance we have reached the peak, at least what the public would like to have. I think they have got too much speed today. I think the industry has made a tremendous improvement on brakes over the last four or five years and another tremendous improvement this year on steering. In the new cars there is a tremendous difference in the steering and the handling, especially at high speeds. Now if there are any questions relating

to the product, about things we are doing and things we should do or not do, I would be glad to answer them.

Q. With the advent of all steel bodies there appears to come about an increasing number of fatalities incident to fire as a result of collisions which simultaneously start fires. With the old bodies there was a means of exit at the top of the window. With these new bodies you can't break out either through the top or window. If the doors are jammed there is a little toasting process on. I wonder if the industry has given any thought to planning a safe means of exit.

A. I would say no. Of course we are trying to build these bodies today so strong that you could roll them down the mountain without crushing them and so you can't open a door now. We have made tests in the proving grounds where we roll these cars down the hill to see what happens. We know some cars today won't stand very much abuse of this kind, but we have that in mind. The idea is to build these motor jobs that you can turn over and you can open the doors. It gets back to that same one thing, the safety of these motor cars on the highway that we are dealing with.

Q. In the industry in the matter of safety, has the industry ever thought of safety belts to secure people in the cars?

A. We have had lots of such propositions. Apparently the passenger in the front seat seems to get the worst in an accident. Now in some of the cars there are rails on the instrument board so that in case of an accident they can get hold of something and hold on. You see that is being dealt with. There is a point in that.

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There are no sharp corners and buttons. We are trying to conceal all the instruments on the instrument board and take everything away so that in case of accident you don't get hurt. That has been given a lot of thought, especially in the new cars this year.

Q. Progress has been made in streamlining, but the ultimate has not been achieved. What will be the effect on safety if the ultimate were achieved?

A. I don't think that is going to affect the safety. Until you get up to 50 or 60 miles an hour the streamlining means nothing. The idea behind streamlining was to make the car look faster and sleeker and all, but as far as the factor of safety is concerned I can't see much in it.

Q. How about the location of your power plant, having it in the rear end instead of the front end?

A. Off-hand, I would say the power plant in the rear would be more dangerous than in the front. I think that would be one of the most objectionable things to have a rear engine drive because people would be afraid. You would have nothing up there but a luggage compartment and maybe your spare tire. I think it would be pretty dangerous.

Q. You mean the sense of distance is what gives the apparent safety?

A. The engine and all are a protection today in case of an accident.

Q. In recent years we are getting a large number of accidents with fracture of the neck. What do you consider that to be due to and what are you going to do about it?

A. That is a hard one to answer. You see accidents where people turn over and over and some of them come out without a scratch. The next accident they get their necks broken and backs broken. It is a funny thing about these accidents. I drove up to a camp a while ago and saw a car turn over just ahead of us. There were two ladies and two young girls in it and the car rolled over and over several times, and nobody was hurt. They were stunned a little bit. The fracture of the neck is probably from the impact. You don't know just what it is. I think that in some of these accidents the passenger is sitting in the car and a car comes across and they don't see it at all except perhaps the driver does. They are relaxed, you see, and the shock either snaps their back or their neck. I think that is the way it happens.

Q. How rapidly did the idea of the closed car with the sliding panel top, the so-called sun salon, which you see all over the continent, develop?

A. Not at all. They are using it, as you know, in taxicabs and there are a few cars out in California, but it seems to have no virtue at all as far as the American public is concerned. Of course over there they have no cold weather to deal with and all. In England it has been quite pronounced.

Mr. Knudsen: But still the percentage of cars with the sunlight roof isn't too great.

Mr. Fisher: I have showed you the difference. Germany has practically no cars over there, but in England that seems to be the thing.

Colonel Jordan: Mr. Fisher, I want to thank you for coming up and talking to us. It has been exceptionally nice.

Mr. Fisher: Being near Christmas I want to wish you all a very happy and merry Christmas.

Colonel Jordan: I want to tell you how much the College appreciates your coming here and talking to us. We look forward to this annual report of the state of the union, and you have given it to us. Thank you very much, sir.