

245

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MODERN TRANSPORTATION

by

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MODERN TRANSPORTATION

It is indeed a privilege and a pleasure to be able to speak to you for a few moments this morning. I first became acquainted with the men of the United States Army in 1911, and since that time it has been a privilege to be here and to meet various sections of the Army and the Navy. I want to say unhesitatingly that it has been a very pleasing experience. I don't know of any type of men that I have met anywhere in the business world who represent more sincerity and more earnestness than those who have charge of the protection and the defense of our nation. In the discussion following my talk I will probably be limited in what I can say, but I assure you if there remain any questions I can look up for you I should be very glad to do it.

Sir Isaac Ceddes, Minister of Transportation for Great Britain, said: "Transportation is the key that unlocks the door of all opportunity." That is a very broad statement, difficult perhaps for some of us to fully appreciate and to understand. But those who have been across and seen those islands in the sea, seen the raw material come in from across the seas, there to be fabricated into goods, and then in turn to again cross the sea to find a market, can perhaps appreciate the importance of transportation to those people.

There have always been three kinds of transportation: transportation of thought, transportation of people, and transportation of commodities. Down through the countless centuries, the means of transporting one was largely used to transport the others.

Not so very long ago on our western plains the Fleet Runner ran across the plains along the mountain trails, carrying and transporting thought from one tribe to another. In the Far East he travelled on camels and later in boats.

Just a few years ago there took place in this country one of the greatest acts in the transportation of thought then known in the world. It headlined the papers all over the civilized world. It was the old Pony Express. It started at St. Joseph, Missouri, and ended at Sacramento, California, a distance of 1,966 miles, and that distance was covered in the average of nine days, and just 73 years ago.

on the 11th of next March they made it then in the miraculous time of 7 days and 17 hours. The newspapers were printed on tissue paper or goose paper so that many of them could be put in the mail sacks. The occasion was announcing to the far west the inauguration of Abraham Lincoln as President of the United States. Each horse ran 15 miles per day and each rider had 3 mounts, and the average for the entire distance was 10¹/₂ miles per hour.

On the 8th of October of that same year the Western Union completed the stringing of its lines along the Union Pacific Railroad, and the telegraph took the place of the Pony Express for the transportation of thought and the Pony Express went out of business forever.

Since that time there has grown up in America and largely throughout the rest of the world, a very new and unique type of industry, devoting itself entirely to the transportation of your thought and my thought. Just five years after this event the cable system was laid under the sea and connected us up with foreign countries.

Then a little later along came the telephone, and today you can step to your telephone and reach any one of twenty million connections. Four years ago it would have taken you an average of seven minutes to make those connections, and today you can make them in 1-3/4 minutes. If you were to step to the phone and call up your friend over in London, England, your voice would travel from here to New York and then out to Rocky Point. There it would jump the air, travel 3,350 miles through air, through the bottom and up 200 miles into the heavens and back in its zigzag journey across to Cupar, Scotland. There it would hit the wire, travel 334 miles into London, and the voice of the one who answered your voice would travel out to Rugby, 85 miles in a different direction. There it would jump the air and travel 2,950 miles across to Houlton, Maine. From Houlton, Maine, that voice would come back to New York and then back on the wire over which you were speaking. Here 550 miles apart through space, voices travel so completely synchronized, so completely coordinated and organized that neither one of you are conscious of the marvelous mechanism by which your thought and his thought and your personality and his personality are being exchanged.

There used to be at the corner of Maiden Lane and Broadway in New York not very many years ago, and perhaps some in this room have seen it, a telegraph pole, one of many that was 90 feet tall, and on it there were 30 cross

arms and they carried the tremendous task of 150 wires. Now at that corner there are 17 cables and they carry 30,000 wires. At the corner of Seventh Avenue and West 36th Street there are now 232 cables and they carry a total of 560,000 wires. It is possible to conceive that at one time there may be 2,260,000 human beings exchanging personalities and exchanging their thought through that one place. There are now four wires under experimental trial between New York and Philadelphia that carry 250 human voices at one time, and in their latest trial they have brought it up to 450 voices on four wires.

We must have our individual type of transportation of thought for our business, for our social engagements and for every type of human activity. That one company engaged in that business now represents one and a half times as many people working for it as there are men, women and children in the state that granted them their charter. They own in property four and one-half times the entire assessed valuation of the state that granted them their charter, and still every day we hear of new expansions, new developments and new wonderful things to carry your thought and my thought.

Not content with our individual type of transportation of thought we now have the radio by which we can broadcast instantly our thought to every conceivable place. This new and unique type of industry, concentrated, centered entirely, no compromise with anything else, exclusively devoting itself to the transportation of thought, is one of the reasons why it has made such rapid progress. There is nothing in industry that is so harmful to progress as compromise. This new and unique type of industry devoting itself entirely to the transportation of thought has created demands upon all other types of transportation, the transportation of people and the transportation of commodities. And so, there again is a frantic effort to try to keep up with the transportation of thought. While we had our individual type of transportation of thought with our telephone, now we must have our individual type of transportation in our automobile. But when we pause to think that some 30,000,000 people in our own country are driving cars every day and we are demanding more speed, we are demanding more roads, we are spending millions, yes billions, that we might bring up and shorten the period from place to place. Humanity is like a sea, our thoughts the ships that roam, and when our hopes are realized it is then our ship comes home, and whether it be for military purposes or whether it be a ball game or a business

meeting, there is very little difference. We all want the same speed, we all want to shorten that period in which desire rests in the human mind.

Our automobiles and our trucks in the year 1937 cost 39,500 human lives, over a million people injured, and over five billion dollars in property damage, and yet there is no serious effort made anywhere to curtail the speed of the automobile or to let up in the building of streets and roads to carry them.

But not content with our individual type of transportation, the automobile, we want to be able to broadcast, so to speak, and so we have brought on our flying machine, that we might broadcast ourselves individually, into every conceivable direction. It is needless for me to say to you what is going on in that industry. So far as my own personal experience goes, I have never seen any type of transportation that has such marvelous, such formidable, such powerful sources back of it for the development of it as there are back of the flying machine. I think it is said now that there are one hundred and two air departments of different nations that want flying machines and every day we hear of what Germany, France and England are doing, and back of every government is that tremendous force to bring on faster flying machines and more capable flying machines and that has to be followed by landing fields. We have a total of 1,167 airports in America, a very small number considering the state of the aviation industry. Yet it seems that we are entering a cycle when those people or airports will be government owned or municipally owned. Over 60 per cent of them are now owned and being developed by governments, states, counties or municipalities. I think, too, that the trend is to bring them in closer and closer to the cities, and the probabilities are in some places and the start has already begun to have the airport the base and the center of all other types of transportation. It is possible that the truck industry and the bus industry and all those sooner or later will be tying in with the aviation industry and will have the same depot.

Next comes our transportation of commodities and there again the battle is probably more keen and we hear of more rivalry between the railroad industry, the steamship industry and the truck industry, and even now the flying machine industry, the pipeline industry and the electric power industry for the transportation of those things that are industrial. A simple illustration: You can move a ton with a team of

298

horses, a caterpillar tractor or a wheel tractor on the law of averages from 4 to 10 miles for a dollar. We sometimes call that the transportation from farm and forest and mine to railroad. You can move that ton with a truck from 20 up to about 60 miles for a dollar. You can move that ton by railroad 100 miles for a dollar. You can move that ton with barges on our rivers an average of 750 miles for a dollar. The reason why the City of Chicago is making such a strenuous effort for the diversion of water from Lake Michigan through the canals and down the Mississippi River is for the development of the barge industry through that state. It is said that that alone will save the merchants of the City of Chicago over \$5,000,000 a year in transportation. It will save the farmers of the State of Illinois over \$7,500,000 per year, a saving of \$12,500,000 per year in transportation costs. You can move that ton on the Great Lakes from 1,000 to 1,250 miles for a dollar, depending on whether you go through locks or not, and out on our ocean going ships we move it 2,000 miles for a dollar. From 4 to 10 miles for a dollar, from 20 to 60 miles for a dollar, a hundred miles, 750, 1,000 to 1,250 and 2,000 miles for a dollar.

We will have some slides now.

In 1925 you will find that the railroads moved 76 per cent of the total freight tonnage of America, the water ways 17 per cent, pipelines 5 per cent, and the trucks 2 per cent. In 1937, the last figures available, the railroads showed 66 per cent, waterways 21 per cent, pipelines 8 per cent, and trucks 5 per cent. But when we add up the total tonnage for the years 1925 and 1937 we find that the total tonnage was less in 1937 than it was in 1925. They account for the increase in water ways largely through the transportation of iron ore Gogebic and Meserba ranges and for the transportation of coal by water instead of railroads. Trucks would indicate that either they are moving more goods in place of the horse drawn equipment and the other types of equipment are perhaps taking some away from the railroads.

It is said that a railroad will develop a country agriculturally and industrially for a distance of 12 miles on each side of the railroad track. From 12 miles back to 20 miles agriculture and industry may break even. Beyond that they are supposed to have no particular influence on the development of industry or upon economic values.

We built at one time, I think, probably between two and three million dollars worth of trucks to run on railroad

tracks and we have some small railroads that have been built up around our trucks in the foreign field. So we made rather exhaustive studies of the economic value of a railroad in the communities in the hope that we might put on smaller and lighter equipment to take the place of the heavy and expensive railroad equipment.

This is a place in the state of Iowa from Cherokee to Onoway, and taking the cost of a railroad on the average throughout the country it represents a value over the average of \$50,000 per mile and if the railroad is abandoned the salvage value amounts to about \$1,000 per mile. So the railroad has a capital structure loss of an average of \$49,000 per mile. The farm values for that section, just taking the 12 mile zone on each side, represented an assessed value of 121 million, and it is estimated that farm values will decrease in value. If a railroad is abandoned by at least 25 per cent, or a loss for that particular railroad which was 61 miles long of \$24,399,194. The cities and villages are usually figured about 50 per cent but in this case we used the same figure, 25 per cent, or a loss of four million, a total economic loss to that community if no other type of transportation could take its place, of \$31,419,000 or \$515,066 per mile. Economic loss to the nation, to the railroad, to the farming community and to the cities and villages through which it operates, but there was another loss in that particular railroad. There was paid to the United States an average of \$395 per mile in taxes. It was paying to the State of Iowa \$793 per mile in taxes for a year. The local taxes to the villages, \$209 and the loss in the taxes on the depreciated values of the farm property amounted to \$6,091 or a loss in tax producing revenues to the Federal Government, the state, the county, the villages and the cities, of \$8,358 per mile per year. So when we deal with the railroads and the abandoned amount of railroads we deal with a very large and a very important subject that should not be passed over lightly or thoughtlessly.

In the Upper Peninsula of Michigan we found an extreme case. We found a place up there of 7,000 people. It was quite a well built town. This picture shows a skating rink. There was another town also on that railroad of 3,800 people. This is a picture of the hospital and this was a hockey club. Here are some of the dwellings, the railroad in that particular town, that is one of the elevators. This is a dwelling house, twelve room dwelling house, with a two compartment heated garage, and that beautiful lawn. The railroad in that town was abandoned, and all the houses sold for an average of \$1.00 a

247

a room That is just how far that subject can be carried. It is an extreme case and yet it does represent the tremendous problem of transition that is going on in America on this question of transportation.

There have been 14,000 miles of railroad abandoned in the last eight years and 9,000 miles of side track. Thirty-two per cent of the Class A railroads that represent railroads and investment of over a million dollars are in the hands of receivers or in the process of some form of reorganization. All these economic losses are going on I have here the pamphlet of the Truck Association showing the abandonment of a number of railroads and showing the truck transportation that has taken its place It is a very excellent book and treats the subject very well. The only difference I want to draw between that book and the illustrations I have given you is that the analysis here was made after the railroad has been abandoned. These economic losses do not take place over night. They take place when that road starts to run down and the service begins to give out, the ties begin to rot, the fences begin to decay, and the rails become disjointed, and it is a process of years, like paralysis that creeps in upon the community life. The best that the truck and the bus can do is to provide a substitute. Neither one of them can ever take the place of and bring back to that community the economic values of a railroad.

I believe that we have to be very sympathetic with our railroads because they do not know, like other types of transportation, how to make their adjustments. They are under the control of the Interstate Commerce Commission to regulate the rates. The Commission deals with the railroads on the basis that the greatest thing is competition, fair competition between the railroads, themselves, and service to the community regardless of cost.

Some years ago, back in 1819, a decision was made by John Marshall that, I think, has been very, very far-reaching in the development of our industries of all kinds in America, and particularly does it apply to the railroads Up to that time in Europe and in this country corporations were treated as individuals. They were artificial people, subject to all the laws and regulations and interpretation of laws that an individual was, and as a result there was very little business ever done by corporations. They were used only for those coordinated organizations and charitable organizations, churches and institutions of that kind But in this decision in the Dartmouth College case, Judge Marshall in the Supreme Court of the United States ruled that a corporation

was not an artificial person at all. It was a special contract issued by the state for a very limited purpose and a very limited right. Since that time courts have repeatedly held that the only function of an industrial corporation, whether it be a railroad or a factory or any other type, is to make money for the stockholders. That is the all-controlling rule every time it comes up, whether it be a bank or a railroad or an industry. The functions for the charter were given that you might make money for the stockholders, and so the railroads were between those two great conflicts, of making money for the stockholders on one side and giving a service that is profitable, and adhering to a competition that is unprofitable and prevent progress and improvement of tracks, and through that great conflict we all must be sympathetic and thoughtful and helpful to straighten out that problem in American industry.

There has been such a shifting in our transportation problems it is hard to say whether any type of transportation that we have today is going to endure very long. Perhaps you will pardon this personal experience, but I was born on a farm and my first recollection of transportation was a yoke of oxen, Star and Lyons, and an old trundle wagon, and we picked roots and helped to clear land with it. Then father traded that off for a team of horses and a wagon and we became modern. When a young man I went to Normal School at Oshkosh and I rode on the horse drawn street cars, and then I heard and saw the awful battles of industrial leaders and lawyers and every type of American ingenuity to go into city after city and get those street car franchises for electric lines, and they seemed to base their supposition on the fact that when they got that franchise they had something that would last for eternity. I remember very distinctly father coming home one day and telling about a new street car and he said his version was that there was a button running along on a wire and pulling a street car. He had an awful job with mother and the rest of us and it took quite a long while and some of the neighbors to come in and verify it before we believed it, but that was the home of the street car, the electric line. Now those street cars are all gone, the electric lines have all been torn up, also the tracks, and they have a bus through there. In some of the great cities of the country, Dallas, Fort Worth, and places like that of 160,000 and 250,000 people, the entire electric line is gone and busses are taking their place. And so the transportation goes on, in every line that we have. So there is restlessness and there is going to be required a keenness in judging the transportation of the future.

There are now over 43,000 communities in the United States that have no railroad. Perhaps you remember that at Annapolis, one of our state capitals, we have no railroad. Eight years ago we had 10,000 miles of electric railroads and they have been cut down to 5,000 miles now and more are being abandoned.

250

In London I was interested to see the great battle that went on in that city. When they came out with the bus over there to compete with the electric street car there was a great battle. The franchise or permit to operate is given by the police department of London, not by the mayor and common council, so they have transportation under their control. The busses were required to cross the intersection and stop at the curb. The street car could stop out in the middle of the street. The bus people complained about that and said, "We have to stay here where the slow traffic is, we have to pull up to the curb, we have to stop at that particular inlet section, the brakes won't hold, and the busses will slip back into the street". They told me they had \$3,000,000 in crushed feet to pay for in one year. The street car could stop out in the middle of the street, receive and let off passengers, and it had the open, fast part of the street for their type of transportation, and so the battle went on.

I was also interested over there in the battle between the flying machine and the railroad that is still going on, when they started flying from the Croydon Field to the Bogart Field they began to take passengers away from the railroads. You travel from London out to Dover, cross over to Calais, and then by railroad again to Paris. So the railroads began to study and they conceived the idea of arranging with the government to have the immigration officers and the custom officers on the train at each end so you could have your baggage examined and everything taken care of on the train. Then they cut down the running time from London to Dover a half hour. They cut down the time of the boat crossing 15 minutes, 26 miles, and they cut down the time on the other side to 30 minutes, so they saved an hour and fifteen minutes and they saved the time it took to go through the customs and immigration offices on both ends, which was quite a factor. The flying machines were having trouble then. The railroads began to take business away from them because of that. That awful pea-soup fog -- they might start out from Bogart and get half way to London and have to turn back. So the sound indicator was thought out and worked out, and I think you will find this -- I hesitate sometimes to tell it, but you will find it in a book by Lowell Thomas called "European Airways." They set the indicator at London at the Croydon Field, a man may be flying over Dover and he calls in to find out where he is. They set the indicator, they call up Polham, a hundred and fifty miles, they set that indicator that shows where he is and inside of two or three minutes they locate him and tell him, talking back and forth, they bring him in through that fog to distances of one hundred and fifty miles and then land him at the Croydon Field, and sometimes it takes the man an hour to the hangar to find the plane after it has landed. So the great battle is on.

Out in our country in industry we had an invention of a new machine called a viner. We used to have to go out and pick all the pears by hand, shall them, an enormous job. So the pear canning industry got busy, went to Burbank, in California, and asked him if he couldn't develop a pear that would blossom and ripen within a range of three or four days. They were blossoming for six or eight weeks during the season, and they had to pick during that time. In some eight years he developed the pear. Now in our whole pear industry we have the mower. We go out and mow down the whole field. We have a loader that loads them onto the wagon, and then we haul them to the viner and there they are run through the machinery and we have them all divided now into seven different classes of pears, those overly ripe, the cheapest, and then the pawpaws, those that are just in the mill. The whole crop now is harvested in one operation. So wherever we go in industry or anywhere else it is speed, speed in transportation everywhere.

I think we are arranging now with our flying machines from 60 tons up to a cent a mile for gasoline. I think it is marvelous, the new thought that is being developed down in Central America by that young man, who, (if we want to interpret very concisely, we take 200 box cars of freight sitting on the side track of 40,000 pounds in each car) - moved the equivalent of that in his flying machine over the mountains and over the forests of Central America in 6 months, together with 12,000 passengers and 187,000 pounds of mail and 145,000 pounds of excess baggage. He has contracted with the Wrigley people and others for 8,000,000 tons to be hauled out a year, and so the flying machine is taking on its new type of work - the transportation of commodities.

Up at Clumet the Columet and Hecla Mining Company has to go down into the earth two miles to get their ore. It costs them, on the average, ten and one-half cents a pound to get the ore out. They average about 32 to 33 pounds of ore in a ton of rock and they never are able to get it all out. There is always 3 or 10 pounds left that they never get. At Rhoades they have a new copper mine on the side of the mountain and they run it into those ships that carry the ore 2,000 miles per dollar. They get 50 pounds of copper out of a ton of rock. They can produce it now and deliver it at Liverpool for 8 to 9 cents a pound at a profit. America is stepping into a new cycle, the copper industry, the iron industry, and all the other industries, and I think one of the problems of our economic situation and our industrial situation in America is largely because the ships have passed away from America. That type of transportation in America has been sadly neglected. It is said that we have only 400 ships of over a hundred ton each capable of ocean travel, a less number than the government of Norway with 3,000,000 people and the government of Holland with 4,000,000

people. Probably there is no problem of defense, as I understand national defense, whether we are talking to you as the Army and the Navy, national defense means that balance of industry and transportation as well as ammunition and guns. I think that over in Spain, those countries where our observers have been, it has been said that even the cruelty of going into a defenseless country and killing off the women and children with bombs does not win a war, but the quick movement of troops, the quick movement of supplies, the surprise of attacks and planning, are still the most effective means. If that be true, then may I appeal to you with your sense of patriotism, with your sense of love of country, with your sense of the real meaning of national defense, that every effort be made to give America a better knowledge of the lack of transportation in time of imminent need.

When the World War broke out we had an order from England for 128 trucks. It came in January, 1915, and you remember that war broke out in August 1914. Our first trucks went to England in September. They were tried out at Aldershot in November and December. In January this order for 128 trucks came in. The English inspection force was there to see that we got them out right away. I had ordered all the tires from the B. F. Goodrich Company. One day the President called up and said, "We can't get any tires, and we wish you would take it up with your English inspectors and have them report back to England." It is just my own humble opinion -- it may not be worth anything -- but it is a strange experience, to say the least. As I remember, President Wilson went out and his whole campaign was, "I will keep you out of war," and I believe he was sincere. I believe he meant it. He was elected upon that basis. Then when England came and wanted to borrow some money from Morgan, or someone in America, Morgan came down here to Washington to see the administration, and the administration said, "No, we are going to remain neutral, I was elected on the plank of keeping the country out of war, and I am going to do it." Morgan said, "We can't loan money to England or France or anybody else." Then England did what she thought was best. She notified all her ships "If you haul any more rubber gum to America we will confiscate and use you for transports," and the whole automobile and truck industry and tire industry in America were paralyzed right there. The president of every one of the truck and tire companies went to England, they were all over there, and after several weeks the thing was worked out. Now, I do not know, but I do know this - that Morgan made the loans and the tires came. During that whole war there wasn't a single truck that we shipped that we didn't have to sign bonds of indemnity to

the English Government agreeing not to sell any trucks to any of England's enemies or any other country in Europe, any neutral country in Europe, without England's consent. We had one shipment of trucks to go to Spain, and we had to ship the trucks to England without the tires, and they were there for months before the situation was straightened out with Spain and the trucks went to their destination.

I remember calling Senator LaFollette, the older gentleman whom I knew very well, when he happened to be lecturing in our town, and showed him those bonds. It was a strange thing to me why the thing never came up in the United States Senate or the House of Representatives, and I never saw an article in the paper about it. It seemed to have been hushed up and kept quiet, or perhaps they thought it was so insignificant that there was no necessity to mention it. In any event, I showed them to him, and he said, "Yes, there are ten commodities like that, upon which America is absolutely at the mercy of other countries". If that be true, then as a matter of national defense, it seems that that might be a very timely subject, that the American people may fully know their relationship with that of other countries. I presume you have read "The Strategy of Rowlett". I understand it was compiled largely by the Army, or under its supervision, but as near as I can find, this book and one other by Mr. Rowlett, are the only two books ever published on this subject. If that be true, and I understand it to be true, the weak spot in our American transportation lies in those ships that may have to go out there and get supplies for you and me whether it be in times of peace or times of war.

Bishop Jones, one of the great Methodist bishops, was lecturing in India. In his book "Christ of the Indian Road", he said he was lecturing in the Interior of India. It was a religious meeting. At the end of it he invited them all to come up and join the Christian Church. One man got up and said "Why should I join the Church of Christ? What has he done for us over here? If you have a Ford church we might join it. Ford brought us this car. With it we can go fifty miles and seventy-five miles with our rice and find markets we never had before. With this car we can go over a hundred miles and get a doctor and medicine. Ford brought us the blessings of transportation. We had sooner join a Ford church."

And so I believe today that there is a great blessing in the proper understanding of the coordination of our transportation systems. Each has its place and each is useful, and each will continue to be useful if it confines itself within its own borders and seeks to carry it on to greater usefulness and greater service to society.

I think you.

Discussion

"Modern Transportation"

by Mr. Walter A. Olen

President, Four Wheel Drive Company

February 17, 1939

Colonel Miles: Are there any questions you may have on transportation? I'm sure Mr. Olen has covered a tremendous subject very adequately in a very short time.

Major Van Deusen: Mr. Olen, we appreciate the fact that you have stayed away from the direct question of motor transportation. What, in your position with the Ford Motor Company and in considering the recognition by the Army in general, is necessary for certain types of motor equipment not usually available in the run-of-the-mine production. Would you care to discuss the military advantages of the military wheel-drive type of vehicle for military purposes?

Mr. Olen: The four-wheel drive type of truck has been championed by a number of small industries. It came out at a time when the two-wheel drive and the pleasure car and the truck had already reached quantity production. I think I may safely say that the attitude of the large production organizations is not visible to the swing over to that type of vehicle even though it has advantages, until the market's ready for it. So it's capable of quantity production. You are undoubtedly familiar with

the German classification of drives. Briefly, they are here. The German undertook to conduct tests on the different types of drives - a front drive, a rear drive, and a four-wheel drive. These tests were made on grades, for speeds and for tractive ability, tractive ability not only to propel the vehicle but to control it, and I think we are entering upon that stage in automobile and truck industry when it's more vital to control a vehicle, to keep it under control at the higher speeds, than it is to propel it at a faster speed. There must be a balance between the control of a vehicle and its speed. Speed that runs wild and is uncontrollable wouldn't be useful. It's the safety of the people in the vehicle, the safety of the men in your Army first of all. On that basis they found that the all-around drive between a front drive and a rear drive was 36.53 per cent in favor of the rear drive. Then they found that the difference between the all-around possible efficiency of a four-wheel drive as compared with a rear-drive was 75.25 per cent in favor of the four-wheel drive. We rather questioned those figures. We were afraid to use them. It was so much more than we had ever thought of claiming. But we know now that in snow-removing and in boring holes and setting poles and in oil-well cementing that we're getting all of that. The question remains that out on the open road-is the necessity there? Our contention is that vehicles of this type are needed there even more than it is in snow removal and boring holes and out in the oil fields. There are four kinds of power in a truck. There is

the power of the motor. Probably the most marvelously developed scientific development in there is in the way of machinery in the world. A lady can just feed that horsepower into that car with the tip of her toe, five horsepower, ten horsepower, a hundred horsepower, whatever she wants and she can shut it off instantly. That is the least harmful power in the truck, because it is under constant control. The second kind of power I define as momentum. Get your car going. General Motors claims that in their pleasure cars at a speed of fifty miles per hour they use about a hundred horsepower. When they shut off the power of the motor and step on the brake they step into five hundred horsepower. That can only be controlled by the tractive effort of your wheel on the ground. The third kind of power is what I call the power of gravity for want of a better name. A little chart I have here shows the different kinds of road conditions; for instance, in the city of Chicago concrete road is down where it has a fall of probably an inch in nine feet. It's pretty close to level. But if you get to a brick street they tell me they must have a crown of at least eight inches - that is a pretty big crown - or the brick will deteriorate. If it's macadam, it must be five inches. That may smooth out later but those are the figures available at the time the study was made. So as you're driving along the road you have the problem of momentum and in addition to that you have to control that momentum under these different crowned roads. The difference in gravity, the different conditions constantly changing, and

to have the human judgment and the foresight of the speeds at which we travel determine what this grade is and what that grade is is a very big problem. Then you have the question of control under consideration. You have wind resistance and wind resistance is quite a factor. They claim that in New York State they have as high as 101 days in a year when they have a wind velocity of over thirty-five miles an hour and so you have this problem of momentum, under variable roads, variable conditions of gravity, various angles at which you need your wind and under those conditions about the only thing you can meet it with is proper tractive effort and a proper distribution of the total load of your vehicle. If we take a common car and we speed it up to twenty-five miles an hour the average pleasure car, I think, will run around, as it stands on the floor, forty-seven percent weight front and fifty-five in the rear. If you speed that up to twenty-five miles an hour and step on your brake—just a reasonable application of the brake—you will throw $19\frac{1}{2}$ per cent of the total weight of that car instantly on the front wheels so you have around 67 or 69 per cent of the total weight of that vehicle on the front wheels meeting the problem of gravity, meeting the curve, meeting the wind, meeting all those three different kinds of power that are always unknown powers, and you have an unbalanced car. At the Indianapolis Speedway the cars travel only in one direction but they have curves and they have grades and there we found that the skillful driver of a front drive car drives into the grade with the power on; the rear drive

has to shut it off as he comes into the curve and then it's the skillful bending of the wheel that determines whether that car will take that grade in that curve. The reason so many people are killed at the track is because they are inexperienced. Boys who have never driven the track and haven't learned the technique of going into grades are in a dangerous position. The skilled drivers are very seldom injured in the race through some defect in the driver - but because of a defect in the car. The front drive becomes front heavy when you shut off the power and it does just what a flying machine does - it takes a tail spin. The load piles up on the front and it's light in the rear. To test that out further—a question of balance—we take a truck here on an icy condition where the car doesn't do any harm to skid around and slide. Take a car - let's say a rear drive. At 21 miles an hour, if the weight distribution on that truck is forty per cent front and 60 per cent rear at 21 miles an hour we'll make the complete turn in 72 feet. We shift that load on the same truck and now we have 31 per cent on the front and 69 on the rear. It took 200 feet to turn that truck. We shift it again to 20 per cent front and 80 per cent rear. It took 300 feet. At 21½ per cent front and 88½ per cent rear it took 400 feet. When you start out with a rear drive truck built primarily to carry its load on the drive wheel where it should be the turning radius of that truck depends upon the distribution of that load. Where is it on the front and where is it on the rear

and again under those conditions that car ought^{to be}/at 50 and 60 miles an hour on the different types of road conditions. The problem we don't know in our four wheel drive yet is what is the right balance. We just know this. That all in a four wheel drive we can have our load on our driving wheel and on our braking wheel wherever we want it. We used to think and probably some of you gentlemen remember the old Model B that had 45 per cent front and 55 per cent rear. At 16 miles an hour it was all right but when we put on the pneumatic tires and brought it up to a speed of 22 miles an hour, when we stepped on our brake on a crowned road you found yourself across the road. She was front heavy for that speed and she did just what a front drive does. Those things are easy to measure. You can take your own car out and ease the throw of that car when you apply your brake and we're going to assume that roads are going to improve. Then we must recognize that in the future desire of our vehicles on the open roads and I think the same applies but it's good practice on the modern icy slippery streets and on the open terrain. Balance is a wonderful thing wherever you want to go and on balanced grades there is also some element of liability. We have found too that as the speed increases the coefficient of friction both from the forward motion of your car and in the side motion of your car decreases. At Ames, Iowa, they have conducted some very interesting tests. For instance, here is an asphalt concrete and this rig had a coefficient of friction of 84 at five miles an

857

want something and then fight to get it and industry will respond but today and everywhere we have some compromises to deal with. I might put it this way. Would you like to have a compromise between the pleasure car and the truck. Would you like to have a compromise between a caterpillar and a truck? Is that what you want or do you want a caterpillar developed to everything it can do. It's greatest possible performance, or do you want to compromise on a problem of law of averages? I don't know whether that answers your question.

Major Van Deusen: I think that answers my question. Thank you, Mr. Olen, and I think you made one point toward the last. The Army must first decide what we want. I think that is one of the prime points that Mr. Olen's brought out.

Colonel Miles: You can't solve any problem when you don't know it's a problem, that's sure. Any more questions?

Colonel Riefkohl: Mr. Olen, in the field of truck manufacture, you have two distinct types. The manufacture of complete vehicles, manufacturing all the way through or largely all the way through, and then you have on the other hand the assembling. Would you care to discuss the features of the two and what the probabilities are for the future of the two types?

Mr. Olen: We have kind of been on the trail of that. We have done some assembling and some manufacturing and so I have just recently made a - I might say - temporary investigation of that subject and the results are rather surprising. I would not want to leave these with you on any other basis except that

they should be gone int further. They are not entirely complete and the avenue of information has to be largely from those statistical organizations that are available. U, here at the top we used to have something over 300 truck companies in America. In the last eight years 54 have gone out of business. They were practically all assemblers. There are still 44 listed of a total in the truck industry, at the top we have General Motors with \$1,508,000,000 of capital, - they have the Chevrolet Motor Truck division and they have the Yellow Truck and Coach. Then comes Ford with \$717,000,000 of capital. Then the International Harvester. Then the Chrysler Corporation with its Dodge with \$250,000,000. They are in the lighter field. Then we have the Mack with \$45,000,000 and none of these are in debt for anything; they are all in excellent financial condition. We come down to the White with \$31,000,000 and about \$4,500,000 of obligations. We have the Reo with \$11,000,000. We have the Willys Overland listed as a truck; we have the Autocar and the FWD in the manufacturing group. Then underneath you have still twenty who assemble trucks. As near as I can get to it they are making a total volume in a good year of about \$28,000,000 worth of trucks of every kind. If you will notice most all of them are rather heavily involved. Their capital figures up to about \$17,000,000 and their obligations on which they are paying interest between \$7,000,000 and \$8,000,000. Four of these have gone out of business in the last four months. Along with that is the harvest manufacturing which in the past has been a very large factor when we hired about

767

six per cent of all the units that went into their car. So that the parts makers - a good many of them - have been passing out. I haven't gone into analysis of all of them but just judging from those we have been buying from who have gone out they have still another field - that is the tractor field. But that tractor field is heading up into International Harvester and Holt and a few large ones that just as soon as quantity justifies we assume they are going to take over the manufacturing themselves. I think we are entering into a cycle - just how dangerous it is is hard to say because it has been very difficult for all types of industry the last few years and perhaps it would be unfair to base the mortality of the truck assembler and the parts maker during the last eight years. But I'd say they are not in a very healthy condition. We have reached the point where we think that ^{if} we are going to continue we are going to have to swing over to more manufacturing ourselves.

Colonel Miles: There appear to be no more questions, Mr. Olen. We want to thank you for a very fine talk and I think you have given us all a broader vision of transportation and I think your remarks today at the last part have been particularly enlightening and I know the the question that Colonel Riefkohl posed has been bothering him for some time and I wonder if he got a new slant. I think probably he did. I want to thank you,