INTANGIBLE ECONOMICS OF HIGHWAY TRANSPORTATION

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SYNOPSIS

This discussion suggests changes in the physical structure of routes and terminal facilities for utilizing, in urban transportation, the comfort, speed, safety, and convenience made possible by progress in the design of motor vehicles and the road surfaces

Special attention is called to the importance of terminal facilities Improvements in car and highway design have done much to increase comfort, speed, and safety of travel Terminal progress, in contrast, has principally concerned itself with legal restrictions as a result of which the demand for urban parking space greatly exceeds, by 5 or 10 to 1 in some instances, the effective supply This robs the car owner of much of the benefit for which he has demonstrated not only his ability, but his eagerness to pay

In considering the economics of terminal facilities, the important question concerns the expenditure justified by sound economics to increase the speed, comfort, and safety of the entire traveling public by removing parked cars from the highly expensive street surfaces to off curb parking areas with less expensive surfacing Parking space is not merely a personal convenience for car operators, but an integral part of economic motor transport

Intangible, according to Webster, means "not directly appreciated by the mind" Economics, according to the same authority, pertains among other things to "means or methods of living well" Hence, our discussion concerns the imperceptible personal and social benefits furnished by private motor transport

Frugality has no place in the picture Whether travel via motor costs more or less than that furnished by rail, boat or street car has little significance here

Of more importance are the social improvements for which the traveling public have demonstrated their eagerness regardless of cost These include the transformation of the urbanite to the suburbanite, the remodeling of rural educational systems, the making of the urban commercial facilities available to the farm, the rural recreational facilities to the city, the mountains and the seashore to both; and withal the exhilaration and rehabilitation which contribute not only to our pleasure but our physical and mental health as well.

Financial returns can no more evaluate such benefits than those furnished by the motion picture, the theater, the baseball game or the pleasure trip abroad Their costs are not justified by frugality but

instead by adequate return in the way of better living, intellectual improvement, and recreation productive of increased working capacity Undoubtedly, such intangible benefits account largely for the huge contributions of passenger car transport to the nation's commerce

Facts and figures of the automotive industry, for instance, disclose that about 20 million passenger cars were registered in the United States in 1932 [6] At an assumed low purchase price of $600 each they must have put about twelve billion dollars in circulation during the past five or six years

Also, if the cost of operation and replacement can be assumed at the conservative figure of five cents per mile and the annual travel at 7,500 miles, seven billion dollars are poured into the business channels of the nation annually H J Struth notes in American Motorist, December, 1929, that the total gas, gas tax and oil bills alone amount to $6,000 per minute

A problem in the field of structural design is thus introduced It suggests the necessity of changing the physical structure of route and terminal in order to furnish the motorist with the comfort, speed, safety and convenience for which he has demonstrated not only his ability but his eagerness to pay

In this connection let us consider the case of one of the 7,000,000 passenger car owners residing in 124 cities of population exceeding 50,000 each and with a total of 38,000,000 Furthermore, let our driver be one of the 143,000 registrants in the City of Washington

While much of his mileage costs less than that charged by commercial carriers, yet some of it undoubtedly costs more His willingness to pay the additional cost of the latter may be explained as follows

To ride in the commercial carrier he *must* be willing to board it at some point on its route, at its scheduled time, must travel only on the streets it traverses, with whatever in the way of standing or seating facilities it offers, and finally must be satisfied to get off at some point along its route closest to his destination

His own car, in contrast, leaves from his residence, at his convenience, travels at such speed and along such route as he desires, and lands him at his destination with the utmost despatch and comfort

The difference in accommodations is both physical and mental Physical, as to comfort, convenience, etc , and mental as to regulations and restrictions Four or five "musts" which control his travel in commercial carriers are eliminated by the private transport

The known aversion of the American people to any but the most essential regulations suggests that desire to escape these "musts" or mental restrictions accounts largely for the huge private car ownership, that freedom from the irksome restrictions, not to mention possible physical discomforts of commercial carriers, is largely responsible for the assumed 140 billion miles of annual passenger car transport

The essential features desired in this type of motor transport are convenient origin, comfortable and safe transit and satisfactory terminal.

Figure 1A

Figure 1B

Resident emigration to suburban districts has done much to provide origin facilities; ingenuity of motor car design combined with increased road widths, better alignment, easier curves with greater sight distances

and modern traffic control methods and mechanisms have done much to expedite safe transit.

The destination or parking space, in contrast, seems to have been left out of consideration, causing progress in terminal facilities to consist in the main of legal restrictions. Even current technical literature

Figure 2A

Figure 2B

reflects the neglect of terminal facilities. Thus, for instance, in a bibliography consisting of 802 articles on traffic engineering but 47 concerned parking and, of these, 41 had to do with regulations, leaving but six to deal with actual terminal structures or parking space.

Figures 1A and 1B show how engineering skill transformed the dusty,

muddy part-season road of 20 years ago into the ultra modern high speed superhighway of today.

Figures 2A and 2B show how the bridge builder contributed his share to the improvement in transportation facilities.

Figure 3A

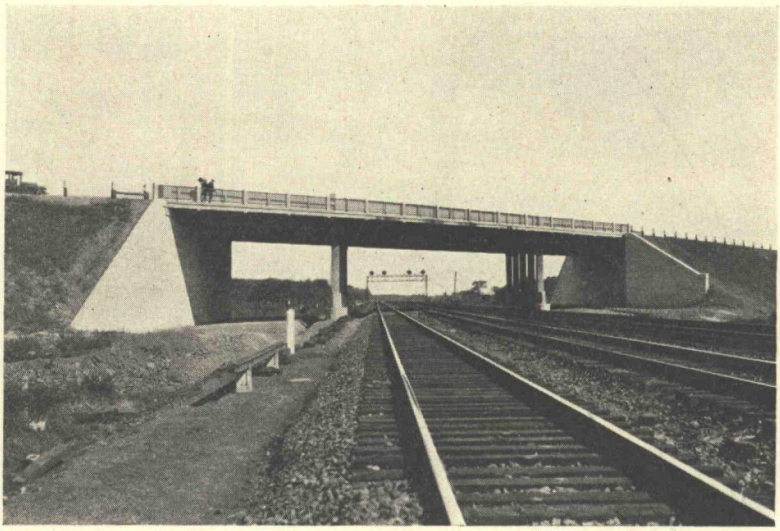

Figure 3B

Figures 3A and 3B illustrate how change in physical structure as substitute for regulatory signs, signal, etc. is solving the grade crossing problem.

Figures 4A and 4B illustrate how the genius of the automotive engineer transformed the stop-and-go, 15-mile-per-hour horseless carriage of a quarter century ago into the dependable, high speed, luxurious modern palace of comfort.

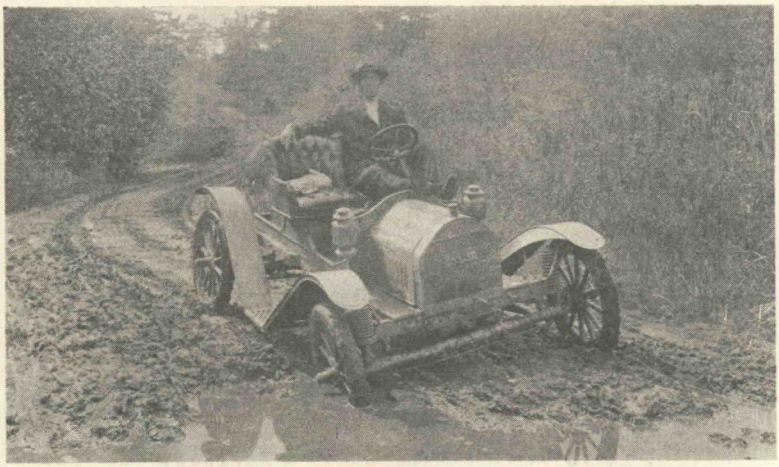

Figure 4A

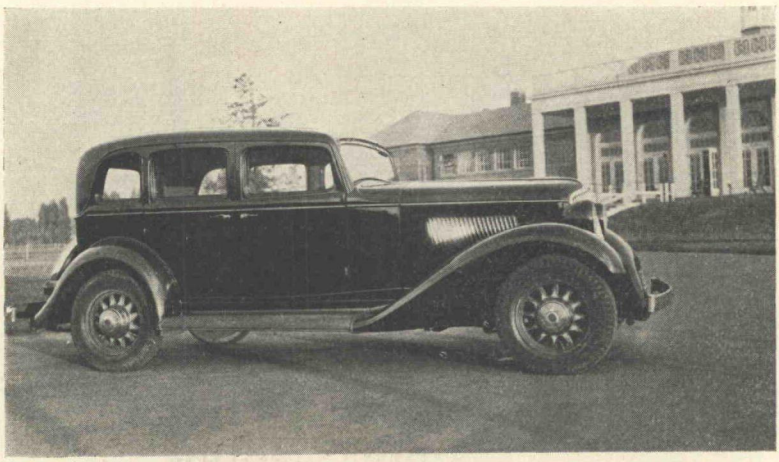

Figure 4B

Figures 5A and 5B show that while increased facilities are made for the traveling car, the improvement does not increase the parking space, the sacred curbs remaining inviolate. Here the parkway in the center was eliminated and the width between curbs (Figure 5A) was increased to furnish better facilities for moving vehicles. As seen in Figure 5B, however, the improvement furnished no increase in the facilities for parking cars.

Figures 6, 7 and 8 illustrate the effect of the absence of terminal facilities. They were obtained by recording the times by means of a

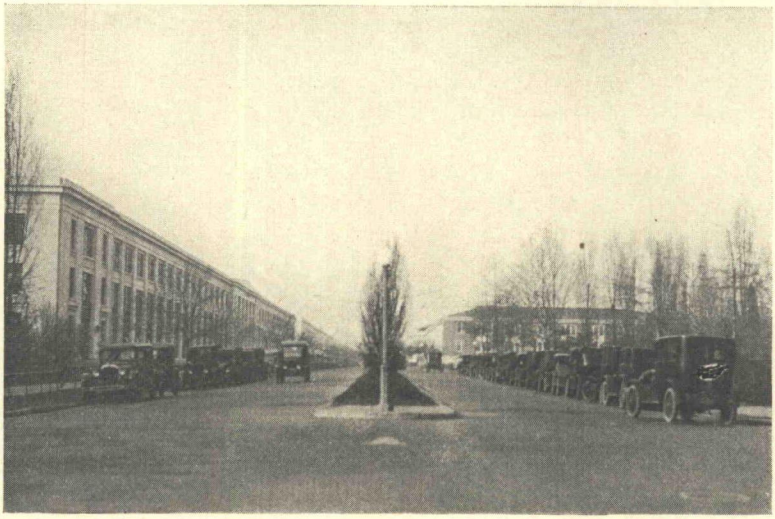

Figure 5A

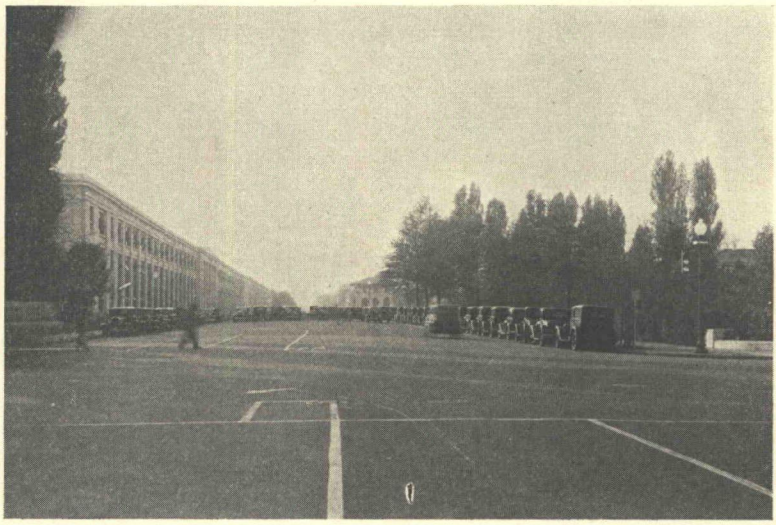

Figure 5B

stop watch corresponding to odometer readings on different routes during the morning rush hour.

Figure 6 shows the run down Sixteenth Street in Washington. The distance traveled is plotted against time. The distance from origin to destination is six miles. The upper curve shows that at 5 a.m.,

in the absence of travel, almost the maximum legal speed is maintained, thus allowing the trip to be made in 14 minutes

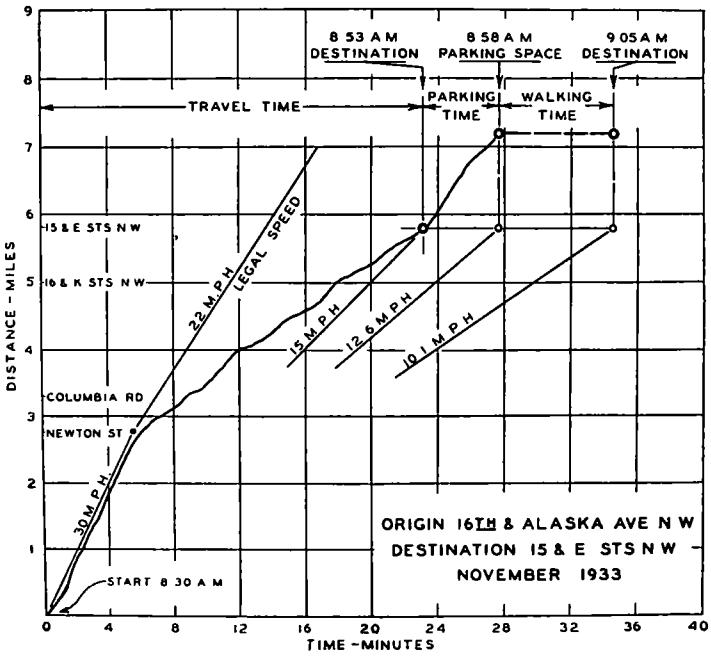

Figure 6. Effect of Lack of Parking Facilities upon Trip Time

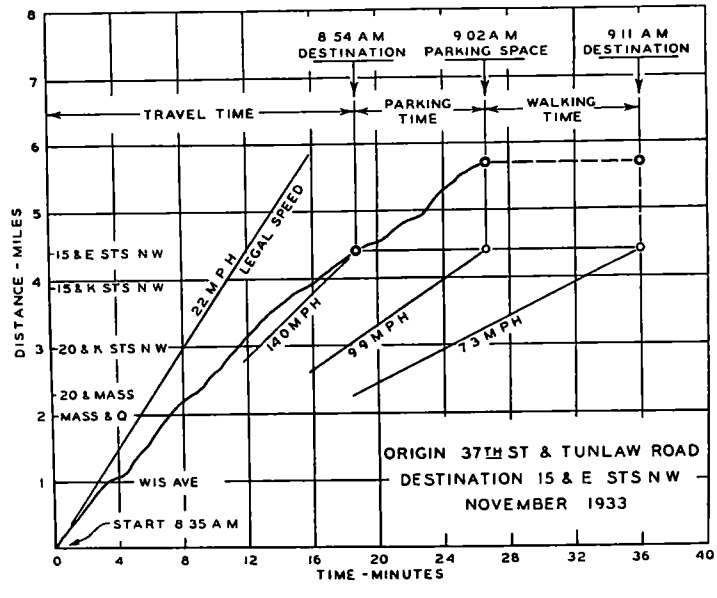

Figure 7. Effect of Lack of Parking Facilities upon Trip Time

During the rush hour, however, the average speed from origin to destination is reduced to 15 miles per hour, requiring 23 minutes At the end of five additional minutes spent in finding a parking space it drops still further to 12 6 miles per hour, and an additional seven minutes spent in walking back to the destination brings the final average to 10 1 miles per hour

Figure 7 shows a similar run from 37th Street and Tunlaw Road to the Commerce Building Here the speed to destination, 14 miles per hour, is reduced to 9 9 after the car is parked and finally to 7 3 miles per hour at the conclusion of the walk back to the office

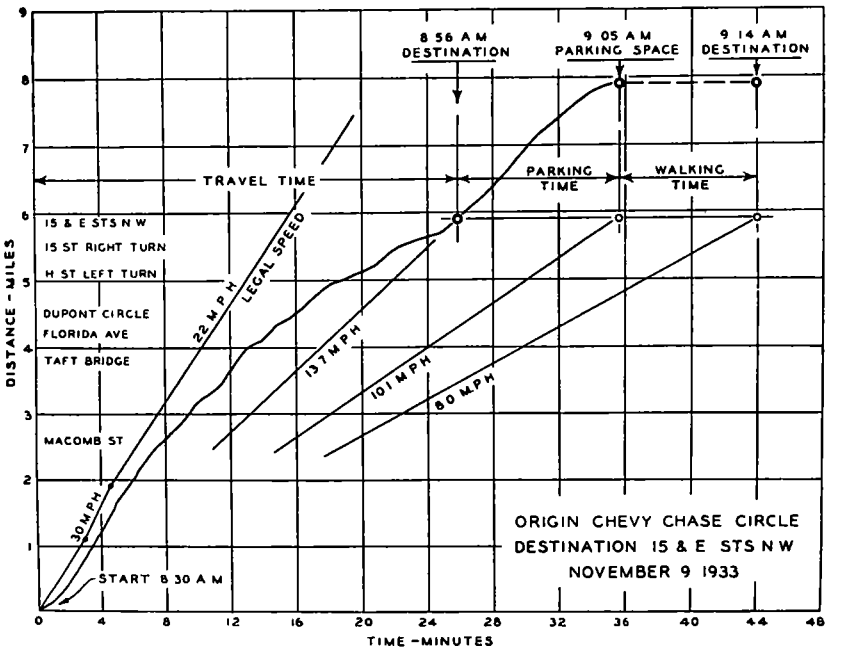

Figure 8. Effect of Lack of Parking Facilities upon Trip Time

Figure 8 is for a trip down Connecticut Avenue from Chevy Chase Circle to the Commerce Building Here the speeds are 13 7 miles per hour to destination, 10 1 to parking space and 8 0 miles per hour to the office

The average times of the three runs are 14 2 miles to destination, 10 8 miles per hour to parking space, and 8 5 as the final average after the walk back to the destination after parking

The last word in motor car design, so accurately streamlined that hardly a particle of dust will accumulate on its fenders and body surface, is shown in Figure 9

Figure 10 shows the first steamboat, the Clermont, which sailed up the Hudson in 1807

After a century of progress which saw the birth and development of the telegraph, the telephone, the motion picture, the radio, the talking picture, and the airplane, this automobile, the acme of ingenuity and skill, which on a road surface serviceable for high speeds, is capable in rural transport of bettering with ease and comfort standard train schedules, when used in urban transport is slowed down, first, by legal regulations, second, by traffic congestion, and third, by poor terminal facilities, until the average speed of travel including the walk back to

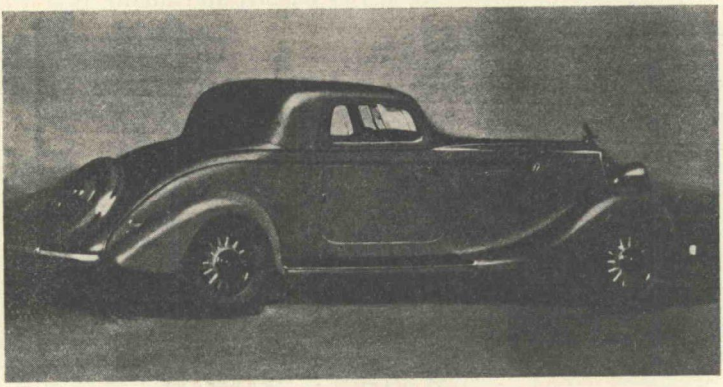

Figure 9

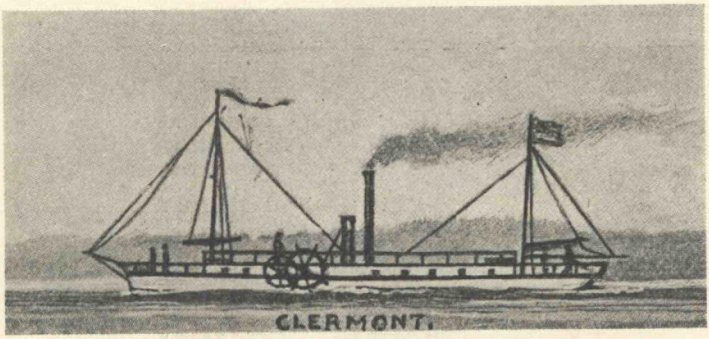

Figure 10

the office, store or shop becomes just a few miles per hour greater than that of Robert Fulton's first steamboat on the Hudson River 124 years ago.

This is no reflection on the traffic engineer and no criticism of the traffic regulations and control mechanism. His job has been to make one parking space serve from 5 to 10 cars. In Washington's business section, for instance, his job has been to accommodate a possible 100,000 cars daily in curb space capable of accommodating only 10,000. And he has done his job well. But you can not park your car on a regulation.

Thus we reach the natural conclusion aptly stated in the "Report of the Automobile Parking Committee of Washington," published under the chairmanship of Colonel U S Grant, 3rd, "that additional provision must be made (for parking space) if this form of transportation is to develop" Thus parking space instead of financial ability becomes the true index of the saturation point of urban car ownership

The consideration of terminal facilities concerns not how much the car owner is willing to pay for such service but instead the expenditure justified by sound economics to increase the speed, comfort and safety of the entire traveling public by removing parked cars from the highly

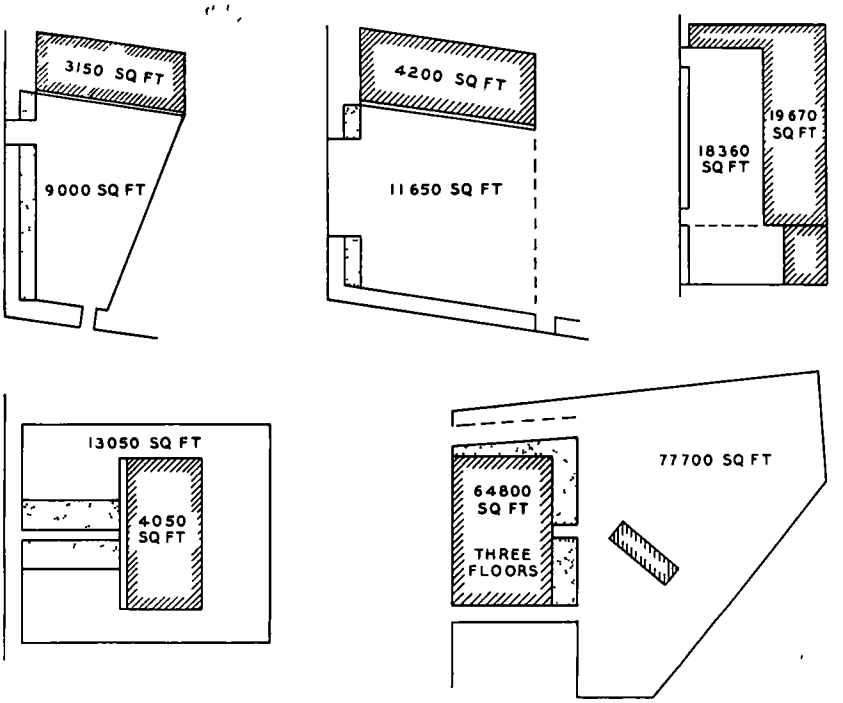

Figure 11 Relative Store Area and Parking Area of Typical Industrial Establishments

expensive street surfaces to off curb parking areas with less expensive surfacing

Parking space is not merely a personal convenience for car operators, but an integral part of economic motor transport Consequently, expenditures justified for its provision can be computed on the same basis as expenditures for increased road width, smoother riding surfaces, reduced curvature, greater sight distance, wider bridges, and better alignment Included also is the effect of adequate terminal facilities on putting more cars into service with their purchase price going to pay the cost of wages and materials of manufacture and their operating

costs for tires, gas, oil, repairs and insurance going to increase the general industry and prosperity of the nation.

Whether an individual is willing to pay 10, 20 or 50 cents per day for parking facilities is subordinate to the placing in service of additional

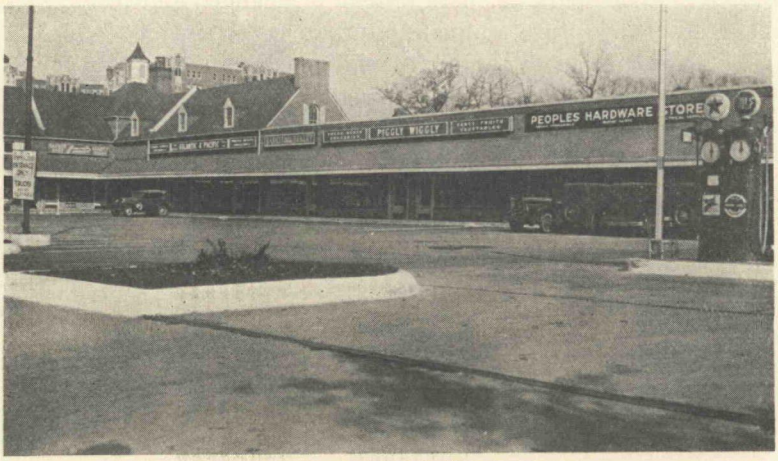

Figure 12. Off Curb Parking Space

Figure 13. Parking Area

units of transportation which contribute considerably to the commerce of the community and the nation.

Savings which accrue from provision of adequate parking facilities might be computed from several bases as follows:

1. The difference in value of parking lot and street surface.
2. The increase in speed of travel of moving traffic due to wider roadways.

3. The reduced operating costs due to shorter distance of travel.
4. Saving of time when necessity for hunting parking space is eliminated.

Thus, M. O. Eldridge in "Cost of Parking," Engineering News-Record, February 9, 1933, shows that the carrying charges for parking

Figure 14. Neighborhood Store Parking

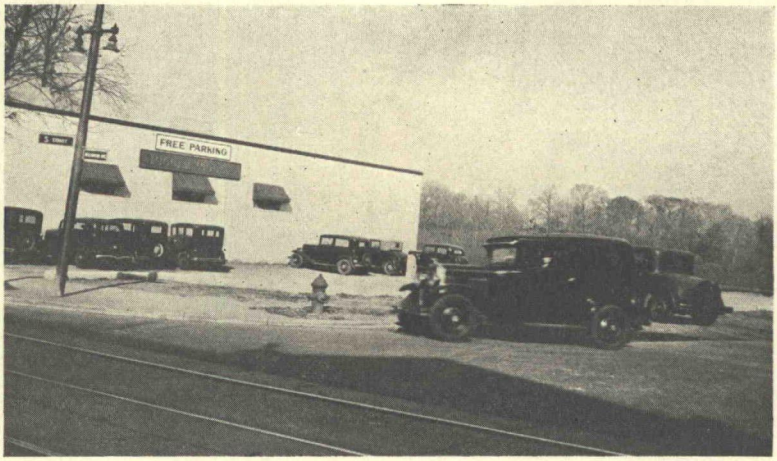

Figure 15. Neighborhood Store Parking

space for one car on Fifth Avenue, New York, about 156 square feet, amounts to $142 per month, or about ten times the cost of parking in the modern garage.

On the assumption that parking space can be covered with cheaper surfacing than street surfaces, additional savings can be estimated.

If this difference amounts to $2.00 per square yard, the capital savings for 400 cars occupying two miles of curb space and requiring about 7,000 square yards of off curb space would amount to about $14,000.

On the basis of 20,000 cars per day, which can be taken as the traffic on a main artery like Pennsylvania Avenue, the savings due to increase of speed of travel due to parking elimination could be enormous. If this increase of speed were only five miles per hour, the time saving in a year of 300 days would amount to 6,000,000 vehicle minutes per mile annually.

At one cent per vehicle minute, the saving proposed by Sigvold Johannesson in his book "Highway Economics," the annual return

Figure 16. Parking Areas at Mount Vernon

becomes $60,000 per mile annually or the interest at five per cent on $1,200,000.

The average distance from destination to parking space in the three runs is 1.65 miles. At 400 cars per day, 300 days per year, this becomes 198,000 miles which, at five cents per mile, cost $9,900 per year. This capitalized at five per cent is equal to $198,000.

I venture no estimate of the value of the time which must be spent in walking back to the destination. This is one of the "musts" however, which diminish the intangible returns which have made the highway and motor satisfy a national transportation need not furnished by any other type of transportation. All such necessities introduce into

motor transport the type of irksome travel restrictions which motor transport is designed to eliminate Exclusive of this item and also of any carrying charge on the valuation of the street area, the savings accruing from placing 400 cars per day in off curb space per mile of street carrying 20,000 vehicles per day becomes

$$14{,}000 + 1{,}200{,}000 + 198{,}000 = \$1{,}412{,}000$$

The cost of providing the 1½ to 2 acres of parking space for the 400 cars subtracted from $1,412,000 represents the profit due to furnishing off curb space for parking the cars now occupying one mile of street Thus, like the old argument for good roads "we pay for parking space whether we have it or not and it costs more not to have it than to have it"

That this is recognized by some of our old conservative business organizations is shown by Figures 11 to 16 They show what is being done toward providing the 400 acres with attendants or the 800 acres without attendants required for Washington's 100,000 vehicles

Along with the parking facilities we might include also other fields of change in physical structure which are justified part by the tangible and part by intangible economics Such problems include the following

1 *Development of design of sidings for expediting traffic on two-lane traffic roads* With mixed traffic of appreciable amount on two-lane traffic roads, the speed of traffic is practically that of the slower moving vehicles To increase the width of all such roads as occasion demands is a physical as well as a financial impossibility However, single lane sidings placed at proper intervals to furnish a three-lane road, especially on upgrades where the faster units can pass the slow moving traffic, will accomplish much toward speeding up traffic

2 *Development of anti-skid high speed road surfaces* The annual casulty lists of about 30,000 killed, 85,000 permanently and 945,000 temporarily injured in highway transportation is contributed to largely by skidding automobiles This is reason enough for studying the mechanics of skidding and preventive measures in both construction and maintenance Here it may be necessary to increase the cost of operation due to greater tire wear in order to reduce expensive loss of life

3 *Development of methods for segregating pedestrians from auto traffic especially in urban districts* This is to make a further cut in the casulty list and to speed up traffic as well because, according to estimate, pedestrians are concerned in about two-thirds of the traffic accidents

For years, attempts have been made to legislate pedestrians into certain locations for crossing streets Even at these designated locations pedestrians have to be more and more alert and be able to look in three or four directions at the same time to prevent being run down This is not only a city problem, for the bypassing of small towns is but a

temporary expedient which lasts only long enough for the gas station, the barbecue, drug store and the rest of the town to move to the new location

The only logical remedy is, through research, to devise the means for gradually preventing the pedestrians from using the street roadway, thus following the example of Radburn, New Jersey The design of underpasses or overpasses and the selection of their proper location for accomplishing this, combined with the design of accompanying parking areas, loading platforms and corresponding methods of traffic control, furnish an almost unlimited field for improvement in highway transportation

The railroad engineer has been solving a similar problem for the past half century Prohibitive restrictions made increasingly necessary the separation of tracks from the street grades on which rail transportation originally developed This called for new routes and often new terminals as well Terminals with through routes for highway transportation can follow the same general principles of design and economic justification

If suggestions such as these are considered impractical and the highway field fully developed and, if in the city the curb line is considered the ultimate barrier beyond which the highway builder may not pass, the field of future motor transport development is indeed limited If, on the other hand, we are willing to recognize that scientific inquiry into new fields of structural design can promote the comfort, speed and safety of highway transportation, the road builder has an unlimited field

Several years ago, at a Highway Research Board dinner, Colonel Chevalier asked the question—What will the highway engineer do when he is through building highways? The foregoing might serve as a reply for it suggests the almost unlimited task required to remold the urban structure to accommodate modern motor transport requirements instead of restricting motor transport development to the urban facilities of horse and carriage days And in this remolding the aim is profits, not costs.

DISCUSSION
ON
INTANGIBLE ECONOMICS

MR J ROWLAND BIBBINS, *Washington, D C* On this particular phase of economics there is now much disagreement in Washington Mr. Hogentogler has introduced the problem of remodeling the entire urban structure Let us look at this problem of the community as a whole, urban and suburban, regardless of political boundaries, draw a circle around it, and work out the totalized balance sheet of the dis-

tribution of costs, the benefits and problems of development Those of us who have been studying urban districts intensively recognize the growing blight that has so much affected internal land values and the housing of people This cannot be discussed now, but it is an outstanding problem of economic relatives Rapid transit has contributed to the blight and so have express highways It has opened up a large subject which I hope will go on the programs of succeeding meetings.