

which is honored by the township trustee in giving orders for the necessities of life. In some cases these men have done very satisfactory work but as a rule they are worth what they cost. With the advent of more normal conditions, it is our hope that our work may be done in a more orderly and systematic manner and that charity will be dispensed where charity is due and that a man will again become worthy of his hire.

RELATIONSHIP OF STREET RAILWAYS TO CITY TRAFFIC PROBLEMS

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A street railway company has a very vital relationship to and interest in every city problem—an interest and relationship that is measured by the tax dollar if in no other way. If you will examine the books of your city treasurer, you will find that the street railway company is one of your large taxpayers. The assessed value for taxation purposes of the electric railway lines in Indiana is shown to be \$28,000,000 in 1929, exclusive of buildings for car storage, shops, substations, power houses, and offices. With tax rates varying both up and down from \$3.59 per \$100, according to local conditions, you will find the railways carrying tremendous tax burdens. From that standpoint, then, if from no other, the railways are interested in city problems. It requires over 50,000 passengers per month to pay the taxes on Gary Railways, or approximately the gross receipts of two days' operation.

GENERAL PROBLEMS

In considering the causes and results of the traffic problem we will find, in general, that the solution is the unknown quantity. Surely we can agree on a considerable list of causes, such as congestion, speed, inadequate roadway widths, inadequate pavement surfaces, poor circulation of traffic, improper traffic routing, jay-walkers, lack of police regulation, too much police regulation, regulated parking, unregulated parking, obstructions in roadways, railroad grade crossings, street cars, busses, trucks, automobiles, horse-drawn vehicles, baby buggies, roller skates, people. This list is not complete and I reserve the right to introduce additional factors or to ignore some of these as we proceed. Most of the items sound as if they applied exclusively to the present day, indicating that the traffic problem is strictly a twentieth century affair. The following newspaper clippings from the Christian Science Monitor of December 14 would rather contradict this belief:

“The parking problem is not so modern as some commentators seem to believe. In 1660, when Charles II sat on the English throne, the extensive use of the streets for storing vehicles was seen as occasion for serious discussion and some alarm. Here is a stern decree given at the Royal Court at Whitehall on October 18, 1660:

‘Whereas the excessive number of hackney coaches in the city of London are found to be a common nuisance, the streets and highways being thereby made impassable and dangerous.

We command that no person or persons permit or suffer the said coaches to stand or remain in any of the streets.’

Motorists may find some consolation in the history of parking. For the record discloses that neither automobilists nor their trusted servants of the road are responsible for bringing another complex problem into an already too complex world. And if Charles II never so much as thought of solving the 1660 difficulty with the aid of police tags, neither is it likely a public official of this day would attempt to ban automobiles so completely as Cromwell’s successor attempted to ban carriages.

In fact, the motorist, looking back to earlier times, may find reason to congratulate himself. It is true that fire hydrants sprout like weeds in every unoccupied place along the curb. And it is as sadly certain that many a parking space seen from a distance is appropriated before the driver gets there. Nevertheless, the motorist of today has no autocratic edicts hanging over his head, nor is the unwitting parking offender in danger of having his person parked in the pillory.”

Of course, there was no street railway in 1660; so we can only draw the conclusion that a lack of adequate transportation facilities was responsible for congestion. The street railway had no relationship to the traffic problem of that day.

While the movement of city dwellers to suburban homes in the early stages was directly credited to the development of street car transportation, the return movement of suburban workers to city factories, stores, and offices was accepted as the obligation. The center of the community and the center of the transportation system were the same and around that point developed the high value district of the town and city. In the establishment of the lines of street car tracks from city centers to suburban districts, such volumes of traffic as congest our city streets today were beyond the vision of our forefathers. The routes that were established by horse-drawn street cars, then changed over to electric car lines, were not selected with the knowledge that they would later become the main highway arteries for a community of automobile riders.

A large percentage of our route mileage of today was developed before the occasional use of an auto. Particularly is it true in the downtown sections of our cities that the tracks of the street car system are located today on routes determined in the infancy of the industry. The street widths that are inadequate today were doubtless considered suitable when first selected.

St. Louis as an Example. A very frank recognition of the deadening effect of inadequate transportation upon commerce, industry, city growth, and property values has been set forth in a report submitted by the Chamber of Commerce to the City Council in St. Louis. "No criticism of the management of the Public Service Company was contained in the report, although it was pointed out that the original location of certain of the lines had proven faulty in view of the subsequent growth of the city, and that service was slow due to excessive congestion. On the other hand, full recognition is given to the absolute necessity of mass transportation as supplied by street railway lines and to the partial stagnation which has resulted from the failure of such service to keep pace with the growth of the city.

The report deals extensively with conditions of transportation, setting forth the sharp decline in passengers carried by street cars over a period of years, the slump in the number of people entering the downtown areas, the steady drift of business and industry into the suburbs, the slackening in building construction and the generally slow growth of St. Louis during the last decade in comparison with other large cities of the country, attributing the whole to inadequate mass transportation facilities. In 1916, 83 per cent of the people entering the downtown area were street car passengers while in 1930, only 49 per cent used that method of conveyance. In 1916, the operation of 4,521 street cars accommodated the patronage of 83 per cent of those entering the business district, while in 1930, 4,013 street cars carried only 49 per cent. The number of people had not decreased between 1916 and 1930 but it appears that over 50,000 persons used some other type of conveyance in the more recent period. Because of the small number of persons carried per automobile and the consequent large number of autos employed, destructive congestion has followed in the downtown district. Business decentralization is the inevitable result of congestion.

Inefficient transportation is not, of course, the only factor responsible for the slowing down of St. Louis. There are other obstructions which are contributing causes, but the greatest need is more trade from the outside, and nothing is stifling outside trade so much as poor mass transportation and congestion and congestion is in turn caused by the use of private automobiles instead of mass forms of transportation."

The effects of poor transportation on the city government is shown in its relation to the tax dollar. "The downtown area is bearing from 16 per cent to 20 per cent of the total city property tax burden, and when personal property assessments and license and merchant taxes are added this area probably bears from 30 per cent to 35 per cent of the total city taxes. Unless better transportation is provided, the rental income of this area is going to progressively decline and tax values and revenues must follow suit. Additional costs to the city are foreseen. If they cannot provide suitable mass transportation and shift a large proportion of the regular transportation from private automobiles to the mass forms, it is going to be necessary to embark on plans for street widening and for the construction of traffic relief facilities more extensive than any thought of heretofore."

Most of what has been said about St. Louis might have been said about any of our American cities. The charges of inadequate location of tracks, insufficient extensions of facilities and service, and slow schedules with poor equipment might have been directed in part at most of our Indiana cities as well as at most of the cities of the other states of the Union. Most of the railway properties in operation today were planned before the days of the automobile. The tremendous investments in track structures and in rolling stock coupled with the declining revenues caused by automobile competition have made it difficult if not impossible to relocate tracks to more adequately planned thoroughfares or to purchase equipment to keep pace with the rapidly changing and constantly improving types of automotive equipment.

Traffic Survey in Chicago. In the St. Louis report, attention was directed to the fact that comparatively more people used the mass forms of transportation in Chicago than in St. Louis. It should be interesting to refer to a report of the Metropolitan Street Traffic Survey submitted to the city officials by the Street Traffic Committee of the Chicago Association of Commerce in December, 1926.

The survey was "developed for the purpose of obtaining a comprehensive view of the entire traffic problem of the metropolitan district in order that recommendations could be made for the uniform treatment of difficulties throughout the region. It was based on the assumption that satisfactory control of traffic in a great city can never come from casual observation or guess work, but must be based on sound facts." It took cognizance of the fact that the traffic problem as it exists in Chicago and in all great cities, involves many varied interests and demands. The principal motive for the survey came from the pressure developed by increasing traffic accidents and congestion.

During the previous decade, Chicago had been experiencing street traffic difficulties similar to those which have affected

every other major city in the country. It was inevitable that the situation should become acute there because of the tremendous volume of commercial activities centered there. There had been a growing realization that existing agencies should be more fully supported in attempts to deal with the traffic situation. The increased volume of traffic had resulted in a general retardation of street travel and in many locations had caused serious congestion. Injuries and deaths to citizens, through traffic accidents, had reached large figures.

The Chicago Metropolitan area was considered to include the territory lying within an approximately forty mile radius from the center of the loop district, with an estimated population exceeding 4,000,000 located in two states, six counties, fifty cities with a population of more than 2,500 each, and 109 towns and villages. The most important area within the region was naturally urban Chicago. It was in this district that traffic had become most pressing because of concentration of population and the large volume of industrial and commercial activities.

The most interesting feature of the Chicago street traffic situation was the concentration of traffic in the central business district—a district slightly less than one mile square, a district with which few places in the world show a comparable density of population and street activity during normal business days.

The actual number of persons entering this district during a typical day was determined through the co-operation of the several transportation companies and city employees. The figures greatly surpassed the estimates generally made. During the 12 hour period from 7:00 A.M. to 7:00 P.M. of an average week day in May, 1926, it was discovered that 1,693,506 persons enter or leave this central business district. On the reasonable assumption that all who enter leave during the day, this means that during a normal business day the streets of this restricted central district were called upon to carry 846,753 persons, or approximately 25% of the population of the city proper.

The relation of the street railway to this traffic problem is shown when the figures are analyzed. Of the total movement 80.8 per cent was handled by the several forms of mass transportation, 61.6 per cent being on street and elevated cars, 33.6 per cent on street cars. Agencies using the streets, classified as street cars, motor busses, and passenger automobiles, carried 58.1 per cent of the burden. In this classification the street cars carried 57.8 per cent of the total.

A similar survey showed that 6.4 per cent of the vehicles entering and leaving the central district in a 12-hour period were street cars, which from the preceding figures were seen to be handling 57.8 per cent of the street traffic. In the same period 69 per cent of the vehicles were passenger autos carry-

ing an average of 1.8 persons per unit or a total of 33.1 per cent of the volume counted. The average passenger count per street car is seen to be 33.6 per unit, indicating that 18 people entered the district via street cars for every individual that travelled in a passenger auto.

The survey developed the fact that congestion of traffic resulting primarily from the number of passenger automobiles caused expensive traffic delays. It was believed that a considerable proportion of the resulting loss could be prevented. A saving equivalent to 10 per cent of the total operating time of the vehicles noted would mean over \$75,000 per day, or \$27,295,200 per year.

If all street accidents could be prevented and the resulting loss through personal injuries and property destruction be saved, there was shown to be a saving of \$17,000,000. During the months of May, June, and July, there were shown to have been a total of 3,726 motor vehicle accidents, of which 193 or 5.2 per cent were classified as "motor vehicle with street car." Of the 199 deaths due to motor vehicles, 14.5 per cent were in motor vehicle collisions and 2.5 per cent in collisions of motor vehicle and street car. The number of accidents to pedestrians waiting for or getting on or off street cars caused the recommendation to be made that street car stops should be provided with clearly defined safety zones and that drivers should be permitted at no time to drive a vehicle into a marked safety zone. A second important regulatory recommendation would prohibit a driver from passing a street car that was stopping or had stopped for the purpose of taking on or letting off passengers until all passengers had boarded or alighted, except where the street car stop was provided with a protected safety zone.

The survey found that automobiles and street cars were mutually obstructive. On many narrow streets the speed of the street car regulates the speed of all traffic. In districts where there is considerable movement of slow motor trucks, the speed of the street cars are retarded by the use of the center of the street by the heavy trucks.

The use of the streets by standing vehicles is a problem which was inherited by the modern streets of Chicago from the hitching post practice of the village of Chicago. The primary and most important use for which any highway is intended is public travel. The streets of the city of Chicago were dedicated to the purpose of travel, and any use, including parking, which interferes with this primary use must be considered both from a legal and practical standpoint as an abatable nuisance. Probably the most important result of the recommendation of the survey has been the elimination of parking on many of the important streets in the loop district.

Conclusions. Both the St. Louis report and the Chicago study bear conclusive evidence of the large number of persons

dependent upon and using the street cars for transportation. And both reports indicate that the street cars represent a comparatively small percentage of the number of vehicles involved in the traffic problem, and consequently contribute very little to the congestion factor of this problem.

A start has been made in Cincinnati towards the unification of transit facilities, where the street railway company has acquired an interest in various other transportation agencies, including taxicabs and motor busses.

The space required per person in standing or moving vehicles can be readily determined and will show that in an automobile the amount of street space occupied per person is 52.9 sq. ft. for the standing vehicle and 77.5 sq. ft. while in motion. For a street car the street space per passenger is 4.5 sq. ft. while standing and 49 sq. ft. while in motion. On this basis it is possible to determine the street capacity or single lane capacity.

The automobile lane would accommodate 1,350 persons per hour as compared with 11,480 persons per hour in the street car lane. This is based on 795 autos in the auto lane and 120 street cars and 400 automobiles in the street car lane. From these figures it may be developed that one double-track car line has the same passenger capacity as sixteen lanes of passenger automobiles. A single street with a 76-foot pavement on which both street cars and busses operate will carry as many people during an hour as will five boulevards of the same width, restricted solely to the use of passenger automobiles. Here is an economical and immediately available answer to the cry of the crowded street, but the public is not yet ready to take advantage of the latent potentialities of public transportation. As congestion increases and conditions become more hopelessly involved and the futility of street widenings and elevated highways as general traffic relief measures in cities is more fully recognized, the public will be alert to demand transit and traffic plans in which public transit will play a large part. The problem is not merely a public utility and transportation problem; it affects the very conduct of the social and business activities of the city. It is a huge community problem.

PAVING PROBLEMS

Only recently in Gary the city attorney's office found that the city was without legal power to force the street railway company to construct a new pavement in car-track areas, but could only require the maintenance of the original pavement. In our two most recent paving jobs in Gary we have secured the co-operation of the abutting property owners to the extent of sharing equally in the cost of paving the car-track areas. Earlier reconstruction jobs, such as the double-track concrete

pavement on Broadway and East Fifth Avenue, were financed by the street car company in their program of expansion.

Types and design of pavement do have an important place in the discussion of traffic problems. The simple matter of the amount of crown to give a modern city pavement affects the traffic problem. On a business street with an excessive crown—such a crown as was required for a macadam surface—the heavy traffic will all seek the center of the street. When car trucks occupy the center of the street and are built of course with both rails and both tracks at the same cross-sectional elevation, the heavier traffic finds this area most attractive. Horse-drawn vehicles particularly will endeavor to travel on the level surface because of the less tractive resistance to turning and the proper equalization of the load. And with slowly moving vehicles on the car-track area there is bound to be a traffic delay affecting not only the street car but every type of conveyance behind it.

Inadequate widths of pavement as a factor in the traffic problem can only result in congestion, and can only be remedied by widening or regulation of traffic to one-way streets or re-routing. When street car tracks are located on streets of inadequate width, the schedules of operation on such divisions must necessarily provide for delays due to traffic.

SAFETY ZONES

Safety zones of many kinds are in use. Some have structural protective devices effectively prohibiting the entrance of vehicles within the pedestrian area; some have raised platforms with or without other end protection; some have areas marked only by mushroom buttons, either illuminated with reflectors or plain; and still others have the safety zones marked only by painted lines or pavement inserts.

The National Conference on Street and Highway Safety defines the safety zone as "the area or space officially set apart within a roadway for the exclusive use of pedestrians and which is protected or is so marked or indicated by adequate signs as to be plainly visible at all times while set apart as a safety zone." A recent study of safety zones in 46 cities of this country wherein almost 3,500 safety zones are installed shows that both construction and maintenance of safety zones have been recognized as the obligation of the municipality in the majority of cases. In 63 per cent of the cases the cities financed the entire cost, and they maintain the structures in 74 per cent of the cases. In only 11 cities representing 24 per cent of the total number is the cost of construction carried by the railway company, and in only 9 cities or 20 per cent of the total is the maintenance cost borne by the company.

It is generally found that where the installation of an adequate loading platform is justified by the amount of street car loading, there is a reduction in accidents and an increase in

traffic capacity of the existing roadway by reason of permitting the traffic to pass standing street cars at this point. In some instances cities have found it advisable to move the curb back to make possible the installation of the loading platforms without reducing the width of roadway. An immediate reduction in the number of traffic accidents followed the installation of safety zones in Chicago when police regulations were enforced to prevent driving into the safety zone. Everyone who has made any study of traffic accidents can recall many serious cases of pedestrians being struck by automobiles passing standing street cars. When the pedestrian is away from the car his safety is the problem of the city and himself; yet the street railways have a very vital interest in seeing that their patrons can board and alight from the cars in safety.

One effort to accomplish the safe loading and unloading of street cars without the provision of safety zones has been proposed in Detroit in connection with some new street widening projects. The plan under discussion contemplates the location of car tracks adjacent to the curb line on each side of the street and the complete elimination of parking, giving the center of the roadway over to through traffic. This location of car tracks is deemed the only logical one by the Chief Engineer of the London General Omnibus Company, who believes that "tram" cars should only be operated on thoroughfares of sufficient width to enable them to have their lines adjacent to the sidewalk, leaving ample room for following or overtaking traffic to pass.

PARKING

The most debatable factor in the traffic problem is probably the question of parking. Some authorities contend that without the parking problem there would be no traffic problem. Others will argue that restriction of parking aggravates the traffic problem. Recently a suggestion was offered to permit taxicabs to park in that most sacred area adjacent to the fire hydrants in the downtown districts to eliminate somewhat the cruising on the downtown streets when taxi stands were fully occupied. Whatever form of parking is permitted in a downtown district, the result is that a considerable portion of the street area is given over to a service other than that for which a street is intended. In downtown areas that have been seriously troubled with traffic congestion, the most effective remedy has been the complete elimination of parking. In other cases, time restriction on parking has proved beneficial and at the same time has introduced a hazard in traffic that has been the cause of many minor accidents. Especially in parking parallel to the curb is there seen to be an increase in the business of repairing fenders. Any regulation that causes vehicles to back up in traffic is a distinct menace to the safety of other vehicles on the street. In angle parking the auto is required

to back out into traffic. Many of the accidents on our records are chargeable to the neglect of the driver of the car that was parked to make sure that there is no approaching auto before he pulls out or backs out from the curb.

Last fall City Manager Dykstra in Cincinnati pointed out that the street area occupied by an automobile parked in the street would cost the city \$22,500 if prices compared with the cost of widening certain streets in their business area. A 25-foot strip on their East 5th Avenue, adding two lanes of traffic, cost on an average of \$3,000 a foot. An automobile parked parallel to the curb occupies one traffic lane and a space at least 15 ft. long, which at \$1,500 per foot per lane gives the cost of \$22,500 for parking space for one car. There again is an opportunity to develop an actual saving in expenditure of public funds by making more efficient use of the mass forms of transportation; and it can be expected that the public, being interested in the street car service through their service at cost franchise, will demand the adoption of the no-parking rule and the consequently greater use of other means of transportation than the private automobile.

An interesting example of the recognition of the factor of congestion arising from using and parking automobiles during occasions of exceptional interest is shown in the announcement broadcast to motorists in Detroit during the recent convention of the American Legion in that city. "The Police Department suggests that motorists leave their cars at home when visiting the congested downtown areas during the week of the convention" was the message, adding, "The use of busses and street cars for mass transportation is urged owing to the limited parking space available. Do not attempt to drive on tracks ahead of moving street cars. Leave the tracks as soon as gong is sounded." Some one will remember that Detroit is operating the street cars under municipal control and will suggest that such management brought about the announcement. Probably so, yet everything stated must be admitted and it is particularly significant that such an announcement and such recognition of the limitations of the automobile as a vehicle of transportation for the movement of a great volume of traffic should come from the authorities of a city where the private automobile has so completely dominated civic thought and enterprise.

In common with other facilities of modern life, local transportation has made tremendous advances in the period which started with horses and mules as motive power, passed through the days of cable cars and is now in the height of its development under the magic of electricity. With the electric street car we have motor busses and trackless trolley coaches, each fitting into the problems of mass transportation. The great need now is for greater and closer co-operation between the community and the company which furnishes its

transportation service. With the proper correlation of all the units of transportation and their proper control and regulation will come a greater usefulness and a greater opportunity for service by the company to the community. Such co-operation will be heartily welcomed by the transportation companies and will bring wonderful results in providing improved street traffic conditions. The street railways of today recognize their relationship to the traffic problem and welcome every opportunity to co-operate in the solution.

In the preparation of this paper, reference has been had to much that has been written and said on this and kindred subjects. Quotations have been taken liberally from many sources and acknowledgment is given to the last four monthly issues of the "Aera" magazine, the "Electric Railway Journal News," "The Report and Recommendations of the Metropolitan Street Traffic Survey" by Miller McLintock, the Proceedings of the 1930 Meeting of the American Electric Railway Association and to the 1930 Proceedings of the American Society of Municipal Engineers.

CIVIL ENGINEERING AND THE PUBLIC HEALTH

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High above a lovely Italian lake stands one of the largest statues in the world—112 feet from ground to top, the colossal figure of Carlo Borromeo, archbishop of Milan, hero of the great plague which visited the city in 1572. When other wealthy men fled to their country estates to escape the approaching scourge, the archbishop remained to comfort his afflicted flock in their distress. After his death the people raised this great memorial to him because he stayed to bring them the consolation of religion, though he could do nothing to alleviate their bodily ills nor to stay the hand of death.

If, as some believe, the plague of 1572 in Milan was typhoid fever, then one of the first sanitarians to conquer this ancient pestilence was the German, Pettenkofer, who in Munich in 1867 caused the death rate from this disease to drop suddenly from 203 per 100,000 to almost nothing. How did he do this? By persuading the city to install sewers, to abandon their polluted wells, and to build a new pure water supply. But where is the memorial to this man? I can find no record of one.

Quoting from "Riders of the Plagues" by Tobey: "In spite of these tremendous benefactions, Pettenkofer was practically unknown by the people. The late Dr. Victor C. Vaughn relates in his memoirs that one day en route to Pettenkofer's laboratory he found flags flying and bands playing and upon