

THE FUNDAMENTALS OF STREET TRAFFIC CONGESTION

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The solution of any problem is obtained with the most ease when the fundamentals that make up the problem are fully understood. -- so the solution of traffic congestion problems can be worked out only after one has thorough knowledge of its basic factors.

Traffic congestion is an expression of our present civilization. Call it by whatever name you will, this evil - inconvenience, annoyance - is here to stay, there is no formula by which it can be eliminated never to return. The best that can be hoped for is to have a measure of relief from its most chronic stages, for, briefly defined, traffic congestion is the result of too many persons and vehicles using or attempting to use a street at the same instant of time.

Transportation is made up of three elements: the load, the vehicle and the way. The load is persons or goods or both; the vehicle is the instrument used to carry the load - pack animal or automobile, man or cart, street car or freight car; the way is the strip of land along which the load and the vehicle move.

From the view point of economics there is an interesting relationship between the load and the vehicle, and between the vehicle and the way. The number of persons or the character of the goods that make up the load determines the sort of vehicle necessary, and in turn, each vehicle requires a particular way. Theoretically, we have three variables between any two of which there is a peculiar relationship, or equilibrium. Of the three, the way is least flexible. In most

cities the number and the width of streets were fixed years ago, and to all practical purposes, they have remained unchanged. In Boston, Chicago, and New York, as in every other city of any size, practically every square foot of area that is not used for street space is occupied by important and costly structures. Thus, the making of new streets or the widening of existing ones becomes inordinately expensive. This fact places the burden of the adjustment of relationship upon the two other elements, the load and the vehicle.

The accepted requirements of the social and economic life in large cities demand the regular movement of a certain amount of persons and freight, the character of which can be but little changed, if at all.

Of the three elements of transportation then, the one most susceptible to change is the vehicle. This alone is available to be adapted to meet new conditions that are arising daily. Vehicles may be enlarged or diminished in size, increased or decreased in numbers, and in many other respects can be changed. So we see that as the density of traffic increases, that is, more vehicles crowd the ways, provision must be made to transport persons and freight, either in larger groups or in greater bulk, in order to bring about a more economical use of the street areas.

The best unit measure for economy of use of streets is the street space per passenger occupied by the individual vehicle. A pedestrian, on an average, occupies approximately four square feet. He can move in eight square feet. When he rides in the ordinary street car, this pedestrian occupies, as a passenger, six and

one-half square feet of street space when all seats in the car are full and three and three-fourths square feet when the car is carrying 100% overload. In the average motor bus space requirements range from three and one-half to six square feet per passenger.

The most extravagant vehicles in the use of street area are the taxicab and the privately-owned automobile. Dividing the total time a taxicab is on the street - carrying a fare or fares, returning empty and waiting at the curb - by the passenger-hours gives a quotient less than one which is equivalent to less than one passenger. If we take into consideration the time the privately owned automobile is parked along the curb we will find that it has a street-space-economy lower than that of the taxicab. With the liberal allowance of one passenger per taxicab and the same for privately-owned automobile, the following table shows the relative economy of vehicles for transportation of persons.

Street car per passenger .....	$3\frac{1}{4}$ to $5\frac{1}{2}$ sq. ft.
Auto bus .....	$3\frac{1}{2}$ to 6 sq. ft.
Privately owned automobile .....	.80 sq. ft.
Taxicab .....	.80 sq. ft.

This table illustrates most graphically the wasteful manner in which the streets are being used.

Besides the number of cars, the population is the only thing that is increasing; the street areas, with few exceptions, are surely not. More vehicles cannot be parked in the streets. Therefore, the vehicle which carried the greatest number of passengers in the smallest amount of street space should be used and the use of the vehicles that are

wasteful of the street areas should be discontinued.

Another view on traffic congestion can be had from a study of the following table, which shows annually, from 1900 to date, the approximate number of vehicles on the roads and streets of the United States.

<u>Year</u>	<u>*Horse Drawn</u>	<u>Motor Cars and Trucks</u>	<u>Total</u>	<u>Percent increase over 1900</u>
1900	7,812,000	13,000	7,825,000	-
1901	9,804,000	20,000	9,804,000	25.5
1902	9,644,000	28,000	9,672,000	23.6
1903	9,642,000	38,000	9,680,000	23.7
1904	9,746,000	57,000	9,803,000	25.2
1905	9,973,000	77,000	10,050,000	28.4
1906	11,061,000	106,000	11,167,000	42.7
1907	11,781,000	142,000	11,923,000	52.3
1908	11,930,000	197,000	12,127,000	54.9
1909	12,346,000	311,000	12,657,000	61.7
1910	12,581,000	468,000	13,040,000	59.9
1911	12,300,000	639,000	12,939,000	65.3
1912	12,435,000	944,000	13,379,000	70.0
1913	12,476,000	1,237,000	13,768,000	75.8
1914	12,705,000	1,701,000	14,416,000	84.2
1915	12,837,000	2,445,000	15,282,000	95.3
1916	13,376,000	3,512,000	16,888,000	115.0
1917	12,366,000	5,104,000	18,070,000	130.0
1918	13,214,000	6,146,000	19,360,000	147.0
1919	13,218,000	7,530,000	20,748,000	165.0
1920	12,796,000	9,177,000	21,973,000	180.0
1921	12,591,000	10,464,000	23,655,000	194.0
1922	12,500,000	12,230,000	24,739,000	216.0
1923	12,500,000	15,010,000	27,510,000	251.5

\* This figure is based upon the assumption that two horses or mules are equal to one vehicle.

From the above table it is seen that the annual increase in vehicles on the road averages about 10%. An extensive study of the vehicles on the streets of New York and Boston has shown an average annual increase of vehicles of a little over 10%. As the street areas become more congested and their occupancy approaches the point of saturation, it is readily seen that the traffic congestion increases at some arithmetic or geometric ratio.

During the last five years the automobile manufacturers have been greatly interested to know when the annual production of new cars will become uniform in amount or, putting it another way, when the market will reach the point of saturation.

This same information is of great importance to those who are devoting their effort to solving our transportation problems. Today (January 1924) there are 15,000,000 cars registered in the United States, or an average of one to every 7.75 persons. In California, where the registration is the most per capita, there is one to every 3.8 persons. In Massachusetts there is one car to every ten persons. Interpreting the statistics on this subject in the most conservative way, the only conclusion that can be reached is that the registration of cars in all states will continue at a rate out of proportion to the increase in population. If the rate of annual increase in automotive vehicles placed upon the roads and streets continues - and it is reasonable to expect that it will - and the population continues its increase; no further evidence is needed of the impossible condition which will obtain on the streets of the large cities, in the near future.

Can there be any other than the condition of congestion of

traffic which prevails today in any representative street in any representative city? Here is a conglomerate of vehicles of almost infinite variety hauling passengers and goods, not to a few points along a single route, but to an infinite number of points along many routes. Each vehicle has its individual driver. At street intersections and elsewhere they are continually meeting and passing, stopping and starting. There is no general directing head; there are as many directors as there are vehicles, the only restrictions limiting their movements is the physical confines of the streets. Their only control is that imposed by a few traffic regulations. Scattered through this jumbled mass of creeping wagons, snorting auto trucks, hurrying automobiles, clanging street cars, and crowding taxicabs, are thousands of pedestrians, moving in even more individual directions, each equally intent upon reaching his own goal. Through this writhing sea, people transport their goods, go to and from their homes and places of business and engage in their social and commercial activities.

As our cities begin to experience the inconvenience of traffic congestion, we find them turning to such means of relief as:

1. Direction of traffic.
2. Education of those using the streets.
3. One-way streets.
4. Widened streets.
5. Control lights.
6. Depression or elevation of sidewalks at street crossings.
7. Limited parking of automobiles.
8. Additional entrance and exit streets.

The first sign of distress is the crossing officer at the busy corner who, with a "high hand," directs the flow of traffic.

Immediate relief is experienced. Once traffic has reached a point of density requiring a director, the traffic officer becomes an institution and is indispensable.

With the advent of the crossing officer, are issued a series of traffic regulations. In themselves these are good, but as a rule they are not well observed. A fault due to laxity of enforcement rather than to the worth of the ordinances themselves.

Due to the normal increase in the density in traffic, the relief obtained by the establishment of traffic officers at strategic points is not longlived. To gain further help, one-way streets are established. This measure often meets stubborn opposition from the merchant and others who, by some form of reasoning, arrive at the conclusion that traffic flowing only one way in front of their places of business will lessen the volume of their trade. It is of much interest to find the shopkeepers and merchants along Fifth Avenue in New York are so dominated by this fallacious reasoning that they have bitterly fought such a regulation. It seems obvious to a layman that a smooth flow of traffic all in one direction along this famous street makes the shops and stores more available to customers.

The one "cure" for congestion which is offered regularly, is wider streets. That wider streets are needed in all of our large cities is obvious. Those who planned the streets, in their widest flights of imagination, never dreamed of the volume of traffic that is today placed on them. The philosophy of widening the streets comes from the long formed habit of using larger box, or vessel, when the load becomes too bulky for the one being used. Wherever streets are being repaved, or some other improvements are being made that create a condition favorable for widening

streets, they should be widened if needed. This widening is usually done at the expense of the sidewalk area. There are a few rare instances where streets can be profitably widened by acquiring not only the whole of the sidewalk space, but also a strip of the adjoining land and demolishing the buildings thereon. An example, where the cost of improvement was well justified, is found in the north end of Michigan Avenue in Chicago. Each case of this sort, however, must be decided upon its own merits. The wholesale widening of streets as a cure for traffic congestion will probably be found to be of little value and will result in a disappointment. The relief obtained is as a rule not commensurate with the cost.

A system of signal lights for a uniform control of traffic in all directions was first tried out on Fifth Avenue, New York City, and as an assisting instrumentality it has been a great success. As a cure for congestion it has been a complete failure. The good that came from the new system was immediately noticeable. Today, because of the increased density of traffic, the congestion is as bad or worse than ever before. Without the lights, however, the traffic today would be entirely out of control. All conditions are not susceptible to efficient use of control lights. The most favorable conditions are found in long straight streets.

Some local conditions are helped by separating street crossings, and by the segregation of the pedestrian traffic from the vehicular traffic.

The subject of "parking," "no parking" or "restricted parking" is simple. No single factor contributes to congestion as much as does the unrestricted practice of parking. It does not need to be argued, it is so obvious. A time limit, as a measure of relief, means nothing. Whenever drivers find no place to park their cars they keep on driving until a place

is found which has been made so by the expiration of some other driver's parking privilege.

The long established custom that has allowed almost unrestricted use of the "king's highway" carrying with it the special privilege of stopping and leaving one's wagon standing before one's home or place of business, whenever and wherever social and commercial life found it desirable, has given precedent to the practice of parking - the most glaring example of uneconomical use of the streets. It is not infrequent that parked cars occupy a third to one-half of the total street area, in many cases leaving hardly room for the actual passing of moving vehicles on the same street.

As said before, parking is the largest single contributing factor to traffic congestion. This truth should be fully recognized. As long as there is no restriction placed on the use of the streets for parking, no other means of regulation can bring any perceptible measure of relief. In considering this question it is solely for the people to decide what price in terms of congestion they wish to pay for certain privileges of parking.

To provide facilities for relief of congestion, proposals have been made to construct roadways and speedways - generally at inordinate costs - from, and into the congested area so as to permit a freer flow of traffic. The proponents of this plan seem to have failed to recognize that this works both ways, for facilities that allow a free flow of traffic out of a congested zone are available to carry the same amount of traffic into the congested zone, thus augmenting the bad condition.

All these things which have been proposed and done for the relief of traffic congestion are valuable, and to those engaged in traffic problems each is recommended for use in its proper place. The adoption of any, or all of them, however, should be done with the full knowledge that they are only reliefs and not cures. There are no permanent cures for traffic congestion. The whole problem of traffic congestion is the overloading of the street area by vehicles and pedestrians. The solution to be sought is not one of elimination, but of alleviation.

Proper administration of traffic means efficient use of facilities at hand. However, twenty-five years hence the only manner whereby large cities will be able to handle their passenger traffic will be by mass transportation. This means a transit system with facilities sufficiently well planned to carry one comfortably and efficiently from one's home station to a point within two blocks of one's destination.

In a short time regulations that place limitations on the use of private automobiles during certain times of the day in the more congested business sections of many of our cities will have to be adopted. Regardless of the opposition this suggestion will receive, this truth is inevitable. Give the people a means of transportation such as described above, and the use of the passenger automobile as a unit in the transportation system will, in the congested districts, no longer be needed. No money should be expended on extensive street widening and in the construction of elevated automobile expressways. All energies should be directed toward the most efficient use of the existing facilities. Expenditures for other purposes will be wasted.

Traffic congestion relief rests primarily in efficient adminis-

tration. To date, highway transport can be said to have no administration, unless an occasional traffic policeman may be considered such. By this term is meant the same thorough administration as is received by every large commercial enterprise. A complete knowledge of all the physical, economic and legal aspects of highway transport; a careful study of the various character of goods to be hauled; the selection of the most efficient instrumentalities, the separation of passenger and freight vehicles; the assignment of certain streets to passenger and others to freight traffic; the separation of fast and slow-going vehicles; the adoption of means for facilitating the movement of pedestrians as underpassages - escalators, and others; the widening of vehicular and pedestrian areas in streets; the determination of zones in which there is "parking", "no parking" or "restricted parking"; the education of drivers and pedestrians; the training of traffic officers; and the promulgation of regulations and the enforcement thereof. The foregoing is not a complete enumeration of all the elements of ideal administration but it is sufficient to fully illustrate that practically there is no administration of traffic and that what little there is, is of the "town hall" variety, the efficiency of which cannot be praised.

In fine there is no cure for traffic congestion, relief only can be obtained. This relief will not come through large expenditures for new streets and roads, extensive widening of streets or the establishment or construction of speedways. Relief will be found in intensive, efficient, and intelligent administration of street traffic - in the most economical use of existing street areas.