II. SOME ASPECTS OF STREET AND HIGHWAY SAFETY.

H. E. Wolford, University of Oklahoma.

The making of our streets and highways "Safe for Democracy" is a task involving the concentrated effort, in degree, of every "mother son" and "dad's daughter" of us. These hackneyed phrases are used advisedly; unless a more democratic spirit permeates and actuates the traveling public, be it motor-driven, horse-drawn or pedestrian, by which a mutual courtesy to, and deference for the common rights, safety and comfort of the wayfarer are enhanced and reverenced, then will the democracy of the highway, necessarily, be curbed for the common good by stringent regulations enforced by uniformed patrols.

This problem of public welfare is not one to be championed alone by any one organization but hurls the gauntlet at the feet of invention, education, administration, legislation, the judiciary, industry, commerce, social service and religion. In the complex structure of modern civilization few may protest entire innocence from the blood which is being spilled, thrice hourly, or the injury occuring every 45 seconds on the highways and streets of these United States, due to motor car accidents.

Thus is presented a huge task and an appalling spectacle for attack in a fifteen minute paper.

Only certain aspects of the problem will be here referred to, these being discussed more to the end of provoking thought and research than for the purpose of giving results already accomplished. A great deal has been accomplished, however thru the efforts of the several state and municipal traffic and safety departments with many individuals and commercial, industrial and social organizations cooperating.

Yet the American Road Builders Association in connection with the nation wide Highway Safety Campaign launched on October 1st. is offering $1000 in prizes for the best ideas on Street and Highway Safety. This organization concludes "From Studies of the Highway Safety Problem, it is evident that the individual holds the key to the solution and this contest is for the purpose of securing ideas from the individual."

Highway accidents in regard to causation may be broadly classified into two groups, as follows: those due to physical imperfection of the roadway, roadway appurtenances and of the vehicle itself, and those due to human erring, ignorance, incompetence or recklessness on the part of the vehicle driver or pedestrian or both. An exhaustive detailed analysis of these causes would require much time and would lead us to consider many industrial processes in design and manufacture in the first instance and many human characteristics, whims and infirmities in the latter case.

As regards roadway imperfections, highway engineers are designing for service and efficiency which imply economy which in turn

embraces safety. Indeed *safety* is more and more becoming the watchword in highway design, construction and maintenance. Alignment, in many instances, is governed more from safety considerations than by principles of economic vehicle performances. However, contrary to popular belief, accident statistics would indiate that accidents occurring on long tangents are in preponderance over those occurring on winding and tortuous sections of highway on which reasonable consideration, in design, has been given to safety provision. *Thus the finger of guilt points to the vehicle operator.*

In the selection of paving types on steep grades safety, again, is the controlling factor. Roadway widths are also not infrequently controlled by safety considerations.

Highway appurtenances, comprising caution, warning and guide signs, guard rails, etc. should be selected in type, and placed in respect to the traveled way, wholly from the standpoint of safety. Such is largely the practice on our main improved highways today. However, occassionaly we find safety appurtenances of such design and so placed as to tend to confuse rather than aid traffic and which constitute a potential physical danger to traffic.

Of comparatively recent date, there has been placed on the market designs of acetylene and battery illuminated flash signals for use along highways were generator current is not available. A more extended use should be made of these flash signals at railroad crossings, main highway intersections and other danger locations on rural roads.

An innovation in urban traffic signal light control is foreshadowed by the use of sound waves as a medium of control. This principle has been incorporated in a device for the control of traffic signals, by H. E. Witwer of Cleveland, Ohio. The workability of the device, in so far as I know, has not yet been demonstrated. The end sought for is the automatic control of traffic signals by fire trucks and other emergency vehicles thru the agency of sound waves set up by shrieking sirens.

Considerable investigation and experimentation in design and colors suitable for light signals has been carried out by various organizations—"a sectional committee, working under the auspices of the American Engineering Standards Committee and sponsored by the American Association of State Highway Officials, the National Safety Council and Bureau of Standards, has agreed upon specifications for the use of colors, and this has already resulted in pretty general adoption of uniform practice in the use of red, green and yellow luminous signals for traffic control."

"A series of tests has been made on the visability of red, yellow, green and blue traffic signal glasses under daylight conditions. It was found that color traffic signals under daylight conditions, with the sun shining on the signals, are clearly distinguishable by the average observer at a distance of 1,200 feet from the signal if there is behind the signal a light having a beam candlepower of approximately the following values for the four colors:

Red	1,400
Green	2,600
Yellow	3,800
Blue	9,300

It was found that a 15 watt lamp in a 4 or 5 inch parabolic reflector will be satisfactory to use as a source of light for such signal glases and that with a lamp of that intensity the colors will be clearly distinguishable at a distance of 1,200 feet, even though the sun is shining directly on the signal." (1:27).

Chief among vehicle imperfections and weakness contributary to street and highway accidents are, faulty lighting, steering gear and brakes.

Perfection in automobile headlight design has not yet been attained or at least is not in evidence on oru highways. Here is opportunity for scientific investigation and research which will net tangable benefits to untold millions.

Adoption by the several states of the "Uniform Vehicle Code" (9:88)* recommended by the National Conference on Street and Highway Safety, undoubtedly, would be a most forceful legislative step in the interest of roadway safety. Said code provides a rigid control of headlighing and signal lighting apparatus. Sectional attempts to control this menace to safety and comfort will be at once expensive and in-efficient due to possible conflicting requirements.

Steering gear and brake mechanism have reached a high degree of perfection. The menace to safety from these sources will obtain only through carelessness of the owner in his neglect to keep these controls properly adjusted. Really accidents from such cause might be placed more correctly in the second group of accident causation due to human negligence. However, the remedy to be suggested comprises both mechanical inspection and human suasion, hence this might be considered a transitory condition between strictly physical and decidely human or in-human causation of accidents.

It would not seem unreasonable to require motorists to display on demand of traffic officers, a "certificate of inspection" from a licensed state, county or municipal motor car inspector, which certificate should be attested and dated by a distinctive impression or perforation design. These inspections should embrace a rigid examination and test of the steering and braking mechanisms and a check-up on front wheel convergence, all according to certain methods and standards which should be uniformly established by all states. The frequency of these investigations and where and by whom executed should be established by state statute.

In rural and small urban districts, certain mechanics in local garages or the garage management itself might well be licensed to make the inspections. In large cities the same system might obtain or they might be handled in connection with a system of municipal

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*The first figure of the number in parentheses denotes the article quoted as listed in the appended bibligraphy and the second number refers to the page of the publication containing the reference.

parking garages or automobile rest rooms, the construction of which the writer will submit for consideration as one relief measure in overcoming traffic congestion, which is not only a major menace to safety but an economic cancer on the bosom of industrial and commercial progress.

A workable scheme, as I see it, would be to locate these parking garages at strategic points in and around congested traffic centers within eight or ten blocks of each other and in harmonious coordination with a traffic routing segregation and grade separation scheme. All day parking of individual transportation autos, belonging to office, factory and business employees, could then be entirely removed from congested centers.

In an article on "Trafic Congestion and its Relief" submitted by the writer to the American Road Builders Association, a year ago, among other relief measures was suggested a requirement that large commercial and industrial enterprises, located within congested areas, provide loading and service docks in the basement of their establishment, or within the confines of their own property as a further relief to street congestion.

The charge will at once be made that this army of workers and these business concerns are being deprived of personal right and privelege also maybe that the cost of such a scheme would be excessive. Forestalling the second charge first, if we are to maintain safety and reasonable traffic dispatch in congested areas the individuals contribution to the increasing amount of public funds which will be required to widen streets, build subways and elevated ways in order to provide public parking and service space on the streets for private transportation facilities will far exceed, in my estimation, his financial burden incident to the proposed relief measures.

The scheme has other possibilities also to recommend it, which further detail may not be here discussed.

We are jealous of our "personal liberties" accorded by our democracy. Jealousy always behaveth unseemly; many a wrong and even crime against fellow man has been the offspring of jealousy. Is not this jealousy of our protested right to go where we will, how we will, as fast as we will and park where we will as long as we will, and the other fellow be d-----d, a crime against fellow man and economic and moral suicide for the individual?

We are now at the threshold of the second and by far the most formidable and stubborn source of accidents, carelessness and what might be termed the inhuman complex of the individual. Here social science might well assist in study the fundamental emotions, behaviors and reactions incident to and on roadway accidents.

In this connection we are interested in the correct technical analysis and characteristic or trait designation only in-so-far as it will aid in a specific for the malady. Investigation and analysis of the statistics which are somewhat fragmentary as to detail, yield the conclusion that over 90% of these are due to carelessness and recklessness.

Here then is the crux of the problem in the removal of which all

may assist from the scientist to the child who chases his ball or hoop on the street. It is a task for the individual to voluntarily practice caution and courtesy himself and exert what influence he may in bolstering up a general safety morale and respect for safety measures.

A scarcely less important safety responsibility of the adult is financial support and exercise of his vote in matters pertaining to traffic relief and safety. It is a common fact that the individual may not feel that he is directly concerned with a certain community traffic or civic problem, yet in most instances direct relief of traffic congestion, through improved and enlarged traffic facilities, or through selective and rigid control of traffic, will redound to economic gain and increased safety for every patron of the trade community.

The price the individual pays for accidents and befuddled traffic condition, although his child be not a victim nor his profession or business a direct sufferer economically, is not easily prorated yet he may be assured that toll is taken.

Each and every individual has also direct responsibility, financial and moral, in the provision of ample playgrounds for children in congested districts. Playgrounds are expensive, so are accidents; playgrounds are constructive and human; accidents are destructive and inhuman.

The following figures taken from a recent circular distributed by the American Road Builders Association may be enlightening.

1. Assuming every death or serious injury to affect either directy or indirectly five persons, highway accidents brought suffering to approximately 4,369,695 people last year, or nearly one-sixth of the nation's population during the past five years.

HIGHWAY ACCIDENT TOLLS

Year	Killed	Injured	Economic Loss
1922	19,203	576,090	$ 484,875,750
1923	22,621	678,630	571,180,750
1924	23,291	698,730	588,097,750
1925	24,462	733,860	617,665,500
1925	25,302	759,060	638,875,500
5 Yr. Toll	114,879	3,446,370	$2,900,694,750

3. Carlessness and reckessness causes nearly 90 percent of all accidents. On this basis 22,771 persons were killed last year because of these evils.

4. Approximately 7,211 children were killed in highway accidents last year. That is 28.5 per cent of all fatalities.

Who will dare sit back and say "it is not my baby?" *The next may be our baby.*

Comparison of the number of motor car deaths in Oklahoma with those resulting from disease will tend to impress upon our consciousness the serious proportions of the former.

Number of Deaths in Oklahoma caused by Motor Car Accidents compared to those Resulting from Certain Diseases.

Disease	No. of deaths	Motor car	M. C. Deaths %
Tuberculosis	1321	336	25.4%
Typhoid	413		81.5%
Influenza	758		44.4%
Cancer	1168		28.8%
Apoplexy	1008		31.2%
Heart Disease	1669		20.2%
Accident	1064		3.16%

Motor Car Deaths, 1925, 239.
Motor Car Registrations 1925—424,345
Motor Car Registrations 1926—499,938
Motor Car Regisitrations percent increase, 17.8%
Motor Car Death percent increases, 40.6%
Total Death Rate per 1000, 9.5
Motor Car Death Rate per 1000, 0.15

Outstandnig facts from the above comparisons are these—almost 1-3 of all deaths from accident, in Oklahoma are consequent on motor car accidents; while motor car registrations increased 17.8 percent during the year of 1926, deaths due to motor car accident increased 40.6 percent; of the deaths due to all causes in the same year 1.6 percent resulted from motor car accident.

The charge is prevailing that "statistics distort facts." Statistics intelligently compiled and evaluated are exempt from the charge and moreover, they constitute a dependable barometer from which to project future endeavors in a given field. In the instance of the matter under discussion, complete statistics accurately reported and intelligently analyzed compiled and made available to students of our safety problem would be invaluable in formulating effective safety measures.

Paramount in reducing motor vehicle accident to a minimum is the awakening of consciousness of responsibility early in childhood and maintaining alertness throughout life.

The hope and belief is expressed by many writers and speakers on this subject that engineering ingenuity will evolve methods and means for reducing the roadway accident hazard to a minimum. Accomplishments in this regard, in the fields of railroading, mining operation and manipulation of industrial and factory machinery and other hazardous occupations, are cited as a basis for presaging such relief. We acknowledge the compliment to our profession yet would plead recognition of the colossal task we are herein charged with.

Railroading is confined to certain definite and individual routes of travel, the entire mileage of which is only 8.4 percent of the mileage of highways in the United States, and the engine pilot has gained his position at the throttle only after years of preparation and after proving himself mentally and physically fit. Consider in contrast, our general requirements for motor vehicle operators on our highways. The other fields of hazardous endeavor hold scarcely a com-

parison to our highway safety problem which in its various ramification, is consequent, to greater or less degree, on the intelligence and behavior of the entire populace.

The task of bringing the roadway hazard to an irreducible minnmum is, in the final reckoning, one of individual responsibility.

BIBLIOGRAPHY

1. "Brake-Testing Machine Simulates Road Operating Conditions." Automotive Industries, 57 No. 19.
2. "Final Text of Uniform Vehicle Code." Nat'l Conference on Street and Highway Safety, Dept. of Commerce. Washington, D. C.
3. "Industries Spotlight is Turned on Traffic Problem." Automotive Industries, 56 No. 16.
4. Long, John C., "Call in the Engineer." Automotive Industries. 55, No. 23.
5. "Proceedings of a cfnerence on Highway Traffic Regulation held at Yale University." (1921) Edited by C. J. Tilden. The Highway and Highway Transport. Education Committee, Washington, D. C.
6. "Proceedings of the Sixth Annual Meeting of the Highway Research Board." (1926) National Research Council, Washington, D. C.
7. "Report of the First National Confereice on Street and Highway Safety." (1924) Dept. of Cmomerce, Washington, D. C.
8. "Report of the Second National Conference on Street and Highway Safety." (1926) Department of Commerce, Washington, D. C.
9. "Report of the Committee on Uniformity of Laws and Regulations of the National Conference on Street and Highway Safety." Department of Commerce, Washington, D. C.
10. "State Legislation Affecting Highways." Am. Highways 6. No. 3.
11. "Total motor vehicles, License and Gas Revenues Per Vehicle, 1926." Am. Highways, 6 No. 2.
12. "Transactions of the National Safety Council." 15th An. Safety Congress Vol. III (1926) Chicago, Ill.