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THE GEOGRAPHIC PATTERN AND TRAFFIC PROBLEMS OF WARREN, OHIO[1]

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Warren is located in the south-central portion of Trumbull County in northeastern Ohio. By highway, it is 52 miles southeast of Cleveland, 14 miles northwest of Youngstown, 86 miles northwest of Pittsburgh, and 41 miles east of Akron (fig. 1). It lies in the path of US Route 422, and State Routes 5, 45, 82, and 169 (fig. 2).

THE GEOGRAPHIC PATTERN OF WARREN

The city occupies an area of 5582.4 acres, or about 8.7 square miles. Its plat is rectangular with the east-west distance measuring almost 4 miles and the north-south span equalling slightly less than 3 miles. It is bisected by the southeastward flowing Mahoning River (fig. 2).

The Transportation Pattern

The arterial highways. The street pattern of Warren was originally intended to resemble that of a New England town, with a square or rectangular grid, but the development of the city witnessed the introduction of several diagonal arterial highways, namely, Niles and Youngstown roads to the southeast, Mahoning Avenue to the northwest and north, Parkman Road to the northwest, and Elm Road to the northeast (fig. 2). However, a remnant of the New England town pattern survives in the commercial core area. There is a decided lack of arterial routes circumventing the commercial core; hence, the core has become the focus for the traffic of the city.

The Railroads. Significant aspects of the relationship of the railroad pattern and the traffic problems are discussed elsewhere in this paper. It may be noted here that the railroads passing through Warren are the Erie (Mahoning Division and Main Line), the Baltimore and Ohio (Painesville Division and Pittsburgh and Wheeling Division), the Pennsylvania (Youngstown and Ashtabula Division), and the New York Central (which runs through Warren on the rails of the Mahoning Division of the Erie Railroad).

The Residential Pattern

The residential parts of Warren surround the commercial core and are located chiefly on the east side of the Mahoning River. Approximately 70 percent of Warren's 50,000 residents live on the east side of the river, 30 percent residing north of East Market Street, and the remaining 40 percent living south of it. On

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the west side of the river, 14 percent live north of West Market Street, while 16 percent live south of it (fig. 2).

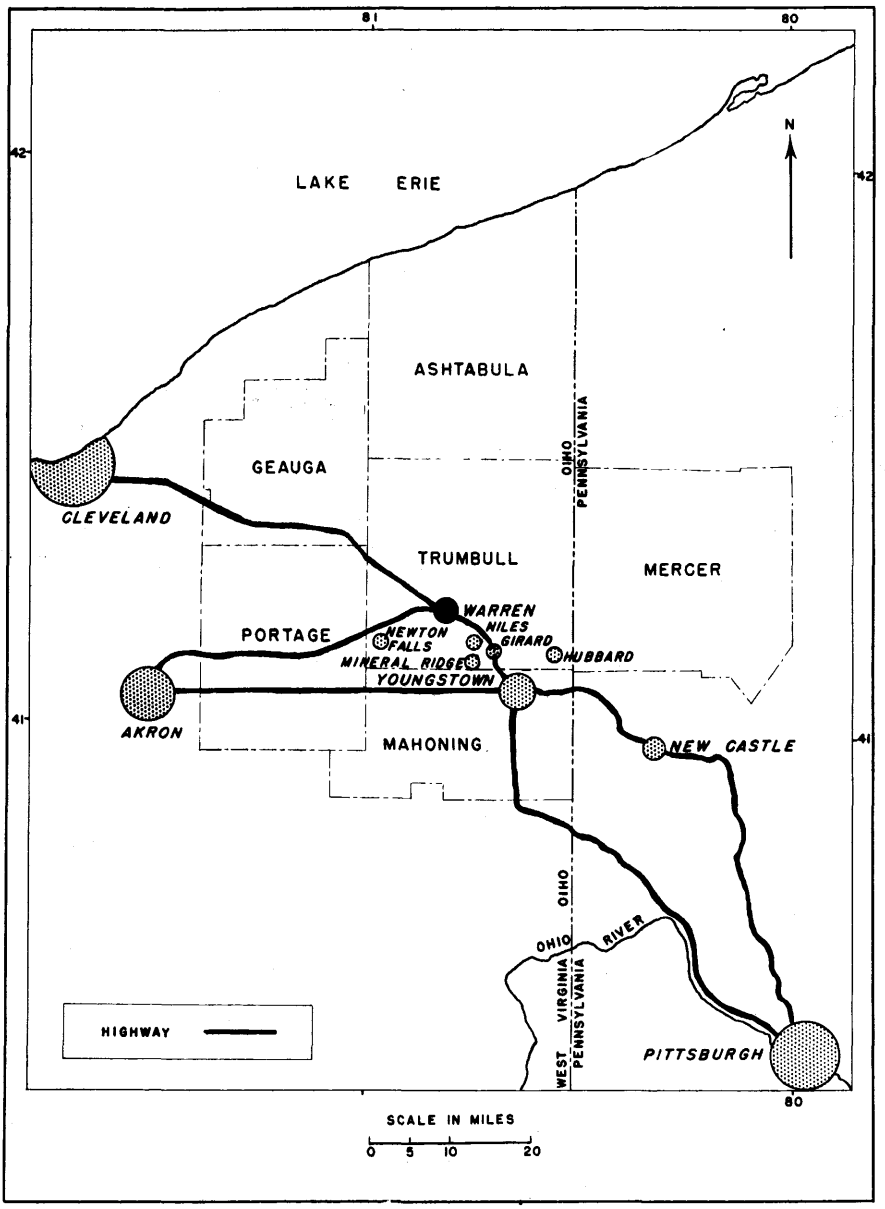

FIGURE 1. Location of Warren, Ohio.

The Commercial Pattern

The commercial core, consisting of about eight blocks, is located slightly to the southwest of the center of the city. The corner of North Park Avenue and East Market Street (the most important street of the core) is the focal point and the approximate center of the core (fig. 3).

The Industrial Pattern

Three major and three minor industrial areas may be recognized. A major area is located one and one-half miles north of the corporate limits of Warren on Mahoning Avenue Route 45 (fig. 2). A second major area is situated in southern Warren and contains plants of Warren's largest industry, the Republic Steel Corporation (fig. 2). The third major area occupies the property in an attenuated fashion along the Erie (Main Line) Railroad in northern and northeastern Warren proceding eastward from the intersection of the Erie and B. and O. railroads (fig. 2).

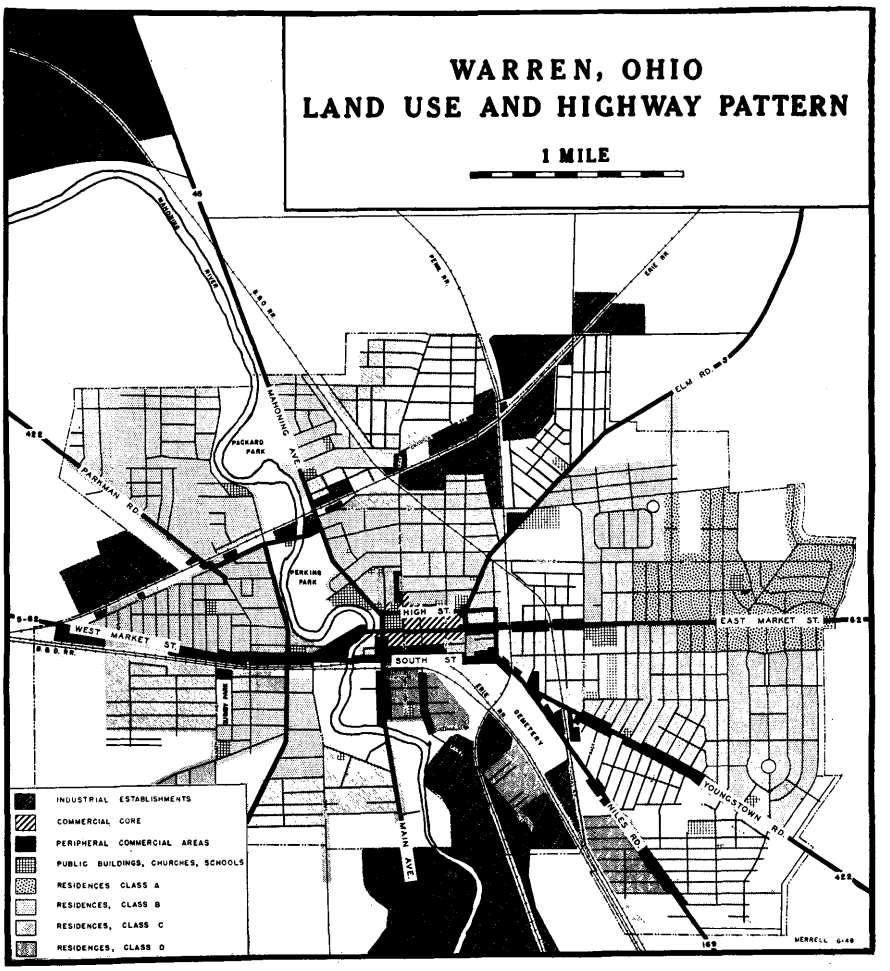

FIGURE 2. Land use and highway pattern of Warren, Ohio.

The third major area is continued to the north and northeast in the triangle between the Pennsylvania and the Erie railroads, an area which lies outside the city limits (fig. 2).

A minor area of industrial activity is found along the Erie Railroad near the Mahoning River in northern Warren (fig. 2). A second minor area is located in western Warren along the Erie Railroad, while a third area is situated along West Market Street (fig. 2).

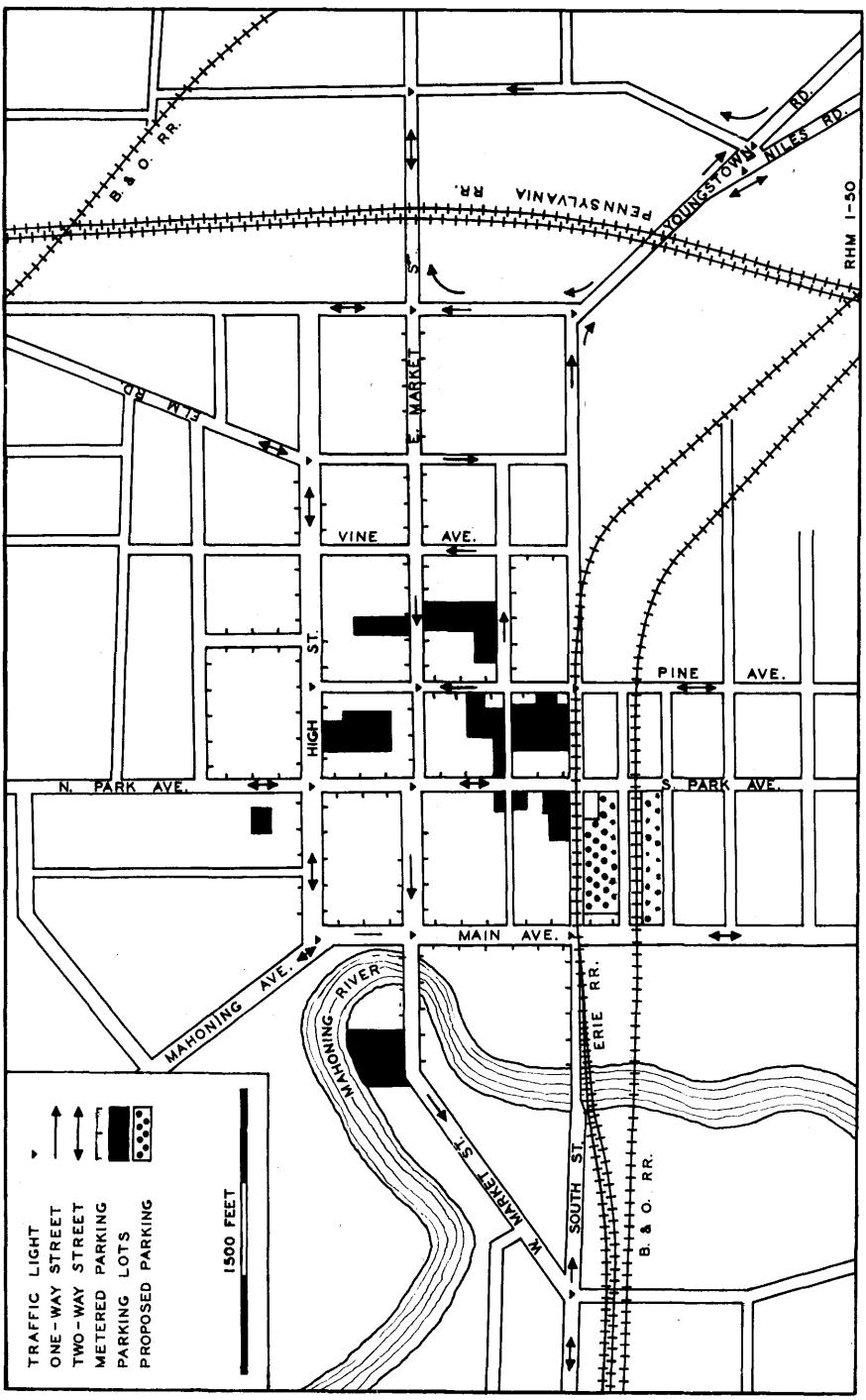

FIGURE 3. Commercial core and proposed one-way street system of Warren, Ohio

Summary

The industries of Warren are not concentrated in one portion of the city, but rather are localized in five dispersed areas. Due to the lack of alternate routes, the commercial core, which is located almost in the center of the city, is the focus for the traffic of the city.

THE FUNCTIONS OF WARREN

The Industrial Function

Warren is primarily an industrial city with 45 major industries which employ 22,000 people, or about two-fifths of Warren's total population. The city contains a number of diversified industries, although the primary metal industries employ 37 percent of all industrial workers, and the electrical industries employ 25 percent.

The Commercial Function

The Warren Retail Merchants Association has estimated that the inhabitants of Warren are responsible for 55 to 70 percent of the trade in the commercial core area, and the Warren Chamber of Commerce has estimated that 97 percent of Trumbull County's residents are served by Warren commercial establishments. With relation to the trading area of Warren, the writer conducted a survey of automobiles parked in the commercial core area of Warren on a weekday and a Saturday and found that 23 and 35 percent, respectively, of the sampled automobiles were licensed outside of Warren. Seventy percent of the out-of-town automobiles were licensed in communities within a fifteen mile radius of Warren.

The Residential Function

The residential function of Warren is becoming increasingly important. In 1940, 42,837 inhabitants of Warren occupied 11,342 dwelling units,[2] and by the end of 1948, 50,000 people were occupying approximately 15,000 dwelling units.

The Transportation Function

Intra-city transportation. Municipal bus service is supplied over nine regular routes. Thirty buses cover a total of 68,500 miles and carry an average of 421,000 passengers each month.[3] Two taxicab companies operate 30 cabs and transport a monthly average of 40,000 passengers. Two Railway Express agencies and 15 motor freight lines provide for the transportation of freight to points within Warren.

Inter-city transportation. Passenger transportation to other cities is offered by the Erie Railroad, and by numerous bus companies. Freight transportation offered by all railroads and by motor freight lines. Regular bus service to many points surrounding Warren is offered, bus service between Warren and Youngstown is most frequent. Warren is also a stopping point for many interstate buses, especially those traveling between Cleveland and Pittsburgh.

Private passenger automobiles. In 1948, over 16,000 motor vehicles were registered in Warren, of which about 13,000 were private passenger automobiles.[4]

The Recreational Function

There are three public parks in Warren; Packard and Perkins, the larger parks, are located along the Mahoning River north of Market Street, while Quimby, the smaller one, is located in southwest Warren (fig. 2).

Warren has five motion picture theaters, all of which are located in the commercial core.

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[2]United States Bureau of the Census, *Sixteenth Census of the United States, 1940: Housing*, Vol. I, Part 2, (Washington: Gov't Printing Office, 1943), p. 219.

[3]The Warren Transportation Company.

[4]Bureau of Motor Vehicles, Columbus, Ohio.

Taverns, cafes, night clubs, and other similar amusement or recreational establishments are well distributed throughout the city, although Market Street contains more of these establishments than any other single street.

Summary

Warren is primarily industrial in function, but it is also important as a service center for a relatively large trading area. It has adequate municipal transportation facilities which are well integrated with other transportation systems. Its recreational areas and establishments are situated on or near arterial highways.

THE TRAFFIC PROBLEMS OF WARREN

The Geographic Bases of the Problems

One of the basic factors in the creation of an urban traffic problem is that of residents and their distribution. The traffic problems of Warren are caused by the movements of a large percentage of the community, plus the movements of those people who are coming to, going from, or passing through it.

Four types of human movements or traffic flows may be recognized. The first is made by those who live within Warren and move from their homes to another point within the city and, after a lapse of time, return. The second type involves the people living within the city who move to a point outside and return. The third type involves those living outside the city who commute to the city and return. The fourth type of flow is produced by the transient who is merely passing through the city. The direction of the four types of human movements or traffic flows may be affected by several factors.

The location of industry. The location of the industry with which an individual is affiliated with relation to the location of his home determines, to a large extent, the direction and route of his movement to and from that industry.

The location of the commercial core. The central location of the commercial core brings about a convergence of traffic flows originating in all parts of the city and out-lying areas.

The distribution of recreational facilities. The recreational facilities of Warren, which include the public parks, motion picture theaters, and drinking places, have a definite influence upon the traffic flow. The parks attract large numbers of people in the summer months, while the movies of the commercial core account for much of the traffic flow during evenings of the cooler months.

The distribution of various classes of people. The location of various classes of people within the city affects, to a minor degree, the traffic flow patterns of the city, especially in the evening and during the weekend. Persons of similar economic circumstances and cultural backgrounds are more likely to move in the same social circle. A person living near Youngstown Road in the Class B type of residence (fig. 2) is more likely to have friends in other Class B portions of the city than in the adjacent Class A or C sections. Small traffic flows are thereby created among similar residential areas.

The location of schools and churches. These have a profound effect upon the volume and direction of the traffic flows. The solitary public high school on Elm Road in northeast Warren, and the parochial school near High Street and Elm Road (fig. 2) draw upon the whole of Warren for their student bodies, and greatly affect the early morning and mid-afternoon traffic flow patterns. Churches are well distributed throughout the city, but the largest are located in the commercial core area. The heavy concentration of large churches in this area attracts large numbers of people and thereby affects greatly the Sunday morning traffic volume and flow pattern.

The location, number, and types of arterial highways. This factor largely determines the direction and the density of the city traffic flows. The insufficient

number of alternate routes places an undue flow load upon the available highways. The convergence of arterial highways upon the commercial core practically predetermines the traffic flow pattern. Furthermore, the width and condition of these highways largely determines the speed and density of moving traffic.

An Analysis of the Vehicular Traffic of Warren

The bulk of the data for the analysis was obtained by taking traffic counts at all entrances to the city on major highways, except Route 45 South, and at two locations within Warren. An accurate count of vehicular traffic was recorded from 9 a.m. to 6 p.m. at city entrances for all days excepting Sunday, and from 7 a.m. to 6 p.m. on the same days at two locations within the city.

Daily and hourly differentials of traffic entering and leaving Warren. During the week the hour of heaviest traffic volume was between 4 and 5 p.m., which was due mainly to the fact that most industrial plants changed shifts at 4 p.m. On Saturday, the greatest number of vehicles entered Warren from 12 to 1 p.m. and departed from 2 to 3 p.m. The Saturday peak hours are largely caused by shoppers since few industrial plants operate more than a five-day week. The Saturday traffic volume was from 2 to 33 percent greater than the average weekday volume, a fact which indicates the importance of Warren as a shopping center for the surrounding population.

Classes of vehicles entering and leaving Warren. Of all vehicles, private passenger automobiles accounted for 78 percent; tractor-trailers, almost 4 percent; heavy trucks, 7 percent; light trucks, slightly over 8 percent; all buses, 1 percent; and taxicabs and other vehicles, slightly over 1 percent. All trucks represented slightly less than 20 percent of all vehicles.

Daily and hourly differentials of traffic within Warren. On West Market Street at the bridge over the Mahoning River (fig. 3), the Saturday volume was 5 to 15 percent greater than the weekday volume, while on Youngstown Road at the Pennsylvania Railroad crossing (fig. 3), the average weekday volume was 8 percent higher than the Saturday volume. The highest volumes were recorded on Monday and Saturday at the former location, and on Monday and Friday at the latter.

The peak hours of eastbound traffic at the Market Street location were from 10 to 11 a.m. on Monday and Saturday, 3 to 4 p.m. on Tuesday, 3 to 5 p.m. on Wednesday, and 4 to 5 p.m. on Thursday and Friday, while the westbound peak hours were from 4 to 5 p.m. on Monday, Tuesday, Thursday and Friday, from 3 to 4 p.m. on Wednesday, and from 12 to 1 p.m. on Saturday. The eastbound peak hours on Youngstown Road were from 4 to 5 p.m. on weekdays and from 2 to 3 p.m. on Saturday, while the westbound peak hours were from 4 to 5 p.m. on Monday and Wednesday, 9 to 10 a.m. on Tuesday, 12 to 1 p.m. on Thursday and Saturday, and from 2 to 3 p.m. on Friday.

Classes of vehicles within Warren. All private passenger automobiles comprised 80 percent of the vehicular traffic movements at the combined locations during the weekdays, and 82 percent on Saturday. All trucks accounted for almost 16 percent during the weekdays and almost 14 percent on Saturday. All buses represented 1 percent. Taxicabs and other vehicles represented 2 percent on weekdays and almost 3 percent on Saturday.

Problems Resulting from the Mixture of Different Classes of Traffic

In the commercial core area, one of every six vehicles is a truck, and one of every twenty vehicles is a tractor-trailer. These cumbersome, slow-moving vehicles have decreased the speed of the traffic flow, created a hazard for pedestrians at intersections where turning movements occur, and increased the possibility of accidents when faster moving vehicles attempt to pass the slower moving trucks, and are a major factor in the problem of traffic congestion.

Traffic Congestion

Congestion of traffic is evident during peak hours in most parts of the commercial core area. Congestion on East Market Street between Vine and Main avenues is largely due to five factors: (1) it is the only east-west arterial highway; (2) East Market Street between North Park and Pine avenues is 13 feet narrower than the next block west, and seven feet narrower than the next block east, thus effecting a channelling of traffic into a narrow bottleneck; (3) it is designated as Route 5–82 and carries a rather heavy volume of through traffic; (4) classes of traffic are intermixed; and (5) traffic lights are not adjusted for maximum vehicular flow.

Congestion on South Street (fig. 4) may be attributed to the following factors: (1) only two lanes are available for moving traffic between Pine and Main avenues;

FIGURE 4. Traffic congestion on South Street between Main Avenue and West Market Street. Traffic backlogs like this one are common occurrences on South Street.

(2) turning movements from South Street cause considerable backlogs of traffic to form; (3) South Street attracts much traffic which attempts to avoid congestion on East Market Street; and (4) traffic light stop-and-go periods are not adjusted for the traffic volume.

The dismissal of industrial employees within the same brief period of time is a major cause of traffic congestion in all parts of Warren.

The South Street Problem

Through the center of South Street between Main and Pine avenues run the tracks of the Erie Railroad. The north side is used for moving traffic only, while the south side is used only for parking (fig. 5).

Periodically, passenger and freight trains travel the rails through the center of the street (fig. 5) and traffic hazards are thereby created. Although the location of the railroad increases the element of danger to moving automobiles and pedes-

trians, it imposes no other serious traffic problems other than congestion at intersections due to the halting of traffic whenever a train approaches.

Other Traffic Problems

Traffic accidents. Traffic accidents are decreasing in number whereas the number of motor vehicles is increasing. In 1940, there were 13,526 motor vehicles registered in Warren and a total of 978 traffic accidents. In 1947, over 15,000 motor vehicles were registered and 675 traffic accidents occurred. The number of vehicles had increased more than 10 percent, but the number of traffic accidents had decreased by 31 percent. Traffic accidents in 1948 had decreased by 24 percent. In 1947, the commercial core area accounted for slightly over one-third of all

FIGURE 5. The tracks in South Street between Main and Pine Avenues. Note the approaching train.

traffic accidents. Almost one-half of all accidents occurred on Market Street, and about one-eighth occurred on South Street. The number of traffic accidents has been reduced by the lowering of the speed limits on arterial highways from 35 MPH to 25 MPH, by stricter supervision and enforcement, and by educational campaigns.

The parking problem. Almost every city has a parking problem, and Warren is no exception. Every day thousands of automobiles enter the commercial core area and attempt to find parking space. The task is often difficult, especially on Saturday, and frequently automobiles must be parked a considerable distance from the commercial core.

Parallel free parking is permitted on most streets except in the commercial core area where 542 parking meters have been installed. Nine parking lots, accommodating about 700 automobiles, are distributed throughout the core area (fig. 3).

Summary and Conclusions

Among the most serious of the traffic problems is the congestion of traffic which is caused by many factors, including the lack of alternate routes, the mixture of different classes of traffic, the dismissal of industrial employees from all plants at approximately the same time, and inefficient traffic signal timing. If this problem were solved, or at least alleviated, other associated problems would become less serious.

The writer's analysis of the traffic problems has led him to believe that the following proposals would go far toward improving the city traffic situation.

Approximately 11 percent of the vehicular traffic entering and leaving the city is composed of tractor-trailers and heavy trucks. An assumption might be made that over one-half of these trucks are through trucks, i.e., their destination is beyond Warren and not in it. If this assumption is approximately correct, a rerouting of through trucks around the city would decrease traffic congestion by considerably more than 6 or 7 percent, which is the percentage of total vehicles to be rerouted. The routes encircling the city would involve a greater driving distance, but time lost because of distance would nearly equal time lost in Warren due to congestion.

The second proposal calls for a series of one-way streets (fig. 3). This plan would certainly eliminate much of the congestion in the commercial core area, and in addition, would allow traffic to pass through Warren at a much faster rate. Third, the writer recommends that major industrial plants change shifts alternately with one hour intervals. Under this plan, industrial workers from the major plants would not be on the streets at the same time; hence, much congestion would be avoided. Fourth, part of a slum area south of South Street might be razed and parking facilities constructed (fig. 3). Commercial core parallel parking should be prohibited. A fifth proposal calls for the installation of a centrally controlled traffic light system with lights set at a progressive rate, i.e., lights that change to green progressively as traffic moves along at a given rate of speed. This would allow traffic to move at a uniform speed through the city at almost twice its present rate.

Sixth, the narrow block on East Market Street should be widened to correspond as closely as possible to the general width of the street. This would help eliminate congestion in this and preceding blocks. The seventh proposal would result in police supervision at hazardous locations during peak hours. At present, police supervision is evident at two intersections in the commercial core from 10 a.m. to 12 p.m. and from 3 to 5 p.m., but these hours are not complete peak hours. Peak hours have been established by this study as being from 7 to 9 a.m. and 3 to 6 p.m. on weekdays, and from 10 a.m. to 3 p.m. on Saturday.

The eighth proposal would result in the widening of South Street, particularly the portion which contains the railroad, so that heavy volumes of traffic will be able to move unimpeded along the street at a rapid rate. The ninth and final proposal is that a press and radio campaign be inaugurated to persuade the public to use bus transportation more frequently rather than their automobiles. The results of the campaign would probably decrease traffic congestion by a small percentage.

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