FRIDAY, MARCH 23

Hotel Benson, 12:10, Sharp

CHARLES T. FAIRFIELD
Representative National Department of Finance
of Washington, D. C.

Subject
"Will the Farmer Starve"

SPECIAL MUSIC BY THE GASCO TRIO
Elizabeth Reger, Wade Ferguson, Fred Cotter

Everybody Enjoys the City Club—
Form the Habit of Attendance—125 were present last week.

NEXT WEEK: "Billie" Finley and his Pictures. For members only

CENTRAL FACTORS IN TRAFFIC DELAY NEAR WEST APPROACH OF THE HAWTHORNE BRIDGE

To the Board of Governors:
City Club of Portland.

In presenting to you the result of the study made by Mr. Charles McKinley, of Reed College, of the movements of traffic at the west approach of the Hawthorne Bridge, the City Planning Committee of the City Club desires to call your attention to the fact that in the brief period since the completion of the last of Portland's Trans-Willamette bridges, the traffic problems of the City have been completely revolutionized by the coming of the automobile.

Such studies as the one herewith presented lay the foundation for the solution of traffic problems. The objective aimed at by the study was to secure as complete a picture as possible of certain central factors of the Hawthorne Bridge traffic problem, namely, volume and direction of vehicular traffic and the sources and deviation of delays. The limits to the problem studied are stated in the report. Your City Planning Bureau believes that while such a report cannot pretend to prescribe the remedies for the evils found to exist, because questions of business and property values are involved as well as the movement of traffic, it does present valuable data which may aid our public officials in dealing with the traffic problems.

Respectfully submitted,
CITY CLUB CITY PLANNING BUREAU

I submit herewith a report covering an investigation made at your suggestion on the factors of delay in handling the traffic during the rush period of the afternoon near the west approach of the Hawthorne street bridge. The problem which was particularly suggested for investigation was the delay situation at Front and Madison streets. In-as-much as the possibility of altering present modes of handling the traffic at this point might be directly concerned with information as to the traffic condition at First and Madison, Second and Madison, Front and Jefferson and on the bridge approach itself, these locations were also studied.

Observations took place simultaneously at the points above indicated on January 16th and January 19th between the hours of 4:30 and 6:00 P. M., on two typical week days (Tuesday and Friday). By choosing the time between 4:30 and 6:00 it is obvious that we concentrated upon the problem of handling the traffic moving from the business section to the outlying residence sections. The other high peak of traffic congestion, which occurs when our population is trying to get to work and to business in the morning, and which creates distinct congestion in this same area, was excluded from the scope of this study.

TRAFFIC CENSUS. It was thought desirable to make a complete vehicular and street car census at the four intersections named, and to note not merely numbers of vehicles and street cars, but direction also, including departures from the main line of traffic and the additions at each intersection. Pedestrian traffic was ignored excepting at three points. Pedestrian traffic in
this area constitutes practically no traffic problem. The diagrams which accompany this report (see Insert) shows the traffic volume and direction for January 19th. The census for the 19th shows a slightly larger volume of eastbound traffic and some 137 fewer vehicles coming from the bridge, westward bound. All the other factors as to volume and direction are practically the same as for the 19th, so that the one diagram is typical.

The diagram indicates that approximately fifty per cent of the vehicular traffic which finally crosses the bridge, eastward bound, originates west of Second and Madison. It shows also that the next point where the chief contributions to the main stream of traffic occur is at Front and Jefferson, at which point the main stream coming down Madison is again increased by approximately fifty per cent more machines. Of this fifty per cent increase at Front street, traffic from the south contributes nearly two-thirds, and constitutes the most important secondary stream of traffic feeding the Hawthorne bridge.

A census taken at Front and Jefferson streets, which is not shown in the diagram, indicates that Jefferson street carries a light vehicular load, for less than half the stream of south Front street traffic which finally meets the main stream at Madison and Front, comes down Jefferson. And yet, practically all the machines which travel east on Jefferson turn north at Front to enter this chief secondary vehicular stream.

The exact figures are as follows:

1.—For January 16th—
180 vehicles, moving east on Jefferson, 21 turn south at Front and remainders, 159, turn north. These join 202 vehicles coming from south Front street. There were 15 other vehicles coming from the south on Front street which turned west at the Jefferson street intersection.

2.—For January 19th—
180 vehicles, moving east on Jefferson, 20 turn south at Front leaving 160 turning north where they are joined by a stream from south Front street, amounting to 213. (See note on "Technique of the Study") for account of error in this figure.)

Delays To Vehicular Traffic. It has been noted for some time that the congestion at Front street is most acute, and that this frequently affects the traffic back at First street, Second street and sometimes even further west. In order to get at the factors of delay it was decided to view the problem from the point of view of its effect upon the main stream of vehicular traffic which comes from west Madison street. It was, therefore, decided to make a time study of the stoppages produced at Front, First and Second streets, and to count the number of occasions when the main stream, while not brought to a standstill, was slowed down to a speed of two or three miles an hour. It seemed wise, also, to segregate the delay due to the vehicular traffic from the south, the vehicular traffic from the north, the street car delay and the delay produced by the trains. The results of these studies appear in Tables I, II and III. In connection with Table I, data secured on January 31, at the same time of day as on the preceding occasions, should be considered. An oversight was made in planning the first studies which omitted to note the stoppages produced by east-bound street cars which are compelled by ordinance to stop at Front street, and which automatically compel vehicles to stop so that the safety of passengers boarding or leaving the street car be not jeopardized.

Summarizing the results shown by Tables I and IV, it would appear that during approximately thirty-one minutes of time in a total period of an hour and a half the main stream of vehicular traffic was at a standstill at Front and Madison streets, and that in addition to this complete cessation of movement, there were 140 occasions on one night, and 127 the second night, when the traffic stream was slowed down to a rate of two or three miles an hour.

It should be especially noticed that the North Front Street vehicular traffic is the most important single source of delay, with the possible exception of the drawbridge. A comparison between the delays produced by the North Front street vehicles filling themselves into the east bound stream of traffic with the vehicles from South Front street is interesting.

Statistics of Delay

On January 16th the traffic diagram shows 182 vehicles from north Front street making the left hand turn to swing into the Madison stream of traffic, while 345 vehicles from the south came into the Madison stream of traffic. The average delay per machine caused by the North Front street traffic in making this turn was 2.18 seconds on January 16th, 2.07 seconds on January 19th. Compared with these figures, the averages for the same day produced by the south Front Street traffic in making this turn were 0.17 and 0.311 seconds. This, of course, takes no account of slow-downs which slightly counterbalance the foregoing contrasts.

Another way of comparing the potential interference with the Madison stream of traffic by the streams from the North and South on
Front street is to examine the results of a turning time study shown in Table V. This study was made by timing the period required for a machine to fit itself into the main stream of traffic going across the Hawthorne Bridge. Timing did not start, however, until the machine became a potential obstacle to the Madison Street East-bound traffic. That is to say, for vehicles coming from North Front street, watches were started at the moment the front of the machines reached the center of the intersection, and for the south Front vehicles, timing began when the front of the machine reached the curb line on Madison street. The timing continued in both cases until the vehicles had rounded the corner and fitted itself into the east-bound traffic.

The table segregates the study into two groups, the first, those cases captioned "free" in which the vehicle met no obstacle when making the turn, secondly those in which it was interfered with by other vehicles or street cars, the latter being designated "obstructed."

It was impossible to time every machine that turned the corner during the period studied, but we were able to time nearly 70 per cent of all the vehicles which turned from north Front street and approximately 90 per cent of those which turned from south Front street. It would appear, therefore, that we had taken a sufficient number of instances to warrant its conclusion that the results of the study are typical. The conclusion pointed to seems to be that it requires about fifty per cent more time to make this left-hand turn from north Front street than to make the corresponding turn from south Front street, when there are no obstacles in the way and when there are obstructions the excess time required by the north Front street vehicle is about 150 per cent. It should be borne in mind that these figures do not include any of the delay produced by the vehicles from north Front street and caused to the west-bound traffic.

Another source of delay that should be clearly noted is that which is produced by the small number of west-bound vehicles, coming from the bridge, which turn south at Front. On January 16, a total of 57 vehicles turned, and caused a total delay of 1 minute 24 seconds; on the 19th, 23 vehicles caused 1 minute 29 seconds delay. Comparing this with the traffic coming from south Front and we find 27 vehicles causing seven-eights as much delay as 373 from south Front, and 23 vehicles stopping traffic six-eighths as long as 361 south Front vehicles.

**Traffic Delay At First and Madison Streets.** The delay at First and Madison, which is summarized in Table II, is primarily due to the left-hand turn of street cars eastward bound and to this factor combined with the stoppages at Front street. This street car turn will remain an obstacle so long as Madison street pavement on the southeast corner remains at its present width. When the car is turning there is no room for a vehicle to pass between the front of the car and the curb. If the sidewalk at this point could be sheared off as it has been at Second and Madison on the corresponding corner it would almost completely remove this source of delay. With this hypothesis in mind a study was made of the pedestrian traffic at this point of the sidewalk of Madison street on January 19th between 4:00 o'clock and 5:00 o'clock.

Assuming that these pedestrians walk at a rate of two and a half miles per hour, the sidewalk average load would be equivalent to a single file of pedestrians walking at intervals of twenty-five feet. At the peak of the period (10.5 per minute) this single file would show intervals of approximately twenty-one feet.

**Delay At Second and Madison.** Table III summarizes the results of the analysis of delay factors at Second and Madison. These indicate that the congestion caused by street cars and vehicles at this corner was negligible. It reveals clearly, however, the effects of congestion at First and at Front streets, and the drawbridge. On the 16th total stoppage of 3 minutes 26 seconds was due to vehicular and street cars. On the 19th, 11 minutes 2 seconds cessation of traffic was produced by congestion east of Second street on Madison street. On the 19th, a more disparate situation is revealed with 2 minutes 14 seconds as a total delay produced by causes at Second street while 17 minutes and 18 seconds delay was the result of congestion on Madison street east of Second street. This, of course, excludes the slow-downs which counter-balance in some degree the preceding disparities.

**Delay On the Bridge Approach.** If it were possible to remove the delays at Front, First and at Second streets so that there might be a continuous and uninterrupted movement of traffic onto the Hawthorne Bridge, there would be under present conditions another obstacle which would then become the center of congestion. This is the point at which the street car track crosses diagonally the vehicular

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**TABLE IV.** Delays to Madison Vehicular Traffic—East Bound at Front and Madison Streets between 4:34 and 6:00 P. M. on January 31st, 1923; caused by east bound street cars making safety stop at Front Street.

<table>
<thead>
<tr>
<th>Number</th>
<th>Delay Time</th>
<th>Average Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>98</td>
<td>5' 03&quot;</td>
<td>1.09 seconds</td>
</tr>
<tr>
<td>90</td>
<td>5' 03&quot;</td>
<td>1.05 seconds</td>
</tr>
<tr>
<td>35</td>
<td>3' 47&quot;</td>
<td>4.13 seconds</td>
</tr>
<tr>
<td>43</td>
<td>1' 16&quot;</td>
<td>1.77 seconds</td>
</tr>
</tbody>
</table>

*In 10 cases of the 57 stops for passengers, no delay resulted to vehicular traffic.

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**TABLE V.** Motor Vehicle Turning Time, Front and Madison Streets.

<table>
<thead>
<tr>
<th></th>
<th>North Front to Madison—East</th>
<th>South Front to Madison—East</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free</td>
<td>Obstructed</td>
<td>Free</td>
</tr>
<tr>
<td>134</td>
<td>3.48&quot;</td>
<td>144</td>
</tr>
<tr>
<td>135</td>
<td>8.8&quot;</td>
<td>108</td>
</tr>
</tbody>
</table>

(See report for explanation of the terms "Free" and "Obstructed".)
traffic which is coming up on the bridge. This crossing causes traffic to pile up when the street cars move from the center of the street to the outside of the bridge. An observer was stationed at this point and made a record of the stoppages of vehicular traffic. On January 19th the record showed in addition to 7 minutes and 3 seconds of delay produced by the opening of the draw-span, 4 minutes and 16 seconds. On January 19th the record shows 14 occasions when vehicles were stopped by street cars, producing a total delay of 2 minutes and 20 seconds and 19 occasions when vehicles were slowed down to a speed of two or three miles an hour with a total duration of slow-down periods of 8 minutes and 49 seconds. The drawbridge delay at this point on the 19th totaled 7 minutes 26 seconds. The effect of traffic congestion at this point upon the traffic at Madison street under existing conditions is shown in Table I, for January 19th, where 42 seconds of delay at Front street was due to bridge approach congestion. Obviously this will greatly increase if traffic is speeded up at Front street and west of Front street, and nothing is done to the problem of congestion up on the bridge approach. The city planning commission is making a study of this factor.

DELAY AT FRONT AND JEFFERSON STREETS

Working upon the hypothesis that it might be possible to avoid certain factors of delay at Front and Madison streets if more vehicles were routed so that they might come into the Madison traffic stream from the south, the observers at Front and Jefferson streets were instructed to time the delays to north bound traffic at that point, and to count the total volume of such traffic. By consulting the traffic diagrams it will be apparent that the volume of traffic on Jefferson street, east bound and that on Front street, north bound, is capable of very considerable expansion. The only delays to traffic at the intersection of Front and Jefferson were produced by the trains of the Oregon Electric and the Southern Pacific. On January 19th, through a misunderstanding, no record of delays produced by Oregon Electric trains was made; but a record of delays caused by Southern Pacific trains shows 10 seconds delay caused by east bound trains, and 1 minute 33 seconds caused by west bound trains. For the 19th, the record shows total delay for all Oregon Electric trains to be 2 minutes 10 seconds; for all Southern Pacific trains it was 1 minute and 5 seconds.

PEDESTRIAN CENSUS

In addition to the pedestrian census at First and Madison streets above described, counts of pedestrian uses of the sidewalk were made at Front and Madison streets, on the Madison street side of the southwest and northwest corners. This study indicates very slight use of the sidewalk by pedestrians near the northwest corner (2.61 persons per minute), and the moderate use on the southwest corner (13.1 persons per minute). It should appear desirable at any time to take a portion of the sidewalk at the points studied for non-pedestrian uses, our study indicates that this would not interfere with reasonable pedestrian needs. It has been suggested that three or four feet of the side-walk space be turned into street space, and traffic islands for pedestrians boarding and alighting from street cars be constructed adjacent to the curbs on both sides of Madison street, west of Front street intersection. Were it deemed desirable to do this it would eliminate the causes of delay to east bound vehicles, shown in Table IV, and a great percentage of the delay to west bound vehicles which are held up on the bridge approach while street cars stop to unload passengers on the east side of the intersection. This last factor is certainly one of the most important causes of congestion during the morning rush hours.

Conclusions

This investigation is probably typical of traffic conditions in the area studied, for mid-winter, but it is quite likely that a study made in July would show very decided increases both in volume and delay. It seems reasonable to expect that any increase in traffic load will increase the importance of the congestion on the bridge approach (described on pages 6 and 7) which will then supersede Front street as the major focus of congestion.

In addition to the conclusions stated incidentally in the foregoing descriptions, it appears that vehicular traffic entering the east bound traffic stream by means of the left-hand turn from north Front street, should be encouraged to fit itself into the main traffic stream at some other point. The Tables throw some light upon this problem, indicating the greater opportunity for vehicles to enter the main stream at Second street, without causing delay. A one-way traffic requirement at Front street, during rush hours, is one possibility, but this seems very drastic. Since a traffic officer is regularly maintained at Front and Madison streets, it seems reasonable to consider the plan of authorizing this officer to give Madison street vehicles, and south Front street vehicles the right of way over other traffic at this point. Such a method would require that machines coming from north Front street would wait until the Madison street traffic and the south Front street traffic does not need the street. A glance at the traffic diagrams shows that this plan would throw the burden of waiting upon the smallest of the three traffic streams, and the data contained in Tables I and V adds other important information bearing on this problem.

I would suggest the consideration of a similar method for handling the traffic which comes from the bridge and wishes to go south on Front street. As already related the amount of delay caused by the few vehicles which take this direction is out of all proportion to their importance. The traffic officer might be instructed to require such vehicles to proceed west on Madison street and to permit the southward turn only if the east-bound Madison traffic were not using the street.

Respectfully submitted,

CHARLES McKNINLEY.

Note.—On file in the office are the forms used by Mr. McKinley in making his study, together with a detailed description of how the records were obtained.
TABLE I.
Delays to Madison Street Vehicular Traffic—East Bound at Front and Madison Streets between
4:30 and 6:00 P. M.

<table>
<thead>
<tr>
<th>Causes of Delay</th>
<th>January 16, 1923</th>
<th>January 19, 1923</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow Downs</td>
<td>Stops</td>
<td>Slow Downs</td>
</tr>
<tr>
<td>Number</td>
<td>Time</td>
<td>Number</td>
</tr>
</tbody>
</table>

SOUTH FRONT VEHICLES:
- South to East: 91, 41" 1' 01" 1' 42"
- South—crossing Madison 100, 1' 01" 1' 42"

NORTH FRONT VEHICLES:
- North to East: 32, 6' 37" 8' 08"
- North—crossing Madison 4, 36, 1' 31" 3' 10"

N. & S. FRONT SIMULTANEOUSLY:
- Turning East 3, 10" 3' 10"
- Crossing Madison 1, 0" 0' 06" 3' 10"

Vehicles from Bridge to S. Front St 4, 4, 1' 24" 1' 24"

Simultaneously—V. from Br. turning S. and S. Front V. crossing Madison 3, 03" 03"

Total due to Vehicles: 140, 14' 27" 127, 14' 23"

OREGON ELECTRIC TRAINS:
- North Bound: 60, 2' 28", 3' 47"
- South Bound: 7, 3' 31", 4' 14"

Vehicular—Street Car congestion on Bridge Approach: No Record

Total—Above Causes: 140, 25' 17" 127, 26' 45"

TABLE II.
Delays to Madison Vehicular Traffic—East Bound at First and Madison Streets, between 4:30 and 6:00 P. M.

<table>
<thead>
<tr>
<th>Causes of Delay</th>
<th>January 16, 1923</th>
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<tr>
<td>Number</td>
<td>Time</td>
<td>Number</td>
</tr>
</tbody>
</table>

I. CAUSED BY VEHICLES:
A. From S. First St.
1. South to East 5, 26" 4
2. South to North 18, 1' 13" 7
3. South to West 23, 1' 39" 11
Total 23, 1' 39" 11

B. From N. First St.
1. North to East 12, 53" 6
2. North to South 12, 1' 18" 12
Total 24, 1' 18" 12

Vehicular Total: 47, 2' 57" 23

II. Caused by Street Car turning from N. First St. to Madison, East 34, 11' 09" 34

Total Delay—All Causes: 81, 14' 06" 94, 6' 41"

TABLE III.
Delays to Madison Street Vehicular Traffic—East Bound at Second and Madison Streets between 4:30 and 6:00 P. M.

<table>
<thead>
<tr>
<th>Causes of Delay</th>
<th>January 16, 1923</th>
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<tbody>
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<td>Slow Downs</td>
</tr>
<tr>
<td>Number</td>
<td>Time</td>
<td>Number</td>
</tr>
</tbody>
</table>

VEHICLES:
1. From S. 2nd St.
1. South to East 8
2. South to North (cross Madison) 23, 22" 5 5.4"
3. Collision 9
Total 31, 36" 21

II. From North 2nd St.
1. North to East 44, 45" 8 5.3"
2. North to South (Across Madison) 33, 41" 8 5.1"
Total 77, 1' 26" 37

Vehicular Total: 108, 2' 02" 98

STREET CARS:
1. Fulton Street Cars
1. North Bound 4, 31" 3 10.3"
2. South Bound 4, 4" 1 4"
1. Cars on Madison Street turning N. at 2nd 49, 3 16.3"
Street Car Total 6, 1' 24" 30

Congestion on Madison Street East of 2nd Street 11' 02" 13 51"

17' 18" 28 37"

*One 14" delay included herein was jointly due to vehicles crossing Madison Street.
DIAGRAM OF TRAFFIC MOVEMENT RELATIVE TO WEST APPROACH TO HAWTHORNE BRIDGE, PORTLAND, ORE.

Note:—Figures denote number of vehicles and lines show direction of movements. For detailed analysis refer to main body of City Club report.

COMPARISON OF DELAYS TO EAST-BOUND MADISON STREET VEHICULAR TRAFFIC AT FRONT STREET, 4:40 to 6:00 P.M., January 19, 1923.

Due to traffic crossing Madison Street from the North and South at Front... 1' 46"
Due to left-hand turn of vehicles from North Front Street to the Bridge. 8' 30"
Due to vehicles making left-hand turn from Bridge to South Front Street. 1' 20"
Due to Oregon Electric Trains... 4' 14"
Due to congestion on Bridge Approach... 4' 32"
Due to open draw-span... 7' 26"
Due to street-car stops—53 stops for passengers and 43 non-passenger stops... 5' 26"
Due to vehicles making right-hand turn from South Front Street to Bridge... 2' 32"

Total Delay, 31' 31". Total time Madison Street was clear, 58' 18".