A Study of Traffic
at
Governor Square, Boston,
with
Suggestions for Its Regulation,

by

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PREFACE

The regulation of traffic in the City of Boston has always been a most difficult problem owing to the non-systematic laying out of streets as well as their narrowness in some parts of the city. Streets intersect at any angle from a few degrees up, and some intersections which carry quite a large amount of traffic daily have too small square space.

Governor Square is one of those typical intersections of the City of Boston which needs intensive study in order to eliminate congestion and accidents.

The object of this thesis is to improve the system which is now in practice, thus to "regulate the movements of vehicles and pedestrians so that they interfere with one another as little as possible and are enabled to go from point to point in the shortest time compatible with safety."

For vaious informations I am indebted to Professor C.B. Breed, William Phelps Eno, and Dean C.J. Hughes of Harvard Engineering School. I am obliged to the Public Works Department of the City of Boston, Highway Division, for a map of Governor Square, Boston, Mass.

Present Condition of Traffic at The Square

From observations made for several days during the morning and afternoon rush hours and also during the middle of the day, traffic was found to be heaviest from 8-45 a.m. to 9-15 a.m., and from 4-30 p.m. traffic begins to get heavy ~~heavy~~ until it reaches maximun from 5 to 6 p.m. During these rush hours street cars which run on Commonwealth Avenue and Beacon Street put on either one or two trailers which obstruct a greater part of the square. The heavy traffic only occurs from September to the latter part of November and from April to about the 15th. June. After November owing to the cold weather and the snow many automobile owners store their cars until April when they are taken out again for the spring and will continually use the square until about the middle of June which time most of the business men leave the city for ~~for~~ their summer homes.

Most of the traffic move along Commonwealth Avenue and Beacon Street; a very small percentage go through Brookline Avenue; and the traffic moving to and from Deerfield Street is almost negligible. An intensive study of traffic using Deerfield Street was made on May, 4, 1923, from 4-30 to 6 p.m. which is the busiest period of the day at the square, and the result is shown in the following table.

Traffic Count at Governor Sq.

May 4, 1923. 4-30 p.m. to 6. p.m.

Deerfield St.

↓ Brookline Ave.	↑ Brookline Ave.	↓ Inb. Comm. Ave.	↑ Inb. Comm. Ave.	↓ Out. Comm. Ave.	↑ Out. Comm. Ave.	↓ Beacon St.	↑ Beacon St.
Time: 4-30 to 5 p.m.							
5	5	0	0	8	6	0	1
Time: 5 to 6 p.m.							
13	7	2	5	19	14	1	1
Total: 1 hour 30 min.							
18	12	2	5	27	20	1	2

The arrows show the directions of vehicles.

The figures show the numbers of vehicles.

A previous observation was made on April 11, 1923, at the time between 1-30p.m. and 2-30p.m. when traffic was moderate at the square, only 12 vehicles passed through Deerfield Street.

Of the morning and afternoon rush hours traffic is handled with greater ease in the morning than in the afternoon, since comparatively few vehicles move on the outbound Commonwealth Avenue and Beacon Street with the result that the inbound traffic on these two streets is kept moving almost continuously. It is different in the afternoon, however, since about the same volume of traffic travel in both directions necessitating alternate stops.

The Present Regulation of Traffic.

At the present a traffic officer takes his position in the middle of the square, and from there regulates the traffic with his hands. The outbound traffic on Commonwealth Avenue is kept moving almost continuously since it does not cross the square; the few interuptions to that line of traffic is for those vehicles wishing to go through Brookline Avenue and Deerfield Street, Beacon and Deerfield Streets, and inbound Commonwealth Avenue and Deerfield Street.

In order to allow the inbound traffic on Beacon Street and Commonwealth Avenue to move, outbound

traffic on Beacon Street and those vehicles wishing to cross the square from Brookline Avenue and Deerfield Street are stopped. In order to allow the outbound traffic on Beacon Street to move the inbound traffic on Beacon Street and Commonwealth Avenue and also vehicles wishing to cross the square from Brookline Avenue and Deerfield Street are stopped. These last two operations are the most important and frequent and are performed alternately, since as has been mentioned previously the traffic travelling on Beacon Street and Commonwealth Avenue is by far the greatest. At about every five minutes the whole traffic at the square is stopped just to let one or two vehicles cross the square from or to Deerfield Street. From observations made from time to time the traffic officer in charge of the square leaves his position at the center at times when traffic is very light, but he is always present at the square to take up duty at any time that he was needed. This last statement does not refer to evenings and Sundays.

Some Defects in The Present System.

The different defects at the square which need to be solved are as follows:

(1) The position of the traffic officer directing traffic at the square is so low that he is spotted with difficulty by drivers, and those, who are unfamiliar

with the site, are apt to overlook him entirely, which can result in serious accidents.

(2) During the morning and afternoon rush hours, street cars on Beacon Street and Commonwealth Avenue put on one or two trailers and travel at a very slow speed across the square, thus forming an obstruction as each one goes by and resulting in accumulation of vehicles at the square.

(3) The point of stop for street cars on Beacon Street is so near the square that when a street car stops to take on or alight passengers the lines of vehicles travelling on Beacon Street are compelled to stop, as required by the State law, and extending into the square resulting in the increase of congestion.

(4) The inbound vehicles on Commonwealth Avenue tend to advance too far, when signalled to stop, as to be in the way of vehicles on Beacon Street, and similarly the outbound vehicles on Beacon Street are in the way of the outbound street cars.

(5) At the time a street car for Commonwealth Avenue passes the traffic officer the latter is out of view of the outbound traffic on Beacon Street and Commonwealth Avenue, and the drivers have to guess at the signals. Similarly a Beacon Street street car will hide the officer from the inbound traffic on Beacon Street and Brookline Avenue.

(6) The outbound traffic on Commonwealth Avenue and Beacon Street tend to poach on the right of way of the inbound vehicles on Beacon Street by the fence of the Kenmore Station of the subway causing a jam there.

(7) Unnecessary conjestion is caused by stoping all traffic at the square to let one or two vehicles cross the square to or from Brookline Avenue and Deerfield Street.

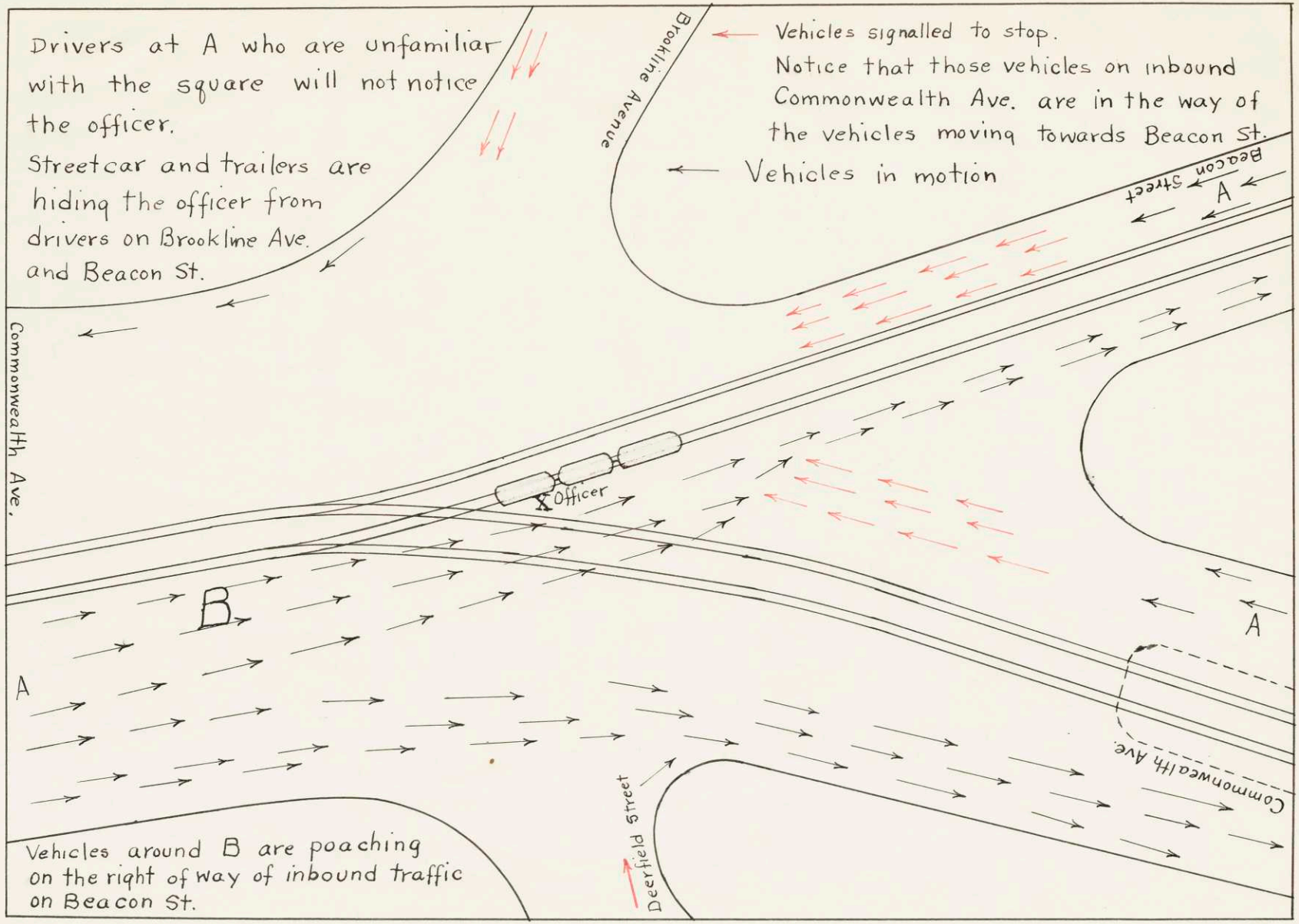
The diagram on the next page shows some of the defects mentioned above.

S O L U T I O N S.

Solution for Defect No. 7.

In as much as Deerfield Street is very short and is one of many streets connecting Baystate Road and Commonwealth Avenue, Deerfield street should undoubtedly be made a one-way street in the direction towards Baystate Road. This change will cause only one block of detour, since vehicles wishing to enter Commonwealth Avenue and Beacon Street can use Sherborn Street and Kenmore Street respectively. Vehicles wishing to enter Brookline Avenue can detour by the way of Charlegate West and Newbury Street. The table of the traffic using that street during the busiest time of the day shows that traffic is almost negligible, while almost continuous lines of vehicles move along Commonwealth Avenue and Beacon Street, and whose movement should be

Governor Square Showing Causes of Congestions



kept as perpetual as circumstances will permit, therefore it is important that traffic on the two latter streets should not be held up in order to let one or two vehicles from Deerfield Street cross the square at every interval.

Solutions for Defects Nos. 1&5. The modern tendency in regulating traffic at intersections is towards rotary or gyratory system where it is practicable. The advantage of this system over others is obvious, since vehicles travel in one direction around a center space with no requirement for the service of traffic officers, except to help the pedestrians. This system is used in many of the most complicated intersections of many cities of the world such as: Arc De Triomphe, Paris; Columbus Circle, New York City; Du Pont Circle, Washington, D.C. This system, however, requires a large space at the intersection to provide big enough radius for vehicles to turn.

Although Governor Square has large enough space for installing rotory system the traffic condition makes such a system impracticable. As has been stated previously, most of the traffic is on Beacon Street and Commonwealth Avenue, and also the angle of intersection between the former and the inbound Commonwealth Avenue is so small that great difficulty will be met with a rotory system. Moreover, the routes taken by

street cars prevent such a system from being advantageous.

The only possible way by which traffic can be handled at the square most efficiency is by the block system aided by a Crowsnest, in which the following benefits are to be attached:

(1) The officer is able to obtain a clear of the traffic for a longer distance.

(2) He is isolated from distractions and is able to do more effective work.

(3) He is moderately protected from weather.

(4) The drivers are able to see the officer and his signals from a greater distance as well as over a street car.

First of these Crowsnests was put in use in Detroit, Michigan, in 1917 , and has proved to be so successful that several others were installed in the same city.

Many letters from Detroit officials have been received by Mr. W.P. Eno, the inventor of the Crowsnests, and by a kind permission of Mr. Eno the writer is producing extracts of two of the letters from W.P. Rutledge, who was formerly Chief Inspector and is now Assistant Commissioner of the Police.

January 24, 1918.

" My dear Mr. Eno:

" I have yours of the 18th. instant and in reply would say that we put the Crowsnest in operation at Woodward and Michigan Avenue on Tuesday, Oct. 9, 1917. I assure you that it was partly through neglect and partly owing to the pressure of other matters that I failed to do so. You say you are anxious to know all about it. I am anxious that you should. It was this way: Last summer one of the Aldermen suggested to the Commissioner 'That something elevated be placed at this corner for the traffic man to stand on.' I immediately recommended 'Mr. Eno's Crowsnest.' Together with this recommendation I submitted a sketch similar to the one in your pamphlet. This recommendation was approved by the Commissioner and construction of the Crowsnest commenced. About a week after it was put in operation I reported to the Commissioner that 'It proves to be a successful innovation beyond our expectations.' We did not realize what an advantage the elevated position gives the officer. He has a clear view over the tops of street cars and automobiles and can command the whole situation for two or three blocks in all directions. Men at other corners in the vicinity work in conjunction with this master semaphore with the result that movement of traffic is noticeably faster and safer. Drivers and

pedestrians frequently expressed their approval. It works to the advantage of the driver because they have the officer in it in plain view at all times from all angles. Direct telephone communication between the booth and First Precinct Station is another good feature.

" One of the better proofs of its success is that one officer can control the traffic alone, while heretofore it required two men. One of our oldest and best traffic officers who had been regulating traffic at this cofner for years, after occupying the Crowsnest for one day, said ' It is the best thing in the world.' * * * * * * * *

(S) W.P. Rutledge,
Chief Inspector."

City of Detroit

Department of Police

July 27, 1918

Mr. Wm. P. Eno
Saugatuck
Fairfield County
Connecticut.

" My dear Mr. Eno;

" I have your letter of July 9th. together with the Traffic Regulations and also your letter of the 22nd.

* * * * * * * * *

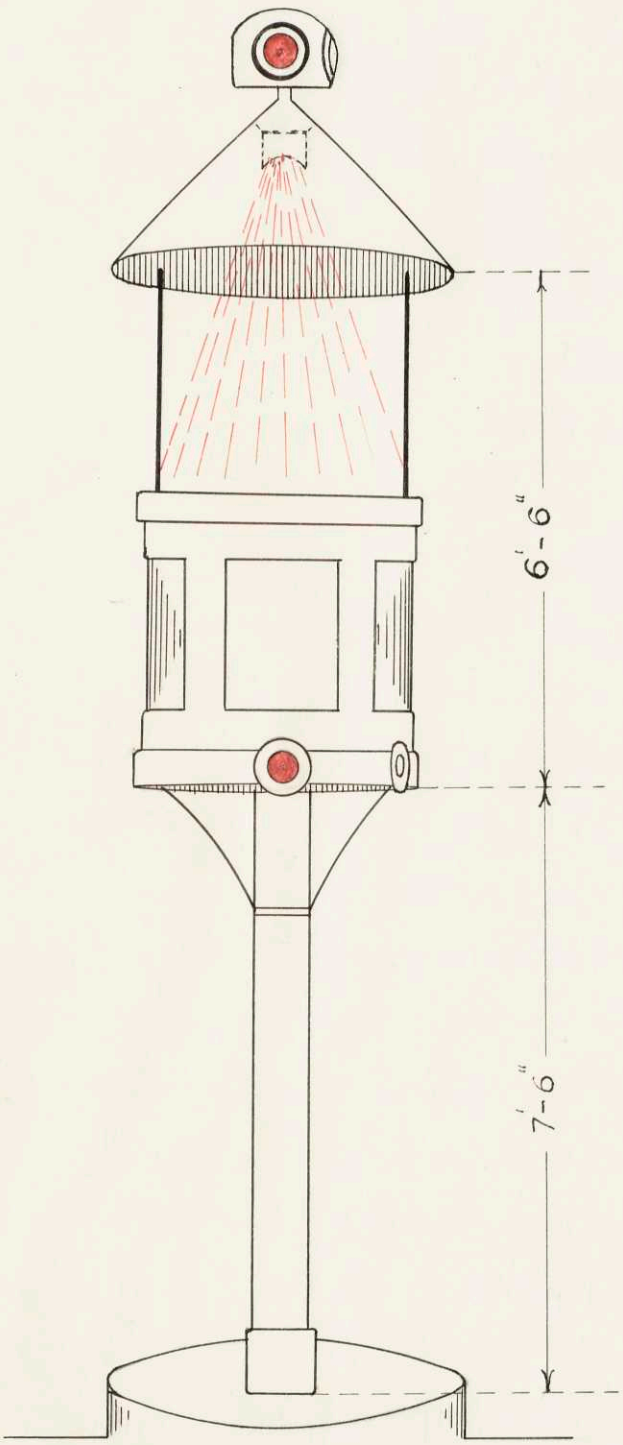
"I am enclosing a plan of the Traffic Mushrooms or Safety Zone Base or Bumper. It has several names. I can say that the Crow's Nests are getting along famously - you notice I say Nests. We have just put the second one in operation at Michigan Avenue and Griswold Street. * * * * * Our Engineer is giving orders today for material to build three more Crow's Nests. If you remember our city well enough, you may know where they are when I say one is to be at Jefferson and Woodward Avenues, one at North Grand Boulevard and another over on Pingree Square. * * * * *

Very truly yours,
(signed) W.P. Rutledge
First Deputy Commissioner."

The Crowsnest to be installed should be similar to the type shown in the sketch on page 13. The following list gives the height from the top of the rail to the top of various types of street cars in use in the City of Boston.

Type of Cars		Height
Convertible	---------	12' - o"
Latest Type	---------	10' - $7\frac{1}{2}$" to 11' - $8\frac{1}{4}$"
One Man Car	---------	9' - 11"
Trailer	---------	9' - $6\frac{1}{4}$"

CROWSNEST



Since no ordinary truck would exceed a street car in height, twelve feet can be considered as the maximum height over which a traffic officer should be able to see. From the sketch the officer is elevated over 7' - 6" above the pavement, which will enable an officer six feet or less tall to see over the highest street cars.

The signal should be made by red and green lights with sufficient candle-power to be seen in the day time. The use of light signals will be found to effect the action of the drivers quicker, and the signal can be seen from a longer distance. From the writer's personal experience in driving through Fifth Avenue, New York City, with the new Tower-Block System, the light signals received quicker response from the drivers than the semaphores. Moreover, with the adoption of light signals one system only is necessary, while with the use of semaphores the light signals will have to be installed for nigh purpose. Two systems of lights should be used as shown in the sketch. The lower system is for those vehicles waiting to take a left turn or for pedestrians who will not be able to see the higher system, while the higher system signals to traffic at some distance away. The lower system should consist of small lamps of lower candle-power to insure greater economy. Each of

the system should consist of green and red lights for each lamp, and the lamps of the two systems for one particular street should be connected to the same switch. Since Deerfield Street is made a one-way street at all times no lamp facing that street is necessary, the traffic will be taken care of by a "One-Way Street" sign placed at the beginning of the street. The interior of the Crowsnest should be illuminated in such a way as to enable drivers to see the traffic officer at night, and at the same time not to dazzle the eyes of the officer. Such an illumination is suggested in the sketch. The Crowsnest should be connected directly by telephone to the Police Station for that community.

The location of the Crowsnest is shown in the accompanying map. It is to be noticed that this position offers the traffic officer a commanding view on all streets leading into the square.

Solution for Defect No. 2.

In as much as the street cars are one of the biggest factors in creating congestion at the square by reason of their slow movement which delay traffic on all sides, there is a good remedy for this defect, and that is to extend further the subway both on Commonwealth Avenue and Beacon Street so that the cars run up to the surface after passing the square to their respective streets. It is an expensive proposition as compared to the others treated in this thesis, and for this reason the writer merely suggests the scheme. From

conversations with one of the traffic officers in charge of the square he said that one of the hardest problems in directing traffic there was the crossing of street cars, because they went so slow, and he added that it was easier to direct traffic going 20 m.p.h. than going at 10 m.p.h. During observations in the rush hours the writer has seen two or three street cars with trailers waiting to cross the square, and this is a daily occurence; when they are signalled to go so much time is taken for them to pass that vehicles accumulate at corners in all directions. The extension of the subway beyond the square, howevever, will eliminate the tracksmaking it possible for a "Safety Zone" to be installed by the Crowsnest for the use of the pedestrians wishing to cross the square. At present it is an impossibility for pedestrians without acrobatic ability to accomplish this purpose at this part of the square during the busy hours. But, since this proposition is an expensive undertaking a closer study of all conditions should be done before attempting its operation. The yearly damage due to accidents and the time lost by vehicles, especially motor-trucks, whose operating expenses varies with the time as well as the distance,(assuming that the extra time taken by the pleasure cars is of no importance to the owners) should be computed. The whole thing will, however, be merely an estimation and depend on the judgement of the engineer, since great difficulty will be found as to how many of the accidents and how much time

lost are due directly, or if partly how much weight to be given, to the existence of street cars.

Solution for Defect No. 3. On the assumption that the street cars will continue to run on the surface across the square, the elimination of defect no. 3. is to move the point of stop of street cars further down Beacon Street. The most suitable place would be before the cars cross Beacon Street Bridge. This point will allow about 660 feet from the square.

Solution for Defect No. 4. The sketch on page seven shows plainly the unnecessary congestion because the inbound vehicles on Commonwealth Avenue advance too far into the square. The vehicles travelling on Beacon Street have to squeeze into a single line instead of keeping three parallel lines.

In order to provide a "Safety Zone" for pedestrians midway, and thus making it possible for them to cross at this part of the square as well as having a certain guide mark by which vehicles on the inbound Commonwealth Avenue are able to tell where to stop, when signalled is given from the Crowsnest, an "Isle of Safety" should be built. Its location is shown in the map. The corners are made eliptical in order to glance off the blows of striking vehicles. "Isles of Safety" have been used extensively and with a great deal of

success in Europe and South America. It has been found to divide traffic into channels most effectively.

Since the whole trouble from which vehicles get in the way of outbound street cars for Commonwealth Avenue is the branching out of the tracks to the right, and also the vehicles do not stop until they are right near the traffic officer, a white line of atleast 4" should be painted on the pavement just before the tracks curve to the right indicating where vehicles must stop when signalled to. The location of the whire line is shown in the map.

Solution for Defect No. 6.

Guides should be placed as shown in the map to elimate this defect. The guides directly across the fence are 16 feet from it to allow two lines of traffic, and these should be moved out to 24 feet to allow three lines of traffic between 8-30 and 9-30 a.m. to take care of the inbound traffic. It has been found by experiment that vivid yellow letters on black background is the best combination both for day and night purposes and this combination should be used. The wordings should be similar to "Slow moving vehicles. Keep to right."

C O N C L U S I O N S.

In arriving at these solutions for the various defects in order to eliminate congestion and accidents as much as possible, investigations were made as to the forbidding of vehicles to enter the square from Brookline Avenue, which will divert inbound traffic on to Newbury Street or Boylston Street, and outbound traffic on to Audubon Road. Since most of the shops on that part of Brookline Avenue between Boylston Street and the square deal in automobiles and their accessories, it is to be expected that automobiles will use that street to a certain extent resulting in the use of Newbury Street for inbound route, while traffic from the direction of Brookline Village will use Boylston Street. The crowding of this part of Newbury Street, however, must be avoided, since the intersection of this street and Charlegate West , by which place traffic will have to pass, is most dangerous on account of a grade there; thus the congestion and accidents will not be eliminated, but will be only transferred from the square to this intersection. In forbidding vehicles to enter the square from Brookline Avenue will eliminate almost entirely any straight crossing of the square, leaving it entirely for the traffic on Commonwealth Avenue and Beacon Street.

The directing of the traffic at the present by stopping inbound vehicles on Beacon Street and Commonwealth Avenue simultaneously to allow outbound traffic on Beacon Street to proceed should not be follwed, but, instead, the traffic on Beacon Street should be stopped at the same time, or should be allow to proceed at the same time. This method will eliminate the crossing between inbound traffic on Commonwealth Avenue and Beacon Street, which delays traffic considerably, and will allow inbound vehicles on Beacon Street which wish to proceed on Commonwealth Avenue to move during the time that the latter street is empty, thus distributing traffic equally on that street.

BEACON ST.

BROOKLINE AVE.

COMMONWEALTH AVE.

COMMONWEALTH AVE.

DEERFIELD ST.

Crows Nest

Guide

41'-0"

Guide

100'-0"

Guide

24'-0"

18'-0"

18'-0"

One-Way Sign

44'-0"

White Line

Vehicles Stop

20'-0"

Island of Safety

Lamp

51'-0"

White Line

Vehicles Stop

KENMORE ST.

BEACON ST.

BROOKLINE AVE.

GOVERNOR SQUARE

BOSTON, MASS.

SHOWING LOCATION OF CROWSNEST, ISLE OF SAFETY, & GUIDES.

SCALE:- 1 IN = 20 FT. MAY, 1923.

Lower map is continuation of the upper

Prasob Sukhum.