April 26, 1966 W. W. PLEASANTS 3,247,539

SUSPENDED OVERPASS

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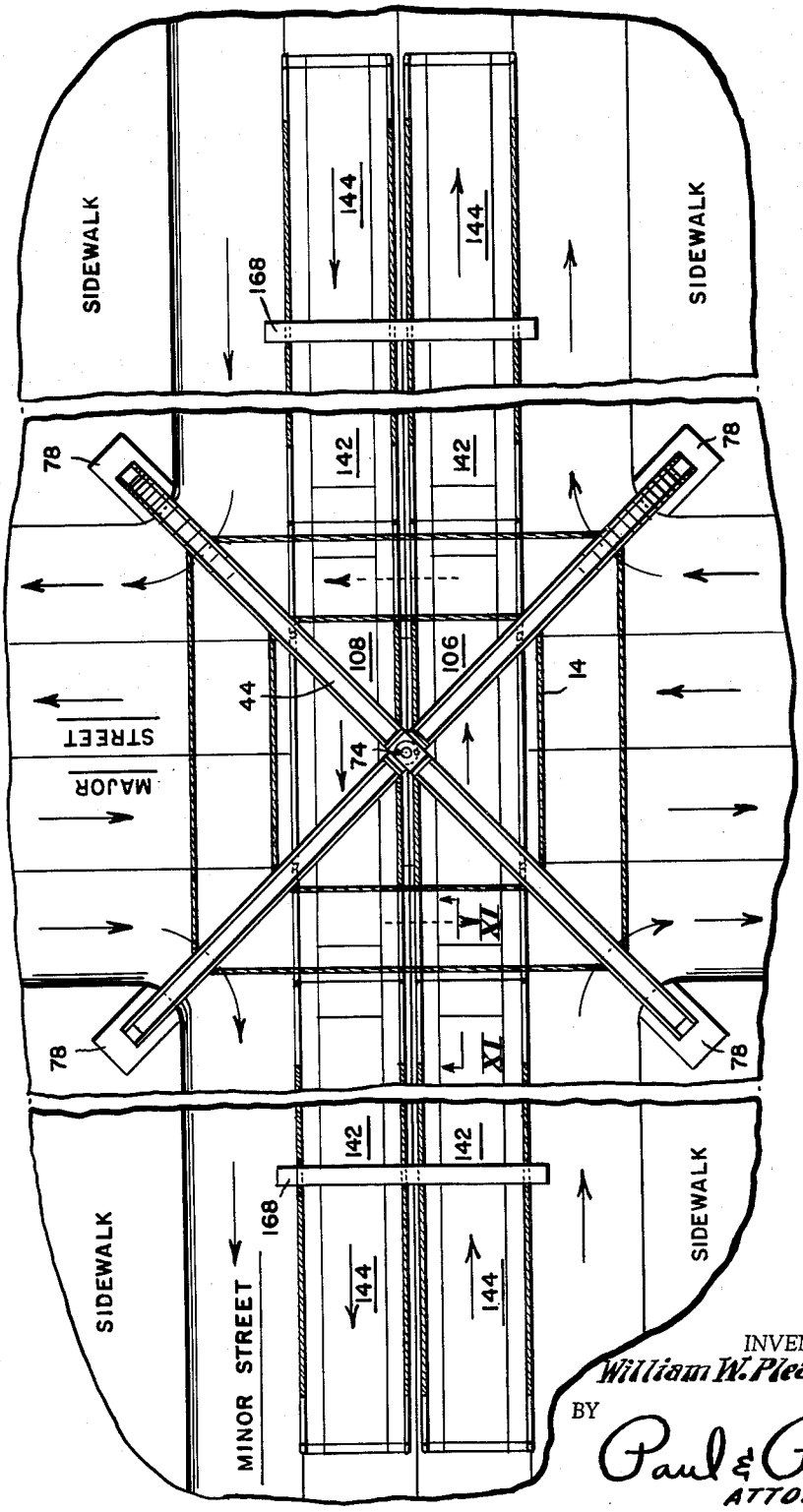



FIG. 1

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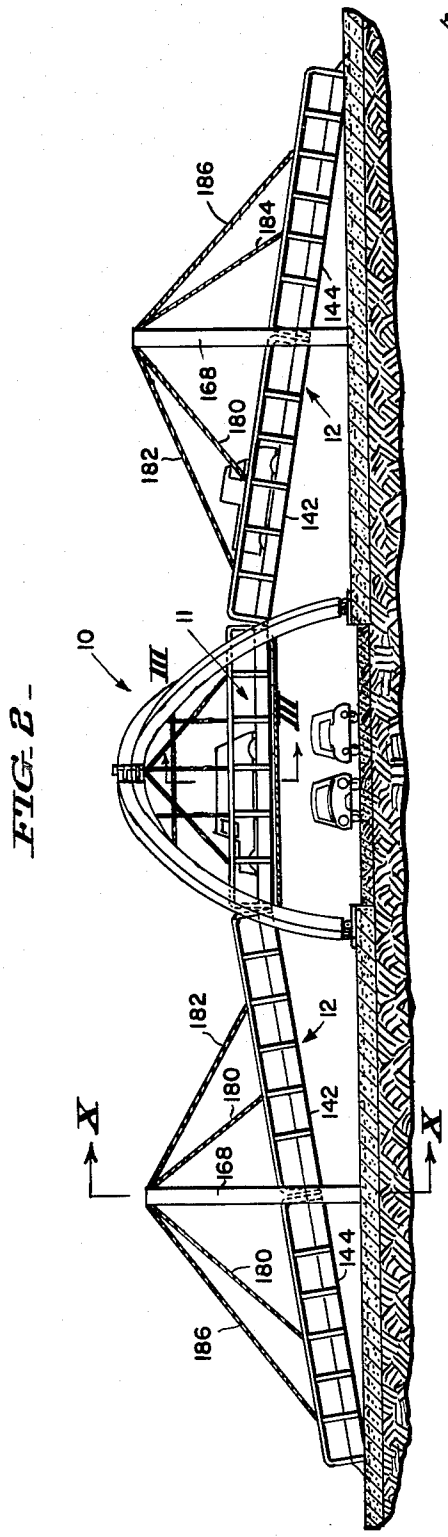



FIG. 2

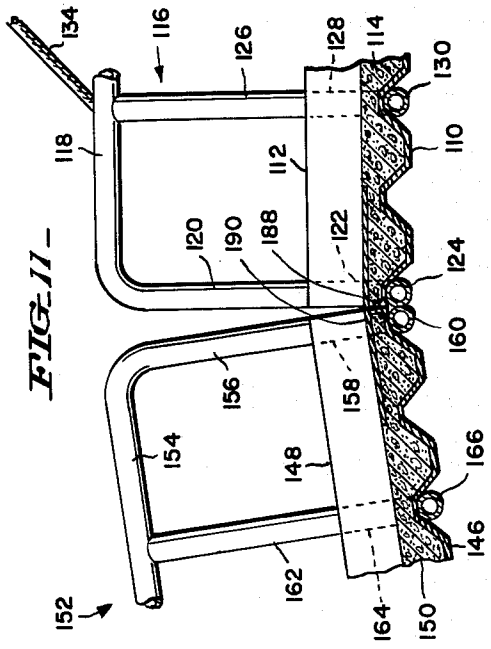



FIG. 11

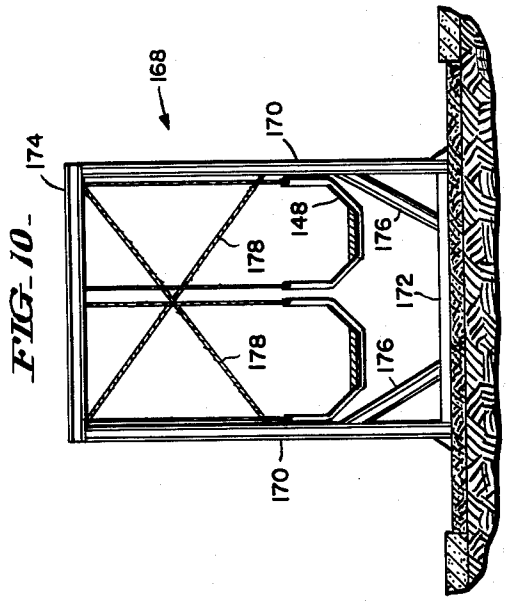



FIG. 10

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FIG. 3

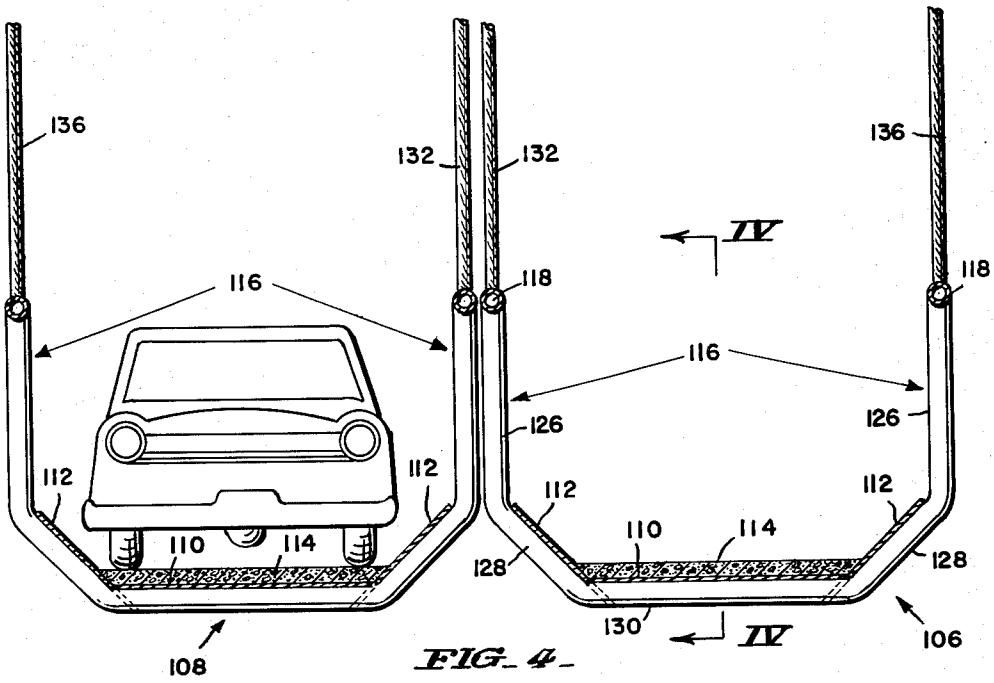
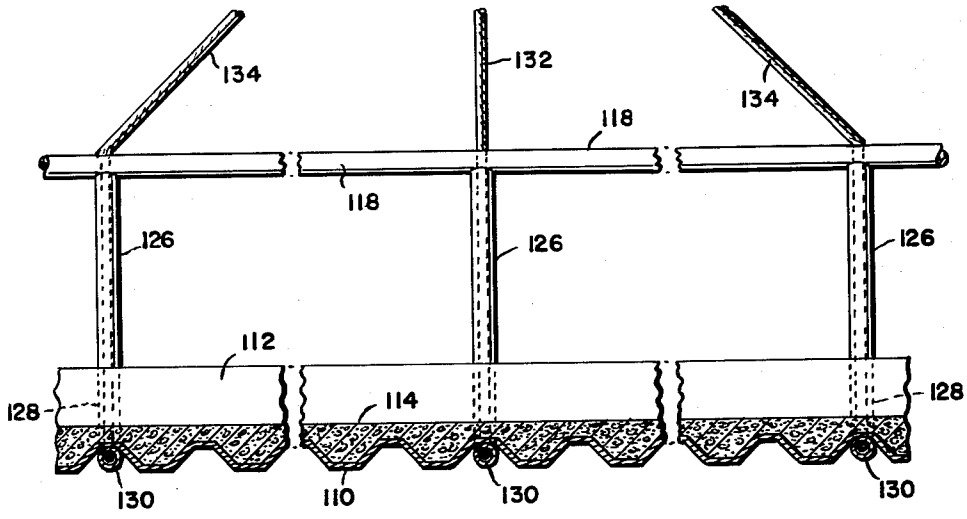



FIG. 4




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SUSPENDED OVERPASS

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FIG. 5

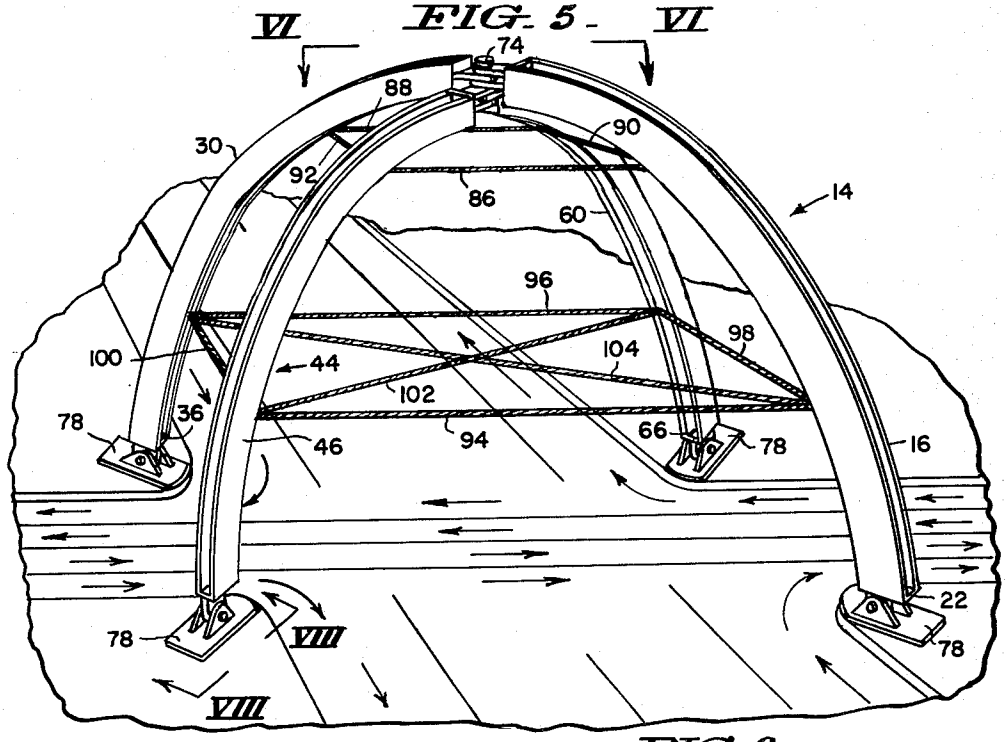



FIG. 6

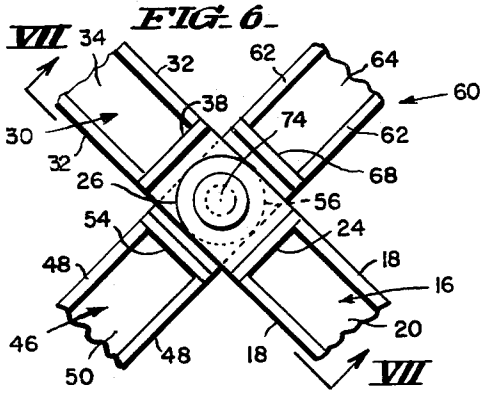



FIG. 7

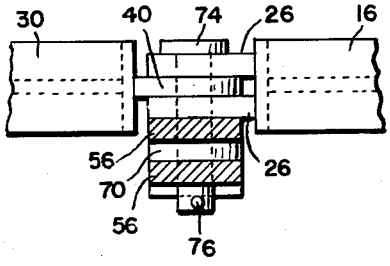



FIG. 8

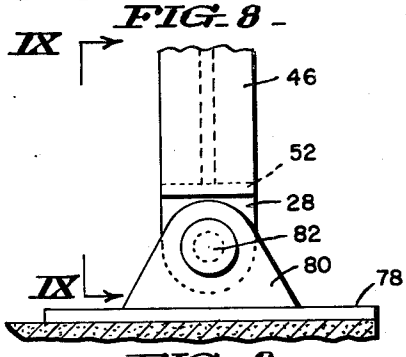
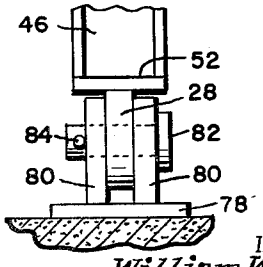



FIG. 9




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United States Patent Office 3,247,539 Patented Apr. 26, 1966



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# SUSPENDED OVERPASS

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4 Claims. (Cl. 14—19)

This invention relates generally to bridges and particularly to improvements in overpasses for facilitating the movement of vehicles at the intersection of a plurality of thoroughfares.

Various overpasses have been proposed for facilitating movement of vehicles at street intersections in urban areas where space is at a premium and disturbance of existing construction is impractical. However, these overpasses have not been entirely satisfactory because they are too costly, take an inordinate length of time to design and build and occupy too much space. In addition, the structures commonly are supported upon members that rise from the street pavement, in consequence of which street area is removed from service where it is needed most, and visibility is reduced at a critical point in the intersection. Accordingly, an important object of the invention is to provide an overpass characterized by a ground supported framework bridging both streets at the intersection and having suspended therefrom an elevated overpass section extending across said intersection.

Another object is to provide such an overpass wherein the ground supported framework is characterized by interconnected members each arching diagonally over the intersection and having cables depending therefrom for supporting said overpass section.

Another object is to provide such an overpass with ramps at both ends of and furnishing approaches from street level to said elevated overpass section.

Other objects of the invention will become apparent when the following description is read with reference to the accompanying drawings, in which:

FIGURE 1 is a plan view of an overpass embodying the invention and erected at a street intersection;

FIGURE 2 is an elevation of the overpass shown in FIGURE 1;

FIGURE 3 is an enlarged section on line III—III of FIGURE 2;

FIGURE 4 is a section on line IV—IV of FIGURE 3;

FIGURE 5 is a perspective view of the ground supported framework from which the overpass section is suspended;

FIGURE 6 is an enlarged plan view at the crown of the ground supported framework;

FIGURE 7 is a section on line VII—VII of FIGURE 6;

FIGURE 8 is an enlarged elevation at the foot of the ground supported framework, as indicated by line VIII—VIII of FIGURE 5;

FIGURE 9 is an elevation at the foot of the ground supported framework, as indicated by line IX—IX of FIGURE 8;

FIGURE 10 is an enlarged section on line X—X of FIGURE 2; and

FIGURE 11 is an enlarged section on line XI—XI of FIGURE 1.

Referring to the drawings and particularly to FIGURE 2, the bridge embodying the present invention comprises a ground supported frame, generally designated **10**, fully spanning a street intersection, an elevated overpass section **11** suspended from the frame **10**, and two ramps, generally designated **12**, providing approaches to the overpass section **11** from street level.

Referring particularly to FIGURES 5 to 9, the ground supported framework **10** comprises an arched member, generally designated **14**, which is substantially semicircular. The member **14** includes a rolled section **16** having



parallel flanges **18** interconnected by a web **20**. At the foot of section **16** is a horizontally extending plate **22**, and at the head of section **16** is an upright plate **24**. Affixed to the plate **24** are a pair of vertically spaced horizontally extending connection plates **26**, and affixed to the plate **22** and depending therefrom is an upright connection plate **28**.

The arched member **14** also includes a second rolled section **30** having parallel flanges **32** interconnected by a web **34**. At the foot of section **30** is a horizontally extending plate **36**, and at the head of section **30** is an upright plate **38**. Affixed to the plate **38** is a horizontally extending connection plate **40** sandwiched between the connection plate **26**, and affixed to the plate **36** and depending therefrom is a connection plate **28**.

The ground supported framework **10** also comprises an arched member, generally designated **44**, which is substantially semicircular. The member **44** includes a rolled section **46** having parallel flanges **48** interconnected by a web **50**. At the foot of section **46** is a horizontally extending plate **52**, and at the head of section **46** is an upright plate **54**. Affixed to the plate **54** are a pair of vertically spaced horizontally extending connection plates **56**, and affixed to the plate **52** and depending therefrom is a connection plate **28**.

The arched member **44** also includes a rolled section **60** having parallel flanges **62** interconnected by a web **64**. At the foot of section **60** is a horizontally extending plate **66**, and at the head of section **60** is an upright plate **68**. Affixed to the plate **68** is a horizontally extending connection plate **70** sandwiched between the connection plates **56**, and affixed to the plate **66** and depending therefrom is a connection plate **28**.

At the crown of the frame a connection pin, designated **74**, extends downwardly through aligned openings in the horizontally extending connection plates **26**, **40**, **56** and **70**. Extending through the lower end portion of the pin **74** is a retainer pin **76**.

At each foot of the frame is a shoe including a horizontally extending sole plate **78** anchored to the ground and provided with laterally spaced upstanding ears **80** having the plate **28** sandwiched therebetween. Extending through aligned openings in the ears **80** and the plate **28** is a pin **82**, and extending through one end portion of the pin **82** is a retainer pin **84**.

High above the intersection, at a level just under the crown of the framework, is a set of cables including a cable **86** opposite end portions of which are affixed respectively to the arch sections **16** and **46**, a cable **88** opposite end portions of which are affixed respectively to the arch sections **30** and **60**, a cable **90** opposite end portions of which are affixed respectively to arch sections **16** and **60**, and a cable **92** opposite end portions of which are affixed respectively to arch sections **30** and **46**.

At an intermediate level, between grade and the set of cables mentioned hereinabove, is a network of cables including a cable **94** opposite end portions of which are affixed respectively to the arch sections **16** and **46**, a cable **96** opposite end portions of which are affixed respectively to the arch sections **30** and **60**, a cable **98** opposite end portions of which are affixed respectively to the arch sections **16** and **60**, a cable **100** opposite end portions of which are affixed respectively to the arch sections **30** and **46**, a cable **102** opposite end portions of which are connected respectively to the arch sections **46** and **60** and a cable **104** opposite end portions of which are connected respectively to the arch sections **16** and **30**.

Referring particularly to FIGURES 1 to 4 and 11, the overpass section **11** includes two one lane units disposed side by side, respectively designated **106** and **108**. The units **106** and **108** are similar, in consequence of which a description of the unit **106** will suffice also for a descrip-

tion of the unit 108. The unit 106 comprises a deck plate 110 formed into a series of transversely extending parallel troughs. Extending along each side of the deck plate and disposed at an angle of approximately 45 degrees relative to the horizontal is a curb plate 112. Deposited upon the deck plate is a paving material, for example, blacktop, designated 114, forming the road bed. The deck plate, curb plates and blacktop assembly is cradled in an open framework of piping providing a railing 116 on each side. The top rail 118 terminates at each end in an end post 120 which, at its lower end turns inwardly, as at 122, along the curb plate. The turned in portions of the end posts respectively on opposite sides and at each end of the unit are connected by a cross tie portion 124 underlying the deck plate. Intermediate posts, designated 126, have lower end portions turned inwardly, as at 128, along the curb plates, and the turned in portions of corresponding intermediate posts respectively on opposite sides of the unit are connected by a cross tie portion 130.

Suitably connected to the crown of the framework 11 are a cable 132 and a pair of cables 134. The cable 132 extends vertically downwardly and the cables 134 diverge downwardly, on the inner side of the unit 106. Each of the cables extends through the inner top rail 118 and downwardly through an intermediate post 126, where it is suitably affixed. Affixed respectively to the arch sections 16 and 46 and extending vertically downwardly therefrom are a pair of cables 136, on the outer side of the unit 106. Each of the cables 136 extends downwardly through the outer top rail 118 and through an intermediate post 126, where it is suitably affixed.

Referring particularly to FIGURES 1, 2, 10 and 11, the ramp 12 at each end of the overpass section 11 comprises a one lane up ramp part and a one lane down ramp part. These ramp parts are similar, in consequence of which a description of one part will suffice for a description of both. The up ramp part comprises a head unit 142 and a foot unit 144. Again, the units 142 and 144 are similar, in consequence of which a description of the unit 142 will suffice also for a description of the unit 144. The head unit 142 comprises a deck plate 146 formed into a series of transversely extending parallel troughs. Extending along each side of the deck plate and disposed at an angle of approximately 45 degrees relative thereto is a curb plate 148. Deposited upon the deck plate is blacktop, designated 150, to provide a suitable road bed. The deck plate, curb plates and blacktop assembly is cradled in an open framework of piping providing a railing 152 on each side. The top rail 154 terminates at each end in an end post 156 which, at its lower end, turns inwardly, as at 158, along the curb plate. The turned in portions of the end posts respectively on opposite sides and at each end of the unit are connected by a cross tie portion 160 underlying the deck plate. Intermediate posts, designated 162, have lower end portions turned inwardly, as at 164, along the curb plates, and the turned in portions of corresponding intermediate posts respectively on opposite sides of the unit are connected by a cross tie portion 166.

At the juncture of the foot and head units is an upright ground supported bent 168 comprising laterally spaced posts 170, a cross tie 172 at the foot of the bent, a cross tie 174 at the head of the bent and a pair of braces 176. Extending across the upper portion of the bent are a pair of cross cables 178. Diverging downwardly from the top of the bent, on each side of the up and down ramps, are a set of cables 180, 182, 184 and 186. Each of the cables 180 and 182 extends through the associated top railing 154 of the head unit 142 and downwardly through an intermediate post 162, where it is suitably affixed. Each of the cables 184 and 186 extends through the associated top railing 154 of the foot unit 144 and downwardly through an intermediate post 162, where it is suitably affixed.



Referring particularly to FIGURE 11, the terminal portion of each deck plate is turned upwardly to form a flange 188 and bridging the opposed end portions of adjacent units is a suitable plate 190.

The bridge embodying the invention is not intended to provide full clover leaf separation, but merely to elevate two lanes of through traffic on a minor street where it intersects a major street. In addition, it is not intended to handle trucks, which constitute a fairly small percentage of total traffic volume at most intersections and can best be handled at grade.

Referring to FIGURE 1, the intersection may consist, for example, of a major street running north and south and a minor street running east and west. There are four lanes of travel in each street, as indicated by arrows. On the major street, right-hand turns are made at grade from the outside lane and left-hand turns are made at grade from the inside lane. On the minor street, all turns are made from grade from the outside lane, the inside lanes being reserved for through traffic by way of the overpass structure of the invention. Thus there is complete freedom for making right turns or left turns at grade from either street and from any direction.

The structure of the invention preferably is made entirely of steel, and the whole assembly may be installed at an intersection in one day's time. Since there is no excavation and no concrete required for its construction, there is no disruption of traffic and no changes necessary in existing pavement, curbing, sidewalks, etc. If the need for it ceases to exist at one intersection, the structure may be easily relocated at another intesection at a very low cost.

It will be noted that lateral support for the arches is obtained in two ways. First, at the apex, where the arches provide lateral support for each other. Second, by the cables at the intermediate level and at the upper level. In this way each arch is supported laterally at a plurality of levels.

By way of emphasis, certain features should be noted: The overpass structure is suspended from overhead so that there are no supports in the traffic lanes in the intersection area. This eliminates the possibility of vehicles running into the bridge supports, and eliminates any obstruction of visibility between vehicles entering the intersection. The structure can be used as a temporary structure during permanent construction, or it may be put to other temporary uses, at resorts, athletic events, conventions, fairs, etc. The structure is suspended from two semicircular steel arches which cross each other at the apex in the middle of the intersection to form a cross frame in plan view. Each foot or base of each arch rests upon the sidewalk and the crowns of the arches are secured together so that each gives the other lateral support. This configuration provides maximum flexibility in that a pair of standard size arches may be arranged at various angles relative to each other to fit a variety of widths of streets. The structure incorporates a novel roadway design which utilizes three common materials in a new arrangement which minimizes the vertical distance required between the road surface above and the clearance line below. It is important to minimize vertical distance because this controls the length of the ramp required. A convenient ramp slope is 6.4 to 1, in consequence of which every foot eliminated from the vertical distance reduces ramp length by 6.4 feet and the overall ramp structure by 12.8 feet. The structure utilizes a novel curb design which consists of a heavy steel plate set at a 45-degree angle. This plate has a twofold function. First, it performs the normal function of a curb, namely, controlling the path of travel of a vehicle. The plate has a smooth surface which means that an automobile wheel will not climb it but will merely slide along. Second, it performs a structural function in tying together the ends of the sections of steel decking and giving them

rigidity. The guard rail is used to transmit tension from the cables down under the roadway and also acts as a truss to lend rigidity to the overall assembly. The structure may be made up of five identical units for each lane of travel for a total of ten units for a complete two lane overpass. These units may be fabricated in quantity at low cost in a central plant. By utilizing a number of identical sections, it is possible to vary the combination of them to fit many different traffic situations. For example, one situation might dictate that only one lane be elevated. In another situation the minor street may be on a hill and only one ramp section on one side and three on the other might be required.

It will be understood, of course, that the present invention, as described and shown, is susceptible to various changes and modifications which may be made without any departure from the general principles or real spirit of the invention. Accordingly, it is intended to claim the present invention broadly, as well as specifically, as indicated in the appended claims.

What is claimed is:

1. In a structure for facilitating the movement of vehicles at the intersection of a pair of thoroughfares crossing substantially at right angles, the combination comprising a rigid framework including a pair of frame members each having opposite end portions supported upon and anchored to the ground without said thoroughfares, and each arching diagonally over said intersection, means interconnecting said frame members at the crown of said framework whereby each of said members braces the other against lateral movement, an overpass section parallel to one of said thoroughfares, means fully and freely suspending said overpass section directly from said framework above said intersection, and ramp means from said one thoroughfare to said overpass section providing an approach to and an exit from said overpass section.

2. In a structure for facilitating the movement of vehicles at the intersection of a pair of thoroughfares crossing substantially at right angles, the combination comprising a rigid framework including a pair of frame members each having opposite end portions supported upon the ground without said thoroughfares, and each arching diagonally over said intersection with one of said frame members passing under the other, means interconnecting the mutually overlying crown portions of said frame members so that each of said members braces the other against lateral movement, an overpass section parallel to one of said thoroughfares, means fully and freely suspending said overpass section directly from said framework above said intersection, and ramp means from said one thoroughfare to said overpass section providing an approach to and exit from said overpass section.

3. In a structure for facilitating the movement of vehicles at the intersection of a pair of thoroughfares crossing substantially at right angles, the combination comprising a ground supported rigid framework fully spanning said intersection in both directions, an overpass section including a pair of single lane units disposed side by side and parallel to one of said thoroughfares, each of said units including a deck plate having a series of corrugations extending transversely thereof, a pair of upright curb plates extending along said deck plate and affixed respectively to the opposite side edges thereof, a layer of paving material fully covering said deck plate from curb plate to curb plate, and means having said deck plate seated thereon, each extending parallel to said corrugations and disposed between an adjacent pair thereof and cradling said deck and curb plates and the paving material carried thereby, means affixed to each of said cradling means and fully and freely suspending each of said single lane units directly from said framework above said intersection, and ramp means providing an approach to and an exit from each of said single lane units.

4. In a structure for facilitating the movement of vehicles at the intersection of a pair of thoroughfares crossing substantially at right angles, the combination comprising a ground supported rigid framework fully spanning said intersection in both directions, an overpass section including a plurality of single lane units disposed side by side and parallel to one of said thoroughfares, ramp sections for each of said single lane units providing an approach to said unit and an exit therefrom, said overpass single lane units and said ramp single lane units all being substantially identical and each including a deck plate, a pair of curb plates affixed to said deck plate and extending upwardly therefrom, and paving material overlying said deck plate, and means fully and freely suspending each of said overpass single lane units directly from said framework above said intersection.

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