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ROAD GAUGES

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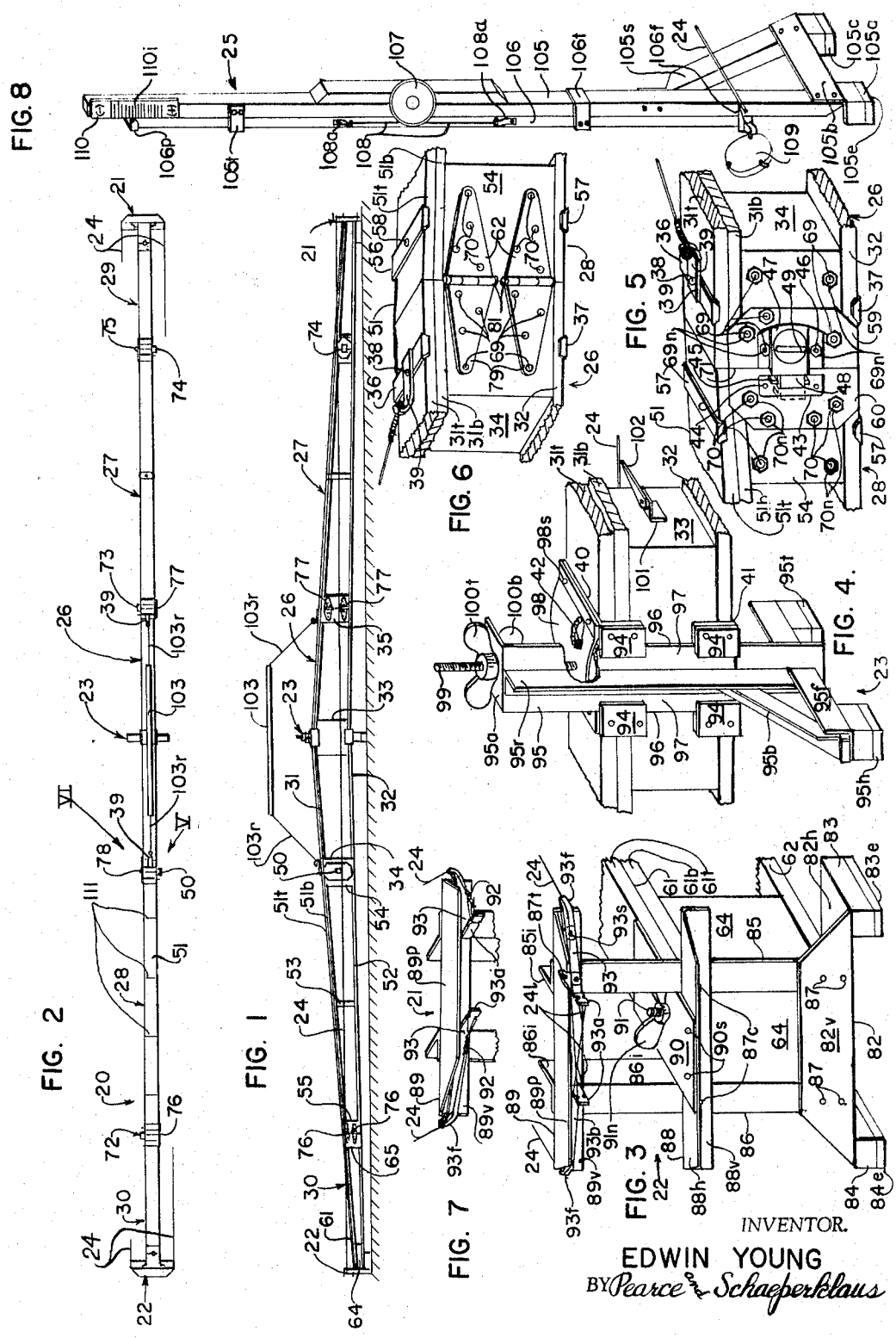

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# ROAD GAUGES

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This invention relates to road gauges for use in checking the profile or contour of the surface of a road or other paved area.

Paved areas such as streets and highways in particular, are customarily constructed in accordance with specifications and drawings which prescribe the contour or profile of the pavement along a straight line, particularly the transverse profile of a road or highway showing its crowned profile, longitudinal profiles such as the edges and the center line, and other intermediate lines of those portions of a road in which transition from the transversely crowned contour of a straight section of such road through the tangent into a curve in which the transverse profile may be a straight sloping line or an upwardly crowned or downwardly curved or bowed transverse contour or profile. The profiles and contours of the foregoing type are usually defined with specified tolerances beyond which the surface must not deviate from the prescribed profile or contour. In order to determine whether a highway has been built, within permitted tolerances, to conform with the various contours specified, it has been the general practice in the past, to make such determination through the efforts of a surveying crew equipped with conventional surveying instruments. Such a survey requires a very substantial amount of time and labor, which in terms of cost is substantial. Further, a surveying crew by collecting field data which is subsequently processed can only check a limited amount of highway during a working day, and the accuracy of any such surveying is subject to introduction of human error, both in collection of field data and in computations involved in converting the field data to a form comparable with the specifications and in comparing same to the specifications, the field data at least being subject to instrumental error as well.

Some straight sections of highway of a width of 24 feet, have a specified transverse pavement surface profile which is symmetric with reference to the center-line of the 24 foot pavement. One such profile has an upwardly convex parabolic central portion extending symmetrically for three feet on both sides of the centerline of the pavement and then along a tangent straight line of constant downward slope of 3/16 inch to the foot to the edges of the highway. Checking the parabolic profile of the six foot wide central portion is a difficult task when conventional surveying instruments are used. As a result the central portion of the concrete pavement is apt to be assumed to be of prescribed parabolic profile, sole reliance being placed upon the shape of the screed of the cement leveling or spreading machine because of the difficulty of satisfactory surveying. In the laying of asphalt or petroleum type surfacing materials, same are usually laid in the form of two twelve foot ribbons which slope downwardly and outwardly from the center line at which they meet, the parabolic contour of the central portion of the pavement is simply that contour which results from rolling of the peak with a road roller incident to compacting of the material.

An object of this invention is to provide a device which may be conveniently transported and operated by one person.

Another object of this invention is to provide a device of the foregoing character with which one person may check the surface of a highway for conformity with specifications of the character mentioned above.

Another object of this invention is to provide a device of the above character, so constructed as to be readily



adapted for use in checking highway pavement contours of various usual lengths.

Another object of this invention is to provide a device of the above character which may be used to check the conformity of various contours of a road surface to specifications, speedily and accurately at a substantial saving in time and labor.

Another object of this invention is to provide a device of the above character which is so constructed as to be light in weight, strong, rugged, resistant to permanent distortion affecting its accuracy, easily transportable by one man from place to place in compact condition, easily placed in operative condition or in compact condition by one man and may be easily transported from profile line to profile line checking positions by one man.

Another object of this invention is to provide a device of the above character which may be easily checked for correctness in the field at the time it is placed in operative condition or at any time when it is in operative condition, thereby avoiding waste of time through use of an erroneous instrument.

Another object of this invention is to provide a device of the above character which is constructed so as to substantially minimize the effect of any distortion, temporary or otherwise, of the frame or other portion, of the device upon readings obtained through its use in checking surface profile contours and the like.

Another object of this invention is to provide a device of the above character having an elongate supporting frame, at least one stringline supported at two points adjacent respective ends of said frame and spanning the distance between said points in a substantially straight line fashion and parallel to an imaginary straight line extending between points which perpendiculars from the stringline at the stringline supporting points intersect the surface, the contour of which is to be checked.

Another object of this invention is to provide a device of the above character having a lightweight, strong frame comprising a plurality of sections adapted to be repeatedly secured in predetermined aligned relation to each other.

Another object of this invention is to provide means for measuring the distance from points on the surface of the pavement beneath the stringline to the stringline at any desired point therealong.

The above and other features of this invention will in part be obvious and will in part be apparent to those having ordinary skill in the art to which this invention pertains, from the following detailed description and the drawings of the illustrative embodiment of the invention disclosed.

In the drawings:

FIG. 1 is a view in side elevation of what presently appears to be a preferred embodiment of my invention;

FIG. 2 is a top plan view in the device shown in FIG. 1;

FIG. 3 is a view in perspective of an end portion of the device shown in FIG. 1;

FIG. 4 is a fragmentary view in perspective of the central portion of the device shown in FIG. 1;

FIG. 5 is a fragmentary view in perspective of a fragmentary portion of the device of FIGS. 1 and 2 viewed in the direction of arrow V in FIG. 2;

FIG. 6 is a view in perspective of the fragmentary portion of the device shown in FIG. 5, but viewed from the direction of arrow VI in FIG. 2;

FIG. 7 is a fragmentary view in perspective of a portion of one of the end columns of the device shown in FIG. 1; and,

FIG. 8 is a view in perspective of a stringline reading standard or measuring gauge used in cooperation with the device of FIG. 1 for measuring the elevation of a

point on the pavement surface beneath the stringline of the device of FIG. 1 from a standing position.

In the following detailed description and the drawing, like reference characters indicate like parts and any dimensions given are, unless otherwise stated, for purposes of illustration and not for any purposes of limitation.

A stringline device constructed in accordance with an embodiment of this invention is shown generally in FIGS. 1 and 2, and comprises a frame **20**, central column **23**, end columns **21**, **22** and stringline **24** supported for cooperation with stringline reading standard **25** shown in FIG. 8.

Frame **20** is preferably light in weight, stiff and strong in construction, but need not be rigid in the inflexible sense, as some flexibility is quite acceptable as will hereinafter appear, I have found that many parts of frame **20** may be made from straight grained, clear, white pine lumber which has been impregnated with raw linseed oil and cured, while others may be of strong lightweight metal alloys.

As shown in FIGS. 1 and 2, frame **20** has a central portion **26** coupled by span portions **27**, **28** to end portions **29**, **30** and is preferably constructed with an underprofile having camber or arch at least as great as that of the greatest crowned profile as might be encountered in a surface to be gauged.

Central portions **26**, shown in FIGS. 1, 2, 4, 5 and 6, has an upper stringer **31** having a top member **31***t* and a bottom member **31***b*, a lower stringer **32**, spaced by central spacer **33**, and end spacers **34**, **35**. The stringers and spacers are joined together by suitable securing means such as is shown in FIGS. 5 and 6, where an upper saddle plate **36** and a lower saddle plate **37** are respectively shown straddling upper and lower stringers **31**, **32**. Bolt **38** extends successively from its head, down through aligned apertures in a handle anchor **39**, upper saddle plate **36**, upper stringer top and bottom members **31***t* and **31***b*, end spacer **34**, lower stringer **32** and lower saddle plate **37** into engagement with a nut (not shown). I prefer that bolt **38** is snuggly received in the apertures, as may be accomplished by drilling and tapping them to size for bolt **38**, in order that bolt **38** serves to index as well as secure the several parts engaged by it. Another bolt **38** similarly secures corresponding portions of members relative to end spacer **35**.

Upper saddle bracket **40** straddles the mid-portion of upper stringer **31** and lower saddle bracket **41** cradles or straddles the mid-portion of lower stringer **32** as shown most clearly in FIG. 4, and are secured in place by a bolt **42** which extends successively through bracket **40**, upper stringer **31** (**31***t* and **31***b*) central spacer **33**, lower stringer **32** and bracket **41** into cooperation with a nut, not shown.

Span portion **28** of frame **20** has an upper stringer **51** having a top member **51***t* and a bottom member **51***b* and a lower stringer **52** spaced by central spacer **53** and end spacers **54**, **55**. The stringers and spacers are joined together in a manner similar to that in which the similar portions of central portion **26**, are secured, namely, a pair of saddle plates **56**, **57**, respectively straddle the upper and lower stringer **51**, **52** at locations opposite each spacer **53**, **54**, **55** and a bolt **58** with its head in cooperative engagement with an upper saddle plate **56** extends successively through the upper saddle plate, upper stringer, the respective spacer, lower stringer and lower saddle plate into cooperative engagement with a nut (not shown).

Span portion **27** is a substantial duplicate of span portion **28** and like reference characters have been applied to corresponding parts thereof in accordance with the above description of portion **28**.

End portion **30** has an upper stringer **61**, having a top member **61***t* and a bottom member **61***b*, and a lower stringer **62** spaced by end spacers **64**, **65**. Upper saddle plate **66** straddles upper stringer **61** and a lower saddle plate **67** straddles lower stringer **62**. Bolt **68** extends successively through plate **66**, stringer **61**, end spacer **65**, stringer **62** and plate **67** into engagement with a nut (not shown). Upper stringer **61**, end spacer **64** and lower stringer **62** may be secured by suitable means such as glue, mechanical fastening means or the like.

End portion **29** is a substantial duplicate of end portion **30** and like reference characters have been applied to corresponding parts thereof in accordance with the above description of end portion **30**.

The portions **30**, **28**, **26**, **27** and **29** of frame **20** are coupled together so as to be secured in aligned tandem relation by lockable hinged joints, a representative one of which is illustrated in FIGS. 5 and 6.

The adjacent end faces of portions **26** and **28** are smooth, flat and so oriented that when in face-to-face abutment the portions **26** and **28** will be in desired alignment. Portions **26** and **28** are then secured as by clamping or the like in aligned positions with their end faces in face-to-face abutting relation as shown in FIGS. 5 and 6. Hinge means such as hinges **78** shown in FIG. 6, are then applied by securing the hinge plates **79** to end spacer **34** and hinge plates **80** to end spacer **54** as hereinafter described, while the axis of the hinge pins **81** is disposed in the plane of abutment of the end faces of the frame portions **26**, **28**. The play or slack in the hinge is substantially removed by pulling the hinge plates **79**, **80** in opposite directions so as to end to draw them into greater spaced relation to each other and into firm engagement with the coupling hinge pin **81**.

Similarly, hinges **76** couple portions **28** and **30**, hinges **77** couple portions **26** and **27** and hinges **75** couple portions **27** and **29**, so that frame **20** may be folded into the condition in which its portions are substantially in side-by-side parallel relation with the end portions **29**, **30** outermost.

Respective similar lock means **50**, **72**, **73**, **74** are provided for securing each hinged joint against folding and each like lock means **50**, as shown particularly in FIG. 5, may be associated with indexing means.

Index-plates **59**, **60** are respectively secured to portions **26** and **28** with their edge faces abutting at **71** in the plane of the end faces of portions **26** and **28**, as shown in FIG. 5. Index plate **59** and hinge plates **79** may be secured, at least in part, by screws or bolts **69**, the heads of which may for example engage the plates **79** while nuts **69***n* engaging the bolts also engage plate **59**. Index plate **60** and hinge plates **80** are similarly secured by bolts **70** and nuts **70***n*.

Base **43** is secured in fixed relation to index plates **60**, by screws or bolts **44** with lug **45** projecting. A latch base **46** is secured in fixed relation to index plate **59** by a pair of bolts **69** and nuts **69***n*. A turret **47** is pivotally mounted on base **46** for rotation about an axis parallel to a radius of the axis of pivoting of hinges **78**. A hook-bolt **48** is supported in turret **47** for sliding movement along a radius of the axis of turret pivoting and its sliding movement is effected and controlled by swinging movement of latch handle **49**. The latch hook-bolt **48** is shown in retracted or latched condition in full lines in FIG. 5 and by swinging handle **49** in a clockwise direction as viewed in FIG. 5, hook-bolt **48** may be advanced into the position shown in dashed lines and then swung in clockwise unison movement with the turret **47** and handle **49** into a position in which it will not engage lug **45** when the hinged joint is swung open. Locking of the hinged joint may be effected by swinging portions **26** and **28** into alignment with index plates **59**, **60** abutting, and then effecting counterclockwise movement of handle **49** to swing turret **47** to the position of FIG. 5, preferably determined by an indexing stop (not shown), and then continuing swing of handle **49** to retract hook-bolt **48** into securing engagement with lug **45**.

End columns **21** and **22** are alike and the reference characters used in the following description of column

22, FIG. 3, apply to corresponding portions of column 21.

Column 22, shown in FIGS. 1, 2 and particularly in FIG. 3, has an angle form base 82 supported on a pair of spaced pedestals or feet 83, 84. Angle columns 85, 86 are secured to the vertical flange 82*v* of base 82 by securing means 87 such as bolts, screws, rivets or the like, and also to the horizontal flange 82*h* of base 82 by similar securing means or brackets not shown. Angle columns 85, 86 have spaced parallel opposed flanges 85*i*, 86*i* between which frame end portion 30 is indexingly received while it rests on top of the flange 82*h* spaced above the surface to be gauged and with its end face abutting flange 82*v*. Angle columns 85, 86 are supportingly coupled by tie-bars 88 and 89.

Tie-bar 88 has a vertical flange 88*v*, secured to angle columns 85, 86 by securing means 87*c*, in coplanar relation to flange 82*v* and which like 82*v* serves as an indexing abutment for frame end portion 30. Horizontal flange 88*h* of tie-bar 88 is in substantial alignment with the upper surface of stringer 61. Leaf or plate 90 is secured by means 90*s* to flange 88*h* and extends in overlying relation to the upper surface of stringer 61. Aligned apertures are provided in flange 82*h*, members 62, 64, 61*b*, and 61*t* of portion 30 and plate 90 to receive indexing and securing bolt 91 with which wing-nut 91*n* cooperates to secure column 22 and frame 21 in predetermined relation.

Tie-bar 89 has a vertical flange 89*v* fixedly secured by securing means 87*t* to angle columns 85, 86 and a protective horizontal flange 89*p* beneath which stringline anchoring and supporting means are disposed. Stringline support 93 has a body portion 93*b* secured in face-to-face relation to flange 89*v* by screws 93*s*. A notched anchor lug portion 93*a* is provided at one end of body 93*b* and a stringline support finger 93*f* which is curved and externally grooved to support and hold stringline 24 without its riding over an edge which might damage it. As shown in FIGS. 3 and 7, two stringline supports are provided on each column. Screws 93*s* preferably extend through slots in the body portion 93*b* of stringline support 93 in order that the position of the latter may be adjusted in relation to the column while screws 93*s* are loosened and then fixedly secured when they are tightened. Stringline 24 has a permanent loop 241 in its one end which encircles an anchor lug 93*a* and cooperates with a retaining notch therein. Stringline 24 extends from loop 241 through the external groove in finger 93*f* of column 22 to the groove in a cooperating finger 93*f* on column 21 and thence to tension spring 92 to one end of which it is secured. Tension spring 92 is adjacent its other end supported by an anchor lug 93*a*, FIG. 7. A pair of stringlines 24 are supported in spaced parallel relation, one on each side of frame 20, and spaced laterally thereof.

In order that the frame 20 may be supported in a predetermined condition, I provide central column 23 in cooperative relation to the pair of saddle brackets 40, 41 and central portion 26 of frame 20. Guides 94 are secured to coplanar faces of adjacent vertical flanges of saddle brackets 40, 41. Guides 94 each cooperate with an edge 96 and face 97 of slide 95 to limit it to substantially linear vertical movement. Slide 95 is rigid, stiffened by angle form reinforcing member 95*r* and has a horizontal foot 95*f* braced by angle member 95*b* and having toe 95*t* and heel 95*h*. Slide 95 is thus a rigid assembly slideably related to frame 20. Arched bracket 98 is secured to the upper saddle bracket 40 by securing means such as screws 98*s*. Threaded stem 99 is secured to arched bracket 98 in parallel relation to the line of movement of slide 95 and extends through an aperture provided in arms 95*a* of the slide. A pair of wingnuts 100*t*, 100*b* are provided in threaded relation to stem 99 and on opposite sides of slide arm 95*a* which may be securely clamped in fixed relation to stem 99 as desired.

When frame 20, columns 21, 22, 23 and stringline 24 have been assembled, the assembly is placed on a supporting surface and the central column 23 is moved into the position in which frame 20 is straight and parallel to the stringlines 24 as shown in FIG. 2.

The stringlines 24 may be made of any suitable material such as thread, cord or other nonkinking, lightweight, strong, durable material of small cross-section, for example, nylon thread, fish line, cable cord or the like, which may be substantially tensioned so as to provide a substantially straight reference line. Wing nuts 100*t* and 100*b* are then positioned so as to clamp arm 95*a* in the position relative to stem 99 in which frame 20 has the arch or camber with which it was constructed.

Positioning of the stringlines is effected by loosening screws 93s, locating each stringline support 93 so that stringline 24 at the tip of support finger 93*f* is a predetermined perpendicular distance above a point on edge 83*e* or 84*e* in the plane of the undersurfaces of the pedestals 83, 84, and then retightening the screws 93*s*. Each stringline support 93 is positioned so that it supports the stringline 24 the same predetermined perpendicular distance from the plane of the under surfaces of the pedestals 83, 84 and in the same relation to the subjacent edge 83*e* or 84*e* as the case may be. The stringlines 24 are placed under equal tension and index bracket 101 is secured to central spacer 33, FIG. 4, so as to support index finger 102 for swinging about a vertical axis and through an arc of at least 180°. The index finger 102 extends radially from its axis a distance very slightly less than one half the distance between the spaced, parallel stringlines 24 and bracket 101 is so positioned that each stringline 24 will be adjacent the tip of the index finger 102 when the latter extends perpendicularly to the former. Thus, the index finger 102 may be used to determine if frame 20 is aligned in relation to the stringline 24 and is supported with the proper amount of camber or arch relative to the plane of the end column feet 83, 84 and irrespective of the elevation of the portion of the surface upon which heel and toe abutments 95*h*, 95*t* rest, with reference to that plane of end column feet 83, 84.

Once index finger 102 is so located, the frame, columns and stringline unit may be transported from place to place by grasping bar-handle 103, the ends of which are suitably connected to handle anchors 39 by means such as strong rope 103*r* which may also be somewhat elastic, as nylon rope, for example, which because of its elasticity, would as rope 103*r* serve to cushion jerks or shocks which may be transmitted from the handle to the stringline unit. The unit may be set down in a position as desired, central column 23 shifted laterally of the line between columns 21, 22 if necessary, and wing nuts 100*t* and 100*b* rotated if necessary to restore the proper camber to frame 20, all in a precise fashion as indicated by references of index finger 102 in relation to stringlines 24.

When the stringline unit is set up in predetermined relation, the stringlines 24 are parallel to each other and to the plane of pedestals or feet 83, 84, and thus by measuring the distances from a series of points spaced along a stringline 24 to corresponding points on the surface therebeneath, the contour of the surface along a line beneath the stringline may be easily determined.

To measure the distance from a point on the stringline 24 to a point therebeneath on the surface being gauged, I provide a stringline reading standard 25 shown in FIG. 8. Standard 25 has a staff 105, which may be white pine treated and cured as mentioned earlier, or other lightweight suitable material, secured to a base 105*b*. Strut 105*s* joins spaced portions of staff 105 and base 105*b* for greater rigidity. A pair of wear-resistant surface-engaging abutments 105*a* and 105*c* are secured to base 105*b*, the plane of the surface-contacting faces of the abutments being coplanar and the staff 105 extending

perpendicularly to said plane. A slide **106** is secured in slideable relation to staff **105** by strap **105***t* secured to staff **105** and by strap **106***t* secured to slide **106**. Sliding of slide **106** along staff **105** is controlled by knob **107** mounted for rotation on staff **105** and which may be a capstan about which a portion of cable **108** is tightly wrapped. The ends of cable **108** are secured to cable anchors **108***a* provided on slide **106** whereby rotation of knob **107** shifts slide **106** up or down along staff **105**. A mirror **109**, preferably a concave, magnifying mirror, is adjustably mounted on the lower end portion of slide **106** adjacent finger **106***f* which extends across one face of staff **105**. A pointer **106***p* is mounted on slide **106** adjacent its upper end at substantially the eye level of the gauger or operator. Scale **110** is mounted on staff **105** in cooperative relation to adjacent pointer **106***p*. With pointer **106***p* at the index or "zero deviation" line **110***i* of scale **110**, the tip of finger **106***f* is positioned so as to spaced from the abutment edge **105***e* a distance equal to the distance from stringline **24** to the subjacent pedestal edge **83***e* or **84***e*. Thus, with mirror **109** properly positioned, a gauge operator by turning knob **107** may with the aid of mirror **109** move finger **106***f* into the position wherein its tip is at stringline **24**, FIG. 8, and then read scale **110** at pointer **106***p*. As shown, surface points below the reference plane supporting end column feet **83**, **84** will result in readings between the "zero" line **110***i* and the minus sign (—) at the upper end of scale **110** while points above the reference plane will give readings between the "zero" line **110***i* and the plus sign (+) at the lower end of scale **110**. Also the reading stand **25** may be used to verify its own setting and the proper positioning of the stringlines **24** at the tip of each finger **93***f* where mark readings should be indicated, that is pointer **106***p* should indicate scale "zero" line **110***i* when finger **106***f* is at stringline **24**. With very little experience a gauge operator can check the tension in stringline **24** by plucking same and listening to the sound produced.

For gauging highway surface contours or the like, reading stations may be indicated by marks **111** on the top surface of frame **20** at one foot or other desired space intervals.

Since highway pavements are constructed in standard widths, the number of sections comprising frame **20** may be easily varied, to alter its length, for example, a plurality of sections may be substituted for each of the single span portions **27**, **28** or longer end portions substituted for portions **29**, **30** when frame **20** is constructed as herein disclosed.

Having thus described what presently appears to be a preferred embodiment of my invention, it will be apparent to those having ordinary skill in the art to which this invention pertains that various modifications and changes may be made in the illustrative embodiment, without departing from the spirit or scope of the appended claims.

What I claim and desire to secure by Letters Patent is:

**1.** A pavement surface contour gauging device comprising in combination a frame having two spaced indexing fingers, a stringline supported by and in fixed relation to said frame and extending on a substantially straight line between and predetermined by said spaced fingers cooperating therewith and means cooperating with said stringline and severally with selected points on the pavement surface therebeneath to determine the location of each of said points with reference to said stringline whereby the profile of said surface beneath said stringline may be determined.

**2.** A pavement surface contour gauging device comprising in combination a frame having two spaced indexing fingers, a stringline supported by and in fixed relation to said frame and extending on a substantially straight line between and predetermined by said spaced fingers cooperating therewith and a reading standard cooperating with said stringline and successively with selected points on the pavement surface therebeneath to measure the distance to each of said points from said stringline whereby the profile of said surface beneath said stringline may be determined.

**3.** A pavement surface contour gauging device comprising in combination a frame having two spaced indexing fingers, a stringline supported by said frame and extending on a substantially straight line between and predetermined by said spaced fingers cooperating therewith, a staff, a scale thereon, a slide movable along said staff, a pointer arm on said slide for cooperating with said stringline, a scale indicator on said slide cooperating with said scale, means for moving said slide along said staff to place said pointer arm in cooperating relation with said stringline while said staff engages a selected point on the pavement surface therebeneath and said scale indicator and scale indicate the location of said point with reference to said stringline whereby the location of any point on the vertical profile of said surface on a line beneath said stringline may be determined.

**4.** A device for gauging the contour of a pavement surface comprising in combination a pair of spaced end columns, a frame supported by and supportingly joining said end columns, a pair of substantially parallel spaced stringlines supported adjacent their ends at equal height by said columns, each one of said pair being equally spaced laterally on opposite sides of said frame and loading the frame under compressive forces directed longitudinally thereof, and means for measuring the distance between selected points on one said stringline and the surface therebeneath while the stringline is in a selected position whereby the profile of said surface along a line beneath said stringline may be determined with reference to said stringline.

**5.** A device for gauging the contour of a pavement surface comprising in combination a pair of spaced end columns; a frame having a camber arch sufficient to preclude contact with the subjacent pavement surface and supported above said surface by and supportingly joining said end colunms, a pair of substantially parallel spaced stringlines supported adjacent their ends at equal height by said columns each one of said pair equally spaced laterally on opposite sides of said frame and loading said frame under compressive forces directed longitudinally thereof, and means for measuring the distance between selected points on one said stringline and the surface therebeneath whereby the profile of said surface along a line beneath said stringline may be determined with reference to said stringline.

**6.** A device for gauging the contour of a pavement surface comprising in combination a pair of spaced end columns, a semi-rigid frame having a preferred camber arch sufficient to preclude contact with the subjacent pavement surface and supported adjacent its ends by and supportingly joining said end columns, a central column, means adjustably coupling said central column in supporting relation to said frame intermediate said end columns for supporting said frame in the condition in which it has said preferred camber arch, a pair of substantially parallel spaced stringlines supported adjacent their ends at equal height by said end columns and equally spaced laterally of said frame, and means for measuring the distance between selected points on one said stringline and the surface therebeneath whereby the profile of said surface along a line beneath said stringline may be determined with reference to said stringline.

**7.** A device for gauging the contour of a pavement surface comprising in combination a pair of spaced end columns, a semi-rigid frame having a preferred camber arch sufficient to preclude contact with the subjacent pavement surface and supported adjacent its ends by and joining said end columns, a central column, means adjustably coupling said central column in supporting relation to said frame intermediate said end columns for sup-

porting said frame in the condition in which it has said preferred camber arch, a pair of substantially parallel spaced stringlines supported adjacent their ends at equal height of said end columns and equally spaced laterally of said frame, index means mounted on said frame and cooperating with said stringlines to indicate the condition of said frame by its relation to said stringlines, and means for measurng the distance between selected points on one said stringline and the surface therebeneath whereby the profile of said surface along a line beneath said stringline may be determined with reference to said stringline.

8. A device for gauging the contour of a pavement surface comprising in combination a pair of spaced end columns, a semi-rigid frame having a preferred camber arch sufficient to preclude contact with the subjacent pavement surface and supported adjacent its ends by and joining said end columns, a central column, means adjustably coupling said central column in supporting relation to said frame intermediate said end columns for supporting said frame in the condition in which it has said preferred camber arch, a pair of substantially parallel spaced stringlines supported adjacent their ends at equal height by said columns and equally spaced laterally of said frame, index means mounted on same frame and cooperating with said stringlines to indicate the condition of said frame by its relation to said stringlines, a staff cooperatively engaging said surface substantially at a point beneath said stringline, a scale on said staff, a slide on and movable along said staff, a pointer arm on said slide for cooperating with one said stringline, a scale indicator on said slide cooperating with said scale, means for moving said slide along said staff to support said pointer arm at said stringline and said scale indicator in cooperation with said scale whereby the distance relationship between the staff engaged point on the surface and said stringline is indicated by said scale and indicator in determining the profile of said surface along a line beneath said stringline with reference to said stringline.

9. A pavement surface gauging device comprising in combination a supporting frame, an elongate thin line member extending spanwise between and supported at two spaced points by and in fixed relation to said supporting frame, said line member being alongside said supporting frame and above and substantially parallel to an imaginary straight line between two spaced points on a pavement surface and means supported at any selected point upon said surface between said two spaced points and beneath said line member in cooperative indicating relation to said line member, whereby the elevational relation to the imaginary line of the point supporting said second mentioned means may be determined.

10. A pavement surface gauging device comprising in combination a supporting frame an elongate thin line member alongside said supporting frame and extending spanwise between and supported at two spaced points by and in fixed relation to said supporting frame, said spaced points each being equidistant from respective predetermined equally spaced points on a surface to be gauged, said line member being substantially parallel to an imaginary straight line between said points on said surface and means supported at a point upon said surface between said spaced surface points and in cooperative indicating relation to said line member, whereby the elevational relation to the imaginary line of the point supporting said second mentioned means may be determined.

11. A device for gauging the contour of a pavement surface comprising in combination a pair of spaced end columns, a semi-rigid frame supported adjacent its ends by and joining said end columns, a central column, means coupling said central column in supporting relation to said frame intermediate said end columns for supporting said frame, the frame being supported above the pavement surface by the central and end columns, a stringline supported adjacent its ends by said end columns and in fixed relation to said frame, and means for measuring the distance between selected points on said stringline and the surface therebeneath, whereby the profile of said surface along a line beneath said stringline may be determined with reference to said stringline.

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