This invention relates to bridges, particularly of the bascule or leaf lever type, together with their approaches and equipments.

The several objects sought to be attained include means to obtain, and positively maintain, a level roadway at the junction of the leaves when in lowered position; means to cushion the leaves at the extremities of their movements avoiding bridge shock, jolting and jarring; an auxiliary counter-balancing device movable into different positions as may be required and the interposition of spring buffers to counteract movement of the leaves when they are being moved into either of their extreme positions.

Further features are, in the provision of automatic navigation light signals at the meeting ends of the leaves, viable to all traffic there below, as roadway or waterway, changing in accordance with their position; automatic barrier gates at the entrance of the bridge controlling traffic there over; side walks raised above the flooring of the bridge to allow for the ready disposal of rainwater, snow, light dirt, etc., and to reduce wind resistance when the leaves are in the air; side walks and bulkheads composed of readily removable, interchangeable elements requiring no individual fastening means; indirect lighting means for the bridge carried in hand rails and curbs; center apron plates combined with jolt and jar proof shear-locks that allow either leaf to open or close independently and also provide for expansion and contraction of the leaves.

These and other important improvements in bridges, as will hereafter appear, are accomplished by the novel construction, combination and arrangement of parts hereinafter described and illustrated in the accompanying drawings, constituting an essential component of this disclosure, and in which:

Figure 2 is a side elevational view of the same.

Figure 3 is a longitudinal sectional view taken on line 3—3 of Fig. 1.

Figure 4 is a plan view of one portion of the bridge and its approach, including a traffic control gate, drawn to a reduced scale.

Figure 5 is a fragmentary perspective view showing the roadway, side walk, guard rail, curbing, lighting arrangement and general structural features.

Figure 6 is an enlarged fragmentary plan view of the traffic control gate and adjacent elements.

Figure 7 is a side elevational and sectional view of the parts shown in Fig. 6.

Figure 8 is a sectional view taken on line 8—8 of Fig. 2 showing the eccentric adjusting device of the bridge seated on its supporting column.

Figure 9 is a fragmentary side elevational view of the automatic light signal system.

Figure 10 is a fragmentary side view of the shee-rocks at their engaging ends, drawn to an enlarged scale.

Figure 11 is a fragmentary elevation of a bridge bulkhead, shown in section in Fig. 3.

Referring in greater detail to the drawings, the structure will be seen to consist of two main operating parts, substantially alike and arranged in contra-relation, each being pivoted to turn into horizontal and essentially upright positions as may be required to accommodate traffic conditions.

One of these lever-like bridge leaves only will be described, as it will be understood that the other is intrinsically a duplicate.

Set in piers upon a solid foundation, at the sides of the water or roadway to be spanned, are main support columns 25, while spaced therefrom, nearer the edge of the stream or underpass, are live-load-bearing columns 26 to sustain a large proportion of the bridge weight and its load when in closed position, and spaced further apart, on the opposite, land side are still other columns 27 carrying the bridge approaches.

Mounted on the columns 25 are bearings 28 to receive trunnions 29 on which are seated gudgeons 30 firmly fixed to the main leaf girders 31 of the bridge, these elements being reduced in cross sectional depth towards their meeting front ends and increased at their opposite road approach or tail ends 32, all presenting level horizontal upper surfaces.

A series of transverse beams 33 extend across between the girders 31 to carry the bridge flooring 38, which is also supported, together with the superstructure, by other heavier beams 34 alternating therewith, while at points on the approach sides 32 of the girders are a pair of spaced transverse beams 36 to support a rigid pendant counter-weight frame consisting of pockets 37 provided with weights 38 in a manner to permit of addition or removal to properly balance the overhang of the girders.

The foregoing is generally descriptive of a conventional type of bascule or balance bridge and is given in order that the improvements may be readily understood.

Rigidly attached to the lower portions of the terminal outer ends of the girders 32 are brackets 40—41 having between them tail end bumpers 55.
their upper and lower faces extending outwardly beyond the upper brackets 40 and adapted to contact the heads of the cushion buffers 44 movable up and down in the bearings 45 fixed on the main approach girders 48 and pressed downwardly by springs 46 surrounding the buffer rods within the bearings.

These spring buffer rods are threaded and provided with adjusting lock nuts bearing against washers at the ends of the springs; the buffers are disposed below the forward ends of the girders 48, supporting the permanent roadway at the bridge approaches and serve to adjustably cushion the descent of the main leaf girders 31 into closing position; it is to be noted that the buffer rods project through guides in the bearings to act as positive stops when the leaf girders are in fully closed position, the movement of the leaf girders being further controlled by brakes, not shown.

Co-operative therewith are similar bearings 50 attached to the sides of the leaf girders 31 and carrying buffers 51, pressed downwardly by springs 52, coiled around the buffer rods within the bearings, and adjustable by nuts 53.

These buffers make contact with the upper surfaces of support bearings 55 mounted on transverse beams 56 extending over and between the live-load-bearing columns.

The pairs of bearings 55 have revolvably mounted in them short shafts 57, their central portions being cranked or offset to provide eccentricity 58, or may be supplied with cams, and are turnable by wrenches applied to their squared end projections 55. The live-load-bearing shafts fit in bearings that have set-screws 59' in them, so that the shafts may be held in a firm position after adjustment is made.

Remarking on the upper surface of the eccentricities 58 are concavely faced blocks or live-load-bearing 60 fixed on the sides of the main trunnion girders 31, and, as will be evident the ultimate weight of the main trunnion girders, and proportion of the bridge load, is supported on the shaft eccentricities in a manner to permit of up or down adjustments; furthermore, the descent of the leaves or main trunnion girders is cushioned at two points of contact on closing, the same being the bumpers at the tail ends of the leaves and at the live-load-bearing rests.

When the bridge is raised, the bumpers 43 make contact with spring buffers 62 having buffer-rods slideable in bearings 63 adjustably mounted in flanged elements 64 secured between the adjacent faces of the support columns 25—26. This bearing also acts as a final travel stop when the leaves are in a full open position.

These buffer rods are normally pressed outwardly by encircling springs 66 and their ultimate movement is controlled by adjustable nuts 67.

Thus the action of the bridge is limited and cushioned by spring actuated buffers at the limits of its movement in both directions.

At the meeting front ends of the leaf girders, both are provided with a series of bars 70 mounted to move lengthwise between a plurality of rollers 71 arranged in upper and lower rows at the ends of the girders, the bars having at their rear ends studs 72 moveable through openings in the beams 34 in the floor supporting series, the studs preventing the apron plates from coming off when the bridge is in an open position.

Springs 76 coiled around the studs 72 press the bars 70 outwardly to the limit of adjusting nuts 75, these elements being below the plane of the flooring 35.

The springs 75, which bear at their inner, rear ends against the beam 34, press the shear-locks and apron plates outwardly, being compressed, when the bridge is closed, due to the shear-locks and center apron plates touching each other; in this closed position there is a space between the beam 34 and studs which allow for contraction and expansion of the bridge elements due to extremes in temperature.

The apron plates and associated elements lap over the roadway, sidewalks, curbs and hand railings sufficiently to avoid any open space at these points, being snugly closed.

The shear-locks comprise the following construction.

One of the bar series carries a raised transverse beam 77 having an angular outstanding central face in which are rotatably mounted rolls 78 on the male end of both shear-locks, the same being engageable in a corresponding female lock consisting of an angular longitudinal groove 79 in the face of a mating beam 80 on the other main girder.

It is to be noted that the rolls render the device substantially frictionless when the ends of the main girders are brought into contact or when closing or opening, and that all shock and jar is eliminated, due to the resiliency of their supports, and form a firm joint when in engagement.

Disposed over shear-locks 77—80 are center apron plates 82 having meeting edges to cover any gap that might otherwise occur; these plates are carried by transverse beams 83 which in turn are supported by bars 70.

Carried on the front ends of both sets of main girders 31, at their outer sides, are discs 85 mounted to freely rotate in lantern housings 86, removably engaged on the bridge, and provided with colored lights, as red and green, 87—88, the former showing red through the disc when the bridge is open for traffic theretoe and showing green when the bridge is raised, thus automatically presenting visible warning or safety signals to traffic under the bridge.

Springs 89, at the lower peripheral edges of the navigation lights thus formed act as shock absorbers to prolong the life of the lights, as electric bulbs.

The discs 85 are provided with weights 85' at their lower edges, which cause the lenses to pass the openings in the lantern housings 86, to act by gravity as the bridge is opened and closed.

The lantern housings are carried by tongue and groove connections attached to the outermost sidewalk main posts; only one bulb is necessary in each housing as the gravity actuated, lens carrying discs automatically display proper signals as the bridge is raised and lowered.

A flexible connection may be used to raise and lower the navigation lights when making bulb replacements.

At about midway of each of the short beams 83, channel iron 84 are arranged in spaced paired relation supported by the beams 34, and slideable on the beams 83 is an auxiliary counterweight 94 movable lengthwise of the bridge by a screw 95 that may be actuated by a hand wheel 96 of equivalent device, thus shifting the unpressed weight in accordance with requirements; obviously power means may be employed if preferred.

The counterweight 94, under ordinary condi-
tions, is positioned in approximately the center of length of the leaf to evenly balance it.

In case of failure of power actuating mechanism, the doors may be opened by moving the weight towards the tail end of the structure and, conversely, the bridge may be closed by moving the weight towards the front.

Carried by the upper portions of the main trunnion girders 81 are web braces 109 raised considerably above the flooring 35 and having on their outer surfaces a plurality of sidewalk main posts 101, between which are hollow hand-rails 102, their inner proximate surfaces 103 being inclined outwardly and downwardly from the top and provided with openings 104 through which indirect light may issue from lamps 108 enclosed in the rails. The bottom part of handrailing bar or channel has ample clearance above the sidewalk planking to allow for snow removal from the sidewalk. Indirect lighting does away with heavy lampposts and makes replacement of bulbs easy.

Thus the light is directed to part of the roadway and to the sidewalk floor 105, composed of slats retained at their outer ends in channels 106 and at their inner ends held by angle elements 107, secured to the upper flanges of the girders 31.

Due to this arrangement the floors of the sidewalks are readily removable for replacement or repairs at any time, as planks are easily taken out or put into position by removing sectional angle elements at curbing; the slats are reversible and can be made of wood, rubber, aluminum, etc.

Another series of lamps 108 are carried by the girders 31 at the curbs to thoroughly illuminate the bridge floor 35, the adjacent side edges of which are spaced as at 110 from the girders, below the sidewalks, in order to facilitate the disposal of light dirt, rainwater and snow; the open work also reduces wind resistance when the leaves are in open position.

The bridge bulkheads 115, made of heavy reversible planks, are similarly set at their bottom ends in channels 116 and held in place at their upper ends by bars 117, these bulkheads being arranged closely against the lower portions of the columns 26 and are thus readily removable, similar to the sidewalk tread elements.

The planks are held in position by retainers at the top and bottom of the fender. The retainers have spacers that fit between adjacent planks that are cut out to the same size as the spacers. The middle plank is straight and always put in place last and taken out first. The retainers may be held in position by a screw or bolt that goes through the spacer into the supporting member of the bulkhead.

In this construction there are three planks in every section. Thus planking repairs and replacements are easily made; the sidewalks may also be made in this way.

The traffic control gates 120 are disposed on the roadway approach adjacent the tail ends of the leaves, the same consisting of brackets 121, fixed on the outer sides of the bridge approach girders, and supporting posts 122, pivotally carrying frames 123, having in their outer end portions 124 adjustable counterweights 125 slidable on the bridge car or axled by hand screws 127.

The inner end portions 128 of the frames carry hollow extensions constituting the gates 120 and have heads 129 at their extremities in which are slidable stems 130 normally projected outwardly by springs 131.

Carried by the stems are male and female locks 132-133, in the former of which is mounted a roll 134 adapted to engage in grooves 135 formed in the female lock of the opposed elements.

The posts 122 have fixed on their inner sides brackets 148 against which bolts 149, slidable in the frame elements 128, make contact when the gates are down, or in operative position, the bolts being pressed by springs 151 held in adjustment by nuts 152.

The gates are pivotally on shafts 155 passing through lateral extensions of the posts 122, and fixed on the shafts are worm gears 156, actuated by worms on vertical shafts 158 driven by a bevel gear train 159 which may be actuated by a motor, or by hand, and if by motor, conductors 160 are extended to the incoming traffic side of the bridge so as to cause equal and simultaneous action of the gate pairs.

A signal system 152 is carried by the posts, and the gates are provided with a series of foldable slats 165, the lower of which reaches nearly to the roadway and sidewalks.

The gates are operated from inside of the incoming approaches, and/or by remote control from an operating house. When the gates close, a red traffic light automatically appears at a point above the horizontal shaft. At the center of the gate rods, over the roadway, are red lights that automatically go on when the gates are closed to traffic; the center of the gates is also provided with stop signs on the trolleys that are visible during the daylight.

Each gate is equipped with a key and hand crank for operating in an emergency, should power fail. The gates are also connected with traffic lights to a considerable distance away to give traffic an opportunity to stop before approaching the bridge too close when open.

While certain preferred embodiments of this device have been shown and described, it will be understood that changes in the form, arrangements, proportions, sizes and details thereof may be made without departing from the scope of the invention as defined in the appended claims.

Having thus described the invention, what is claimed as new and desired to secure by Letters Patent, is:

1. In a bascule bridge having opposed leaves, columns on which said leaves are pivoted, road end approach columns spaced therefrom, and oppositely spaced bulkhead columns, spring buffers fixed on the proximate sides of said approach and bulkhead columns at substantially equal radial distances from the axes of the leaf pivots, and double ended bumpers carried at the tail ends of said leaves to contact said buffers respectively when the leaves are at the extremities of their pivotal movements.

2. In a bascule bridge having opposed leaves, columns on which said leaves are pivoted, and bulkhead columns spaced therefrom, bearings supported by said bulkhead columns, eccentric shafts rotatable therein, means to turn said shafts, set screws to clamp the shafts when said eccentrics are in adjustment, journals interposed between said eccentrics and said leaves and spring buffers carried by said leaves to cushion the action of said journals.

3. In a bascule bridge having opposed leaves, columns on which said leaves are pivoted, and bulkhead columns spaced therefrom, height adjustable support means intermediate said bulk-
head columns and leaves, spring buffers carried by said leaves to cushion the contact of said leaves and said height adjustable support means and means for adjusting the resiliency of said buffers.

4. In a bascule bridge having opposed leaves, columns on which said leaves are pivoted, road end approach columns spaced therefrom, and oppositely spaced bulkhead columns, spring buffers fixed on the proximate sides of said approach and bulkhead columns at substantially equal radial distances from the axes of the leaf pivots, other spring buffers on said leaves to contact said bulkhead columns, and bumpers at the tall ends of said leaves to contact the first named buffers when said leaves are raised and lowered into extreme positions.

5. In a bascule bridge having opposed leaves, transverse beams at the meeting extremities of said leaves, one of said beams presenting an angular face and the other having a reciprocal groove, longitudinal bars slidable in said leaves supporting said beams, means to resiliently press said bars into engagement when said leaves are lowered into level positions, and apron plates automatically movable to cover the joint between said beams.

6. In a bascule bridge having opposed leaves, a plurality of guide rolls arranged in upper and lower rows adjacent the meeting ends of said leaves longitudinally thereof, bars movable between the rows of rolls, springs urging said bars outwardly, means limiting the movement of said bars, a beam having a grooved face carried by the bars of one of said leaves, a second beam carried by the bars of the other leaf, and a series of rolls mounted in said second beam, said rolls adapted to engage in the grooved beam when said leaves are in lowered position.

7. In a bascule bridge having opposed leaves, and spring pressed angular tenon and groove connections at the meeting ends of said leaves to interlock when said leaves are in the same level plane.

8. In a bascule bridge having opposed leaves, groove and roll connections at the abutting ends of said leaves, beams slideable longitudinally in said leaves and carrying said connections, and springs associated with said beams to urge said connections into engagement when said leaves are level.

9. In a bascule bridge having opposed pivotally supported leaves and counter-weights thereof, trackways carried by said leaves in a plane parallel and below their upper surfaces, auxiliary counterweights slideable on said trackways, and positive means to shift said auxiliary weights along said trackways.

10. In a bascule bridge having opposed pivotally supported leaves and counter-weights thereof, auxiliary counterweights slidably supported by said leaves, screws to actuate the auxiliary weights, and remote manual means to rotate said screws to adjust the auxiliary weights.

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