(No Model.) 4 Sheets—Sheet 1.

R. A. SAWYIER.

BRIDGE.

No. 381,584. Patented Apr. 24, 1888.

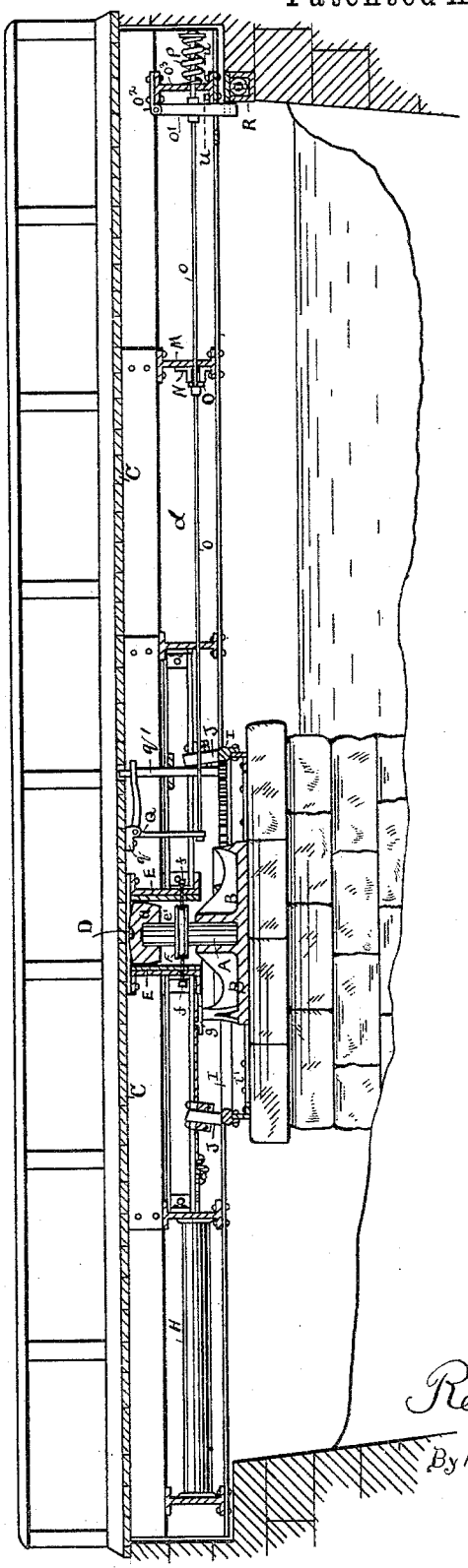


FIG. 1

WITNESSES
Geo. B. Travel.
Ira C. Hoehne

INVENTOR
Reuben A. Sawyier.
By his Att'y
C. C. Shepherd.

(No Model.) 4 Sheets—Sheet 2.

R. A. SAWYIER.

BRIDGE.

No. 381,584. Patented Apr. 24, 1888.

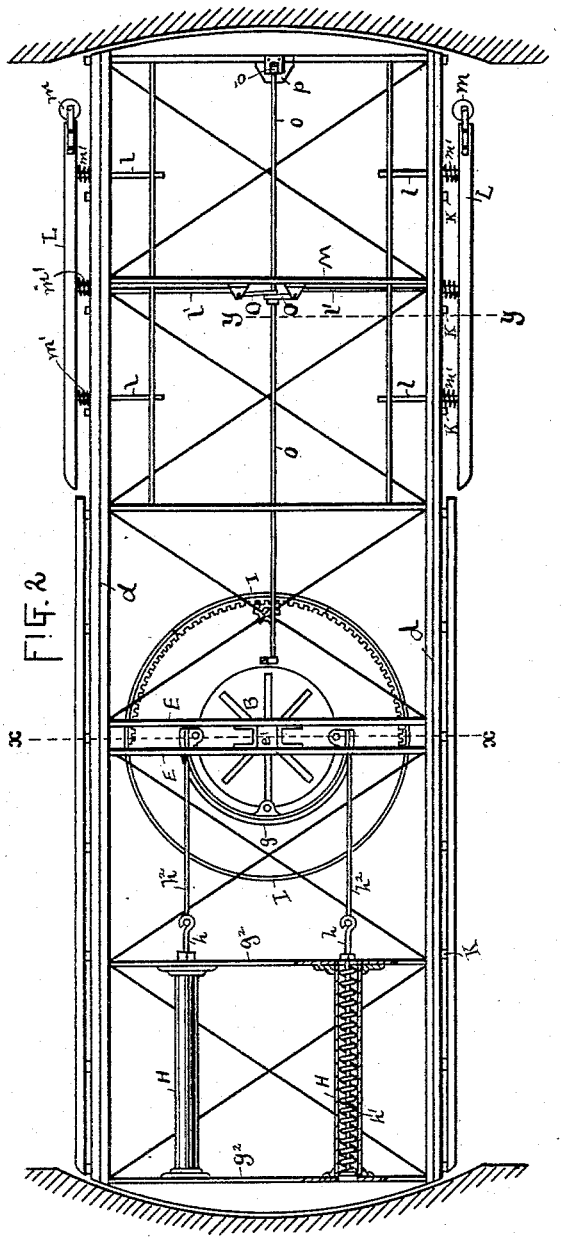


FIG. 2

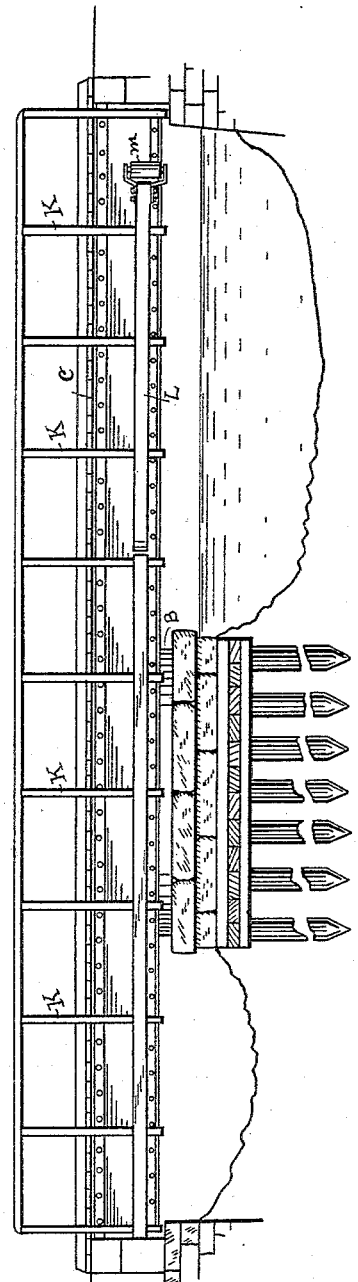


FIG. 3

WITNESSES

Geo. B. Travel

Ira C. Koehne.

INVENTOR

Reuben A. Sawyier.

By his Att'y C. C. Shepherd.

(No Model.) 4 Sheets—Sheet 3.

R. A. SAWYIER.

BRIDGE.

No. 381,584. Patented Apr. 24, 1888.

FIG. 4.

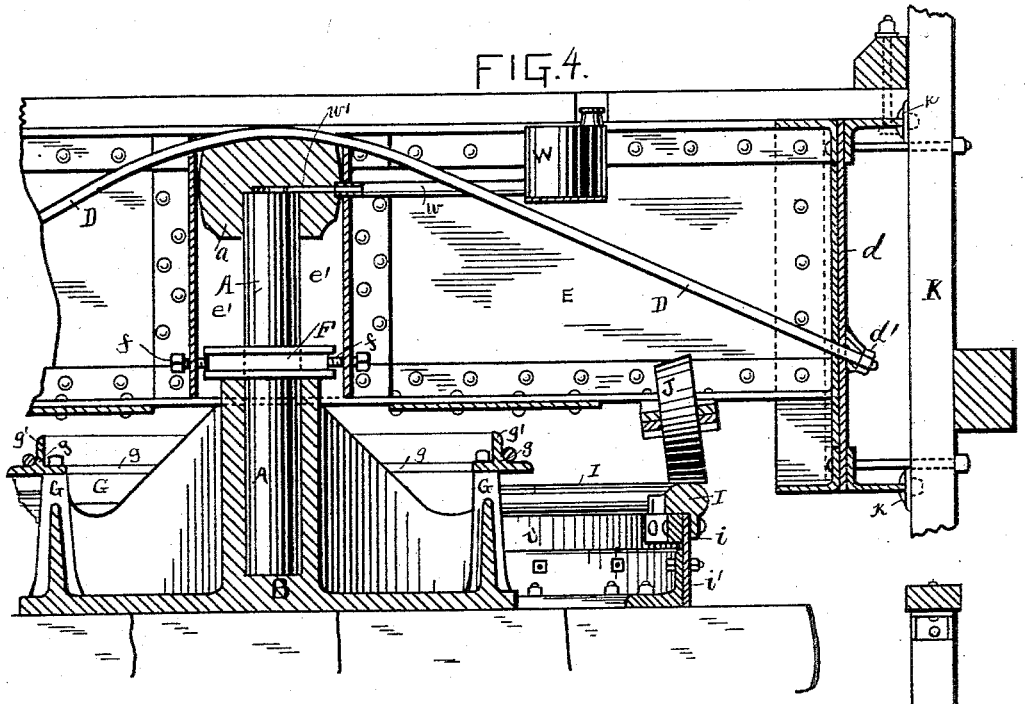
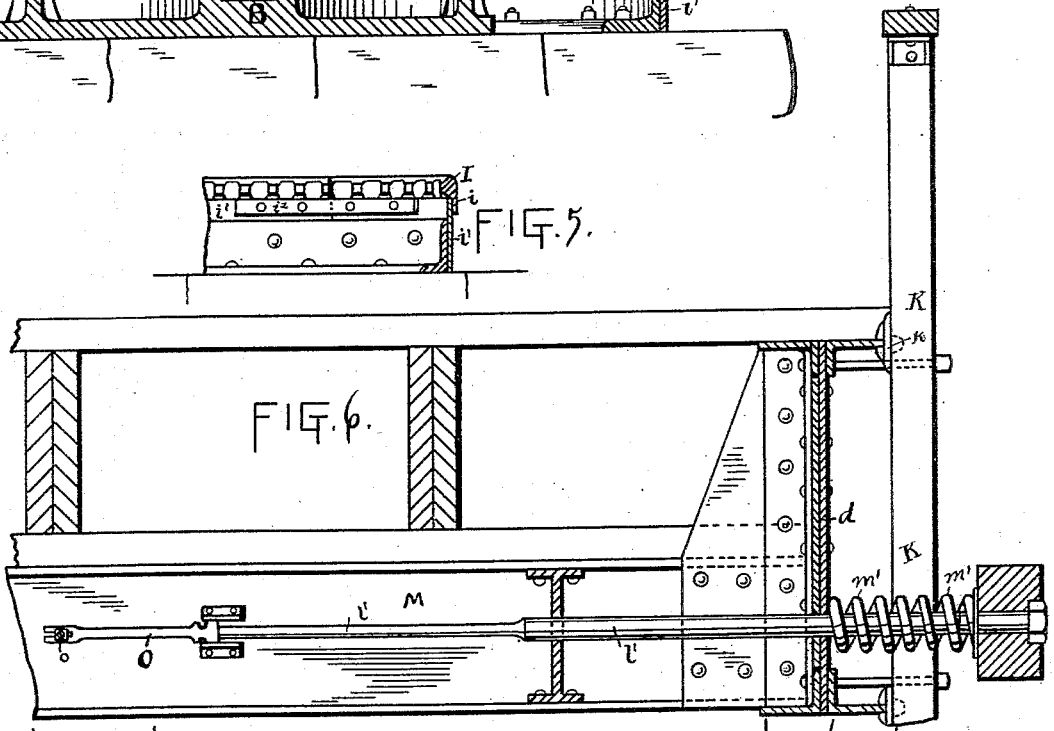


FIG. 5.

FIG. 6.



WITNESSES

Geo. B. Fravel.

Ira C. Koehner.

INVENTOR.

Reuben A. Sawyier.

By his Atty.

C. C. Shepherd.

(No Model.) 4 Sheets—Sheet 4.

R. A. SAWYIER.

BRIDGE.

No. 381,584. Patented Apr. 24, 1888.

FIG 7

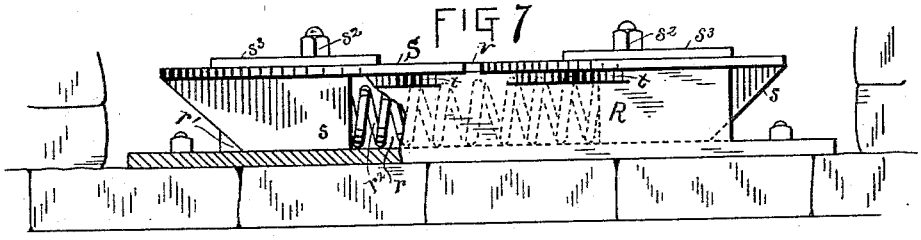


FIG 8

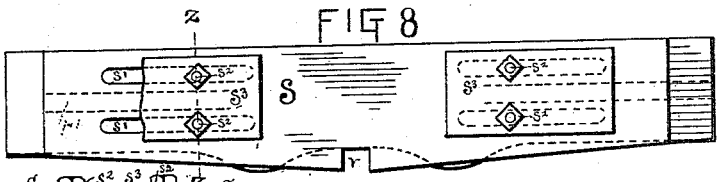


FIG. 10

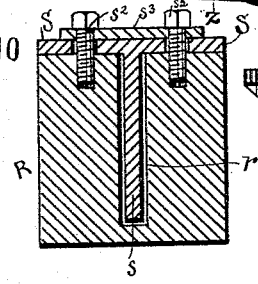


FIG 9

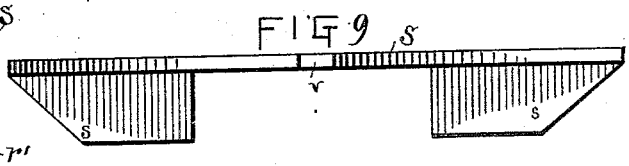


FIG 11

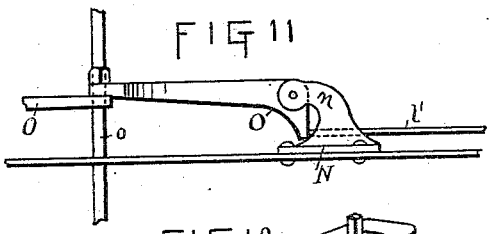


FIG. 13

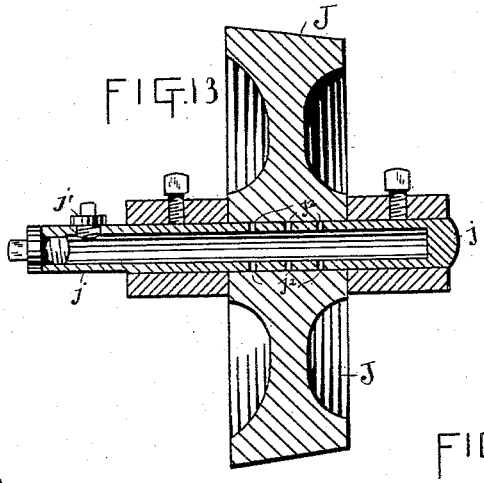


FIG. 12

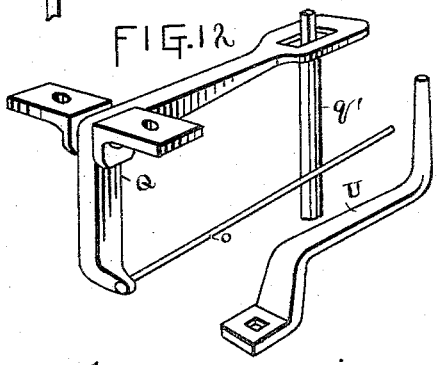
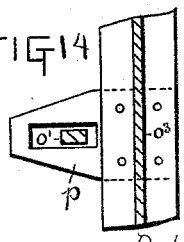


FIG 14



WITNESSES.

Geo B. Travel

Ira C. Kochne.

INVENTOR.

Reuben A. Sawyier.

By his Att'y

C. C. Shepherd.

UNITED STATES PATENT OFFICE.

REUBEN A. SAWYIER, OF COLUMBUS, OHIO.

BRIDGE.

SPECIFICATION forming part of Letters Patent No. 381,584, dated April 24, 1888.

Application filed January 28, 1888. Serial No. 262,288. (No model.)

To all whom it may concern:

Be it known that I, REUBEN A. SAWYIER, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Bridges, of which the following is a specification.

My invention relates to the improvement of swinging bridges, and has particular relation to that class of bridges made to span canals.

The objects of my invention are to provide a simple, durable, and reliable bridge of this class adapted to be automatically opened and closed by contact therewith of a moving boat, to combine therewith means for automatically latching and unlatching the bridge from its connection with the abutment-wall, and to provide mechanism for operating said bridge by hand from the floor. These objects I accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the bridge. Fig. 2 is a plan view of the upper portion of the frame-work of the bridge with the floor removed. Fig. 3 is a side elevation of the bridge. Fig. 4 is a transverse section of the bridge, taken on line *x x* of Fig. 2. Fig. 5 is a detail view of the means of strengthening the joints of the segmental track. Fig. 6 is a section taken on line *y y* of Fig. 2. Fig. 7 is a side elevation of the latch-box, showing the box partially broken away. Fig. 8 is a plan view of the same. Fig. 9 is a side elevation of the latch-box top plate. Fig. 10 is an enlarged transverse section taken on line *z z* of Fig. 8. Fig. 11 is a side elevation, in detail, of the latch-rod-operating lever. Fig. 12 is a perspective view, in detail, of a portion of the device for operating the latch-rod by hand, showing beneath it a view of the operating-key. Fig. 13 is a sectional view of one of the bridge-wheels and its axle, and Fig. 14 is a transverse section of the latch-bar taken on line *u u* of Fig. 1.

Similar letters refer to similar parts throughout the several views.

A represents a vertical pivot pin or shaft, the lower end of which is loosely seated in a correspondingly-shaped socket formed in the upwardly-extending central portion, *b*, of a metallic bed-plate, B, the latter being firmly secured in any desirable manner to a pier or suitable foundation made to project from the bed of the stream, as shown.

C represents the floor of the bridge, the general frame-work of the latter being constructed in any suitable or well-known manner, with the exception of certain parts hereinafter specified.

The upper end of the pivot-pin A extends to within a short distance of the floor of the bridge and enters a socket formed on the under side of a bearing-cap, *a*. The general form of the latter is square, although, for reasons hereinafter stated, its sides are formed slightly convex, as shown. This cap is located immediately beneath the floor C of the bridge at the center of its width, but for canal use is preferably located on one side of the center of the length of the bridge, as illustrated, to allow sufficient room between one of the abutments and the supporting-pier to admit of the passage of a boat therethrough.

The weight of the bridge is carried directly to the top of the pivot-cap *a* by means of one or more truss-rods, D, which, extending transversely beneath the floor of the bridge, have their central portions bearing in suitable grooves formed in the upper side of the cap, and, extending diagonally outward and downward, have their respective lower ends extending through the lower portion of the side girders, *d*, of the bridge. The ends of the trusses are screw-threaded, and are adjustably held in this position by means of nuts *d'*, screwed thereon and made to bear against the outer sides of the girders *d*. A box-girder formed by plates E, extending transversely across the bridge, is made to bear on opposite sides of the cap *a*. The sides of the cap at right angles with the plates E are made to bear against U-shaped plates *e*, the flanges of which are secured to the inner sides of the box-girder plates, as shown, thus forming in connection with said box-girder an elongated vertical box, *e'*, the upper portion of which embraces the cap *a*.

F represents a square metallic collar having a central hole, through which passes loosely the pivot-pin A. This collar is adjustably held within the box *e'* at a point below the cap *a* by means of set-screws *f*, the latter passing

through screw-threaded holes formed in the four sides of the box, and having their inner ends bearing in horizontal grooves formed in the sides of the collar.

The bed-plate B is formed with suitable strengthening webs or ribs, and has formed on its outer edge a half-circular upwardly-extending wall, G, to the upper side of which is bolted or otherwise secured a half-circular metallic rim, *g*, which is made angular, as shown, by having formed on its upper side an upwardly-projecting flange or ridge, *g'*. Extending between two cross-pieces, g^2, of the bridge frame-work, near one end thereof, are two horizontal metallic tubes, H, preferably formed of ordinary gas-piping having flanged ends bolted or otherwise secured to the inner sides of said cross-pieces. Small holes are formed in each of the cross-pieces opposite the open ends of the tubes H, those in the inner cross-piece being somewhat smaller than the hollow of the tubes. Through each of these tubes is made to extend a rod, *h*, the front end of which is provided with an enlarged follower, while its rear or inner end extends a short distance through the corresponding hole of the inner cross-piece, and is provided with a nut adapted to bear when the spring is at rest against the rear side of the said inner cross-piece. Coiled about each of these rods is a coiled spring, *h'*, which is preferably formed in sections, but may be formed of one piece of spring metal. The rear ends of the rods *h* are respectively connected with the ends of the metallic rim *g*, the latter being in line with said rod ends, by means of suitable cables or chains, h^2.

I represents a circular metallic track made to surround the bed-plate, and having a downwardly-extending flange, *i*, on its outer side, said flange being bolted to the outer side of a semicircular track-plate, *i'*, the lower side of which is secured in any suitable manner to the pier. A portion of the inner side of the track I is thickened, as shown, said thickened portion having cog-teeth formed therein, for the purpose hereinafter described. As shown in detail in Fig. 5 of the drawings, for convenience in making, I form this track in two or more sections, bolting each section, as above described, to the plate *i'*. The joints thus formed are strengthened, as shown in Fig. 5, by bolting a bar, i^2, curved to conform to the curve of the track and plate, to the inner side of the plate in such manner as to cover the point in the plate opposite the joint of the track-rail flange, the connecting-bolts passing through the plate *i'*, and hence through the sections so joined.

Mounted on axles *j*, extending between suitable bearings made to extend downward from the lower frame-work of the bridge at desired intervals, are wheels J, the latter adapted to rest and be made to travel upon the track I. For convenience in oiling, these axles are of peculiar construction, each being formed hollow and having an oil-receiving hole, *j'*, formed on its upper side, said hole being provided with a suitable removable stopper. Formed about the central or wheel-bearing portion of the axle are a number of small perforations, j^2, through which the oil is allowed to escape to the bearing-surface of the wheel.

K represents the upright posts of the bridge side railing, each of which is bolted, as shown, to the side girders, while additional security of connection is formed by having the flanges of said girders resting in grooves formed in the faces of metallic disks *k*, each of the latter having formed on its opposite side a dowel-pin driven into the post K, as shown, partly in elevation and partly in dotted lines in Figs. 4 and 6 of the drawings.

Each side of that portion of the bridge spanning the channel of the stream is provided near its lower side with an elongated bumping-arm, L, having pivoted in its outer end a friction-roller, *m*. Each of the arms L is held parallel with and a short distance from the side of the bridge by means of rods *l l'*, rigidly secured to the bumper, which, extending inward, pass loosely through holes formed in the side of the bridge and a conveniently-located beam of the frame-work. About each of these rods, bearing between the bumper and bridge side girders, is coiled a spring, *m'*. The central rod, *l'*, of each bumper is of greater length than the rods *l*, and extends inwardly to a point a short distance from the center of the width of the bridge, where, passing between two parallel arms, *n*, projecting outwardly from a plate, N, secured to the side of a cross-girder, M, it bears against one arm of a bell-crank lever, O, the latter being pivoted between the outer ends of the arms *n*, as shown in detail in Fig. 11 of the drawings. The remaining arm of the lever O extends in the direction of the length of the rod *l'* until at the center of the width of the bridge, and has its ends provided with a slot.

o represents a horizontal latch-operating rod passing through suitable bearing-holes formed in the center of the length of the cross-girders in that portion of the bridge spanning the channel of the stream. The outer portion of this rod *o* passes through and is secured to a vertical latch-bar, *o'*, the upper end of which is hinged to a plate, o^2, bolted to the upper side of the end cross-girder, o^3. From the latch-bar *o'* the rod *o* is continued through a hole formed in said end girder, and, having a nut on its end, carries a coiled spring, P, bearing between said girder and nut, as shown in Fig. 1 of the drawings. To the under side of the girder o^3 is bolted an outwardly-projecting plate, *p*, having an elongated slot therein, through which extends the lower portion of the pendent latch-bar *o'*. The rear end of the rod *o* is rigidly secured to the end of the downwardly-extending arm of a bell-crank lever, Q, the latter being pivoted at its angle in suitable bearings, *q*, depending from the floor of the bridge. The upper arm of the lever Q extends beneath the floor in the direction of

the length of the rod *o*, and has its outer flattened end slotted, as shown in Fig. 12 of the drawings.

q' represents a vertical shaft supported and adapted to be revolved in suitable bearings formed in the frame-work of the bridge. The upper portion of this shaft is quadrilateral in form and is made to project upwardly through the slot of the lever Q, while its lower end carries a pinion wheel gearing with the teeth of the circular track I.

R represents an oblong metallic box having its base secured in an offset preferably formed in the abutment-wall on the channel side of the stream. This box, which is open on its upper side, is, with the exception of a central recess, *r*, and central horizontal slots, *r'*, leading from said recess to the ends of the box, formed solid. Fitting within said recess is a coiled spring, r^2.

S represents a metallic top plate adapted to fit over the open top of the box R, and having formed on its under side, at the center of its width, lugs *s*, extending inward from the respective ends of the plate and terminating at equidistant points from the center of the length of the plate. The distance between these lugs *s*, which are adapted to slide within the slots *r'* of the box, is equivalent to the length of the box-recess *r*.

The plate S is provided on each side of each of the lugs *s* with an elongated slot, *s'*. Extending upwardly on each side of each of the box-slots *r'* from the solid portions of the box, to which it is screwed or otherwise secured, is a metallic pin, s^2, said each pair of pins being rigidly secured at their upper ends to a metallic plate, s^3, above the top plate, S, said plate s^3 being adapted to cover the slots *s'*.

The front side of the box R, adjoining the upper edge thereof, is provided on each side of the center of its length with an outwardly-projecting lug, *t*, said lugs curving outwardly away from said center, and thence inwardly again to meet the front surface of the box, as shown. The front edge of the top plate slightly overlaps the front upper edge of the box, and is provided with a notch, *v*, at the center of its length, in which normally rests the latch-bar *o'*.

In order to supply the pivot-pin A with oil, an oil-can, W, is supported beneath the floor of the bridge, having an outlet-spout, *w*, running to the cap *a*, where it communicates with a hole, *w'*, in said cap, said hole extending inward to a point above the top of the pivot, where it communicates with the socket of the cap and pivot-top, as shown.

The operation of my improved bridge is as follows: A boat moving in either direction in the channel of the stream comes into contact with one of the bumpers L, the springs *m'* serving as a cushion to prevent the usual results of a sudden contact. This contact will, through the pressure on the central rod, *l'*, cause the latter to press upon one arm of the lever O, causing its remaining arm, through its connection with the latch-rod *o*, to force said latch-rod inward sufficiently to withdraw the latch-bar *o'* from the notch *v* in the box top plate. This operation, as will be seen, will serve to unlatch the bridge from its connection with the abutment. The bridge being thus unlatched, it will be seen that the pressure of the boat will operate to cause the bridge to revolve on its pivot A, the boat bearing easily against friction-roller *m*. This partial revolution of the bridge will cause one of the springs *h'* to be compressed within its tube, which in turn will cause its cable h^2 to wind against the angle of the segmental rim *g*. The bridge having been revolved sufficiently to admit of the passage of the boat, it will be seen that the tension of the compressed spring h^2 will operate to draw the bridge to its normal position. The latch-bar *o'* having cleared the latch-box, the spring P will draw the latch-bar back to its vertical position. The return of the bridge will cause said latch-bar to bear against the front edge of the top plate until it drops into the notch *v* therein, the forcible contact therewith causing said top plate to move horizontally on the box until the latch-bar comes into contact with the curved edge of the lug *t*, and, following said edge outward, is released from contact with the top plate and allowed to swing until the tension of one of the springs h^2 is sufficient to overcome the force of the bridge, when the latter will be returned until the latch-bar again drops into its notch. The force of contact between the bridge latch-box top plate may, however, not be sufficient to prevent the tension of the spring r^2, which will be compressed by the pressure of one of the lugs *s* from retaining the latch-bar in its place in the notch *v*. The plate S is prevented from being elevated from its position on the box by means of the pins s^2 and plates s^3, the latter also serving as a cover for the slots in the top plate, S.

The uneven balance of the bridge produced by pivoting the bridge on one side of its center is obviated by weighting the lighter end of the bridge in any suitable manner. An accurate adjustment of the pivot-pin is readily had through the collar F by turning one or more of the set-screws *f*. It is obvious that the greater portion of the weight of the bridge is upon the pin A, and that the track-rollers serve more as a means of balancing the bridge than as a support. A further adjustment of the bridge may be had by tightening the truss-rod nuts, operating to slightly elevate the bridge.

In case it is desired to open the bridge by hand from the bridge-floor a key, U, (preferably such as is shown in Fig. 12 of the drawings,) is first fitted over the head of the shaft *q'*, allowing it to rest upon the slotted arm of the lever Q. By pressure upon this key said upper lever-arm is depressed, causing the lower arm to swing toward the pivot, thus operating, through the rod *o*, to withdraw the latch-bar *o'* from the notch *v*. The shaft *q'*

may then be revolved by turning the key U, causing the bridge, through the pinion and its engagement with the teeth of the segmental track I, to be turned. The sides of the pivot-cap *a* are slightly convex to admit of its easy adjustment within the box *e'*.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a swinging bridge, the combination, with the pier and frame-work of a bridge, the latter having adjustable truss-rods D, of the vertical pivot-pin A, supported loosely in a socket of the bed-plate B and having cap *a*, said bed-plate supporting a segmental angular rim, *g*, the inclosed springs *h'*, supported by the frame-work, and spring-rods *h*, connected, as described, with the ends of the rim *g*, substantially as and for the purpose specified.

2. In a swinging bridge, the combination, with the pier and frame-work of a bridge, the latter having adjustable truss-rods D, and pivot-box *e'*, having set-screws *f*, of the vertical pivot-pin A, having collar F, supported in a socket of the bed-plate B and having cap *a*, said bed-plate supporting a segmental rim, *g*, inclosed spring *h'*, supported in the frame-work, and spring-rods *h*, connected with the ends of rim *g* by cables h^2, substantially as and for the purpose specified.

3. The combination of the bridge frame-work having truss-rods D, the pivot-pin A, having cap *a*, said pin pivoted, as described, within block B, the latter supporting a segmental rim, *g*, inclosed spiral springs *h'*, spring-rods *h*, connected, as described, with the ends of the rim *g*, with the circular track I, supported by the pier, and track-wheels J, pivoted beneath the frame-work of the bridge, substantially as and for the purpose specified.

4. In a swinging bridge, pivoted as described, the combination of the frame-work, the bumpers L, having rollers *m*, said bumpers supported at the sides of the bridge by spring-coiled rods *l l'*, the latter being made to bear against one arm of a bell-crank lever, O, pivoted, as described, within the frame-work, spring-actuated latch-operating rod *o*, connected with the remaining arm of said lever, and hinged latch-bar *o'*, with the latch-box R, supported, as described, in an abutment-wall, having recess *r*, slots *r'*, and coiled spring r^2, seated within said recess, sliding top plate, S, having latch-notch *v* and lugs *s*, the latter adapted to bear against and to be made to compress the spring r^2, substantially as and for the purpose specified.

5. In a latch for swinging bridges, the combination, with the box R, having central recess, *r*, slots *r'*, coiled springs r^2, and pins s^2, projecting from either side of said slots *r'*, of the top plate, S, having slots, lugs *s*, and notch *v*, and slot-covering plates s^3, substantially as and for the purpose specified.

6. In a mechanism for operating a swinging bridge, the combination, with the bridge frame-work, the pier, a segmental rack supported on said pier, a vertical shaft, *q'*, having its upper end opposite an opening in the bridge-floor, and carrying on its lower end a pinion-wheel engaging with the teeth of said rack, of a bell-crank lever, Q, pivoted beneath the floor of said bridge, having its upper arm slotted to receive the upper end of shaft *q'*, a spring-actuated latch-operating rod, *o*, carrying latch-bar *o'*, and having its rear end secured to the lower arm of said lever Q, substantially as and for the purpose specified.

7. A track for swinging bridges, consisting of a circular plate, *i'*, having bolted thereto in sections a track, I, and strengthening-bars i^2, bolted to said plate opposite the joints of said track-segments, substantially as and for the purpose specified.

REUBEN A. SAWYIER.

In presence of—
C. W. ALLISON,
IRA KOEHNE.