Nov. 19, 1946. V. V. MAPPIN 2,411,218

TRAVELING CRANE

Filed Sept. 27, 1943 3 Sheets-Sheet 1

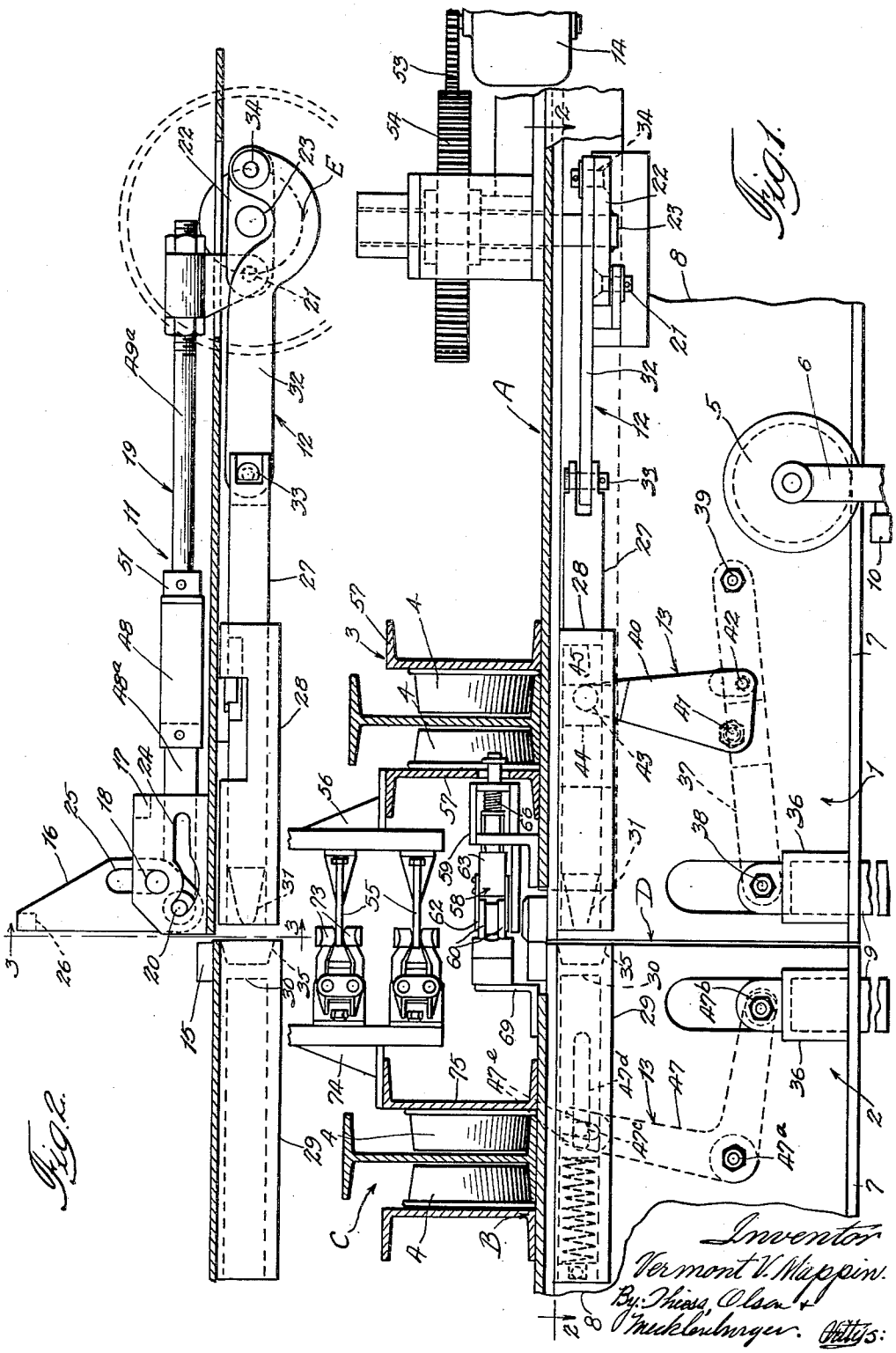


Fig. 1.

Fig. 2.

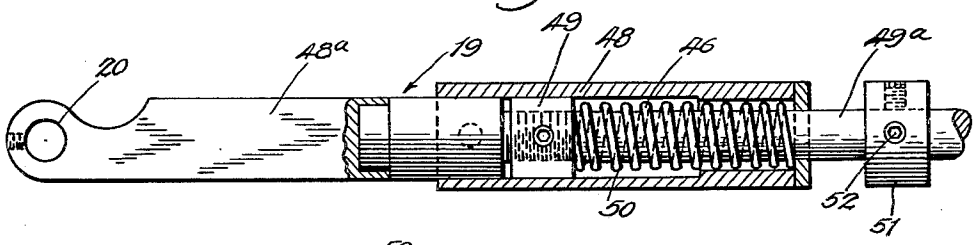
Inventor
Vermont V. Mappin.
By: Theiss, Olsen
Muckelenburger. Hetts:

Nov. 19, 1946. V. V. MAPPIN 2,411,218

TRAVELING CRANE

Filed Sept. 27, 1943 3 Sheets-Sheet 2

Fig. 4.



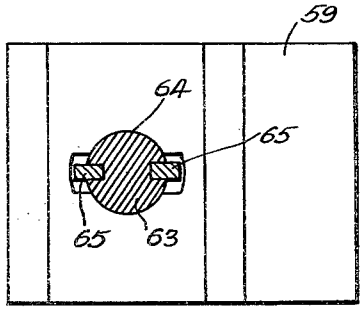


Fig. 7.

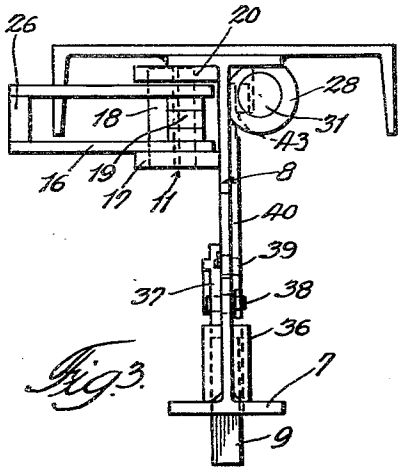


Fig. 3.

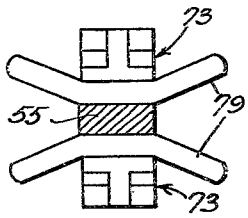


Fig. 9.

Inventor.
Vermont V. Mappin.
By: Theiss, Olson & Brickenstein.
Attys.

Nov. 19, 1946. V. V. MAPPIN 2,411,218

TRAVELING CRANE

Filed Sept. 27, 1943 3 Sheets-Sheet 3

Fig. 5.

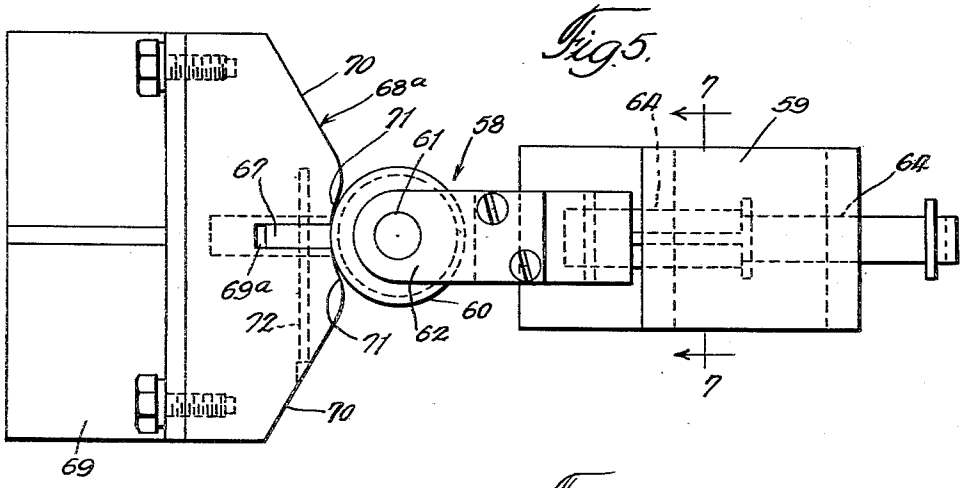


Fig. 6.

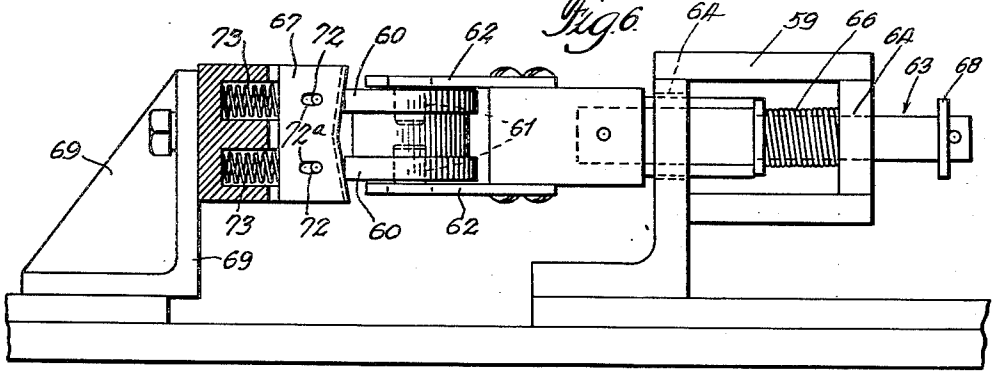
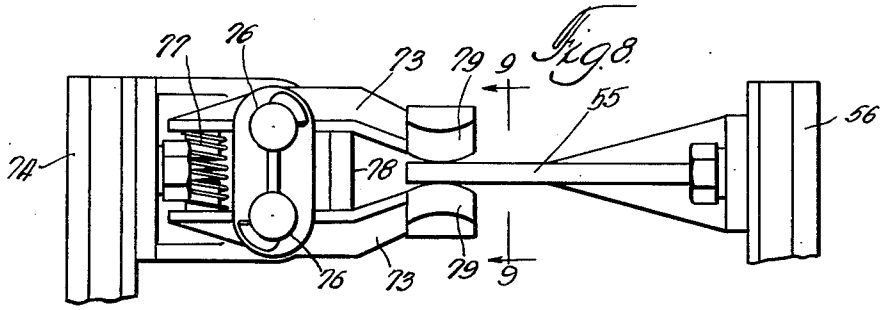


Fig. 8.



Inventor:
Vermont V. Mappin.
By: Thiess Olson & Mecklenburger.
Attys:

Patented Nov. 19, 1946 2,411,218

UNITED STATES PATENT OFFICE

2,411,218

TRAVELING CRANE

Vermont V. Mappin, Fairfield, Iowa, assignor to The Louden Machinery Company, Fairfield, Iowa, a corporation of Iowa

Application September 27, 1943, Serial No. 504,037

7 Claims. (Cl. 104—98)

1

My invention relates to traveling cranes.

When two or more cranes operate on separate parallel runways, it is often desirable to lock the cranes together end to end to permit passage of carrier units from one crane girder to another. In order to provide a smooth and straight joint between the cranes, it is desirable that the adjacent ends of aligned girders be brought as close together as possible.

It is also a prime requisite to have sufficient clearances between adjacent crane girders to permit passage of one crane by another without collision of girders.

Because of the fact that all monorail crane runways are more or less flexible when erected, this point of clearance becomes important. Thus it is important to keep this clearance at a maximum to prevent cranes from hitting each other when passing, and at the same time it is important to keep this clearance at a minimum to provide a smooth joint for passage of the carrier unit from one crane to another when the cranes are brought into alignment.

Another problem is presented because of runway or building steel deflection which may prevent the crane girders of adjacent cranes from lining up vertically. At present, in cranes of large capacity, the method of doing this vertical aligning is by means of a tapered pin on one crane being forced into a mating tube on the other. This is not satisfactorily accomplished in this way, because of the fact that if one crane girder is lower than the other when latching, the tapered pin contacts the tube somewhere on the incline of the taper, so that instead of the girders adjusting themselves vertically when the pin is forced into the tube, the tendency is for the pin to force the girders farther apart, depending, of course, on the amount of vertical adjustment necessary, and the power required to align the girders. This, of course, aggravates the joint condition to such an extent that movement of the carrier over the joint is often impossible.

One of the objects of my invention is to provide a construction which will accomplish the above desired results and avoid the objections noted. With my construction one may have as much clearance between the ends of adjacent crane girders while not locked together as desired (a normal passing clearance should be approximately ½ inch), yet when the cranes are held together by means of my construction, the clearance may be zero.

Other objects and advantages of the invention will be apparent from the description and claims.

2

In the drawings, in which an embodiment of my invention is shown,

Figure 1 is a side elevational view showing two aligned cranes;

Fig. 2 is a horizontal sectional view substantially on the line 2—2 of Fig. 1;

Fig. 3 is an end view on the line 3—3 of Fig. 2;

Fig. 4 is a plan view of the grappling hook operating drawbar, parts being in section;

Fig. 5 is a plan view of the electrical connector between the cranes for supplying current to the connector operating motor;

Fig. 6 is a side elevational view of Fig. 5, parts being in section;

Fig. 7 is a section on the line 7—7 of Fig. 5;

Fig. 8 is a side elevational view of the electrical connectors between the two bridges for supplying current to the power motors; and

Fig. 9 is a section on the line 9—9 of Fig. 8.

The construction shown comprises two cranes A and B mounted to travel on parallel runways C so designed that in normal operation, in which the two cranes are operated independently of each other, there will be sufficient clearance D between the adjacent ends of the crane girders 1 and 2 in passing to prevent collision between these girders.

The cranes shown are of the single girder bridge monorail type, each bridge being provided at each end with a bridge truck 3 mounted on and carried by truck wheels 4 which travel on the runways C. The wheels 5 of the bridge trolleys 6 are mounted to travel on the lower flanges 7 of the girders 8 which form part of the bridges.

As indicated above, it is sometimes desirable to line up two of these bridge girders to enable the trolley to roll from the girder 8 of one crane onto the girder 8 of the other crane. To accomplish this, after the bridges have been brought into approximate alignment, the adjacent ends of the girders are drawn toward each other and accurately aligned. To prevent the trolley from running off the end of the girder when in ordinary use, stops 9 are provided adjacent each end of each girder for engagement with the trolley load beam 10, which stops 9 have to be moved out of the way after the latching and alignment of the girders is effected in order to enable the trolley to roll from the bridge girder of one crane onto the bridge girder of the other. To accomplish the above, I provide apparatus which will effect the desired results in proper timed sequence.

The apparatus for this purpose comprises what may be termed grappling mechanism 11, centering mechanism 12, stop lifting mechanism 13, an elec-

tric motor 14 for operating said mechanisms, and means for effecting the electrical connection for the electric motor when the cranes are in approximate alignment. It should be explained that part of the above apparatus is mounted on one end of one crane and a different part of the apparatus is mounted on the adjacent end of the other crane.

Grappling mechanism

The mechanism for drawing the adjacent ends of the girders together when they are brought into approximate alignment comprises a latching or grappling mechanism 11 mounted on the right-hand crane as viewed in Figs. 1 and 2 and a keeper 15 mounted on the left-hand girder engaged by the pivoted slidable latch or grappling hook 16 when the cranes are in approximate alignment and drawn by this grappling hook to the right after the hook has engaged the keeper member 15. The grappling mechanism comprises a U-shaped bracket 17 secured to the right-hand bridge, a U-shaped latch 16 pivotally and slidably mounted on a pin 18 extending between the side walls of the bracket 17, and a motor-operated drawbar 19 pivotally connected with the pivoted grappling hook 16 at 20 and pivotally secured at its other end at 21 to one end of a rock arm 22 secured to the motor operated rock shaft 23. Each wall of the U-shaped bracket 17 is provided with an irregularly shaped slot 24 in which the extended ends of the pivot pin 20 engage for guiding this pivot pin in its movement. Each arm of the U-shaped grappling hook 16 is provided with a straight elongated slot 25 through which the pivot pin 18 extends. When the motor is operated to move the crank arm 180 degrees in the direction of the arrow E from the position shown in Fig. 2 and to move the grappling hook from the position shown in Fig. 2 into latching and grappling position, the first part of the movement will effect a swinging movement of the grappling hook about the pivot pin 18 until the slot 25 in the grappling hook is in substantial alignment with the direction of motion of the drawbar 19 and until the pivot pin 20 connecting the drawbar and grappling hook is moved up to the straight portion of the irregularly shaped slots 24. This will move the keeper engaging portion 26 of the grappling hook into position to engage the keeper 15 on the left-hand bridge when the movement of the drawbar is continued. As the movement of the drawbar 19 continues, the pin 20 connecting the drawbar and grappling hook will move in the straight portions of the slots 24 and the grappling hook will be drawn to the right, the edges of the straight slots 25 in the grappling hook engaging the fixed pivot pin 18 on the bracket 17. This will draw the adjacent ends of the girders 8 toward each other so that the trolley wheels 5 will not bump on the corners of the girders as the wheels pass from one bridge girder to the other.

Accurate aligning mechanism

As the grappling hook is moving into latching position, the accurate aligning mechanism begins to operate. This aligning mechanism comprises a taper-ended pin 27, slidably mounted in a guide sleeve 28 secured to the right-hand bridge, a flaring mouth latch block tube 29 secured to the left-hand bridge, a spring-pressed latch block 30 slidably mounted in this tube and engaged by the tapered end 31 of the sliding latch bolt and a link 32 pivotally connected at 33 with the latch bolt

and pivotally connected at its other end at 34 with an end of the rock arm 22 secured to the motor operated shaft 23. As hereinafter described, the latch bolt 27 and latch block 30 in their movement operate the trolley stops 9. In operation, as the slidable latch bolt 27 is moved from the position shown in Figs. 1 and 2 to the aligning position and assuming that the bridges are in approximate alignment as the latch pin begins to move to the left, the tapered end 31 of the latch bolt will enter the flaring mouth 35 of the latch block tube 29 and will engage the spring pressed latch block 30 to move it to the left. If the tube 29 is not accurately aligned both vertically and horizontally with the latch pin 27, the tapered portion 31 of the latch pin will engage some portion of the flaring mouth or entrance 35 of the latch block tube and continued movement of the latch bolt will effect accurate alignment of the latch bolt and latch block tube, thus effecting accurate vertical and horizontal alignment of the girders which provide tracks for the two cranes.

Stop lifting mechanism

The mechanism provided for lifting the vertically slidable stop block 9 of the right-hand bridge out of the way of the trolley, the load bar 10 of which is traveling underneath the girder 8, comprises in addition to the vertically slidable stop block 9 which is mounted in guide sleeves 36 secured to the web of the girder, a rock lever 37 pivotally secured at one end at 38 to the slidable stop block 9 and pivotally mounted at the other end at 39 on the web of the girder, and a bell crank lever 40 pivotally mounted at 41 on the web of the girder and having on one arm a pin 42 engaging loosely in an opening in the lifting arm 37 and having on its other arm a pin 43 having a lost motion engagement between the shoulders 44 and 45 on the slidable latch bolt 27. There is enough lost motion between the shoulders 44 and 45 of the latch bolt to enable the latch bolt to effect substantially accurate alignment between the girders of the two bridges and to allow the grappling hook to have brought the ends of the two adjacent bridges into close proximity prior to the lifting of the stop 9.

Timed sequence of operation of grappling hook, aligning pin and trolley stop mechanisms

These operations are all accomplished by the reciprocal half revolution of the motor-driven shaft. The movement of the grappling hook drawbar 19 may be considered as having three stages: (1) a movement which swings the hook 16 through about 90 degrees movement to swing it into longitudinal alignment with the drawbar and to bring the hook into grappling position with respect to the keeper 15; (2) a further movement of the drawbar 19 to draw the hook longitudinally, without shortening the length of the spring 46 which resists extension or lost motion of the link, until the pins 20 on the hook have traveled in the slots 24 as far as they can go and the two cranes are drawn together, and (3) a stage in which further movement of the crank arm 22 causes a shortening of the length of the opposing spring 46 and a corresponding lengthening of the over-all length of the drawbar 19 without causing any movement of the grappling hook 16.

It will now be pointed out what stages of movement of the aligning pin and trolley stops correspond to the above three stages. In the first stage, in which the grappling hook 16 is swung into

grappling position, the aligning pin 27 is moved from its fully withdrawn position to a position in which the tapered portion 31 of the pin is about two-thirds of the way into the flaring entrance 35 of the aligning block sleeve 29 and the point of the aligning pin is about to engage the sliding block 30 which actuates the stop 9 on the left-hand crane. This movement of the aligning pin has also brought the shoulder 45 on the aligning pin 28 into engagement with the pin 43 on the stop lifting arm 40 so that further movement of the aligning pin will cause movement of the trolley stop.

During the second stage in which the grappling hook is moved longitudinally until the opposing spring 46 is about to begin its compression movement, the latch pin 27 will enter still further into the sleeve 29 of the aligning pin block, the point of the aligning pin will shift the plunger 30 to the left to actuate the bell crank 47 and raise the trolley stop of the left-hand crane about one-half as high as it is to be raised and the shoulder 45 on the aligning pin 27 will have actuated the bell crank 40 to raise the stop lift lever 37 and trolley stop 9 on the right-hand crane about one-half the full distance to which it is to be raised.

The mechanism for lifting the stop 9 on the left-hand bridge comprises the L-shaped rock lever 47 pivotally mounted at 47*a* on the web of the girder and loosely pivotally connected at 47*b* to the slidable stop 9, and a pin 47*c* secured to the slidable latch block 30 and extending through a slot 47*d* in the latch block sleeve for engagement between the arms of the forked end 47*e* of the other arm of the L-shaped lever 47.

In the third stage in which the grappling hook is not moved but the lost motion opposing spring 46 is being compressed, the aligning pin will move to its final position in the sleeve of the aligning pin block, the block will move the bell crank lever 47 still further to raise the trolley stop 9 of the left-hand crane to its full height and the aligning pin will move the bell crank lever 40 still further to raise the stop lifting lever 37 and the trolley stop 9 of the right-hand crane to their full height. In this position both of the trolley stops 9 are raised so as not to interfere with the travel of the trolley from one girder to the other.

As previously indicated, the movement of the two drawbars 19 and 27 which operate the grappling hook, aligning pin and stop lift mechanisms is effected by means of a two-armed crank 22 secured to rock with the motor operated rock shaft 23. This motor 14 may be controlled so as to rock the shaft back and forth 180 degrees clockwise and counterclockwise, as viewed in Fig. 2. If it is assumed that the aligning pin drawbar 32 is in the left-hand position and the hook operating drawbar 19 is in the right-hand position, a 180 degrees movement of the crank pin 34 in a counterclockwise direction will rotate the crank-connected end of the aligning pin drawbar counterclockwise 180 degrees to the position shown in Fig. 2, in which the curved end of the drawbar will embrace the rock shaft 23 and will at the same time rotate the crank-connected end of the hook operating drawbar 19 180 degrees counterclockwise. When the motor is reversed to rotate the crank shaft 180 degrees clockwise, the reverse movement of the rock shaft and the drawbars will take place.

The spring opposed lost motion connection between the two parts of the drawbar 19 comprises a sleeve 48 (Figs. 1 and 4) to which the hook connected end 48*a* of the drawbar is secured, an adjustable nut 49 slidable in this sleeve into which the crank-connected end 49*a* of the drawbar is screwed, a coil compression spring 50 acting between the nut 49 and the head of the sleeve 48, and a stop collar 51 adjustably secured on the drawbar by means of a set screw 52 or the like. The tension of the spring may be adjusted by adjusting the nut 49 on the drawbar section. The expanding action of the compression spring may be limited by means of the adjustable collar 51.

Motor and transmission

The motor 14 for operating the above mechanisms may be mounted in any suitable manner on the bridge. The drive from this motor 14 to the rock shaft 23 comprises a reduction gearing terminating in a pinion 53 meshing with a gear wheel 54 keyed to the rock shaft 23. This rock shaft is mounted in suitable bearings on the bridge. Any suitable type of motor may be used which will effect the desired half revolution of the rock shaft, suitable limiting stops being provided to hold the motion of the rock shaft to 180 degrees.

Electrical connections for motor

The electrical apparatus shown comprises means for establishing automatically electrical connection for the motor 14 when the two bridges are accurately aligned with each other, and means for establishing automatically electrical connections between the two bridges which will enable the operator in a cage carried by one of the bridges to control the power motors carried by the other bridge.

The electrical apparatus shown mounted on the right-hand bridge includes a plurality of wiper members 55 cooperating with the power motors mounted on a bracket 56 secured to a bridge truck channel 57 which in turn is secured to the bridge 1, and a roller contact device 58 cooperating with the coupling motor 14 mounted on a bracket 59 also secured to the bridge 1 (Figs. 1, 5, 6, 7, 8, and 9). This roller contact device 58 comprises a pair of rollers 60 of conducting material insulated from each other, a pair of trunnions 61 on which the roller contacts are mounted, a pair of arms 62 on which these trunnions are mounted and a bolt 63 to which the trunnion-carrying arms are secured, slidably mounted on the bracket 59. This bolt has cylindrical portions 64 slidably mounted in openings in the spaced walls of the bracket and is provided with keys 65 slidable in keyways to prevent swiveling action of the bolt. A coil compression spring 66 is provided urging the contact rollers to the left for engagement with the cooperating slidably mounted contact piece 67 on the left-hand crane. A stop collar 68 is provided to limit the movement of the sliding bolt when the contact rollers 60 are not in engagement with the contact piece 67 on the left-hand crane. The circuit between the two conducting rollers 60 is completed when both of them are in engagement with the spring pressed contact piece 67 on the left-hand crane. When the two contact rollers are thus electrically connected, a circuit is completed which enables the operation of the motor 14 which controls the grappling, aligning and stop lifting mechanisms.

The apparatus mounted on the left-hand bridge comprises a cam-like member 68*a* of suitable insulating material mounted on a bracket 69 secured to the bridge 2 and the above-mentioned

slidable spring pressed contact block 67 which is mounted in a slot 69a at the mid portion of the cam-like member. This cam-like member comprises two wing portions 70 extending in bilateral symmetry from the slot 69a in which the slidable contact block 67 is mounted. As the two cranes are being brought into alignment, the contact rollers will ride up along one or the other inclined slopes 70 and will drop into the central depressed portion 71 between the inclined portions and will come into engagement with the spring pressed conductor slide 67. Thus a circuit will be completed between the two conductor rollers 60. This will enable the motor 14 to be operated as desired by means of suitable control switches to effect motion of the motor in either direction desired.

The conductor slide 67 is guided in its movement by two pins 72 extending across the slot 69a in which the slide 67 is mounted and through slots 72a in this slide. The contact slide is urged outwardly by a pair of coil compression springs 73.

Each wiper contact 55 cooperates with a pair of rockable spring-pressed wiper contacts 73 rockably mounted on a bracket 74 secured to the bridge truck channel 75 of the left-hand bridge 2. The rockable contacts 73 are mounted on pins 76 in the bracket 74 and are urged toward each other by a coil compression spring 77. A stop 78 on the bracket 74 limits the movement of the contact faces 79 toward each other.

It is obvious that my invention might be utilized in making a connection between a girder on a movable bridge and a fixed girder to insure alignment between the girders and to draw the girders toward each other.

Further modifications will be apparent to those skilled in the art and it is desired, therefore, that the invention be limited only by the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. Two crane bridges for traveling, respectively, on parallel runways, each bridge having a trolley runway extending longitudinally thereof, and cooperating means on said bridges for engaging each other when the trolley runways are in substantial alignment and holding the adjacent ends of said trolley runways against longitudinal separating movement comprising two alignable abutment means mounted on said trolley runways, respectively, having interengageable separation opposing faces, and means for mounting one of said abutment means for pivotal movement on its runway into and out of alignment with the other abutment means, said abutment means being securely anchored to resist longitudinal separating movement of said trolley runways.

2. A bridge for traveling on a runway, said bridge having a trolley runway extending longitudinally thereof, and means on said bridge for engaging cooperating means on an adjacent trolley runway when the trolley runways are in substantial alignment for holding the adjacent ends of the trolley runways against longitudinally acting forces tending to separate them said bridge means and co-operating means comprising two alignable abutment means mounted on said trolley runways, respectively, having interengageable separation opposing faces, and means for mounting one of said abutment means for pivotal movement on its runway into and out of alignment with the other abutment means, said abutment means being securely anchored to resist longitudinal separating movement of said trolley runways.

3. A bridge for traveling on a runway, said bridge having a trolley runway extending longitudinally thereof, and latch means on said bridge for engaging cooperating means on an adjacent trolley runway when the trolley runways are in substantial alignment for holding the adjacent ends of the trolley runways against longitudinally acting forces tending to separate them said latch means and cooperating means comprising two alignable abutment means mounted on said trolley runways, respectively, having interengageable separation opposing faces, and means for mounting one of said abutment means for pivotal movement on its runway into and out of alignment with the other abutment means, said abutment means being securely anchored to resist longitudinal separating movement of said trolley runways.

4. A bridge for traveling on a runway, said bridge having a trolley runway extending longitudinally thereof, and means on said bridge for engaging cooperating means on an adjacent trolley runway when the trolley runways are in substantial alignment for holding the adjacent ends of the trolley runways against longitudinally acting forces tending to separate them and drawing the adjacent ends of said trolley runways toward each other said bridge means and co-operating means comprising two alignable abutment means mounted on said trolley runways, respectively, having interengageable separation opposing faces, and means for mounting one of said abutment means for pivotal and sliding movement on its runway into and out of alignment with the other abutment means, said abutment means being securely anchored to resist longitudinal separating movement of said trolley runways.

5. A bridge for traveling on a runway, said bridge having a trolley runway extending longitudinally thereof, and means on said bridge for engaging cooperating means on an adjacent trolley runway when the trolley runways are in substantial alignment for holding the adjacent ends of the trolley runways against longitudinally acting forces tending to separate them and drawing the adjacent ends of said trolley runways toward each other comprising a grappling hook carried by the bridge mounted for swinging movement to engage a keeper fixed with respect to said adjacent trolley runway, said grappling hook being mounted for longitudinal movement to draw the trolley runways toward each other.

6. A bridge for traveling on a runway, said bridge having a trolley runway extending longitudinally thereof, means on said bridge for engaging cooperating means on an adjacent trolley runway when the trolley runways are in substantial alignment for holding the adjacent ends of the trolley runways against longitudinally acting forces tending to separate them and drawing the adjacent ends of said trolley runways toward each other comprising a grappling hook carried by the bridge mounted for swinging movement to engage a keeper fixed with respect to said adjacent trolley runway, said grappling hook being mounted for longitudinal movement to draw the trolley runways toward each other, and an aligning member carried by the bridge and movable longitudinally thereof for insuring alignment of the trolley runways when the trolley runways are drawn together.

7. A bridge for traveling on a runway, said bridge having a trolley runway extending longitudinally thereof, means on said bridge for engaging cooperating means on an adjacent trolley runway when the trolley runways are in substantial alignment for holding the adjacent ends of the trolley runways against longitudinally acting forces tending to separate them and drawing the adjacent ends of said trolley runways toward each other comprising a grappling hook carried by the bridge mounted for swinging movement to engage a keeper fixed with respect to said adjacent trolley runway, said grappling hook being mounted for longitudinal movement to draw the trolley runways toward each other, an aligning member carried by the bridge and movable longitudinally thereof for insuring alignment of the trolley runways when the girders are drawn together, a link connected to said grappling hook, a link connected to said aligning member, crank means to which said links are pivotally connected, and a rock arm on which said crank means are mounted.

VERMONT V. MAPPIN.