Jan. 14, 1947. F. C. HARRIS 2,414,301

SHUTTLE BRIDGE CRANE

Filed April 3, 1943 3 Sheets-Sheet 1

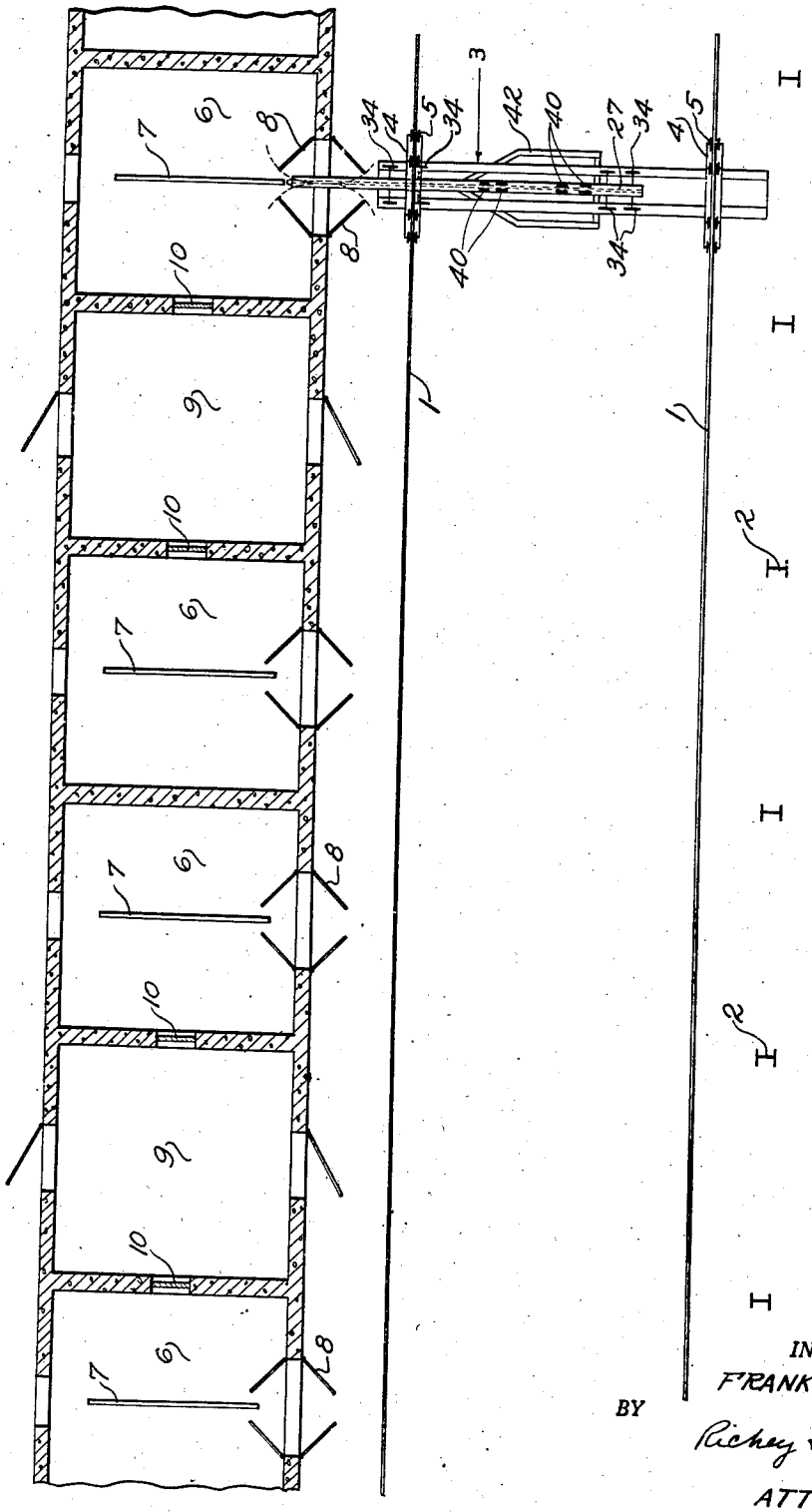


Fig. 1.

INVENTOR.
FRANK C. HARRIS
BY Richey & Watts
ATTORNEYS

Jan. 14, 1947. F. C. HARRIS 2,414,301

SHUTTLE BRIDGE CRANE

Filed April 3, 1943 3 Sheets-Sheet 2

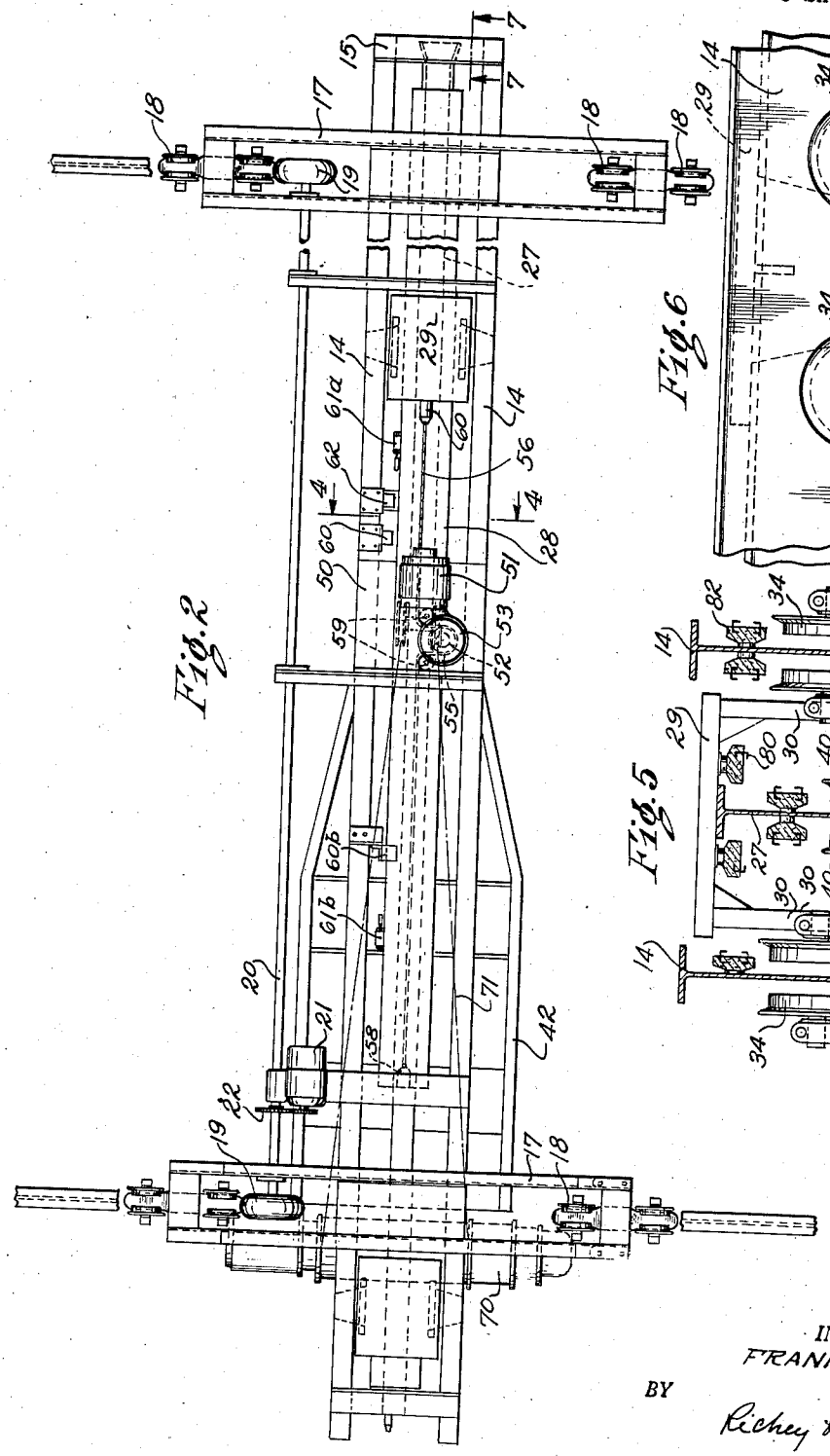


Fig. 2

Fig. 6

Fig. 5

INVENTOR.
FRANK C. HARRIS

BY

Richey & Watt

ATTORNEYS

Jan. 14, 1947. F. C. HARRIS 2,414,301

SHUTTLE BRIDGE CRANE

Filed April 3, 1943 3 Sheets-Sheet 3

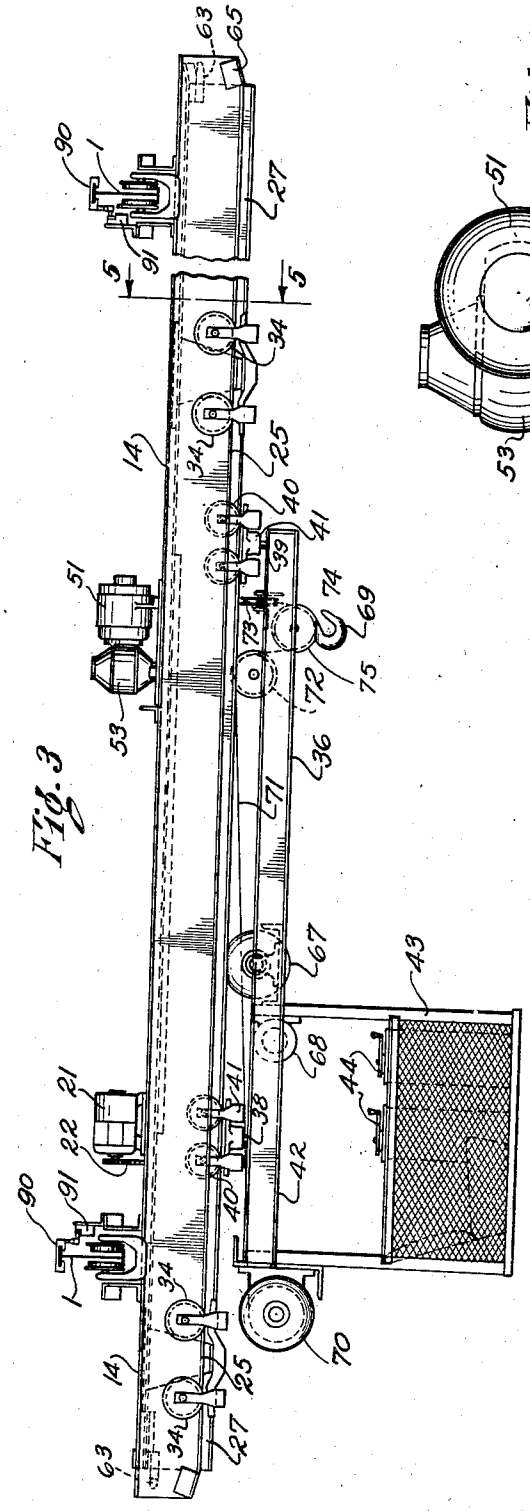


Fig. 3

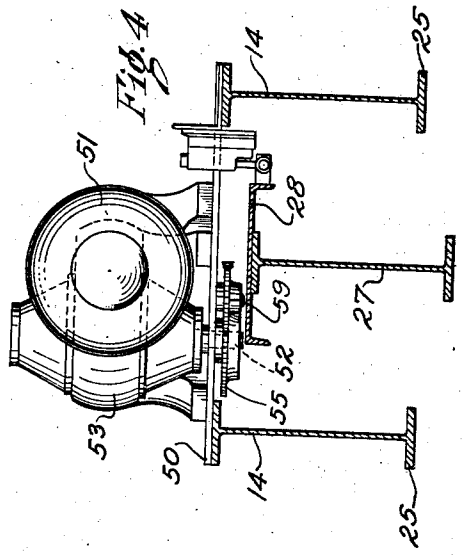


Fig. 4

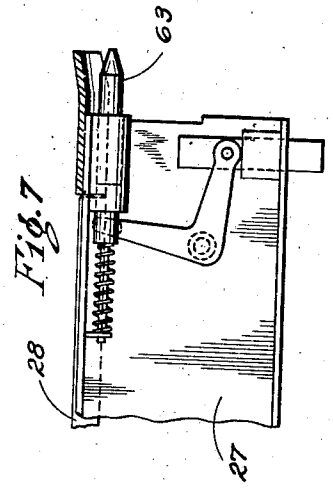


Fig. 7

INVENTOR.
FRANK C. HARRIS

BY Richey & Watts

ATTORNEYS

Patented Jan. 14, 1947

2,414,301

UNITED STATES PATENT OFFICE

2,414,301

SHUTTLE BRIDGE CRANE

Frank C. Harris, Bay Village, Ohio, assignor to The American MonoRail Company, Cleveland, Ohio, a corporation of Ohio

Application April 3, 1943, Serial No. 481,733

11 Claims. (Cl. 104—98)

1

This invention relates to improvements in crane bridge systems and more particularly to an apparatus I have chosen to call a shuttle bridge crane. As is well known to those versed in the art, manufacturing plants are often provided with fixed runway tracks that usually extend longitudinally of the building, and upon which a crane bridge is designed to travel. The crane itself is also provided with bridge tracks that extend transversely to the fixed runway tracks, and a carrier is supported on these bridge tracks thus enabling the carrier to travel transversely relative to the crane runways. In this manner the entire floor area of the plant within the confines of the fixed tracks may be provided with hook service.

It sometimes happens, however, that it may be desirable to move the carrier beyond the end limits of the crane bridge, and in such instances, it may not be convenient or practical to provide auxiliary interlocking tracks for the carrier. It also may be desirable to move the carrier beyond the end limits of the crane bridge and in such instances radiating interlocking trackways may be inconvenient.

As an example I illustrate the case of a factory where engines are manufactured. These engines may be fabricated or assembled and after assembly it is desirable and sometimes necessary that they be conveyed to test stands upon which the engines are mounted and "run in." In the case of airplane engines, it is desirable to place the engines in separate testing chambers where the temperature may be varied to provide conditions more nearly like that to which an engine will be subjected under actual operating conditions. In this case separate test rooms are provided where the tests are run. It will also be clear that in such a chamber or room, it is desirable and necessary that an effective sealing means for the room be provided. This necessitates the utilization of insulated walls, and doors which can be completely sealed. In order to expedite moving the engines in and out of such rooms it is necessary to provide doors sufficiently large to enable engines to be shuttled in and out and at the same time it is highly desirable that all tracks or rails at the point where the door closes be eliminated in order to more effectively enable the doors to be closed and to seal the room.

To further insulate these chambers or cells double sets of doors are provided, one set of which opens inside the room and the other set of which opens outwardly of the room. This

2

arrangement previously made it necessary to provide expensive and complicated swingout sections of the rail for providing a track through the doors.

By my present invention I have provided a crane bridge which can be moved longitudinally on the runway tracks until it is opposite the door of one of these chambers. The main crane bridge is provided with a shuttle bridge which may be moved through the open door into connection with a spur track inside the chamber, the spur track being disposed beyond the swing of the doors and being of a permanent nature.

In this manner without the aid of interlock and swingout sections the carrier can be run over the shuttle bridge into the chamber onto the spur tracks. It then deposits its load onto the spur tracks after which the shuttle bridge may be retracted and the doors closed and sealed.

It is therefore an object of my invention to provide an improved type of shuttle bridge crane.

It is another object of my invention to provide a carrier system which does not interfere with the opening, closing or sealing of the doors of a chamber.

It is another object of my invention to provide a shuttle bridge crane which may be controlled by the operator from a cab on the carrier.

It is another object of my invention to eliminate the expensive and complicated swingout members for operating a trackway through the doors.

Still other objects of the invention will become more apparent from the following description of an embodiment thereof which description is illustrated by the accompanying drawings and forms a part of this specification.

In the drawings

Fig. 1 is a diagrammatic plan view of the crane shuttle bridge system of my invention.

Fig. 2 is a plan view of a shuttle bridge crane with certain sections removed for convenience in illustration.

Fig. 3 is a side elevational view of the shuttle bridge crane in Fig. 2, but showing in section the rails for supporting the crane bridge and showing the movable carrier disposed on the shuttle bridge.

Fig. 4 is a section taken on the line 4—4 of Fig. 2 and showing the shuttle operating mechanism in elevation.

Fig. 5 is a section taken along the line 5—5 of Fig. 3 showing in elevation the manner of support for the shuttle bridge on the main crane bridge and the carrier on the shuttle bridge.

Fig. 6 is an enlarged side elevation of the shut-

tle bridge trolley and its manner of support from the crane bridge.

Fig. 7 is a fragmentary elevational view of an interlocking mechanism for the shuttle bridge.

Referring now to the drawings throughout which like parts have been designated by like reference characters, and particularly to Fig. 1, at 1 I have illustrated a pair of runway tracks which extend longitudinally of a building. These tracks 1 are of the overhead type being suspended from the truss structure which supports the roof and in a manner well known to those versed in the art, the roof being supported from the columns 2.

A main crane bridge is illustrated at 3 and may comprise the usual frame work which is supported by end trucks 4 having trolley wheels 5 disposed for travel on the flanges of the tracks 1.

In this particular instance I have shown the system as being in use in an engine factory where the tracks 1 extend parallel to and opposite a series of chambers or rooms. The rooms designated at 6 are provided with monorail spur track sections 7 supported from the ceiling and extending toward but short enough to allow the doors 8 to be closed without interference by the track.

Rooms 9 are provided between the rooms 6 as shown, and may have observation windows 10 set in the wall permitting the tester to view the operations in the engine in room 6 without necessarily being in the same room with the engine being tested.

Although I am about to describe the invention as used in conjunction with individual rooms as set forth, it will be understood that the invention is not limited to any such particular arrangement, but is useful in many other ways, the description being merely for effecting a clearer understanding of one instance where the invention may be used to a considerable advantage.

As previously stated, the crane bridge may be moved along the tracks 1 until it is opposite the door 8. The doors 8 are illustrated as being of the double type, one pair of which opens inwardly and the other pair outwardly. It is desirable to to provide a track extension from the bridge crane through the doors and into connection with the spur track 7 inside the room over which the carrier may operate. The bridge crane being aligned with the doors and the doors being opened a shuttle track on the bridge crane is extended through the doors and the carrier with the engine is shuttled onto the shuttle bridge track onto the spur track and the engine deposited upon its mount, after which the carrier moves back onto the shuttle bridge, which is then retracted out of the runway, the doors closed, and the room sealed for testing. Since there are no tracks to interfere with the doors they may be more effectively sealed than they could be if there were a permanent track through the door.

The crane bridge comprises a frame (Fig. 2) including longitudinally extending side members 14 and end members 15. The crane frame is connected to truck frames 17 near the ends, and each truck frame is supported by trolleys 18 which are arranged to run on the track flanges of the runways 1. A drive for the crane is provided and includes pneumatic wheels 19, arranged for frictional engagement with the bottom of the track runway and driven by a drive shaft 20 which is in turn driven by a motor 21 through the reduction gears 22.

The frame members 14 of the bridge crane also constitute track members the lower ends of which have track flanges 25 (Fig. 5) thus providing parallel tracks extending longitudinally of the main crane bridge frame and transversely relative to the fixed runway tracks 1.

The crane bridge supports a shuttle bridge and the shuttle bridge in turns supports a carrier which is mounted for movement on the shuttle portion and arranged to carry the load which is to be moved.

Specifically the shuttle bridge includes a single monorail 27 which is secured to the under side of substantially square plates 29 (Figs. 2 and 5). The plates are provided with downwardly extended side brackets 30 and which terminate in outwardly extending horizontal arms 31 that are connected to the upper side of the load bars 32. The load bars are supported by yokes 33 which in turn are connected to trolleys 34 adapted to run on and be supported by the track flanges 25. In this manner the shuttle bridge is supported between the members 14 of the main crane frame and may be moved longitudinally thereon. It should be noted as shown in Fig. 3 that the trucks for supporting the shuttle bridge are not disposed equidistant from the ends of the main crane bridge but those at the left are closer to the end of the shuttle bridge than those at the right, the tracks at the right being a considerably greater distance from the end of the shuttle bridge. This permits the shuttle bridge to have greater movement on the tracks 25, and allows the shuttle bridge to be shuttled for some distance beyond the end of the main crane bridge to make connection with the spur tracks.

The shuttle bridge, in turn, supports a load carrier which may be moved longitudinally on the track 27. The carrier includes a rectangular frame 36 which is suspended at 38 and 39 from load carrying trolleys, each of which includes a yoke 41 and wheels 40 which run on track 27.

The one end of the carrier, at the left as shown in Figs. 2 and 3, is provided with a sub frame 42 from which is suspended an operator's cab 43 in which are disposed the controls 44 for controlling the operation of the apparatus.

As previously mentioned, the entire apparatus is movable longitudinally of the building; its movement is under the control of the operator from the cab 43, the drive along the main tracks being effected through the wheels 19 which frictionally engage the under side of the tracks. In this manner the bridge crane, shuttle and carrier may be moved with a load, which might be an engine, into alignment with one of the tracks 7 in the room 6.

It is then desired to move the shuttle bridge out from the end of the crane bridge through the doors 8 so that its track connects with the spur track 7 in the room to provide a continuous track for the carrier into the room 6. To provide for this movement of the shuttle a suitable mechanism for moving the shuttle is supported on a platform 50 which is disposed on top of and bridging the members 14. The mechanism supported on this platform includes a motor 51 that drives a vertical shaft 52 (Fig. 4) through a gear train disposed in the gear box 53. The shaft 52 extends down through the platform 50, and carries on its end a sprocket wheel 55 below the surface of the platform and between the members 14. Connection is made between the sprocket wheel and the shuttle bridge by a chain 56 which has one end adjustably secured to the shuttle bridge at 58 (Fig. 2) and it then extends longitudinally of the bridge and around an idler

sprocket 59 after which it is looped around the drive sprocket 55 then around the other idler 59 and the other end of the chain is secured to the shuttle bridge at 60.

It will thus be seen that when the motor 51, which is a reversible motor, is energized the sprocket 55 causes the chain to be pulled and the chain being connected at its ends to the shuttle bridge moves the shuttle bridge longitudinally between the main crane bridge tracks 25.

The movement of the shuttle bridge is under control of the operator but movement is limited in either direction by limit switches 60*a* and 60*b* on the members 14 which are operated by adjustable cam 61*a* and 61*b* on the shuttle bridge to prevent possible overtravel of the shuttle bridge in either direction.

The end of the shuttle bridge is provided with interlocking mechanism indicated at 63 and which may be of the character described in the patent to F. C. Harris et al., No. 2,276,272 of March 17, 1942.

Travel of the shuttle bridge is also limited by permanent stops 65 on the track 14 which extend upward in the path of the trolleys 34 to prevent the shuttle bridge trolley from accidentally leaving the tracks 25.

As previously stated the shuttle bridge when in alignment with track 7 can be moved outward from the crane bridge until the shuttle track 27 is in contact and interlocked with the spur track 7. During this movement the shuttle bridge carries with it the carrier which at this time is disposed on the shuttle bridge tracks midway between the shuttle bridge trolleys. In order to assure that the carrier is properly positioned midway between the trolleys and prevent the shuttle bridge from being moved on the bridge crane should the carrier be on the shuttle bridge beyond the trolleys an additional limit switch 62 is provided which has control of the shuttle bridge motor and which keeps the shuttle bridge motor circuit open except at such times as the carrier is disposed in its proper centralized position on the shuttle bridge.

Once the shuttle bridge is locked with the spur tracks it is then possible to move the carrier on the shuttle bridge crane. This carrier is driven by the drive wheel 67 and motor 68, the drive wheel being frictionally engaged with the track 27. The carrier, with its load which may be disposed on the hook 69, is moved over the shuttle bridge tracks and onto the spur track.

When the carrier is on the spur track the load may be lowered. The lifting mechanism for raising and lowering the load includes the usual winch 70, the cables 71 of which pass over the idler pulleys 72 and 73 and around the block 75 of the hook 69.

It should be noted that with this arrangement it is not necessary to have the spur track electrified. In carrying this out electrification is provided in the usual manner by bus bars on the main runway tracks 1, the current being picked up therefrom by suitable collectors as is a well known practice. Electrification for the shuttle bridge is from the main collectors through electric cables to the cab and to connecting conductor bars 80 on the shuttle bridge, the current being carried between the shuttle bridge conductors 80 by collectors connected to the conductor bars 82 on the crane bridge proper.

Proper alignment of the shuttle bridge with the spur track can be determined by the operator from the cab. In effecting this proper alignment,

cams 90 are provided on the main tracks which operate a limit switch 91 on the crane bridge to flash on a green light when the alignment is effected and to close the shuttle bridge circuit to enable operation of the shuttle bridge.

In depositing the load the electrification is maintained inasmuch as the shuttle bridge never leaves the main crane bridge and the carrier never entirely leaves the shuttle bridge, although the trolley end of the carrier remote from the cab may go beyond the end of the shuttle bridge onto the spur 7.

The load being then lowered, the operator may then move the carrier back to the center of the shuttle bridge, movement of the shuttle bridge is not possible unless the carrier is properly centered between the trolleys 32, and then the shuttle bridge and carrier may be moved back onto the bridge crane. The bridge crane and its associated mechanism may now be moved to another desired place for another load.

It will thus be seen I have provided a crane bridge mechanism that enables a load to be shunted onto spur tracks without having electrification on the spur tracks and that it enables loads to be passed through doors or other places where it is impractical to have the usual connecting or crossover tracks.

Thus there is a complete elimination of a complicated and undesirable swingout mechanism for the tracks through the doors.

Having thus described my invention I am aware that numerous and extensive departures may be made therefrom without departing from the spirit or scope of my invention.

I claim:

1. A shuttle crane bridge for a conveyer system having main tracks and spur tracks extending normal to and spaced from the main tracks, including a crane bridge, trucks connected to said crane bridge and disposed on said main tracks, shuttle bridge tracks carried by said crane bridge and extending transversely relative to said main tracks, a shuttle bridge, trolleys for the shuttle bridge disposed on the crane bridge and supporting said shuttle bridge therefrom, a carrier track carried by said shuttle bridge, and a carrier movably suspended from the carrier track, motor driven means carried by the crane bridge and means connected to the shuttle bridge and said motor means for moving the shuttle bridge relative to the crane bridge, said shuttle bridge adapted to be moved with the carrier track into interlocking engagement with the spur tracks and said carrier adapted to be moved from said carrier track onto the spur tracks.

2. A conveyor system including main tracks and spur tracks extending at right angles from the main tracks, a crane bridge disposed for travel on said main tracks and a pair of shuttle bridge tracks on said bridge extending transversely relative to the main tracks, a shuttle bridge for said crane bridge and shuttle bridge trolleys connected to the shuttle bridge and disposed on said shuttle bridge tracks, said trolleys for the shuttle bridge being disposed spaced from the end thereof to allow movement of the shuttle bridge relative to the crane bridge and permit the end of the shuttle bridge to extend beyond the end of the crane bridge toward and into alignment with said spur tracks, a carrier track supported by said shuttle bridge and adapted for selective interlocking engagement with said spur tracks; a carrier, trolleys for said carrier on said shuttle bridge carrier track, means

controlled by the carrier to permit movement of the shuttle bridge when the carrier trolleys are disposed between the span of the shuttle bridge trolleys, and means for moving the shuttle bridge including a motor drive supported by the crane bridge and connector means connecting said motor drive to said shuttle bridge.

3. A conveyor system including main tracks and spur tracks extending at right angles from the main tracks, a crane bridge disposed for travel on said main tracks and a pair of shuttle bridge tracks on said bridge extending transversely relative to the main tracks, a shuttle bridge for said crane bridge, and shuttle bridge trolleys connected to the shuttle bridge and disposed on said shuttle bridge tracks, said shuttle bridge being substantially as long as the crane bridge and said trolleys for the shuttle bridge being disposed spaced from the ends thereof to allow movement of the shuttle bridge relative to the crane bridge and permit an end of the shuttle bridge to extend beyond an end of the crane bridge toward and into alignment with said spur tracks, a carrier track supported by said shuttle bridge and adapted for selective interlocking engagement with said spur tracks, a carrier, trolleys for said carrier on said shuttle bridge carrier track, said carrier trolleys being disposed in spaced relation on said carrier, means controlled by the carrier to permit movement of the shuttle bridge when the carrier trolleys are disposed on the shuttle bridge, said means for moving the shuttle bridge including a motor drive supported by the crane bridge and means connecting said motor drive to said shuttle bridge.

4. A shuttle bridge crane for operation on a conveyor system having main crane bridge runways and spur tracks extending at angles and spaced from the main runways, trolleys for supporting said bridge crane on the runways and shuttle tracks carried by said bridge crane and extending transversely relative to said runways, a shuttle bridge and supporting trolleys therefor disposed on said shuttle tracks and supporting said shuttle bridge, said trolleys being spaced from ends of the shuttle bridge, motor drive means for moving the shuttle bridge carried by said crane bridge and connector means connected to said shuttle bridge and to said drive means, a carrier track carried by the shuttle bridge, a carrier and trolleys therefor, said carrier being movably supported on said carrier track by said trolleys, and circuit controlling means operated by said carrier to open the circuit to said motor drive means when said carrier is moved on said shuttle bridge, said shuttle bridge adapted to be moved into interlocking engagement with said spur tracks, and said carrier adapted to be moved off of said shuttle bridge when the shuttle bridge is interlocked with the spur tracks and circuit means for maintaining electrical connections for said carrier with said shuttle bridge and from said shuttle bridge to said main bridge at all times.

5. A shuttle crane bridge for a conveyor system having main tracks and spur tracks extending normal to and spaced from the main tracks, including a crane bridge, trucks connected to said crane bridge and disposed on said main tracks, shuttle bridge tracks carried by said crane bridge and extending transversely relative to said main tracks, a shuttle bridge, trolleys for the shuttle bridge disposed on the crane bridge and supporting said shuttle bridge therefrom, a carrier track carried by said shuttle bridge, and a carrier movably suspended from the carrier tracks, motor driven means carried by the crane bridge and flexible means connected to the shuttle bridge and said drive means for moving the shuttle bridge relative to the crane bridge, said shuttle bridge adapted to be moved with the carrier track into interlocking engagement with the spur tracks and said carrier adapted to be moved from said carrier track onto the spur tracks.

6. A conveyor system including main tracks and spur tracks extending at an angle from the main tracks, a crane bridge disposed for travel on the main tracks and shuttle bridge supporting means on said bridge extending transversely relative to the main tracks, a shuttle bridge for said crane bridge and means carried by the shuttle bridge cooperating with said shuttle supporting means on the main bridge to allow movement of the shuttle bridge on the main bridge and permit the end of the shuttle bridge to be extended beyond the end of the crane bridge toward and into alignment with the spur tracks, carrier supporting means carried by the shuttle bridge and having interlock means on its end adapted for selective interlocking engagement with the spur tracks; a carrier, and means on the carrier for connecting it to the carrier supporting means on said shuttle, means controlled by the carrier to allow movement of the shuttle bridge when the carrier is disposed on the shuttle bridge, said means for moving the shuttle bridge including a motor drive supported by the crane bridge and connector means connecting said motor drive to said shuttle bridge.

7. A shuttle crane comprising a bridge including end trucks and spaced, parallel, trolley tracks suspended therefrom, a shuttle including trolleys supported on said tracks, a trolley rail suspended from said shuttle between said trolley tracks, and load carrying trolley means suspended from said rail.

8. A shuttle crane comprising a bridge including end trucks and spaced, parallel, trolley tracks suspended therefrom, a shuttle including trolleys supported on said tracks, a trolley rail suspended from said shuttle between said trolley tracks, load carrying trolley means suspended from said rail, and means for moving said shuttle endwise along said tracks to advance one end thereof beyond the adjacent end of said bridge.

9. A shuttle crane comprising a bridge including end trucks and spaced, parallel, trolley tracks suspended therefrom, a shuttle including trolleys supported on said tracks, a trolley rail suspended from said shuttle between said trolley tracks, load carrying trolley means suspended from said rail, means for moving said shuttle endwise relative to said bridge for a limited distance in either direction, and other independent means for propelling said load carrying trolley means on said rail relative to said shuttle and bridge.

10. A conveyor system comprising spaced, parallel runways, spur tracks disposed at right angles to and in spaced relation to said runways, a shuttle crane including a bridge having wheeled end trucks to run on said runways and spaced, parallel, trolley tracks suspended therefrom, a shuttle including trolleys supported on said trolley tracks, a trolley rail suspended from said shuttle between said trolley tracks, load carrying trolley means suspended from said rail, and means for moving said shuttle relative to said bridge and advancing said rail into endwise engagement with one of said spur tracks.

11. A conveyor system comprising spaced, parallel runways, spur tracks disposed at right angles to and in spaced relation to said runways, a shuttle crane including a bridge having wheeled end trucks to run on said runways and spaced, parallel, trolley tracks suspended therefrom, a shuttle including trolleys supported on said trolley tracks, a trolley rail suspended from said shuttle between said trolley tracks, load carrying trolley means suspended from said rail, means for moving said shuttle relative to said bridge and advancing said rail into endwise engagement with one of said spur tracks, and means for propelling said load carrying means along said rail and a spur track in endwise engagement therewith.

FRANK C. HARRIS.