United States Patent [19]

Cullom

[11] **3,783,792**

[45] **Jan. 8, 1974**

[54] **REPAIR FACILITY FOR OVERHEAD CRANE**

[76] Inventor: **John T. Cullom,** 628 6th Ave., San Manuel, Ariz. 85631

[22] Filed: **Jan. 20, 1972**

[21] Appl. No.: **219,217**

[52] **U.S. Cl.** ..... **104/128,** 212/10, 104/98, 214/16.4 R

[51] **Int. Cl.** **B61b 3/00**

[58] **Field of Search** 214/624; 187/17; 212/10, 125; 104/89, 95, 106, 96, 98, 127, 128, 129, 137

[56] **References Cited**

UNITED STATES PATENTS

1,517,707	12/1924	Castleman	104/128
1,032,819	7/1912	Driscoll	187/17
3,611,946	10/1971	Heximer	104/98
659,492	10/1900	Schouboe	214/624
2,667,983	2/1954	Billings	104/127
3,517,830	6/1970	Virkkala	212/10

Primary Examiner—Gerald M. Forlenza
Assistant Examiner—D. W. Keen
Attorney—Dean S. Edmonds et al.

[57] **ABSTRACT**

An overhead crane arrangement that includes an overhead railway and at least one traveling crane riding on the rails of the railway is provided with a crane repair bay located directly below the overhead railway and with a vertically movable crane elevator section of the overhead railway that is adapted to receive and transport the traveling crane from the level of the overhead railway to the level of a railway spur located in the crane repair bay. Lift means are provided for moving the crane elevator section from the level of the overhead railway to the level of the repair bay railway spur and return.

7 Claims, 6 Drawing Figures

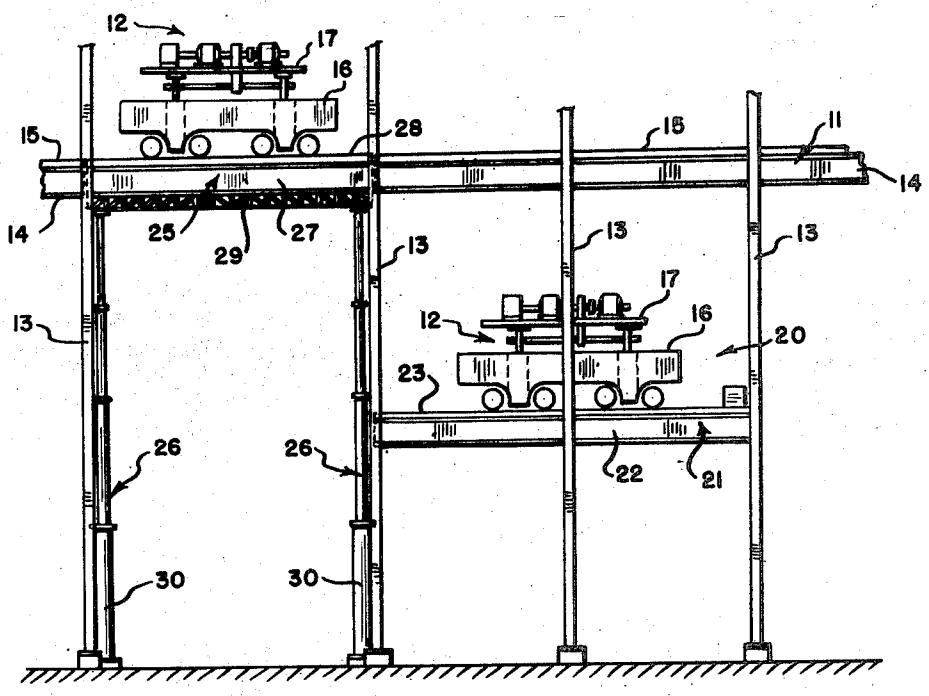


FIG. 1

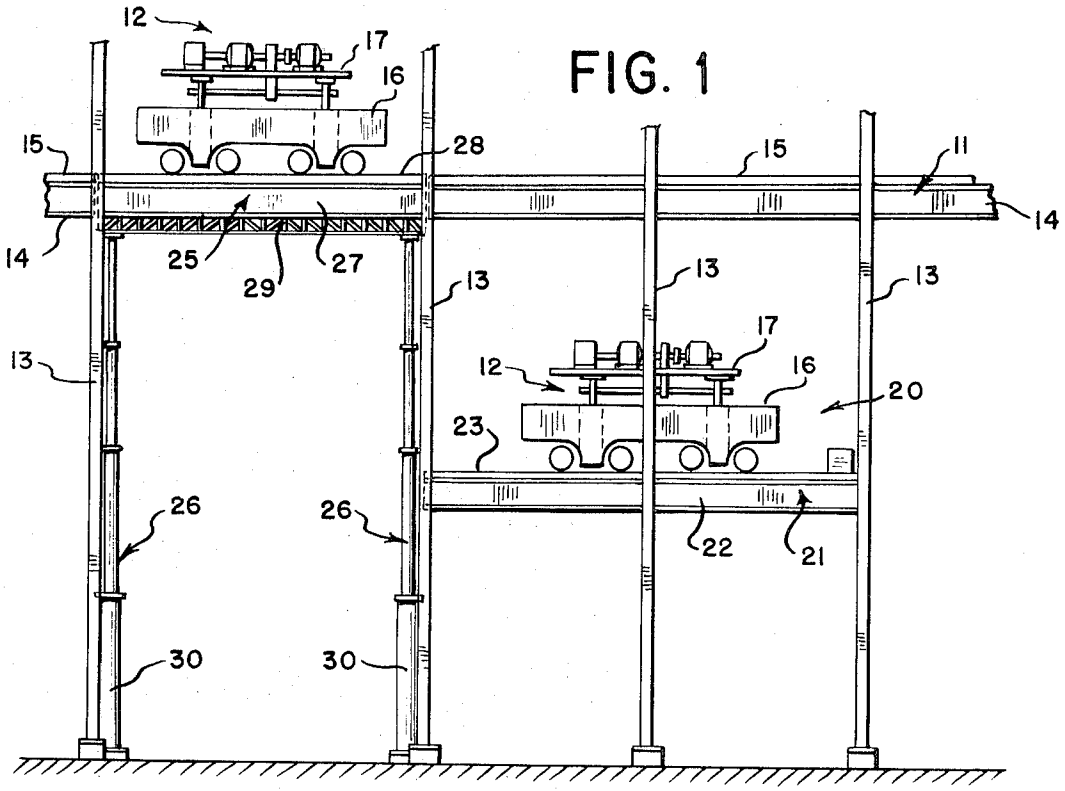

12
17
16
15
28
15
11
14
14
25
29
27
13
13
13
13
17
12
16
20
23
26
26
22
21
30
30

FIG. 2

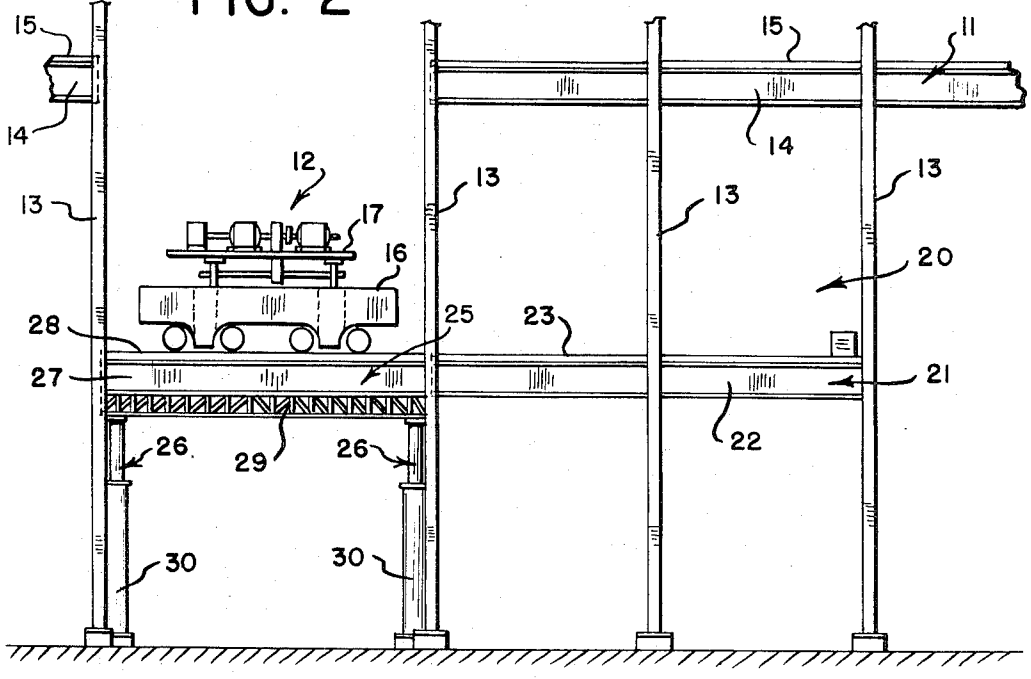

15
15
11
14
14
12
13
13
13
17
16
20
28
25
23
27
21
26
29
26
22
30
30

FIG. 3

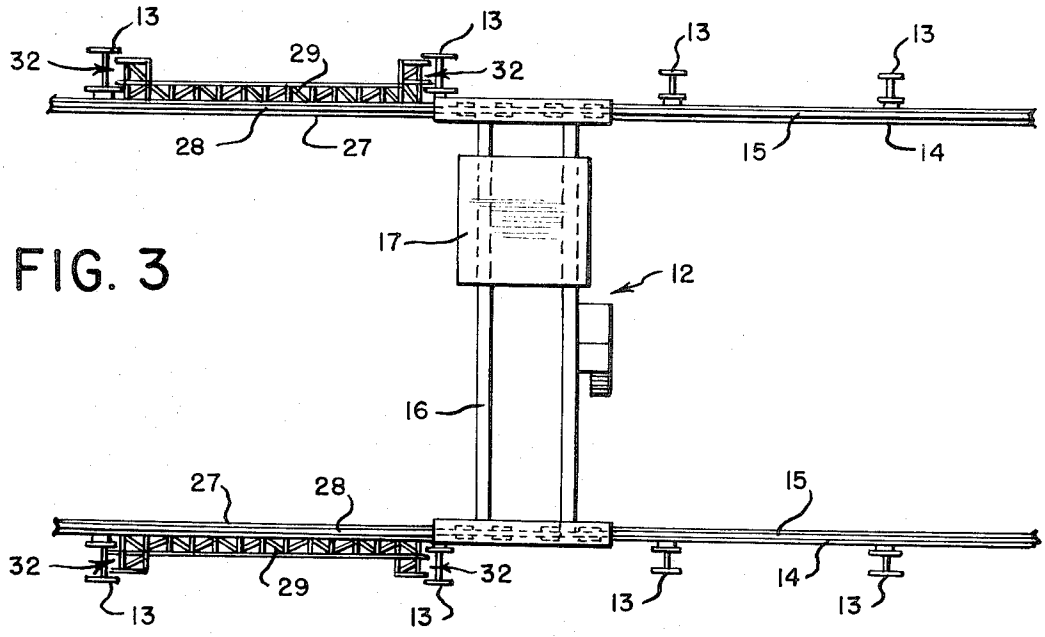

13
32
29
13
32
13
13
28
27
15
14
17
12
16
27
28
15
32
29
32
14
13
13
13
13

FIG. 4

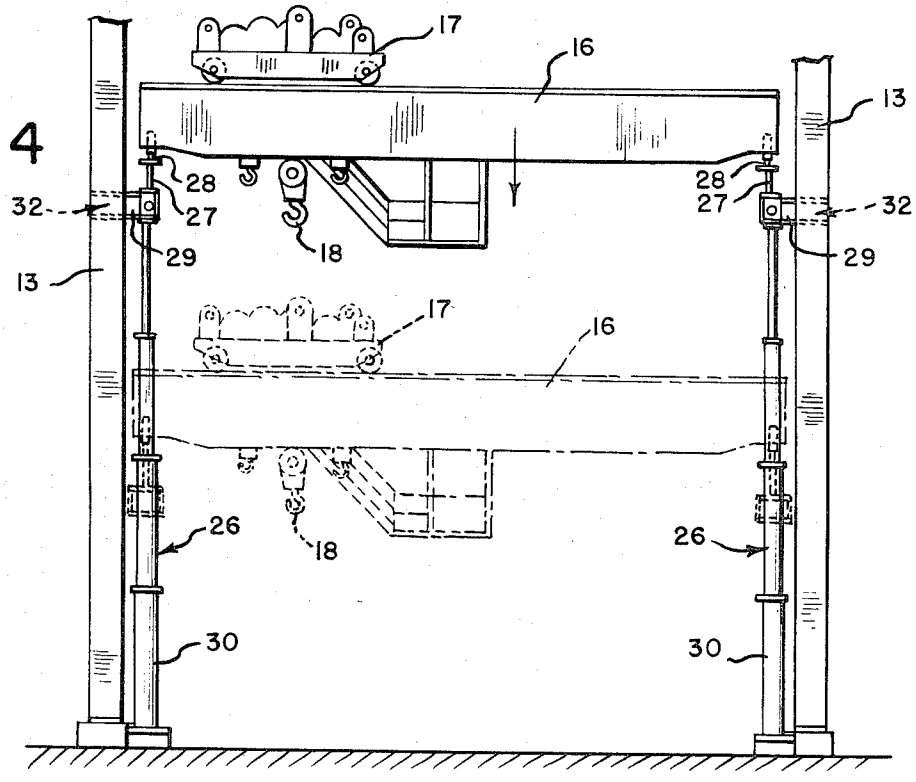
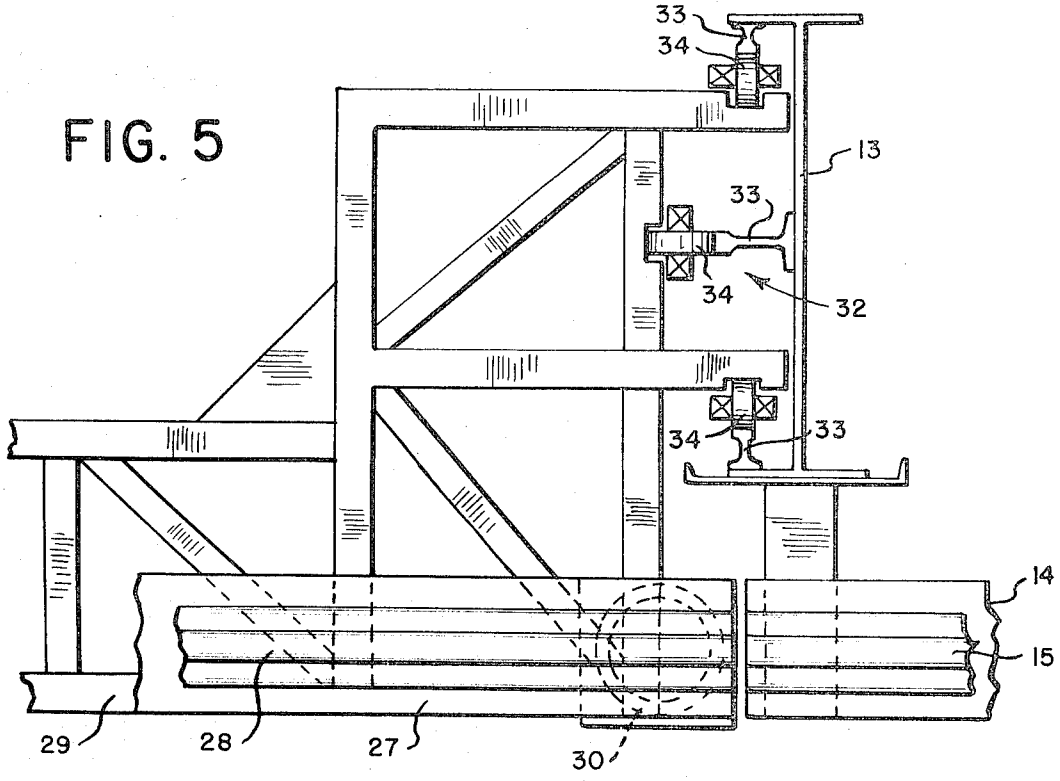

17
16
13
28
28
32
27
27
32
29
29
18
13
17
16
18
26
26
30
30

FIG. 5


33
34
13
33
34
32
34
33
14
15
29
28
27
30

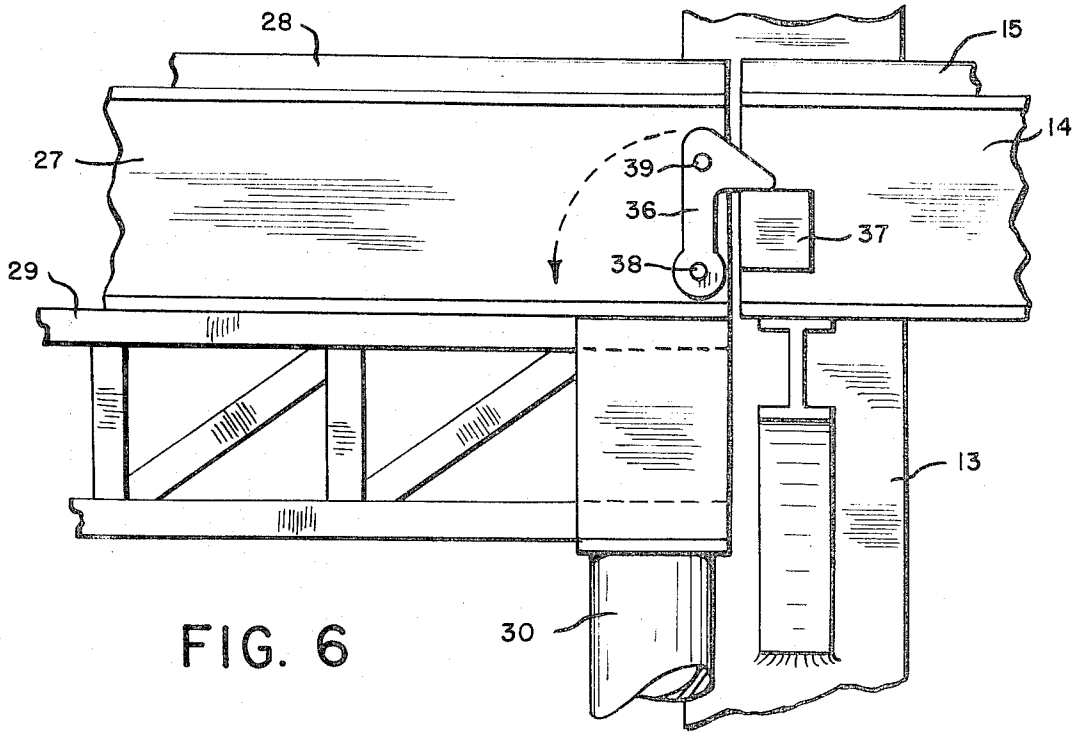

28
15
14
27
39
36
37
38
29
13
30

FIG. 6

REPAIR FACILITY FOR OVERHEAD CRANE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to traveling overhead cranes such as those employed in smelters, foundries and heavy manufacturing plants.

2. Description of the Prior Art

Many industrial plants are equipped with heavy duty overhead cranes that are used to lift and transport heavy loads from one location in the plant to another. In general, a conventional overhead crane arrangement comprises an overhead railway consisting of a pair of longitudinally extending parallel rails mounted on a plurality of spaced vertical columns, and at least one traveling crane consisting of a wheeled carriage riding on the rails of the overhead railway and a hoisting device mounted on the wheeled carriage. Usually, two or more traveling cranes are mounted on the overhead railway so that several lifting operations can be carried out at the same time and so that the withdrawal of one crane from service for maintenance or repair will not tie up all operations in the plant which require the use of an overhead crane. The provision of several traveling cranes on the same overhead railway is of particular importance in metallurgical plants where huge ladles of molten metal and slag must be handled with dispatch at several different locations within the plant quite often at the same time.

A traveling overhead crane on its operating rails is difficult to service and repair due to its extreme height above the ground and the absence of any lifting device able to handle the massive components of the crane. For example, a crane of 60 ton lift capacity weighs about 140 tons, the carriage of the crane by itself weighing about 60 tons. As a result, routine maintenance such as the changing of worn wheels and other such components is so difficult that ordinarily it is not done until the crane breaks down. As preventive maintenance is never properly accomplished, overhead cranes deteriorate in time. A further problem in the case of those installations having more than two cranes on a single overhead railway is that the repair of an inner crane takes the outside cranes out of service as well. If an attempt is made to repair a crane in the middle of the crane aisle no end-to-end traffic is possible. This is crippling to production in those crane aisles where an operation such as copper refining and casting is done at one end of the aisle only.

As a result of an investigation into the problems which arise in connection with the breakdown and repair of traveling overhead cranes, I have devised a repair facility for such cranes that provides for the lowering of a disabled crane into a repair bay located at an intermediate level below the overhead railway of the crane structure. When the disabled crane is moved into the repair bay, the heavy lifting necessitated by the repair of the crane and its components is carried out by other cranes remaining on the overhead crane railway above the repair bay. In addition, heavy components removed from the disabled crane can be lowered by an operating crane to ground level for transportation to the repair shop for efficient repair of the component in the shop. In the meantime, normal lifting and transporting operations along the entire length of the crane aisle can proceed without interruption by the use of the traveling cranes remaining in service.

SUMMARY OF THE INVENTION

The repair facility of my invention is an adjunct to a conventional overhead crane arrangement or assembly that includes an overhead railway mounted overhead on a plurality of spaced vertical columns and at least one traveling crane riding on the rails of the railway for longitudinal travel thereon. In accordance with the invention, a crane repair bay is located directly below the overhead railway, the repair bay having a pair of parallel rail sections which comprise a repair bay railway spur that is adapted to receive one of the traveling cranes. The overhead railway is provided with a vertically movable crane elevator section, the crane elevator section being adapted to receive and transport one of the traveling cranes from the level of the overhead railway to the level of the repair bay railway spur and to return the crane to the level of the overhead railway. The rails of the crane elevator section are maintained in alignment with and comprise an integral part of the overhead railway when the crane elevator section is moved to the level of the overhead railway, and the rails of said section are maintained in alignment with and comprise an extension of the repair bay railway spur when the crane elevator section is moved to the level of the repair bay. Lift means are provided for moving the crane elevator section vertically from the level of the overhead railway to the level of the repair bay railway spur and to return said section to the level of the overhead railway. The lift means advantageously comprises a hydraulic elevator mechanism. Guide means comprising guide rollers riding on vertical guide rails located at each end of each elevator crane section are also advantageously provided.

DESCRIPTION OF THE DRAWINGS

The invention will be better understood from the following description thereof in conjunction with the accompanying drawings of which:

FIG. 1 is a side elevation of the repair facility showing the vertically movable crane elevator section of the overhead railway in its raised position;

FIG. 2 is a side elevation showing the crane elevator section in its lowered position;

FIG. 3 is a plan view of the overhead railway shown in FIGS. 1 and 2;

FIG. 4 is an end elevation showing the crane elevator section in both its upper and lower positions;

FIG. 5 is an enlarged fragmentary plan view showing the guide means of the repair facility and

FIG. 6 is a side elevation of the apparatus shown in FIG. 5.

DESCRIPTION OF PREFERRED EMBODIMENT

As shown in FIGS. 1 through 4 in the drawings, the overhead crane arrangement to which the improved crane repair facility of the invention applies comprises a conventional overhead railway 11 and at least one conventional traveling crane 12 riding on the rails of the overhead railway for longitudinal travel thereon.

The overhead railway 11 comprises two parallel rows of spaced vertical columns 13 which support the longitudinally extending parallel I beams or girders 14 on which are mounted the pair of longitudinally extending parallel rails 15 of the railway. Each traveling crane 12

comprises a wheeled carriage **16** riding on the rails **15** of the overhead railway and a hoisting device **17** mounted on the carriage **16.** Usually, the hoisting device **17** is mounted on wheels which ride on traversely extending rails on top of the carriage **16** so that a load carried on the hook **18** of the hoisting device can be moved both longitudinally and transversely to any position beneath the overhead railway that can be reached by the traveling crane. For the reasons previously discussed, the overhead railway arrangement is ordinarily equipped with at least two traveling cranes **12,** and frequently it is equipped with more than two such cranes.

In accordance with the invention, a crane repair bay **20** is located at an intermediate level directly below the overhead railway **11.** The repair bay **20** is provided with a repair bay railway spur **21** that is adapted to receive at least one of the traveling cranes **12** for maintenance and repair thereof. In the embodiment shown in the drawings, the repair bay railway spur **21** comprises a pair of parallel longitudinally extending girders **22** that are supported by the vertical columns **13,** and a pair of parallel rails **23** that are supported by the girders **22.** The girders **22** and rails **23** comprise the spur **21** on which the traveling crane **12** rides when in the repair bay **20.**

The overhead railway **11** is provided with a vertically movable crane elevator section **25** which normally forms an integral part of the trackage of the overhead railway **11.** The crane elevator section **25** of the overhead railway is adapted to receive one of the traveling cranes **12** and to transport the crane from the level of the overhead railway **11** to the level of the repair bay railway spur **21.** Lift means **26** are provided for moving the crane elevator section **25** from the level of the overhead railway to the level of the repair bay railway spur **21** and back to the level of the overhead railway.

As shown in the drawings, the crane elevator section **25** advantageously comprises a pair of longitudinally extending parallel girder sections **27** on which are mounted a pair of parallel rail sections **28.** In the embodiment shown in the drawings, each of the grider sections **27** is advantageously mounted on a truss bridge **29,** and each end of each truss bridge **29** is supported by a multi-cylinder telescoping hydraulic lift mechanism **30.** In addition, as shown best in FIGS. **3, 4** and **5,** each truss bridge **29** is provided with vertical guide means **32** at each end thereof for maintaining the rail sections **28** of the crane elevator section **25** invertical alignment with the rails **15** of the overhead railway **11** and with the rails **28** of the repair bay spur **21.** As shown in FIG. **5,** the vertical guide means **32** advantageously comprises a group of cooperating vertical guide rails **33** mounted on each of the columns **13** adjacent each end of each bridge truss **29** and, therefore, adjacent each end of the rail section **28** supported thereby. A group of cooperating guide rollers **34** are mounted on each end of each truss bridge **29,** the guide rollers **34** riding on and being guided by the vertical guide rails **33** as shown in FIG. **5.** As a result, the rail sections **28** of the crane elevator section **25** are maintained in vertical alignment with the rails **15** of the overhead railway **11** when the crane elevator section **25** is moved to the level of the overhead railway, and are maintained in alignment with the rails **23** of the repair bay railway spur **21** when the crane elevator section **25** is moved to the level of the repair bay.

Locking means are advantageously provided for securing the crane elevator section **25** in position at the level of the overhead railway **11** and at the level of the repair bay railway spur **21.** Any suitable locking device may be employed for this purpose. In the embodiment shown in FIG. **6** of the drawings, the locking device comprises a latch member **36** at least one of which is pivotally mounted on each girder section **27** adjacent each end thereof, and cooperating latch support members **37** mounted on the adjacent girders **14.** Each latch member **36** is pivotally secured to the girder section **27** by means of a pivot pin **38** so that the latch member can be swung out of engagement with the cooperating latch support member **37** as indicated by the dotted lines in FIG. **6** of the drawing. When the latch member **36** is in its latched position as shown in FIG. **6,** it rests on and is supported by the support member **37,** the latch member **36** being locked in position by means of the removable locking pin **39** which extends through matching holes formed in the latch member **36** and the girder section **27.** When all of the latch members **36** are thus locked in their latched position the rail sections **28** of the crane elevator section **25** are maintained in vertical and horizontal alignment with the rails **15** of the overhead railway or with the rail sections **28** of the repair bay railway spur, as the case may be.

The crane repair facility is employed to maintain and repair the traveling cranes **12** in the following manner: When the crane elevator section **25** is in its normal position in alignment with the overhead railway **11,** the crane **12** requiring maintenance or repair is moved on to the crane elevator section as shown in FIGS. **1** and **4.** The locking means of the crane elevator section **25** are then released, and the crane elevator section with the crane **12** thereon is lowered to the level of the repair bay railway spur **21** as shown in FIG. **2** and in outline in FIG. **4.** The crane **12** is then moved into the repair bay **20** as shown in FIG. **1,** and the crane elevator section **25** is returned to the level of the overhead railway **11** where it is again locked in place. The crane **12** now located in the repair bay **20** can be serviced and repaired without interfering with the normal operations of the traveling cranes **12** remaining on the overhead railway **11.** If it is necessary to disassemble the crane **12** undergoing repair in the repair bay **20,** the heavy lifting operations involved in such repair work are carried out by the use of one of the traveling cranes **12** remaining in service on the overhead railway **11.** On completion of repairs the crane **12** in the repair bay is returned to the level of the overhead railway **11** by the use of the crane elevator section **25.**

It will be understood by those skilled in the art that the lift means **26** employed in the practice of the invention may comprise any suitable lifting mechanism such as a screw jack or a winch and cable mechanism, as well as the hydraulic lift mechanism **30** shown in the drawings. Similarly, as previously mentioned the locking means for the crane elevator section may comprise any suitable locking device such as sliding bolts or movable support brackets, as well as the latch member **36** shown in the drawing.

I claim:

1. A repair facility for an overhead crane that normally rides on an overhead railway, said overhead railway and crane arrangement comprising a pair of longitudinally extending parallel rails mounted overhead on a plurality of spaced vertical columns and at least two

traveling cranes riding on the rails of said railway for longitudinal travel thereon, said repair facility comprising:

a crane repair bay located directly below the overhead railway, said repair bay having a pair of parallel rail sections which comprise a repair bay railway spur that is adapted to receive one of said traveling cranes, another of said traveling cranes being positioned on the overhead railway directly over said repair bay in position to facilitate the repair of the traveling crane in said repair bay, by hoisting portions of the one crane when necessary,

a vertically movable crane elevator section of the overhead railway that normally comprises an integral part of said overhead railway, said crane elevator section being adapted to receive and transport one of said traveling cranes from the level of the overhead railway to the level of the repair bay railway spur and to return the crane to the level of the overhead railway, the rails of the crane elevator section being maintained in alignment with the overhead railway when the crane elevator section is moved to the level of the overhead railway and said rails being maintained in alignment with the repair bay railway spur when said crane elevator section is moved to the level of the repair bay, and

lift means for moving the crane elevator section vertically from the level of the overhead railway to the level of the repair bay railway spur and return.

2. The apparatus according to claim **1** in which vertical guide means are provided for maintaining said vertically movable crane elevator section in vertical alignment with said overhead railway and said repair bay railway spur.

3. The apparatus according to claim **2** in which the vertical guide means comprise vertically extending guide rails mounted on the vertical columns of the overhead railway located adjacent each end of each of the parallel rails of said crane elevator section, and guide rollers mounted on said crane elevator section adjacent each end of each of the parallel rails thereof, said guide rollers riding on said vertical guide rails.

4. The apparatus according to claim **1** in which each of the parallel rails of said crane elevator section is separately supported by said lift means.

5. The apparatus according to claim **4** in which the lift means comprises at least two hydraulic elevator mechanisms, at least one of said mechanisms supporting and raising and lowering each of the parallel rails of said crane elevator section.

6. The apparatus according to claim **1** in which crane elevator locking means are provided for maintaining the rails of said crane elevator section in horizontal alignment with the rails of said overhead railway when the crane elevator section is at the level of the overhead railway.

7. The apparatus according to claim **1** in which crane elevator locking means are provided for maintaining the rails of said crane elevator section in horizontal alignment with the rails of said repair bay railway spur when the crane elevator section is at the level of the repair bay railway spur.

* * * * *