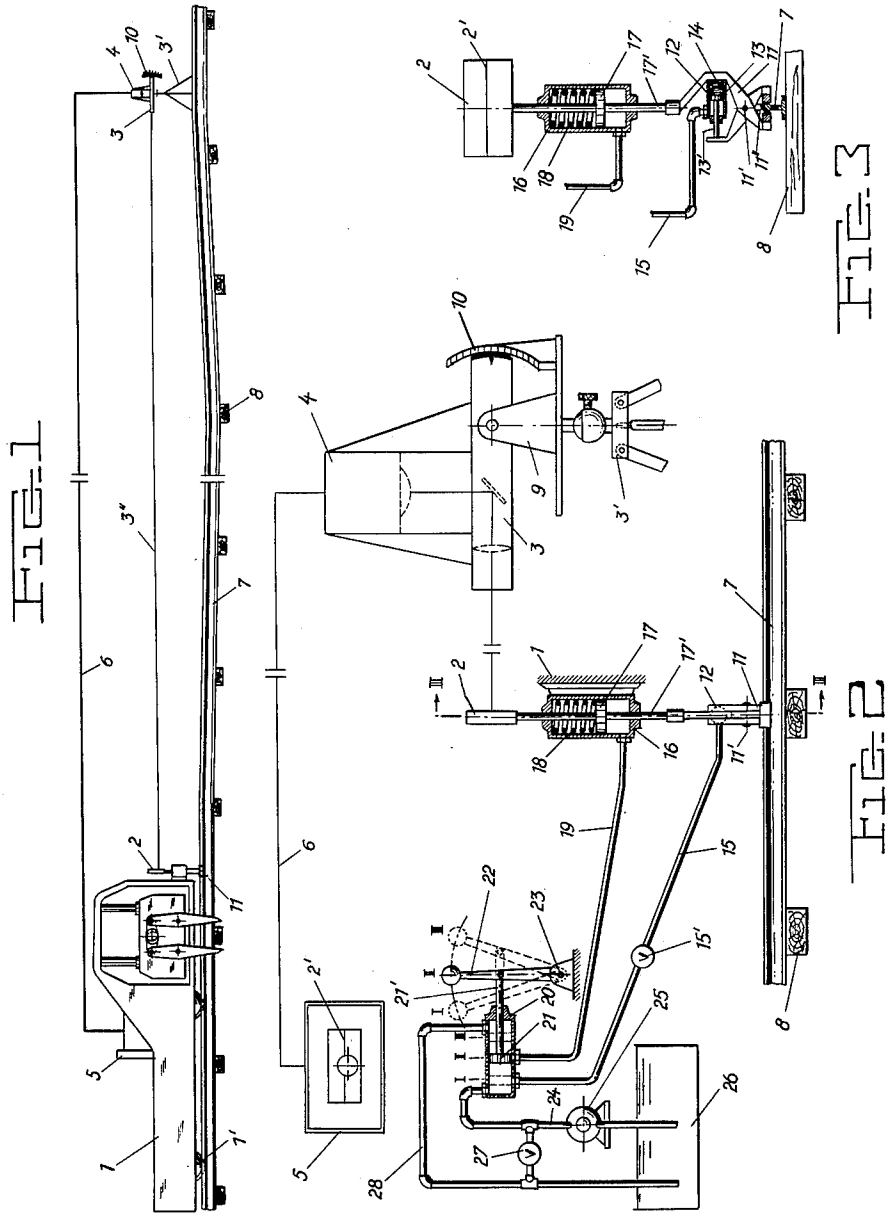
July 3, 1962 F. PLASSER ET AL 3,041,982

SYSTEM FOR LIFTING A TRACK SECTION

Filed April 28, 1958 4 Sheets-Sheet 1



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SYSTEM FOR LIFTING A TRACK SECTION

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FIG. 5

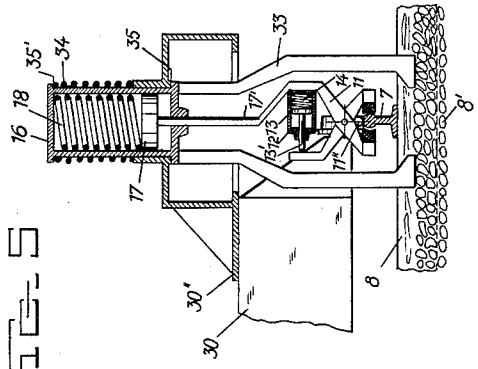
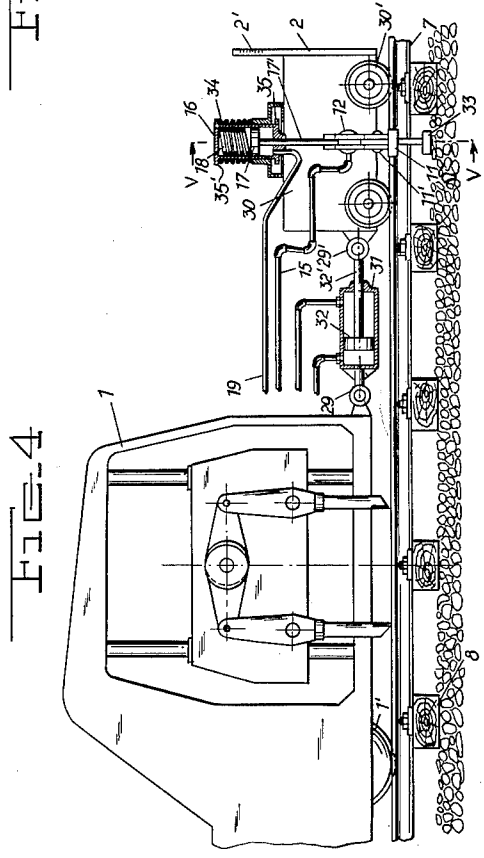


FIG. 4



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SYSTEM FOR LIFTING A TRACK SECTION

Filed April 28, 1958 4 Sheets-Sheet 3

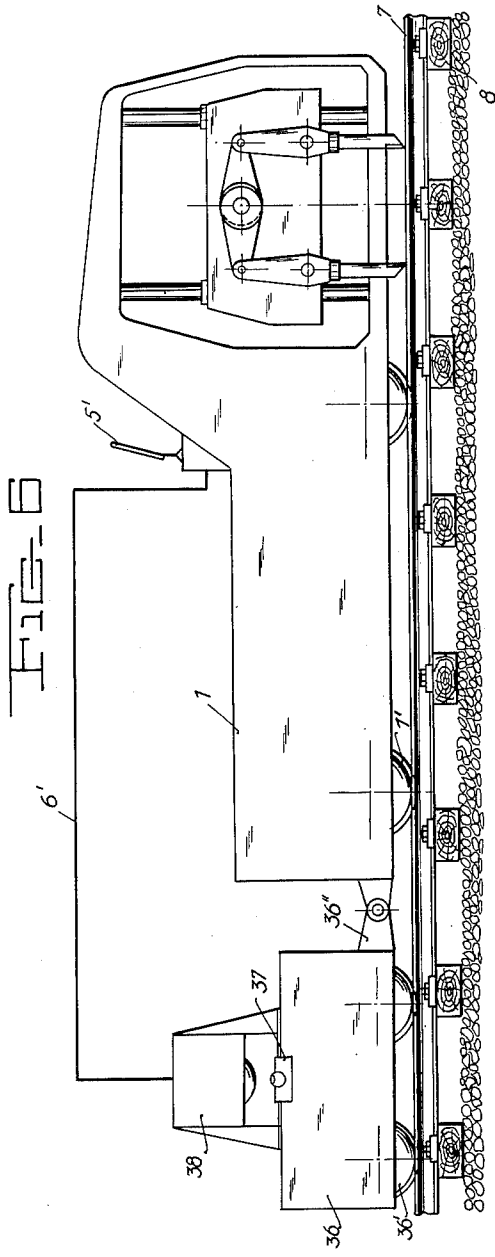

FIG. 6

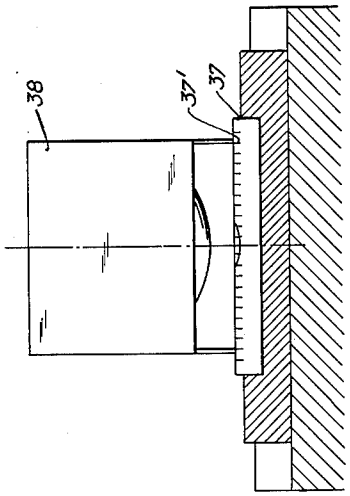

FIG. 7

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SYSTEM FOR LIFTING A TRACK SECTION

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FIG 8

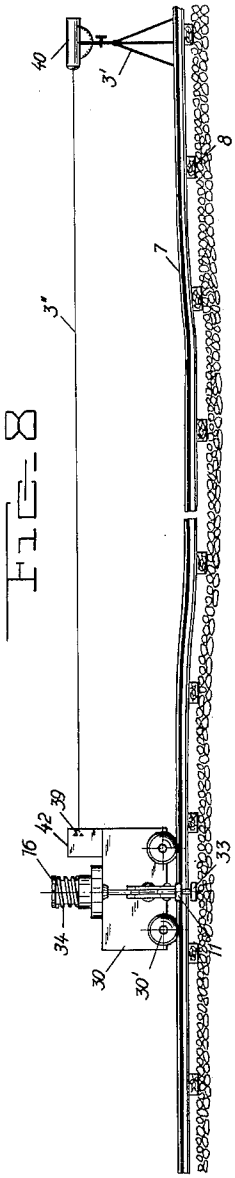
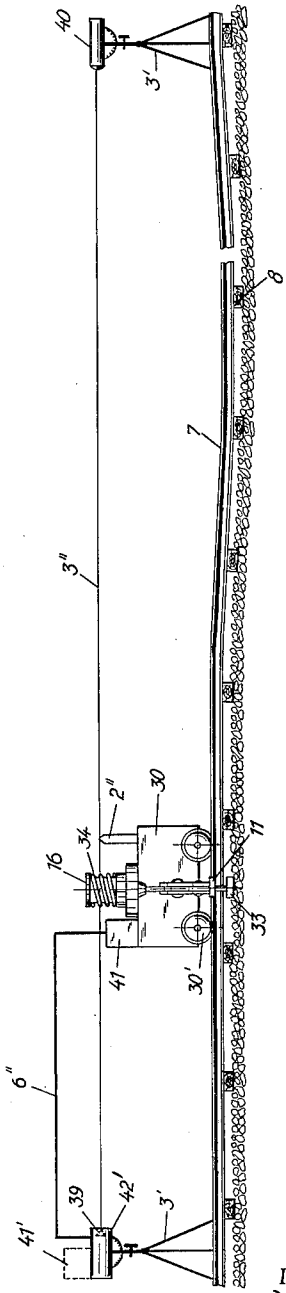


FIG 9



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United States Patent Office

3,041,982

Patented July 3, 1962

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SYSTEM FOR LIFTING A TRACK SECTION

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Filed Apr. 28, 1958, Ser. No. 731,326
Claims priority, application Austria May 3, 1957
2 Claims. (Cl. 104—7)

The present invention relates to a system for lifting a track section to a predetermined level and includes a rail lifting mechanism which moves on wheels on the track and a stationary instrument positioned at one end of this track section ahead of and spaced from the rail lifting mechanism, the stationary instrument having a sight adjustable to the desired level of the track.

It is the object of this invention to improve and simplify such a track lifting system. In accordance with the invention, any deviation of the sight line, which has been adjusted to the desired level of the track, from the actual track position at the location of the rail lifter may be observed at the carriage which supports the lifting mechanism. For this purpose, the carriage is provided with optical, photoelectric, television or equivalent means responsive to the sight line, this means transmitting intelligence to an operator of or directly operating the rail lifting mechanism under constant control of this intelligence so that the track will be accurately raised to the desired level.

In accordance with one embodiment of the invention, an emitter of radiant energy, for instance a light source, may be positioned at one end of the track section to be lifted. The rail lifting mechanism is mounted on a carriage moving toward the other end of said track section. The radiant energy beam is adjusted to be parallel to the desired position of the track section and is viewed from the carriage. This observation may be effected by a receiver mounted on the carriage. The receiver may be a photoelectric cell, such as a selenium cell, which emits a signal or an impulse when the beam impinges thereupon, i.e. when the track has been lifted to the desired level. Alternatively, the receiver may itself be mounted on an angularly adjustable stationary instrument positioned at the other end of the track section, with the carriage placed between the emitting and receiving instruments and having a stop or the like to influence or interrupt the emitted beam when the rail lifter has reached a predetermined height. In this manner, the receiver is caused to transmit a signal or an impulse to stop the lifting mechanism when the predetermined height is reached.

According to another embodiment of the invention, the instrument at one end of the track section to be lifted is a transit with a telescope focused on a marker on the track lifting mechanism. A television camera is arranged to view the marker and the coordinated centering hairline of the telescope and to transmit this picture to a screen which may be observed by the operator of the lifting mechanism to stop it when the marker and the hairline register horizontally.

If the track lifting mechanism is combined with a track tamper, a visual control means, for instance another television screen, may be provided on the tamper to enable the operator to view the tamped track section behind the tamper.

The above and other objects, features and advantages of the present invention will be more fully explained in connection with some preferred embodiments described in detail in conjunction with the accompanying drawing wherein—

FIG. 1 is a schematic side view of one embodiment of the system showing the cooperation between the track lifting mechanism and an optical surveying instrument;

FIG. 2 illustrates the rail gripping and lifting mechanism and the transit in more detail;

FIG. 3 is a section of FIG. 2 along line III—III;

FIG. 4 is a side view, partly in section, of another embodiment of the track lifting mechanism;

FIG. 5 is a section of FIG. 4 along line V—V;

FIG. 6 is a side view of a track tamping machine with attached surveying carriage;

FIG. 7 is a schematic section of the surveying carriage; and

FIGS. 8 and 9 constitute side views of further embodiments of the invention, wherein the transmitter is an optical light source.

Like reference numerals refer to like parts in all illustrated embodiments.

Referring now to FIG. 1, a carriage **1** of a track tamping machine of any suitable type is shown to have wheels **1'** to move on rails **7**. The rails are mounted on transverse ties **8** in the roadbed. A rail gripping and lifting mechanism (more fully illustrated in FIGS. 2 and 3) is mounted at the front end of the carriage which overhangs the track section to be tamped. The piston rod **17'**, which is vertically reciprocably mounted in cylinder **18** to effect the rail lifting movement, carries at its upper end a plate **2** with horizontal marker **2'**. The surveying instrument or transit is positioned at the end of the track section to be lifted and tamped.

As shown in FIG. 2, the transit is mounted on tripod **3'** which universally supports a platform and bracket **9**, the telescope **3** being pivoted in the bracket **9**. The telescope has a centering hairline and cooperates with an angular scale **10** to adjust the angular position of the telescope. A television camera means **4** is arranged on the telescope to take the picture of the marker **2'** and the telescope hairline as it is received by beam **3''** and projected into the camera by suitable optical means, an inclined reflecting element in the path of beam **3''** being shown. The camera means is connected with a screen **5** by means of a coaxial cable **6** or equivalent transmission means, the screen being mounted on carriage **1**.

The rail gripping device includes a vise consisting of a pair of clamping jaws **11** pivotally connected intermediate their ends at fulcrum **11'**. In a manner known per se, the vise also has a rail contact element **11''** to make certain that the marker **2'** always has the identical distance from the upper edge of the rail. The clamping jaws are operated hydraulically in a known manner. For this purpose, there is provided pressure fluid cylinder **12** carrying piston **13** with piston rod **13'**, return spring **14** being mounted in one of the cylinder chambers while the other chamber is connected to pressure fluid supply conduit **15**.

The rail gripping device, i.e. the stationary one of clamping jaws **11**, is connected to vertically reciprocable piston rod **17'** of the rail lifting mechanism. This mechanism comprises pressure fluid cylinder **16** wherein piston **17** and piston rod **17'** glide. One chamber of the cylinder holds compression spring **18** which is weakly biased downwardly to keep contact element **11''** in permanent engagement with the upper edge of the rail. Pressure fluid supply line **19** leads into the other chamber of cylinder **16**.

The pressure fluid supply to cylinders **12** and **16** is controlled by a valve consisting of cylindrical valve housing **20** and piston or slide **21** connected to piston rod **21'**. A handle is movable about fulcrum **23** into positions I, II, and III, the handle being connected to the piston rod to enable the slide **21** to be moved in cylinder **20** into corresponding control positions I, II, and III. A pump **25** feeds pressure fluid from fluid supply **26** through line **24** into the valve housing, a pressure relief valve **27**

being connected to return line 28 so as to limit the maximum pressure in the cylinders of the rail gripping and lifting mechanism.

The machine operates as follows:

The operator moves the carriage 1 into position so that the tamping tools are vertically aligned above the tie to be tamped, in a manner well known per se. Before starting the tamping of the ballast, he moves handle 22 from its rest position I into operating position II. In position I (illustrated in broken lines in FIG. 2), pump 25 merely returns fluid through valve 27 and return conduit 28 into the fluid storage tank 26. Since valve 15' in conduit 15 is open, fluid will be supplied through line 15 to cylinder 12 when position II (full lines) is assumed. The fluid pressure will move piston 13 to the right (as viewed in FIG. 3) thus forcing the pivoted clamping jaw which is fixedly connected to the piston rod 13' to grip the rail 7 between it and its cooperating fixed jaw, the entire vise being downwardly pressed into engagement with the rail by spring 18. Now handle 22 is thrown into position III. In the latter position, fluid will also be supplied to cylinder 16 through conduit 19 whereby rail 7 will be lifted against the pressure of spring 18.

The operator now looks at television screen 5 where he watches the relative positions of marker 2' and the centering hairline of the telescope, as the picture comes from camera 4. As soon as the marker and the hairline register horizontally, he throws the handle 22 back into position II. This promptly stops further lifting of the rail but maintains the same in the lifted position since the pressure in cylinder 16 remains unchanged for the time being. Tamping of the ballast beneath the tie is now effected to fix the rail in the position to which it was lifted. It is sufficient to fix the vertical position of one of the rails of the track in the indicated manner since the position of the other rail can readily be fixed in the usual manner by means of a level. While tamping proceeds and after it is completed, the operator can constantly observe the correct position of the track by watching the screen which projects the relative position of marker 2' and the centering hairline of the transit telescope 3. Any necessary corrections can be affected immediately by further lifting of the rails and additional tamping.

After tamping is completed, the vise can be promptly detached from the rail by throwing handle 22 into position I, causing pressure fluid to flow out of cylinders 12 and 16 instantly and to return to the fluid supply by return line 28. The tamping machine is now ready to be driven forward to the next tie to be tamped. During this forward movement of the carriage, the contact element 11'' will glide over the rail 7. Therefore, it is preferred to use friction-reducing means such as rollers, balls and the like.

When the tamper is not in use but merely driven over the tracks to a location where road maintenance work is to be effected, the rail gripping device is moved upwardly out of engagement with the rail. This is done by closing check valve 15' so that no fluid can be supplied to cylinder 12 and the vise remains open. While the vise is in this position, handle 22 is moved into position III to lift the vise off the rail. It may be maintained in the upper position by any known mechanical means (not shown).

In the system of FIGS. 4 and 5, the rail gripping and lifting mechanism is not mounted at the front end of tamping machine carriage 1 but on a separate carriage 30 moving on trucks 30'. Carriage 30 is attached to the front end of carriage 1 by means of a longitudinally adjustable coupling. The coupling comprises a cylinder 31 linked at one end to pivot 29 while the pivot 29' is connected to carriage 30 and linked to piston rod 32', the piston rod carrying piston 32 slidably mounted in cylinder 31. As shown, pressure fluid may be supplied to one cylinder chamber to move the piston into any desired position whereby the distance of carriage 30 from carriage 1 may be adjusted according to the tie spacing.

To be operative, the rail gripping and lifting mechanism mounted on carriage 30 must be supportable on the ballast bed 8'. For this purpose, the lift cylinder 16 is vertically slidably mounted in brackets 30'' and has attached thereto a pair of jacking or support members 33 extending downwardly at each side of rail 7 to contact the road bed.

As in the embodiment of FIG. 2, the piston 17 is urged downwardly by spring 18 while a coil spring 34 is mounted between the brackets 30'' and a shoulder 35' at the upper end of the lift cylinder, spring 34 being biased to urge the cylinder upwardly so that the jacking members attached to the cylinder will not interfere with the forward movement of the machine when the lifting device is in its rest position. The vertical play of the lift cylinder is limited by its end shoulders 35 and 35'.

As shown in FIG. 4, the plate 2 with marker 2' is mounted at the front end of carriage 30 whereby the vertical position of the lifting device may be sighted in the same manner as in the aforedescribed embodiment.

The rail gripping and lifting mechanism also operates essentially in the same manner. When pressure fluid is fed through conduit 19 into cylinder 16, the cylinder is first moved downwardly since the piston rod 17' is fixedly held in view of the vise 11 being clamped to the rail. As soon as the downward movement of the lift cylinder brings the jacking members 33 into contact with the road bed, the resistance of the bed will force the entire carriage with the rail clamped to vise 11 to be jacked up upon further supply of fluid to cylinder 16. This causes the marker 2' to move in relation to the centering hairline of the telescope 3 in the same manner as explained in connection with FIG. 1–3, tamping being controlled by the operator who views the television screen 5 to determine the proper level of the rail.

FIG. 6 illustrates a conventional track tamping machine having a trailer 36 coupled to its carriage 1, the coupling being shown at 36''. The trailer carries a bubble level 37 with a scale 37'. The scale is viewed by a television camera 38 connected to screen 5' by a suitable electrical picture transmission means, i.e. a coaxial cable 6'. The television screen 5' is mounted on carriage 1 within view of the machine operator so that he may constantly observe the position of the tamped track.

In the embodiment of FIG. 8, the track gripping and lifting mechanism of FIG. 4 is shown to cooperate with a light source mounted on tripod 3' and adjustable to project a beam 3'' toward the lifting device. The light source may be, for instance, a stroboscopic spotlight 40 which emits a sharply defined pencil of rays 3''. The structure of the rail gripping and lifting device has been described in conjunction with FIG. 4 and is identical therewith. Instead of marker 2', the carriage 30 carries a receiver for light pencil 3'', which is a selenium cell 39 in the illustrated embodiment. Any suitable optical or acoustic signaling device 42 may be connected to the receiver 39 to indicate to the operator when the light pencil 3'' impinges upon the receiver, such means being well known per se and being accordingly only diagrammatically indicated. Alternatively, the execited selenium cell may trip an electrical circuit for automatically actuating the rail gripping and lifting device in a manner known per se. In this case, no signaling device for alerting the operator is needed.

A modification of the embodiment of FIG. 8 is shown in FIG. 9. In this case, the emitting light source is also stationed at the end of the track section to be tamped, as shown at 40, but the receiving selenium cell 39 is mounted on a separate housing 42' which is supported by a tripod 3' at the other end of this track section. The carriage 30 with its rail gripping and lifting mechanism runs on this track section between emitter 40 and receiver 39. The carriage supports a fixed stop 2'' which interrupts the

light pencil 3'' when the rail lifting mechanism raises the track and carriage 30, as hereinbefore described. The impulse in the selenium cell 39 caused by the interruption of the impinging light beam is transmitted by an electrical transmission means, such as electric cable 6'', to signaling device 41 mounted on carriage 30. Alternatively, the impulse from the selenium cell may be used directly to deactivate the rail lifter as soon as the rail is raised to the desired level, i.e. when stop 2'' interrupts the light beam from emitter 40. Furthermore, the cable 6'' may also be omitted if a signaling device 41' is mounted directly on housing 42' and emits a signal which can be received at the location of the lifting mechanism.

Essentially, the embodiments of FIGS. 8 and 9 operate along similar lines. After prolonged use, a railway track shows "high points" at changing distances from each other, where the track has not been or has only been a little depressed from its original and correct level. These points require no position adjustment, i.e. the ties at such high points of the track require no tamping. On the other hand, track sections between these high points have been more or less depressed and must be lifted to their original level.

Such track sections of reasonable length are delineated by positioning a radiant emitter at one of the high points of the track, as the track tamper approaches each section in continuous operation. The emitted light or other radiant beam 3'' is adjusted to be exactly parallel to the desired position of the track. This sight beam can be adjusted either absolutely on the basis of requisite measurements or by means of existing fixed survey points or relatively in respect of a high point at the other end of the track section to be lifted, for instance selenium cell 39.

After the beam is angularly adjusted to the desired position which corresponds to the desired level of the track, the carriage 30 is moved from tie to tie. The beam 3'' is controlled from the carriage by stop 2'' and when the beam is interrupted, the selenium cell 39 will transmit a signal to the operator or will directly operate the rail lifter to stop its movement so that the rail will remain in the desired position.

It is one of the outstanding advantages of the invention that the system constitutes a continuous and automatic control of the track positioning without manual aid, assuring accurate levelling of the track without the need of time-consuming after-measurements and corrective work.

The use of light sources is particularly economical and also assures very accurate measurements when present-day stroboscope flashes are utilized for this purpose.

It will be readily understood that the radiant energy emitted and received may be of any suitable type making control from the position of the lifting mechanism possible and assuring sufficient accuracy. Thus, in addition to light or electron waves, there may be used electromagnetic radiation of other types, such as infrared or ultraviolet waves, supersonic waves, etc.

What we claim is:

1. A system for successively aligning an elongated, substantially horizontal track, comprising a first aligned elongated section of said track; a second elongated section of said track longitudinally spaced from said first section and to be aligned therewith; first and second supports respectively arranged on said track sections, said first support being movable on said first track section and having first and second portions spaced along said track sections, the first portion being vertically above said second track section and the second portion resting on said aligned track section direction; track lifting means on the first one of said portions nearer said second support and operable for lifting a longitudinally coordinated element of said second track section; track tamping means on the first one of said portions further remote from said second support for securing said track element in a lifted position when said first support moves towards said second support; marker means on said first support at a fixed vertical distance from said track element; optical means on said second support for establishing a fixed line of sight from said second support toward said marker means, said marker means being aligned with said line of sight when said track element is lifted; indicating means on said second portion of the first support operatively connected to said optical means for indicating alignment of said marker means with said line of sight; and control means on said first support for controlling operation of said track lifting means.

2. A system as set forth in claim 1, wherein said line of sight extends in a substantially, horizontal direction parallel to the direction of elongation of said track.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,041,982 July 3, 1962

Franz Plasser et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 18, strike out "direction"; line 37, after "substantially" strike out the comma.

Signed and sealed this 27th day of November 1962.

(SEAL)
Attest:
ESTON G. JOHNSON
Attesting Officer

DAVID L. LADD
Commissioner of Patents