

March 21, 1950

F. F. ZAVATKAY
FOLDING PILE DRIVER LEAD

2,501,369

Filed Oct. 11, 1946

3 Sheets-Sheet 1

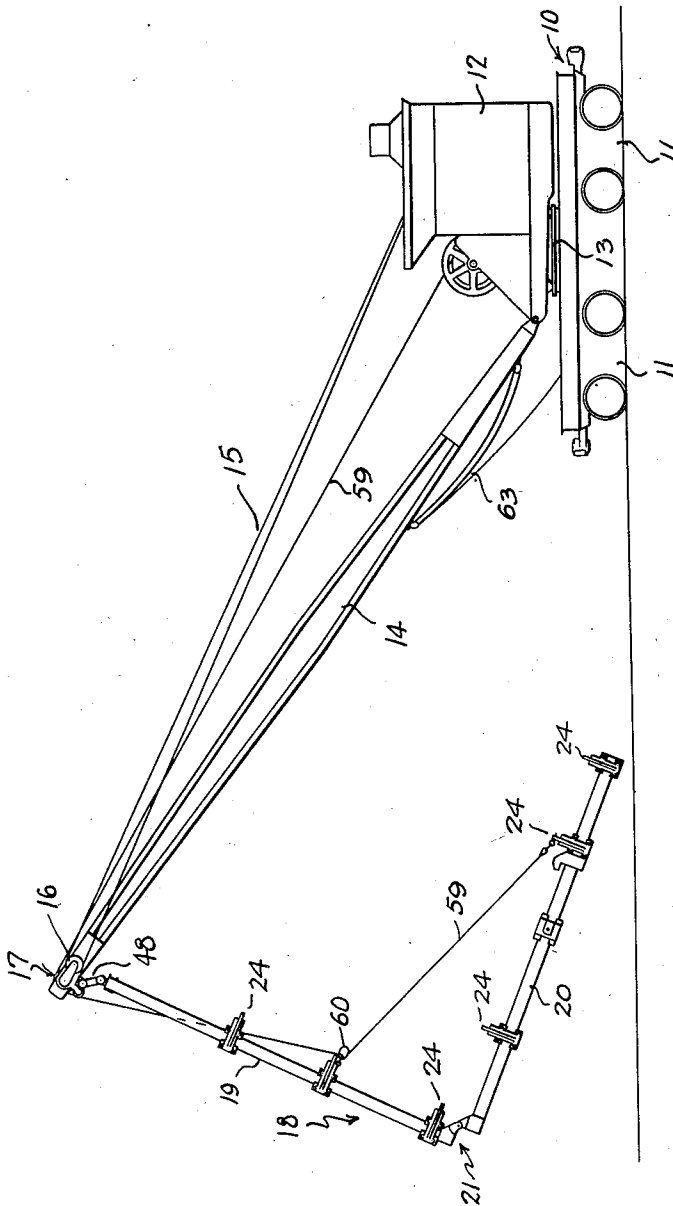


Fig. 1.

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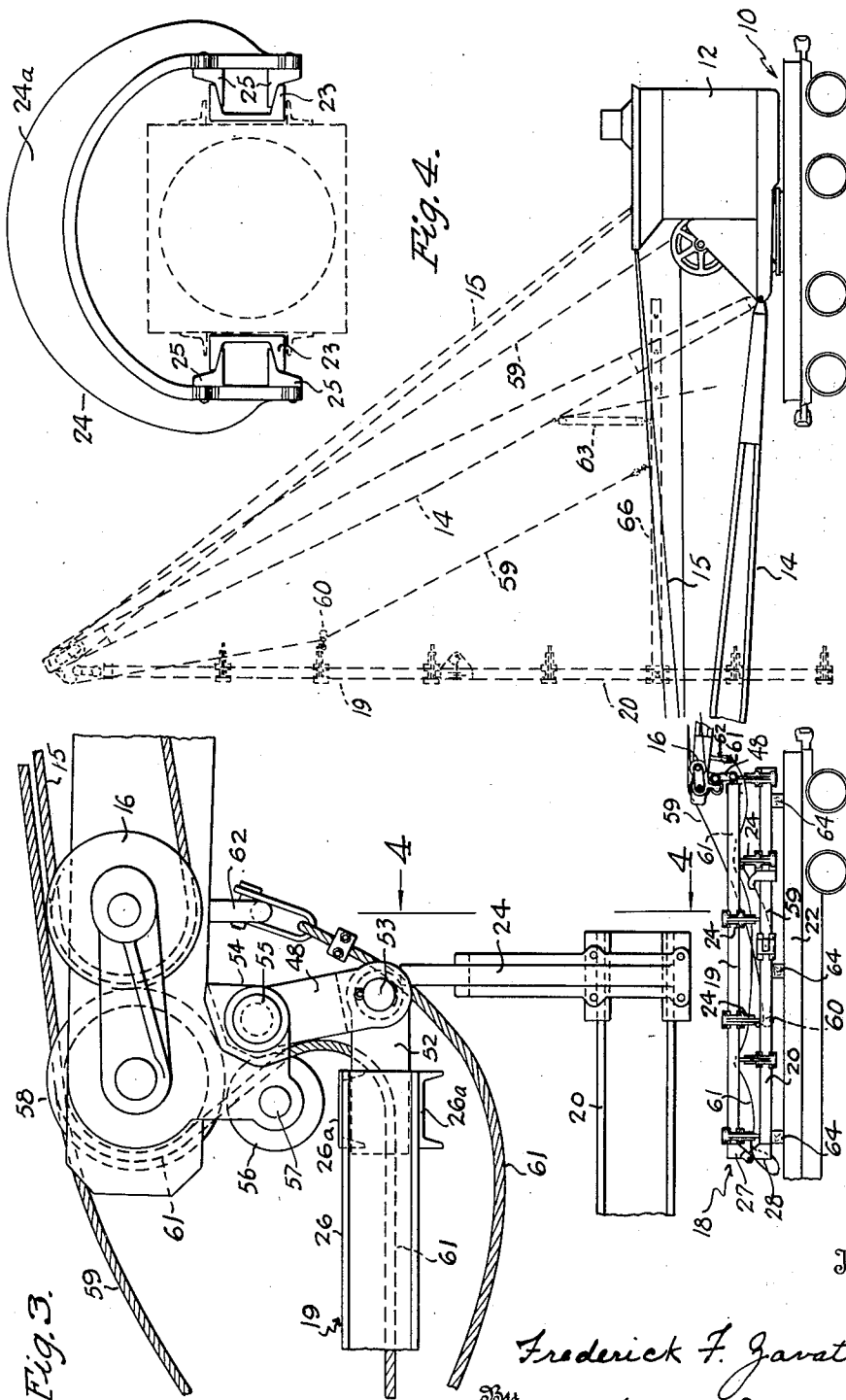
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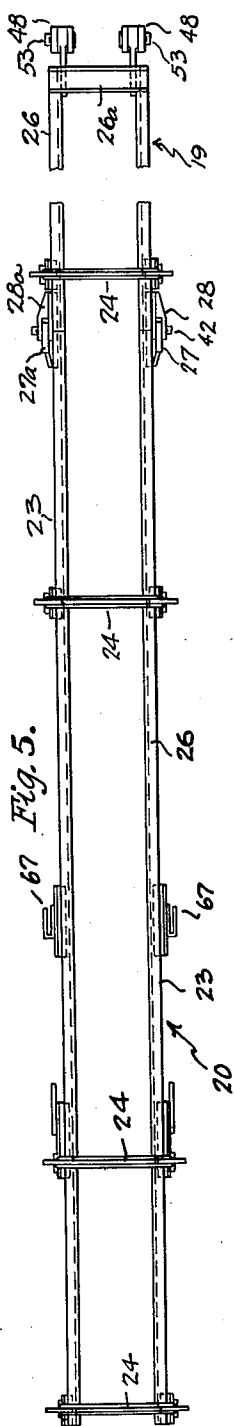


Fig. 5.

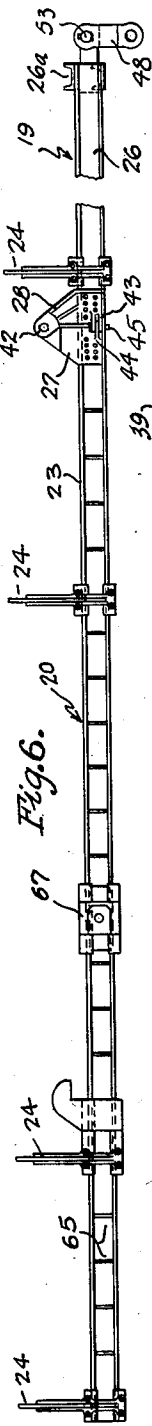


Fig. 6.

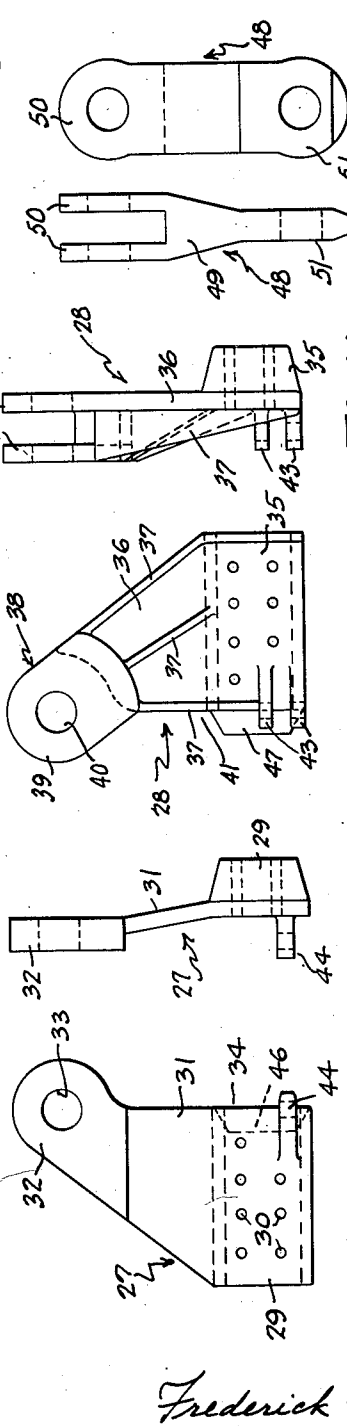


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

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UNITED STATES PATENT OFFICE

2,501,369

FOLDING PILE DRIVER LEAD

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Application October 11, 1946, Serial No. 702,787

11 Claims. (Cl. 61—74)

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This invention relates to pile drivers and the like.

An object of the invention is to provide an improved pile driver and method of setting up the same, which reduces the time required for the setting-up operation, and also reduces the hazard to workmen.

Another object of the invention is to provide an improved lead for a pile driver, which may be quickly erected and put in use, and may be quickly taken down and conveniently collapsed so as to occupy little space, for storage.

A further object of the invention is to provide an improved pile driver lead as above, which is simple in construction and economical to fabricate.

Yet another object of the invention is to provide a conveniently collapsible pile driver lead in accordance with the above, which is sturdy and strong for the purposes required.

These objects are accomplished, according to the invention, by the provision of a pile driver having a multisection, articulated lead the sections of which are hingedly secured together so as to be foldable one on the other. The construction of the lead is such that, when folded it may be quickly erected and extended for use on the job with a minimum of time and personal hazard. Also, when it is necessary to dismantle the pile driver for removal to a new location, the articulated lead may be easily taken down and folded to a collapsed state wherein it is convenient to handle for shipment or storage.

In the embodiment of the invention illustrated herein as exemplary thereof, the articulated lead comprises a pair of lead sections pivotally joined together at one end each. A free end of one lead section carries links which are adapted to be connected to the end of the boom of the crane, so that the entire lead may be raised and suspended from the boom. In carrying out the erection of the lead the boom is first lowered, so that the links of the one lead section may be secured thereto by a workman standing on the ground or a flat car if the leads are on one. The boom is then partially raised, causing the lead sections to spread apart at an angle as the connected section rises with the boom, whereupon the sections are adjustably tied together and the raising of the boom continued, the operator meanwhile controlling and gradually increasing the separation of the sections so as to maintain the entire lead suspended and off the ground with the lowermost lead section just above the ground until the sections are finally in align-

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ment with each other and supported solely by the boom.

At this point a workman climbs the lowermost lead section and applies locking pins to the hinge connection between the sections, the latter being thereby held substantially rigid and in mutual alignment, and functioning as a single unitary lead.

Heretofore it was necessary, where the lead was not constructed of hinged sections but instead comprised a single rigid assembly incapable of folding, for the lead to be raised by the boom of the crane to an upright position, and then for a workman to climb the entire length of the raised boom in order to secure the latter to the top of the upright lead. This was not only a time-consuming operation, but constituted a hazard to the safety of the workers due to the great height and also the difficulty of joining the boom and lead. By the present invention, through the use of a lead formed of hinged sections, the time required for the complete erection of the lead is considerably reduced, and it is only necessary for the workman to climb the lowermost lead section to the center of the lead on ladder irons provided for this purpose; this represents a height of but half that of the total lead height.

Moreover, at this lesser height the workman performs only the very simple operation of inserting locking pins in pre-aligned apertured lugs, in order to lock the lead sections in alignment, which is much simpler and easier than the prior task of bringing together the top of the upright rigid lead and the boom end, and then securing these to each other.

The locking mechanism for the lead sections is incorporated in the hinge device which connects the sections, as is also an aligning means to insure registration and alignment of the adjoining ends of the sections and the locking mechanism thereof, and by this organization the structure is simplified and readily fabricated, yet is sturdy and effective.

When the lead is in the folded or collapsed state, spacers which maintain the proper relation and spacing between the rails or guides of the individual sections, also serve to prevent relative lateral shifting or movement of the sections and enable one section to sturdily support the other above it, and this is a feature of the invention.

Other features and advantages will hereinafter appear.

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In the accompanying drawings:

Fig. 1 is a side elevation of the improved pile driver of the invention, the lead being shown in process of erection, or of taking down;

Fig. 2 is a similar view of the pile driver but with the lead collapsed and folded, preparatory either for erection or removal to another location. The pile driver boom is shown broken away intermediate its ends, to save space in illustrating;

Fig. 3 is a fragmentary side elevation of the tip of the boom and adjacent ends of the lead sections shown in Fig. 2, but on an enlarged scale;

Fig. 4 is an end elevation of the lower lead section, looking in the direction of the arrows, 4, 4 of Fig. 3;

Fig. 5 is a broadside view of the articulated lead when in extended position, the links at the right hand end being shown pendant as if the lead were in a horizontal position;

Fig. 6 is a side or edge view of the lead of Fig. 5;

Fig. 7 is a side elevation of a hinge fitting such as is used on the lower of the lead sections;

Fig. 8 is an edge elevation of the fitting of Fig. 7;

Fig. 9 is a view of the underside of the fitting of Fig. 7;

Fig. 10 is a side elevation of a hinge fitting such as is used on the upper of the lead sections;

Fig. 11 is an edge elevation of the fitting of Fig. 10;

Fig. 12 is a view of the underside of the fitting of Fig. 10;

Fig. 13 is an edge view of one of the links secured to the end of the upper lead section, and

Fig. 14 is a broadside view of the link of Fig. 13.

Referring to Fig. 1, the pile driver shown is of the type used with railway equipment, and comprises a railway carriage or car 10 mounted on trucks 11, the said carriage carrying the crane including the power unit and cab 12 of the pile driver, by means of the usual swivel or pivot 13.

Secured to the power unit 12 is a boom 14, the lowered and raised positions of which are controlled by a boom cable 15 passing over sheaves 16 at the boom point 17, all in the usual manner.

According to the present invention a novel and improved lead 18 for the pile driver hammer is provided, the said lead being cooperable with the boom 14 and so arranged and organized that the setting-up time required for the pile driver, and also the dismantling time, is considerably reduced and the hazard to the workmen minimized during these operations. In addition, the operation of setting up or dismantling the pile driver may be more conveniently carried out. The improved lead 18, when not in use, occupies a relatively small space, and is convenient to handle and manipulate for either storage or transportation.

As shown in Figs. 1, 2, 5 and 6, the lead 18 comprises a plurality of articulated lead sections 19 and 20 which are pivotally secured together at one end each by a hinge connection 21. Referring to Fig. 2, when the lead 18 is not in use, the section 19 thereof may be folded over the section 20 to be supported by the latter, the effective length of the folded lead being thus approximately one-half of its extended length. The folded lead 18 may thus be conveniently carried or transported, either on a railway flat car 22 as shown, or on a truck body or other suitable carrier.

The articulated lead sections 19 and 20, and the hinge connection 21 are of extremely simple and yet rugged construction, and are economical to fabricate and reliable in use. Referring to Figs. 75

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4, 5 and 6, the lower lead section 20 comprises a pair of channels 23 which are secured to each other in back-to-back and spaced relation by a plurality of curved or bowed spacers or hoops 24, which are preferably formed of castings, and which are secured to the channels by angular fittings 25 and are located at spaced intervals along the channels. The lower lead section 20 may have any desired number of spacers 24, three such spacers being shown in Figs. 1 and 2.

A similar number of spacers 24 is provided for the upper lead section 19, which is formed of channels 26 similar to the channels 23 and located back-to-back in spaced parallel relationship, the spacers 24 being secured to the channels 26 by angular fitting 25, as in the case of the lead section 20.

For the purpose of hingedly connecting together the lead sections 19 and 20 at one end each, pairs of hinge fittings 27 and 28 are provided, Figs. 7 through 12, the fittings 27 and 28 of one pair being cooperable with each other and being respectively secured to the adjoining ends of the lead sections 19 and 20, on corresponding channels 23 and 26 thereof. The hinge fittings 27 and 28 are clearly shown in fastened positions on the lead sections 19 and 20 in Figs. 6 and 7, connecting together channels of the said sections. The other pair of channels 23 and 26 of the lead sections are pivotally connected together by hinge fittings 27a and 28a, Fig. 5, these fittings being similar to the fittings 27 and 28 but the exact reverse thereof. Thus, if the hinge fittings 27, 28 are thought of as right-hand fittings, the fittings 27a and 28a would be left-hand fittings.

Referring to Figs. 7, 8 and 9, the hinge fitting 27 comprises a base portion 29 which is of substantial mass, and which in cross-section is in the form of a trapezoid or truncated triangle, as shown in Fig. 8. The shape of the base portion 29 is such as to enable it to snugly fit or nest into the channel 23 of the lead section 20 between the flanges thereof. For the purpose of securing the hinge fitting 27 to the channel 26 the base portion 29 of the fitting has a plurality of through apertures 30 which match with corresponding apertures in the web of the channel 26 for receiving rivets or draw bolts.

The hinge fitting 27 further comprises a plate portion 31 upstanding from the base portion 29 and terminating in an apertured ear 32, the aperture 33 of which is substantially aligned with an edge 34 of the plate portion 31.

The hinge fitting 28 comprises a relatively massive base portion 35 generally similar to the base portion 29 of the fitting 27 and adapted to nest between the flanges of the channel 26 of the lead section 20, the said base portion being secured thereto by rivets or bolts, as shown in Fig. 6. The hinge fitting 28 has a plate portion 36 upstanding from the base portion 35 and reinforced by integral webs 37, and the said plate portion terminates in a bifurcated end 38 which consists of a pair of apertured ears 39 adapted to receive between them the ear 32 of the hinge fitting 27. The apertures 40 of the ears 39 are substantially aligned with the edge 41 of the plate portion 36 of the hinge fitting 28, and when the two hinge fittings are brought together with the ear 32 and interposed between the ears 39, the apertures 33 and 40 thereof will be in registration to receive a hinge pin 42, Fig. 6, and the edges 34 and 41 of the hinge fittings will be substantially in abutting relationship.

For the purpose of securely locking together

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the hinge fittings 27 and 28 when the latter are in the position shown in Fig. 6, or the leads are upright as shown by the upright dotted lines Fig. 2, thereby to lock the lead sections 19 and 20 in their extended positions, the fitting 28 has a pair of apertured ears 43 extending diagonally from the base portion 35 thereof and receiving a single apertured ear 44 extending diagonally from the base portion 30 of the fitting 27. The apertures of the ears 43 and 44 are located to be in registration and to receive a locking pin 45 which securely locks the hinge fittings against relative movement when in the abutting positions of Fig. 6.

The locking pins 45 also serve to prevent relative lateral movement between the base portions 30 and 35 of the hinge fittings when the latter are locked together. To further insure against lateral movement of the fittings, and to provide for accurate registration of the apertures of the ears 43 and 44 during uniting movement of these, the base portion 30 of the fitting 27 is provided with a tapered recess 46 in its end, and the adjoining end of the base portion 35 of the fitting 28 is provided with a matching tapered lug 47 which is adapted to extend into the recess 46 and closely fit therein.

In accordance with the present invention novel means are provided for connecting the upper lead section 19 of the lead 18 with the boom end 17 to enable the boom 14 to suspend the lead 18 in erect position, and to provide for convenient erection and taking-down of the lead. This means comprises a pair of links 48, Figs. 1, 2, 6, 13 and 14, the links being pivotally secured to the top end of the lead section 19 and being attachable to the boom point 17 of the pile driver or crane. As shown in Figs. 13 and 14, each link 48 comprises an elongated body 49 bifurcated at one end to form a pair of apertured ears 50, the other end 51 of the body being of lesser thickness than the bifurcated end and being also apertured.

Referring to Fig. 3, the upper end of the lead section 19 is provided with a pair of cross channels 26a which are secured to the channels 26 to rigidly fasten these together in spaced relationship. The cross channels 26a are also clearly shown in Figs. 5 and 6. The upper ends of the channels 26 also have secured to them respectively arms or extensions 52 which at their extended ends are apertured and adapted to be received between the ears 50 of the links 48, the latter being pivotally secured to the extensions 52 by pivot pins 53 as shown. The ends 51 of the links 48 are so shaped as to enable these to extend into pockets 54 in the boom point 17, to be pivotally secured to the latter by removable pins 55.

The method of erecting the boom 18 and setting up the pile driver of the present invention is as follows: Referring to Fig. 2, the lead 18 is shown in folded condition, resting on the flat car 22, and the crane is shown with its boom 14 lowered, and with the boom point 17 pivotally connected to the top end of the lead section 19 by the links 48. This represents the first operation in the erection of the lead 18 and setting up of the pile driver. Prior to this, the crane has been brought up close to the flat car 22 and the boom 14 of the crane lowered to bring the boom point 17 closely adjacent the end of the lead section 19. With the parts so positioned, it is a simple matter for a workman to swing the links 48 into place in the pockets 54 of the boom

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point, giving directions to the operator of the crane for raising or lowering the boom point to bring into registration the corresponding apertures of the links and the boom point. The workman then inserts the pivot pins 55 in their proper places to pivotally secure the links 48 to the boom.

At the time that the boom 14 is being connected to the top end of the lead section 19, and preferably after the securing of the links 48 to the boom, the pile line and the hammer line of the crane are reaved through the lead section in the manner indicated in Figs. 2 and 3. In accomplishing this, the fair lead sheave 56 is first located and secured in place by the fair lead shaft 57, the sheave being aligned under one of the boom sheaves 58 over which the pile line 59 passes. The pile line 59 is now passed between channels 26 of the upper lead section 19, and passed through a snatch block 60 secured to the middle one of the spacers 24 of the upper lead section. From the snatch block 60 the pile line is lead between the channels 23 of the lower lead section 20 and anchored to the middle one of the spacers or hoops 24 of the lower lead section. In so reaving the pile line 59 care must be taken to have it pass over the first or uppermost spacer 24 of the lead section 19, as shown by the dotted line in Fig. 2.

The hammer line 61 of the pile driver is next passed over its boom point sheave 58, then behind the fair lead shaft 57 and through the two cross channels 26a at the top of the lead section 19. The hammer line is then reaved along the lead sections, between the channels thereof and on top of all the spacers 24, down to the hinge fittings 27 and 28, then through the hammer block (not shown) and back along the lead sections on top of the spacers, then under both cross channels 26 and to a U bolt 62 on the boom point, where it is anchored. A block and fall 63, shown dotted in Fig. 2, is hooked to the boom 14 about one-third of the way up, preparatory to raising a strut, as mentioned in detail later.

The boom 14 is now slowly raised, allowing the carriage or car 19 to roll forward, or allowing the lead sections to slide on the supporting ties 64 which cradle it on the flat car 22. When the upper lead section 19 reaches an angle of about 45° a strain is taken on the pile line 59. The boom is then further raised, whereupon the entire lead comprising the sections 19 and 20 will be lifted clear of the ground or car. As the boom is raised further the pile line 59 is slackened off in such a manner that the lower lead section 20 is kept free of the ground, and the lowermost end thereof just above the ground. This operation is closely shown in Fig. 1.

When the lead sections 19 and 20 are in substantially vertical position, the pile line is released and the bottom of the lead pulled away from the crane by hand, approximately two or three feet. The boom 14 is then lowered until the bottom lead section 20 touches the ground. This causes the hinge fittings 27 and 28 to knuckle back into closed position. A workman then climbs the lower lead section 20 on ladder irons 65 provided on one of the channels 26 for this purpose, Fig. 6, until he reaches the hinge fittings 27, 28 whereupon the locking pins 45 are set in place to lock the hinge fittings together, and to lock the lead sections in alignment with each other. The block and fall 63 is then secured to a strut 66, shown in dotted lines in Fig. 2, and the end of the pile line 59 is also secured

to the strut approximately at its center. The pile line is then raised, as is also the block and fall, to bring one end portion of the strut in position on the boom 14, whereupon the strut is secured to the boom with the usual bolts. The strut 66 is then further raised by raising the pile line 59 until the other end of the strut is slightly above the level of brackets 67 mounted on the channels 26 of the lower lead section 20, whereupon the strut is secured to the section 20, thereby properly locating the lead 18 in its operative position. In connecting the end of the strut 66 with the brackets 67 of the lower lead section 20, the boom 14 may be raised to swing the lead 18 free of the ground and allow it to be properly positioned with respect to the strut end. A workman now again climbs the lower lead section 20 and releases the pile line 59 from the snatch block 60, so that the line is available for use.

The crane may now be swung over the hammer, and the latter secured to the hammer block and hoisted into the lead 18, and the crane repositioned, whereupon the pile driver is set up ready for use.

It will be noted that, in erecting the lead 18, it is only necessary for a workman to climb the lower lead section 20 to a point as high as the hinge connection 21 between the leads, and this is in contradistinction to the previous method wherein the workman had to climb the entire length and height of the boom 14. Also, when the workman is at the hinge connection 21 he is merely required to perform a very simple operation, i. e., that of applying the locking pins 45 to the hinge connection, the holes of which are automatically maintained in true registration. This is much easier and quicker, and less hazardous than connecting the top end of a rigid lead assembly to the boom point of the crane. As a result, the total time required to completely erect the lead and set up the pile driver is considerably reduced, as is also the hazard to the workmen.

The articulated lead 18 of the present invention is of simple construction, being economical to manufacture while at the same time being extremely sturdy for the purpose required. When collapsed, it may be readily handled, transported and stored away in a relatively small space. In connection with the folding of the lead 18, it should be noted that the upper lead section 19 is rigidly supported on the lower lead section 20, Fig. 2, by engagement of the spacers or hoops 24 of the lead sections with the channels 23 and 26 thereof. By virtue of the spacers 24 being curved or bowed, the center or yoke portions 24a of the spacers will extend a slight distance in between the channels at the point of engagement therewith, and will thereby automatically tend to centralize the two lead sections and prevent any relative lateral movement between these.

The operation of taking down the articulated lead 18 and dismantling the pile driver may also be carried out quickly, conveniently and with less hazard than was heretofore possible. The method employed in carrying out the dismantling operation is substantially the reverse of the method described above in erecting the lead 18 and setting up the pile driver.

It should be understood that, while railway equipment is shown in the specific embodiment of the invention illustrated herein, the invention

is not limited to this type of equipment, since it is obviously applicable to other types.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

Having thus set forth the nature of my invention, I claim:

1. A lead for a pile driver, comprising a pair of elongate lead sections pivotally connected together at one end each to permit the sections to be folded one upon the other in a horizontal position; means for pivotally connecting the free end of the upper lead section to a boom to enable the latter to raise and suspend the lead sections comprising a link pivoted to the section and swingable to an upright position for connection to the boom when the sections are in the horizontal position, means for pivotally connecting the upper end of the upright link to the boom, and releasable means for locking the lead sections in alignment with each other.

2. A lead for a pile driver, comprising a pair of elongate lead sections adapted to be arranged in alignment, each section including a pair of channels secured together back-to-back in spaced parallel relationship; hinge fittings secured to the adjacent ends of the aligned channels and cooperable with each other to hingedly connect corresponding channels together at one end each, the said fittings having means for locking them in a predetermined position wherein the lead sections are in alignment with each other.

3. A lead for a pile driver, comprising a pair of elongate lead sections; and a hinge pivotally connecting the lead sections together at one end each comprising pivotally connected hinge fittings connected one to each section, and the said hinge fittings having cooperable positioning means for maintaining accurate registration of the ends of the sections when the latter are in extended aligned position comprising a recess in one fitting and a lug on the other fitting seating in said recess when the sections are in alignment.

4. A lead for a pile driver, comprising a pair of elongate lead sections; and a hinge pivotally connecting the lead sections together at one end each, the said hinge comprising a pair of hinge fittings secured one to each section, said fittings having cooperable positioning means for maintaining accurate registration of the ends of the sections when the latter are in extended aligned position, comprising a tapered recess in one fitting and a similarly tapered lug on the other fitting seating in the recess when the lead sections are in alignment, and having cooperable means for locking the lead sections in the said aligned position.

5. A lead for a pile driver, comprising a pair of elongate lead sections pivotally connected together at one end each to permit them to lie one above the other in a horizontal position; a link having means for pivotally connecting it to a boom, the said link being pivotally connected to a free end of the upper lead section and swingable to an upright position for connection to the boom while the section is in the horizontal position to enable the boom to raise and support the lead sections; and releasable means for locking the lead sections in alignment with each other.

6. A pile driver comprising a boom; a lead removably pivotally secured to the boom and hanging therefrom, said lead having a pair of elongate lead sections located one at the top of the other in respective alignment, the adjoining ends

of the sections being pivotally connected together by cooperating hinge fittings secured one to each section and hinged together, one fitting being provided with a recess and the other being provided with a lug seating in said recess when the sections are in alignment; and means locking the lead sections in alignment, the said means being releasable to enable relative pivotal movement of the lead sections when the lead is being removed from the boom.

7. A pile driver comprising a boom; means for lowering and raising the boom; a lead comprising a pair of elongate lead sections forming guides for a hammer each at one end being pivotally connected to the other; means for pivotally connecting a free end of a lead section with the boom to enable the latter to raise and support the lead sections comprising a link pivoted to the end of the lead section and swingable to a substantially vertical position for attachment to the boom when the lead section is in a horizontal position; releasable means for locking the lead sections in alignment with each other; a hammer carried by the lead; and a hammer line passing over the boom and connected with the hammer.

8. A pile driver comprising a boom; means for lowering and raising the boom; a lead comprising a pair of elongate lead sections each at one end being pivotally connected to the other; means for pivotally connecting a free end of a lead section with the boom to enable the latter to raise and support the lead sections comprising a link pivoted to the end of the lead section and swingable to a substantially vertical position for attachment to the boom when the lead section is in a horizontal position; means controlling the relative positions of the lead sections during the raising of the latter; and releasable means for locking the lead sections together when in alignment with each other.

9. A lead for a pile driver comprising a plurality of lead sections, each section comprising a pair of laterally spaced parallel guides for a hammer, spacer elements connecting the guides, hinge means pivotally connecting the adjacent ends of two sections with their guides in alignment and permitting the sections to be folded to a horizontal position with one section upon the other section, and means for pivotally connecting the free end of the upper section to a crane boom for lifting the sections to an upright position comprising a link pivoted to the free end of each guide of the upper section and swingable to an

upright position while the sections are in the horizontal position, and means for pivotally connecting the upper ends of the upright links to the boom for the lifting operation.

10. A lead for a pile driver comprising a plurality of lead sections, each section comprising a pair of laterally spaced parallel guides for a hammer, spacer elements connecting the guides, hinge means pivotally connecting the adjacent ends of two sections with their guides in alignment comprising a hinge fitting secured to the adjacent ends of the guides of adjacent sections each including a base portion and a plate portion overlapping the plate portion of the adjacent fitting, a hinge pin pivotally connecting the overlapped plate portions, and the base portion of one fitting being provided with a tapered recess, and the base portion of the other fitting being provided with a similarly tapered lug seated in said recess when the sections are in alignment.

11. A lead for a pile driver comprising a plurality of lead sections, each section comprising a pair of laterally spaced parallel channel shaped guides for a hammer, spacer elements connecting the guides, hinge means pivotally connecting the adjacent ends of two sections with their guides in alignment comprising a hinge fitting secured to the adjacent ends of the guides of adjacent sections and each including a base portion seated in the channel of the guide and a plate portion overlapping the plate portion of the adjacent fitting, a hinge pin connecting the overlapped plate portions, the base portion of one fitting being provided with a recess and the base portion of the other fitting provided with a lug seating in the recess of the other fitting when the sections are in alignment, and cooperating means on the two fittings for releasably locking them in the latter position.

FREDERICK F. ZAVATKAY.

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