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2,874,851

VEHICLE-MOUNTED REVOLVING CRANE WITH FOLDING JIB

Filed Dec. 19, 1955

4 Sheets-Sheet 1

Fig. 1.

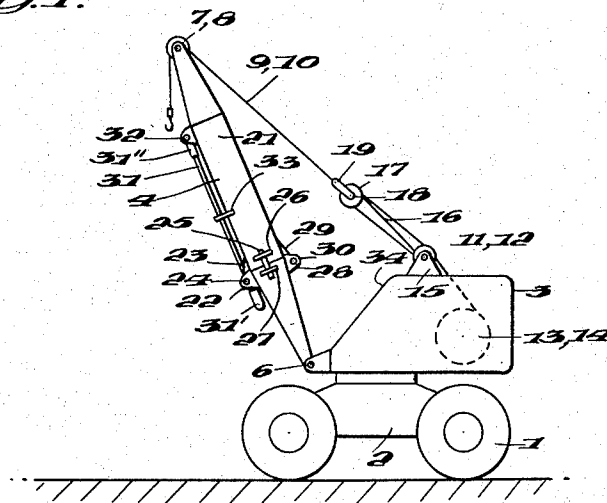
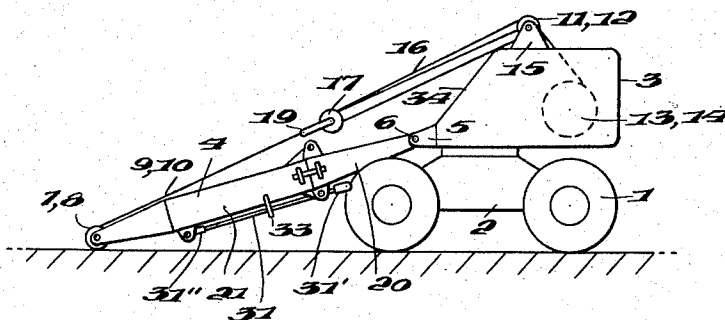


Fig. 2.



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Fig. 3.

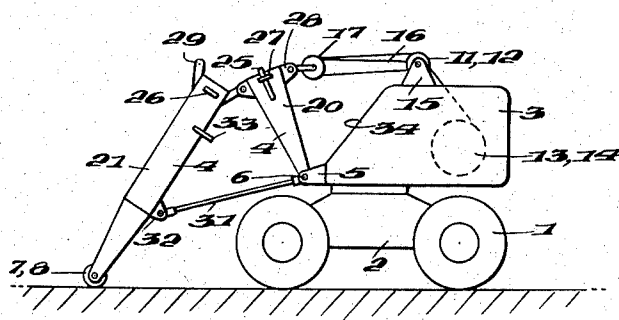
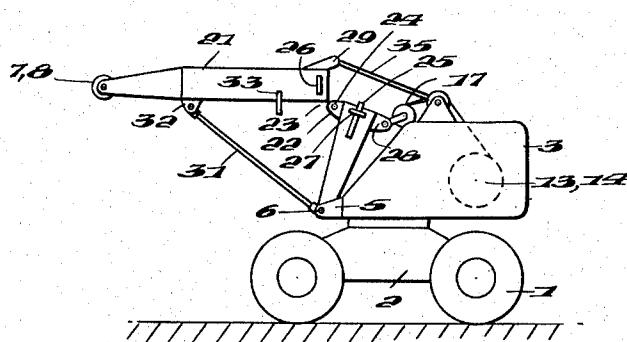


Fig. 4.



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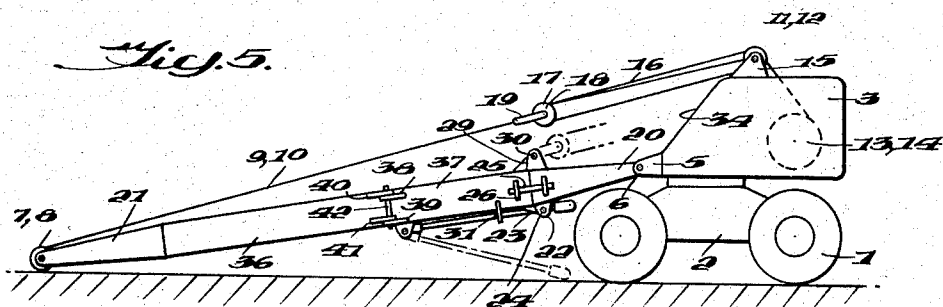
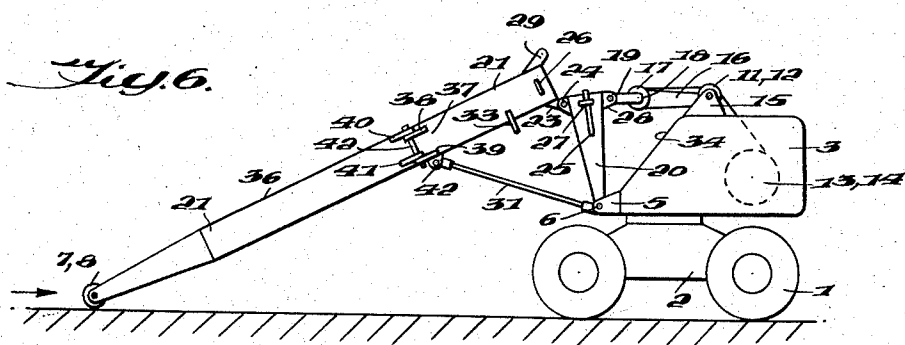
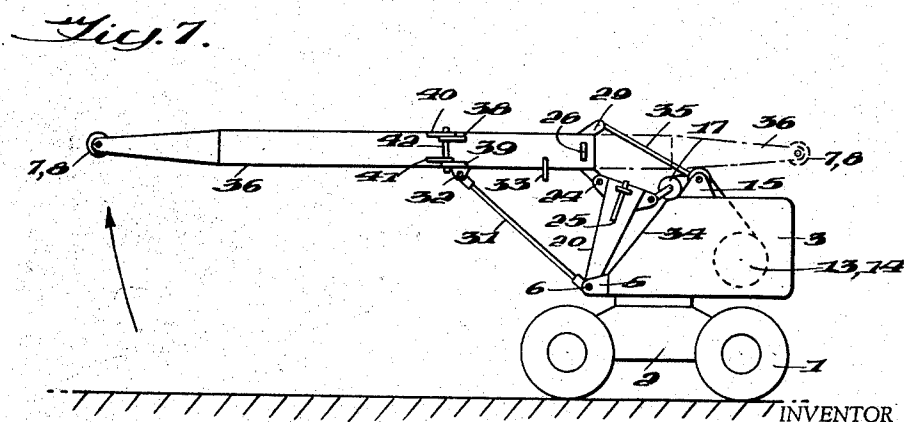
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VEHICLE-MOUNTED REVOLVING CRANE WITH FOLDING JIB

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4 Sheets-Sheet 3



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Fig. 8.

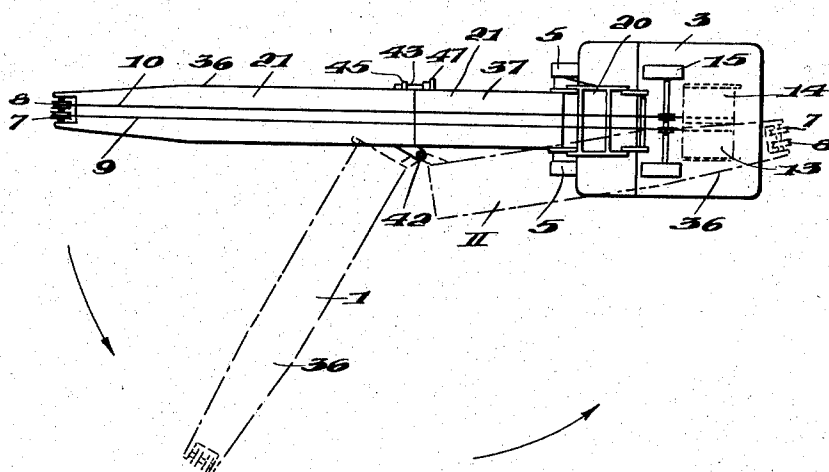
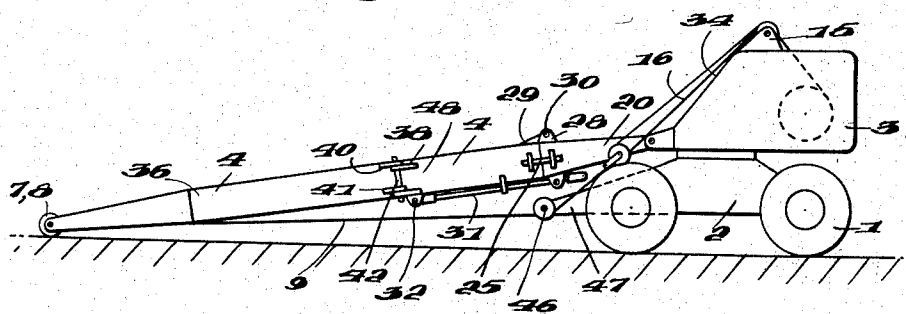


Fig. 9.



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VEHICLE-MOUNTED REVOLVING CRANE WITH FOLDING JIB

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Application December 19, 1955, Serial No. 553,988

Claims priority, application Germany December 17, 1954

5 Claims. (Cl. 212-144)

This invention relates to a vehicle-mounted revolving crane with folding jib.

It is already known to provide portable revolving cranes with multiple-part jibs whose single sections are interconnected by joints about which the jib can be folded together. Hereat, the folding of the jib in general is effected in a vertical plane by alternately folding the individual sections of the jib in a downward or upward direction. Usually for folding out, separate built-on winches or normal pulling-in and hoisting winches and winches for the grab are required, which belong to the crane.

It is an object of the present invention to provide folding jibs meeting with the regulations of road traffic and being adapted for high speed cranes.

Another object of the invention is to provide a folding jib permitting the use of a single driver's stand or seat.

Still another object of the invention is to provide a jib arrangement which can be folded in by very simple means and operations without impairing the sight for the driver or operator of the crane.

With these and further objects in view, according to the present invention the jib is arranged in such a way that it can be folded together above the crane hut in one or two planes, the jib comprising at least two articulated sections which are rigidly connected with each other in the operative condition of the jib, the foot part of the jib being adapted to be hoisted by the luffing, hoisting or an auxiliary winch in such a way that the ends of the chords of the girder extend approximately up to the height of the roof of the crane hut, while the further parts of the jib after the locking of the upwardly swung foot and middle part of the jib can be turned over relatively to the upper carriage of the crane at right angles to their plane of swinging, into a position nearly parallel to the middle part of the jib. Hereat the foot part and the head part of the jib in the course of their swinging movement towards the position for transportation are interconnected to form a triangular structure which is moved into the position for transportation by swinging it about the main pivot of the jib. The head part of the jib in case of a large length of the jib is articulated into several parts which are interconnected by parallel joints and adapted to be turned over successively into a position nearly parallel to the middle part of the jib, viewed from the foot part thereof. The jib folded together into its position ready for transportation is secured in this position by the winch and/or by a member connecting the jib with the upper carriage. The shorter jibs are composed of one foot part and one end part only which can be transported after being united in a triangular structure and wound up.

According to a further feature of the invention the rope of the winch used for winding up the foot and middle or end parts of the jib are anchored either directly on a clip of the chord ends of the foot part of the jib or passed over a guide roller arranged laterally of the jib below the same and independent thereof and secured to the shaft of the jib roller or, in the vicinity thereof, on the jib itself.

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The guide roller may be mounted on an extension of the lower or upper carriage or of the bottom wall itself.

Fig. 1 is a diagrammatic side view of a vehicle-mounted revolving crane having the invention applied thereto, with the jib in its operative position,

Figs. 2 and 3 are similar views, showing the jib in two successive transitional positions leading to the position of the jib ready for transportation,

Fig. 4 is a view similar to Fig. 1, but showing the jib in its position ready for transportation.

Figs. 5 to 7 are side views of a modification having a longer jib, in the positions corresponding to Figs. 2 to 4, respectively,

Fig. 8 is a plan view of the crane shown in Figs. 5 to 7, in the position of the jib as per Fig. 7,

Fig. 9 is a side view showing a further modification of a portable revolving crane according to the present invention.

Similar reference numerals denote similar parts in the different views.

Referring now to the drawings in greater detail and first to Fig. 1, it will be seen that the portable crane, viewed from the outside consists substantially of a lower carriage 2 provided with wheels 1, an upper carriage which is rotatable in a horizontal plane and includes a crane hut 3 and a jib 4, whose lower end is pivoted on the upper carriage of the crane, by a joint with horizontal pivot. The joint consists of a bracket 5 of the upper carriage and a transverse bolt or pivot pin 6 extending through corresponding bores in the pivot 5 and the jib 4. Rotatably mounted on the forward end of the jib 4 are rope pulleys 7, 8 guiding the luffing rope 9 and the hoisting rope 10 which serves for hoisting and lowering the load, while the luffing rope serves for swinging the job. The ends of the ropes 9, 10, facing away from the load or from the forward end of the jib are wound up on rope drums 13, 14 over rope pulleys 11, 12, mounted for rotation in bearing brackets 15 fixed on the roof of the crane hut, while the rope drums 13, 14 are mounted for rotation within the crane hut. Inserted in the course of the luffing rope 9 is a block 16 whose pulley 17 is mounted on a pin 18, beside shackles 19, Figure 2, to which the luffing rope 9 is fastened.

According to Figs. 1 to 4 the jib 4 consists of a foot section 20 and a head section 21, connected by a joint including a horizontal pivot, a bracket 22 secured to the lower side of the foot section 20 of the jib, a bracket 23 provided on the lower side of the head section 21, and a transverse pin or bolt 24 extending through the two brackets 22 and 23.

In the operative position of the jib 4 shown in Fig. 1, the foot part 20 and the head part 21 are rigidly connected to each other by locking means comprising a bar 25 passed through guides 26, 27 of the foot and head sections, respectively. By way of alternative, a rigid connection between the foot and head sections 20 and 21 of the jib can be established by a bracket 28 of the foot section 20 and a bracket 29 of the head section 21 with a common transverse pin or bolt 30, in connection with the joint 22 to 24 shown in Fig. 1.

The device operates as follows:

In order to swing the jib of the crane into its position for transportation, the luffing rope is wound off from its rope drum to such an extent that the forward end of the jib comes to lie on the bottom (Fig. 2).

Now the locking between the foot section 20 and the head section 21 of the jib 4 is released either by sliding the bar 25 out of the guides 26, 27, or by drawing the transverse pin 30 out of the brackets 28, 29. Hereafter the luffing rope 9 is lifted out of the shackles 19 of the block 16. The shackles 19 are secured to the foot sec-

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tion 20 of the jib by putting the pin 30 through the bracket 28 of the foot section 20 and the shackles 19.

Now the foot section of the jib is swung upwards about the main pivot pin 6 of the bearing 5, 6, by means of the block 16, to such an extent that it nearly reaches a vertical position (Fig. 3). In this position of the foot section 20 a stay 31 is hinged to the upper carriage 3 of the crane by sliding an eyelet 31' thereof onto the pin 6 of the bearing 5, 6. An eyelet 31'' at the opposite end of the stay 31 is hinged to the head section 21 of the jib by means of a bearing bracket 32 with horizontal pivot. In the operative position of the jib, the stay 31 is fastened on the head section of the jib by a locking member 33, which must be released before swinging the foot section 20 into a nearly vertical position. With the stay 31 thus hinged to the upper carriage, the foot section 20, the head section 21 and the stay 31 form a rigid triangular structure which is swingably mounted in the bearing 5, 6. As soon as this structure is formed, it is swung until the foot section 20 of the jib has reached its vertical position. Advantageously the face 34 of the crane hut is rearwardly inclined by a small angle so that the triangular structure can be swung a little beyond the vertical position of the foot section of the jib, into a slightly rearwardly inclined position thereof. In this position and owing to its length the top edge of the foot section is approximately in the height of the top edge of the crane hut. The head section of the jib in this case is in a horizontal position.

As soon as the foot section of the jib has reached the said slightly rearwardly inclined position and the head section has reached its horizontal position, the rope drum is stopped and the rope of the block is prevented from rolling off from the drum. The jib is additionally secured in this condition by hanging a connecting rod 35 into the bracket 29 of the head section of the jib and into a bracket of the crane hut, Figure 4.

It will be understood that it is also possible to swing the triangular structure or system consisting of the foot section 20, the head section 21 and the stay 31 to such an extent that the foot section of the jib assumes an accurately vertical position. In this case care must be taken that the head section is disposed in a horizontal position in case of the accurately vertical position of the foot section. This is effected in such a way that the length of the stay 35 is made larger than the length which would result if the foot section would be swung into a slightly rearwardly inclined position.

Figs. 5 to 8 show a further embodiment of the invention whose fundamental construction is the same as that shown in Figs. 1-4. However, the jib 4 is considerably longer than that of the crane shown in Figs. 1 to 4, i. e., the head section 21 thereof is of a considerably larger length while the foot section 20 is of the same length as the foot section 20 of the jib of the crane as per Figs. 1 to 4. In order to permit an unobjectionable and safe driving of the crane over larger distances with such a long head section of the jib, said head section 21 is subdivided once more in its transverse direction. Hence it consists of the real head section 36 of the jib and an intermediate section hereinafter denoted 37 and hinged to the foot section 20 by a joint 22 to 24, with a horizontal pivot, while a joint with vertical pivot is provided between the intermediate section 37 and the head 36 of the jib. Said joint consists of brackets 38, 39 which are secured to the side of the intermediate part 37, so as to be arranged vertically above each other, brackets 40, 41 secured to the head 36 of the jib also vertically above each other, and a vertical pivot pin 42 put through bores in the brackets 38 to 41. In the working position of the jib of the crane the intermediate section 37 is rigidly connected to the foot section 20 by the locking members 25, 26, 27 or 28, 29, 30, respectively. The head 36 of the jib is also rigidly connected to the intermediate section 37 by locking means consisting for instance of a bar 43 put through

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lateral guides 44, 45 of the intermediate section 37 and of the head section 36 of the jib, respectively.

In order to move the jib 4 of the crane into its position for transportation, the arrangement shown in Figs. 5 to 8 is operated as follows.

At first the jib is swung downwards to such an extent, by unrolling the luffing rope 9, that the pulleys 7, 8 at the forward end of the jib come to lie on the ground, Fig. 5. Then the jib is swung through the position shown in Fig. 6, into the position shown in Fig. 7 after releasing the locking means 25, 26, 27 or 28, 29, 30. This operation for the rest is exactly the same as described above with respect to Figs. 2 to 4 so that it will not be necessary to describe this operation once more. It will be understood however, that in the crane with bi-partite head section of the jib as per Figs. 5 to 8 the intermediate section 37 and the head 36 of the jib are rigidly connected to each other during this phase of the operation.

As soon as the jib with bi-partite head section has reached the position shown in Fig. 7, the interlocking 43-45 is released. The jib 36 is then swung rearwards about the vertical pivot 42 by about 180 to 200°, so that the head of the jib comes to lie on the crane hut. This operation is indicated in Fig. 8 by the dotted lines I and II. The head section 36 of the jib is now secured in this position by suitable means whereupon the crane is ready for transportation.

It will be understood that the said operations must be carried out in a reverse direction and order for bringing the jib into its position for operation.

By way of alternative the jib 4 of large length consisting of three sections may be moved into the position for transportation by the device shown in Fig. 9 which, for the rest, can also be used for a crane jib consisting of two sections as shown in Figs. 1 to 4.

The general construction of the device shown in Fig. 9 is the same as in Figs. 1-8. However the block 16 is not separated from the luffing rope 9 but the latter is passed around a guide pulley 46 which may be secured to an extension 47 of the lower carriage 2 or of the upper carriage 3 of the crane, after the head or forward end of the jib has engaged the ground. However, the pulley 46 can also be held by a girder sunk into the ground. In order to ensure a good efficiency of the luffing rope acting on the head of the jib from the lower side, the pulley 46 must be mounted at the lowest possible level below the center of the jib on one side of the jib 4.

The device shown in Fig. 9 is operated as follows:

As the block 16 of the luffing gear is pulled after the locking device 25, 26, 27 of the joint 22, 23, 24 has been released, the two sections 20, 21 of the jib will swing upwards about the pivot 24 of the joint, whereby the head of the jib will approach the joint 5, 6 of the foot section 20 of the jib, while sliding on the ground. In the device hereinbefore described the construction must be adapted in such a way that the center of gravity 48 of the jib is not shifted to the rear end of the crane beyond the pivot of the joint 5, 6, in order to prevent the folded jib from falling rearwards. All the further hoisting and folding operations of the jib are the same as in the embodiments of Figs. 1-8.

While the invention has been described in detail with respect to certain now preferred examples and embodiments of the invention it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended, therefore, to cover all such changes and modifications in the appended claims.

I claim:

1. In a vehicle-mounted revolving crane, a rotary upper carriage, a folding jib hinged by a pivot pin to the upper carriage for vertical swinging, said jib comprising at least a foot section, a head section, a joint with horizontal pivot between said sections, and locking

means ensuring a rigid connection between the sections in the operative condition of the jib, means for swinging the foot and head sections of the jib on release of the locking means, into a nearly vertical and into a nearly horizontal position, respectively, and stay means joined to said head section and said pivot pin for holding the head and foot sections in said positions.

2. In a vehicle-mounted revolving crane, a rotary upper carriage, a crane hut mounted on the upper carriage, a folding jib hinged by a pivot pin to the upper carriage for vertical swinging, said jib comprising at least a foot section, a head section, a joint with horizontal pivot between said sections, and locking means ensuring a rigid connection between the sections in the operative condition of the jib, means for swinging the foot and head sections of the jib on release of the locking means, into a nearly vertical and into a nearly horizontal position, respectively, and stay means joined to said head section and said pivot pin for holding the head and foot sections in said positions, said foot section being of such a length that its end facing away from the hinge in the folded position of the jib is approximately in the level of the top edge of the crane hut.

3. In a vehicle-mounted revolving crane, a rotary upper carriage, a folding jib hinged by a pivot pin to the upper carriage for vertical swinging, said jib comprising at least a foot section, a head section, and a joint with horizontal pivot between said sections, a stay hinged to the head section of the jib, locking means ensuring a rigid connection between the sections in the operative condition of the jib, means for swinging the foot and head sections of the jib, on release of the locking means, into a nearly vertical and into a nearly horizontal position, respectively, said stay being hinged to the pivot pin on the upper carriage with its end facing away from the head section of the jib, shortly before the foot section of the jib has reached its vertical position, and means for holding the head and foot sections in said positions.

4. In a vehicle-mounted revolving crane, a rotary upper carriage, a crane hut mounted on said upper carriage, a folding jib hinged by a pivot pin to the upper carriage for vertical swinging, said jib comprising at

least a foot section, a head section, a joint with horizontal pivot between said sections, and locking means ensuring a rigid connection between the sections in the operative condition of the jib, a crane hut mounted on the upper carriage, the wall of the crane hut facing the jib being rearwardly inclined, means for swinging the foot and head sections of the jib, on release of the locking means, into a slightly rearwardly inclined position corresponding to the inclination of the adjacent crane hut wall and into a horizontal position, respectively, and stay means between said pivot pin and said head section for holding the head and foot sections in said positions.

5. In a vehicle-mounted revolving crane, a rotary upper carriage, a folding jib hinged by a pivot pin to the upper carriage for vertical swinging, said jib comprising a foot section, a bi-partite head section, a joint with horizontal pivot between the foot section and the head section, a joint with vertical pivot between the two parts of the head section, first locking means adapted to establish a rigid connection at the joint with horizontal pivot in an operative condition of the jib, second locking means adapted to establish a rigid connection at the joint with vertical pivot, means for swinging the foot and head sections of the jib, on release of the first locking means, into a nearly vertical and into a nearly horizontal position, respectively, whereupon the end portion of the head section on release of the second locking means, is adapted to be swung rearwards by at least 180° about its vertical pivot, means for holding the jib sections in their folded positions, and stay means between said pivot pin and said head section for supporting the end portion of the head section on the upper carriage.

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