V. E. HAYWARD.

LADDER ASSEMBLING MACHINE.

APPLICATION FILED SEPT. 18, 1915.

1,209,705.

Patented Dec. 26, 1916.

3 SHEETS—SHEET 1.

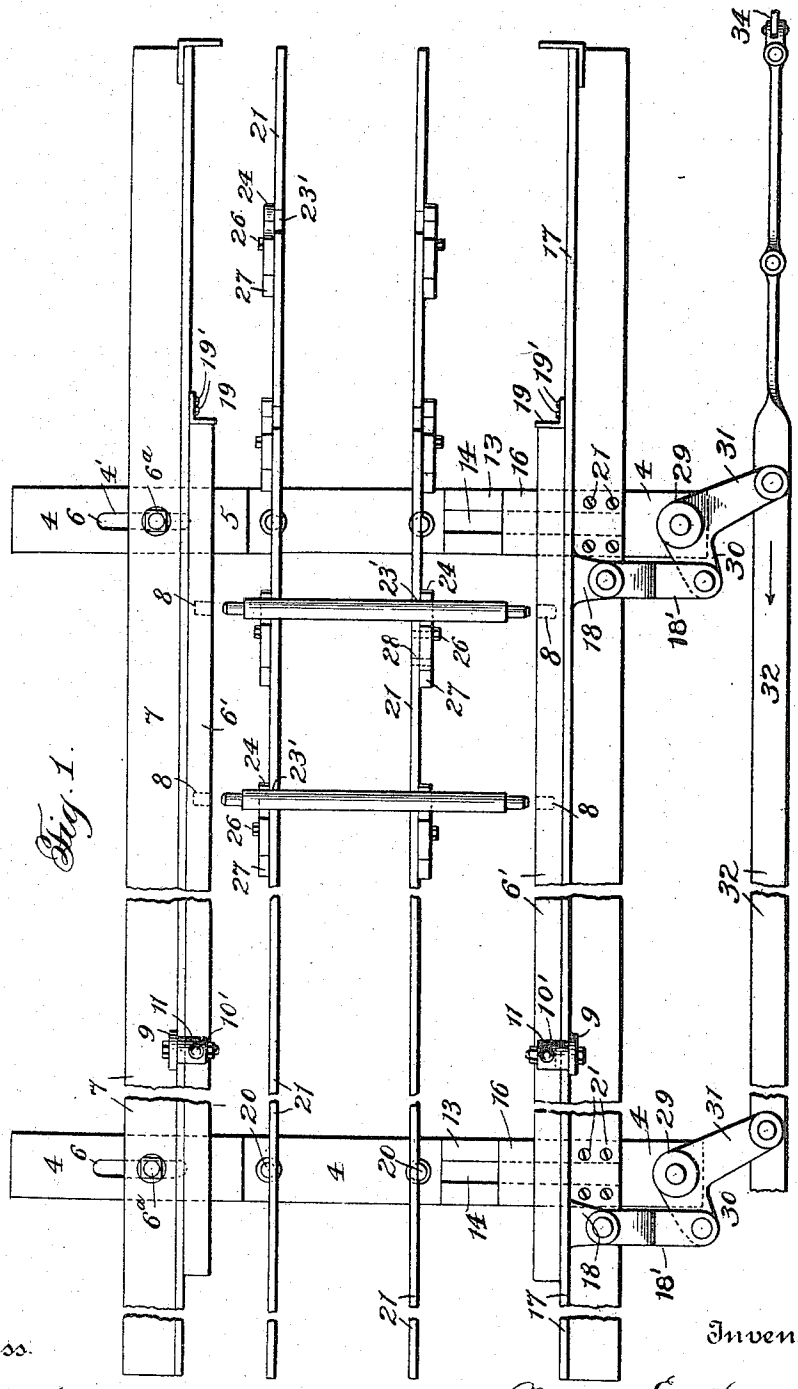


Fig. 1.

Witness:

Jas. E. Hutchinson.

Inventor:

Verner E. Hayward.

By Bellinger & Block

Attorneys:

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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3 SHEETS—SHEET 2.

Fig. 2.

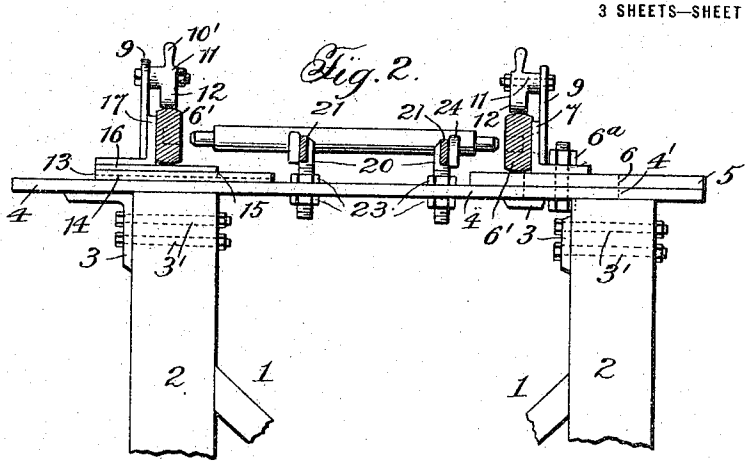
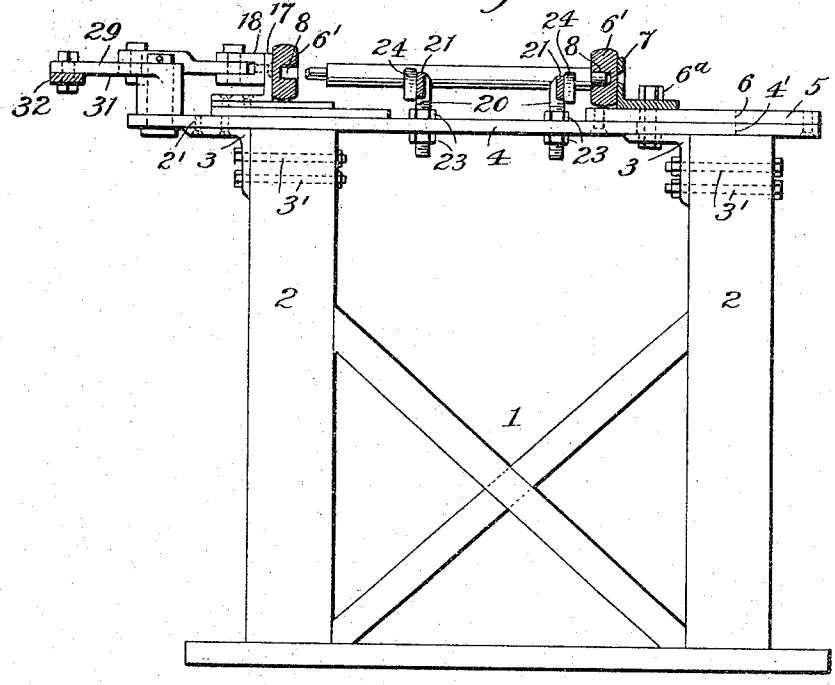


Fig. 3.



Witness

Jas. E. Hutchinson.

Inventor:

By Verner E. Hayward,

Bellinger & Block Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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3 SHEETS—SHEET 3.

Fig. 4.

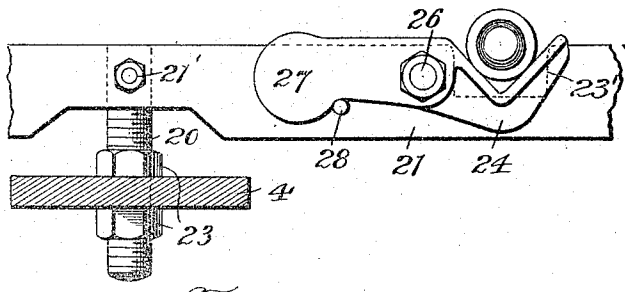


Fig. 4.a.

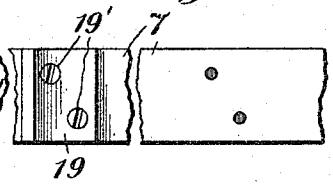


Fig. 5.

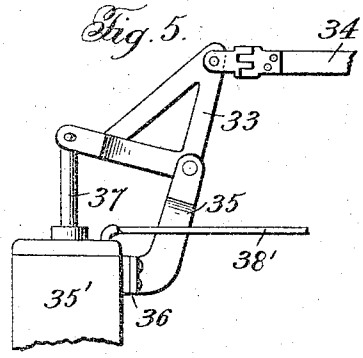


Fig. 6.

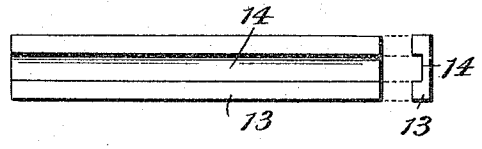


Fig. 7.

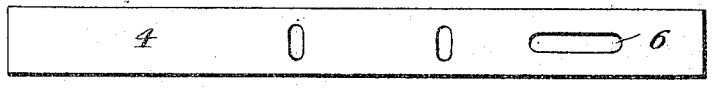
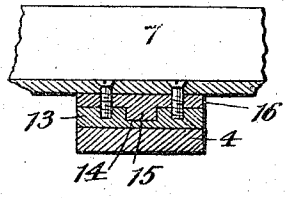


Fig. 8.



Witnesses:

Jas. E. Hutchinson

Inventor.

By Verner E. Hayward,

Bollinger & Block Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

VERNER E. HAYWARD, OF DAVENPORT, IOWA.

LADDER-ASSEMBLING MACHINE.

1,209,705. Specification of Letters Patent. Patented Dec. 26, 1916.

Application filed September 18, 1915. Serial No. 51,388.

To all whom it may concern:

Be it known that I, VERNER E. HAYWARD, a citizen of the United States, residing at Davenport, in the county of Scott and State of Iowa, have invented certain new and useful Improvements in Ladder-Assembling Machines, of which the following is a specification.

The invention relates to improvements in a machine embodying a minimum number of parts and simple in operation, for supporting the different constituents of a ladder to permit the same to be assembled in their proper position while the said parts are being secured together.

A further object of the invention is to provide a mechanism wherein the clamping bars constitute a lateral support for the ladder stile, and having one of these clamping bars adjustable to permit the construction of ladders of different widths, and the other of said clamping bars being movable by power actuated means to force the stiles into engagement with the rungs.

A still further object of the invention is the provision of rung supporting fingers, whereby the rungs carried thereon are capable of a limited movement to yieldably support the rung in place and allow sufficient play with the stiles and rungs so that the different parts of the ladder may be held together during the clamping action without causing any warping or bending of the same.

With the above and other objects in view the invention consists of a clamping machine and its parts to be more fully set forth in the accompanying specification and drawings in which—

Figure 1 is a top plan view of the parts broken away; Figs. 2 and 3 are cross sectional views of the same; and Figs. 4, 4ª, 5, 6, 7, and 8 are detail views.

Referring now more particularly to the drawing wherein like numerals indicate corresponding parts, the numeral 1 designates a supporting structure for the clamping mechanism consisting of two parallel rows of spaced supporting standards 2 having secured thereto the brackets 3. These brackets are axially alined and of substantially inverted L shape formation, being secured to the standards by cross pins 3′ passing through apertures therein and through the supporting standards 2, and the bearing portions thereof arranged flush with the upper edges of the standards.

Secured to each pair of axially alined brackets 3 and connected thereto by bolts 2′ are the transversely extending supporting plates 4, each having a flat face and projecting beyond the plane of the brackets on each side thereof. Each supporting plate is provided on one side with an elongated slot 4′ by which a filler block 5 having a registering slot 6 therein is adjustably secured to the supporting plate, the filler block 5 extending from the edge of the bracket 3 to the outer portion of the plate 4, and is secured in position by a threaded bolt 6ª passing through the apertures in the plate 4 and filler block 5.

Resting on each filler block is a longitudinally extending adjustable clamping bar 7 of angular formation secured in position by the bolts 6ª, the upwardly extending part of the clamping bar constituting a lateral support for the ladder stile 6′, which ladder stile is provided with a series of regularly spaced openings 8 corresponding in number to the number of rungs used in the construction of the ladder to permit the rungs to be nailed to the stile when the clamping frame is in its closed position. Extending upwardly from the clamping bars 7 and 17 are a plurality of arms 9 each carrying at their upper ends outwardly extending pivoted pins adapted to support a fastening latch 11 provided with a stile gripping part 12 and an operating handle 10′, whereby the stile is rigidly retained in any desired position.

Arranged on each supporting plate at the opposite side thereof and overlying the standards are the guide blocks 13 each guide block having transverse guide ways 14 therein, which coöperate with a tongue 15 extending from the pressure plates 16 to which the longitudinally extending movable clamping bar 17 is attached. The clamping bar 17 also constitutes a lateral support for one of the stiles and is of the same formation as the clamping bar 7. The movable clamping bar 17, however, is adapted to have a lateral movement so that the same may be moved to an open or closed position upon the actuation of a controlling cylinder to be later described, and is provided with a series of outwardly projecting lugs 18 constituting a

means whereby the lever for actuating the clamping bar can be attached thereto to enable the same to be moved to the desired position. Both of the clamping bars are provided with the adjustable stops 19 so that the ladders of different lengths may be constructed at the will of the operator, these stops 19 being of angular formation and secured in position by bolts 19′ passing through apertures in the clamping bars.

Adjustably secured to the transverse plates 4 by the threaded bolts 20 are the rung supports 21. These supports being fastened to the threaded bolts 20 at their upper ends by a cross pin 21′ are held in different position of adjustment by the nuts 23 arranged on the threaded bolts 20 upon each side of the transverse plates 4. The rung supports, preferably two in number, are arranged parallel with each other, and provided with a series of axially alined rectangular openings 23′ in their upper edges, and having a pivoted rung supporting finger 24 adjacent each opening upon which the rung rests, the rung supporting fingers each having a substantially V shaped pocket therein of smaller area than the adjacent rectangular opening 23′, and are pivoted to the supporting bars 21 intermediate their ends by cross bolts 26, the outer ends of each finger having a counterweight 27 by which the finger supporting the rungs are normally held in a raised position. These fingers are of such a construction that the upward movement thereof caused by the counterweight is limited by stop pins 28 projecting from the rung supports 21, but a slight bodily movement of the rung is permitted so that the said rungs are yieldably supported to prevent the warping or bending of the different parts of the ladder during the clamping thereof.

Pivotally attached to each transverse plate 4 at their outer portions are the bell crank levers 29 having their arms 30 secured to the projecting lugs 18 of the clamping bar 17 by means of the intermediate link 18′ and also arms 31 attached to a longitudinally extending rod 32 running parallel with the clamping bar, the rod 32 extending the entire length of the machine and is pivotally attached to the arms 31 of all of the bell crank levers, and at its outer end is connected to a rocking member 33 by means of a link connection 34, the rocking lever being pivoted to a supporting arm 35 projecting from a power cylinder 35′ at the point 36, and has also a pivotal connection with the outer portion of the link member and the reciprocating piston rod 37. The rocking arm is preferably actuated by means of a compressed air motor fed by the feeding pipe 38′, although it will be clearly apparent that any other means for reciprocating the said rocking arm may be used without departing from the spirit of the invention.

Having thus described the invention the operation is as follows: When it is desired to assemble a ladder the stiles are placed on the transverse plates 4, adjacent the clamping bars 7 and 17, after which the adjustable clamping bar 7 is set to the desired position to determine the width of the ladder and the longitudinal movable stops 19 are adjusted so that the stiles are held against any longitudinal movement and the length thereof determined. The rungs are placed upon the rung supports 21 after the same have been adjusted, the said rungs resting on the supporting fingers 24. Air is then introduced into the cylinder 38 through the pipes 38′ causing the rocking lever 33 to be pushed rearwardly, also moving the rod 31 and bell crank levers 29 to such a position as to force the movable clamping bar 17 in a closed position whereby the stiles are pressed into engagement with the rungs and retained in this position until the different parts have been secured to each other. When the ladder has been assembled air is again admitted to the cylinder causing a reverse movement of the rocking arm, which actuates the bell crank lever through the rod 31 so that the movable clamping bar 17 is pulled outwardly to such a position that the assembled ladder may be taken from the frame.

From the foregoing description it will be seen that I have provided a ladder assembling machine of very simple construction and easily operated, and is well adapted to perform the function desired.

Having thus described the invention what I claim is:

1. In a machine of the class described, the combination with a supporting frame, means for supporting a ladder stile thereon, including clamping bars, a rung support arranged between said clamping bars, a pivoted supporting finger upon which the rung rests attached to the rung support and capable of a slight rocking movement, and means for moving one of said clamping bars into an open or closed position.

2. In a machine of the class described, the combination with a supporting frame, means for supporting ladder stiles thereon, including clamping bars, a longitudinally extending rung support having mounted thereon a series of rocking supporting fingers, whereby the rung is capable of a slight bodily movement, and means for moving one of said clamping bars into open or closed position.

3. In a machine of the class described, the combination with a supporting frame, means for supporting ladder stiles thereon, including clamping bars, a rung support arranged between said clamping bars comprising a

member having attached thereto a pivoted supporting finger upon which the rung rests, and means for moving one of said clamping bars into an open and closed position.

4. A machine of the class described, the combination with a supporting frame, means for supporting ladder stiles thereon, including clamping bars, a plurality of longitudinally extending rung supports having a series of pivoted counterweighted supporting fingers thereon to allow a slight bodily movement of the rungs, and means for moving one of said clamping bars into an open or closed position.

5. A machine of the class described, the combination with a supporting frame, means for supporting a ladder stile thereon, including clamping bars, a vertically adjustable rung support arranged between said clamping bars, movable fingers carried by said rung supports and upon which the rung rest, and means for moving one of said clamping bars into an open or closed position.

6. A machine for the class described, the combination with a supporting frame, means for supporting a ladder stile thereon, including clamping bars, a vertically adjustable rung support having mounted a series of yieldable counterweighted fingers upon which the rung rests, means for positively retaining the rung supports in their adjusted positions between the clamping bars and means for moving one of said bars to an open or closed position.

7. In a machine of the class described, the combination with a supporting frame of clamping members, means for supporting ladder stiles upon the frame, rung supports arranged between said clamping members, and having axially alined openings therein, a rung supporting finger adjacent each of said openings upon which the rungs rest, the said supporting fingers being capable of a slight bodily movement to permit the rungs to rise and fall within the openings in the rung supports, and means for moving one of said clamping bars into an open or closed position.

8. In a ladder assembling machine, the combination with a supporting frame, means for supporting ladder stiles thereon, a series of transverse supporting plates arranged on said supporting frame, a filler block arranged on each of said plates at one end thereof, an adjustable clamping bar on said filler block, a guide block at the opposite end of each transverse plate, a movable clamping bar having a dovetailed connection with said guide block, rung supports arranged between the clamping bars and means for moving one of said clamping bars into an open and closed position.

9. In a ladder assembling machine, the combination with a supporting frame, means for supporting ladder stiles thereon, a series of transverse supporting plates arranged on said supporting frame, a filler block arranged on each of said plates at one end thereof, an adjustable clamping bar on said filler blocks, a guide block at the opposite end of each transverse plate, a movable clamping bar slidably mounted on said guide blocks, rung supports arranged between the clamping bars, and means for moving one of said clamping bars into an open or closed position, comprising a series of bell crank levers pivotally attached to the movable clamping bars and operated by a power actuated mechanism.

10. In a ladder assembling machine, the combination with a supporting frame, means for supporting stiles thereon, including clamping bars, longitudinally adjustable stops carried by said clamping bars preventing endwise movement of the stiles, rung supports for supporting the ladder rungs, and means for moving one of said clamping bars into a closed position to clamp the stiles and rungs together.

11. In a machine of the class described, the combination with a supporting frame, means for supporting ladder stiles thereon, including clamping bars, a rung support arranged between said bars, a pivoted counterweighted rung supporting finger upon which the rung rests attached to said rung support whereby the rung is permitted to have a slight bodily movement, and means for moving one of said clamping bars into an open or closed position.

12. In a machine of the class described, the combination with a supporting frame, of means for supporting ladder stiles thereon, including clamping members, a rung support arranged between said clamping members having an opening therein, a movable supporting finger upon which the rung rests attached to said rung support adjacent the said opening therein whereby the rung is permitted to have a slight bodily movement within the openings and means for moving one of said clamping bars into an open or closed position.

13. In a ladder assembling machine, the combination with a support for the ladder stiles, of clamping devices carried thereby, and movable rung supporting means for carrying the ladder rungs whereby a slight bodily movement of the rungs relative to the stiles is permitted upon the actuation of one of the clamping devices, and means for actuating one of said clamping devices.

14. In a ladder assembling machine, the combination with a support for ladder stiles, of clamping devices carried thereby, vertically adjustable rung supporting means for carrying the rungs, parts of the said rung supporting means being capable of slight movement whereby the rungs may

move bodily relative to the stiles, and means for actuating one of said clamping devices.

15. In a ladder assembling machine, the combination with a support for the ladder stiles, of clamping devices carried thereby, a rung support, movable rung supporting members carried thereby and upon which the rungs rest, each supporting member being capable of a slight movement, whereby a bodily movement of the rungs relative to the stiles is permitted, and means for actuating one of said clamping devices.

16. In a ladder assembling machine and in combination, means for supporting two ladder stiles on edge, clamping devices for moving one of said stiles relative to the other, devices for securing the stiles in position on the supports, adjustable gaging stops carried by the clamping devices for positioning the ladder stiles upon the support, means interposed between the stiles for supporting and retaining in spaced relation a series of ladder rungs and means for advancing one of the clamping devices toward the other for setting the ends of the rungs simultaneously into the sockets in the stiles.

In testimony whereof I affix my signature in presence of two witnesses.

VERNER E. HAYWARD.

Witnesses:
H. T. REEVES,
CAROLYN A. ROOB.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."