

Dec. 22, 1942.

W. H. SMITH

2,305,906

BUILDING CONSTRUCTION

Filed Oct. 28, 1941

4 Sheets-Sheet 1

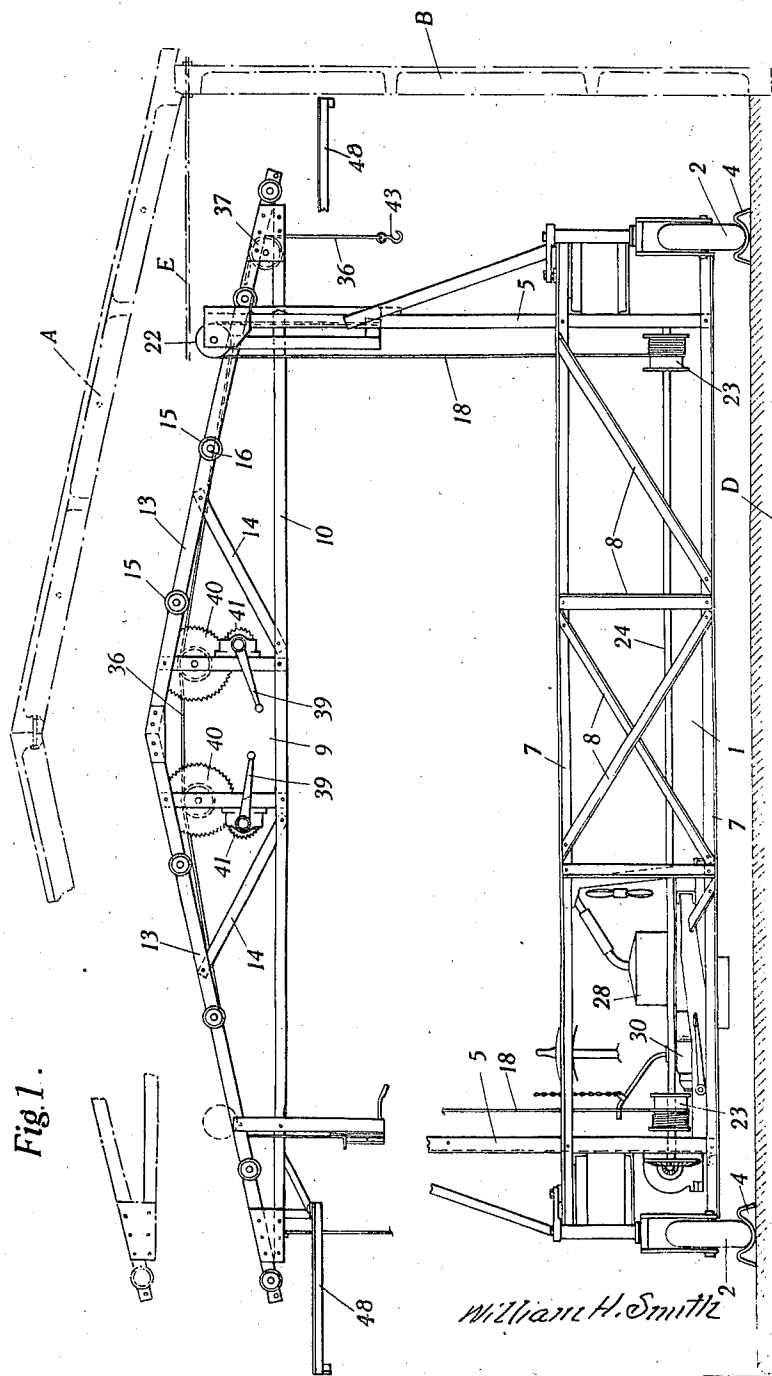


Fig. 1.

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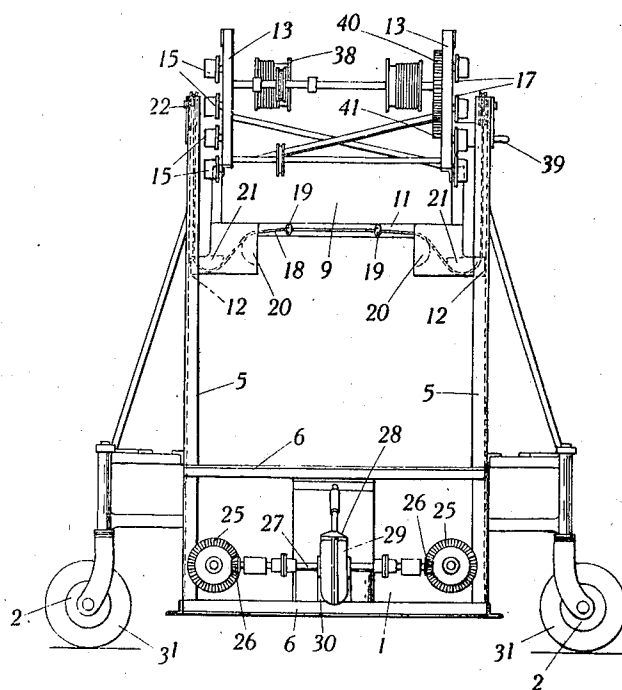
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4 Sheets-Sheet 2

Fig. 2.



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4 Sheets-Sheet 3

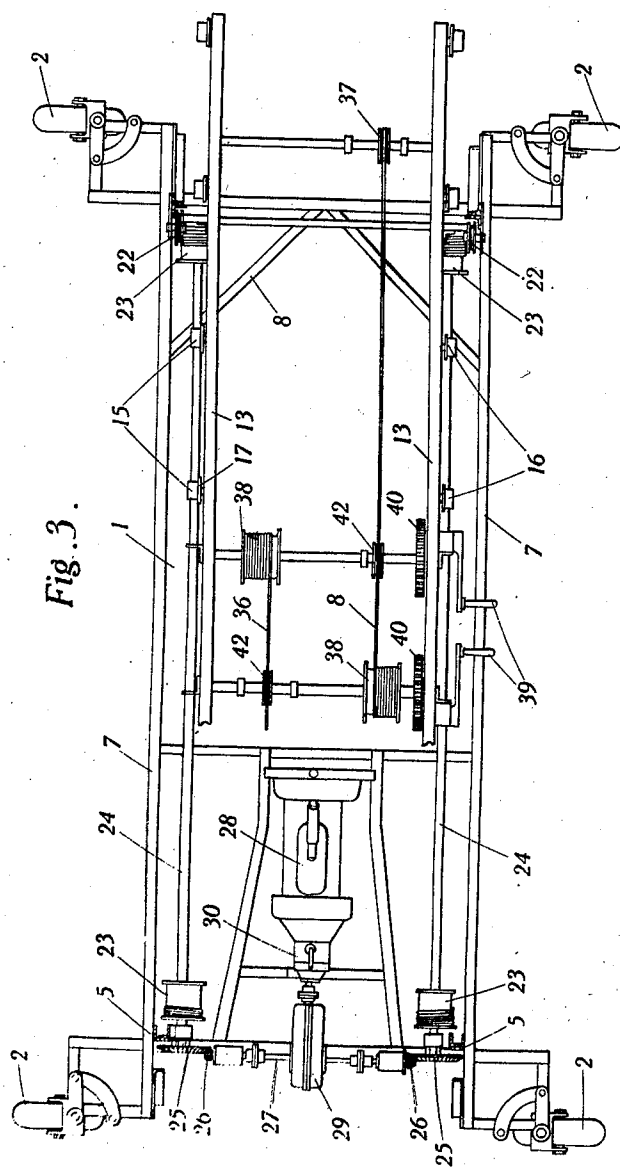


Fig. 3.

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4 Sheets-Sheet 4

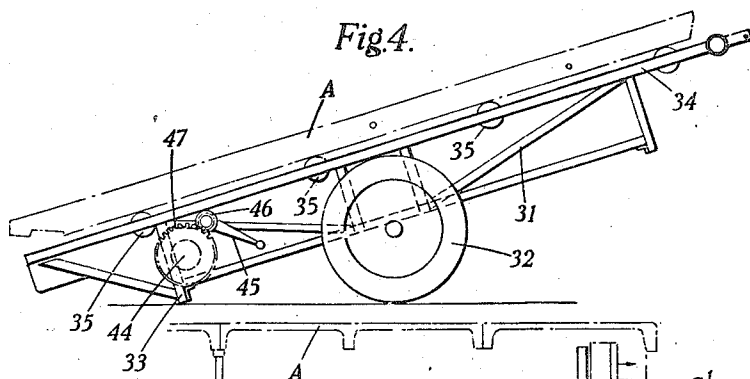


Fig. 5.

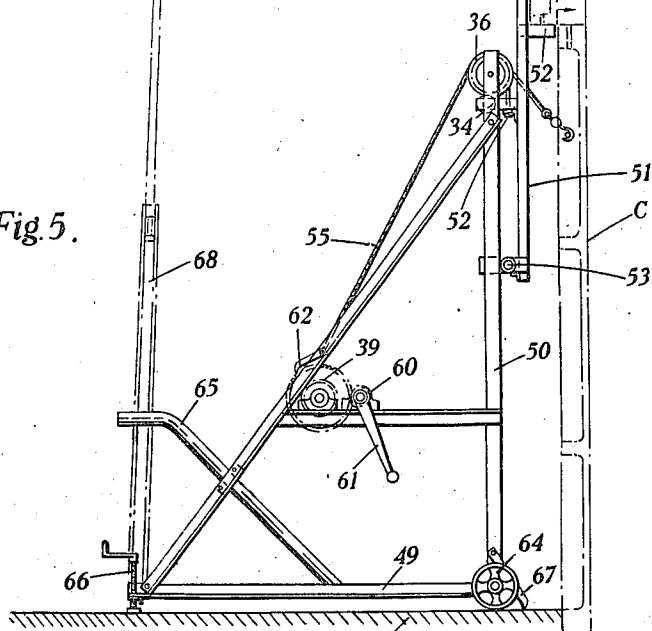
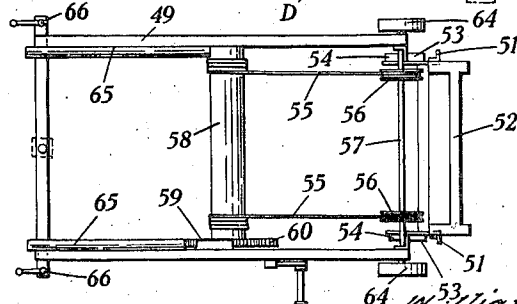


Fig. 6.



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BUILDING CONSTRUCTION

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In Great Britain April 26, 1940

4 Claims. (Cl. 212—1)

This invention relates to the erection of buildings in which the roof and walls are of precast reinforced concrete units, which are preferably coffered.

The primary object of the invention is to provide means whereby sections of the roof of a concrete structure are assembled in correct relative positions on a lifting frame, are raised by this frame above the level of the walls and are lowered into position on the walls.

Another object of the invention is to provide means whereby the lifting frame is raised and lowered relatively to a main frame which is movable along the length of the structure. The main frame and the lifting frame together form a machine which for convenience will hereinafter be termed a gantry.

On the gantry may be mounted hoisting devices for use in the erection of wall slabs of the structure, booms or the equivalent to afford temporary support for the walls and other apparatus which will facilitate the erection of the concrete structure.

With these and other objects in view the invention consists in the improved combinations and arrangements of the preferred embodiments illustrated in the accompanying drawings and set out in the claims which follow.

In these drawings:

Fig. 1 is an elevation of one form of gantry for use in the construction of concrete structures, parts thereof being broken away for clearness,

Fig. 2 is an end view of the apparatus illustrating some modification,

Fig. 3 is a plan partly broken away,

Fig. 4 is a view illustrating one manner of loading roof units onto the apparatus,

Fig. 5 is a side view of auxiliary apparatus for raising the gable and end wall panels, and

Fig. 6 is a plan view of the apparatus shown in Fig. 5.

The gantry comprises a main frame 1 mounted on wheels 2 which may be flanged and run on rails laid on the raft on which the hut is to be erected or as shown may be castor type wheels with rubber tires 3'. In this case rails 4 of inverted W section of sheet material may be provided, the tires of the wheels running in the grooves of these rails.

The main frame 1 comprises upright post members 5 connected together by transverse members 6 and longitudinal members 7 and is strengthened by bracing members 8 as may be desired. The topmost longitudinal member 7

is relatively near the bottom of the apparatus so that in effect an open channel is formed between the upright posts at front and back of the machine within which roof members may be raised or lowered.

A lifting frame 9 is movable up and down in relation to the main frame, the lower part of this lifting frame comprising horizontal longitudinal members 10 and transverse member 11. This frame is guided by the upright posts 5 which as shown are of L section so that the projecting parts 12 of the transverse members of the frame can engage in the angle between the flanges.

The lifting frame also carries bars 13 which are inclined to the horizontal at an angle substantially equal to that of the roof of the structure to be built. These bars 13 are supported by members 14 forming a girder like structure.

Rollers 15 are mounted on spindles 16 at intervals along the bars 13 so that a roof slab A supported on the rollers can be easily moved into position. The rollers 15 have flanges 17 at one side which locate the slab by engaging its side ribs.

The frame 9 is raised and lowered relatively to the main frame by means of cables or the equivalent 18. Each cable 18 is fixed at points 19—19 to a transverse bar 11 of the frame 9 and passes around guide members 20, 21 over a pulley wheel 22 fixed to the upright post 5 and is wound on a drum 23. This drum 23 is mounted on a longitudinal shaft 24 which is rotated by bevel gears 25, 26 from a transverse shaft 27. Two longitudinal shafts 24 are provided each carrying two drums 23 and one transverse shaft 27 drives both longitudinal shafts. The shafts 27—27 are driven from an engine 28 through worm reduction gear 29 and a reversing gear and clutch 30 so that the drums 23 may be rotated either to raise or lower the lifting frame 9.

The driving motor is carried by the main frame 1 and may be arranged to drive the wheels 2 (or some of them) through a clutch so that the gantry may be self-propelling.

The operation of the gantry in the construction of a concrete structure will now be described for a particular form of structure comprising side walls B of precast slabs extending to the eaves, gable end walls also of precast slabs C and a roof formed of precast slabs A bolted together at the ridge in pairs. After the concrete raft or foundation D for the building has been laid the gantry is moved on it so as to be movable on the wheels 2 from one end to the other,

The end pair of roof slabs A (which may be somewhat narrower than the remainder of the roof slabs) are then loaded on to the lifting frame. Such loading is facilitated by the use as shown in Fig. 4 of a truck 31 mounted on a pair of wheels 32 and having a support 33 such that the top surface 34 of the truck when resting on the support 33 is inclined at an angle similar to that of the top bars 13 of the gantry. When the lifting frame 9 is lowered, the truck can be wheeled into position so that its top surface forms in effect a continuation of the top bars 13 of the gantry. Rollers 35 are provided on which the slab A rests.

A roof slab on the truck can then be hauled on to the rollers 15 by means of ropes or the equivalent 36 passing over pulleys 37, these ropes being wound on winch drums 38 rotated by handles 39 through gearing 40, 41 and prevented from running back by ratchets not shown. Alternatively, these ropes may be hauled from the motor used to raise and lower the lifting frame.

As shown, the rope 36 on the right hand side of the machine is wound on a winch drum 22 towards the left hand side of the machine and passes over a pulley 42 on the shaft of a similar winch drum towards the right hand side of the machine on which the rope 36 on the left hand side is wound, this second rope passing over a pulley 42 on the shaft of the first winch.

A hook 43 attached to the cable engages a bar placed temporarily in one of the bolt holes in the roof slab.

The truck 31 is provided with a hand winch 44 rotated by a handle 45 through gearing 46, 47 to facilitate hauling of a roof slab on to it and to hold the slab in position whilst the truck is being moved.

The end pair of roof slabs, having been loaded on to the gantry, are bolted together at the ridge and the lifting frame 9 is raised by rotation of the shaft 27 to bring the roof slabs above the height of the side walls. The gantry is then moved towards the end of the raft until the roof slabs are above the position which they will ultimately take up.

The extreme end side wall units B are placed in position with their lower ends in grooves provided in the raft. The side wall units are raised to the vertical position by the cable 35 and winch drum 38.

These side units when raised are temporarily supported by booms 48 projecting from the gantry and arranged to swivel so that they can be moved back out of the way of the walls when desired.

The lifting frame is then lowered to deposit the roof slabs A on the side slabs B where they are bolted in position.

The gantry is then lowered and withdrawn for a sufficient distance to allow of the next pair of roof units being loaded on to the lifting frame and bolted together at their ridge. The lifting frame is raised to bring the roof slabs above the height of the wall and the gantry is moved forward until the roof units are over their desired position. The next pair of opposite side walls units are hoisted into position and bolted to the already fixed side units and the roof slabs are then lowered into position and bolted to the adjacent roof slabs and to the side walls.

The bars E spanning the width of the structure are fixed and adjusted, preferably before the lowering and withdrawal of the gantry. In this way, side and roof slabs are successively placed

and fixed in position until the structure is complete.

The end wall members C are erected after the first side and roof units have been positioned so that the gantry can protrude beyond the end of the building whilst placing the roof slabs on the first pair of walls slabs. Until the end wall members are erected, the wall slabs are stayed to the roof slabs by means of a temporary steel or other tie, bolted across the eaves joints.

After say three pairs of roof and wall units have been erected the end slabs and the gable slabs are placed in position by means of the apparatus shown in Figs. 5 and 6.

This apparatus comprises a relatively light frame with a base frame 49 and upright members 50. A lifting frame comprising uprights 51 and transverse members 52 is mounted so as to be movable up and down relatively to the base frame, rollers 53, 54 fixed to the uprights 51 running on opposite sides of the base frame uprights 50 so as to guide the lifting frame.

Cables 55 fixed at one end to transverse members 52 pass over pulleys 56 mounted on a shaft 57 carried by the upright base members 50 and are wound on a winch drum 58. This winch drum is rotated through gearing 59, 60 by a handle 61 and a pawl and ratchet 62 are provided to prevent the winch drum running back.

The apparatus is provided with a pair of wheels 64 on which it is movable by handle 65. Screw stops 66 and a pawl 67 are provided so that the apparatus can be fixed temporarily in position.

Before erecting the end walls, the temporary ties are removed and temporary struts are arranged further back along the building. These are arranged with their lower ends at the foot of the wall panels and their upper ends in opposite eaves joints thus forming a pair of diagonal braces.

The gable end members C' are placed on the lifting frame of the auxiliary apparatus which is wheeled up close to the position for the end walls. The end wall panels C are raised into position by means of a cable 69 which may be wound on the drum 58. The telescopic strut 68, extending from a cross member of the apparatus to the roof prevents the apparatus being overturned when the heavy wall member is pulled into position.

The gable end members are raised until their lower edges are level with the top of the end wall and are then manoeuvred from the lifting frame into position. The end wall and gable panels are then bolted together and to the roof members to complete the erection.

I claim:

1. A gantry for use in the erection of structures including precast concrete slabs comprising a main transportable frame, a second frame movable vertically relatively to the main frame and adapted to support precast concrete roof slabs in the relative position they occupy in the roof, and booms or the equivalent which may be swung out to serve as temporary supports for the walls of a structure being erected.

2. A gantry for use in the erection of structures, including precast concrete wall and roof slabs, comprising a main transportable frame, a second frame shaped like a pitched roof structure and movable vertically relatively to the main frame, said second frame serving to support precast concrete roof slabs in the relative position they occupy in the roof, a series of roll-

ers on which the roof slabs are supported, and means for lifting said second frame from the ground to roof position.

3. A gantry for use in the erection of structures, including precast concrete wall and roof slabs, comprising a main transportable frame, a second frame movable vertically relatively to the main frame and designed to support precast concrete roof slabs in the relative position they occupy in the roof, and rollers carried by the vertically movable frame up which roof slabs are pushed into operative position.

5 4. A gantry for use in the erection of structures, including precast concrete wall and roof slabs, comprising a main transportable frame, a second frame movable vertically relatively to the main frame and shaped to correspond with a sloping roof structure and designed to support precast concrete roof slabs in the relative position they occupy in the roof, wheels on said main frame, and a track of inverted W section on which said wheels run.

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