Nov. 6, 1923. 1,473,054

H. R. SMITH ET AL

PILE DRIVER

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Fig. 1.

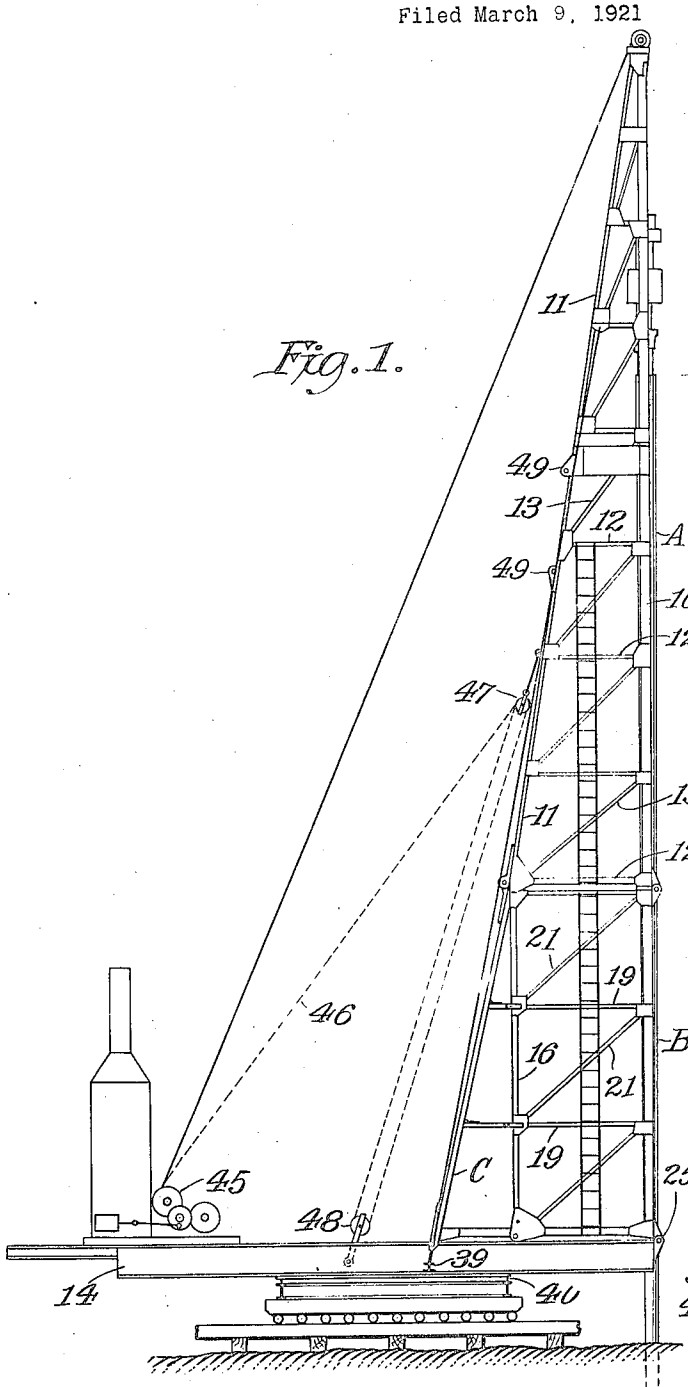
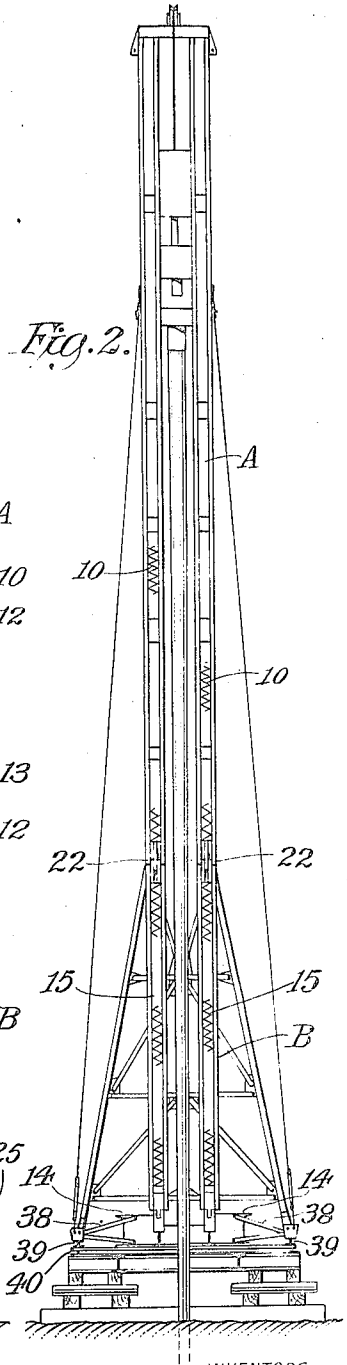



Fig. 2.




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Nov. 6, 1923. 1,473,054

H. R. SMITH ET AL

PILE DRIVER

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Fig. 3

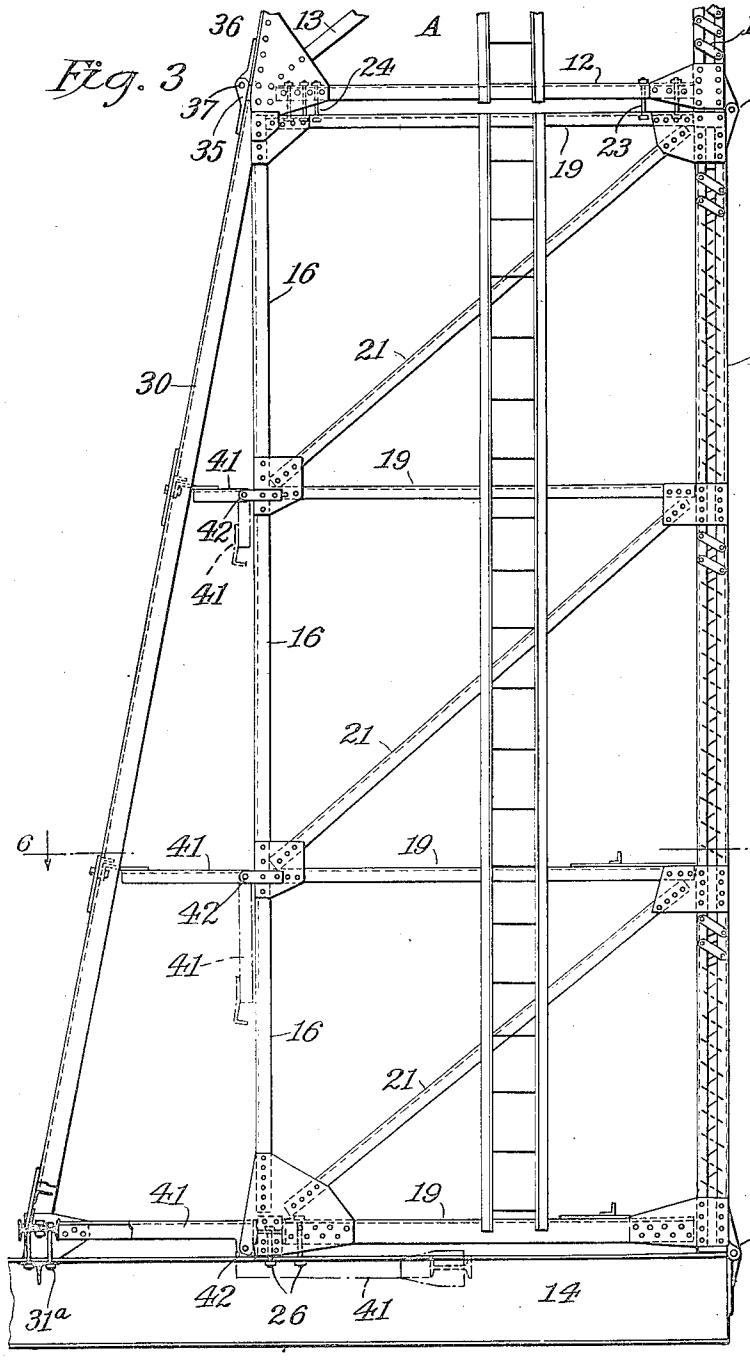
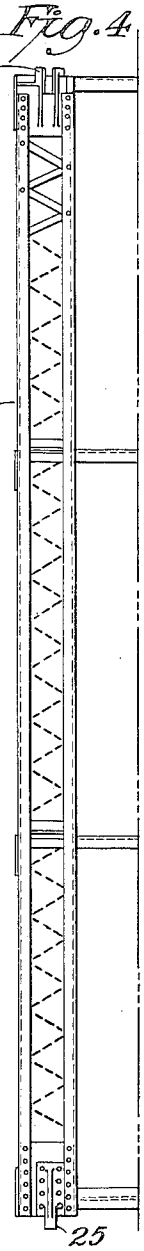



Fig. 4




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1,473,054

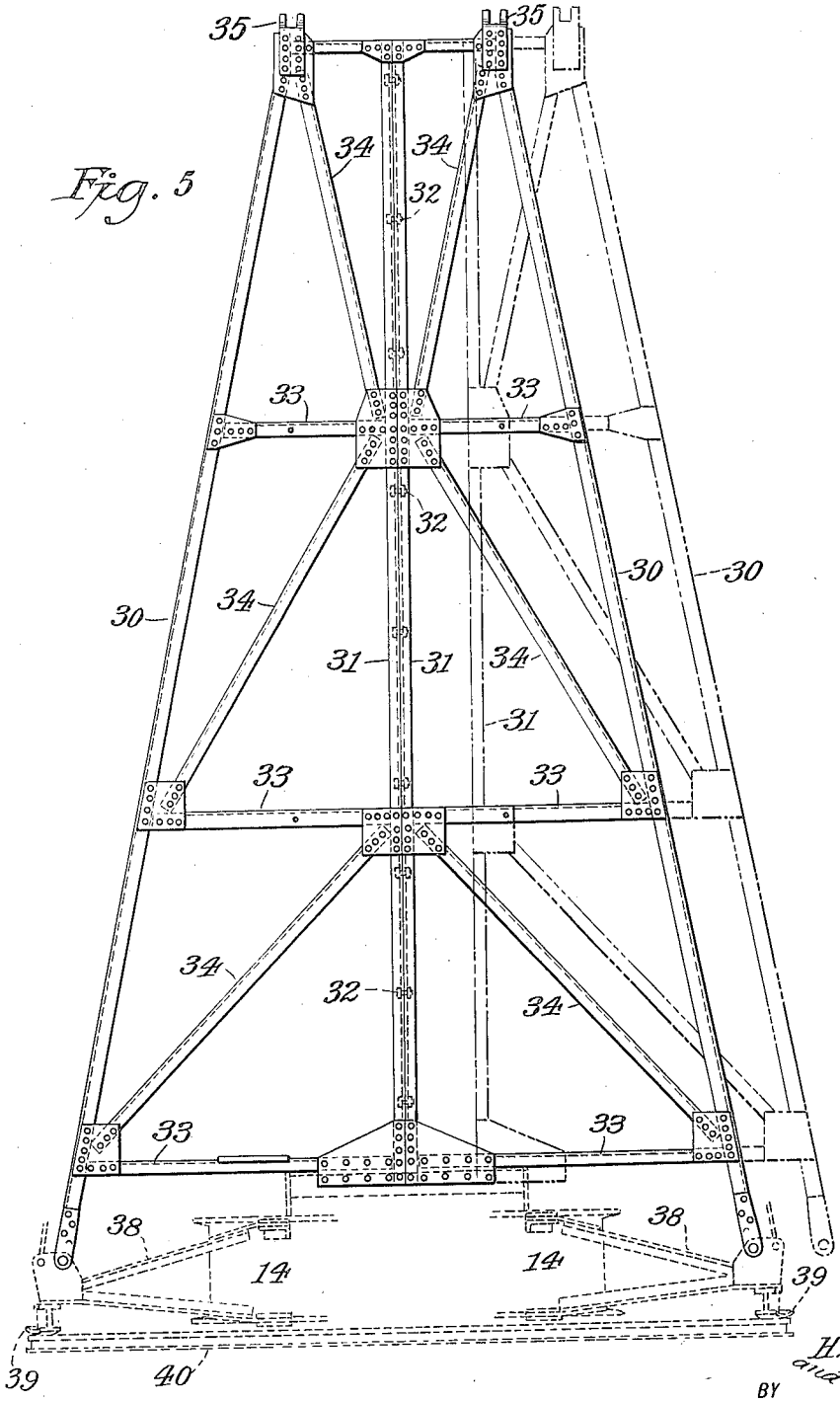
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PILE DRIVER

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Fig. 5




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H. R. SMITH ET AL

PILE DRIVER

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Fig. 6

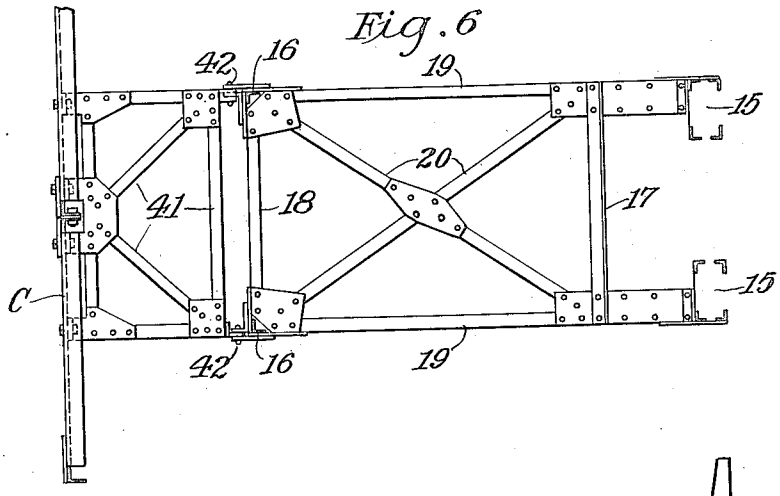



Fig. 8

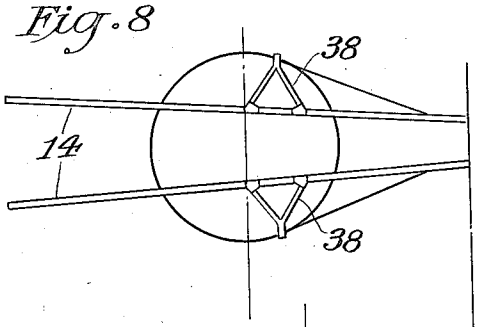



Fig. 9

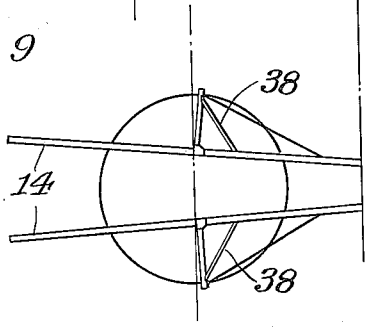



Fig. 7




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H. R. SMITH ET AL

PILE DRIVER

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Fig.10

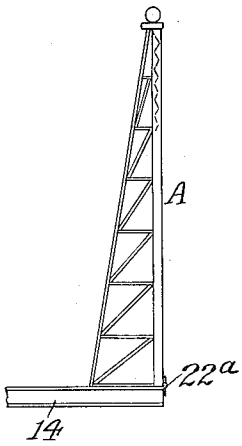



Fig.11

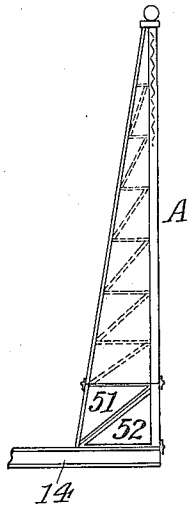



Fig.12

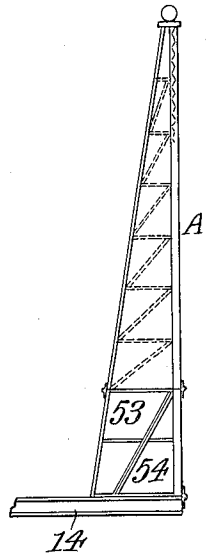



Fig.13

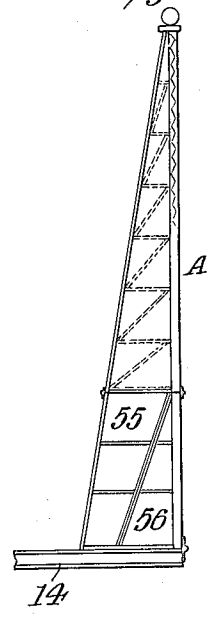



Fig.14

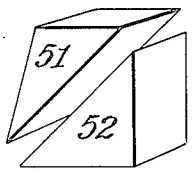



Fig.15

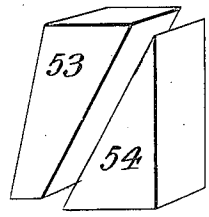



Fig.16

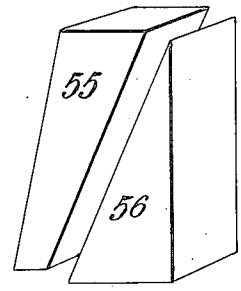



Fig.17

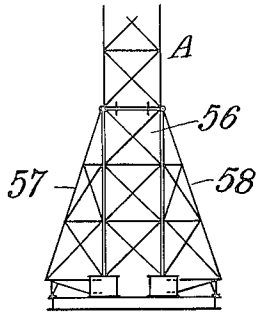



Fig.18

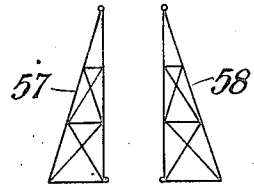
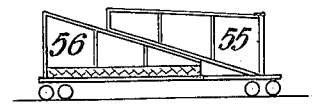



Fig.19




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Patented Nov. 6, 1923. 1,473,054

# UNITED STATES PATENT OFFICE.

HERMAN R. SMITH, OF BROOKLYN, NEW YORK, AND ALBERT E. TWIST, OF CLIFTON, NEW JERSEY, ASSIGNORS TO RAYMOND CONCRETE PILE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

## PILE DRIVER.

Application filed March 9, 1921. Serial No. 450,919.

*To all whom it may concern*:

Be it known that we, HERMAN R. SMITH and ALBERT E. TWIST, both citizens of the United States of America, residing at, respectively, Brooklyn, in the county of Kings and State of New York, and Clifton, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Pile Drivers, of which the following is a full, clear, and exact description.

In transporting piledrivers, particularly in the case of the high structures required for driving long piles, considerable difficulty has been experienced by reason of the limited capacity of freight cars, both as to the length and width of the load. Practical conditions, such as vertical and lateral clearance in tunnels and bridges, clearance between parallel tracks and the like, impose unavoidable limitations on the loading of piledrivers on flat cars, with the result that in some cases it is necessary to take the tower to pieces and ship it in parts which are reassembled at the new location. This method involves considerable time and labor at both ends, and militates seriously against the use of piledrivers above the maximum size that can be shipped by rail without being taken apart.

We have accordingly been led to devise our present invention, which has for its chief object to provide a tower in the form of sectional units which are each small enough for convenient shipment by rail but are capable of being assembled to form a complete piledriver of any desired height, depending upon the number, or size, or both, of the units employed. To this and other ends the invention consists in the novel features hereinafter described.

In the preferred form of the invention the tower is composed of a top or upper section, which may be used alone as a tower; one or more lower sections of the same horizontal dimensions as the bottom of the upper section; and one or more rear bracing sections or panels of greater width than the other sections so as to give the needed lateral stability to the complete tower, which would otherwise be too narrow for its height. These bracing panels are themselves composed of laterally separable sections which are narrow enough to be loaded and shipped on a flat car. The lowermost section is provided with a hinge connection with the turntable, so that the lower section or sections and the top or upper section can be assembled in horizontal position and then swung up as a whole to vertical position on the turntable. Similarly, they can be swung forwardly to a horizontal position on the ground when it is desired to disassemble the tower. All the sections are preferably composed of steel members, as channels, angles, and plates.

The embodiment outlined above is illustrated in the accompanying drawings, in which—

Fig. 1 is a side view, somewhat diagrammatic in character, showing a complete piledriver in which the tower is composed of a top section, one three-story lower section, and a rear bracing panel.

Fig. 2 is a front view of the structure shown in Fig. 1.

Fig. 3 is a detail side view, on a larger scale, of the lower or base section.

Fig. 4 is a detail front view of one of the front columns of the lower section shown in Fig. 3.

Fig. 5 is a rear view of the rear bracing panel, showing in dotted lines one of the panel-sections detached and separated from the other.

Fig. 6 is a horizontal section on line 6—6 of Fig. 3, but on a smaller scale.

Fig. 7 is a diagrammatic side view of a tower in which a two-story lower or base section is used.

Figs. 8 and 9 are plan views showing turntables of different radii, to illustrate the range of utility of our invention.

Fig. 10 is a side view illustrating the upper section used alone as a pile driver tower.

Figs. 11, 12 and 13 are side views showing the top section of Fig. 10 used with two-part lower or base sections of three different heights.

Figs. 14, 15 and 16 are diagrammatic perspective views illustrating the parts of the base sections used in Figs. 11, 12 and 13.

For the sake of clearness the base sections in Figs. 14, 15 and 16 are shown as solids instead of framed structures.

Fig. 17 is a front view of the lower portion of the sectional tower illustrated in Fig. 13, showing the use of bracing panels to give lateral stability.

Fig. 18 is a front view of the two bracing panels of Fig. 17, but showing them detached from the tower.

Fig. 19 is a side view showing how a two-part lower or base section can be loaded on a flat car.

The upper section of our tower is designated generally by the letter A, and is composed of two parallel front columns of the lattice type, 10, and forwardly inclined rear members 11, rigidly connected by horizontal front, rear and side members, as 12, Fig. 1, and diagonal members, as 13. This upper section is shown in Fig. 1 as mounted on a lower section B of the same dimensions in plan, which lower section is mounted on the forwardly converging beams 14, 14 of the turntable, Figs. 8 and 9. As shown, the lower section is composed of vertical front columns 15, 15, of lattice form matching columns 10, 10 of the upper section; vertical rear members 16, 16, Fig. 6; and front, rear, side and diagonal members 17, 18, 19, 20, 21. The front columns 10 of the upper section and the matched columns 15 of the lower section are connected by hinge joints 22 having removable pins or pintles, which joints may be strengthened by vertical bolts 23, Fig. 3, connecting the side members 12 and 19 immediately behind. In the rear, the sections are connected by bolts 24 extending through the said side members 12, 19. The lower section is itself connected to the turntable beams 14 at the forward ends thereof by hinge joints 25, and at the rear by bolts 26.

In plan, the bottom of the upper section and the top and bottom of the lower sections are the same in size, and are constructed to fit together as shown, so that the upper section can be mounted directly on the turntable beams 14 for use as a piledriver of minimum height. Or one or more lower sections may be erected on the turntable and on top of them the upper section, to form a tower of greater height. Preferably, however, we provide a plurality of base sections of different heights, say a "one-story" section, a "two-story" section, a "three-story" section, etc., which can be used interchangeably according to the height of tower desired. But the dimensions for a tower of the height of the upper section used alone, are in general not adequate, either laterally or rearwardly, when the height is increased by one or more lower sections. Accordingly we provide for use under such circumstances a rear bracing means, preferably in the form of a panel, as indicated generally in Fig. 1 by the letter C. This panel is composed of two laterally separable sections, composed of inwardly and upwardly inclined members 30 and vertical meeting members 31 (which are detachably secured together by bolts 32 when the two halves of the panel are assembled), connected by horizontal and diagonal members 33, 34. At the top the two sections are provided with apertured socket members 35 to receive apertured tongues 36 on the bottom of the upper section A (Fig. 3) at the rear thereof, the parts being detachably secured together by means of removable bolts or pins 37. At the bottom of the panel, which, as clearly shown in Figs. 2 and 5, extends laterally beyond the turntable beams 14, the side members 30 are bolted to the ends of suitable stays 38, which are connected at their inner ends to the said members 14 and at their outer ends are provided with shoes 39 adapted to bear on top of the rail-circle 40. At the center of the bottom the panel bears on the turntable and is releasably connected thereto by bolts $31^a$, Fig. 3. Between its top and bottom the panel is connected to the lower tower, section or sections by horizontal stays 41 in the form of rectangular frames as shown in Fig. 6. These stays are connected to the tower section by hinge joints 42 (see also Fig. 3) and are bolted to the bracing panel. When released from the latter they can be swung down to the positions indicated in dotted lines in Fig. 3, and tied in place or secured in any other convenient manner.

When it is desired to disassemble the tower a line, indicated in dotted lines at 46, is led from the hoisting drum 45, Fig. 1, to a block 47, which may be permanently or temporarily attached to the tower, and thence down to a swinging block 48 on the turntable. These blocks may have any convenient and suitable number of sheaves, as for example five. The tower being jacked up at the rear, it swings forward on the hinges 25, the line from the drum 45 being paid out slowly, until the tower rests on suitable timbers or other temporary supports (not shown) arranged to receive it, after which the rear bracing panel can be removed and split into halves and the sections can be disconnected, as by removing bolts 23, 24, and the bolts or pins 37 passing through the socket-and-tongue joints 35, 36. The various parts or sections can now be loaded on the cars by means of a derrick, not shown. In loading the upper section, A, the eyes 49 afford convenient connection for the hoist line. The tower is re-erected on the new job in a similar manner but in reverse order: the sections and bracing panel being assembled in horizontal position on the ground and then swung up to vertical position on the hinge joint 25 by means of

the line 46. When the upper section is used alone, as in Fig. 10, it may be raised to upright position or lowered to horizontal position on the hinge joints 22a.

In the modification shown in Figs. 11, 12 and 13, the single base section is composed of two parts, divided on a diagonal plane extending rearwardly from the front edge of the section. The base section may be of any suitable height, three different heights being shown in the figures referred to, and it is of course made in the form of a steel framework or skeleton construction. Figs. 11 illustrates a "one-story" or one-bay section, composed of two separable parts 51, 52, as indicated in Fig. 14, in which, for the sake of clearness, the two parts are shown as solids. In assembling the parts they are fastened securely together in any convenient manner, as by means of bolts, not shown. Similarly, Figs. 12 and 15 illustrate a two-bay section composed of parts 53, 54, and Figs. 13 and 16 a three-bay section composed of parts 55, 56. To afford better lateral stability the lower portion of the tower at the front or rear may be provided with bracing panels, as 57, 58.

Two-part base sections of the kind illustrated in Figs. 11, 12 and 13 can easily be loaded on a flat car in such manner as to keep within the permissible clearances. For example, Fig. 19 shows the three-bay section of Fig. 13 loaded on a car for shipment, part 56 being laid on its front with the inclined face of part 55 overlapping and resting on the corresponding face of the other. The parts are, however, displaced longitudinally far enough to keep the maximum height of the two within the limit allowed.

It is to be understood that the invention is not limited to the specific construction herein specifically illustrated and described but can be embodied in other forms without departure from its spirit.

We claim:

1. In a pile-driver, a supporting base, a pile-driving tower thereon comprising a plurality of superposed separable tower-sections the upper being capable of use alone as a pile-driving tower and the lower serving to support the former on the base and increase the height of the tower when desired, and means for removably hinging the lower section to the supporting base.

2. In a pile-driver, a supporting base, a pile-driving tower thereon comprising a plurality of superposed separable tower-sections the upper being capable of use alone as a pile-driving tower and the lower serving to support the former on the base and increase the height of the tower when desired, and removable bracing means associated with the supporting base and the lower portion of the tower.

3. In a pile-driver, a tower comprising a lower portion having vertical front and rear members, an upper portion having vertical front members and forwardly inclined rear members, and bracing means releasably connected to the tower at the rear thereof.

4. In a pile-driver, a tower comprising a plurality of superposed sections, a supporting base for the tower, releasable fastening devices carried by the tower sections and the base, to secure the sections to each other and to the base, whereby the upper section can be secured to the base for use alone as a tower, and bracing means associated with the supporting base and with the lower portion of the tower, and adapted to be removed when the uppermost section is used alone.

5. In a pile-driver, a tower comprising a plurality of superposed sections, a supporting base for the tower, releasable fastening devices carried by the tower sections and the base, to secure the sections to each other and to the base, whereby the upper section can be secured to the base for use alone as a tower, and an upwardly and forwardly inclined, laterally and downwardly flaring brace, releasably secured to the lower portion of the tower at the rear thereof, said brace being adapted to be removed when the uppermost section is used alone.

6. In a pile-driver, a tower comprising a plurality of sections arranged one above the other, means for detachably securing the sections together; and a transversely extending panel releasably connected to the lower portion of the tower in rear thereof to brace the same, said panel being composed of laterally separable sections detachably connected together.

7. In a pile-driver, a tower comprising a plurality of sections releasably connected together one above the other; and a trapezoidal forwardly inclined bracing panel releasably connected to the tower at the rear thereof, said panel being composed of laterally separable sections detachably connected together.

8. In a pile-driver, a tower having its front face vertical and its rear face inclined forwardly toward the top, comprising an upper section having vertical front members and inclined rear members; a lower section below the upper section, having vertical front members in alignment with the front members of the upper section, and having vertical rear members; means for releasably connecting the said upper and lower sections rigidly together; and a trapezoidal bracing panel releasably connected to the tower in rear of the lower section and extending rearwardly in an inclined position.

9. In a pile-driver, a tower having its front face vertical and its rear face inclined forwardly toward the top, comprising up-

per and lower sections having vertical front members; means for releasably connecting the said upper and lower sections rigidly together; a trapezoidal bracing panel connected at its top to the rear of the tower at a point adjacent to the joint between said upper and lower sections and extending rearwardly in an inclined position; and stays releasably connecting the panel to the said lower section of the tower.

10. In a pile-driver, a tower having its front face vertical and its rear face inclined forwardly toward the top, comprising upper and lower sections having vertical front members; means for releasably connecting the said upper and lower sections rigidly together; and a trapezoidal bracing panel connected at its top to the rear of the tower at a point adjacent to the joint between said upper and lower sections and extending rearwardly in an inclined position, said panel being composed of laterally separable sections detachably connected together.

11. In a pile-driver, a tower having its front face vertical and its rear face inclined forwardly toward the top, comprising an upper section having vertical front members and inclined rear members; a lower section below the upper section, having vertical front members in alignment with the front members of the upper section, and having vertical rear members; means for releasably connecting the said upper and lower sections rigidly together; a trapezoidal bracing panel connected at its top to the rear of the tower at a point adjacent to the bottom of the upper section and extending rearwardly in an inclined position, said panel being composed of laterally separable sections detachably connected together; and stays releasably connecting the sections of said panel to the said lower section of the tower.

12. In a pile-driver, a tower comprising a plurality of superposed sections releasably connected together, an upwardly and forwardly inclined bracing structure releasably secured at its top to the lower portion of the tower at the rear thereof, and a stay hingedly mounted on the tower and releasably connected to the said bracing structure.

13. In a pile-driver, a tower comprising a plurality of superposed sections releasably connected together, an upwardly and forwardly inclined bracing structure releasably secured at its top to the lower portion of the tower at the rear thereof, a stay hingedly mounted on the tower and releasably connected to the said bracing structure, and a lower stay hingedly mounted on the bracing structure and releasably connected to the tower.

14. In a pile-driver, a tower, a transverse forwardly inclined bracing panel in rear of the tower at the lower part thereof, means releasably connecting the upper part of the panel to the tower; and a stay releasably connected to the tower and to the bracing panel, composed of side members, transverse front and rear members, and diagonal members permanently connected together.

15. In a pile-driver, a tower, a transverse forwardly inclined bracing panel in the rear of the tower at the bottom thereof, means releasably securing the top of the panel to the tower, and a plurality of rearwardly extending framed stays hingedly attached to the rear of the tower at the corners thereof and releasably connected to the bracing panel.

16. In a pile-driver, a tower, an upwardly and forwardly inclined transverse bracing panel in rear of the lower portion of the tower and composed of laterally separable sections, and one or more rearwardly extending framed stays hingedly mounted on the tower and releasably connected to the said bracing structure.

17. In a pile-driver, a tower comprising a plurality of superposed sections releasably connected together, and an upwardly and forwardly inclined transverse bracing panel releasably secured to the lower portion of the tower at the rear thereof, said panel comprising a pair of framed sections, each having an upwardly and inwardly inclined outer side member, a vertical inner side member, and a plurality of horizontal and diagonal members, permanently connected together; the vertical inner side members being releasably secured together to permit separation of the panel sections.

18. In a pile-driver, a tower, and an upwardly and forwardly inclined transverse bracing panel in rear of the lower portion of the tower, said panel comprising a pair of laterally separable framed sections, each having an upwardly and inwardly inclined outer side member, a vertical inner side member, and a plurality of horizontal and diagonal members, permanently connected together.

19. In a pile-driver, a tower, an upwardly and forwardly inclined transverse bracing panel in rear of the lower portion of the tower, said panel comprising a pair of framed sections, each having an upwardly and inwardly inclined outer side member, a vertical inner side member, and a plurality of horizontal and diagonal members, permanently connected together, the vertical inner side members being releasably secured together to permit separation of the panel sections; and a stay releasably connecting the panel sections to the tower.

In testimony whereof we hereto affix our signatures.

HERMAN R. SMITH.
ALBERT E. TWIST.