June 15, 1943. T. B. LEWIS 2,322,150

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Fig. 1

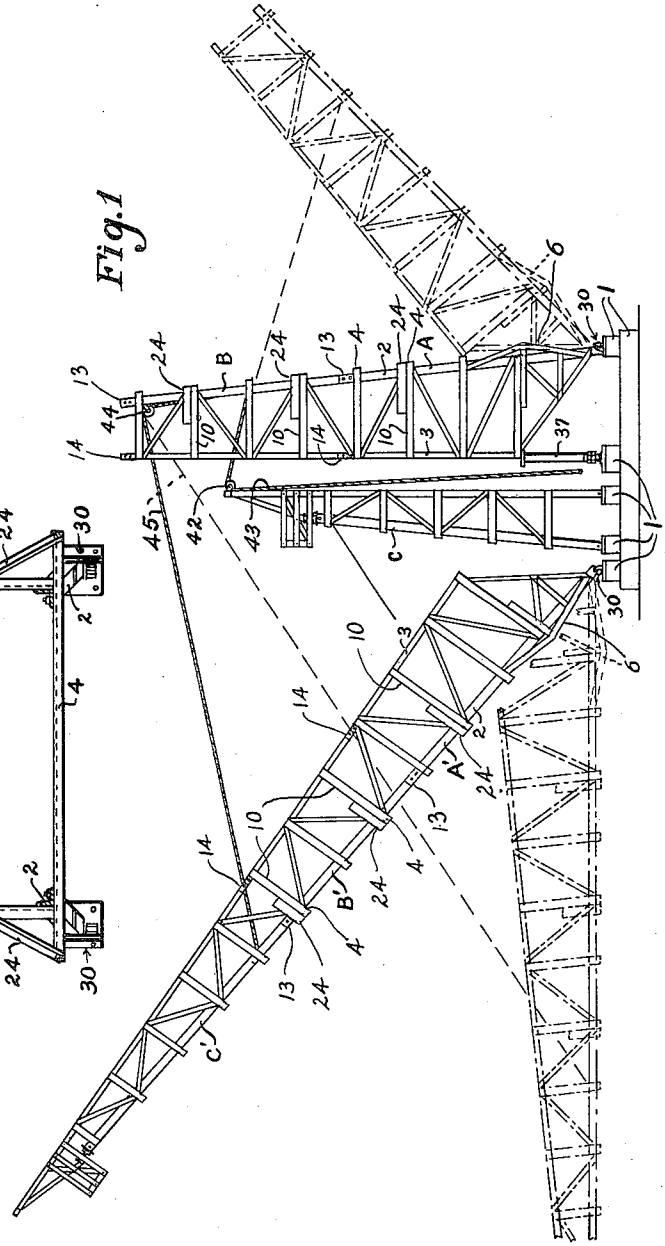
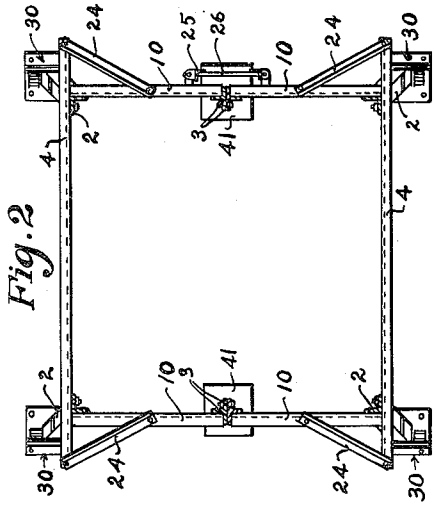


Fig. 2



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Fig. 5

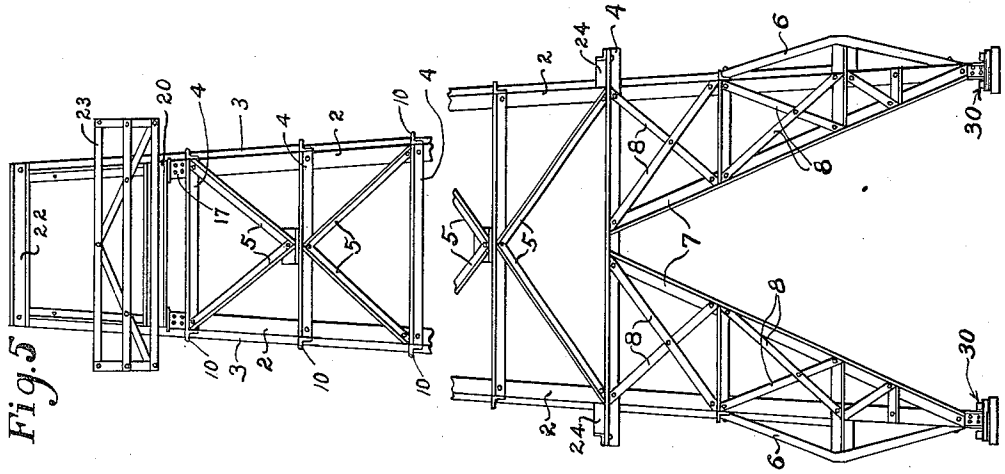


Fig. 4

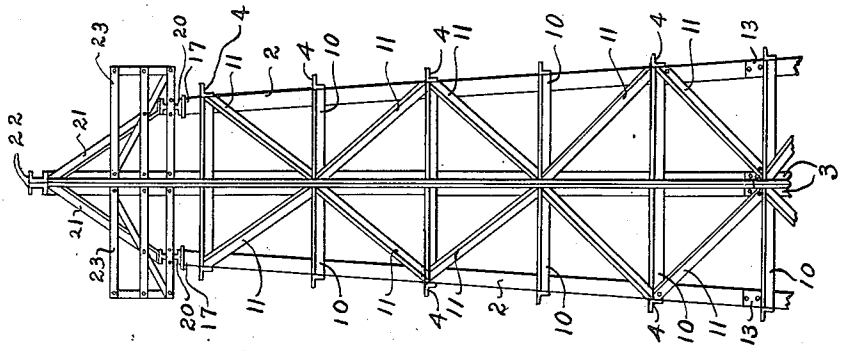
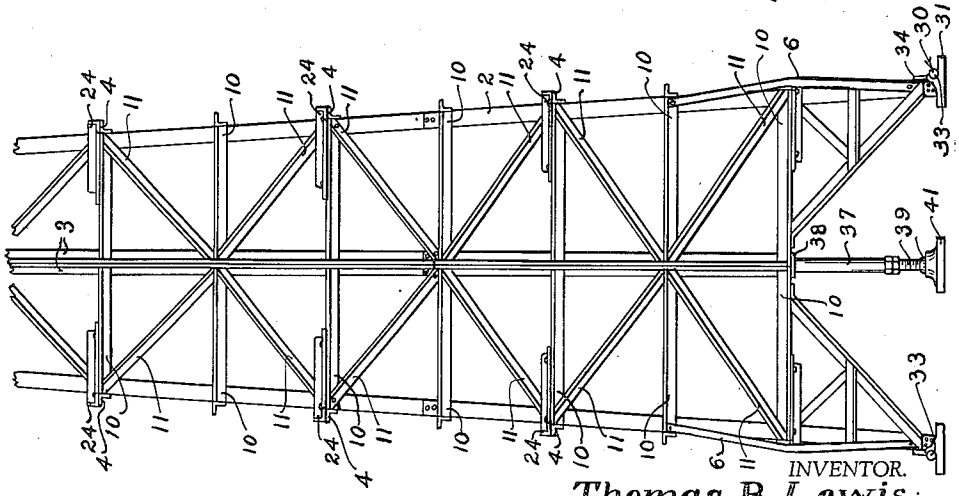


Fig. 3



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Fig. 6

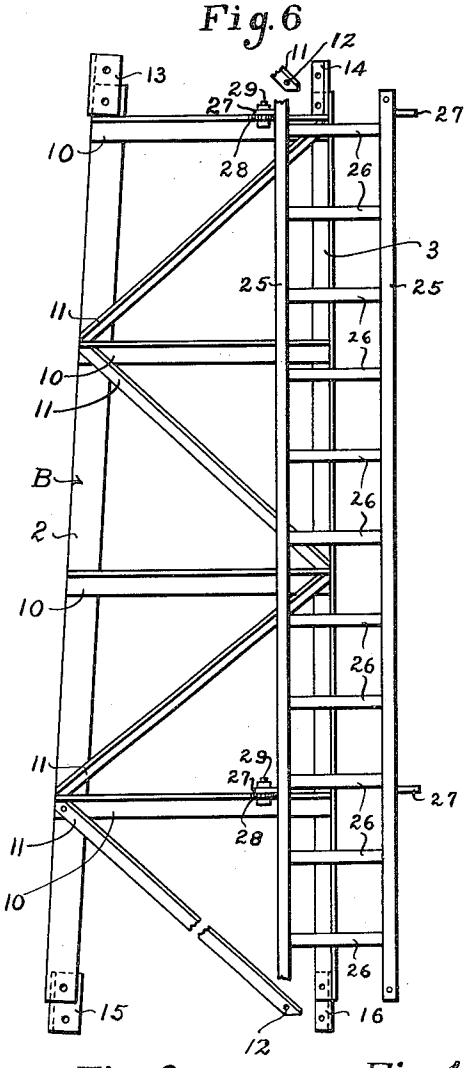


Fig. 7

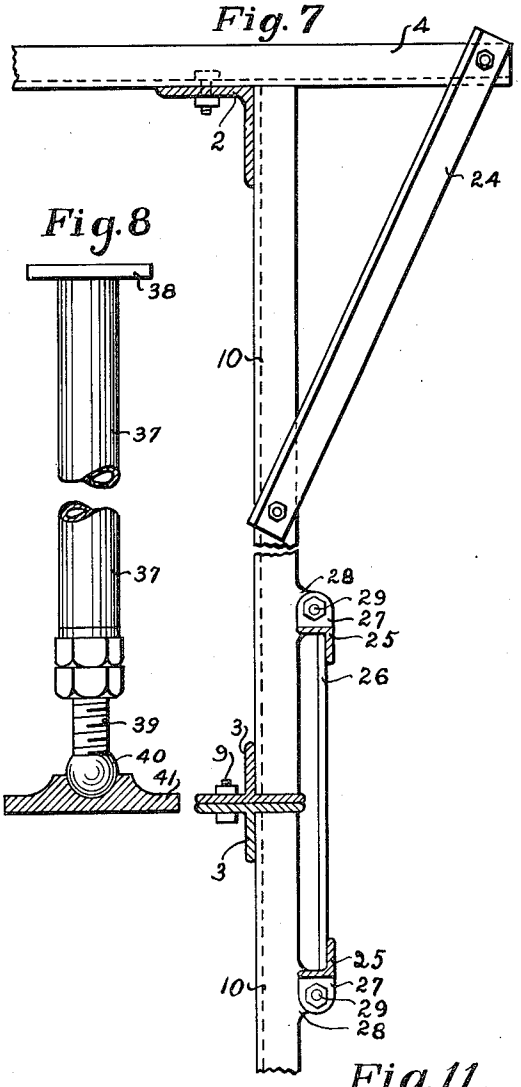


Fig. 8

Fig. 9

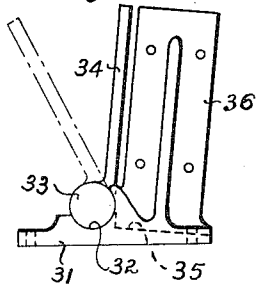


Fig. 10

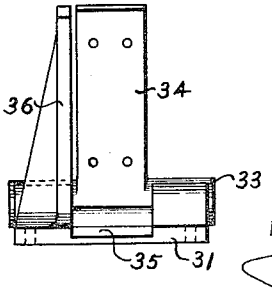
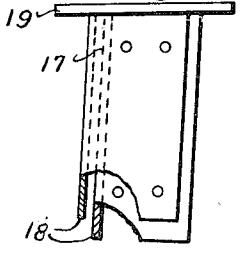


Fig. 11



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UNITED STATES PATENT OFFICE

2,322,150

DERRICK

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Application May 18, 1940, Serial No. 336,050

5 Claims. (Cl. 189—15)

This invention relates to an improvement in derricks, and more particularly to the type of derricks used in oil fields for the drilling and pumping of oil wells.

It has been the general practice heretofore to construct and build such derricks in situ, of wood or steel, the workmen fitting and securing the various parts of the derrick together as it is erected. This manner of construction is not only slow and time-consuming, but is also extremely dangerous to the workmen, often causing injury thereto.

The object of this invention is to improve the manner of constructing and assembling the derrick to enable substantial parts thereof to be assembled and constructed as individual units either in a manufacturing plant or separately on the ground and to provide for the erection of the derrick of preconstructed units, very quickly and without danger to the workmen, and yet when assembled, the derrick has the same rigid construction ordinarily provided and necessary.

The construction of the derrick from individual units not only facilitates the assembly and erection of the derrick, but it also provides for the disassembly thereof in moving the derrick from place to place, the parts being more readily transported on the usual vehicles than a complete derrick, and then quickly and readily assembled.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of the units of the derrick in course of erection;

Fig. 2 is a horizontal sectional view through the erected derrick;

Fig. 3 is a side elevation of the lower portion of the derrick in erected position;

Fig. 4 is a similar view of the upper portion thereof;

Fig. 5 is a side elevation of the top and bottom portions of the derrick at right angles to Figs. 3 and 4;

Fig. 6 is a detail side elevation of a derrick section having a ladder attached thereto;

Fig. 7 is a horizontal sectional view through assembled derrick sections;

Fig. 8 is a side elevation of a supporting post with the base thereof in section;

Fig. 9 is a side elevation of a pivot mounting for a derrick section;

Fig. 10 is a similar view at right angles thereto; and

Fig. 11 is a side elevation, partly in section, of a cap plate for the derrick corner posts.

Referring to Fig. 1 of the drawings, the numeral 1 indicates the usual sills upon which the derrick is mounted, to provide a firm foundation therefor.

The derrick is preferably constructed of two half-sections, each of which is composed of a plurality of units shown as three in number in the form illustrated and designated respectively, A, B and C of one half-section and A', B' and C' of the other half-section, which half-sections are capable of unitary construction and assembly into erected positions, as hereinafter described.

The units forming each half-section are constructed with corner posts 2 and inner posts 3. The outer corner posts 2 are preferably constructed of angle bars and are joined together by girders 4 and braces 5, to hold the same in properly spaced and braced positions. The usual truss braces 6 are provided on the lower portions of the corner posts 2, and arranged between the corner posts is the usual V-brace 7 joined thereto and to the lowermost girder 4, said V-brace having the usual cross bracing 8, as shown in Fig. 5.

The inner posts 3 are preferably constructed of T-bars, as shown in Fig. 7, with the head of each turned inwardly adapted to be arranged in opposed and abutting relation against the complementary inner post of the other half-section, and to be detachably secured thereto, as by bolts 9. Each inner post 3 is connected with the corresponding corner post 2 by girders 10 rigidly fastened respectively to the posts preferably by welding, and braces 11 also extend diagonally therebetween and are similarly secured rigidly to the posts for connecting the same together in rigid braced relation, as shown in Figs. 3, 6 and 7. The braces 11 at the opposite ends of the units are adapted for connection with companion units, for which purpose they are provided with bolt holes 12 therein for detachably fastening thereto.

The intermediate unit of each half-section of the derrick is provided with tie plates for connecting the posts thereof with the posts of the upper and lower units in assembled relation, as shown in Fig. 6. The outer corner posts are provided with tie plates 13 secured to the outer sides of the upper ends thereof for detachably fastening the corner posts of the upper unit thereto, while the inner posts 3 are provided with tie plates 14 on the outer sides thereof for connection with the posts of the upper unit. The lower ends of the corner posts 2 are provided with tie plates 15 on the inner sides thereof, while the lower ends of the posts 3 are provided with tie plates 16 on the inner sides thereof adapted for detachable connection with the corresponding posts of the next lower unit of the derrick. These tie plates are preferably constructed of angle bars arranged to interfit with the bars forming the respective posts and they center and confine the same in proper assembled relation while yet providing detachable fastenings between the units for assembly and disassembly thereof.

The corner posts 2 of the top sections C, C', are provided with caps 17 mounted thereon, each of which is constructed substantially as shown in Fig. 11, of two angle bar plates 18 spaced apart a distance sufficient to receive the corner posts 2 therebetween and to which said plates are secured. A cap plate 19 is mounted on the upper ends of the angle bar plates 18 and preferably secured thereto as by welding. Seated on the corner post caps 17, on the cap plates 19 thereof, is a supporting bar 20, preferably in the form of an I beam, that extends between the corner post caps of the corner posts 2, from which supporting bar 20 extend upright supports 21 which carry the gin pole cross bar 22 usually provided at the top of the derrick, as shown in Figs. 4 and 5. A conventional safety rail 23 surrounds the upper end of each unit C and C', upon which it is supported, to protect the workmen at the top of the derrick against danger of falling.

At intervals throughout the height of the derrick, the girders 4 may be extended beyond the corner posts 2, as shown in Fig. 7, with the extreme ends thereof connected by braces 24 with the adjacent girders 10, to add strength to the construction and bracing of the derrick, if desired.

Provision is made also for supporting a ladder on the derrick to facilitate the movement of the workmen up and down relative thereto, as shown in Figs. 6 and 7. The ladder is constructed of side bars 25 and rungs 26 and may be built in sections substantially corresponding in length with the units of the derrick. The side bars 25 have ears 27 thereon which are seated upon lugs 28 formed at the edges of the girders 10 and are secured thereto by bolts 29. The ladder is secured to the derrick at the joint between the half-sections thereof, overlapping the same, and may be swung back upon either half-section by detaching one pair of bolts 29, during transportation or assembly of the units. However, when the ladder is secured in place between the half-sections, it forms an additional tie therebetween.

The respective half-sections of the derrick are adapted to be pivotally supported on the base sills but for swinging movement into coacting assembled relation for which purpose pivotal supports are provided at the lower ends of the corner posts 2, as designated generally by the numeral 30, and which pivotal supports are shown in detail in Figs. 9 and 10. Each of the pivotal supports 30 is provided with a base plate 31 seated upon a sill 1, and having a concave seat 32 therein receiving trunnions 33, carrying a hinge leaf 34 rigidly secured to a face of the corresponding corner post 2 of the lowermost derrick unit for swinging movement to said unit relative to the base plate 31. The base plate is provided also with an inclined seat 35 at the upper surface thereof arranged substantially at right angles to the inclination of the corner post 2 resting thereon, and an upright bracing plate 36 secured rigid to the base plate 31 or integral therewith, is provided to be secured to the side of the corner post 2 when the derrick unit is moved into the proper desired erected position to hold the same against danger of swinging relative to the base plate, the fastenings thereof being detachable, preferably bolts, for removal when disassembly of the unit is desired.

It will be noted that the inner posts 3 are shorter than the outer corner posts 2 and rise from a higher point, to permit proper swinging movement of the half-sections or units in assembling or disassembling the derrick. To support the derrick half-sections between the inner posts 3, adjustable legs 37 are provided as shown in detail in Fig. 8. Each adjustable leg is provided with a tubular section carrying a plate 38 on the upper end thereof upon which the lower ends of the coacting inner posts 3 are adapted to be seated. A screw 39 is adjustably connected with the lower end of the tubular section of the leg 37 and has a ball and socket connection 40 with a supporting plate 41 adapted to be seated upon the sills 1, midway between the half-sections of the derrick.

The several units of the derrick are preferably constructed individually either on the ground before erection or in a suitable manufacturing plant from which they may be transported to the desired location. The units A and B are secured together on the ground before being erected, and the units A', B' and C' are likewise secured together to form a complete half-section, as indicated at the left in Fig. 1. A guide sheave 42 is secured to the gin pole bar of the unit C when said unit C is in an erected position slightly to one side of the erected position of the units A and B, as shown in Fig. 1, and a cable 43 is extended over the sheave 42, thence to the outer portion of the section B, which, with the joined section A, then lies prone on the ground, but with the trunnions 33 attached to the lower ends of its corner posts 2, disposed in the concave seats 32 of the pivotal supports 30. Then, upon drawing in the cable 43, the sections A and B will be drawn up from said prone position to an upright position, as shown in full lines in Fig. 1 with the lower ends of the inner posts 3 seated upon the legs 37, but only partly overlapping the top plates 38 thereof, leaving space for the corresponding inner posts 3 on section A'.

A sheave 44 is also mounted at the upper end of the unit B over which a cable 45 extends to the other half-section of the derrick being attached preferably to the uppermost unit C' thereof, as shown in Fig. 1. This derrick half-section is then drawn upward by the cable 45 from its prone position, as shown in dotted lines in Fig. 1 to an upright position where the lower ends of its inner posts 3 are seated upon the top plates 38 of the legs 37, when these inner posts 3 are then joined together and secured by the bolts 9, as shown in Fig. 7. The presence of the top unit C does not interfere with the erection of the derrick half-section A'—C', since the latter is open within the skeleton framework, and said half-section may be brought to an upright position, while embracing the unit C therein.

With the half-section A'—C', erected to an upright position beside the units A, B, it is then necessary to elevate the unit C to a supported position upon the unit B. For this purpose, a sheave is secured to the gin pole supported at the top of the unit C', over which sheave a cable is extended to the unit C and the latter is then drawn up through the interior of the derrick and turned through 180° as it is placed on the top of the unit B, where it is bolted securely thereto and to the coacting unit C' by the connections therebetween.

The unit C may be hoisted directly up through the opening in the center of the derrick. The legs projecting below the lower girt 4 will have sufficient resiliency to spring inward more than the thickness of the metal to permit the upward passage of this section beyond the top of the unit B, when the lower projecting portions of the

legs 2 and 3 will spring outward and seat upon the tops of the legs 2 and 3 of the unit B. By reference to Fig. 1, it will be noted that the legs below the lowermost girt or cross braces are several feet in length, and being constructed of relatively thin metal, they are entirely capable of springing inward and outward as described. When the unit C is raised so that its platform is clear of the unit B, it may be turned so that said platform may clear the unit C' in being raised beside the same.

The screws 39 of the supporting legs 37 provide any desired adjustment that may be necessary for properly leveling the half-sections and to bring them into desired positions. The braces 24 strengthen the units of the sections, preventing them from being distorted during the raising movements to their desired positions. These braces also make it unnecessary to provide special bracing for the lower ends of the corner posts 2, during the initial raising operation, leaving the interior of the derrick open for withdrawing and elevating the unit C to the top of the derrick. After the unit C is raised to the top of the unit B, it is swung outward and its posts brought into alignment with the corresponding posts of the unit B, to which it is attached by the tie plates 13 and 14, which securely hold these sections together. These tie plates between the units of the derrick give double reinforcement for the posts, strengthening the connections between the units. These tie plates are preferably welded to one unit of each section, so that no time will be lost by the workmen in making the connections.

By constructing and assembling the derrick in this manner, large unitary sections may be assembled in place with a conventional hoist without appreciable danger and yet with a minimum of effort and time.

Derricks of this character usually range in height from 63 feet to 132 feet, and therefore, it is obvious that the number of sections may be varied as desired. Furthermore, for relatively short derricks, it may be expedient to substitute a gin pole for the uppermost section to provide for the raising of one half-section of the derrick in one step and the other half-section as a second step without the separate assembling of a top unit thereon.

It will be apparent from Figs. 3 and 4 that the sides of the derrick have the girders 10 and braces 5 welded to the posts, while the front and back girders 4 and braces 5 are bolted to the corner posts 2 as shown in Figs. 2, 5 and 7. This construction makes it possible to dismantle the derrick by unbolting the girders 4 and braces 5 from the posts 2, leaving the girders 10 and braces 11 with the attached posts 2 and 3 to be handled as a unitary welded section. The derrick, as shown in Fig. 1, is composed of twelve such sections, and when dismantled for moving, these unitary welded sections can be placed on a truck easily for transportation. The height of the derrick units is usually 32' and the width of each section on the side thereof tapers from 2' at the top to 11' at the bottom. Therefore, the units may be readily handled. When the derrick units for the average derrick are fitted together they form a 22-foot square bottom and converge upward to a 4 foot top, usually comprising three 32-foot sections to make a 96-foot derrick.

I claim:

1. A method of erecting a derrick comprising the steps of constructing derrick sections in prone positions, one of said sections being incomplete and having a separate unit therefor, erecting said separate unit in an upright position, swinging said incomplete section to an upright position beside the separate unit, swinging the other section to an upright position beside the incomplete section, withdrawing the separate unit from between the sections to the top of the incomplete section, and securing said sections together.

2. A method of erecting a derrick comprising the steps of constructing derrick sections, each of a plurality of units, in substantially horizontal or prone positions, one of said sections being incomplete and having a separate unit therefor, erecting said separate unit in an upright position, extending a line over said separate unit to the incomplete section and drawing in said line to swing said incomplete section to an upright position beside the separate unit, extending a line over said incomplete section to the other section and drawing in the last-mentioned line to swing said other section to an upright position beside the incomplete section, withdrawing the separate unit from between the sections to the top of the incomplete section, and securing said sections directly together.

3. A derrick comprising a pair of sections arranged in side-by-side relation, each section having outer and inner supporting posts therefor, rigidly connected together, means pivotally supporting the outer posts of each section for swinging movement of the section from said upright position substantially to a horizontal position, the inner posts of the sections having opposed faces arranged substantially in abutting relation and bearing against each other, said inner posts having the lower ends thereof spaced upwardly from the lower ends of the outer posts, and a stationary vertically adjustable support engaging and supporting the lower end portions of the inner posts and having a supporting level upper surface overlapping the abutting faces of the inner posts, and means for securing said inner posts directly together.

4. A derrick comprising a plurality of sections arranged in side-by-side relation and having the inner portions thereof substantially abutting, means for securing said inner portions together, and a ladder having side bars with rungs connecting the same together and overlapping the adjacent inner portions of the sections, means pivotally connecting one side bar of the ladder to one of the sections and detachable fastenings for connecting the other side bar of the ladder to the other section for detachment therefrom and swinging movement of the ladder upon separation of the sections.

5. A derrick comprising a plurality of sections arranged in upright side-by-side relation, a pivotal support for one of said sections, said pivotal support comprising a supporting plate having a concave seat therein, a plate attached to said section and having a pivot pin seated in said concave seat supporting the section on said base plate for swinging movement relative thereto, and a stationary plate upstanding from the base plate in position to be secured to the section for holding the same in said upright position.

THOMAS B. LEWIS.