Oct. 24, 1939. A. HAYNES 2,176,965

COLLAPSIBLE DERRICK

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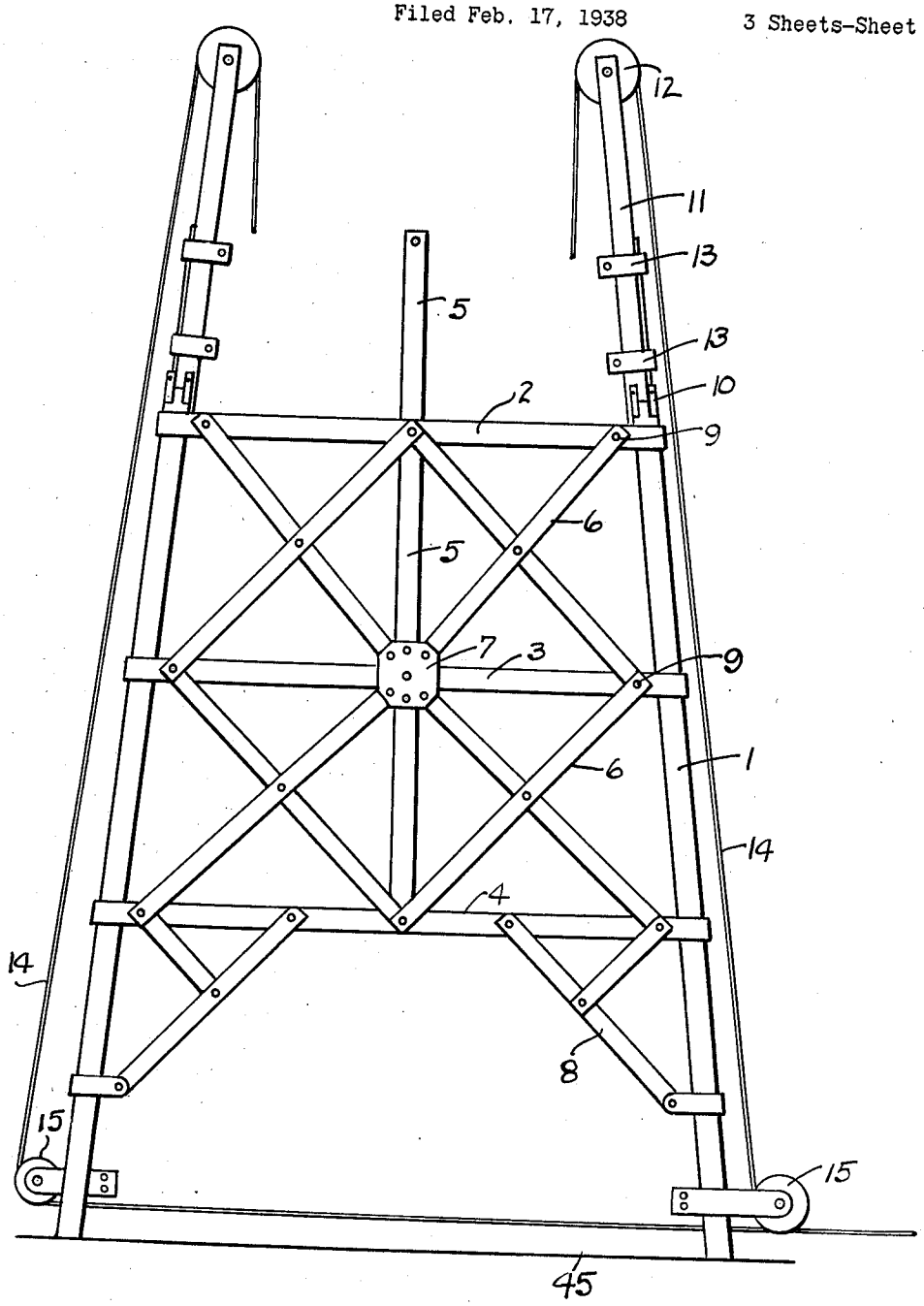

Fig. 1.

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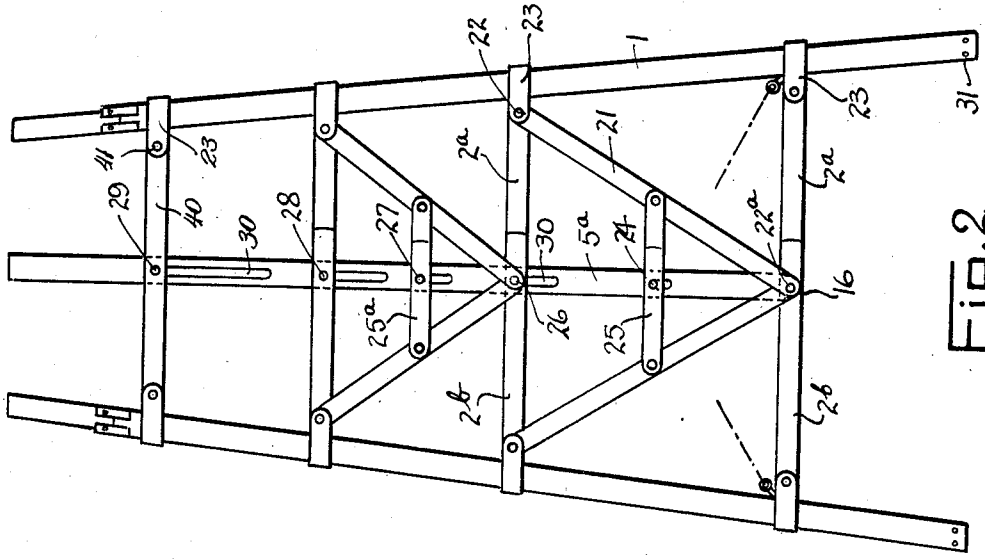

Fig. 2.

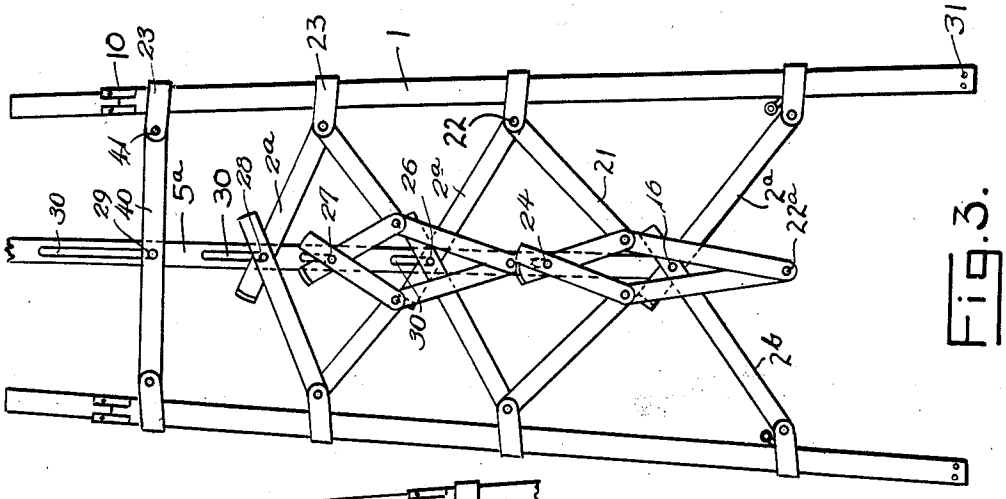

Fig. 3.

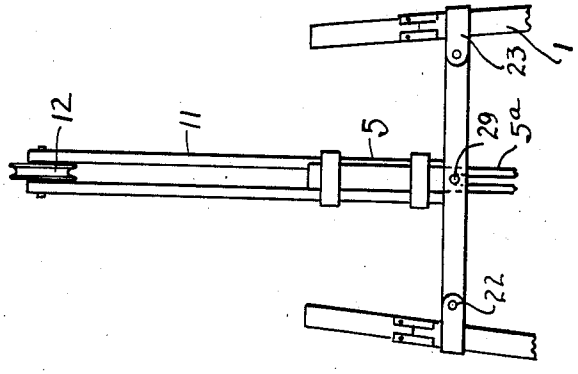

Fig. 4.

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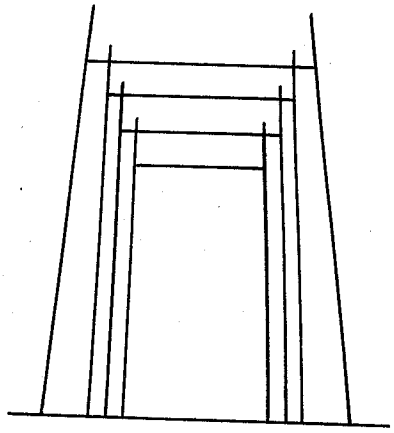

Fig. 11.

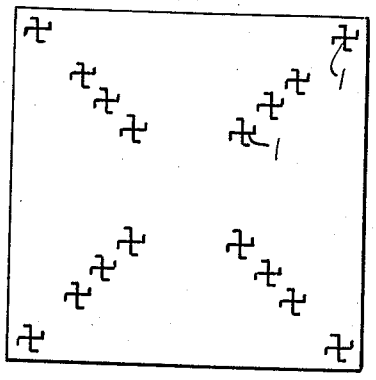

Fig. 10.

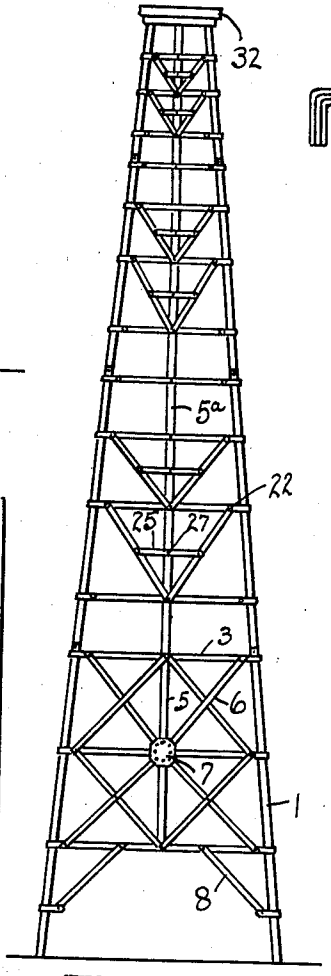

Fig. 12.

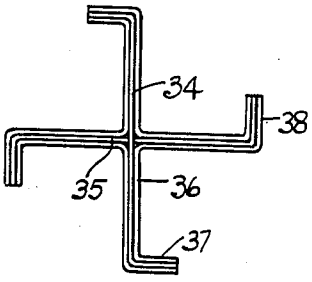

Fig. 5.

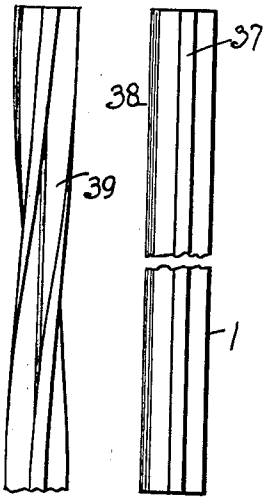

Fig. 6. Fig. 7.

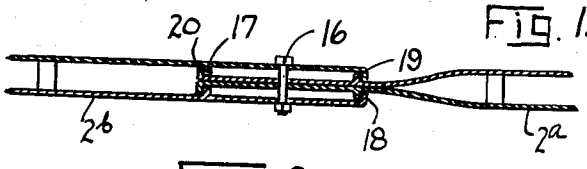

Fig. 8.

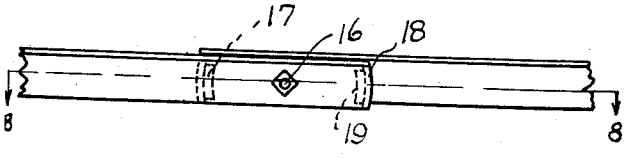

Fig. 9.

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UNITED STATES PATENT OFFICE

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COLLAPSIBLE DERRICK

Albert Haynes, Bay City, Tex.

Application February 17, 1938, Serial No. 190,897

4 Claims. (Cl. 189—12)

My invention relates to derricks such as are employed in well drilling operations.

It is an object of my invention to provide a derrick so constructed that it may be formed in sections or units adapted to be separately assembled and then erected on the location.

I desire to provide separate derrick sections which may be collapsed to a certain extent so that they may be more readily handled.

I have as a further object to connect the separate parts which form the derrick in such manner that the complete derrick may be assembled on the floor and the separate sections then hoisted into position and secured rigidly in place.

I desire to provide a derrick which may be easily assembled and disassembled for moving from one location to another.

It is a further object of the invention to provide a structure of derrick leg which is particularly strong and of light construction and adapted for use on a portable type of derrick.

Referring to the drawings herewith, Fig. 1 is a side elevation showing the construction of the lower section of my improved derrick.

Fig. 2 is a similar view showing one of the upper sections forming a portion of the derrick.

Fig. 3 is a view similar to Fig. 2 but showing the section partially collapsed.

Fig. 4 is a broken detail showing the manner of mounting the hoisting device employed in assembling the sections in position.

Fig. 5 is an end view of a section of the derrick leg.

Figs. 6 and 7 are side views of the construction shown in Fig. 5, Fig. 6 showing the section twisted.

Fig. 8 is a longitudinal section of braces employed in the construction of the derrick, said view being taken on the line 8—8 of Fig. 9.

Fig. 9 is a broken side view of one of the joints in one of the braces.

Fig. 10 is a diagrammatic view showing the relative positions of the sections on the derrick platform before erection.

Fig. 11 is a diagrammatic view showing the different sections nested together upon the platform before the erection of the derrick.

Fig. 12 is a side view of the assembled derrick.

I contemplate forming the derrick in longitudinal sections there being as many sections employed as is necessary to obtain the height of the derrick desired. With reference particularly to Fig. 12 it will be noted that the derrick there shown is made up of four superimposed sections and it is to be understood that these sections can be separately assembled on the derrick platform, as shown in Figs. 10 and 11, before they are hoisted into position in the assembly of the completed device.

With reference to Fig. 1, the construction of the lower section of the derrick is shown. There are four upwardly inclined legs 1 which are connected in spaced relation to each other by transverse braces 2, 3 and 4.

The lower ends of each of the legs are supported upon the derrick platform indicated at 45 in the drawings. In addition to the transverse braces 3 I provide a vertically extending brace 5 which is connected at its lower end to the brace 4 and extends upwardly to project somewhat beyond the upper brace 2. There are also diagonal braces in the usual manner shown at 6. The separate braces may be secured together intermediate the legs of the derrick by plates 7. Any additional braces such as are shown at 8 may be employed as desired.

The lower section of the derrick is intended to be secured rigidly together and the joints between the braces and the framework of the derrick are rigidly secured by rivets or bolts indicated at 9. The upper end of each leg extends somewhat above the upper brace and has upwardly extending plates 10 thereon to connect with the next upper adjacent section of the derrick leg. Between the legs on opposite sides, the extension of the brace 5 holds a supporting post 11 upon the upper end of which is pivoted a pulley 12. The post 11 is secured to the brace 5 of the derrick by means of clamps 13. A cable 14 is extended around the pulley 12 and the loose end may be lowered downwardly for connection with the next interior section of the derrick which is to be hoisted in position above the first section. The other end of the cable is extended around a pulley 15 at the lower end of the derrick and the ends of the two cables employed are adapted to be engaged by a pulling device whereby the next section may be raised. While straps or plates of metal 10 are shown, it is contemplated that any desired type of connection between adjacent sections may be employed, it being desirable to form a strong and rigid connection.

In Figs. 2 and 3 a showing is made of the upper sections of the derrick and it will be noted that these sections are intended to be collapsed and that the brace members connecting the legs 1 are pivotally connected together.

With reference particularly to the drawings it

will be seen that the transverse braces of the derrick are formed of two jointed sections 2*a* and 2*b*, the inner ends of which are overlapped but are pivotally connected by a through pin 16. The construction of the brace members is shown best in Figs. 8 and 9 whereby the transverse members 2*a* and 2*b* are pivoted upon the pin 16 and the end of the brace 2*a* is extended between the two side members of the brace 2*b*. The two side members of the brace 2*b* are formed with inwardly extending lugs 17 shown as arcuate in shape in Fig. 9 and also the ends of the brace at 18 are bent inwardly to engage with laterally extending lugs 19 on the brace 2*a*. It will be seen therefore that when the joint is straightened out into the positions shown in Figs. 8 and 9 the connection between the two braces will be comparatively rigid due to the overlapping ends of the braces and to the engagement between the lugs 17 on the brace 2*b* engaging with the laterally curved ends 20 of the brace 2*a* and the similar engagement of the curved ends 18 of the brace 2*b* with the lug 19 upon the brace 2*a*.

Between the lower transverse braces and the next upper set of transverse braces 2*a* are downwardly inclined brace members 21. These braces are jointed between their ends, as seen in Fig. 3, and are pivoted at 22 to clamping members 23, which secure it to the derrick leg, and at the other ends they are connected to the transverse pivot pin 22*a*. This pin connects the lower ends of these opposed jointed braces together.

The upright brace member 5*a* is provided with slots therein at spaced intervals to receive transverse pins 24 and 27 upon intermediate brace members 25 and 25*a* and transverse pins 26, 28 which connect the ends of the intermediate braces 2*a*. A similar pin 29 in the upper transverse brace 40 is also slidable in the upper slot 30 in the brace 5*a*. These slots or openings 30 in the upright brace member 5*a* allow for the sliding of the transverse pins therein and the length of these slots is sufficient to provide the necessary movement of the pivot pins therein when the derrick is collapsed and the sections of the braces are moved toward each other by the relative upward movement of said member, as shown in Fig. 3. The lower transverse brace is connected to the upright brace member 5*a* by the pin 16; this is not a pin-and-slot connection, but a simple pivotal connection.

In order to collapse the side legs 1 of the derrick toward each other so that one section may be assembled within the next lower section, the brace members will be collapsed into the position shown in Fig. 3 and in so doing the transverse pins upon the brace members will slide within the slots 30 of the upright brace member 5*a*.

It is to be noted that both the diagonal braces 21 and the intermediate braces 25 and 25*a* are jointed between their ends and thus may be moved, as stated, into the Fig. 3 position. When raised into proper position the sections may be again moved into the position ready for use as seen in Fig. 2.

At the upper ends of each of the leg sections there are upwardly extending connecting plates 10, as previously described relative to the lower section.

When assembling the various sections I have, in Fig. 11, shown them in nested position upon the derrick platform. The sections may, however, be erected, off the platform and drawn into position through the space shown between the braces 8 in Fig. 1, in the same manner as are pipe sections. To do this, however, the sections are collapsed further than is shown in Fig. 3. This is accomplished by detaching the ends of the upper brace 40 by removing the bolts 41. This will allow the legs to be moved further inwardly into closely collapsed position so that the unit or section may be better handled or transported.

In making up the derrick the lower section of the derrick shown in Fig. 1 will be first erected, the parts being assembled rigidly together. Each of the additional upper sections of the derrick will be assembled one within the other, as shown in Figs. 10 and 11, ready to be hoisted into position and each section will be collapsed, as shown in Fig. 3. The ends of the two opposite cables 14 will then be secured to the outer one of the sections and the section will be raised into position so that the lower end of the leg section 1 will abut against the upper end of the lower section already in position. Bolts will be extended through the openings in the brace plates 10 and through the lower end of the section as shown at 31 in Figs. 2 and 3, and the parts will be thus held together. The upper end of the longitudinal brace member 5*a* will be secured to the next upper longitudinal brace member and the derrick will be then ready to receive the next upper section which will be assembled in the same manner.

When the parts are completely assembled, as shown in Fig. 12, the crown block 32 may be assembled thereon and the derrick will be ready for use.

The legs 1 of the derrick will necessarily support the larger part of the load and I contemplate the construction of an efficient and light type of leg. With reference to Figs. 5, 6 and 7 it will be seen that the derrick leg comprises longitudinal sections made up of a plurality of assembled plates.

There is an inner plate 34, which is somewhat Z-shaped in end view both the side edges of the plate being curved laterally to a slight extent. There is another plate 35, which is made in two portions, which when connected with the portion 34 at right angles thereto form a type of cross. When these two longitudinal sections have been secured together the parts are reenforced to strengthen the same by angle iron sections, one in each of the angles between the two assembled plates. Each of these angle iron sections 36 have their ends re-curved as shown at 37 and 38 to correspond to the curvature of the sides of the inner plates 34 and 35. The assembled leg is therefore made up of two longitudinal plates set at right angles to each other with angle irons in each of the four angles of the original plates. The plates or irons making up the leg may be welded at their margins or may be riveted together as desired so that their rigidity will be assured. This has been found to be a particularly strong and light type of leg which may be handled without difficulty in a sectional derrick of this character. The strength may be slightly increased by twisting the leg sections between their ends, as shown at 39 in Fig. 6.

A derrick of the character here shown and described may be easily assembled and moved into position to form the complete derrick. It will, therefore, be easily and quickly erected and when it becomes necessary to move the derrick from one location to another it may be easily and quickly disassembled into separate sections which may be then more easily transported. The advantages of the construction lies in the fact that it may be easily erected without danger to the

worker and is cheap and economical in construction.

What is claimed is:

1. A derrick composed of longitudinal sections mounted in superposed position tapered upwardly, each section above the lower section having four spaced legs, a plurality of transverse braces pivotally connected to said legs, a joint midway between the ends of said braces except the uppermost one, diagonal braces jointed between their ends, an intermediate upright member, a slotted connection between said transverse braces except the lowermost transverse brace and said upright member, whereby the relative upward movement of said upright member will move said braces except the uppermost one to collapse said section and move said legs toward each other.

2. A derrick composed of longitudinal sections mounted in superposed position tapering upwardly, each section above the lower section having four spaced legs, a plurality of transverse braces pivotally connected to said legs, a joint midway between the ends of said braces except the uppermost one, diagonal braces jointed between their ends, an intermediate upright member, slot and pin-means connecting said upright member and the joints in said transverse braces, said slots being of different lengths whereby the upward movement of said member will flex said joints and collapse said section in the manner described.

3. A derrick including a lower section and a plurality of superposed upper sections diminishing in size upwardly, legs on said sections, means to brace said lower section, a plurality of transverse braces pivotally connected with said legs on said upper sections, said braces being jointed intermediate their ends, except the uppermost brace on each upper section, diagonal braces jointed intermediate their ends, an upright member midway between each pair of legs, and means on said upright member connected with said transverse braces to flex said joints and collapse the lower ends of said upper sections transversely, said upright member having a limited sliding movement relative to the intermediate and uppermost of said transverse braces.

4. A derrick including a lower section and a plurality of superposed upper sections, legs at the corners of each of said upper sections, transverse braces and diagonal braces connecting said legs, said transverse braces except the uppermost transverse brace on each upper section being made of two parts, a transverse pivot connecting the adjacent ends of said parts, each part overlapping the other at said pivot, laterally extending lugs on each overlapping end and inwardly extending flanges on the adjacent end cooperating to frictionally engage with said lugs to strengthen the joint.

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