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2,804,949

TELESCOPING PORTABLE MAST

Filed March 16, 1954

4 Sheets-Sheet 1

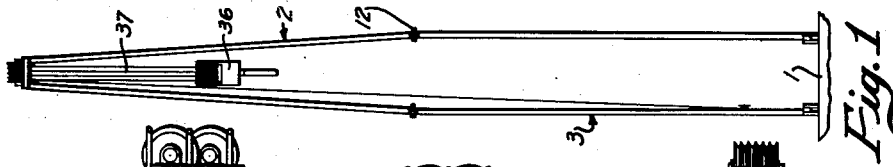


Fig. 1

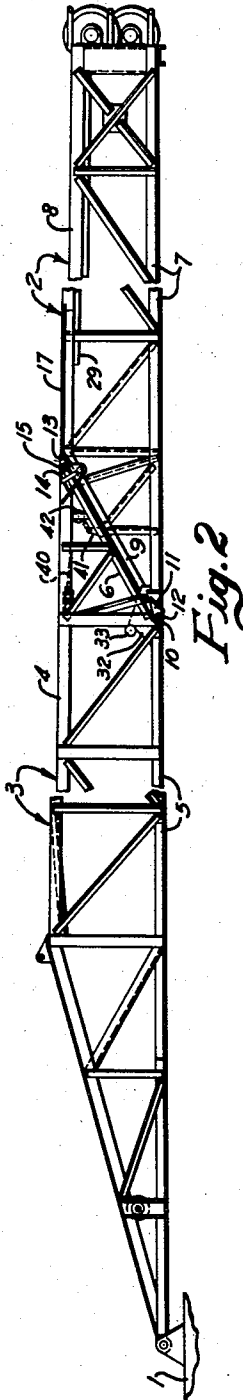


Fig. 2

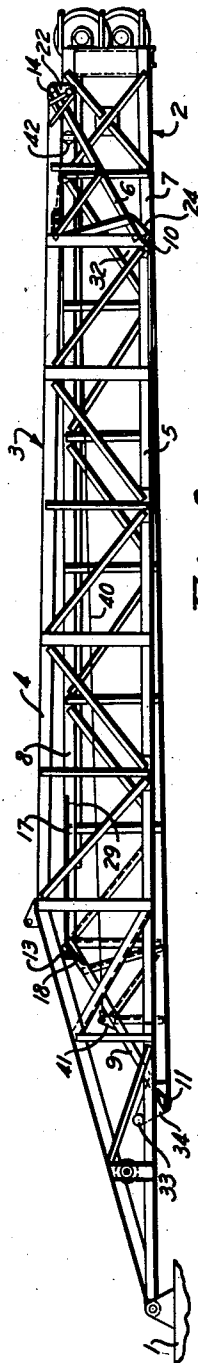


Fig. 3

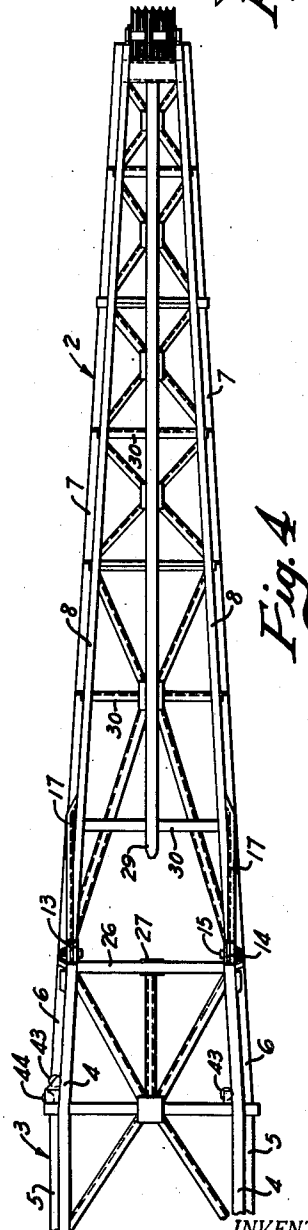


Fig. 4

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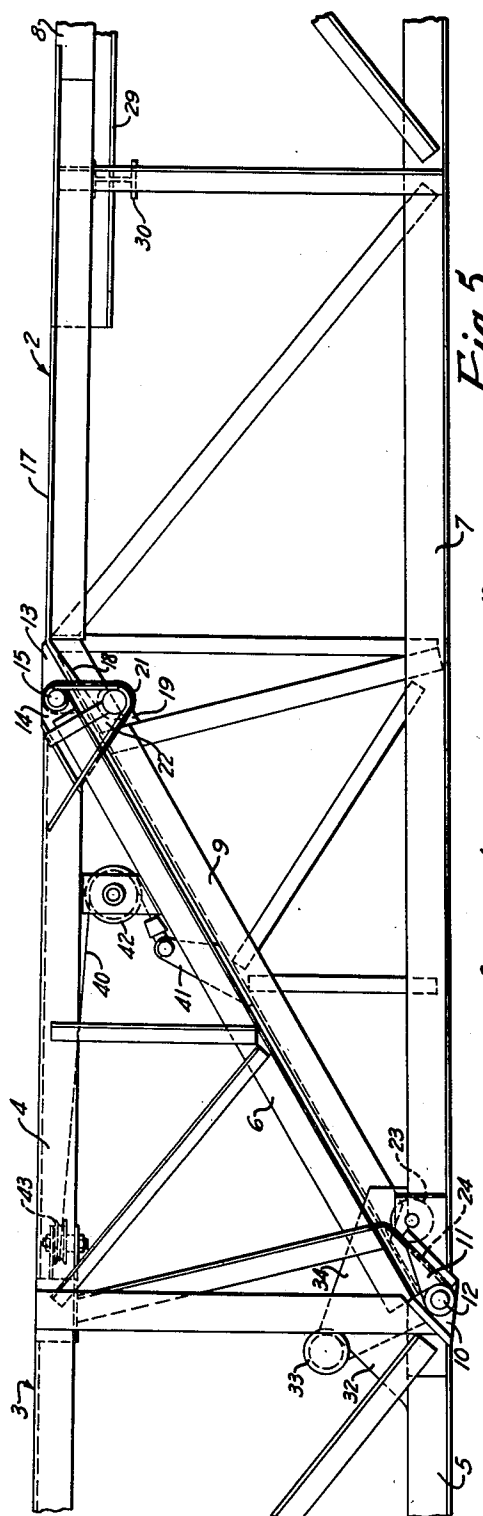


Fig. 5

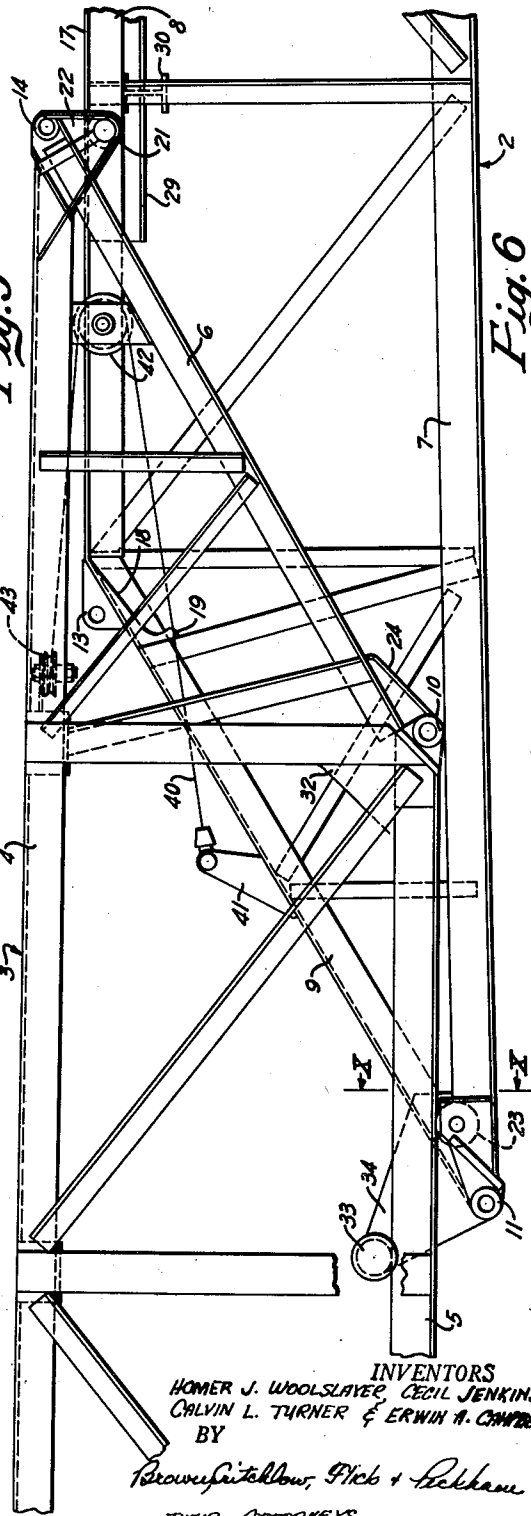


Fig. 6

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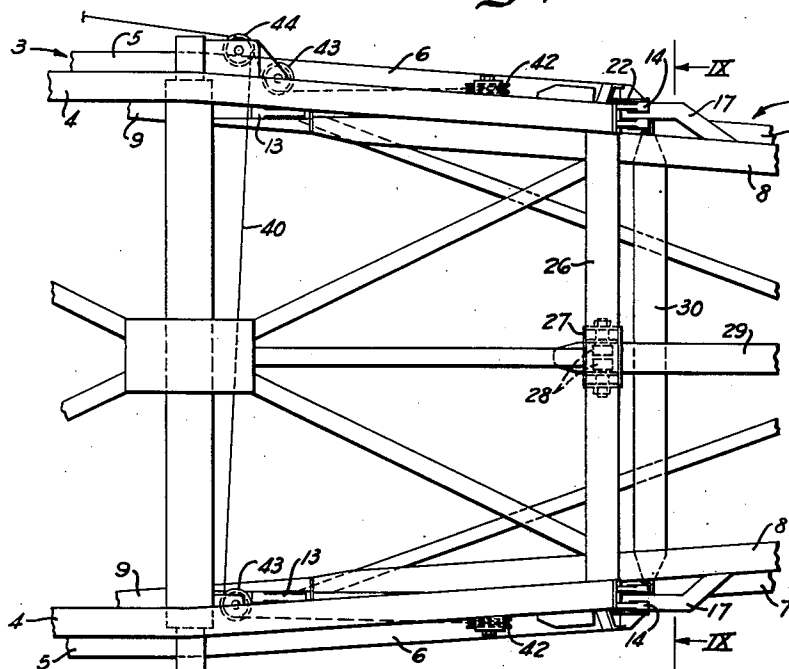
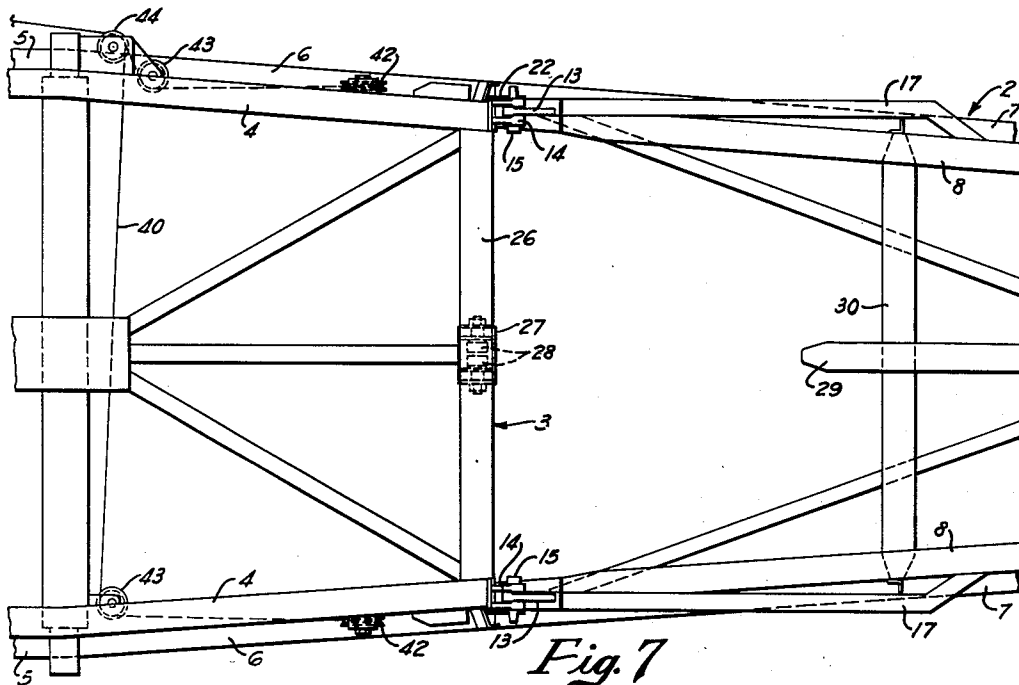


Fig. 8

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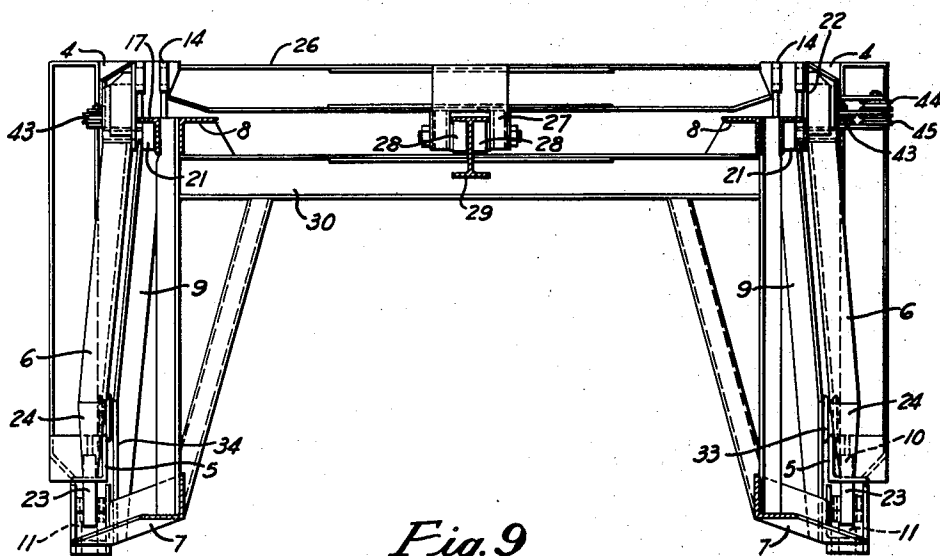


Fig. 9

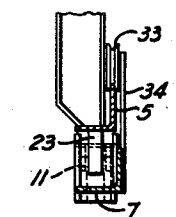


Fig. 10

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TELESCOPING PORTABLE MAST

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Application March 16, 1954, Serial No. 416,566

13 Claims. (Cl. 189—11)

This invention relates to portable oil well drilling masts, and more particularly to a mast which can be swung from an upright position down to a reclining position for transportation.

Such masts are well known. They are made ready for transportation to another location either by separating them into independent sections or by telescoping them. Heretofore, the telescoping and extending of the masts have generally been accomplished in the erect position. The upper section was narrower than the lower section so that the former could slide into the latter. This made it necessary to have considerable overlap of the adjoining legs in the extended position. To make it unnecessary for workmen to climb the erect mast and bolt or pin the extended sections tightly together, latches have been used which operated automatically when the upper section was raised. However, latches do not connect the sections together tightly enough, so guy wires have been required in order to enable the upright mast to resist wind loads. Furthermore, strain was placed on the legs of the mast due to the eccentric loading caused by the upper legs being offset inwardly relative to the lower legs instead of being in line with them.

It is among the objects of this invention to provide a telescoping portable mast which can be extended and telescoped while in reclining position with its open face down, which has the lower ends of the legs of its upper section detachably fastened to the upper ends of the legs of its lower section, which utilizes rigid splices between the sections, and which does not require guy wires to steady it when it is in upright operative position.

In accordance with this invention the mast has an open front and an upper section mounted on a lower section. The mast is adapted to be swung from upright position forward to prone position along the ground. In prone position the lower section has a pair of parallel lower legs and a pair of upper legs, preferably extending forward beyond the lower legs. The upper section has legs in end to end relation with the legs of the lower section. Splicing means detachably connect the rear ends of the prone upper section legs to the front ends of the lower section legs. Cooperating means connected to the adjacent ends of the prone sections support the upper section when the splicing means are removed and guide it down to a lower level as it is moved rearwardly so that it can telescope into the lower section. The cooperating means include means for supporting the upper section at said lower level as it is telescoped into the lower section. Preferably, an overhung trolley roller is suspended from the top of the prone lower section between its opposite sides adjacent the upper leg-splicing means. A rail extends lengthwise of the top of the prone upper section from adjacent its front end to a point normally spaced in front of the trolley roller. This rail is adapted to engage the top of the roller and be moved backward across it after the upper section has been moved down to the lower level. Furthermore, there are means for preventing the upper section from

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tilting more than a predetermined distance while it is moving backward.

The preferred embodiment of the invention is illustrated in the accompanying drawing, in which—

Fig. 1 is a miniature view of the front of the upright mast;

Fig. 2 is an enlarged side view of the mast after it has been lowered to reclining position, with the traveling block and drilling line omitted and with parts broken out;

Fig. 3 is a view similar to the preceding figure, but showing the upper section of the mast telescoped into the lower section;

Fig. 4 is a fragmentary plan view of the reclining extended mast;

Fig. 5 is an enlarged side view of the reclining mast at the connection between its upper and lower sections;

Fig. 6 is a view similar to the preceding figure, but showing the upper section starting to move back into the lower section;

Fig. 7 is a plan view of the mast as shown in Fig. 5;

Fig. 8 is a plan view of the mast as shown in Fig. 6;

Fig. 9 is a vertical section taken on the line IX—IX of Fig. 8; and

Fig. 10 is a fragmentary vertical section taken on the line X—X of Fig. 6.

Referring to the drawings, the front of our mast is shown in outline in Fig. 1, mounted in upright operative position on a suitable support 1. This mast is formed in two sections that are detachably connected together; an upper one 2 that generally is tapered upwardly to some extent and a lower one 3 whose front legs are substantially parallel from their upper ends most or all of the way down. The sides and back of the mast are braced, but the front is open so that drill pipe can be swung in and out of it in the usual way. The lower end of the mast is hinged to the support so that the mast can be swung forward and down into a substantially horizontal prone position, as shown in Fig. 2, in a well-known manner. The front legs of the upright mast become the lower legs of the prone mast, and the back legs of the upright mast become the upper legs of the prone mast. It will be observed that in the illustrated embodiment of the invention the two sections of the mast overlap along an inclined plane. To accomplish this the upper legs 4 of the lower section 3 preferably extend forward several feet beyond its lower legs 5, to which they are connected by inclined braces 6, and the lower legs 7 of the upper section 2 extend backward beyond its upper legs 8, to which they are connected by inclined braces 9.

To connect the two mast sections together, the front ends of the lower legs 5 of the lower section are provided with tongues 10 that extend into forks 11 at the rear ends of the lower legs 7 of the upper section. These tongues and forks are provided with aligned holes, into which splice pins 12 are driven, as shown in Fig. 5. Also, the rear ends of the upper legs 8 are provided with tongues 13 that project into forks 14 on the front ends of the upper legs 4, and these tongues and forks are rigidly connected by splice pins 15 driven through them. The pinned connections are so positioned between the adjoining legs that the legs of the upper section are in end to end relation with those of the lower section; that is the legs of the upper section do not overlap the lower section legs but form continuations of them. The neutral axis of each upper section leg forms a continuation of the neutral axis of the adjoining leg of the lower section, thereby avoiding eccentric loading of the legs. The connected ends of the two sections therefore are the same width, but the rest of the tapered upper section is narrower than the lower section. The lower legs of each reclining section of the mast preferably are formed from angle bars having lower

flanges projecting outward away from their vertical flanges. The upper legs may take any suitable form, those shown being angle bars which may toe in if they converge toward the top of the mast.

Before the reclining upper section can be telescoped into the lower section to shorten the mast for transportation, it is necessary that the rear end of the upper section be lowered far enough for the rear ends of its legs to clear the front ends of the legs of the lower section; i. e. to lower forks 11 and tongues 13 below tongues 10 and forks 14, respectively. The lowering is controlled and limited by cooperating means in the form of tracks and track-engaging members at the spliced ends of the mast sections. The tracks, which are used when the legs of the upper section are not parallel, have horizontal lengths with end portions inclined downward and backward, so that after the prone upper section 2 is disconnected from the lower section, downward movement of the upper section will be controlled by the movement of the inclined tracks and track-engaging members against each other and will be limited by engagement of the horizontal parts of the tracks with those members. It is preferred that the track-engaging members be rollers and be supported by the lower section in which case the tracks are supported by the upper section so that they will run down and across the rollers.

Accordingly, short parallel tracks have substantially horizontal portions 17 extending lengthwise of opposite sides of the mast along the outside of the rear end portions of upper legs 8 of the upper section. Each of these horizontal tracks is formed from an angle bar having a vertical flange and an outwardly projecting upper flange. The rear ends 18 of the tracks are set into inclined braces 9 and are inclined downward and backward and terminate at their lower ends in abutments 19. When the mast is in extended position with splice pins 12 and 15 in place, the lower surfaces of the rear ends of the tracks engage vertical rollers 21 that also are engaged by the abutments. Each of these rollers is journaled at its outer end in a plate 22 extending downward from the outside of the fork 14 above it. The rollers preferably are directly below splice pins 15. With this arrangement, when splice pins 12 and 15 are removed the upper section can be moved downward and backward simultaneously until the horizontal tracks 17 reach the rollers and prevent further lowering of the upper section.

To prevent the reclining upper section from pivoting on the rollers 21 when the splice pins are removed and dropping its front or outer end to the ground, the rear ends of lower legs 7 of the upper section carry vertical rollers 23 that are thrust up against the lower surfaces of a pair of inclined tracks 24 extending forward and upward from tongues 10 to inclined braces 6. When the upper inclined tracks 18 move down rollers 21, the lower rollers 23 roll down the bottoms of lower tracks 24. Continued backward movement of the upper section causes rollers 23 to roll along the bottom of parallel lower legs 5 of the lower section while the parallel upper tracks 17, beside the converging upper legs, move backward across upper rollers 21 until the rear ends of those tracks run off the rollers. Before this last thing happens, the upper section becomes supported in another manner by the front end of the lower section, as now will be described.

As shown in Figs. 7 and 9, the cross brace 26 between the front ends of the upper legs of the lower section supports directly below it a bifurcated bracket 27, in the opposite sides of which a pair of laterally spaced trolley rollers 28 are journaled in overhanging position. The bracket preferably is located midway between the opposite sides of the mast. A few feet in front of the trolley rollers there is a center roll 29 that extends from a point a short distance behind the front ends of parallel tracks 17 forward to the front end of the mast, as shown in Fig. 4. This rail preferably is an I-beam, and its upper flanges are located in the same plane as the upper flanges

of tracks 17. The rail must be so positioned that after upper section 2 has been disconnected from lower section 3 and has descended to its lower level and then moved straight back a short distance, the upper flanges of the rail can engage and ride over the tops of the trolley rollers while its web passes between them. Consequently, there must be no cross braces in the upper section which will interfere with the rail traveling back across the trolley rollers. The cross braces 30 of the upper section therefore are located below its upper legs so that the rail extends above the braces and allows them to pass beneath the trolley rollers. As shown in Figs. 8 and 9, the rail will engage the trolley rollers before upper rollers 21 leave the front ends of parallel tracks 17, and from then on the upper section of the mast is supported by the rail and trolley rollers. Since this support is along the center line of the upper section, the taper of the upper section, which makes parallel tracks 17 necessary, does not affect the situation.

It will be seen that after the upper section has moved back into the lower section to a point where the former's center of gravity passes behind the trolley rollers, the rear end of the upper section will tend to swing down away from the lower section. To prevent this, a pair of plates 32, which are in line with the vertical flanges of lower legs 5, extend upward from the front ends of those legs. The plates are provided with inclined upper edges that form ramps extending forward and upward from the legs. Fitting on the ramps are grooved wheels 33 that are journaled at their inner ends in the upper ends of triangular plates 34 which extend upward and backward between legs 5 from the rear ends of the lower legs of the upper section. As the upper section starts to move down and back in the lower section, the grooved wheels run down the ramps and then start back along the tops of the lower legs 5, but as the weight of the upper section presses bottom rollers 23 tightly against the bottom of those legs, the wheels barely touch the tops of the legs 5. However, as soon as the rear end of the upper section tends to tilt down, due to a shift in the center of gravity, such movement will be restrained by the wheels which then will engage and roll along the tops of the legs 5 to support the upper section's rear end, as shown in Figs. 3, 6 and 10.

The preferred way of retracting the upper section of the reclining mast into the lower section is to hook the traveling block 36 (Fig. 1) to any convenient fixed support near the foot of the mast, and then operate the drawworks (not shown) to reel in the line 37 connected with the stationary traveling block. This will cause the line to pull the upper section of the mast backward toward the traveling block thereby telescoping the mast.

By making the inclination of tracks 24 and ramps 32 steeper than tracks 18, the prone upper section is caused to rotate about its center of gravity when it starts to move downward and backward. Consequently, little effort is required to start retraction of the upper section into the lower section. The same thing is true when the mast is extended again, because the weight of the overhanging upper section will tend to swing its rear end up into final position, ready to receive the splice pins.

The mast can be extended, while reclining along the ground, by merely hitching a line to the outer end of its upper section and pulling it out of the lower section.

A more satisfactory way is to fasten lines 40 to a pair of brackets 41 mounted on inclined braces 9, and lead the lines forward between the telescoped upper and lower sections and up around vertical sheaves 42 journaled in the front end of the lower section. The two lines then extend back around horizontal sheaves 43 journaled in the top of the lower section, and then laterally. One of the lines extends across the mast and back around an upper sheave 44 supported outside of the mast, while the other line extends outward a short distance and then back around a sheave 45 (Fig. 9) directly below sheave

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44. Behind these last two sheaves the two lines can be attached to a single rope that can be looped around the customary drawworks cathead for pulling the lines. When they are pulled, the upper section will be pulled forward out of the lower section.

It will be seen that this mast can be extended while reclining, so that good tight connections can be made between the two sections by workmen working close to the ground. They do not have to climb an upright mast to connect or disconnect the sections, and the use of automatically operating latches is avoided. Consequently, the mast is rigid enough to make guy wires unnecessary. The end to end relation of the connected legs also adds to the strength and rigidity of the mast and saves material that would be required if the legs overlapped.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. An open front portable telescoping mast having a lower section and an upper section and adapted to be swung from upright position forward to prone position, said lower section in its prone position having a pair of parallel lower legs and a pair of upper legs, said upper section having legs in end to end relation with the legs of the lower section, splicing means detachably connecting the rear ends of the prone upper section legs to the front ends of the lower section legs, upper vertical rollers disposed below the front ends of the upper legs of said lower section and supported thereby, and parallel tracks extending lengthwise of the mast along opposite sides of the rear top portion of said upper section above the level of said rollers and having rear end portions inclined down and backward across the tops of said rollers substantially in engagement therewith for supporting the upper section when said splicing means are removed and for guiding it down to a lower level as it is moved rearwardly so that the legs will be moved out of said end to end relation to enable the upper section to be telescoped into the lower section.

2. A mast in accordance with claim 1, including sheaves carried by opposite sides of the front end of the prone lower section, and a line attached to the prone upper section behind said sheaves and extending forward around them and then rearwardly, whereby when the rear end of the line is pulled the upper section of the telescoped mast will be pulled forward in the lower section to extend the mast.

3. A mast in accordance with claim 1, in which the upper legs of one of said sections extend lengthwise beyond the lower leg-splicing means so that the adjoining ends of said sections normally overlap each other along an inclined plane.

4. An open front portable telescoping mast having a lower section and an upwardly tapered upper section and adapted to be swung from upright position forward to prone position, said lower section in its prone position having a pair of parallel lower legs and a pair of upper legs, said upper section having legs in end to end relation with the legs of the lower section, splicing means detachably connecting the rear ends of the prone upper section legs to the front ends of the lower section legs, upper vertical rollers disposed below the front ends of the upper legs of said lower sections and supported thereby, short parallel tracks extending lengthwise of the mast along opposite sides of the rear top portion of said upper section above the level of said rollers and having rear end portions inclined down and backward across the tops of said rollers substantially in engagement therewith for supporting the upper section when said splicing means are removed and for guiding it down to a lower level

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as it is moved rearwardly so that the legs will be moved out of said end to end relation to enable the upper section to telescope into the lower section, an overhung trolley roller suspended from the top of the prone lower section between its opposite sides adjacent the upper leg-splicing means, and a rail rigidly secured to the upper section and extending lengthwise of the top of the prone upper section from adjacent its front end to a point normally spaced in front of said roller and adapted to engage the top of that roller and be moved backward across it after the upper section has been moved down to said lower level.

5. A mast in accordance with claim 4, in which upper cross braces in the prone upper section are located at a lower level than its upper legs and support the top of said rail at substantially the same level as the top of said last-mentioned legs.

6. An open front portable telescoping mast having a lower section and an upwardly tapered upper section and adapted to be swung from upright position forward to prone position, said lower section in its prone position having a pair of parallel lower legs and a pair of upper legs, said upper section having legs in end to end relation with the legs of the lower section, splicing means detachably connecting the rear ends of the prone upper section legs to the front ends of the lower section legs, upper vertical rollers disposed below the front ends of the upper legs of said lower sections and supported thereby, short parallel tracks extending lengthwise of the mast along opposite sides of the rear top portion of said upper section above the level of said rollers and having rear end portions inclined down and backward across the tops of said rollers substantially in engagement therewith for supporting the upper section when said splicing means are removed and for guiding it down to a lower level as it is moved rearwardly so that the legs will be moved out of said end to end relation to enable the upper section to telescope into the lower section, a pair of laterally spaced trolley rollers below the top of the prone lower section, means secured to the lower section midway between its opposite sides adjacent the upper leg-splicing means and supporting said rollers on an axis extending transversely of the mast, and a center rail rigidly secured to the upper section and extending lengthwise of the top of the prone upper section from adjacent its front end to a point normally spaced in front of said trolley rollers, the rail having flanges projecting laterally from the upper edge of a vertical web, and the web being adapted to pass between said trolley rollers while said flanges engage the top of the rollers and move backward on them after the upper section has been moved down to said lower level.

7. An open front portable telescoping mast having a lower section and an upwardly tapered upper section and adapted to be swung from upright position forward and down to prone position, said lower section in its prone position having a pair of parallel lower legs and a pair of upper legs, said upper section having legs in end to end relation with the legs of the lower section, splicing means detachably connecting the rear ends of the prone upper section legs to the front ends of the lower section legs, upper vertical rollers disposed below the front ends of the upper legs of said lower section, means secured to the outside of the lower section supporting the rollers, short parallel tracks extending lengthwise of the mast along opposite sides of the rear top portion of said upper section above the level of said rollers and having rear end portions inclined down and backward across the tops of said rollers substantially in engagement therewith, an overhung vertical trolley roller suspended from the top of the prone lower section between its opposite sides adjacent the upper leg-splicing means, and a rail rigidly secured to the upper section and extending lengthwise of the top of the prone upper section from adjacent its front end to a point spaced in front of the trolley roller and adapted to engage the top of that roller and be moved backward across it after said prone sections are

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disconnected at said splicing means and the upper section is moved backward on said upper rollers to lower the upper section legs below the corresponding lower section legs so that the mast can be telescoped, said rail becoming supported by the trolley roller before said parallel tracks run off the upper rollers.

8. A mast as defined in claim 7, including lower vertical rollers carried by the opposite sides of said upper section adjacent the lower leg-splicing means, and inclined tracks extending upward from the front ends of said lower section and having lower surfaces substantially in engagement with the lower rollers.

9. A mast as defined in claim 7, including ramps extending forward and upward from the front portions of the lower legs of said lower sections, wheels substantially engaging said ramps, and means secured to said upper section supporting the wheels.

10. An open front portable mast having a lower section and an upwardly tapered upper section and adapted to be swung from upright position forward and down to prone position, said lower section in its prone position having a pair of parallel lower legs and a pair of upper legs, said upper section having legs in end to end relation with the legs of the lower section, splicing means detachably connecting the rear ends of the prone upper section legs to the front ends of the lower section legs, upper vertical rollers disposed below the front ends of the upper legs of said lower section, means secured to the outside of the lower section supporting the rollers, short parallel tracks extending lengthwise of the mast along opposite sides of the rear top portion of said upper section above the level of said rollers and having rear end portions inclined down and backward across the tops of said rollers substantially in engagement therewith, lower vertical rollers carried by the opposite sides of said upper section adjacent the lower leg-splicing means, inclined tracks extending upward from the front ends of the lower legs of said lower section behind the lower rollers substantially in engagement therewith, ramps extending forward and upward from the front portions of the lower legs of said lower section, wheels substantially engaging said ramps, means secured to said upper section supporting the wheels, an overhung vertical trolley roller suspended from the top of the prone lower section between its opposite sides adjacent the upper leg-splicing means, and a rail rigidly secured to the upper section and extending lengthwise of the top of the prone upper section from adjacent its front end to a point spaced from the trolley roller and adapted to engage the top of that roller and be moved backward across it after said prone sections are disconnected at said splicing means and the upper section is moved backward on said upper rollers to lower the upper section legs below the corresponding lower section legs so that the mast can be telescoped, said rail becoming supported by the trolley roller before said parallel tracks run off the upper rollers, and said wheels ultimately running along the legs beneath them to support the rear end of the upper section.

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11. A mast as defined in claim 10, in which said ramps and lower inclined tracks are inclined more steeply than said inclined portions of said parallel tracks.

12. An open front portable telescoping mast having a lower section and an upwardly tapered upper section and adapted to be swung from upright position forward and down to prone position, said lower section in its prone position having a pair of parallel lower legs and a pair of upper legs, said upper section having legs in end to end relation with the legs of the lower section, splicing means detachably connecting the rear ends of the prone upper section legs to the front ends of the lower section legs, upper vertical rollers disposed below the front ends of the upper legs of said lower section, means secured to the lower section supporting the rollers, tracks secured to the upper section above the level of said rollers and inclined down and back across the tops of said rollers substantially in engagement therewith to support the upper section when said splicing means are removed, said rollers and tracks being positioned to guide the upper section down to a lower level as it is moved rearwardly so that the legs will be moved out of said end to end relation to enable the upper section to be telescoped into the lower section, and tracks and track-engaging members on said sections for supporting the upper section at said lower level as it is telescoped into the lower section.

13. An open front portable telescoping oil well mast having a lower section and an upwardly tapered upper section adapted to be swung from upright position forward and down to reclining position, said lower section in its reclining position having a pair of upper legs and a pair of substantially parallel lower legs, said upper section having legs in end to end relation with the legs of the lower section, splicing means detachably connecting the upper section legs to the lower section legs, the reclining upper section being movable toward the lower section after the reclining sections are disconnected at said splicing means, and means secured to both sections for guiding the reclining upper section downwardly toward the open front of the reclining lower section as the upper section is first moved toward the lower section, whereby to move the legs of the two sections out of end to end relation to permit the upper section to telescope into the lower section, the reclining mast being provided with vertically spaced track surfaces extending lengthwise thereof and with anti-friction members above and below said surfaces and engageable with them as the mast is telescoped, whereby to hold the reclining upper section in general alignment with the reclining lower section so that the upper section can be supported solely by the lower section during telescoping.

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