

Sept. 12, 1933.

J. F. MURPHY

1,926,697

EXTENSION LADDER

Filed Aug. 22, 1931

7 Sheets-Sheet 1

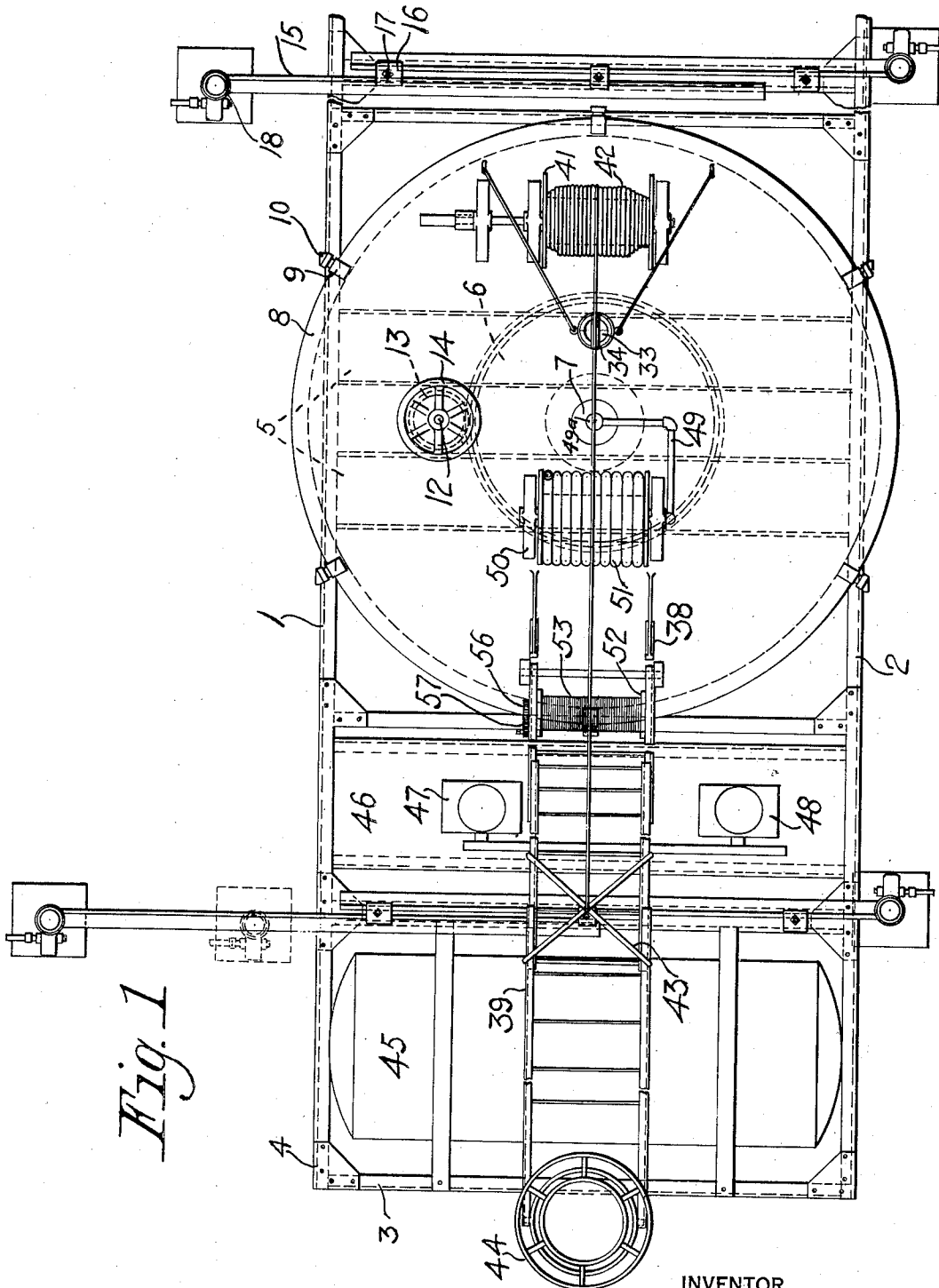


Fig. 1

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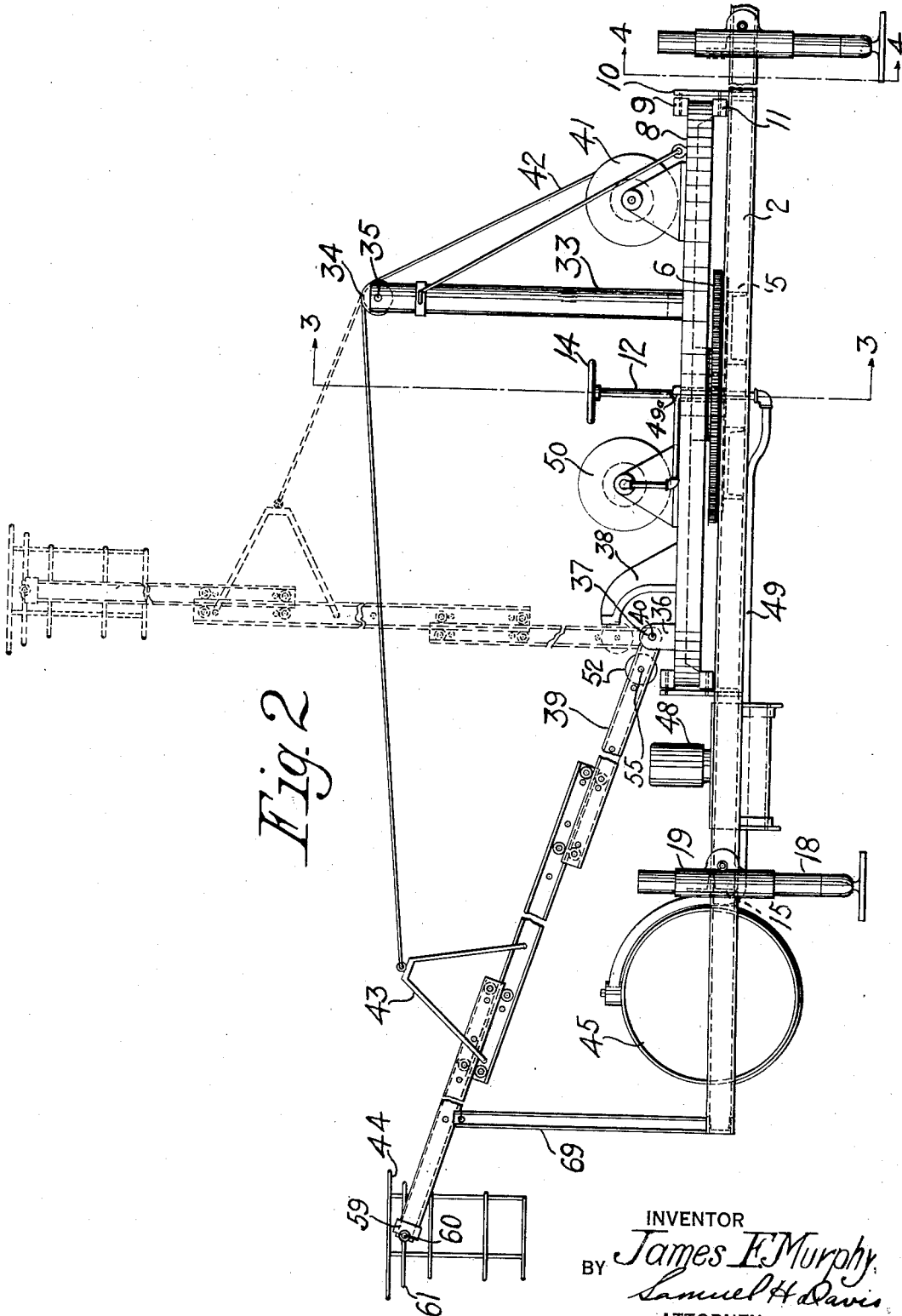
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1,926,697

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Filed Aug. 22, 1931

7 Sheets-Sheet 2



Sept. 12, 1933.

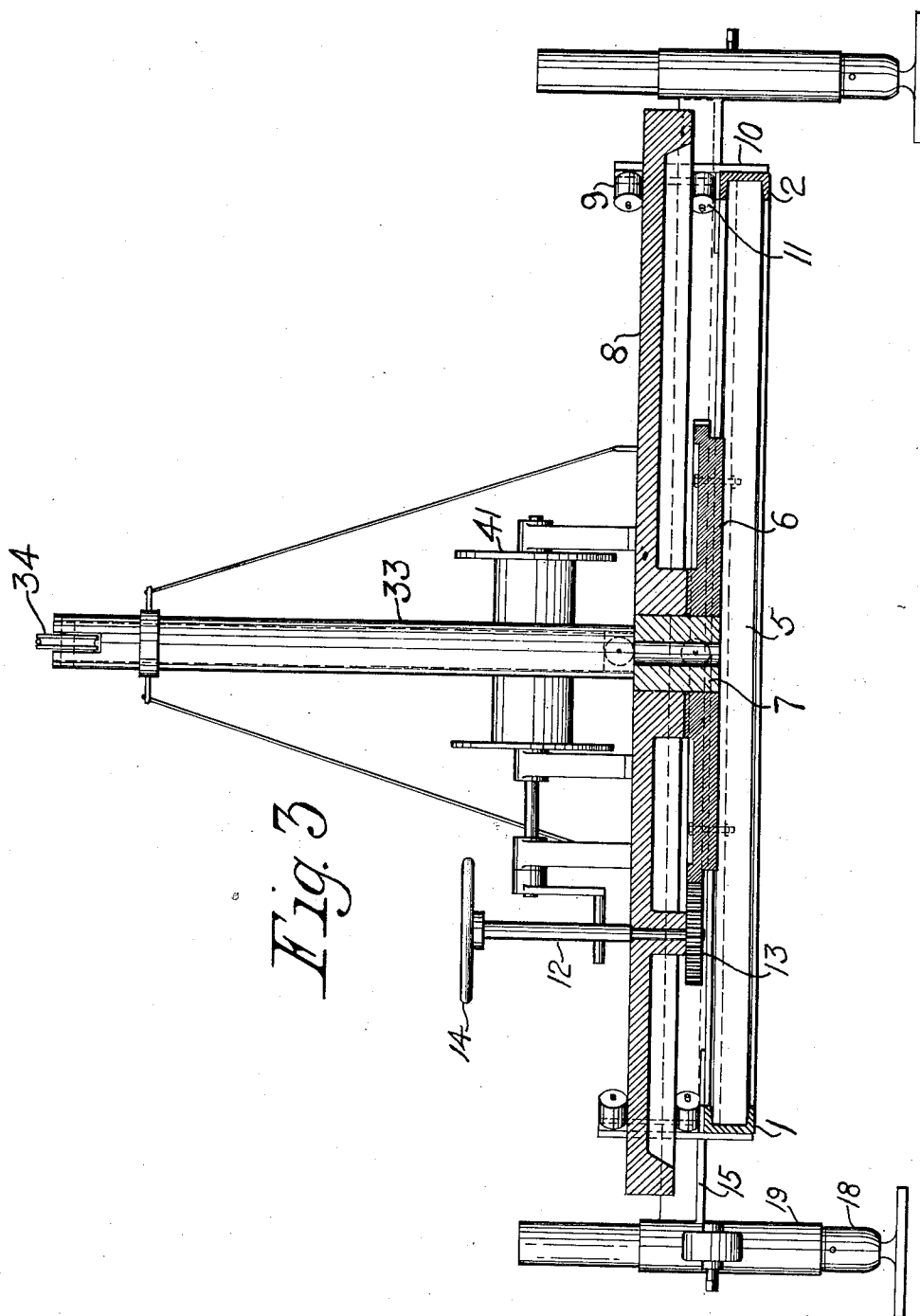
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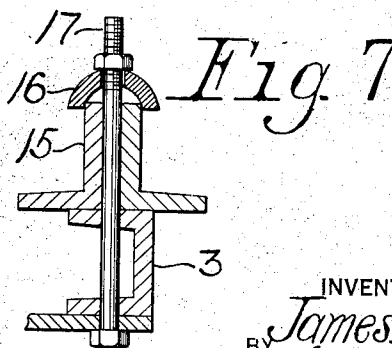
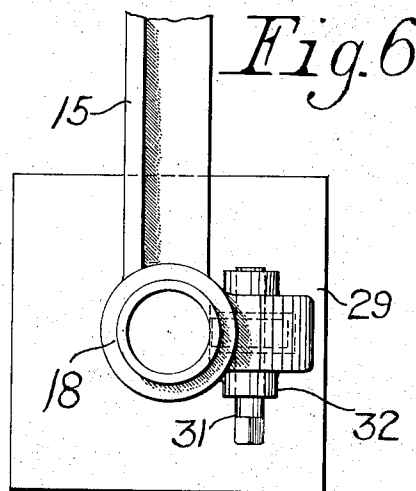
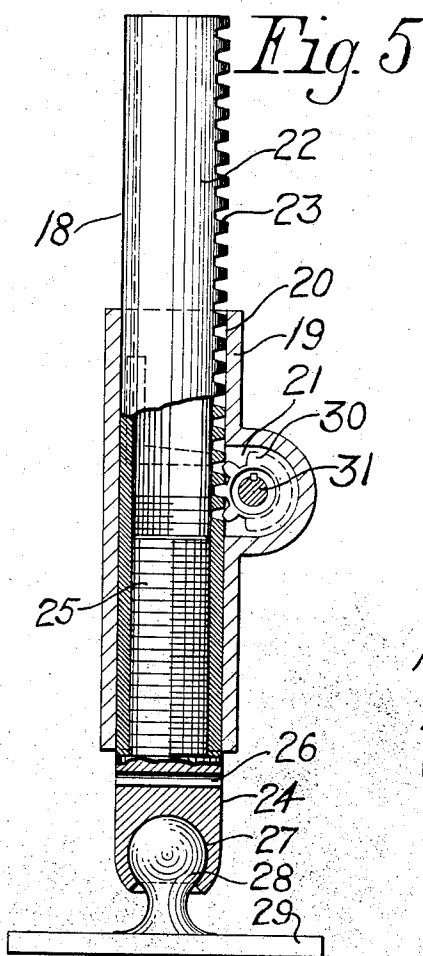
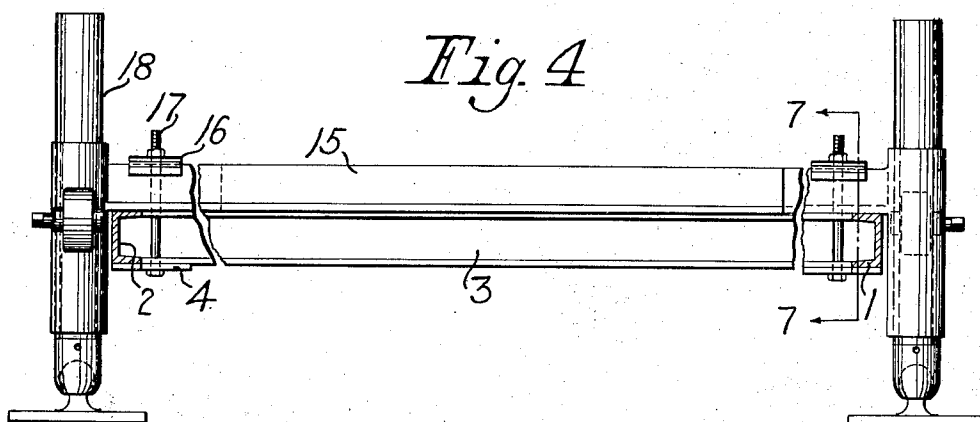
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EXTENSION LADDER

Filed Aug. 22, 1931

7 Sheets-Sheet 4



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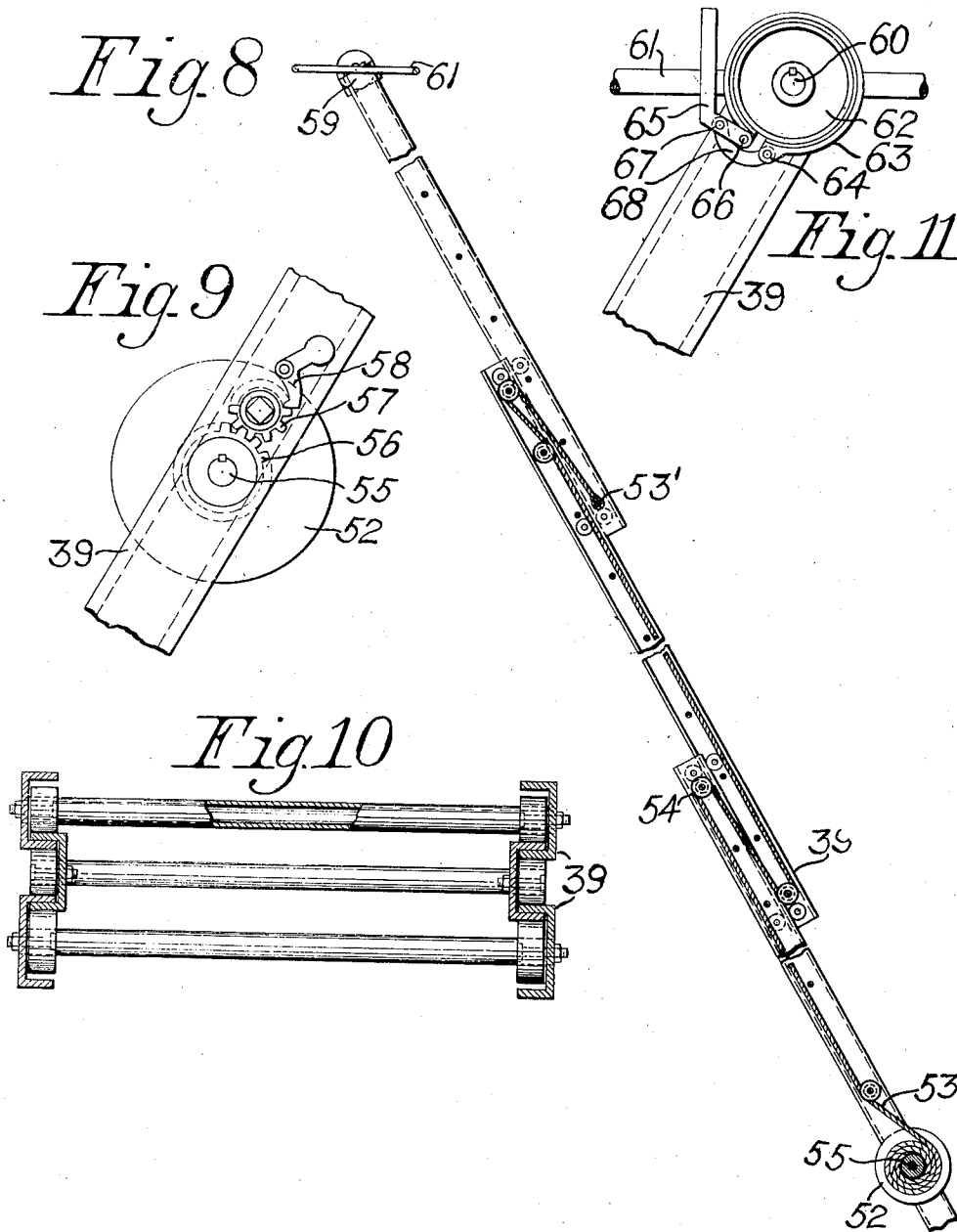
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1,926,697

EXTENSION LADDER

Filed Aug. 22, 1931

7 Sheets-Sheet 5



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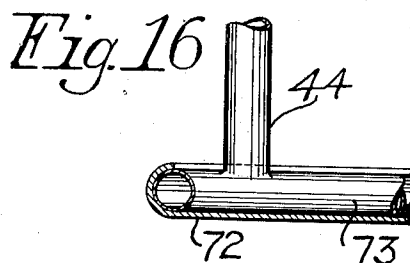
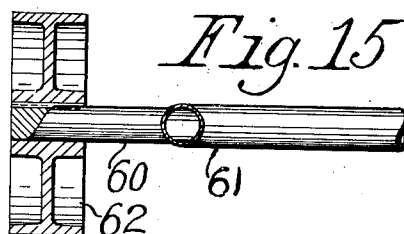
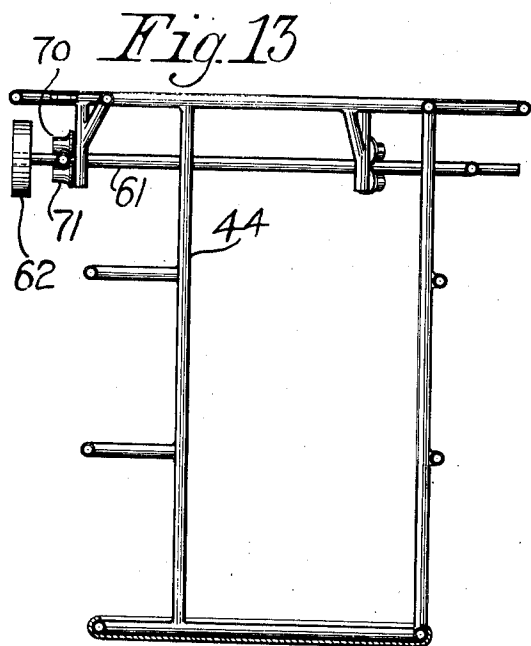
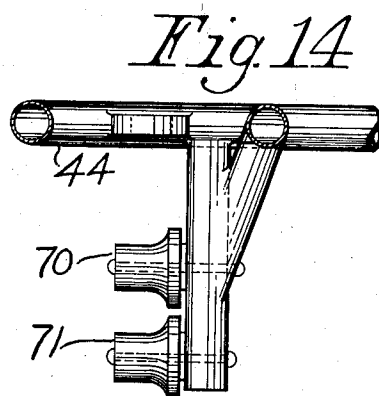
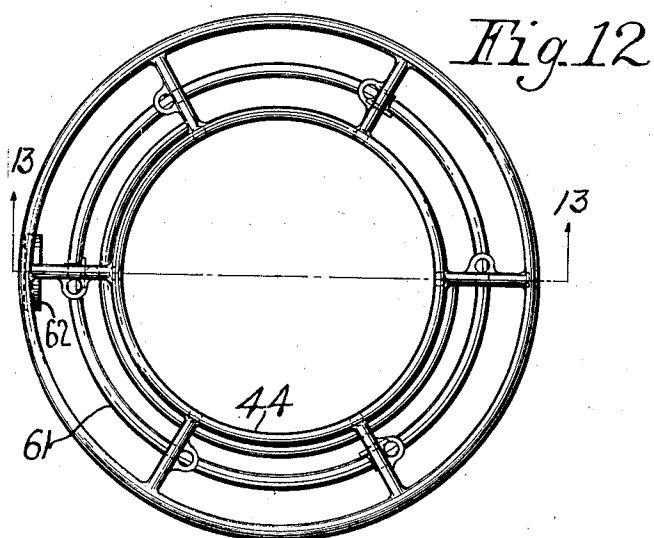
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1,926,697

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Filed Aug. 22, 1931

7 Sheets-Sheet 6



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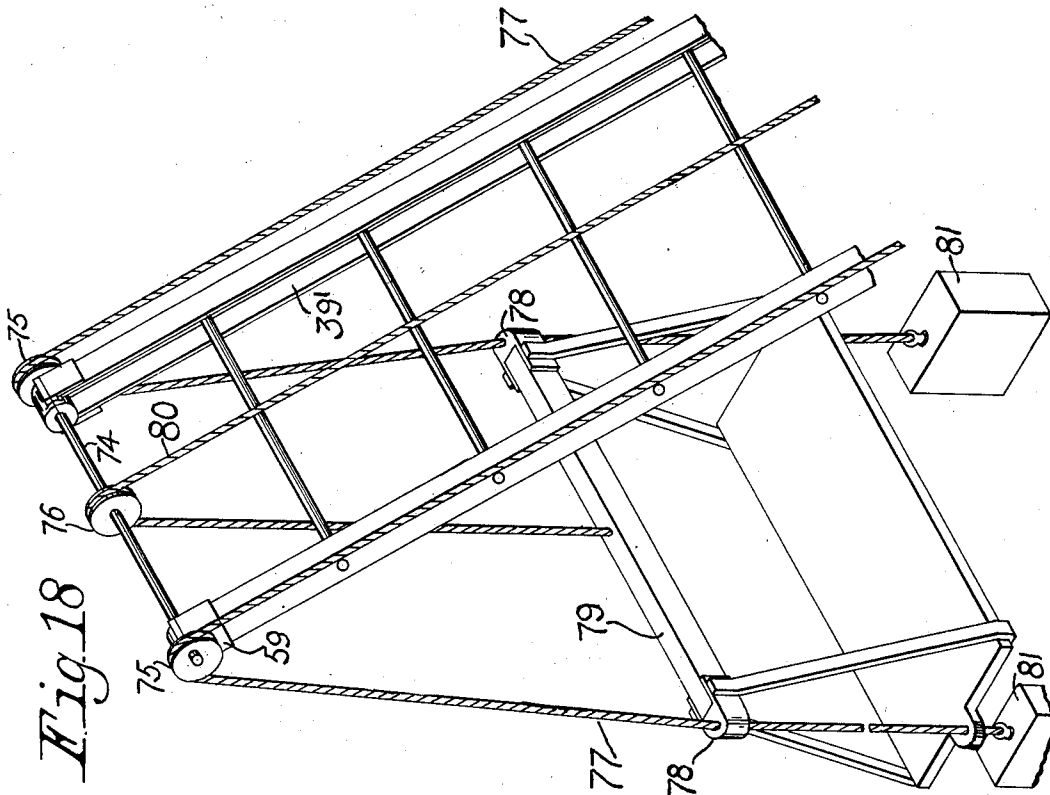
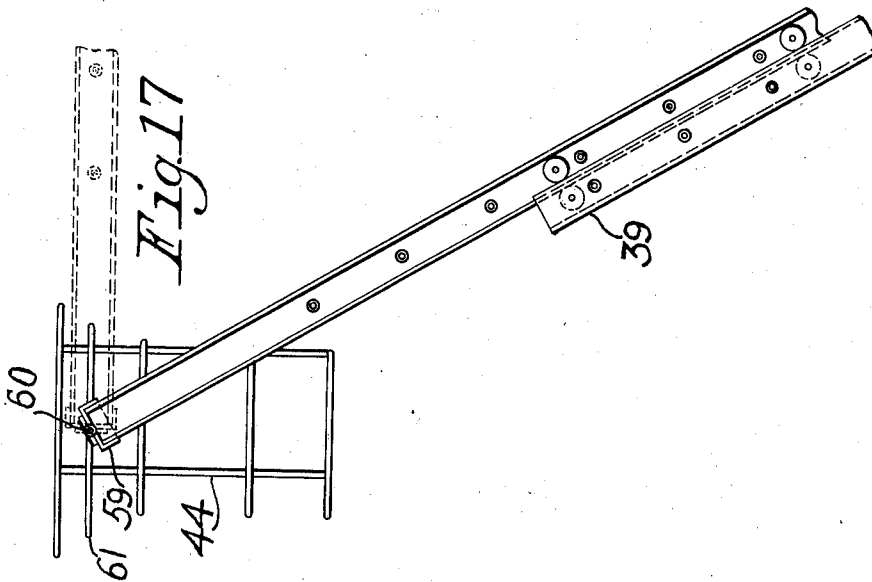
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1,926,697

EXTENSION LADDER

Filed Aug. 22, 1931

7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

1,926,697

EXTENSION LADDER

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Application August 22, 1931. Serial No. 558,797

2 Claims. (Cl. 228—14)

This invention relates to extension ladder constructions, and belongs particularly to that type of ladder comprising a number of sections movable one in or upon the other, with means for
5 extending the ladder sections, and for raising the ladder. This invention is concerned likewise with ladders of the character stated which are associated with or capable of being erected upon a turntable supported by a suitable frame. Means
10 are also provided for revolving and controlling the turntable.

It is the object of this invention to produce an extension ladder comprising parts of special construction and combination, and including an
15 adjustable cage at the top wherein a workman may stand when employed in painting a side wall of a house, for example, or similar occupation. It is believed that the special construction herein specified results in an especially convenient, easily
20 operated and durable structure which will withstand continuous use without depreciation or excessive wear.

In the accompanying drawings are illustrated the various parts of this invention, showing the
25 construction and arrangement thereof. Of the drawings, Fig. 1 represents a plan view or top view showing all parts assembled.

Fig. 2 is a side view with a vertical position of the ladder indicated in broken lines.

30 Fig. 3 is a vertical section taken on the broken line 3—3 of Fig. 2.

Fig. 4 is a vertical section taken on the broken line 4—4 of Fig. 2 looking towards and showing the adjustable jacks.

35 Fig. 5 is a side view of one of the jacks, portions thereof being broken away to disclose internal parts.

Fig. 6 is a top view of the end of one of the laterally movable bars on the supporting frame, and
40 a top view of one of the jacks attached to the bar and showing the ground plate of the jack.

Fig. 7 is a vertical section showing one channel iron side of the supporting frame, and one of the sliding or laterally movable bars thereof, with
45 the means of clamping the bar and frame.

Fig. 8 is a side view of a portion of the ladder extended, showing the relative positions of the sections, and the cable connection, operating
50 drum and sheaves by which the sections of the ladder are extended.

Fig. 9 is a side view of a portion of one of the sections of the ladder showing the ratchet gear and pawl by which the sections are releasably
55 held in extended position.

Fig. 10 is a cross section of the ladder showing

the preferred construction of the sections and the manner of their movable engagement one with another.

Fig. 11 is a side view of the upper end of the top section of the ladder, showing the brake
60 wheel with the brake band thereon, and the brake operating lever by which the brake wheel is held. The brake wheel is shown upon one of the trunnions of the support hoop of the cage, which hoop and cage are held in position by the brake de-
65 vices.

Fig. 12 is a top view of the cage showing the position of the brake wheel on the support hoop of the cage.

Fig. 13 is a side view of the cage, showing the
70 support hoop, the trunnions, and the brake wheel on one of the trunnions.

Fig. 14 is a sectional view showing the top hoop, one of the vertical members of the cage, and the guide rollers which engage the support hoop.
75 This view is enlarged.

Fig. 15 is a sectional view of the support hoop showing one of the trunnions with the brake wheel attached thereto. This view is enlarged.

Fig. 16 shows a fragmentary section of the bot-
80 tom ring of the cage, and illustrates the turn of the edge of the bottom plate or floor of the cage around the ring to support the cage bottom.

Fig. 17 is a side view of the upper sections of the ladder extended, and somewhat enlarged, show-
85 ing the cage in place at the upper extremity of the top section.

Fig. 18 is a perspective view of a modified form of cage ladder showing track cables therefor, and
90 weights for keeping the track cables taut.

Throughout the drawings and description the same number is used to refer to the same part.

Considering the drawings, a supporting frame of any chosen form may be employed. Usually the frame has the side channel irons 1 and 2; the end
95 pieces 3, and the junctions of the cross pieces and side pieces are reinforced by the corner plates 4. The frame also has the intermediate cross beams 5, best shown in Fig. 3, and upon those beams is secured a large gear 6, which encircles a hub 7.
100 The hub 7 is hollow vertically and rises as illustrated even with the upper surface or floor of the turntable 8. Bearing upon the outer edge of the turntable are rollers 9, carried by the brackets 10 attached to the frame. Below the circular edge of
105 the turntable directly beneath the rollers 9 are like rollers 11, and the rim of the turntable is restrained to its circular path as it is revolved. As best shown in Fig. 3 a shaft 12 rises rotatively through the turntable at a point beyond the teeth
110

of the large gear 6, and a small gear 13 is secured to the lower end of the shaft 12 and in mesh with the gear 6. By means of a hand wheel 14 on the top of the shaft 12, which is extended a convenient distance above the turntable, the gear 13 is rotated and the turntable revolved and controlled.

In Fig. 1 are shown the laterally sliding bars or brace angle irons 15. Those bars 15 slide lengthwise side by side in opposite directions beyond the sides 1 and 2 of the frame, and to clamp the bars together and fix their positions when extended there is provided a clamp 16 controlled by a bolt 17 which passes through an end piece 3 of the frame as also shown in Fig. 7. At the outer end of each sliding bar 15 is a jack referred to as a whole by the number 18. The individual constructions of the jacks and the parts for their adjustment are best illustrated in Fig. 5. The housing 19 has a vertical chamber 20, and a side compartment 21. The housings 19 and the ends of the sliding bars 15 are rigidly connected. Within the chamber 20 is a stout pipe 22 with a vertical series of teeth 23. A base member 24 has a screw threaded upper portion 25 engaging internal threads in the lower portion of the pipe or cylinder 22. Through the lower part of the base member 24 is a transverse bar passage 26 in which the end of a hand bar may be inserted to turn the base member 24 when desired. The hand bar is not shown. Any suitable rod will answer the purpose. The base portion 24 of the jack has a spherical seat 27 for a ball 28 that rises from the ground plate 29. Thus there is a universal joint between the jack and the ground, and any angular displacement of the ground plate is corrected by the universal joint, and the frame of the ladder may be arranged on a level. This leveling of the frame is assisted by the adjustment vertically of the jack by turning the engaged screw threaded portions 25 of the base members 24 by the hand bar mentioned. The housing 19 is raised or lowered by means of a small gear 30 in the compartment 21. The gear is rotated by its shaft 31, formed as shown in Fig. 6 for the attachment of an ordinary crank handle, not shown. Any form of pawl and ratchet devices, for example, such as those illustrated in Fig. 9, may be introduced to prevent the contrary rotation of the jack shaft 31 where it is desirable. It is held to be within the purview of this invention to run a suitable set screw through the end bearings 32 for the jack shaft 31 by which the shaft and gear 30 may be held stationary, or released at the will of the operator.

As best illustrated in Fig. 3, a post 33 is erected on the turntable 8 at a point in rear of the center, and the post 33 has a pulley 34 at the top on a transverse short shaft 35. As shown in Fig. 2 at the left near the rim of the turntable are placed standards 36 having an opening 37, and the lower end of the lower section of the ladder 39 is pivotally carried by the round rod or shaft 40 located in the openings 37. Near the pivotal connection of the ladder are placed the stops 38 to limit the upward movement of the extended ladder, as set out in Fig. 2. The raising and lowering of the ladder is effected by operating the drum or reel 41 and cable 42, which passes over pulley 34 on post 33, and is attached to a truss 43 erected on one of the ladder sections. In Fig. 2 the cage shown at the extremity of the upper section of the ladder is referred to as a whole by number 44.

Near one end of the frame, as illustrated in

Fig. 2 is a tank 45, and between the tank and the turntable and upon the floor plate 46 which is supported upon beams such as the intermediate cross beams 5 is located a motor 47 belt connected with a pump 48, and the pump is arranged to force fluid through the pipe line 49 from the tank 45 to the drum 50. It will be understood that the piping 49 as shown in Fig. 2 extends first to the pump 48, and thence below the center of the turntable. The pipe line passes upwardly from beneath the frame through the hollow bearing 7 of the turntable. The drum or hose reel 50 has wound thereon a hose 51, and the hose is connected with the pipe line connection of the reel so that fluid may be sent through the hose. Suitable valves may be introduced, and at the top of the hollow bearing 7, as shown in Figs. 1 and 2, a cylindrical rotative pipe joint 49a is provided to permit the parts of pipe line 49 above the turntable to make a complete revolution therewith while maintaining open passage with the pipe in hollow bearing 7. It will be understood that the pump and motor may be used to serve compressed air for the use of painters or sand blast wall cleaners. The motor is not limited to the operation of a pump for fluid distribution.

As best shown in Figs. 1, 2 and 8, a drum 52 carried by the ladder 39 is wound by the cable 53 that passes over the sheaves 54 and is attached to the point 53' of the top section. The cable is passed first over the top sheave of the lower section, and thence around the lower sheave of the next section so that when the cable is drawn upon the sections are extended as will be readily understood from Fig. 8. To retain the sections in extended condition, the drum shaft 55 of drum 52 as best shown in Fig. 9 has a gear 56 engaging a gear 57, the latter being a ratchet gear and provided with the pawl 58. Thus, the sections may be held extended or released at will.

Considering Figs. 8 and 11, it will be noted that the top section of the ladder has an end plate or cap 59, and through the plate 59 there is passed one trunnion 60 of the cage support hoop 61. The trunnion is best illustrated in Fig. 15. To the trunnion 60 is keyed a brake wheel 62 having a brake band 63, one end of which is pivotally secured by pin 64 to the end plate or cap of the section. A brake lever 65 is connected by the pivot pin 66 to the other end of the brake band, and the lever has a pivot 67, on a projection 68 of the cap. The projection 68 is a pivoted piece or arm substantially of the curved form illustrated in Fig. 11 and the pin 64 connects it with the cap or end plate 59. As the lever is pulled downwardly the band 63 is tightened around the wheel 62, and the end of the band engaged by the pivot 66 is pressed against the wheel. When the brake lever is operated the support hoop 61 is held or released. As illustrated in Fig. 13 the support hoop 61 passes between rollers 70 and 71 on projecting members of the cage so that the cage as a whole may be rotated about a vertical axis. It will further be now understood that there are two trunnions such as 60 and the second trunnion passes pivotally through the cap plate or head of the fellow side member of the top section. In other words, the two side members of the top section of the ladder are each provided with cap plates 59 as shown in Fig. 8, and the support hoop 61 has two trunnions diametrically opposite each other pivotally engaging the two cap plate 59.

The cage 44 swings on the trunnions and may rotate on the support hoop.

Considering Fig. 16, it will be noted that a metal floor plate 72 has its peripheral edge or rim turned up over the lowest ring 73 of the cage. It is upon this floor that the workman stands. His position is always upright, as the cage swings on the trunnions and assumes when the ladder is raised and extended a position substantially as illustrated in Fig. 17.

In Fig. 18 is shown a modified cage and supporting means which is sometimes advantageous. In the figure, the top ends of the sides of the upper ladder section 39' are provided with a transverse shaft 74 upon the outer ends of which are grooved pulleys 75, and midway the shaft has a pulley 76. Over pulleys 75 pass cables 77, which also pass through the ends 78 of the draw bar 79 of a platform cage, which is raised and lowered by the cable 80 passing over the middle pulley 76. The cables 77 are guide cables, and they are kept taught by the weights 81, in order that the cage may be raised and lowered without excessive swinging. It is thought the modification is clearly set forth in Fig. 18.

The operation of this invention is the same as that of extension ladders of similar construction. The ladder may be extended as desired by means of the cable 53, and raised or lowered by the cable 42. It is customary in practice to support the upper portion of the ladder when not in use, in the inclined position illustrated in Fig. 2, by means of the vertical end frame 69, to clear the tank and parts adjacent, and to relieve the cable from constant strain. The cage 44 swings into position with its axis vertical in response to the weight of the workman, and the brake wheel and brake band with the hand brake lever are used after adjustment to prevent the cage from unduly swinging upon its trunnion bearing support hoop. The ladder may be raised to any height, and turned into any position at

the side by controlling the turntable. The frame may be brought to a desired level by means of the jacks, and if the altitude at which the cage is located demands a broader ground base for the frame, the sliding bars may be extended beyond the frame for any distance necessary, and then adjusted by the jacks as set forth.

Having now described this invention and its use, I claim:—

1. In an extension ladder, a supporting frame, in combination with a turntable carried by the frame, a gear borne by the turntable and a stationary gear carried by the frame in engagement with said gear first mentioned, a hand wheel and shaft carried by the turntable for operating said gear whereby a fireman on said turntable may give the same a complete revolution in either direction, an extension ladder carried pivotally by the turntable, means carried by the turntable for extending the ladder, means carried by the turntable for raising the ladder in any rotated position of the turntable, a hose reel carried by the turntable, and fluid serving connections passing upwardly through the center of revolution of the turntable whereby fluid under pressure may be served to the said hose reel during a complete revolution of the turntable.

2. In a ladder mechanism, a supporting frame, in combination with a turntable, a gear borne by the turntable and a stationary gear carried by the frame in engagement with the gear first mentioned, a hand wheel and shaft carried by the turntable for operating said gear whereby a fireman upon the turntable may give same a complete revolution in either direction, a ladder carried by the turntable, a hose reel carried by the turntable, and fluid serving connections passing upwardly through the center of revolution of the turntable whereby fluid under pressure may be served to said hose reel during a complete revolution of the turntable.

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