Oct. 31, 1950 G. I. ROCKWOOD 2,528,179

LATERALLY SHIFTABLE GEARING FOR LIFT MECHANISMS

Filed March 12, 1949 4 Sheets-Sheet 1

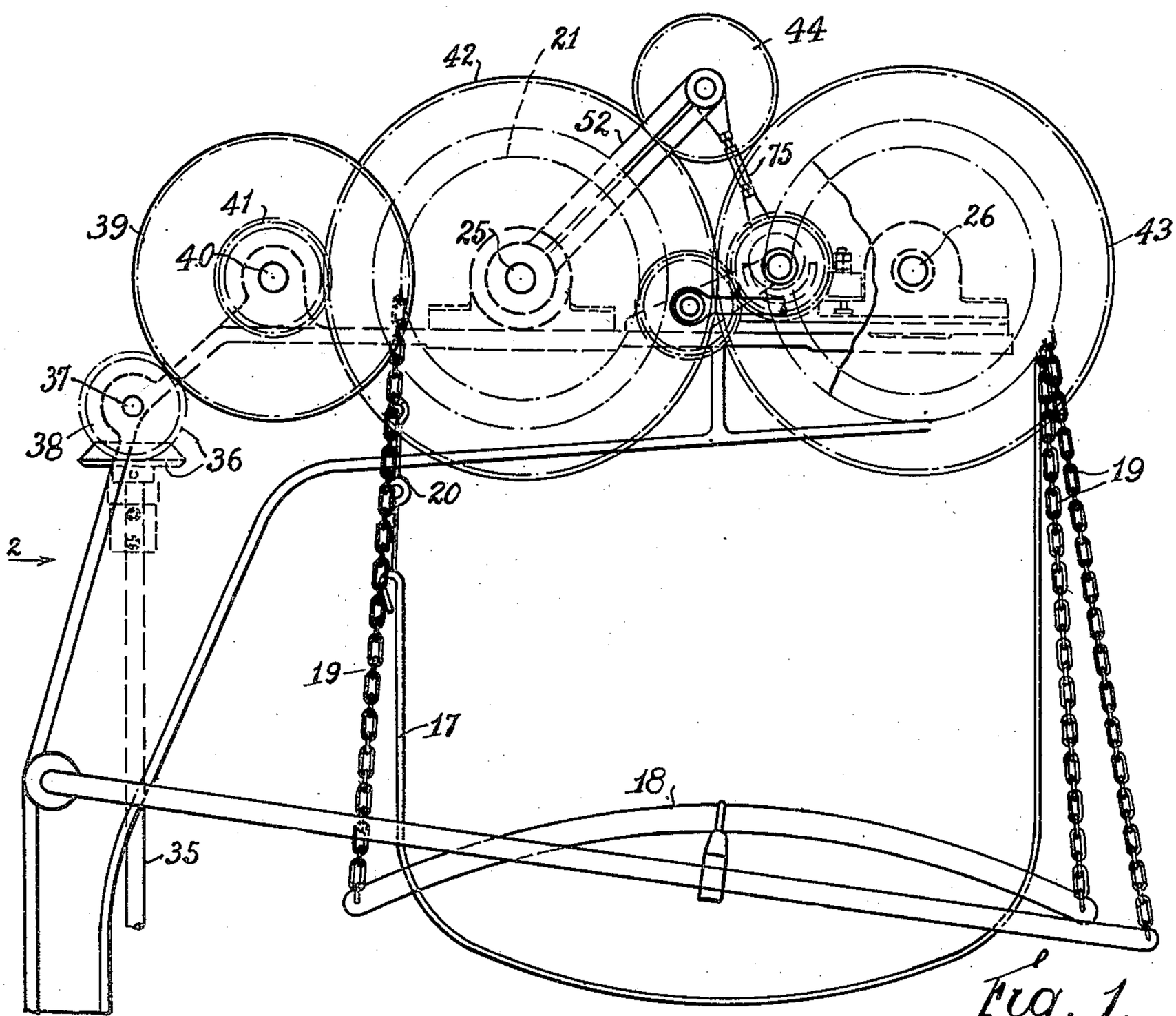

Fig. 1

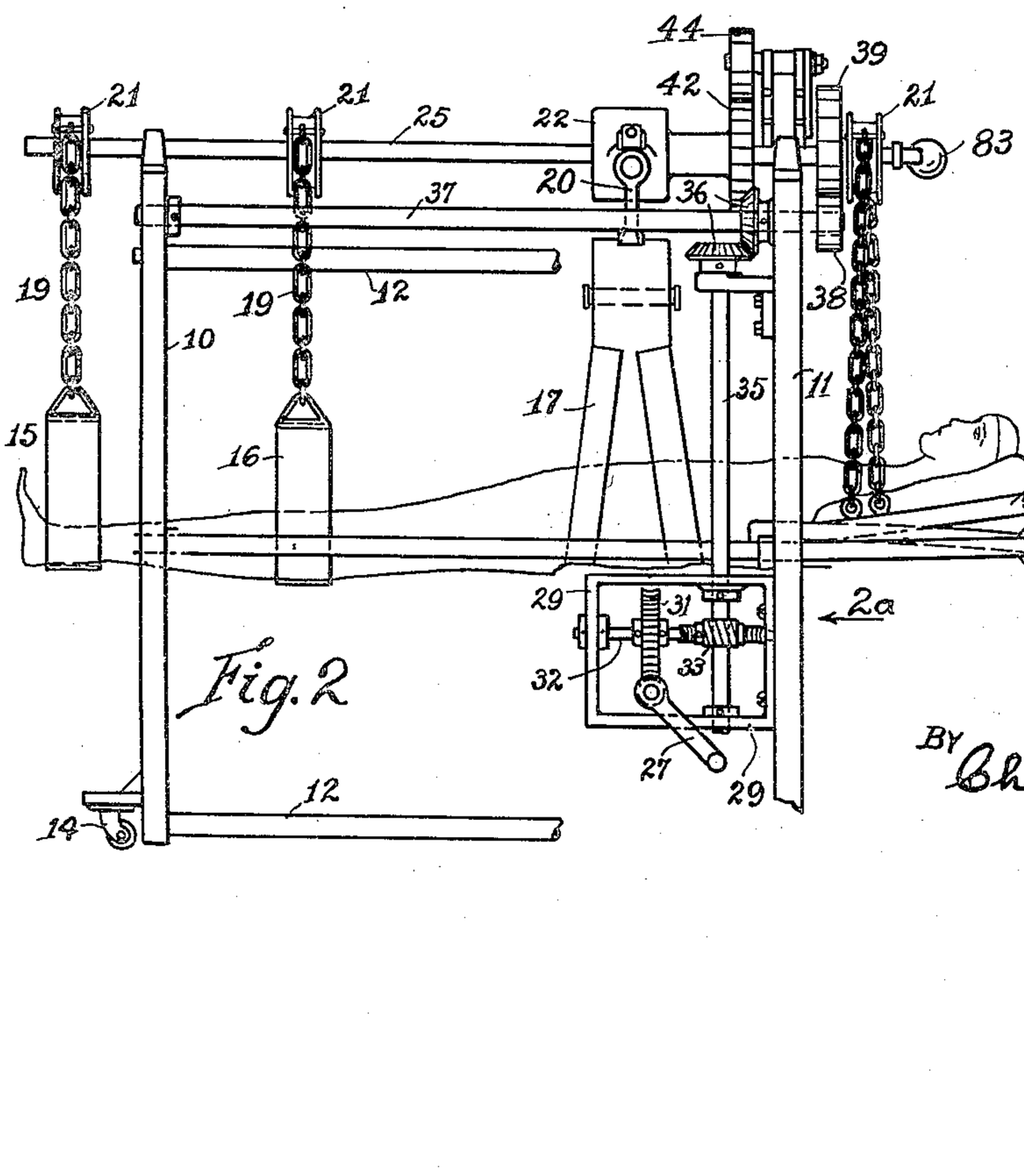

Fig. 2

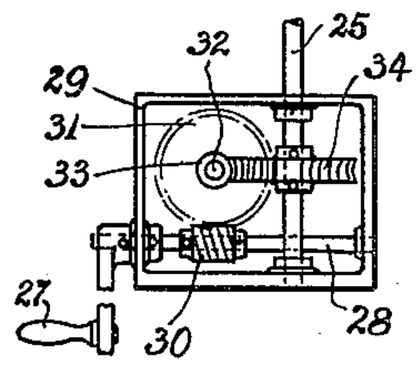

Fig. 2a

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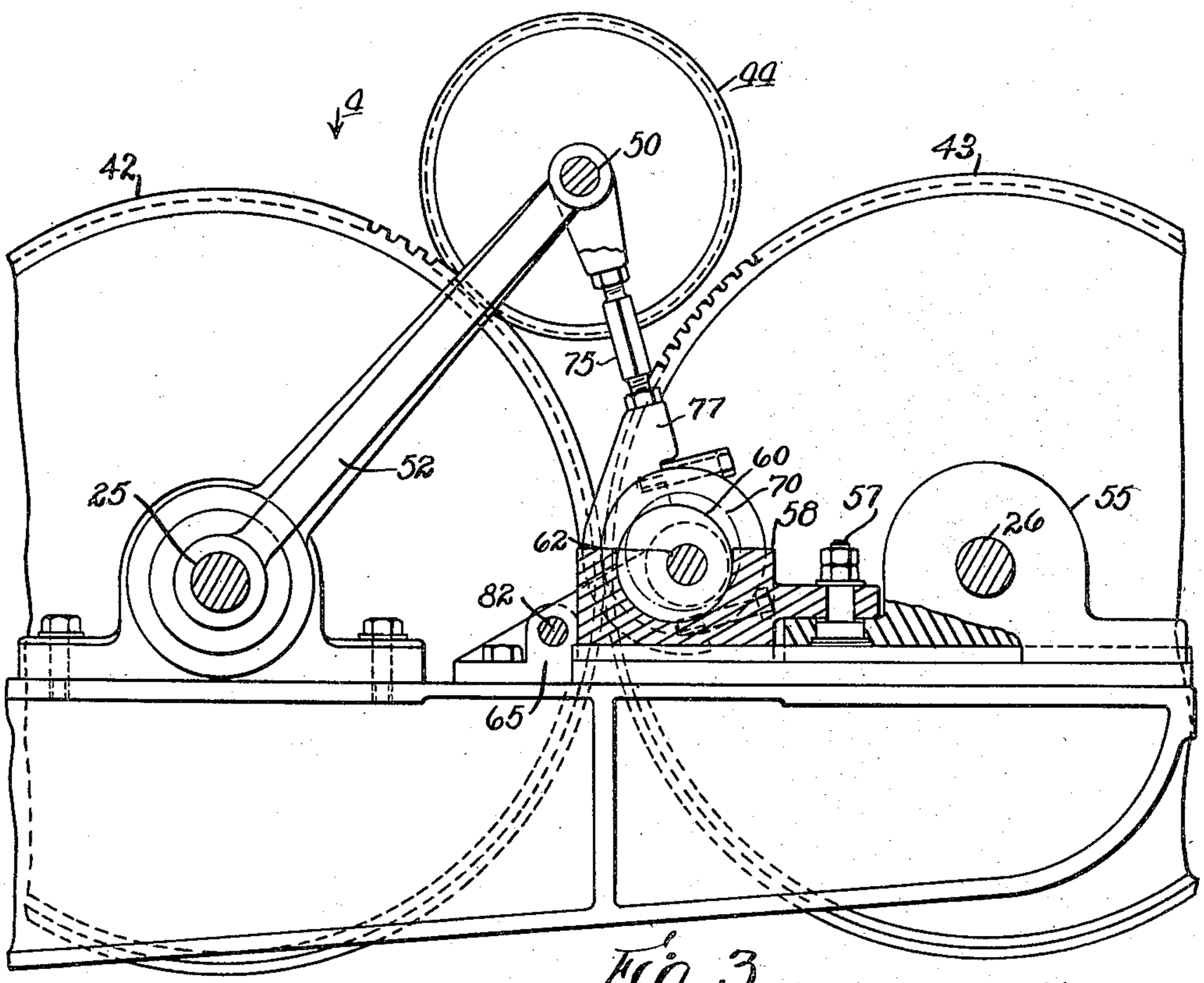

Fig. 3.

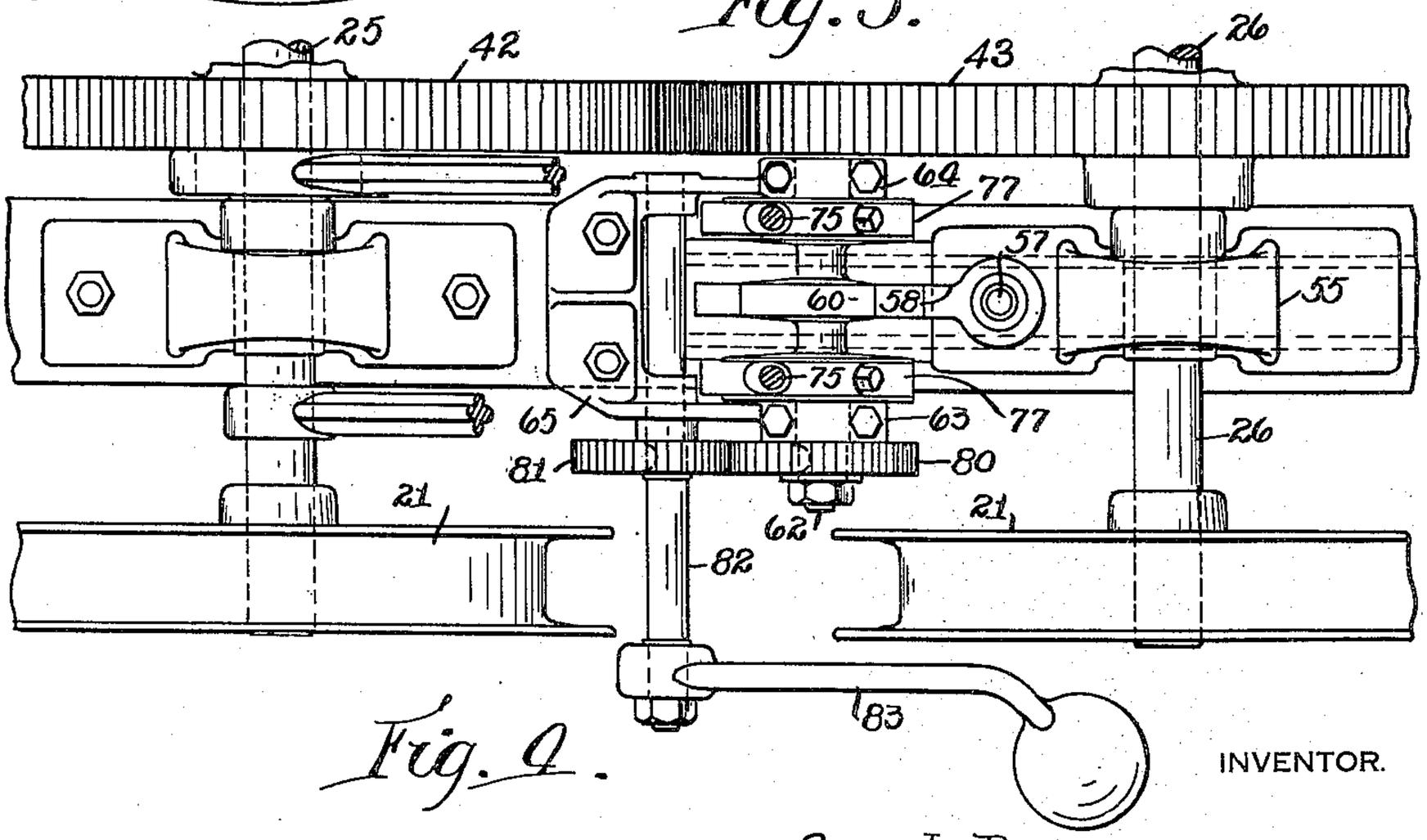

Fig. 4.

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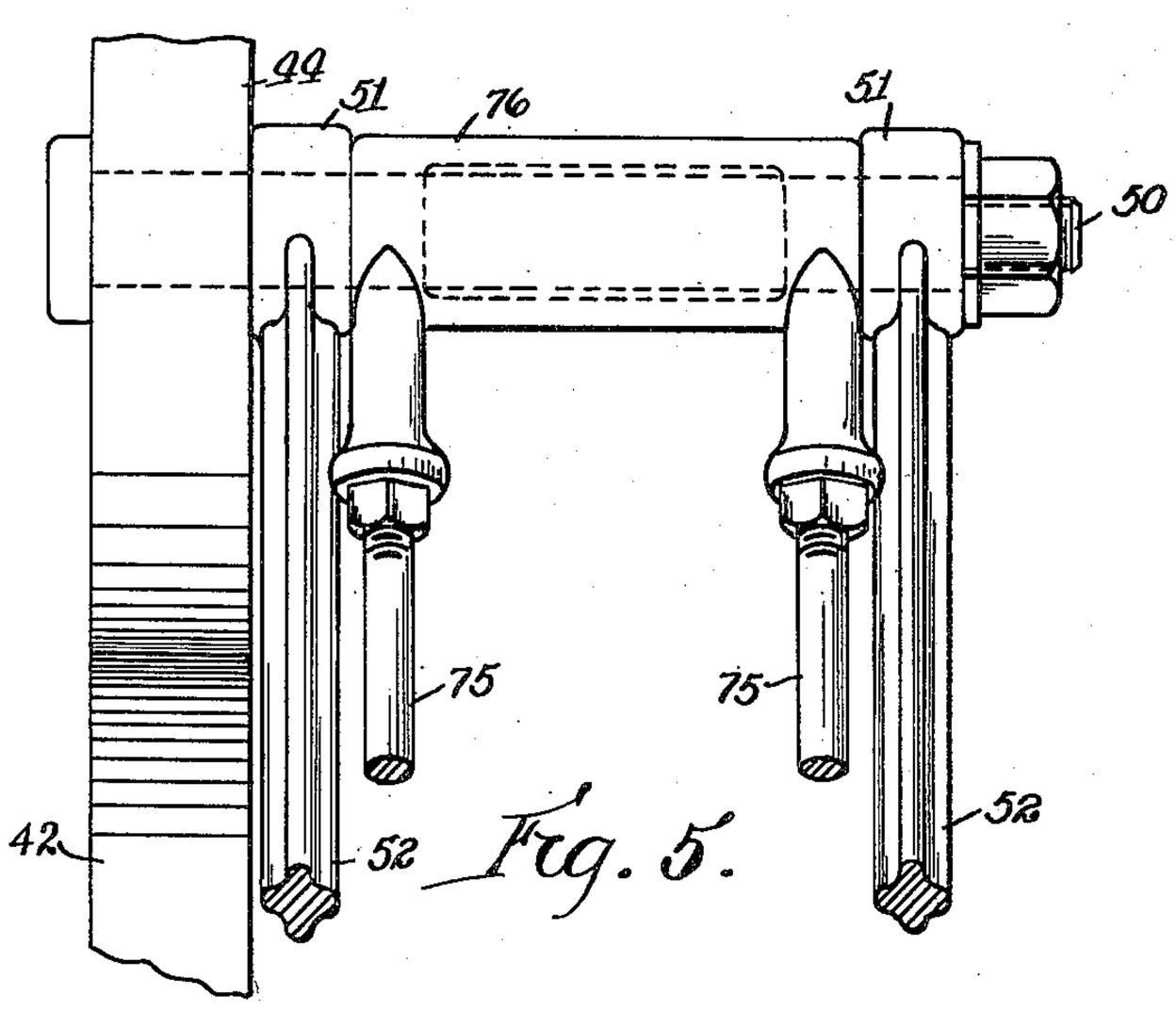

Fig. 5.

Fig. 6.

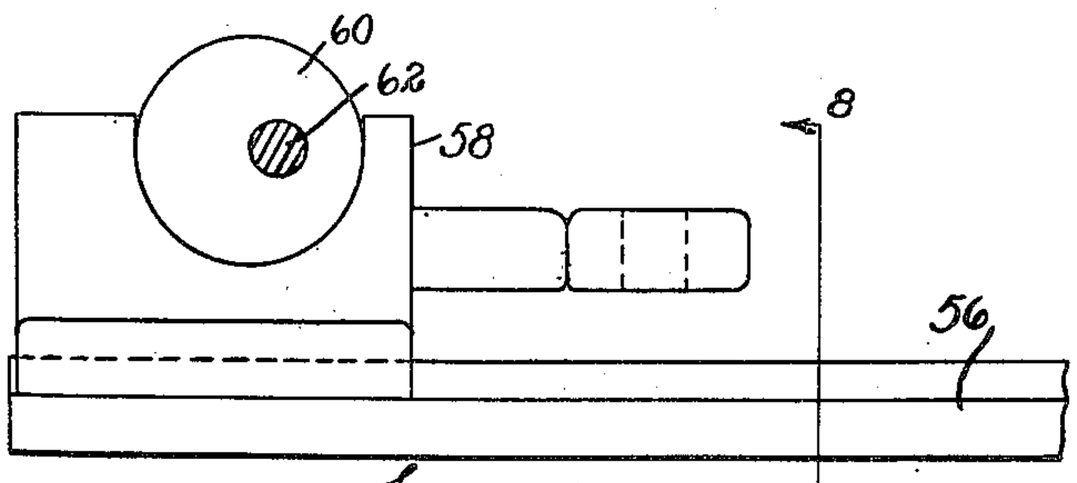

Fig. 7.

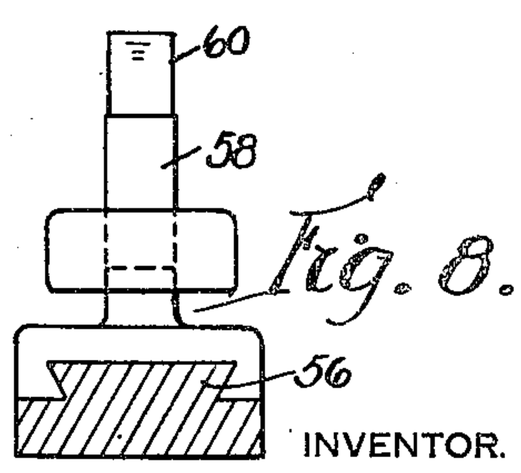

Fig. 8.

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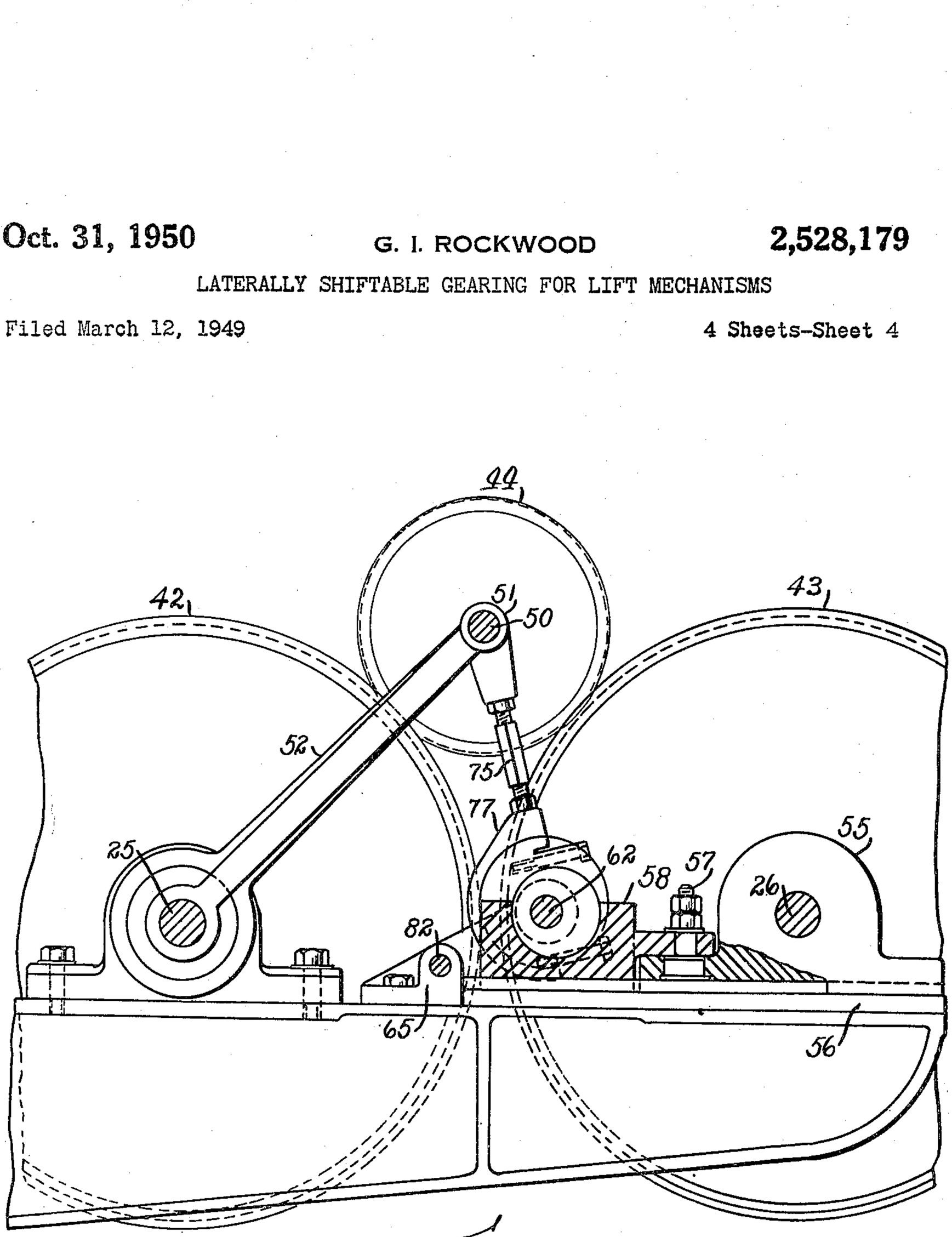

Fig. 9

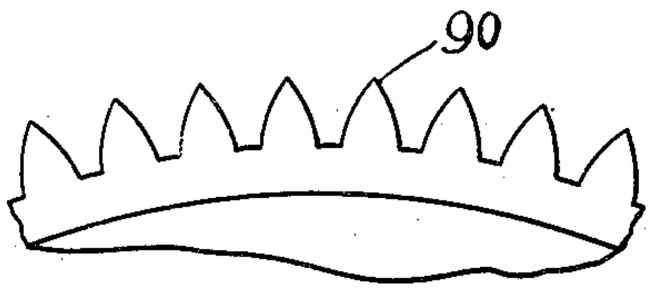

Fig. 10

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Patented Oct. 31, 1950 2,528,179

UNITED STATES PATENT OFFICE

2,528,179

LATERALLY SHIFTABLE GEARING FOR LIFT MECHANISMS

George I. Rockwood, Worcester, Mass.

Application March 12, 1949, Serial No. 81,151

3 Claims. (Cl. 74—355)

1

This invention relates to apparatus for handling patients in hospitals, rest homes and other similar institutions, and is a continuation-in-part of my prior application Serial No. 777,177 filed October 1, 1947, now abandoned.

It is the general object of the invention to provide improved mechanism for raising a patient and also for turning the patient in any position of elevation.

To the accomplishment of this general purpose, I provide two elevating shafts and interposed gearing so devised that the two shafts may be rotated in relatively opposite directions for raising or lowering a patient, or may both be rotated in the same direction for turning the patient. I also provide means for so shifting the operating and connecting gears that the main gears on the elevating shafts are never left free to rotate. Consequently, the patient is at all times supported and cannot be accidentally dropped.

Another feature of the invention relates to the provision of improved and continuously controlled manual operating means which cannot be accidentally reversed.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawings, in which

Fig. 1 is an end view of my improved patient-elevating mechanism;

Fig. 2 is a front elevation thereof, looking in the direction of the arrow **2** in Fig. 1;

Fig. 2*a* is a detail side elevation of the gear box with the nearer side plate omitted, and looking in the direction of the arrow **2***a* in Fig. 2;

Fig. 3 is a partial end view, with certain parts in section and showing the gear connection between the elevating shafts;

Fig. 4 is a partial plan view, looking in the direction of the arrow **4** in Fig. 3 but with the idle gear omitted;

Fig. 5 is a side elevation of a portion of the idle gear and certain associated parts;

Fig. 6 is a plan view of an eccentric shaft and a slidable bearing block associated therewith;

Fig. 7 is a side elevation of certain parts shown in Fig. 6;

Fig. 8 is a sectional end elevation, taken along the line **8—8** in Fig. 7;

Fig. 9 is a view similar to Fig. 3 but showing the main driving gears spaced apart but connected through the idle gear; and

Fig. 10 shows a detail modification to be described.

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Referring to Figs. 1 and 2, my improved patient-handling apparatus comprises side frames **10** and **11** rigidly connected by cross bars or tubes **12** and mounted on casters **14** by which the apparatus may be moved to present the handling mechanism above a bed on which the patient is lying.

Straps **15**, **16** and **17** and a head rest **18** are then placed under the patient and are connected by chains or cables **19** and links **20** to pulleys **21** and drums **22** on elevating shafts **25** and **26**.

A crank or handle **27** is secured on the front end of a worm shaft **28** mounted in a gear box **29** and provided with a worm **30** engaging a worm gear **31** on a worm shaft **32**. A worm **33** on the shaft **32** engages a worm gear **34** on an upright shaft **35**. The shaft **35** is connected by bevel gears **36** to a countershaft **37** which in turn is connected by a pinion **38** and gear **39** to a short shaft **40**, which is provided with a pinion **41** driving a main gear **42** on the elevating shaft **25** previously described. The gear **42** rotates a similar main gear **43** on the shaft **26**, either directly or indirectly as will be later explained. When the gears **42** and **43** engage directly, the shafts **25** and **26** then rotate in opposite directions and all of the chains **19** and link connections **20** are thus simultaneously raised or lowered.

For a more complete description of certain general features above described, reference is made to my copending application Serial No. 746,423, filed May 7, 1947.

In addition to the non-reversible gear drive of the elevating shafts **25** and **26**, my present invention relates particularly to the improved means which I have provided for separating the main gears **42** and **43** and for then driving the gear **43** from the gear **42** through an idle gear **44**. The shafts **25** and **26** are thus rotated in the same direction, which is necessary when the chains and link connections on one side are to be lowered and the corresponding parts on the opposite side are to be raised to effect turning the patient in a desired direction, which direction is according to the direction in which the handle or crank arm **27** is rotated.

It is essential that the main gear **43** shall be at all times under control. I have accordingly provided gear-shifting mechanism by which an idle gear **44** (Fig. 3) will be engaged with the main gear **43** before the gear **43** is disengaged from the main gear **42**.

The idle gear **44** (Figs. 5 and 9) is mounted on a cross shaft **50** supported in bearings **51** in the upper ends of arms **52** mounted to swing about the axis of the elevating shaft **25**. The idle gear

44 is thus held continuously in mesh with the main gear 42.

The driving end of the elevating shaft 26 is journalled in a bearing block 55 mounted to slide on fixed guideways 56 (Figs. 7 and 8). The block 55 is connected by a bolt 57 (Figs. 3 and 9) to an eccentric bearing member 58 which partially encircles a disc 60 eccentrically mounted on a cross shaft 62 rotatable in fixed bearings 63 and 64 (Fig. 4) in a frame 65 which is bolted to the fixed frame of the handling apparatus.

An additional pair of eccentric discs 70 (Fig. 6) are formed on or secured to the shaft 62 but with their centers disposed at a different radial distance and in a different angular position with reference to the axis of the shaft 62, as compared with the eccentricity of the disc 60 (see Fig. 3).

Adjustable connecting rods 75 (Fig. 5) are secured at their upper ends to a sleeve 76 pivoted on the idle gear shaft 50. At their lower ends, the rods 75 are provided with rod ends 77 (Fig. 3) to receive the eccentric discs 70.

The shaft 62 is connected by gears 80 and 81 (Fig. 4) to a shaft 82 rotatable in fixed bearings by a handle 83. As the handle 83 is shifted from the "elevating" position to the "turning" position, the eccentric disc 60 is partially rotated and acts through the member 58 to shift the bearing block 55 to the right from the position shown in Fig. 3 to the position shown in Fig. 9, thus separating the main driving gears 42 and 43.

At the same time, the eccentrics 70 draw the connecting rods 75 downward, thus swinging the idle gear 44 about the axis of the shaft 25 and causing the idle gear to engage the main gear 43.

The eccentrics 60 and 70 are so located relative to each other and are so proportioned as to eccentricity that the downward swinging movement of the idle gear 44 takes place more rapidly than the sliding movement of the bearing block 55. Consequently, the gear 44 engages the gear 43 before the gear 43 is disengaged from the main gear 42. On the return movement, the gear 43 engages the gear 42 before the idle gear 44 is disengaged from the gear 43.

Meshing of the teeth in the gears 43 and 44 is facilitated if the teeth in the gears 42, 43 and 44 are somewhat sharply pointed, as shown at 90 in Fig. 10.

The elevating shaft 26 is thus always under the operator's control and is never free to rotate and thus possibly cause a patient to be dropped.

The location of the handle 27 at or below the level of the patient leaves one hand of the nurse or operator available to conveniently assist the patient, and the provision of the double worm drive prevents accidental reverse movement of the elevating mechanism when the handle 27 is released. The handle 27 must be positively operated to move the elevating mechanism in either direction.

I have thus provided improved mechanism for either raising or turning a patient as desired. The patient may also be raised and thereafter turned in raised position without the possibility of an accident and will be securely held in any position.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. In an apparatus for handling patients, a pair of patient-elevating shafts, means to rotate one of said shafts, a large gear on said shaft, an idle gear continuously engaging said large gear, a second large gear on the second elevating shaft, a shiftable bearing block for said second shaft, means to shift said bearing block to move said second large gear out of engagement with said first large gear, and means operating substantially simultaneously to engage said idle gear with said second large gear, and said latter means being effective to operatively engage said idle gear with said second large gear before said second large gear is fully disengaged from said first large gear.

2. In an apparatus for handling patients, a pair of patient-elevating shafts, means to rotate one of said shafts, a large gear on said shaft, an idle gear continuously engaging said large gear, a second large gear on the second elevating shaft, a shiftable bearing block for said second shaft, an arm swinging about the axis of the first large gear and on which said idle gear is mounted, an eccentric connection which is effective to move the bearing block for the second shaft, an additional eccentric connection which is effective to move the swinging arm to cause said idle gear to engage said second large gear, and means to move said eccentric connections in timed relation to effect engagement of said idle gear with said second large gear before said first and second large gears are fully disengaged.

3. In an apparatus for handling patints, a pair of patient-elevating shafts, means to rotate one of said shafts, a large gear on said shaft, an idle gear continuously engaging said large gear, a second large gear on the second elevating shaft, a shiftable bearing block for said second shaft, an arm swinging about the axis of the first large gear and on which said idle gear is mounted, a manually operated shaft mounted in fixed bearings, an eccentric on said latter shaft, connections from said eccentric to said swinging arm, a second eccentric on said latter shaft, and connections from said second eccentric to said shiftable bearing block, said eccentrics being radially proportioned and angularly related to effect operative engagement of said idle gear with said second large gear before said second large gear is fully disengaged from said first large gear.

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