No. 649,489. Patented May 15, 1900.

C. T. SEARS & C. F. CURREY.

MECHANICAL MOVEMENT.

(Application filed Dec. 20, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

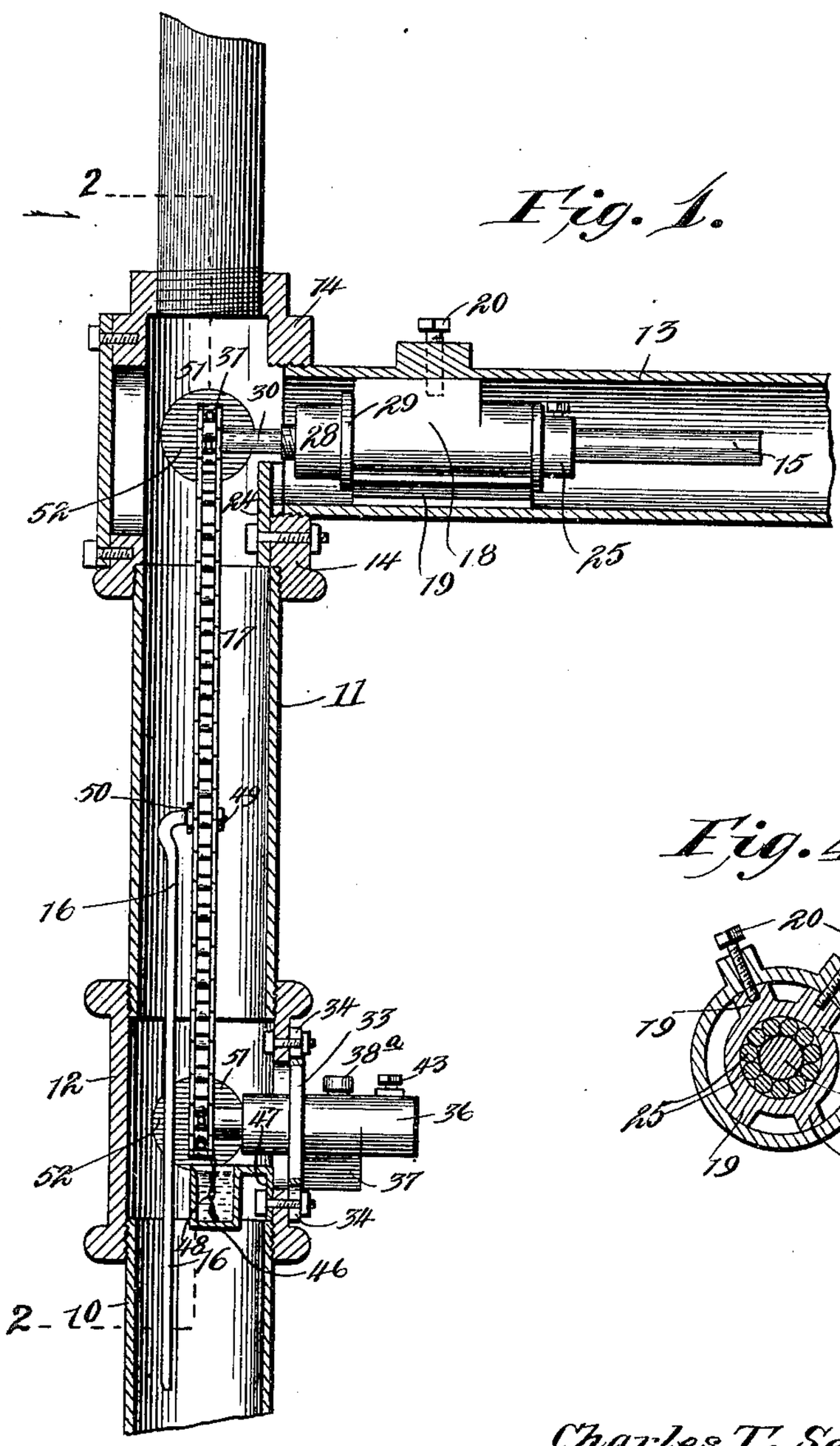

Fig. 4.

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Fig. 2.

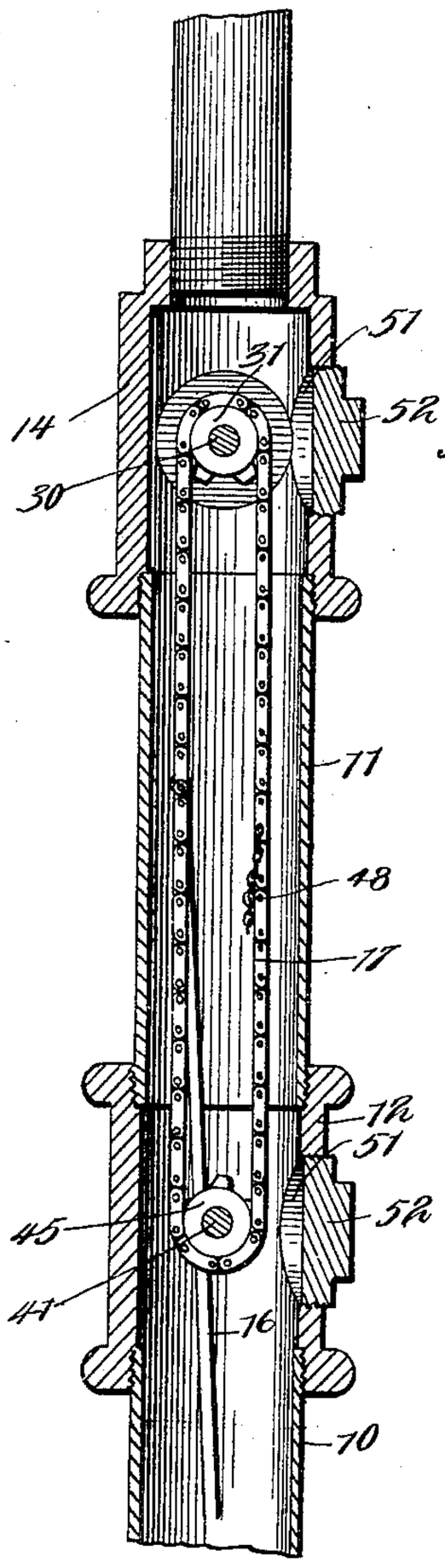


Fig. 3.

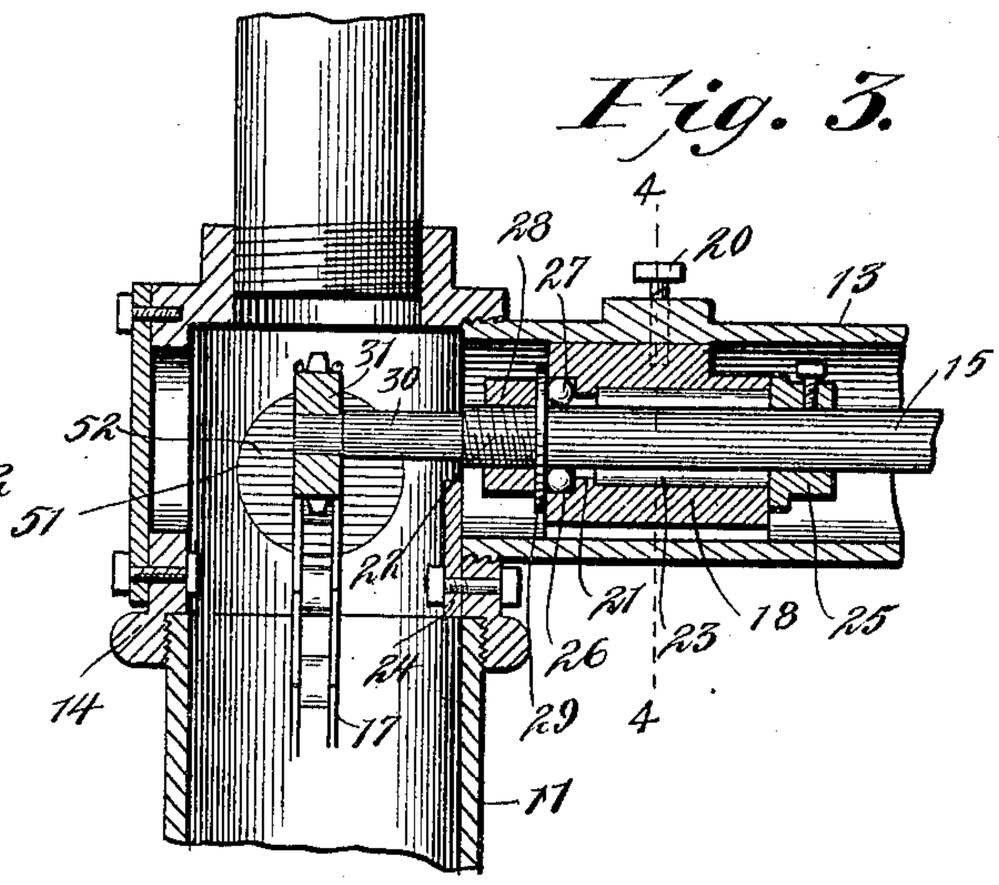
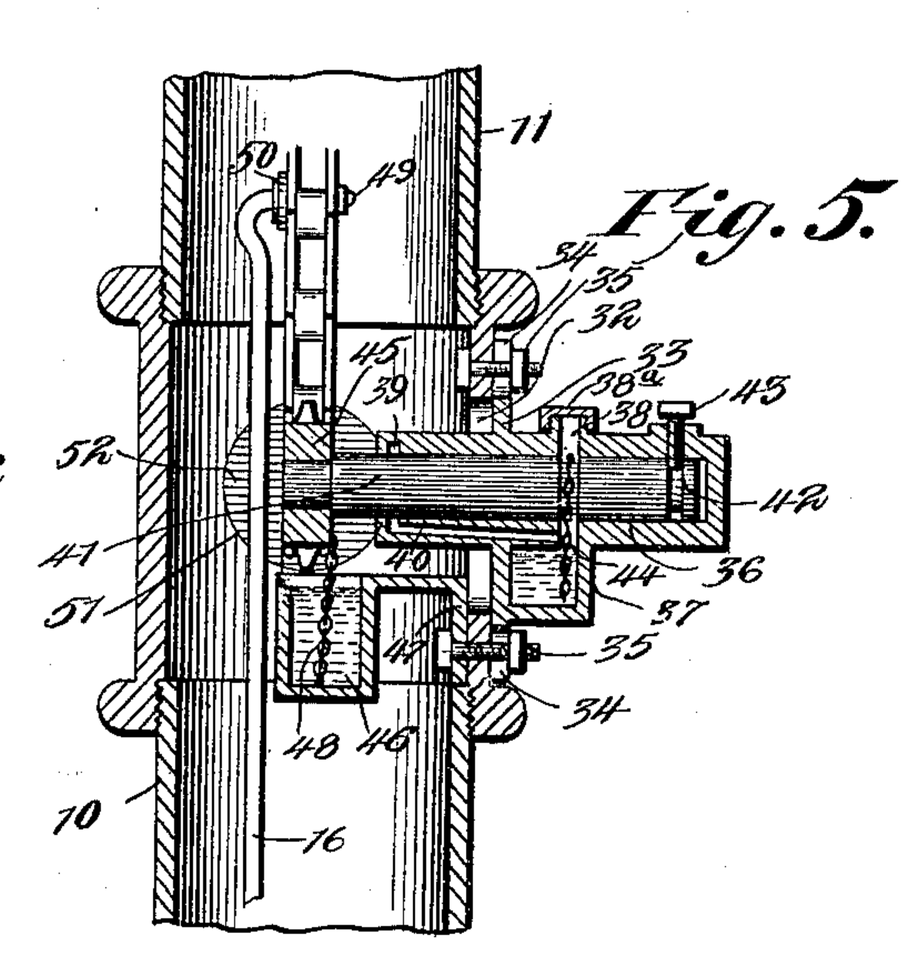


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES T. SEARS AND CHARLES F. CURREY, OF TOPEKA, KANSAS.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 649,489, dated May 15, 1900.

Original application filed November 10, 1897, Serial No. 658,067. Divided and this application filed December 20, 1899. Serial No. 741,041. (No model.)

To all whom it may concern:

Be it known that we, CHARLES T. SEARS and CHARLES F. CURREY, citizens of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented a new and useful Mechanical Movement, of which the following is a specification.

The improvement in mechanical movements embraced in this application constitutes a division of our application for improvement in windmills, filed November 10, 1897, Serial No. 658,067.

One object of this invention is to provide means for converting the rotary motion of a wheel-shaft into reciprocating motion for communication to a pump-rod, whereby the latter may be reciprocated in practically a continuous manner.

A further object is to reduce the number of parts to a minimum and to simplify the construction thereof as much as possible, so as to promote the efficiency of operation and to render the parts strong and durable in service.

A further object is to provide a construction of the column or mast which provides for convenient access to the operating parts, enables the slack in the endless chain to be readily taken up, and provides for the thorough lubrication of the working parts.

To the accomplishment of these ends the invention consists in the combination, with a column or mast and a wheel-shaft having one end extended into the mast, of an idler-shaft journaled in the mast in parallel relation to the wheel-shaft, gear elements made fast with the inner ends of the wheel-shaft and the idler-shaft, respectively, an endless driving element fitted operatively to said gear elements on the shafts, and a pump-rod having a pivotal connection directly with the endless driving element and arranged to travel therewith continuously, so as to move over the gear element on the wheel-shaft and under the gear element on the idler-shaft.

The invention further consists in the novel combination of devices and in the construction and arrangement of the various parts for service, as will be hereinafter fully described and claimed.

To enable others to understand the invention, we have illustrated a preferred embodiment of the same in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional elevation of a mechanical movement embodying our improvements and adapted to a windmill of the class disclosed in our former application to which reference has been made. Fig. 2 is a sectional elevation in a plane at right angles to Fig. 1 and indicated by the dotted line 2 2 of Fig. 1. Fig. 3 is an enlarged vertical section through the upper part of the hollow column, illustrating the bearing for the wheel-shaft. Fig. 4 is a transverse section in the plane of the dotted line 4 4 of Fig. 3. Fig. 5 is an enlarged vertical section illustrating the idler-shaft and the lubricating devices for said idler-shaft and the endless driving element which propels the pump-rod.

The same numerals of reference are used to indicate like and corresponding parts in each of the several figures of the drawings.

A part of the hollow mast or column employed in the construction of our windmill is indicated by the numeral 10. This mast or column is constructed in sections adapted to be coupled together in alined relation, and the numeral 11 indicates one section of the mast which is disposed above that section or length thereof indicated by the numeral 10. The contiguous ends of the two members or sections of the mast are united together by a tubular coupling or sleeve 12, and the horizontal tubular arm 13, which supports the wheel-shaft, is united to the member or section 11 of the mast or column by means of the upper coupling-sleeve 14. The couplings or sleeves are preferably screw-threaded, so that they may be united removably to the members of the mast or column; but the particular means employed for separably coupling the parts may be varied by a skilled mechanic. The wheel-shaft of the windmill is indicated by the numeral 15, and the pump-rod is indicated at 16. The means we have invented for converting the rotary motion of the wheel-shaft into reciprocating motion for the operation of the pump-rod resides in an endless driving element, which is shown by the drawings as an endless chain of the va-

riety known to the art as a "sprocket-chain" or "link belt."

We will first describe the bearing which we prefer to employ for supporting the inner end of the wheel-shaft in a manner to insure thorough lubrication thereof.

The shaft-bearing is indicated at 18 as being cast in a single piece of metal with a series of radial wings 19, that are adapted to engage with the inner surface of the arm 13, thus centering the bearing in said arm. The bearing is held firmly in place by the employment of screws 20, which pass through the arm and into suitable openings provided in certain of the wings. Said bearing has a shaft-opening of larger diameter than the shaft itself, and near one end of the bearing is an internal collar or ledge 21. A series of bearing-rollers 23 are fitted loosely in this shaft-opening of the fixed bearing, so as to engage at one end with the internal ledge 21 thereof, and a collar 25 is clamped on the shaft, so as to bear against the other ends of the rollers, whereby said rollers are confined by the shoulder and the collar against endwise movement in the fixed bearing, and thus produce an anti-friction-support for the wheel-shaft. In the end of the fixed bearing opposite to the collar 25 is provided an annular ball-race 26, adapted for the accommodation of the series of bearing-rollers 27. A nut 28 is screwed on a threaded part 22 of the wheel-shaft, and between the nut and the ball-bearings is interposed the washer 29, said washer coöperating with the internal ledge 21 to confine the bearing-rollers in place, and thus minimize the frictional engagement of the revoluble nut with the stationary shaft-bearing. The end of the shaft 15 is extended beyond the arm 13 and into the space afforded by the coupling or sleeve 14, said extended end of the shaft being indicated by the numeral 30. A sprocket-wheel 31 is secured firmly in a suitable way to the inner extremity of the extended portion 30 of the wheel-shaft, and this sprocket-wheel is thus supported directly by the extended part of the shaft, so as to lie in the vertical plane of the column or mast and free from engagement with any of the supporting devices for the wheel-shaft. The tubular arm 13 serves as a lubricant-reservoir for the bearings of the wheel-shaft, and to the inner end of the arm or to the upper coupling 14 is firmly secured a plate 24, which serves to partly close the communication between the arm 13 and the coupling 14, said plate arresting the escape of oil from the arm into the mast.

The lower coupling 12 between the members 10 11 of the mast is provided on one side thereof with an opening 32, and to this side of the coupling is fastened a vertically-adjustable bearing-plate 33, the latter serving as the means for closing said opening in the coupling. The plate is provided with longitudinal slots 34, adapted for the reception of the bolts 35, which secure the plate firmly to said coupling 12 and permit of the desired adjustment of the plate thereon. Said plate is furthermore provided with an elongated sleeve constituting a journal-bearing for the idler-shaft of the endless driving element, said bearing being indicated by the numeral 36. This plate 33 may be cast integral or provided in any suitable way with an oil-well 37, that is arranged on the outside of the plate and below the shaft-bearing 36 thereof. The shaft-bearing is provided on its upper side with a cavity 38, adapted normally to be closed by a screw-cap 38ª. In the inner end of the bearing is provided an oil-groove 39, having communication with a return-channel 40, the latter arranged to discharge the surplus oil back to the well 37.

41 designates the idler-shaft, which is arranged longitudinally in the bearing 36 of the vertically-adjustable plate. This shaft is supported by the bearing in a plane parallel with the wheel-shaft, and the inner end of this idler-shaft is extended or prolonged into the coupling or sleeve 12. Near its outer end the shaft has an annular groove 42, adapted to receive a limiting screw or pin 43, that is mounted in the bearing-sleeve 36, thus making provision for the free rotation of the shaft while restraining it against endwise movement in the bearing. A lubricant-supplying chain 44 is fitted or connected to the idler-shaft at a point intermediate of its length, so as to lie in the vertical plane of the cavity 38 and to dip into the lubricant contained in the oil-well 37, so that on the rotation of this idler-shaft lubricant will be supplied automatically thereto from the well or cavity. It is to be observed that the wheel-shaft and the idler-shaft, which is parallel therewith, are supported on or project from one and the same side of the mast or column, and the inner ends of these two shafts are prolonged beyond their bearings into the sleeves or couplings, so as to terminate within and in the vertical plane of the mast or column. The idler-shaft is thus mounted for its inner end to receive a sprocket-wheel 45, which is disposed in vertical alinement with the sprocket 31 on the wheel-shaft. These two sprockets are thus arranged for the endless sprocket-chain 17 to travel in a truly-vertical path within the mast or column, and this sprocket-chain is thus mounted or supported by the gears and by the shafts, so as to be entirely free from engagement with any part of the column or mast.

We have also provided means for automatically lubricating the endless sprocket-chain. An oil-well 46 is arranged below the sprocket-gear 45 on the idler-shaft and in the vertical plane of the endless sprocket-chain. This oil-well may be supported in the mast or the coupling-sleeve 12 by any suitable means—such, for example, as the flange 47, which is bolted to the sleeve. A lubricating-chain 48 is attached to the endless driving-chain so as to hang loosely therefrom, and as this loose

element 48 passes with the driving-chain beneath the sprocket 45 it dips into the lubricant of the well 46, so as to allow the lubricant to drip therefrom on the travel of the element 48 with the chain 17.

The pump-rod 16 is arranged laterally with relation to the endless chain and the oil-well 46. One of the important features of our invention consists in a direct attachment of the pump-rod to a link of the endless chain, and this is attained by the employment of a tenon 49 on the upper extremity of the pump-rod. This tenon is made integral or fast with said rod so as to extend laterally therefrom, and the tenon is fitted loosely in or to a link of the endless driving-chain, forming one of the bars thereof. A washer 50 is provided on the tenon, so as to stop the oil from running down the pump-rod by causing it to drip from the edge of the washer back into the oil-well 46, which projects slightly beyond the inner face of the sprocket-wheel 45.

The couplings 12 and 14 between the members of the mast are each provided on one side with a transverse opening 51, serving as a hand-hole for the operator to readily thrust his hand into the column, said opening being normally closed by a suitable head or cap 52.

We attach especial importance to the wheel-shaft and the idler-shaft extended at their inner ends into the column, the gear elements fastened to said inner ends of the respective shafts, the endless sprocket-chain or driving element engaging directly with said gear elements and supported wholly thereby within the column, and the pump-rod connected pivotally and directly with the endless chain. This arrangement and combination of elements enables the tenon of the pump-rod to travel with the chain at all times, so that it will move over the gear element on the wheel-shaft and under the gear element on the idler-shaft. The pump-rod is thus carried with a smooth, even, and practically continuously vertical motion, the turns over one gear element and under the other gear element being quickly and quietly made, giving a long pump-stroke of great power. By changing the distance between said gear elements and altering the endless driving element to correspond a pump-stroke of any desired length may be obtained (only limited by the height of the tower or depth of the well) without detracting from the power of the stroke and without a dead-center in its travel. Our practical experience has demonstrated this device to be the best for elevating water by the power of a windwill.

The plate 33 may be adjusted vertically for moving the shaft 41 to take up the slack in the endless driving-chain, thus compensating for wear on the working parts of the apparatus, and the oil-well 37 is movable with said plate, so that the lubricator for the idler-shaft will always remain in proper relation to said shaft.

The particular type of the mast or column herein shown and described as one means for supporting the wheel-shaft and the transmitting mechanism for the operation of the pump-rod is capable of modification within wide limits—such, for example, as a sectional construction of a tower consisting of suitable longitudinal members braced by intermediate connections—and also the idler-shaft may be placed above the wheel-shaft instead of below, as shown in the drawings, or a second wheel-shaft may be substituted for the idler-shaft and the two-wheel shafts connected by the endless driving element, thus doubling the power of the pump-stroke. We do not therefore desire to restrict our invention to the particular style of tubular sectional column or mast herein shown and described, because the tower is considered the mechanical equivalent for the mast or column as the means for supporting the wheel-shaft and the transmitting mechanism.

Changes within the scope of the appended claims may be made in the form and proportion of some of the parts, while their essential features are retained and the spirit of the invention is embodied. Hence we do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described the invention, what we claim is—

1. The combination of a mast or column, a wheel-shaft, and idler-shaft, gear elements supported by said shafts within said mast or column, an endless driving element supported by said gear elements, and a pump-rod connected directly to the driving element and arranged to travel therewith over one gear element and beneath the other gear element on said shafts, substantially as described.

2. The combination of a mast or column, a wheel-shaft having one end extended into said mast, an idler-shaft supported on the mast or column in parallel relation to the wheel-shaft, sprocket-gears on the inner ends of the wheel and idler-shafts respectively and arranged in vertical alinement within the mast or column, an endless sprocket-chain in engagement with said sprocket-gears and supported thereby within the mast or column, and a pump-rod pivoted permanently and directly to said sprocket-chain, substantially as described.

3. The combination of a mast or column, a bearing adjustable vertically thereon, an idler-shaft mounted in the bearing and adjustable therewith, a wheel-shaft, gear elements supported by said shafts within the mast or column, an endless sprocket-chain fitted to the gear elements and supported wholly thereby, and a pump-rod pivoted directly to the sprocket-chain, substantially as described.

4. A mast or column having an opening in one side thereof, a bearing-plate fastened adjustably to said mast over the opening therein, a lubricating shaft-bearing, and an oil-well

on said plate below the shaft-bearing thereof, in combination with an idler-shaft in said bearing, a wheel-shaft, gear elements on the idler and wheel shafts, an endless sprocket-chain fitted to the gear elements, and a pump-rod pivoted directly to said sprocket-chain, substantially as described.

5. The combination of a mast or column, a wheel-shaft, an idler-shaft, gear elements on said shafts, an endless chain fitted to the gear elements, a pump-rod pivoted to the chain, an oil-well fastened to the mast or column and arranged below the gear element on the idler-shaft to lie substantially in the vertical plane of the endless chain, and a loose lubricating element carried by the endless chain and arranged to dip in the oil-well, substantially as described.

6. A sectional mast or column, a hollow arm, couplings united separably to the members of the mast or column and provided with hand-holes, and closures for said hand-holes, combined with a wheel-shaft, an idler-shaft, the gear elements supported by said shafts opposite to the hand-holes in said couplings, a sprocket-chain fitted to the gear elements, and a pump-rod pivoted to the endless chain, substantially as described.

7. The combination of a mast or column provided with a lateral tubular arm, an externally-flanged shaft-bearing fitted in said hollow arm, clamping-screws engaging with the arm and bearing, a series of rolls confined within a shaft-opening of said bearing, a wheel-shaft fitted to the bearing and projecting into the mast or column, a nut fast with the wheel-shaft adjacent to one end of the bearing, a series of balls confined within one end of the bearing and in engagement with the nut, an idler-shaft, gear elements on the wheel-shaft and the idler-shaft, an endless sprocket-chain fitted to said gear elements, and a pump-rod pivoted directly to said chain, substantially as described.

8. The combination of a wheel-shaft, an idler-shaft, suitable means for supporting the same, gear elements carried by the said shafts, an endless driving element supported by the gear elements, and a pump-rod connected directly with the driving element and arranged to travel over one gear element and beneath the other gear element on said shafts, substantially as described.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

CHAS. T. SEARS.
CHAS. F. CURREY.

Witnesses:
MARIAN L. SEARS,
ETHEL CURREY.