955,458.

W. H. HAMPTON.

POWER GEARING.

APPLICATION FILED JAN. 30, 1907.

Patented Apr. 19, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

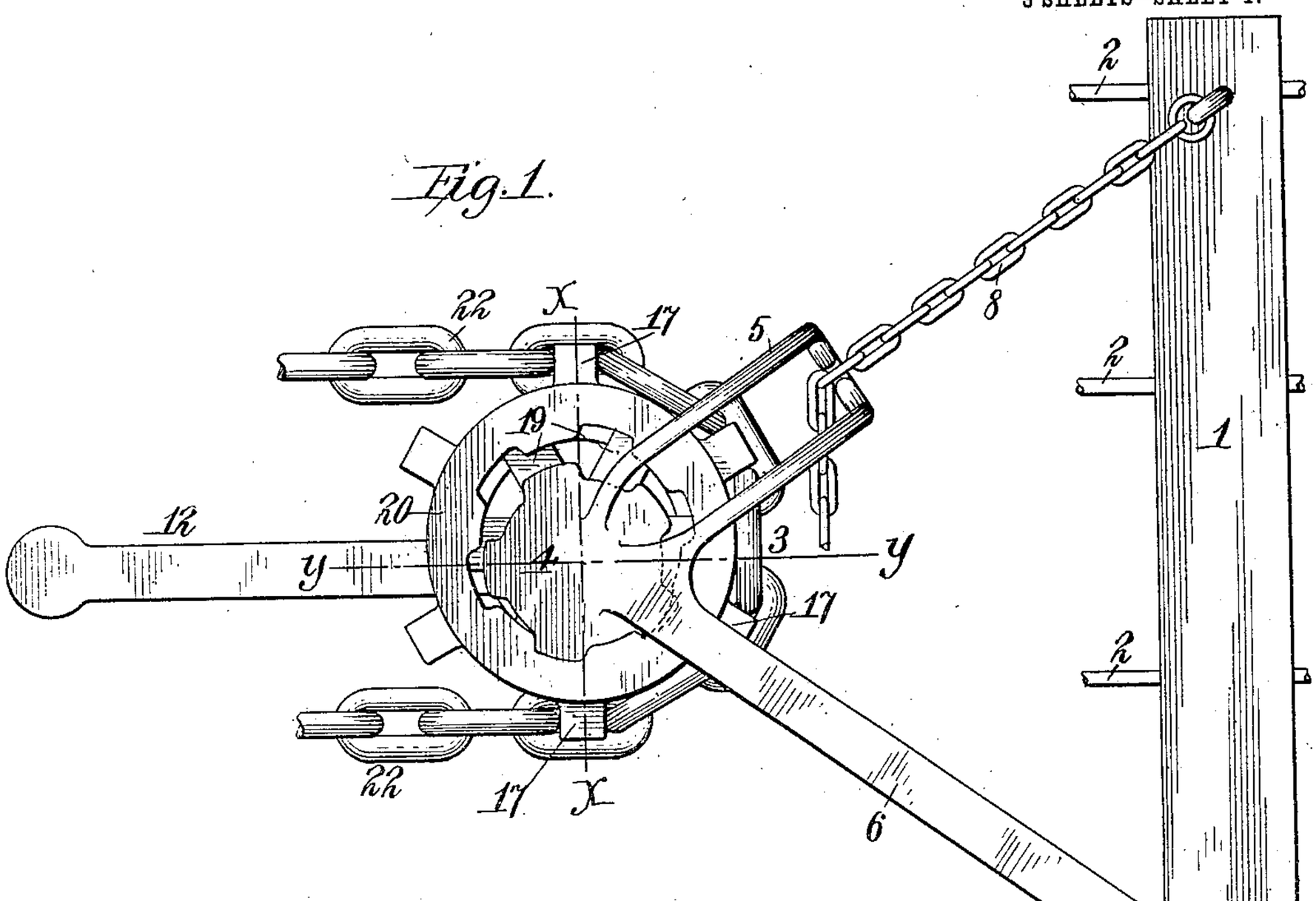



Fig. 2.

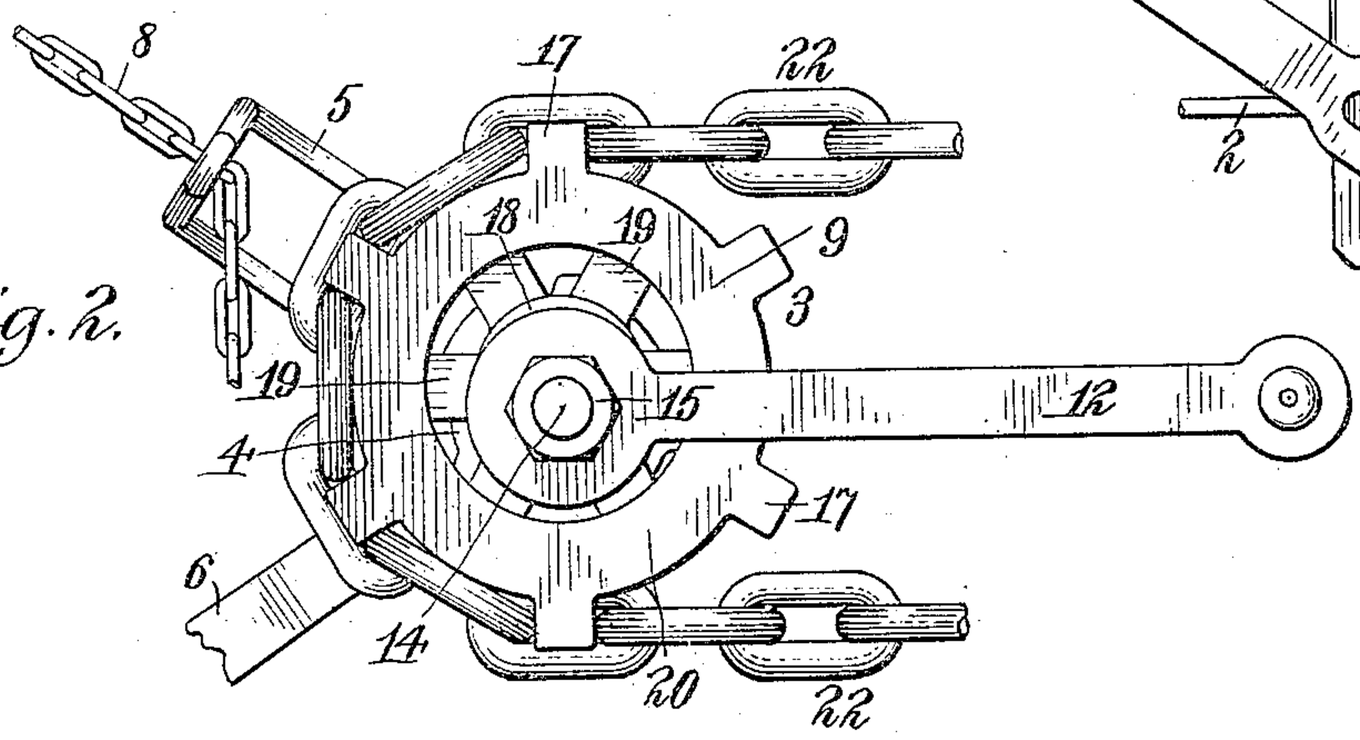
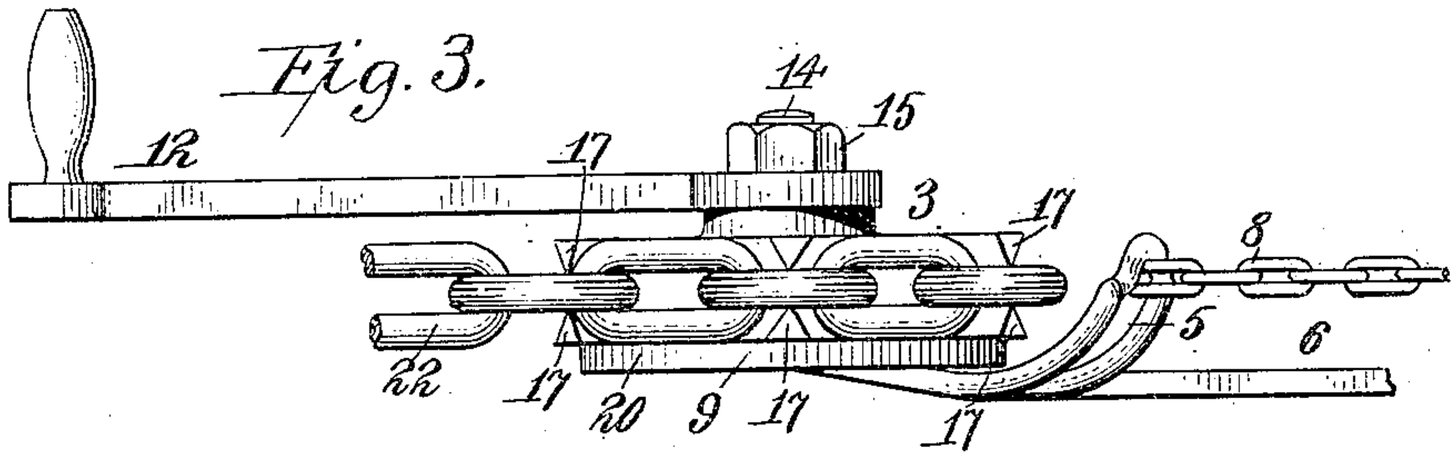



Fig. 3.

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3 SHEETS—SHEET 2.

Fig. 4.

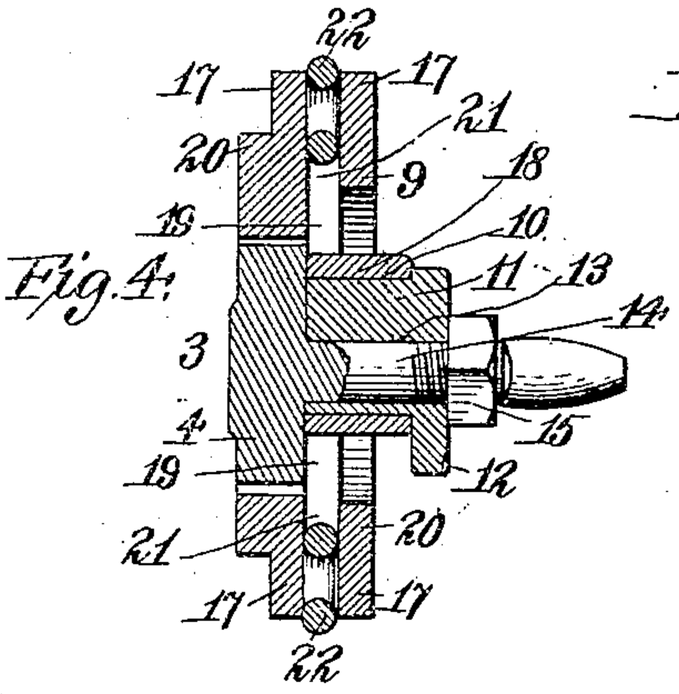



Fig. 5.

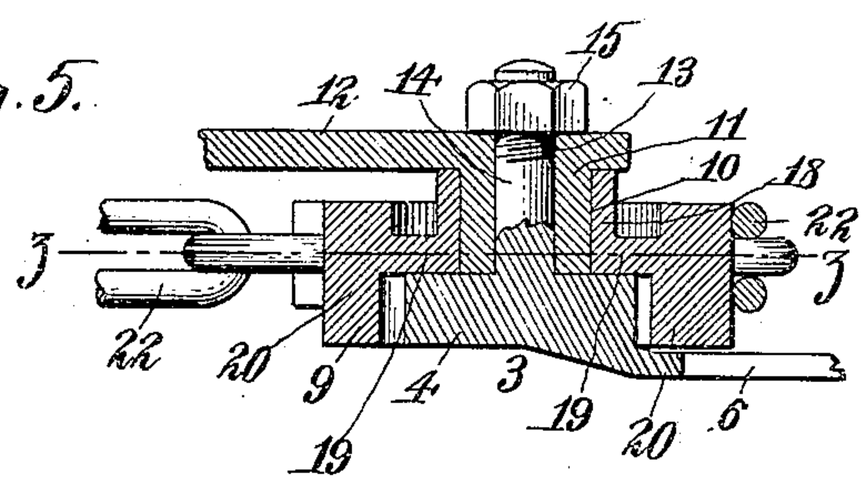



Fig. 6.

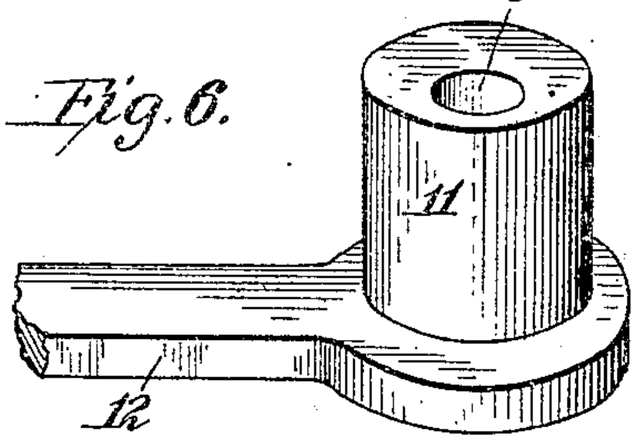



Fig. 7.

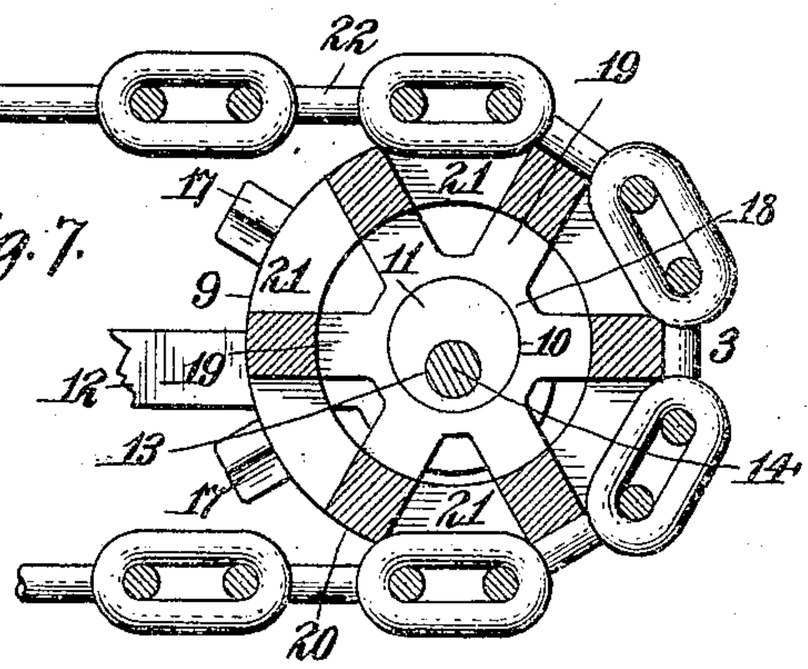
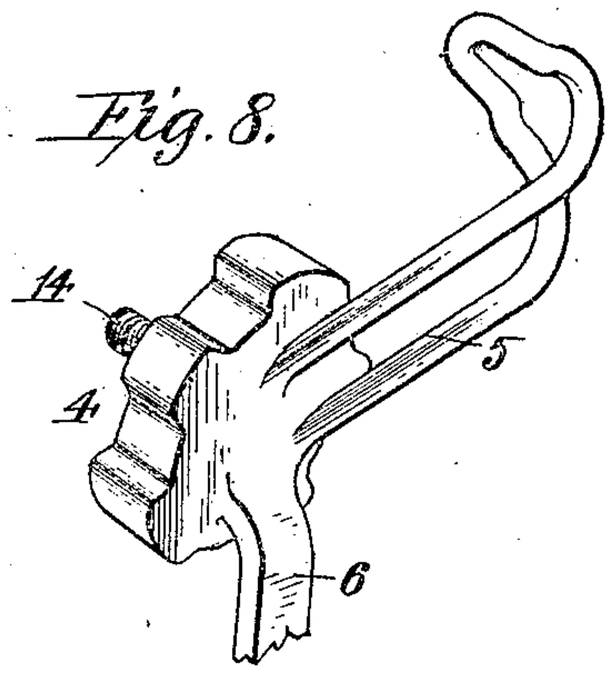



Fig. 8.

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3 SHEETS—SHEET 3.

*Fig. 9.*

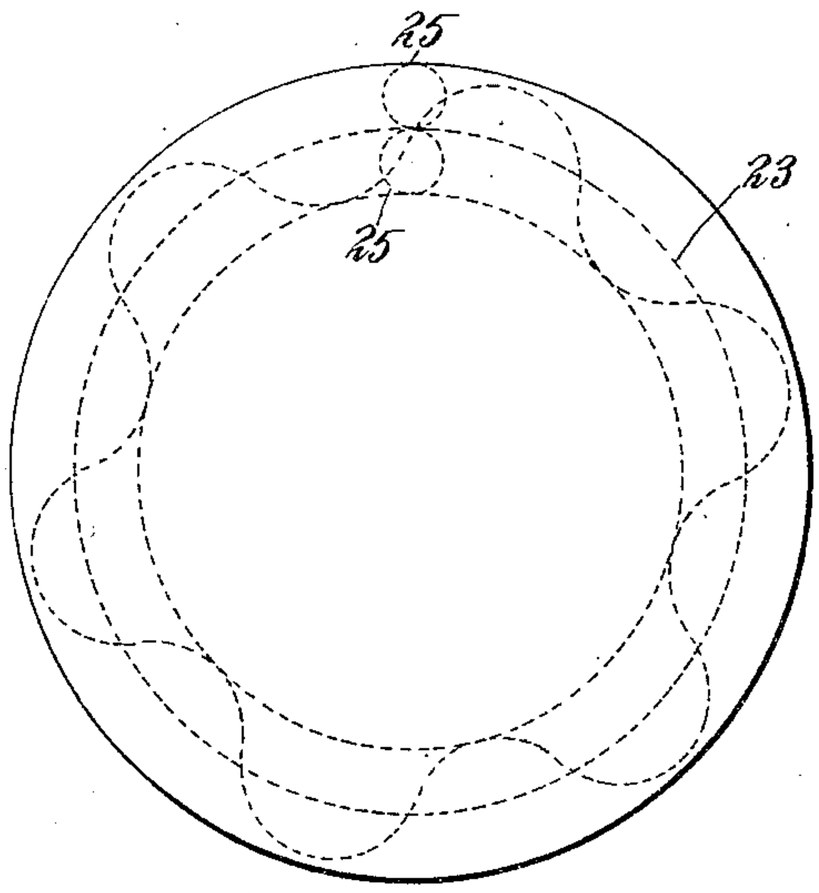



*Fig. 10.*

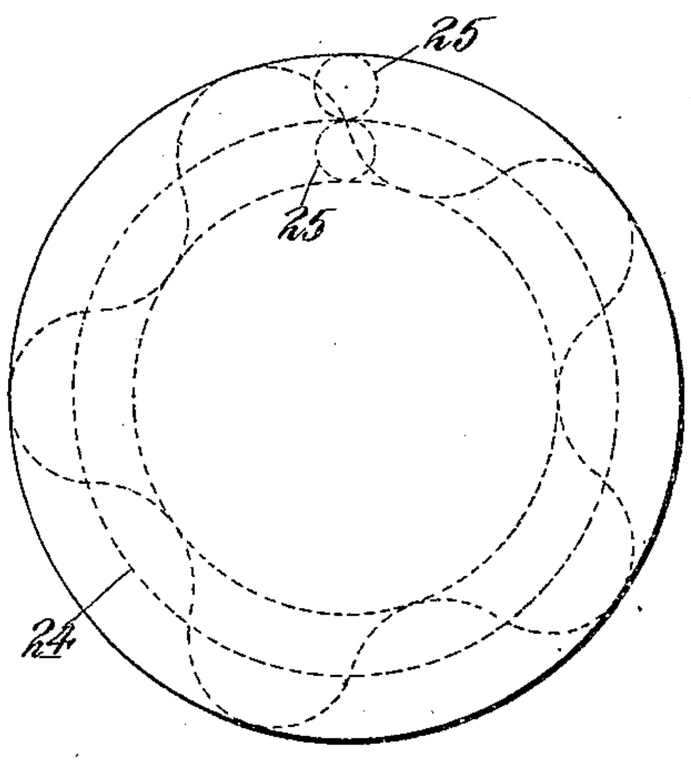



*Fig. 11.*

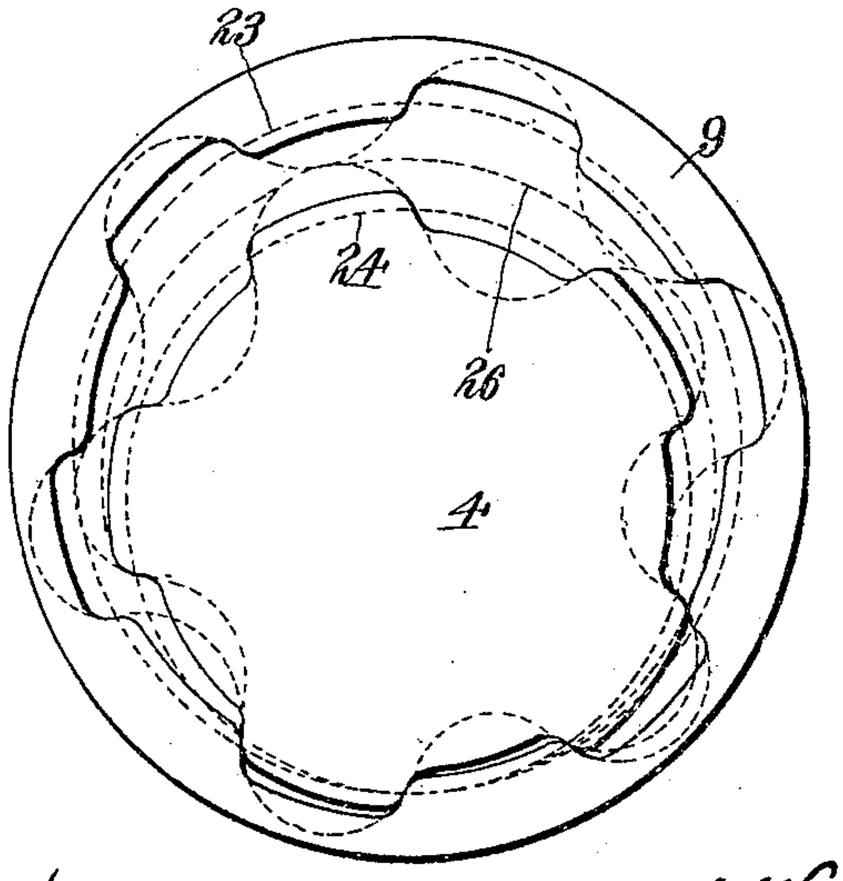
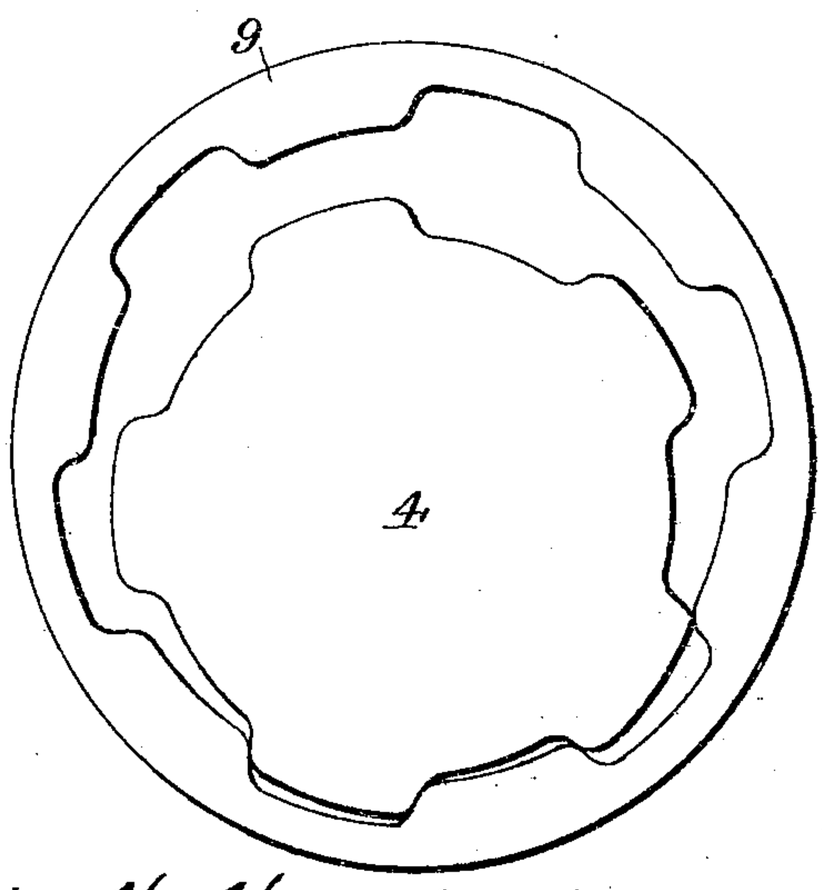



*Fig. 12.*

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# UNITED STATES PATENT OFFICE.

WILLIS H. HAMPTON, OF CANASERAGA, NEW YORK.

## POWER-GEARING.

955,458. Specification of Letters Patent. Patented Apr. 19, 1910.

Application filed January 30, 1907. Serial No. 354,899.

*To all whom it may concern:*

Be it known that I, WILLIS H. HAMPTON, a citizen of the United States, residing at Canaseraga, in the county of Allegany and State of New York, have invented certain new and useful Improvements in Power-Gearing, of which the following is a specification.

My invention relates to an improved power-gearing whereby rotary motion is converted into linear motion at a greatly reduced speed; it being especially designed for use in conjunction with a fence wire-clamp so as to stretch the wires preparatory to fastening to the fence posts, but it is clearly apparent that it may be used in all places where a powerful slow linear movement is desired, such as is required in raising heavy loads, binding loads of hay, or producing a powerful pull upon a chain, cable, or similar object, with a comparatively small driving force.

The objects of my invention are, the production of a device of this character which is light, strong, and inexpensive, and which is highly efficient and quickly adjustable to the various conditions under which it may be placed into action; to so construct the device that it will be self-locking against retrograde action, and will at all times while in use sustain the load or strain without the use of pawls, or other braking or locking-devices when the driving force is removed; and to otherwise improve on devices of this character now in use.

To these ends, the invention consists in the construction, formation, arrangement, and combination of parts to be hereinafter described, and more particularly pointed out in the appended claims.

Reference is to be had to the accompanying drawings in which corresponding numerals of reference refer to corresponding parts in the several figures.

Figures 1 and 2 are opposite side elevations of my improved device. Fig. 3 is a top plan view of the same. Fig. 4 is a diametral section taken on line *x*—*x*, Fig. 1. Fig. 5 is a diametral section taken on line *y*—*y*, Fig. 1. Fig. 6 is a perspective view of the inner end of the operating-handle. Fig. 7. is a section taken on line *z*—*z*, Fig. 5. Fig. 8 is a detached perspective view of the external gear with its integral parts. Fig. 9 is a diagrammatic view of the internal gear showing the manner of generating the teeth therein. Fig. 10 is a diagrammatic view of the external gear, showing the manner of generating the teeth thereon. Fig. 11 is a side elevation of the intermeshed gearing showing the manner of forming the flanks and faces of the teeth. Fig. 12 is a side elevation of the complete intermeshed gears.

The reference numeral 1 designates a wire clamp having the wires 2 of a fence clamped therein, which wires are to be stretched by my improved device 3, preparatory to fastening to the fence posts. As hereinbefore stated, I do not wish to confine myself to conjunctive use with a wire clamp, but simply illustrate the device in use for one of many purposes to which it is adapted.

4 designates an external gear-wheel which may either be fastened to the object to be moved or to a fixed object or anchor; but I have herein shown the same connected to the object to be moved, illustrated as the wire-clamp above referred to. Said gear has formed integrally therewith a loop 5 having a contracted outer end and an arm 6 arranged at an angle to said loop and having at its outer extremity a slot 7 for connection with the wire clamp. Loop 5 and arm 6 may, however, be separably formed and applied to gear 4 in any practicable manner. A chain 8 is provided for connection between loop 5 and the wire-clamp; it having one end thereof secured to said clamp, and at a suitable point it is passed through the enlarged portion of loop 5 and drawn into the contracted end of the latter to cause one of the links of the chain to engage the sides of the loop so as to securely connect it thereto. In this manner the point of connection of chain 8 to the said loop can be changed to vary the line of pulling strain, as may be required; and by reason of the points of the connections of said chain and arm to the wire-clamp being some distance apart, wabbling or rotation of the device in a plane perpendicular to the line of straining force is impossible, thus assuring a fixed position when under strain.

Gear 4 is arranged within and meshes with an internal gear 9 and has the teeth of the latter meshing therewith. Said internal gear has a central opening 10 in

which fits a sleeve or bushing 11 formed on an operating-handle 12 at the inner end thereof. Said bushing is provided with a bore 13 arranged eccentrically therein and passing through said bore is a stud 14 extending axially from the gear 4. Said stud projects through said bore and has its outer end threaded to receive a securing-nut 15; or if desired, a washer and cotter-pin may be used at this point. In this manner, the parts are maintained in operative relation, and upon revolving the operating-handle, the bushing revolves within the opening in the internal gear and around the stud of the external gear. Since the external gear 4 is held in a fixed position, it follows that the internal gear 9 must travel around said external gear and that by reason of its being mounted on the eccentric bushing and being in mesh with the external gear, it is given a combined oscillating and rotary motion whereby each tooth thereof is caused to engage the teeth of the external gear successively, causing a very slow rotary motion of the internal gear, advancing one tooth upon the external gear during a complete revolution of said eccentric bushing.

The eccentricity or throw of the eccentric bushing 11 is in a plane at a right-angle to the operating-handle so that the greatest strain will be exerted upon the bushing when the handle is passing downward, and minimum strain will occur when the handle is moving upward. This is particularly desirable in a hand-operated device, as the greatest resistance is encountered during that portion of the revolution when most power can be exerted on the operating-handle, and the variable work on chain 22 thus harmonizes with the variable effort one is able to exert upon the operating-handle. The internal gear 9 has a chain, rope, or cable-bearing periphery; herein shown in preferred form, with two circumferential series of teeth 17, and its construction comprises in integral form, a hub 18, radial arms 19, and a rim 20 having openings 21 between the arms. The teeth 17 are arranged in pairs and in planes central between said arms so that the links of a chain 22 lying flat against the periphery of the wheel will enter the spaces between the successive pairs of teeth of the two series, while the links standing perpendicular to the face of the wheel rim enter the openings 21 between the arms 19 and the spaces between alined teeth. Chain 22 is secured to an anchor or fixed point, and upon revolving the operating-handle it is apparent that the device is drawn toward the anchor or fixed point by reason of its moving along the chain in a manner similar to a gear-wheel traveling upon a gear-rack. When lifting a load and for many other purposes, the arm 6 and chain 8 may be secured to an anchor or fixed point while the chain 22 is attached to the object to be moved. The eccentric bushing is of a length to provide a good bearing for the internal gear and so that it extends beyond the line of strain of chain 22, thus assuring a solid bearing for the internal gear-wheel.

In order to produce a self-locking device under strain, without the use of pawls, brakes, or other similar devices, and to obtain the greatest reduction in speed, the gears should differ by a single tooth so that the internal gear advances only one tooth during a complete revolution of the eccentric bushing. When so constructed, the axes of the gears are so close together that it is impossible to reverse the gears by tension on chain 22. That these gears may be so nearly equal in diameter, and their teeth clear and work together, it is necessary to provide a special form of teeth. This I accomplish by forming epicycloidal teeth generated or described by rolling or generating circles of a size in diameter equaling or less than one-half the difference in diameter of the two pitch circles of the gears; but preferably one-half of said difference, as clearly shown in Figs. 9 and 11; in which 23 is the pitch circle of the internal gear, 24 the pitch circle of the external gear, and 25 the rolling or generating circles. When so formed, the teeth not only properly escape, but the faces of the teeth of the internal gear will work against the faces of the teeth of the external gear along the medial circle 26 indicated in broken lines in Fig. 11, which is a mean between the pitch circles of both gears. This results in a long arc of contact with very small obliquity of action and minimum sliding action of the teeth upon each other, and this also gives a very short and consequently a very strong tooth, so that the gears may be made small, very light, and powerful; but to further reduce the size of the gears, the height of the teeth are reduced so that the toothed rim or flange of the internal gear need not be as thick as would be necessary if the exact form of teeth generated by the rolling or generating circles were retained. The reduction in height of the teeth also renders the same more effective.

The gears herein shown are in the ratio of five to six; the arc of contact and obliquity of action being as satisfactory as in a wheel of a much larger number of teeth formed in the ordinary way with a rolling or generating circle six times the pitch at least. By using a larger number of teeth for the gears but retaining the difference of one tooth between them, these advantages are amplified.

While my invention is designed primarily for use in exerting a slow and powerful pulling action upon a chain, cable or other object with a comparatively small driving force, it is clearly apparent that it would re-

quire only the skill of an ordinary mechanic to connect the internal-gear with mechanism to be revolved, so that powerful and slow rotary movement can be obtained instead of the lineal movement described.

Having thus described my invention, what I claim is,—

1. A device of the character described, comprising an external gear held against rotation and having a stud extending axially therefrom, an eccentric rotatable on said stud, and an internal gear mounted on said eccentric and in mesh with said external gear.

2. A device of the character described, comprising an external gear held against rotation and having a stud extending axially therefrom, an operating-handle having an eccentric bushing at its inner end fitting onto said stud and revoluble thereon when actuating said handle, and an internal gear mounted on said bushing and being in mesh with said external gear.

3. A device of the character described, comprising an external gear held against rotation and having a stud extending axially therefrom, an operating handle having an eccentric bushing at its inner end fitting onto said stud and revoluble thereon when actuating said handle, said bushing having its eccentricity or throw in a plane at an angle to the handle, and an internal gear mounted on said bushing and being in mesh with said external gear.

In testimony whereof, I have affixed my signature in the presence of two subscribing witnesses.

WILLIS H. HAMPTON.

Witnesses:
CHAS. A. SHAY,
OSCAR E. SHAY.