No. 649,563. Patented May 15, 1900.

W. W. WILLSON.

CABLE SPROCKET WHEEL.

(Application filed Sept. 24, 1897.)

(No Model.)

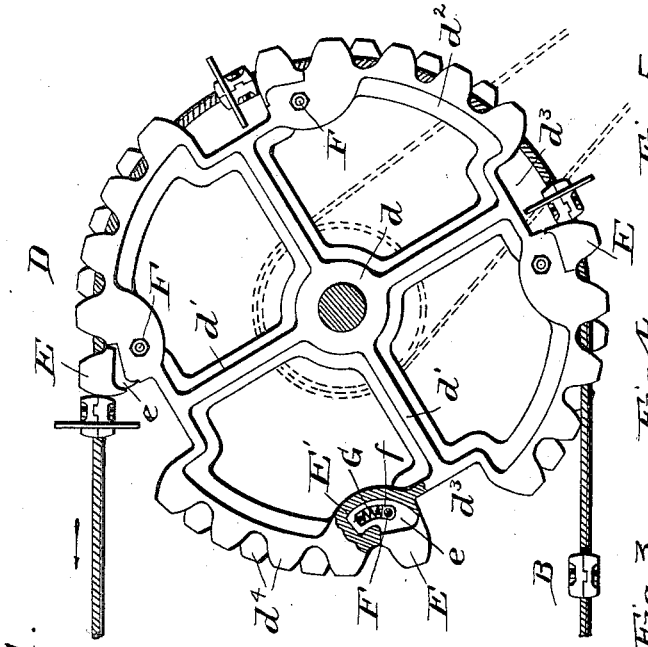


Fig. 1.

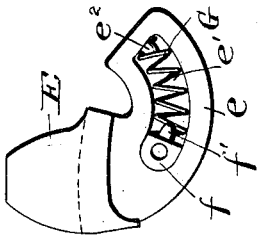


Fig. 5.

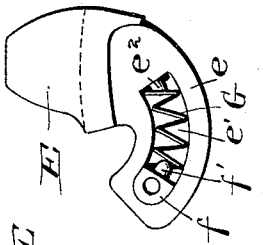


Fig. 4.

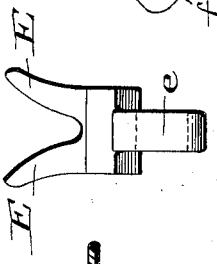


Fig. 3.

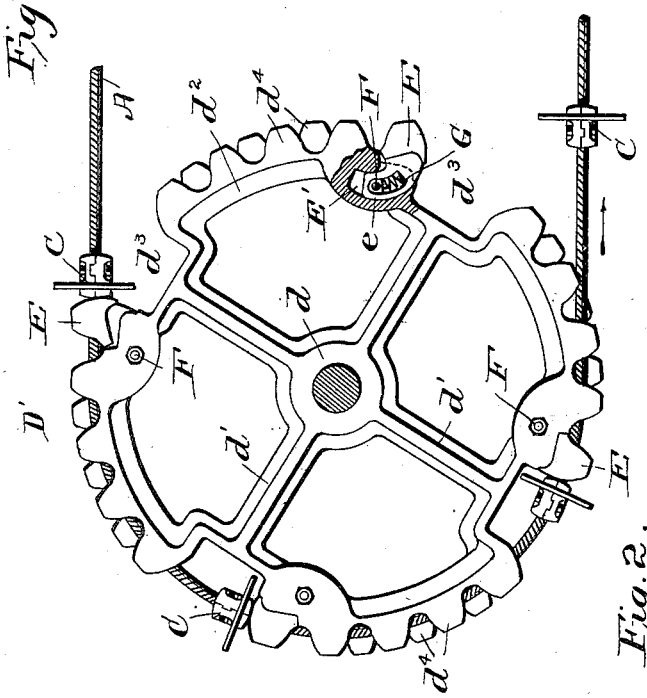
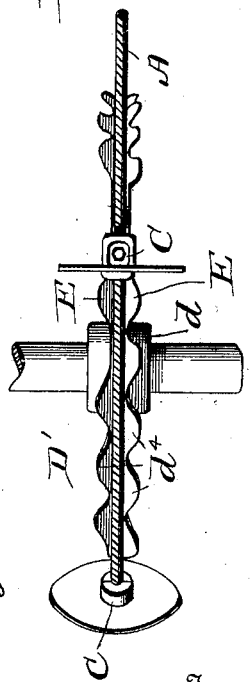


Fig. 2.



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CABLE SPROCKET-WHEEL.

SPECIFICATION forming part of Letters Patent No. 649,563, dated May 15, 1900.

Application filed September 24, 1897. Serial No. 652,867. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. WILLSON, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Cable Sprocket-Wheels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Figure 1 is a side elevation of a mechanism embodying my improvements. Fig. 2 is a plan view. Fig. 3 is a view in end elevation of one of the adjustable teeth. Fig. 4 is a side elevation of one of the adjustable teeth of the driven wheel, and Fig. 5 is a side elevation of one of the adjustable teeth of the driving-wheel.

In the drawings my invention is illustrated as being applied to a mechanism for transmitting power or transporting materials by means of an endless cable having attached thereto sprockets and flights, each or both.

The cable is indicated by A. To this, at suitable intervals, there are secured the attachments, these in some cases being sprocket-blocks B, clamped to the cable, and in some cases being flights, blades, scrapers, or the like, as shown at C, which parts are secured to the cable by sprocket-blocks substantially similar to those at B. Cables of this class and for these purposes as heretofore made and mounted have had incident to them peculiar and serious difficulties, and consequently they have not been introduced into use in lieu of endless chains as largely for many purposes as they would have been.

It has for a long time been recognized that endless cables were preferable to the chains for numerous reasons; but the difficulties aforesaid have prevented their use with entire success. The strands of which the cables are composed are liable to stretch and elongate immediately upon their being subjected to tension or stress, and such stretching continues to a greater or less extent during the time of their use. This makes it practically impossible for the sprocket attachments, the flights, &c., to be secured to the cable in such manner as to always "track" properly upon the wheels. The distance intervals between the sprockets successively are varied because of the stretching, and the "pitch" of the chain soon differs from the pitch of the wheels to such an extent that the sprockets do not register properly with the intended gaps or spaces in the rims of the wheels, and consequently the sprockets "climb" upon the rims or on the teeth, and the mechanism is thrown out of action. The tendency for such stretching to occur necessitates that the gaps or open spaces in the rims of the wheels should be relatively elongated, so as to provide sufficient clearance. After the stretch occurs and the pitch of the sprockets becomes longer than the pitch of the wheels only one of the sprockets can have working bearing against the wheel, and after it leaves the latter there is a slight slip of the cable at many times until the wheel bears against the next sprocket. The teeth of the wheel are tending constantly to move in a circular path, whereas the cable and its attachments after moving for a time in such a path try to escape from the wheel and move away from it in a rectilineal tangential path. The powerful contact-pressure exerted by the teeth or rim of the driving-wheel against the sprockets and, vice versa, exerted by the sprockets on the teeth or rim of the driven wheel interferes with the quick and easy separation of the sprockets and the wheels, and the sprockets are carried by the pressure and friction to points inside of the normal tangential line of the cable. Consequently when the escape occurs it is accompanied by sudden jerks or snaps, which in heavy apparatus is practically a bar to their use.

The present invention aims to overcome the difficulties that have been experienced in using apparatus of this sort.

One of the objects is to have those parts on the wheels which directly engage with the cable-sprockets so arranged that they can move relatively to the wheels, and thus insure a ready engagement and disengagement.

Another object is to have the movable parts on the driving-wheel normally held in one position and adapted to be moved in one di-

rection and the corresponding parts on the driven wheel held in the opposite position normally and adapted to be moved in the opposite direction.

In the drawings, D indicates the driving-wheel as a whole, and D′ the driven wheel. Each of these is shown as being formed with a shaft-hub d, a series of spokes d', a rim d^2, a series of gaps d^3 for the flights or sprockets, and a series of staggered teeth d^4. Adjacent to each of the gaps or recesses d^3 there is a pair of movable teeth E. These are formed with or secured to a plate or carrier-piece e, which is so mounted and supported as to permit the teeth E to move in and out, preferably in a circular or curvilineal path. This carrier-guide e is fitted in a socket or cavity E′, formed in the rim of the wheel, and it is provided with a curved slot e'. It and the teeth E are prevented from escaping by means of a pin or screw F, which passes through apertures in the rim and through the slot e'. G is a coiled spring which is placed in the slot e' and is arranged in such a way as to bear in one direction against the knuckle of the plate e at the end of the slot and in the other direction against the pin or bolt F. Preferably the latter is provided with an abutment-piece f, having a sleeve which surrounds the pin, and the finger f', adapted to hold in place one end of the spring G, the other end being held by a finger or pin e^2, projecting from the plate e.

Upon examining the driving-wheel it will be seen that the spring G is placed between the abutment and the inner end of the slot e'. Consequently the tendency of the spring is to hold the plate e and its teeth E in their innermost position; but at the same time it will allow them to move outward in a curved path to a limited distance, and on turning to the driven wheel it will be seen that the spring is oppositely arranged—that is to say, is placed between the abutment and the metal at the outer end of the slot in the guide-plate e—and consequently that the teeth E will normally be held in their outermost position, but be permitted to move inward.

Fig. 1 illustrates the fact that while a flight or sprocket is traveling around and with the driven wheel through the circular part of its path the teeth E bear against it and impart pressure to it in such a way as to propel it and through it propel the cable; but as soon as the contact-points pass the vertical radius of the wheel and the cable commences its effort to leave the wheel on a tangential line the pressure causes the teeth E to move outward, and a gradual escape of the bearing-surfaces is permitted, the disengagement being such that downward pull upon the rectilineal part of the cable is obviated and sudden jerks or snaps are avoided. When the flight or sprocket reaches the driven wheel, its engagement with the teeth E on the latter is similarly gradual, these teeth being normally held in their outer position by the spring G. As the wheel revolves under the stress of the previous sprockets the newly-approaching sprocket slowly closes down its adjacent teeth E, and at this wheel also there is a similar avoidance of jars or snaps.

While I have above described the sprocket contact part at E and have illustrated it as of the form of a pair of teeth, it will be seen that there can be modification in this respect, the essential feature of the invention relating to having this contact portion of the wheel movable in substantially the way described.

I am aware that it has been proposed to construct a chain sprocket-wheel with bodily-movable teeth or sprockets, each mounted on a fixed pivot at a considerable distance inside the pitched circle, so that the movements of these teeth or sprockets will vary the pitch of the wheel. The pivot of such sprocket-tooth serves as the central point of the two elements of a toggle or knee lever, and the point of contact of the chain cross-bar with a tooth is caused to move outward to a radial distance greater than the normal.

In the present construction the center of motion of the tooth relative to the wheel is an axis in or near the pitch-circle, the purpose being not to vary the pitch distance between the teeth as heretofore. Each movable tooth moves in a circle of very short radius around the aforesaid axis at the pitch-circle, so that the pitch intervals are not materially affected. Consequently the movable teeth in the present construction while not altering the pitch of the wheel enable the cable-sprockets to come to and depart from the normal pitch-line smoothly and without shocks or jars.

By placing the axis of the movable tooth, as aforesaid, well out from the center of the wheel and in or near the pitched circle I have had to devise means for supporting and guiding the tooth different from those heretofore used, as the pivot-pin could not be employed at an axis so placed. The tooth or sprocket part proper, as above described, is in my case provided with a carrier or combined holder and guide, the whole device being bodily movable in contradistinction to swinging around a pivot.

I am further aware, of course, that various constructions have been made or proposed which have had teeth moving directly radially toward and from the center of the wheel; but it will be readily understood that there is a marked difference between a construction of that sort and the one herein presented in that a tooth movable radially does not modify the action of the cable-sprocket and the wheel-sprocket at the instant of engagement or disengagement. In the present case the wheel-sprocket (on the driven wheel) rolls smoothly down to the pitch-line after contacting with the cable-sprocket and as smoothly outward at the time the latter leaves

the wheel, and on the driving-wheel it similarly smoothly effects engagement and disengagement.

What I claim is—

1. In a cable driving mechanism, the combination of an endless cable, provided with a series of wheel-engaging sprockets, a wheel having a series of sprocket-teeth, each tooth being movable on an axis transverse to the wheel plane, and in or near the pitch-circle of the wheel whereby the tooth can have a rocking or roll-like movement without affecting the wheel-pitch, and permit the smooth engagement and disengagement of the wheel-sprocket, substantially as set forth.

2. In a cable driving mechanism, the combination of the cable provided with a series of wheel-engaging sprockets, a wheel provided with a series of teeth rigid with the wheel on a fixed pitch-circle, and a series of movable teeth, each movable tooth being mounted upon an axis transverse to the wheel plane and in or near the pitch-circle of the wheel, substantially as set forth.

3. In a cable driving mechanism, the combination of the cable provided with a series of wheel-engaging sprockets, a wheel having a series of cable-engaging teeth, each tooth being formed of a sprocket portion, and a carrier or base rigid with the sprocket, and the whole tooth being movable longitudinally, curvilineally, substantially as set forth.

4. In a cable driving mechanism, the combination of the cable provided with a series of wheel-engaging sprockets, the wheel provided with a series of curvilineal guides, and a series of cable-engaging teeth on the wheel, each tooth being formed with a sprocket portion, and a sliding guide portion in one of said curvilineal guides, the tooth-guide being rigid with the sprocket-tooth, the sprocket and the tooth being arranged to move longitudinally, and a spring bearing against the tooth and adapted to move it longitudinally, substantially as set forth.

5. In a cable system, the combination of a cable provided with a series of wheel-engaging sprocket-teeth, a driving-wheel for said cable having a series of cable-engaging teeth, and each said tooth having a spring tending to hold it relatively near the center of the wheel, and the driven wheel having a series of sprocket-engaging teeth, each tooth movable toward and from the center of the wheel, and each tooth having a spring arranged to normally hold it relatively remote from the center of the wheel, substantially as set forth.

6. The combination with the endless traction device and the sprockets secured thereto, of the wheel having one or more sprocket-contacts movable in one direction curvilineally in the planes of the wheel when pressing against a sprocket, and means for moving said contact in the opposite direction, whereby the sprockets on the endless traction device are permitted to smoothly engage with and disengage from the wheel-sprockets.

7. The combination with the endless traction device and the sprockets secured thereto, of the wheel having curvilineal guides, the sprocket contacts or teeth movable relatively to the wheel, and the curvilineal sliding plates or guides for the teeth, substantially as set forth.

8. The combination with the endless traction device and the sprockets thereon, of the wheel having the sprocket teeth or contacts moving curvilineally in the planes of the wheel, the guides for the teeth, the springs, and the abutments, substantially as set forth.

9. The combination with the endless traction device and the sprockets thereon, of the wheel having a curvilineal cavity E′, the sprocket tooth or contact movable curvilineally, the guide for said tooth in the said cavity in the planes of the wheels, the spring in said cavity and the abutment for the spring, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. WILLSON.

Witnesses:

ROGER HUTCHINS,

OTTO R. EHRET.