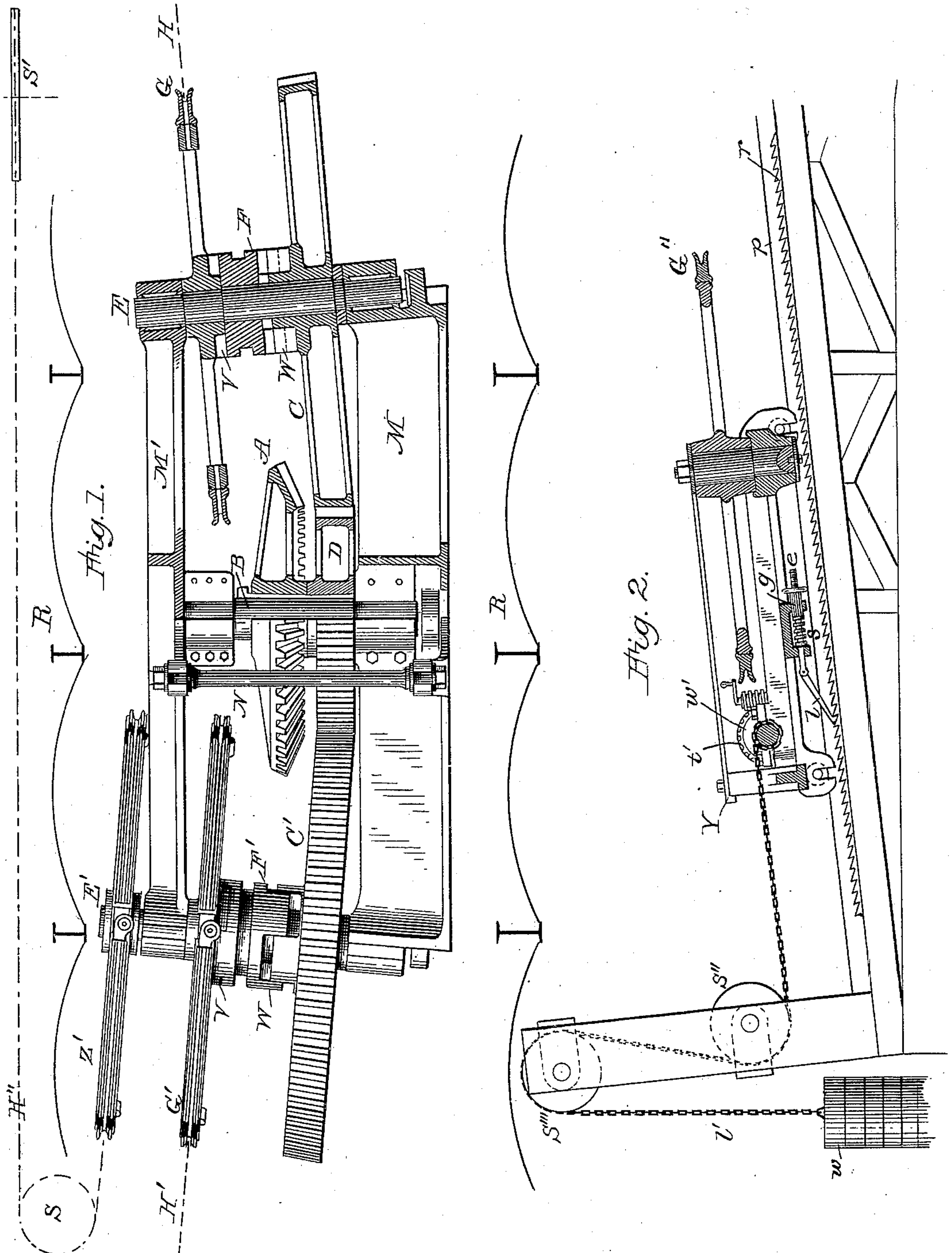
(No Model.) 4 Sheets—Sheet 1.

W. HECKERT.

DRIVING MACHINERY FOR CABLE ROADS.

No. 383,466. Patented May 29, 1888.



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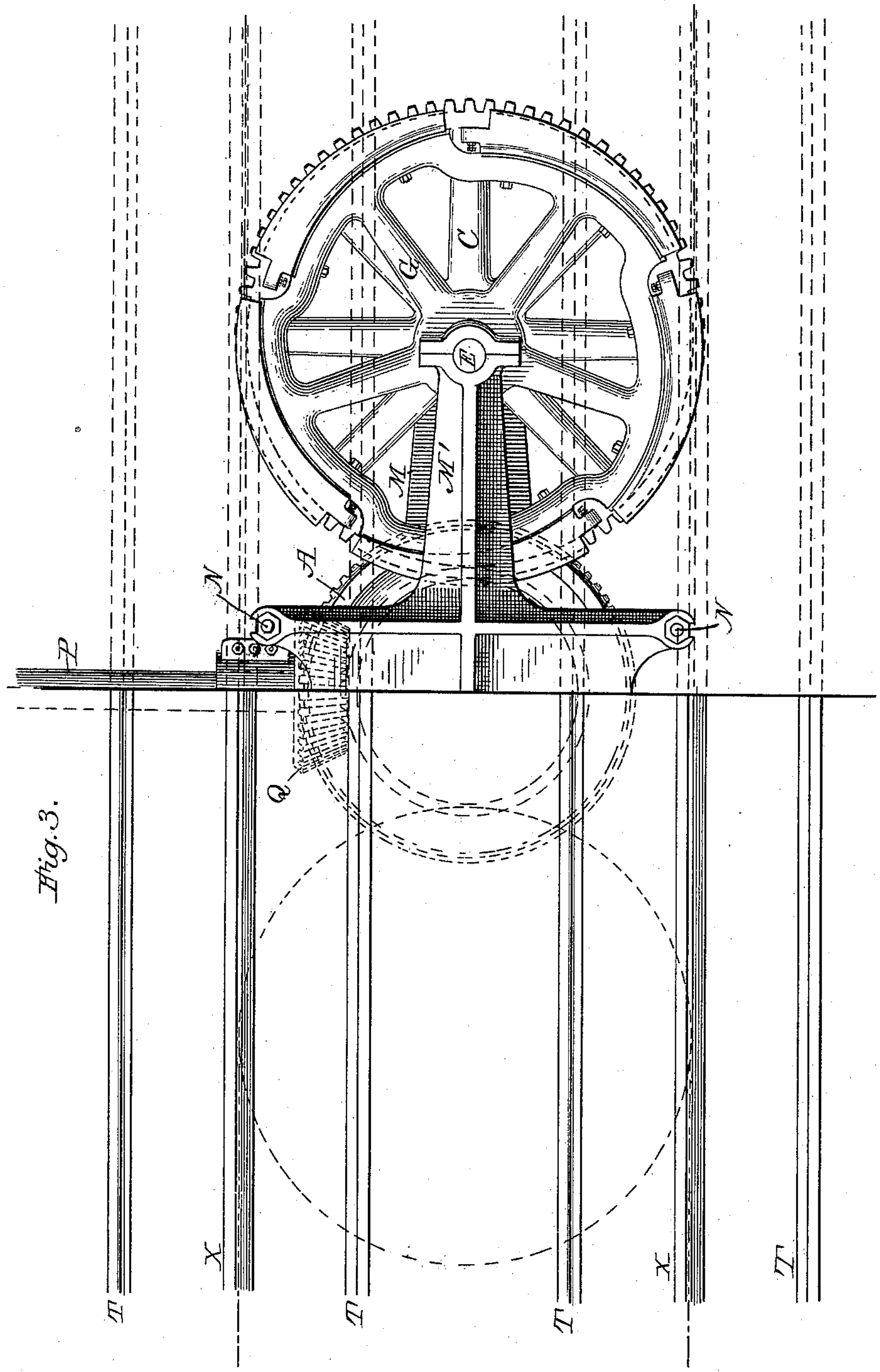

Fig. 3.

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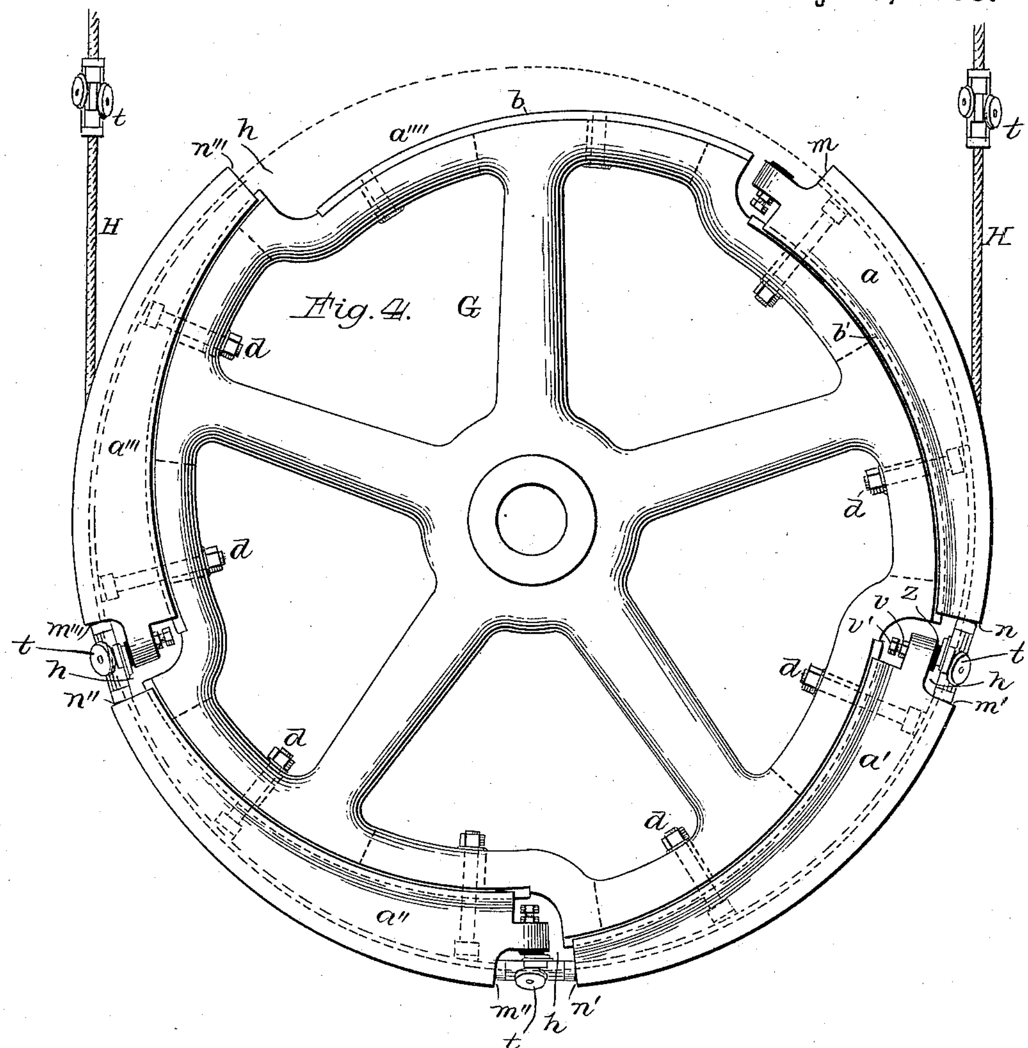

Fig. 4.

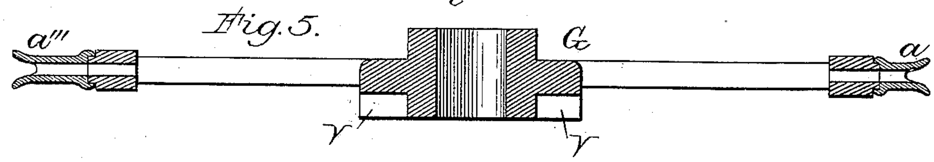

Fig. 5.

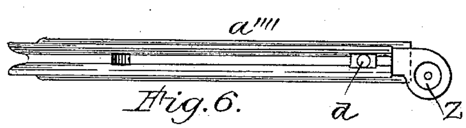

Fig. 6.

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(No Model.)

4 Sheets—Sheet 4.

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DRIVING MACHINERY FOR CABLE ROADS.

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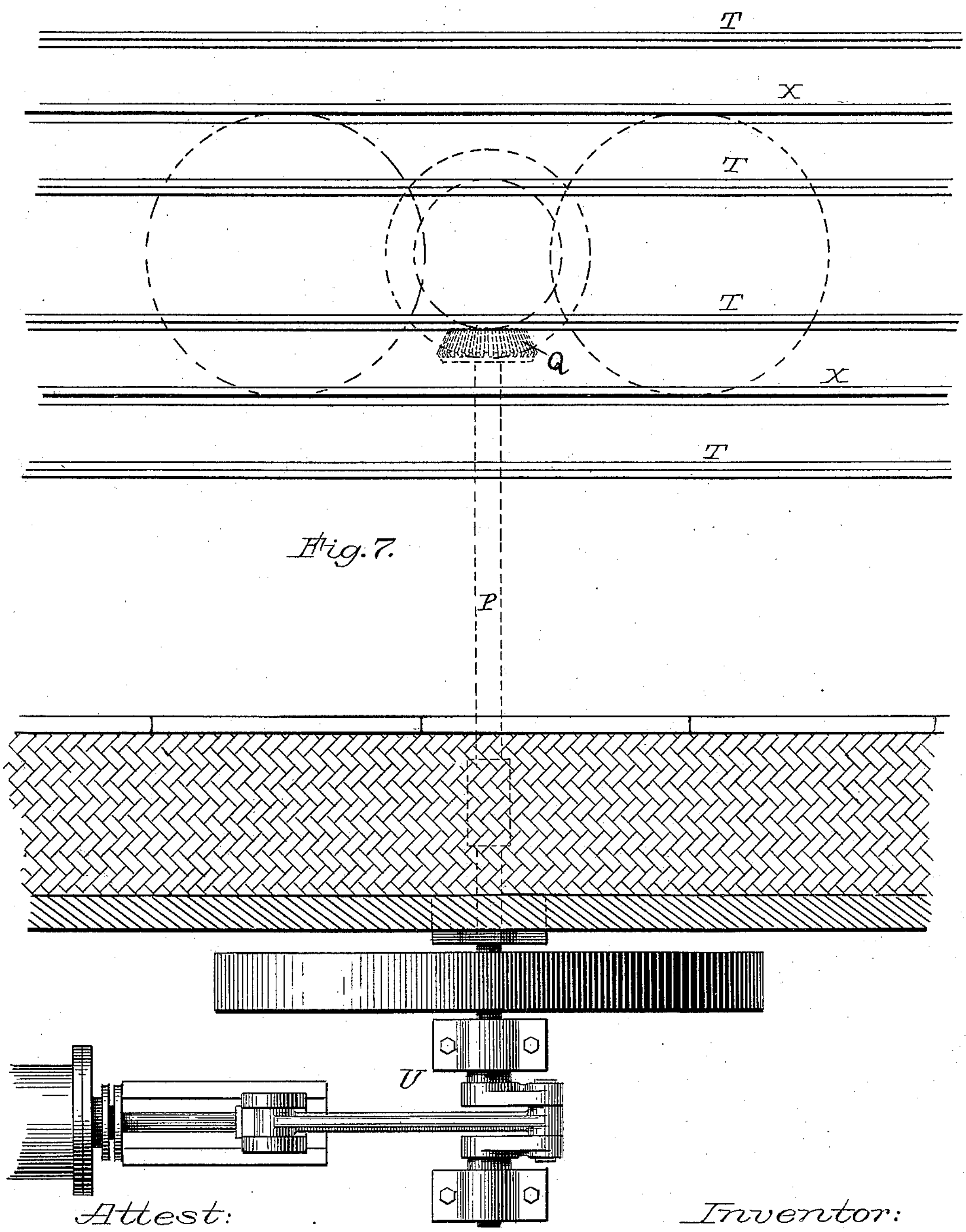

Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM HECKERT, OF YONKERS, NEW YORK, ASSIGNOR TO BENJ. BUTTERWORTH, TRUSTEE, OF CINCINNATI, OHIO.

DRIVING MACHINERY FOR CABLE ROADS.

SPECIFICATION forming part of Letters Patent No. 383,466, dated May 29, 1888.

Application filed February 13, 1888. Serial No. 263,868. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HECKERT, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Driving Machinery for Cable Roads; and I do hereby 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.

My invention consists in certain improvements in the driving machinery of traction-cable roads, and in certain other details of my system of cable roads, as described in this application and in others filed of even date herewith.

In the drawings, Figure 1 represents a half vertical section and half side elevation of the main driving machinery, with cables shown in dotted lines. Fig. 2 shows a vertical longitudinal section of the pit at one end of the road with the inclined railroad and weighted carriage which constitute the tension apparatus. Fig. 3 is a plan view of Fig. 1, one half showing the machinery in full lines and the tracks in dotted lines, the other half showing the tracks and conduits in full lines and the machinery in dotted lines. Fig. 4 is an enlarged view of my expansion driving wheel or drum. Fig. 5 is a diametrical sectional view of Fig. 4. Fig. 6 shows in detail one of the adjustable eccentric shoes upon the driving-wheel. Fig. 7 shows in plan view the relative positions of the driving machinery and the engine or motor from which the power is derived.

One great source of loss of power in all traction-cable railroads as heretofore built has been that expended in overcoming the enormous friction produced by bending the cables around numberless sheaves or pulleys and several times about the winding-drums, in order to get the necessary adhesion of the cable to the driving apparatus. A second loss has been occasioned by the cost of getting the necessary room for the elaborate machinery by which the cable is driven, and by the sinking of so much capital in the first cost of the machinery itself.

In my system, as shown in Figs. 3 and 7, I am enabled to place the driving machinery, which is simple and compact in form, directly beneath the track, while the engine from which motive power is derived may be situated in any convenient place at the side of the street. The cable throughout its entire length makes but two bends, each of a half-circle, or one hundred and eighty degrees. None of the elaborate apparatus heretofore necessary to stretch apart the driving-drums and give the surrounding lengths of cable the necessary adhesion are required in my system. Thus the wear and tear of the cable in passing round many corners is materially reduced and costly cables with wire centers are rendered unnecessary. Moreover, the enormous friction and resistance incurred in bending the cable so many times and dragging it around so many pulleys is totally obviated, and the expense of constructing elaborate machinery is reduced by many thousands of dollars in each road.

Referring to the drawings, U, Fig. 7, is the engine placed in any desired position at the side of the street.

P is the engine-shaft, (shown also in Fig. 3,) which extends from the engine-house to a driving-pit beneath the center of the tracks. Upon the end of the shaft P is the beveled pinion Q, Fig. 3. This gears with the horizontal beveled gear A. (Shown most clearly in Fig. 1.)

Gear A is keyed along with pinion D upon the vertical shaft B. Shaft B is stepped in bearings in the bed-plate M and girder M′ of the frame-work of the driving machinery. This bed-plate and girder are held together, and at a suitable distance, by the vertical tie-rods N, which are threaded at the ends and inserted in the slotted extremities of the girder and bed-plate, as shown in Figs. 1 and 3. At the two ends of the frame-work are stepped the shafts E and E′, inclined slightly from the vertical. Upon these shafts turn freely the large gear-wheels C and C′, which mesh with the pinion-wheel D. Keyed to the shafts E and E′ are the driving wheels or drums G and G′. The clutches F and F′ are upon the shafts E and E′, respectively. The lower teeth, W, of these clutches are twice the length of the upper teeth, V, as clearly shown at the lefthand side of Fig. 1. When the clutches, therefore, are allowed to rest upon the upper faces of the gears C and C′, they do not engage with the driving-wheels G and G′, and the latter need not revolve; but when one of the clutches is raised a distance equal to the length of the teeth V and one-half of the length of the teeth W the former teeth mesh with those upon the clutch-block, while the latter are not entirely disengaged, and the gear C and the driving-wheel G are locked together and revolve as though keyed upon the same shaft E. The cable passes up an incline, as shown in Fig. 1, to the level of the street and then into ends of the conduit and out along the length of the road.

In long lines the driving machinery is placed as near as possible midway of the length of the road, and there are two separate cables, as shown in Fig. 1, each furnishing motive power to one section of the road. To provide for the expansion of the cable a tension apparatus must be placed at each end of the road. Such a tension apparatus is shown in vertical section at Fig. 2. In this figure, as also in Fig. 1, R represents the roof of the pit. *p* represents an inclined track having the rack *r*. Upon the track runs the carriage Y by means of little rollers. (Shown in dotted lines.) Upon the carriage Y is supported a sheave, G″, around which the cable passes in its passage from one conduit to the returning-conduit. Besides the weight of the carriage, which tends to roll it down the track, there is attached to it the heavy weight *w* by means of the chain *l*′, which passes over the pulleys S″ S‴ and around the windlass *w*′. This windlass can be turned by the worm-gear *t*′. Thus the connection of the weight and the carriage being adjustable, it is equally effective for any position of the carriage within a wide range of motion, while the weight itself has but a limited range of motion.

To prevent the combined weight of the carriage and its auxiliary weight from being overcome by a sudden pull of any kind upon the cable, the pawl attached to the carriage is allowed to engage with the rack *r*. This pawl is hinged to a spindle, *e*, which is controlled by the spring *s*. The bearing of the spring is upon the screw-collar *g*, which is adjustable upon the spindle *e*. Thus the pawl under the control of the spring is allowed an amount of play equal to the pitch of the rack; and if for any reason—such as an unusual expansion or contraction of the cable—the carriage is allowed to sag down or is dragged up such a distance that the pawl would become jammed the pressure may be relieved by turning the screw-bearing *g*.

The cable H, Fig. 4, in place of running upon the usual stationary sheaves, carries with it little trucks *t*, placed at convenient distances of about sixty-eight inches, which run upon tracks in the conduit. These trucks are fastened upon the cable and fit into the opening between one end, *n*, of one of the adjustable shoes upon the driving-wheel G and the opposing end, *m*′, of the next shoe. The sides of the trucks come down upon the adjustable bearing *h*. (Shown in Figs. 4 and 6.) This adjustable bearing consists of a plate of rubber, Z, held in place by a bolt on which are the jam-nuts *v v*′, Fig. 4.

It is evident that as the cable stretches in use or with the varying temperature of the seasons the distance between the trucks *t* will vary. To accommodate the driving-wheel to these changes and always have a uniform and equal bearing upon each of the shoes *a a*′, &c., they are provided with an inner bearing-surface, *b*′, which is eccentric to the circumference of the driving-wheel. The rim of the driving-wheel G is provided with correspondingly eccentric bearing-surfaces *b*. The shoes *a a*′, &c., are held to the wheel-rim by bolts *d*. These bolts pass through the slots in the wheel-rim, as shown in Figs. 4 and 5, and allow of considerable lateral adjustment of the shoes. This, with the eccentric bearings before described, permits of the necessary increase or decrease of circumference in the pitch-line of the driving-wheel to provide for the stretching of the cable. It will be observed that through the peculiar construction of these eccentric shoes the pitch-line of the expansion driving-wheel is always an exact circle, whatever the adjustment of the shoes.

It is evident that there will be a break or hiatus in the line of the road from the point where the cable H dives below the surface to the point at which the cable H′ appears, between which points there is no driving power. To supply this hiatus I employ the auxiliary cable, H″, shown in Fig. 1.

A third driving-drum is placed on the shaft E′. Around this the cable H″ passes, then around the pulleys S, through the conduit, and around the horizontal pulley S′. Between Z′ and pulleys S the two parts of the cable must cross in order that the working portion of the cable shall run in the right direction.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In the driving machinery of a traction-cable railroad, the frame under the track, in combination with the motor at one side of the track, the shaft stepped in the frame and inclined slightly from the perpendicular, suitable gearing for transmitting motion from the motor to the shaft, and the expansion driving-drum having adjustable eccentric shoes upon the shaft, substantially as described.

2. In a traction-cable railroad, the combination of the double driving machinery placed midway of the length of the road, the two cables extending in opposite directions, each furnishing motive power to one section of the road, and the auxiliary cable which supplies the hiatus between the two main cables operated by a third wheel on the driving machinery, substantially as described.

3. In cable-driving machinery, an expan-

sion driving-wheel having adjustable eccentric shoes, substantially as described.

4. In cable-driving machinery, an expansion driving-wheel having eccentric bearing-surfaces upon its outer rim, in combination with adjustable shoes having inner eccentric bearing-surfaces and outer concentric bearing-surfaces, and the bolts passing through the shoes and through the slots in the wheel-rim, substantially as described.

5. In a tension apparatus for cable railroads, the combination of the inclined track with its rack, weighted carriage running on the track, and the adjustable spring-pawl engaging with the rack, substantially as described.

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

WILLIAM HECKERT.

Witnesses:

FRANK HECKERT,

LAURA A. HECKERT.