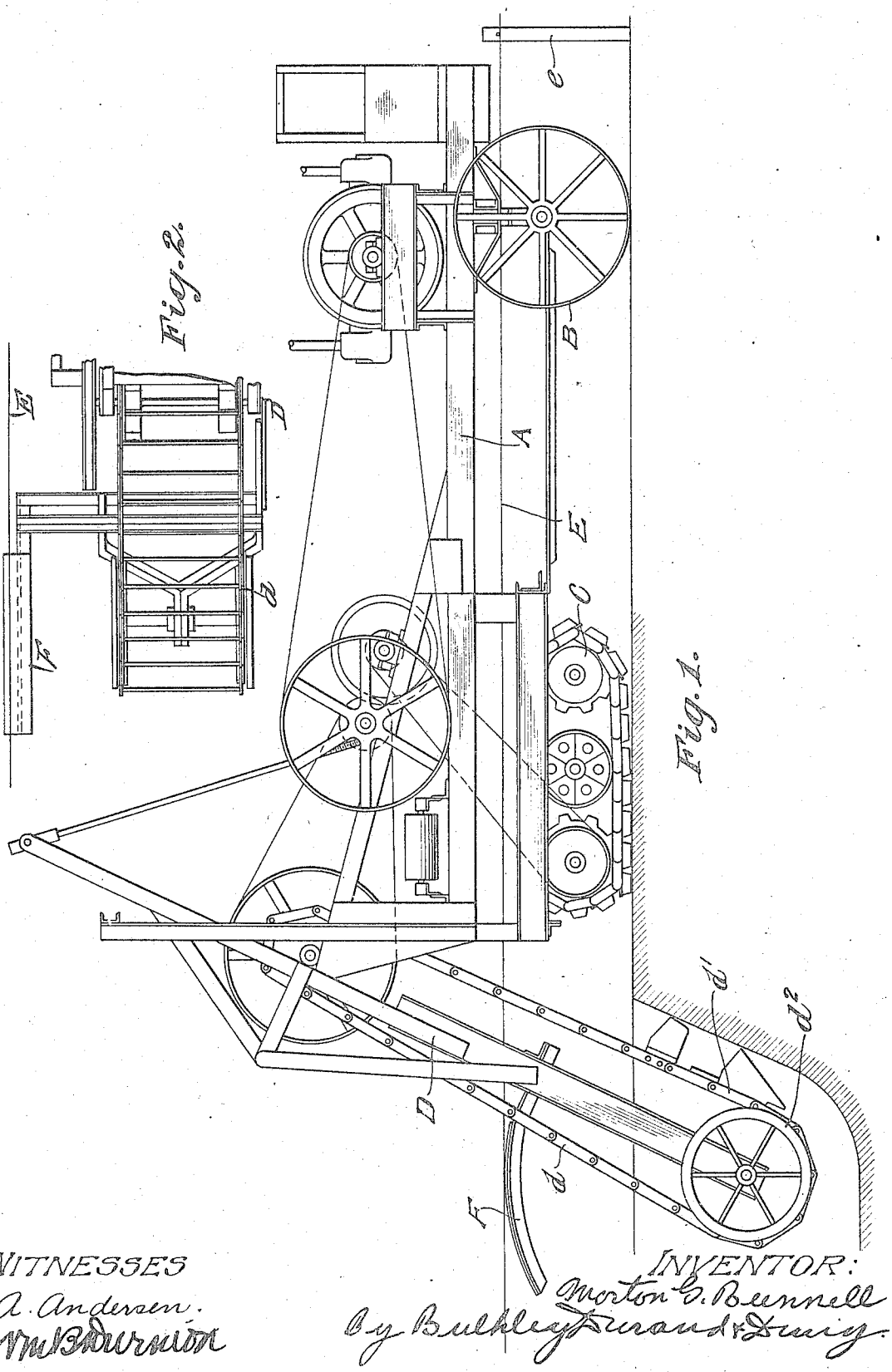
M. G. BUNNELL.

EXCAVATING MACHINE.

APPLICATION FILED FEB. 28, 1910.

1,131,114.

Patented Mar. 9, 1915.



WITNESSES

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EXCAVATING-MACHINE.

1,131,114. Specification of Letters Patent. Patented Mar. 9, 1915.

Application filed February 28, 1910. Serial No. 546,347.

To all whom it may concern:

Be it known that I, MORTON G. BUNNELL, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Excavating-Machines, of which the following is a specification.

My invention relates to excavating machines in general, but more particularly to those for making ditches, and especially to the kind known as trenchers. In the use of machinery of this kind it frequently happens that great difficulty is experienced in making the bottom of the ditch or trench follow a certain predetermined grade line, owing to inequalities in the surface of the ground. Very often the grade line or direction of the ditch, when viewed from the side, does not follow the surface line, and in such case the machine must be adjusted often in order to keep the excavation from going above or below the grade line. If the machine starts down hill, then the excavating apparatus at the rear must be adjusted to prevent the bottom of the trench from rising above the grade line; and if the machine starts up hill, then the apparatus must be given the opposite adjustment in order to prevent it from going below the grade line. Prior to my invention it was a matter of some difficulty to determine these adjustments accurately, and, moreover, the necessity for adjustment was not always instantly and readily apparent.

The object of my invention is, therefore, to provide an arrangement whereby the necessity for adjustment to maintain a certain grade line will at once become manifest, whenever the machine passes on to either lower or higher ground, or for any other reason departs from the direction prescribed for the bottom of the trench, and whereby the adjustment for such purpose, when required, will be more easily made accurate than heretofore.

In the accompanying drawings—Figure 1 is a side elevation of a trencher embodying the principles of my invention. Fig. 2 is a plan of the said machine, with the right hand portion thereof broken away for convenience of illustration.

As thus illustrated, the trencher is of that well known type in which a body A is mounted on front wheels B and on rear tractors C. The trenching apparatus, for making a trench or ditch, comprises the adjustable frame D upon which is mounted the traveling chain belt d having the excavating buckets d'. For convenience of illustration, only one or two buckets are shown, but it will be understood that any number may be employed on said belt, as well as cutters or other known devices for forming a trench in the ground. The said excavating apparatus is at the rear of the excavator, and hence a narrow trench is formed as the machine slowly moves forward. This is all well known. The usual or suitable means are employed for raising and lowering the frame D to vary the depth of the trench, or to maintain a certain predetermined depth. If the forward end of the machine drops down, owing to unevenness of the ground, then the frame D must be lowered to preserve the grade line for the bottom of the ditch. On the other hand, if the machine starts up hill, then the frame D must be raised to prevent the excavation from extending below the grade line. Heretofore the operator has accomplished this as best he could. In accordance with my invention, however, I now provide a line or wire E which is stretched on stakes e above the ground, and which is parallel with the grade line desired for the bottom of the ditch. On the frame D I provide a curved bar F which is formed on the line of a circle struck from the center or axis of the sprocket wheels d^2 at the bottom of the said frame. The link belts d having the excavating buckets and other devices travel around these sprockets. If the periphery of the curved bar F is kept in the same horizontal plane as the wire E, then the grade line will be preserved and the bottom of the ditch will be everywhere the same distance below the said wire. Suppose, for example, that the forward end of the machine suddenly drops down. In such case the operator can then restore the excavating apparatus to the right level by lowering the frame D until the bar F is again in line with the wire E. Or, if the machine starts up hill, then the operator raises the frame D until the said bar F is brought into line with said wire. Thus, and regardless of the angle of the frame D, the grade line will be pre-

served so long as the periphery of the bar F is maintained on a level with the wire E.

If desired, the bar F can be disposed immediately below the said wire E, as shown in Fig. 2. With this arrangement, and in order to keep the machine working at the proper grade line, it is only necessary for the operator to keep the bar F just barely in touch with the said wire. This makes it very easy for the operator to preserve any given or predetermined grade line.

Another way of using my invention is as follows: The bar may be used by the operator to preserve the grade line by sighting, relative to a series of objects, such as a line of posts, if such is desired. Here, also, the operative point on the indicator is always above the axis about which the bar is curved. The bar *f* is, therefore, in the nature of an indicator arm for determining the adjustment necessary for preserving a certain grade line. Being curved, as shown, the indicator is operative at any angle of the frame D, as the point of contact of the indicator with the wire is always directly above the lower axis of the excavator—that is, above the axis of the wheels d^2 of the excavator.

It will be understood that my invention serves equally well to keep the ditch in a straight line, when viewed from above—that is to say, should the machine swerve to the right or the left, such deviation will be instantly observed by the operator, and with my improved indicator the machine can be immediately brought back to the desired or requisite direction of movement. In other words, the wire can be strung at a uniform distance above the depth desired for the bottom of the ditch, and this wire can be straight or made to follow a curve, either to the right or to the left, or can be given any other desired direction. So long as the operator makes the machine follow the wire, the grade line of the ditch and the direction thereof will be in accordance with previous calculations. With my invention the necessity for adjustment is not only easily discernible, but is also more easily made accurate after such necessity becomes manifest. The highest point on the curved indicator bar must be maintained in line with or close to the wire, and this will preserve the grade line, regardless of the angle at which the bucket frame is operating.

The line above ground, relative to which the curved indicator bar is maintained in close relation to maintain the grade, may be a wire or rope, or it may be an imaginary line determined by sighting from one object to another.

With the construction shown and described, the indicating point on the bar F is always on a vertical line which intersects the axis of the sprockets d^2, for regardless of the angle of the frame D, the point on the bar F which must be kept in line with the wire is always the highest point thereon. If the frame D is tilted in one direction, this moves the indicating point toward one end of said bar F—that is to say, the point to be kept on the wire will then be found to have shifted toward one end of the bar; but if the frame D is tilted in the other direction, then the operative point on the bar F will be shifted in the other direction. But always, as stated, this indicating point is on a vertical line which intersects the axis of the wheels d^2, and the curvature of said bar F constitutes the means for causing this.

What I claim as my invention is:

1. In an excavator, an element which works in the ground to form the ditch, and an indicator on said element, movable therewith, in fixed relation thereto, adapted to coöperate with a line above ground, comprising a member having an edge curved about a point at the lower end of said element, whereby the grade line is maintained for the ditch.

2. In an excavator, an element which works in the ground to form the ditch, having an axis of operation for the lower end thereof, means whereby the said element is subject to variations in the angle thereof, means above the ground for determining the grade line of the bottom of said ditch, and mechanism for indicating any up and down deviation from said line, said mechanism having means for keeping the indicating point thereof (for all operating angles of said element) on a vertical line intersecting said axis.

3. In an excavator, an element which which works in the ground to form the ditch, pivoted at its upper end, adapted to be raised and lowered on the excavator to vary or preserve the grade line, and an indicator on said element for showing deviation from the grade line, including a member curved about a center at the lower end of said element, movable therewith and in fixed relation thereto, projecting rearwardly therefrom, disposed above ground, adapted to indicate the necessity for and character of adjustment required to maintain the grade line.

4. In an excavator, an element which works in the ground to form the ditch adjustable to different angles, a grade line suitably supported above ground, and a curved indicator on said element, projecting rearwardly therefrom, disposed above ground, said indicator being formed on the line of a circle struck from a point at the lower end of said element, whereby said element, when disposed at different angles, but always with the periphery of said indicator on said grade line, will keep the bottom of the ditch a uniform distance below said line.

5. In an excavator, an element which works in the ground to form the ditch, adapted to be disposed at different angles, by tilting in a vertical plane, and a curved indicating arm thereon, said arm being formed on the line of a circle struck from an axis at the lower end of said element, said element having supporting means arranged for rotation about said axis.

6. In an excavator, a grade line indicator therefor, having means for keeping the indicating point thereof on the line of a circle struck from a horizontal axis below, and in the vertical plane of said axis, means above for establishing the grade line, coöperating with said indicator.

Signed by me at Chicago, Illinois, this 23rd day of February, 1910.

MORTON G. BUNNELL.

Witnesses:

S. LEWIS,

WM. B. DURMON.