

T. LINGA.

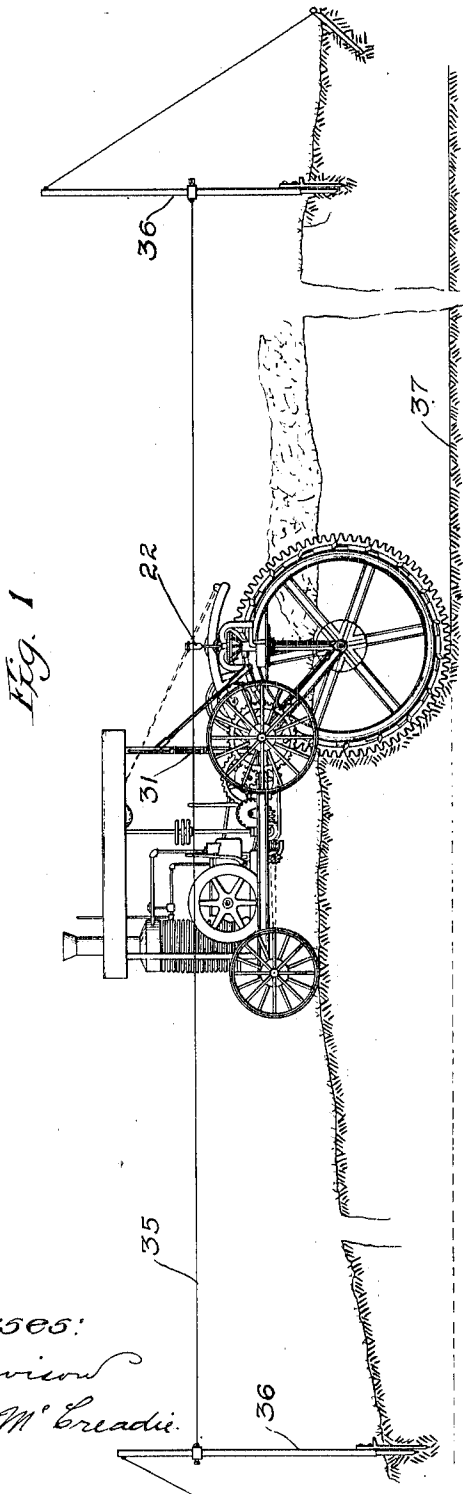
DITCHING MACHINE GAGE.

APPLICATION FILED SEPT. 30, 1910. RENEWED AUG. 20, 1913.

1,099,385.

Patented June 9, 1914.

3 SHEETS—SHEET 1.



Witnesses:

Ed. C. Davison

Robert S. M'Creddie.

Inventor:

Torbjörn Linga

By *[Signature]*
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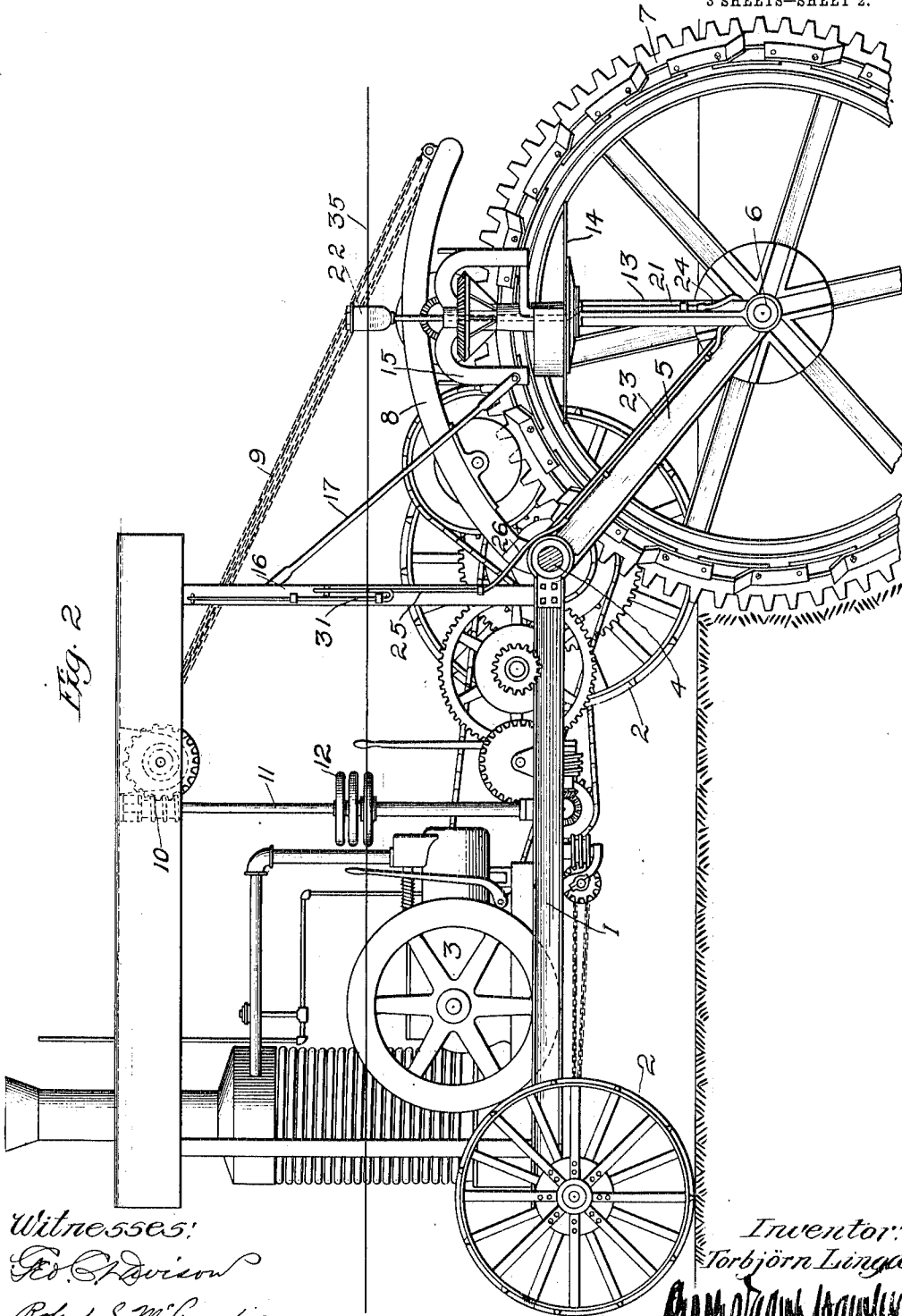
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3 SHEETS—SHEET 2.



Witnesses:
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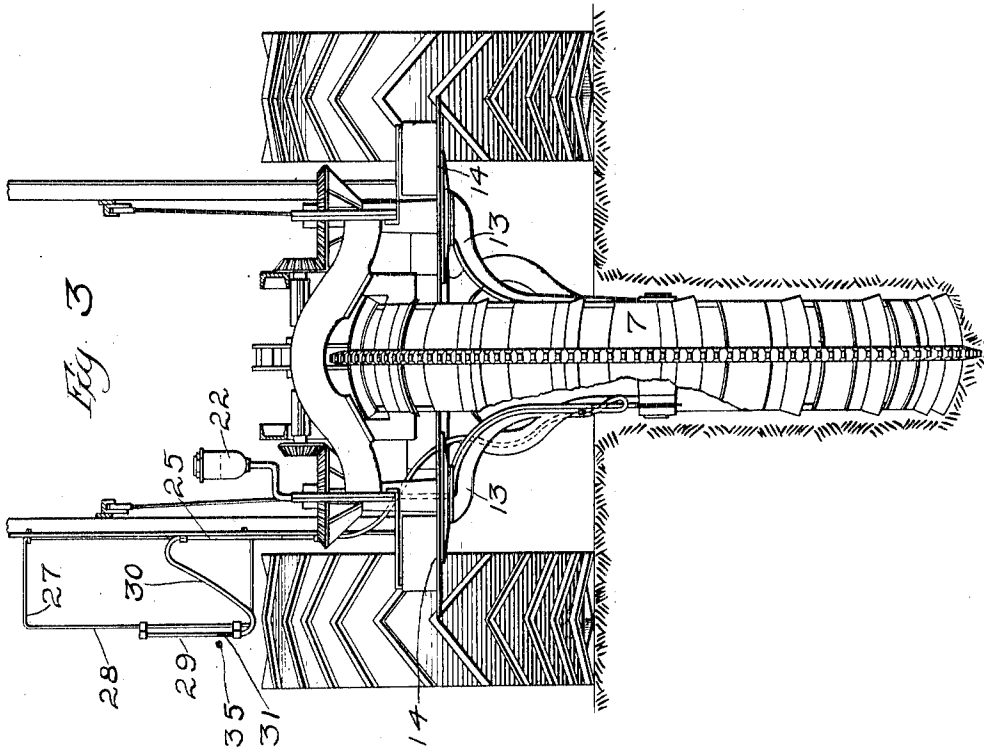
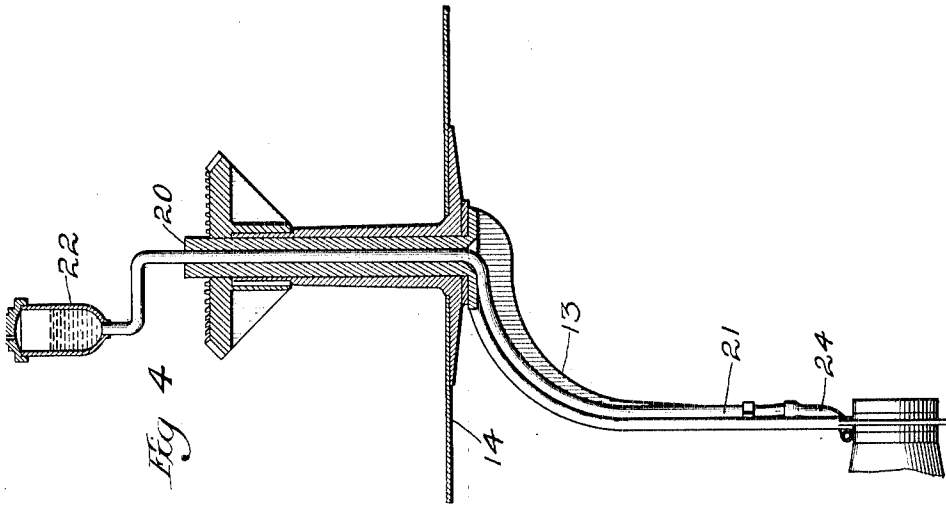
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3 SHEETS—SHEET 3.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

TORBJÖRN LINGA, OF THOR, IOWA, ASSIGNOR TO AMERICAN DITCHING MACHINE COMPANY, OF WEST MINNEAPOLIS, MINNESOTA, A CORPORATION OF MINNESOTA.

DITCHING-MACHINE GAGE.

1,099,385.

Specification of Letters Patent.

Patented June 9, 1914.

Application filed September 30, 1910, Serial No. 594,695. Renewed August 20, 1913. Serial No. 785,321.

To all whom it may concern:

Be it known that I, TORBJÖRN LINGA, a subject of the King of Norway, residing at Thor, in the county of Humboldt and State of Iowa, have invented certain new and useful Improvements in Ditching-Machine Gages, of which the following is a full, true, clear, and exact description.

My invention relates to ditching machines and particularly to ditching machines used for digging ditches or trenches for drainage or sewerage purposes.

Ditches or trenches which are used for sewerage or drainage purposes must necessarily follow a definite grade in order that the water or sewerage carried thereby will be properly directed to the place where it is intended to be delivered. It often happens that the land which is to be drained or in which a sewer is to be laid is irregular in surface contour, and on this account it has been difficult heretofore to maintain the grade and depth of the ditch regardless of the surface irregularities, since the machine necessarily follows these irregularities.

The object of my invention is to provide a ditching machine having means for indicating, at every instant during the operation of the machine, the relation of a ditch or trench dug by said machine to predetermined factors of grade and depth.

My invention consists in a ditching machine having an indicator which indicates any variation in the grade and depth of the ditch from a definite relation to predetermined factors of grade and depth, and which thereby calls to the engineer's attention the necessity of adjusting the machine to compensate for these variations.

The ditching machine comprises a movable truck and a digging element or apparatus which is raised and lowered relatively to the truck so as to vary the depth of the ditch, the raising and lowering of the digging element being under the control of the engineer.

The indicator preferably comprises a liquid gage glass carried on the truck of the machine and connected with a reservoir associated and movable with the digging apparatus. The engineer by adjusting the digging apparatus keeps the level of liquid in the indicator coincident with respect to a surveyor's line. Accordingly the ditch at all points bears a definite relation to said line

regardless of the rise and fall of the machine due to the ground irregularities. The predetermined grade and depth factors are determined usually by survey and preferably represented by a cord or wire stretched along the line on which the ditch is to be dug. Thus the cord or line establishes a basis of grade and depth to which the grade and depth of the ditch is maintained in definite relation.

Reference may be had to the accompanying drawings which represent the preferred embodiment of my invention.

Figure 1 is a diagrammatic view of a ditching machine digging a ditch in ground, the surface of which is irregular, the said view showing the indicator carried by said machine and showing a surveyor's line which represents predetermined factors of grade and depth; Fig. 2 is a side elevation of a digging machine equipped with a liquid indicating device; Fig. 3 is a rear end elevation of the machine in Fig. 1 showing the indicating device associated with the truck and digging wheel of the ditching machine; Fig. 4 is an enlarged sectional view of one of the conveyer uprights upon which is supported the liquid supply reservoir.

Like parts will be referred to by similar reference numerals throughout the several views.

Referring first to Figs. 2, 3 and 4, I will describe in detail the structure of the preferred embodiment of my invention. The main truck of the ditching machine, indicated generally by 1, is adapted to be propelled on its wheels 2 by any suitable motive power, such for instance as the gasoline engine 3 carried in the forward part of said truck and connected by suitable gearing to the wheels thereof to propel said truck along the ground. On the rear axle 4 of said truck is pivotally mounted a clevis 5, in the outer end 6 of which is rotatably mounted a digging wheel 7 which is driven by the engine 3 through suitable gearing. Rigidly secured to the pivotal end of the clevis 5 is a curved arm 8 connected at its outer end by a chain 9 extending to a winding drum or hoisting device 10 supported in the roof of the truck. The hoisting mechanism 10 is operated by a vertical shaft 11 which may be manually rotated by means of the hand wheel 12 or be mechanically driven by the

engine through suitable gear mechanism. This hoisting mechanism together with other devices for ditching machines is more fully described and claimed in my copending application filed September 30, 1910, Serial No. 584,694. The arm 8 and the clevis 5 together constitute a bell crank lever pivoted on the axle of the truck. The hoisting mechanism 10 serves as a means for swinging this bell crank lever about its pivotal axis 4 in a vertical plane and since the digging wheel 7 is carried in the outer end of the clevis 5 of the bell crank lever said wheel will be raised and lowered accordingly as the bell crank lever is swung vertically. By this arrangement the digging wheel 7 is raised or lowered to adjust it to dig any reasonable desired depth of ditch. Pivottally mounted upon the same axis as the digging wheel 20 on the outer end of the arm 5 are the two uprights 13, one on each side of said wheel. These uprights support on their upper ends adjacent the wheel the conveyer tables 14 and their suitable driving mechanism. Between the depending arms of the bridge 15 across the upper ends of the uprights 13 and the vertical roof supports 16 on the truck are the links 17 pivottally connected to said arms and said supports. As the digging wheel is raised or lowered these links swing on their pivots substantially with the clevis 5 thereby maintaining the uprights 13 in a vertical position relatively to the truck at all times regardless of the position to which the digging wheel 7 is raised or lowered.

I will now proceed to describe the indicating device of my invention.

Referring particularly to Figs. 2, 3 and 4 it will be seen that the uprights 13 have outwardly curved upper ends from which extend vertically the stud shafts 20 upon which the conveyer tables 14 are rotatably mounted. From a point near the pivotal axis 6 of one of the uprights 13 is a pipe 21 which follows the curvature of said upright and extends vertically through the center of said stud shaft 20. This pipe projects beyond the upper end of said shaft 20 and is bent horizontally for a short distance and then vertically, finally expanding out into a liquid supply cup or reservoir 22. Along the clevis 5 is arranged another pipe 23 connected at one of its ends with the lower end of the pipe 21 by means of the flexible tube 24 and connected at the other of its ends to another pipe 25 by means of a flexible tube 26. The pipe 25 is vertically mounted on the roof support 16. On the support 16 is a rectangular open frame 27 which swings horizontally thereon, and upon the vertical side 28 of this frame is a gage glass or indicator 29 slidably mounted thereon. The lower end of this gage glass 29 is connected with the upper end of the pipe 25 by means

of the flexible tube 30, which allows the said gage glass 29 to be shifted vertically without breaking the connection between it and the pipe 25. A quantity of liquid, preferably water, is contained in the reservoir 22 and gage glass 29, and in the various pipes and flexible tubing just described which connect them. In the drawings the level of water is indicated at 31, but of course this level rises or falls in said glass 29 accordingly as the reservoir 22 is raised or lowered with the digging wheel with respect to the gage glass 29.

Referring now to Fig. 1, the line 35 is a cord or wire stretched between suitable supports 36 along the line on which the ditch is to be dug. This cord represents factors of grade and depth of ditch which have been determined upon as by a survey. The bottom of the ditch 37 must bear a definite relation to the surveyor's line 35, that is, it must be definitely spaced therefrom at all points. It will be noted, however, that the level of the ground over which the machine is traveling is irregular in surface contour and that if the digging wheel is left in a fixed position relative to the truck, the bottom of the ditch would be given a contour corresponding to the surface irregularities. As the digging operation goes on however, the engineer notices the rise and fall of the liquid in the gage glass and operates the hoisting mechanism 10 to raise or lower said wheel to compensate for these variations, thereby maintaining the level of the water in the gage glass 29 always coincident with the line 35, hence the bottom 37 of the ditch will follow practically a straight line parallel with and at a given depth below the surveyor's line 35 regardless of any irregularities in the surface of the ground. In other words since the reservoir bears a fixed relation to the bottom of the digging wheel and since the water in the gage as a whole at any given instant is in a state of quiescence, the rise or fall of the truck and wheel together will cause the gage glass to correspondingly rise or fall and show the level either above or below the surveyor's line. On noticing such a variation the engineer adjusts the digging wheel until he restores the level of the water in the gage glass coincident with the surveyor's line. The gage glass is mounted on the horizontally swinging frame 27, so as to swing out in a position very close to the wire or cord 35, or to swing inwardly to a position close to the upright 16, where it is out of the way and less liable to be damaged. By mounting the gage glass to slide vertically upon this frame, I am enabled to increase the range through which the digging wheel can be raised or lowered relatively to the truck without causing the level of the water in the glass to rise above or fall below the ends of said glass.

I do not wish to be limited to the particular form of the device which I have shown, since it is apparent that that may be considerably varied without departing from the spirit of my invention.

I claim:

1. The combination with a surveyor's line adjusted to a predetermined grade, of digging apparatus including a main frame and a relatively adjustable digging element for digging a ditch corresponding to the grade of said line, and a fluid indicator associated with both the frame and the digging element for indicating the relation of a given point in said ditch with respect to the grade of said line.

2. The combination with a digging apparatus having two relatively adjustable parts for digging a ditch of a given depth and grade with respect to a predetermined line, of a liquid level indicator associated with both said parts for indicating relatively to said line a variation in the depth and grade of the ditch dug by said apparatus and means for adjusting said digging apparatus to compensate for said variations indicated by said indicator.

3. The combination with a surveyor's line representing predetermined factors of grade and depth, of a ditching machine adapted to follow the irregularities in the surface contour of the ground over which said machine travels and provided with a vertically adjustable digging element adapted to dig a ditch bearing definite relation to said line, a liquid indicating device associated with said machine and digging element indicating variations from said definite relation, and means for controlling the operation of said digging machine to compensate for said variations.

4. The combination with a surveyor's line representing predetermined factors of grade and depth, of a ditching machine comprising a movable truck and a digging wheel carried thereby adapted for digging a ditch bearing a definite relation to said line, a liquid indicator carried by said truck and a reservoir connected therewith movable with said digging wheel, means for raising and lowering said reservoir to maintain the level of the liquid in said indicator coincident with said line and for raising and lowering said digging wheel with respect to the truck when the level of the liquid in said indicator varies from coincidence with said line.

5. In a ditching machine the combination with a movable truck and digging wheel arranged for vertical movement with respect thereto, of a liquid indicator carried by said truck, a reservoir supplying liquid to said indicator and following the movements of said digging wheel, and means for vertically moving said digging wheel to maintain the level of liquid in said indicator coincident

with a given surveyor's line regardless of the variations in the surface contour of the ground over which said machine travels.

6. In a ditching machine the combination with a movable truck and a digging wheel carried thereby and adapted to be raised and lowered with respect to said truck, of a liquid indicating device associated with said truck and wheel comprising an indicator adjustably fixed on said truck and a reservoir connected with said indicator supplying liquid thereto and adapted to be raised and lowered with said digging wheel, and means for raising and lowering said digging wheel to maintain the level of liquid in said indicator coincident with a given surveyor's line regardless of the rise and fall of the machine.

7. In a ditching machine the combination with a movable truck, of a clevis pivotally mounted upon the rear of said truck and carrying at its outer end a digging wheel rotatably mounted thereon, an upright carried by said truck, a gage glass mounted on said upright, an upright carried on the outer end of said clevis and a reservoir mounted upon the upper end thereof, a pipe connecting said gage glass and reservoir, said reservoir supplying liquid to said gage glass, and means for raising and lowering said clevis to cause the liquid level to rise and fall in said gage glass.

8. In a ditching machine the combination with a truck adapted to move along and follow the irregularities in the surface of the ground, of digging apparatus carried by said truck and movable relative thereto, a liquid indicator carried by said truck and a reservoir associated with said digging apparatus having connection with said indicator and movable with said digging apparatus, and means for raising and lowering said digging wheel and reservoir to adjust the liquid level in said indicator coincident with a given surveyor's line regardless of the rise and fall of said indicator with said truck.

9. In a ditching machine the combination with a movable truck, of a clevis pivotally mounted by one of its ends on said truck and carrying at its other end a digging wheel rotatably mounted thereon, an upright carried on said truck, a laterally disposed frame work hinged to swing horizontally upon said upright, and a gage glass vertically adjustable upon the outer portion of said framework, an upright carried on the outer end of said clevis and a reservoir for supplying liquid to said indicator mounted upon the end of said upright, and means for raising and lowering said clevis to vary the level of liquid in said gage glass.

10. In a ditching machine the combination with a truck, and a digging wheel mounted thereon and vertically movable with respect thereto, of a gage glass carried by said truck,

a reservoir movable with said digging wheel and supplying liquid to said gage glass, and a substantially U-shape pipe connection between said reservoir and said gage glass, and means for vertically moving said wheel and said reservoir thereby causing the level of liquid in said gage glass to rise and fall.

11. In a ditching machine the combination with a truck and digging apparatus associated therewith, of a liquid indicating device associated with said truck and digging apparatus and means for raising and lowering said digging apparatus to vary the depth of ditch dug by said apparatus and to maintain the level of the liquid in said indicating device constant with respect to a pre-determined surveyor's line, whereby a ditch is dug bearing a definite relation to said line regardless of the contour of the ground over which said machine travels.

12. In a ditching machine the combination with a movable truck and digging apparatus carried thereby and relatively movable with respect thereto, of a liquid indicating device

associated with said truck and digging apparatus, comprising a liquid indicator adjustably fixed upon said truck and a liquid reservoir movable with said digging apparatus, and means for moving said digging apparatus to maintain the level of the liquid in said indicator coincident with a given surveyor's line.

13. A ditching machine comprising a truck, a digging element adjustable with relation thereto and means for adjusting said digging element to vary the depth of the ditch, a gage glass on said truck, a reservoir movable with said element and a flexible connection extending between and depending from said gage glass and reservoir as and for the purpose specified.

In testimony whereof, I have hereunto set my hand, this 6th day of September, 1910, in the presence of two subscribing witnesses.

TORBJÖRN LINGA.

Witnesses:

VICTOR J. HILL,
WM. MORRIS.