

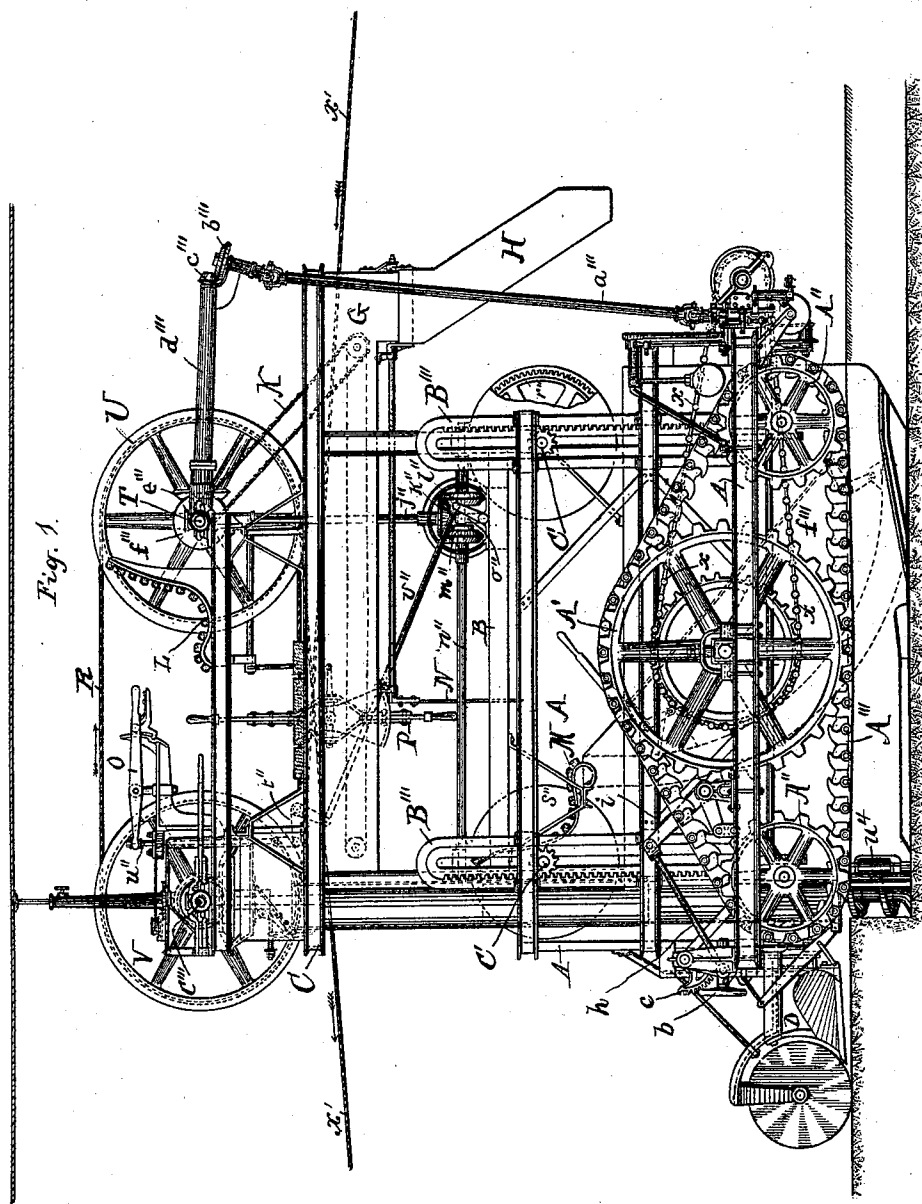
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9 Sheets—Sheet 1.

O. B. H. HANNEBORG,
DITCHING AND TILE LAYING MACHINE.

No. 536,339.

Patented Mar. 26, 1895.



Witnesses:

E. M. Clark

Co. Sedgwick

Inventor:

O. B. H. Hanneborg

per: Munn & Co.

Attorneys

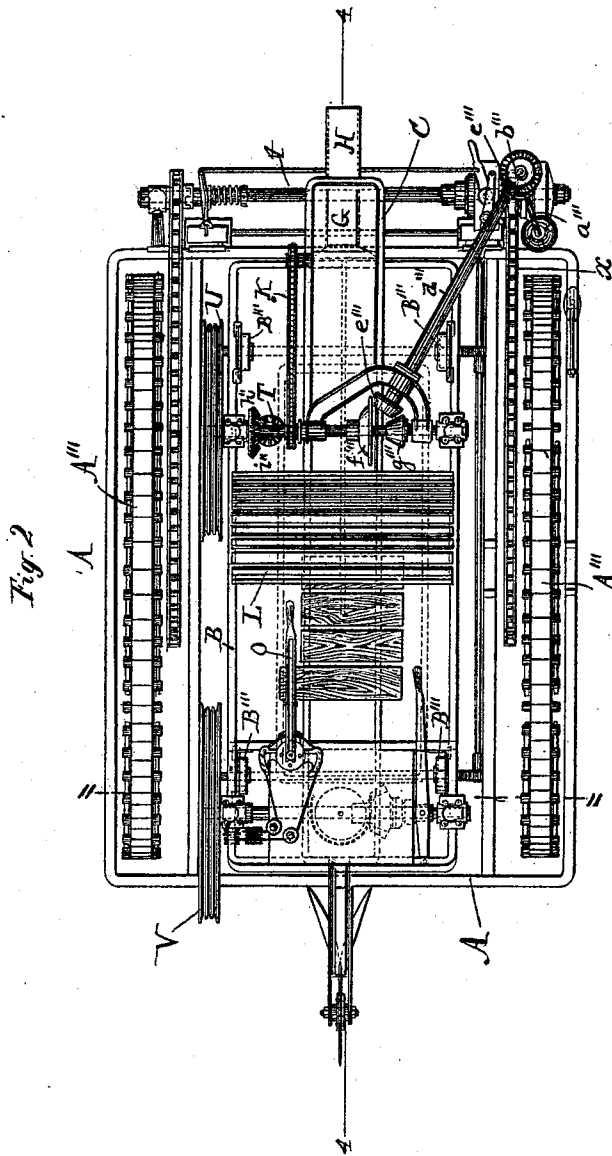
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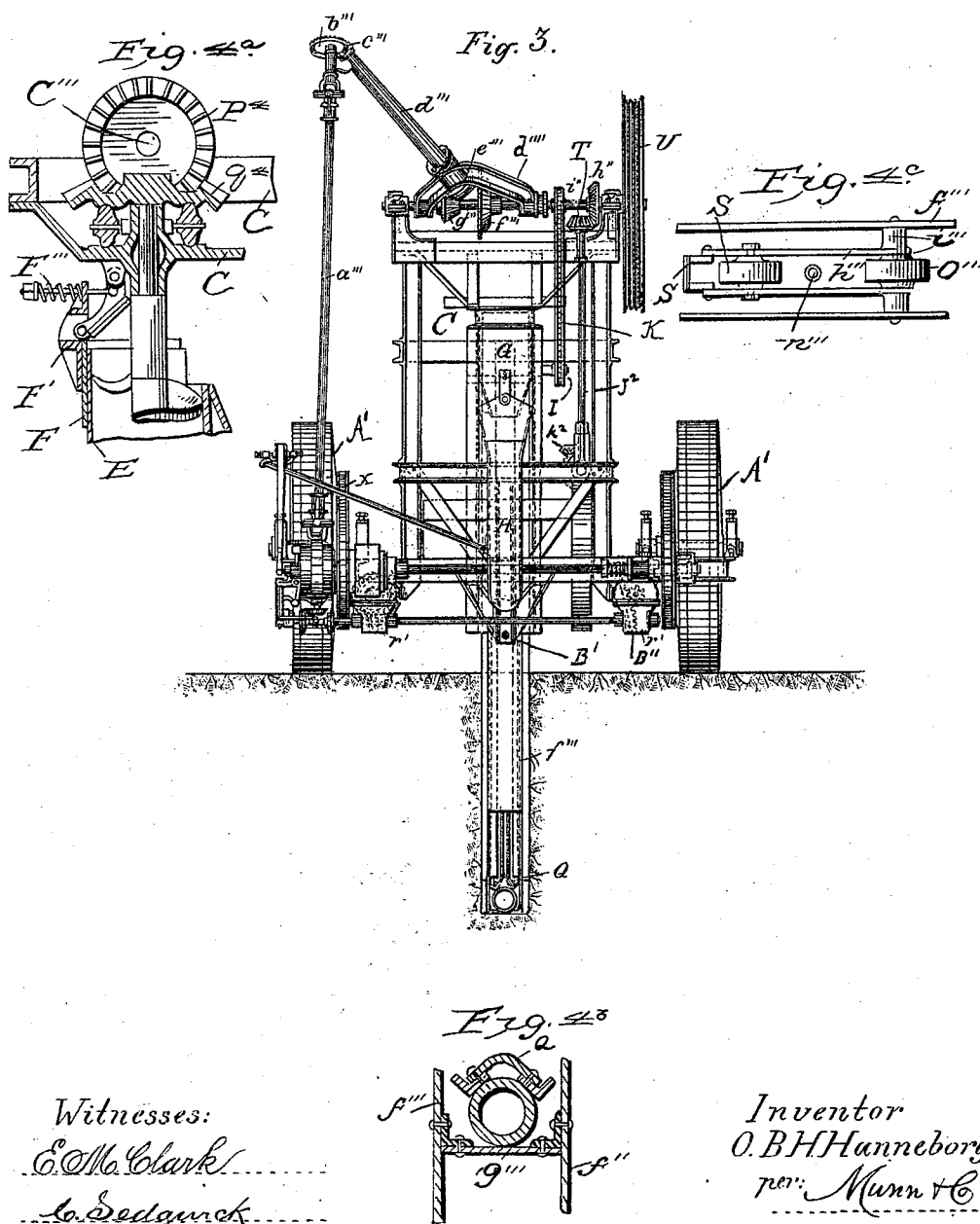
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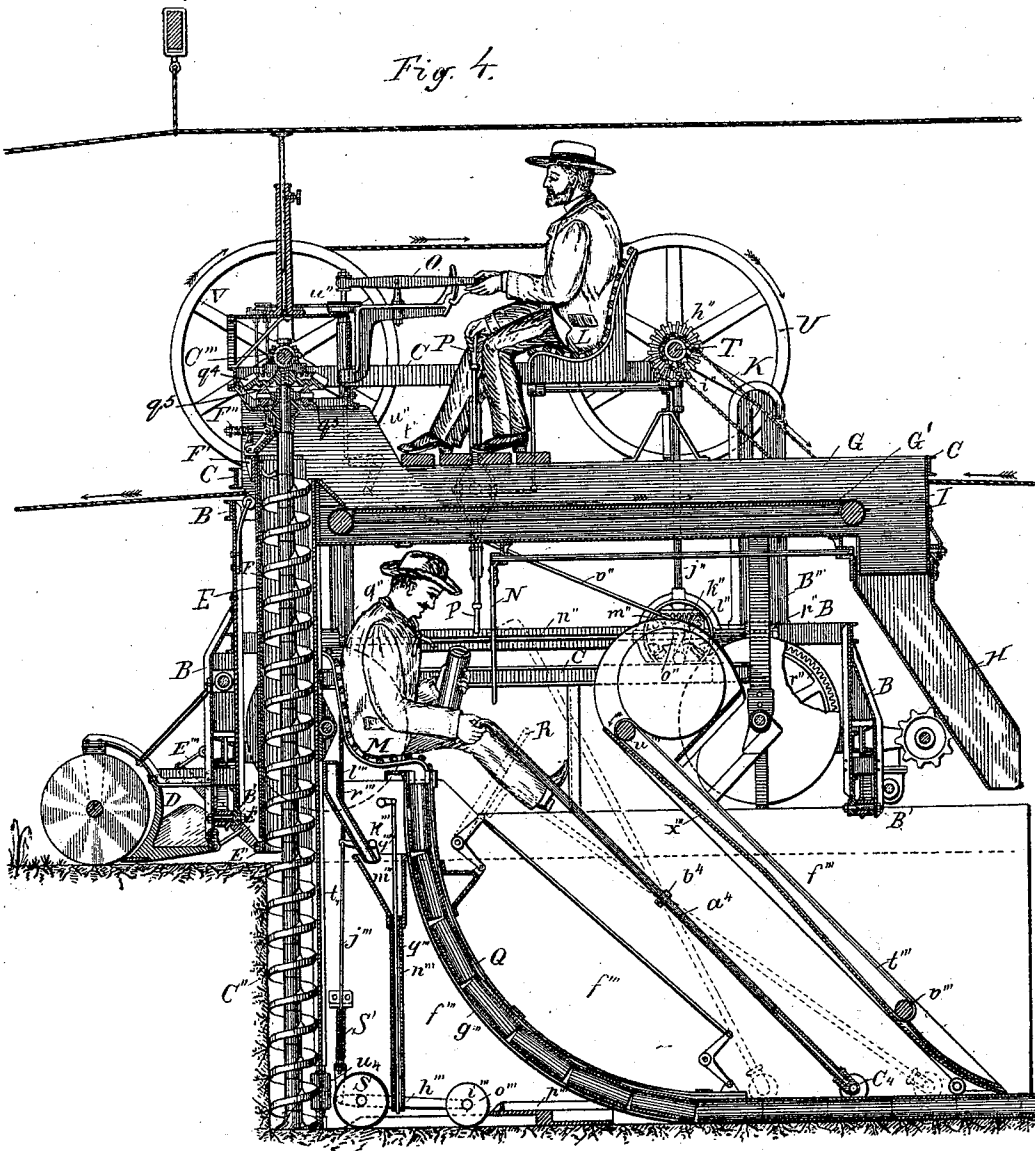
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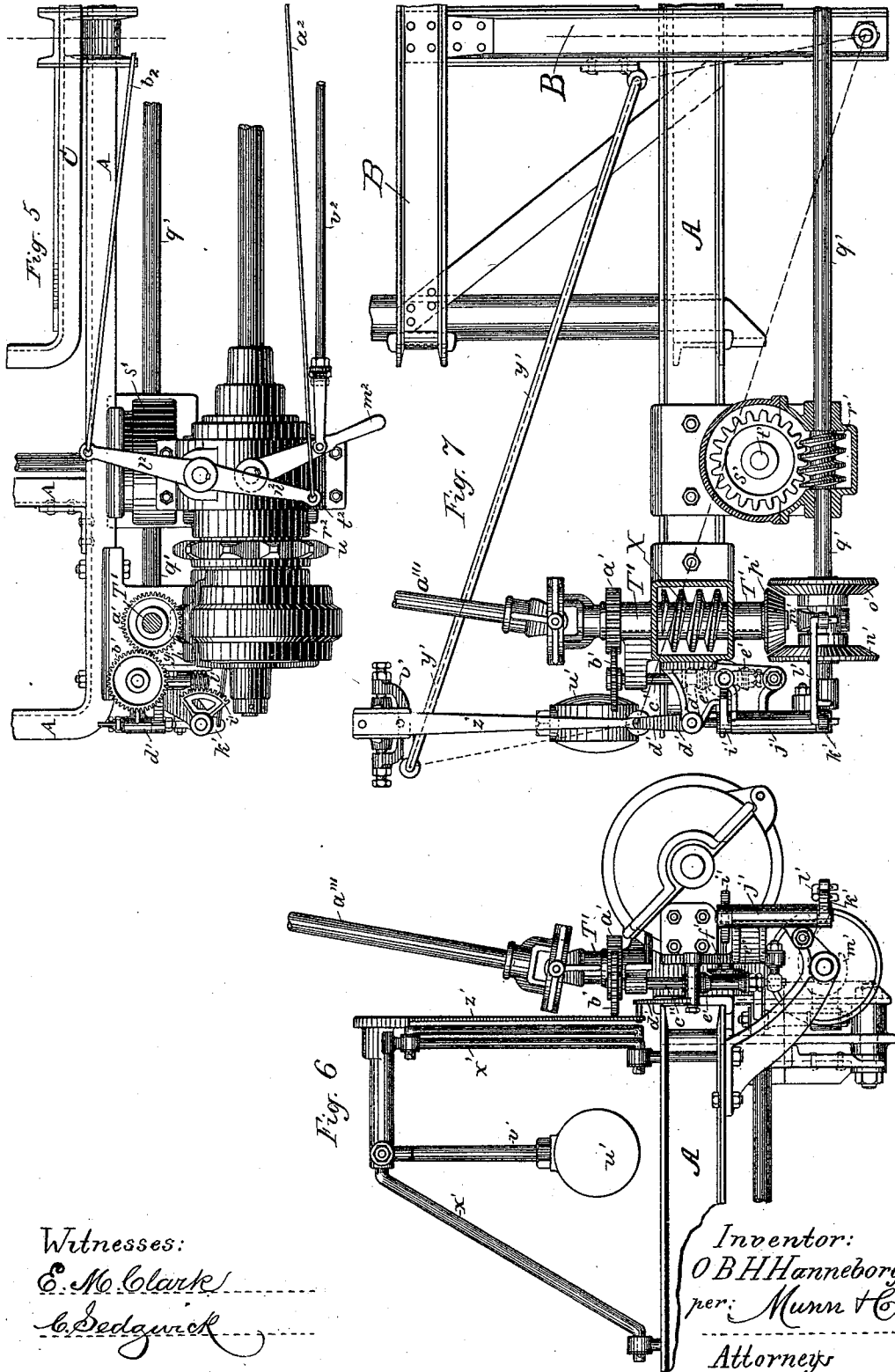
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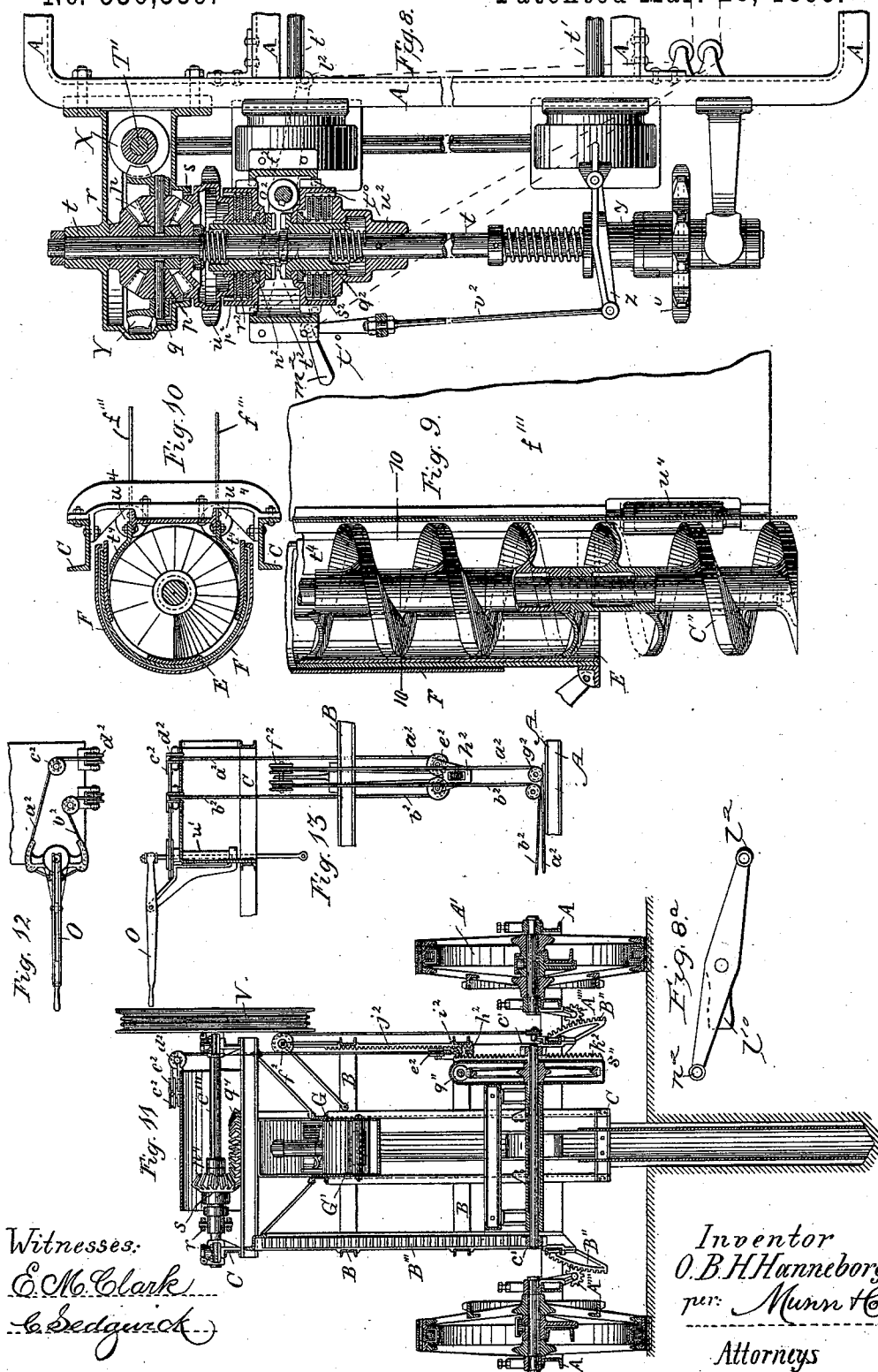
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9 Sheets—Sheet 6.

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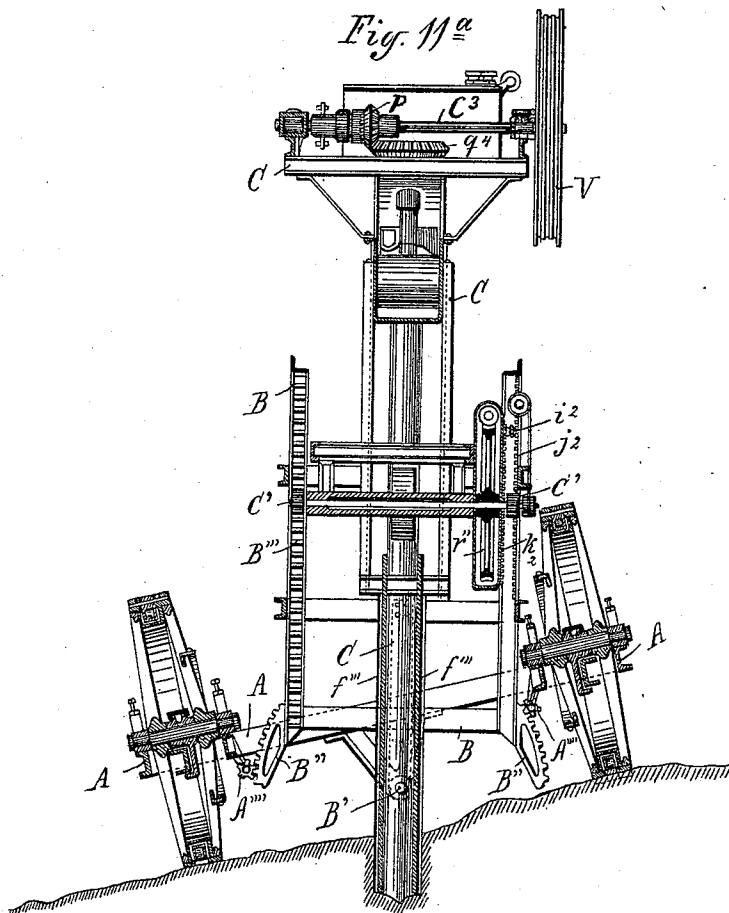
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Patented Mar. 26, 1895.



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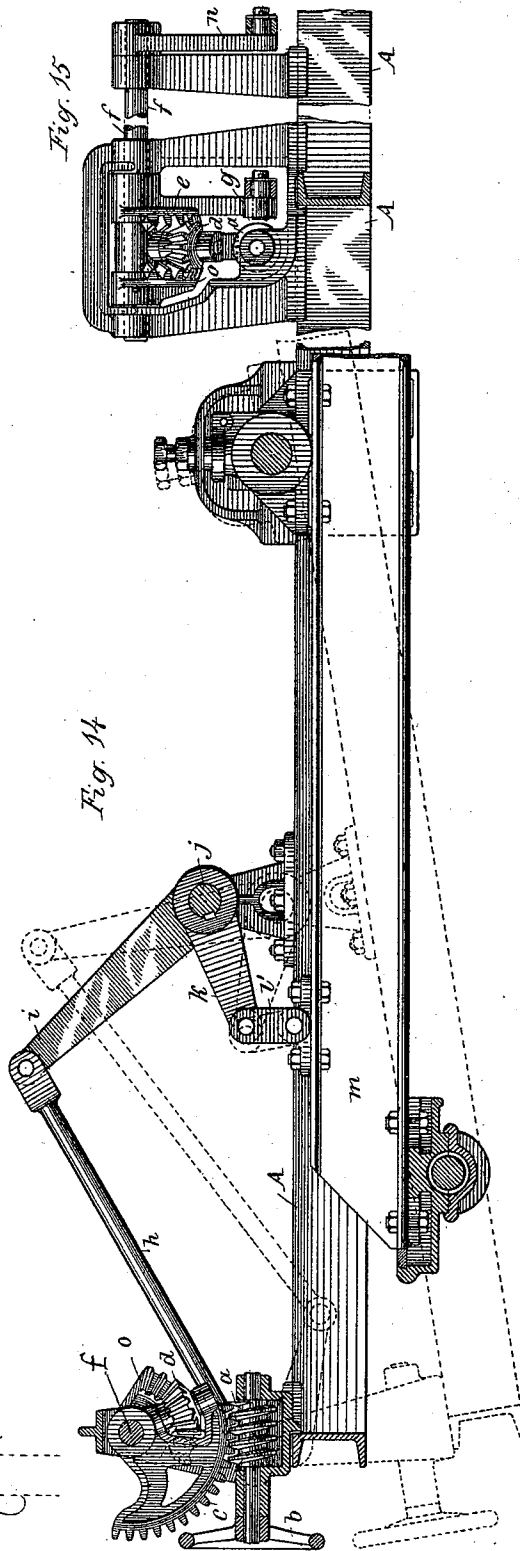
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Witnesses:
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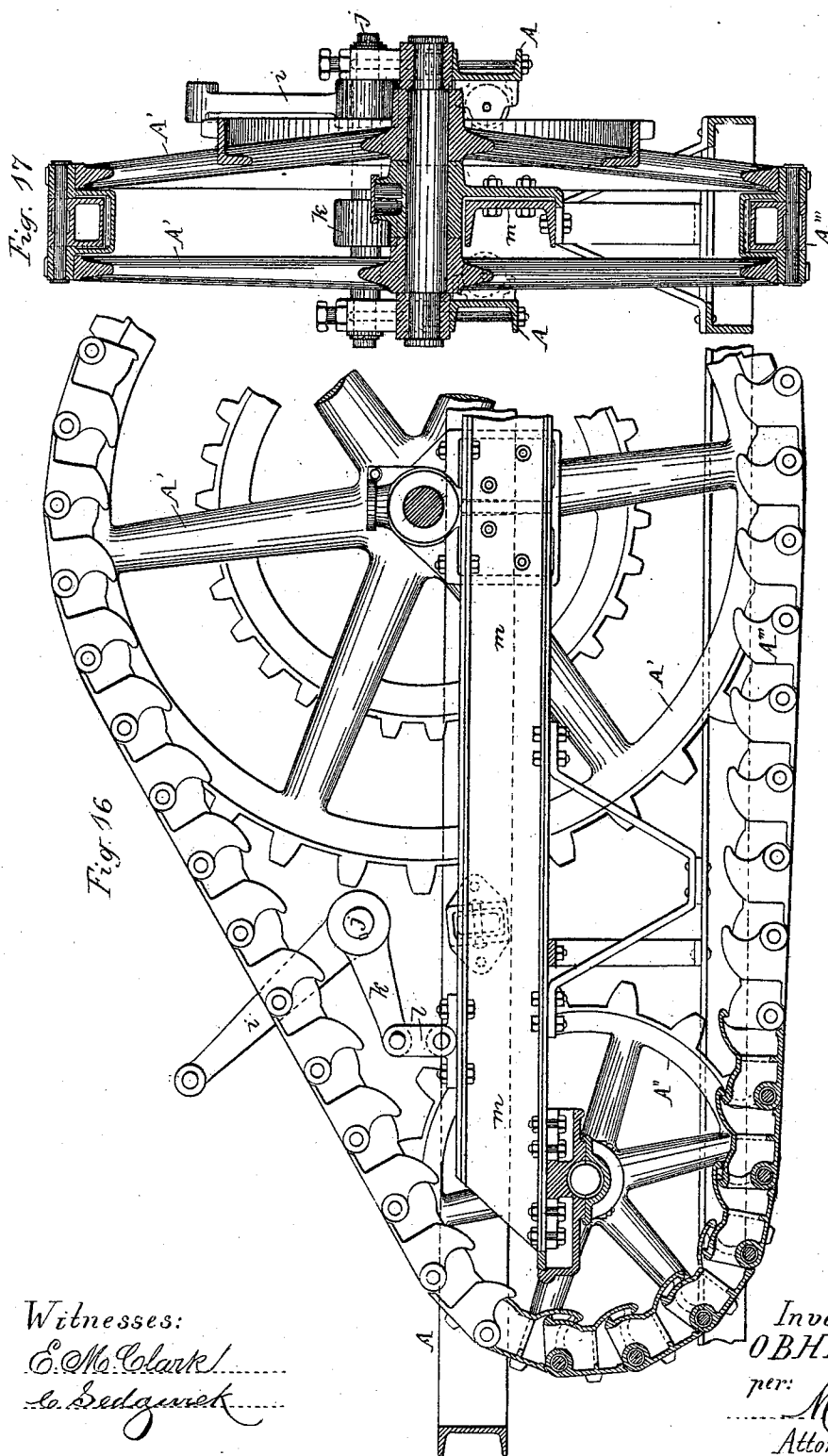
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UNITED STATES PATENT OFFICE.

ODILON BALTZAR HANNIBAL HANNEBORG, OF URSKOUG, NORWAY.

DITCHING AND TILE-LAYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 536,339, dated March 26, 1895.

Application filed January 9, 1892. Serial No. 417,581. (No model.) Patented in Belgium December 15, 1891, No. 97,362; in France February 25, 1892, No. 217,679; in Finland March 15, 1892, No. 414; in Norway May 18, 1892, No. 2,564; in Austria-Hungary May 20, 1892, No. 83,743 and No. 16,778; in Spain May 23, 1892, No. 13,299; in England July 2, 1892, No. 20,955; in Italy July 26, 1892, No. 32,049; in Sweden September 1, 1892, No. 3,926; in Brazil June 5, 1893, No. 1,599; in Germany June 26, 1893, No. 70,855; in Queensland November 1, 1893, No. 2,356; in New Zealand December 11, 1893, No. 6,136; in New South Wales March 30, 1894, No. 4,393, and in Russia June 2, 1894, No. 3,313.

To all whom it may concern:

Be it known that I, ODILON BALTZAR HANNIBAL HANNEBORG, estate-owner, a subject of the King of Sweden and Norway, and a resident of URSKOUG, Norway, have invented certain new and useful Improvements in Ditching and Tile-Laying Machines, of which the following is a specification.

This invention has been patented to me in the following countries: Norway, granted May 18, 1892, No. 2,564; Sweden, granted September 1, 1892, No. 3,926; Germany, granted June 26, 1893, No. 70,855; France, dated February 25, 1892, No. 217,679; Belgium, dated December 15, 1891, No. 97,362; England, dated July 2, 1892, No. 20,955; Austria-Hungary, dated May 20, 1892, No. 83,743 and No. 16,778; Spain, dated May 23, 1892, No. 13,299; Italy, dated July 26, 1892, No. 32,049; Finland, dated March 15, 1892, No. 414; Russia, dated June 2, 1894, No. 3,313; New South Wales, dated March 30, 1894, No. 4,393; Queensland, dated November 1, 1893, No. 2,356; New Zealand, dated December 11, 1893, No. 6,136, and Brazil, dated June 5, 1893, No. 1,599.

Figure 1 is a side elevation of my ditching and tile laying machine, showing the same in operating position. Fig. 2 is a plan view of the same. Fig. 3 is a rear view. Fig. 4 is a vertical section of the machine, taken on line 4-4 of Fig. 2 showing excavating and tile laying apparatus in lowest position. Fig. 4^a is a detail view of the upper part of the screw. Fig. 4^b is a section on line *x-x* of Fig. 4. Fig. 4^c is a detail view of the apparatus for sand filling. Figs. 5, 6 and 7 are respectively a plan view, a side view and a rear view of the automatic balancing mechanism, drawn to a larger scale. Fig. 8 is a horizontal section through the gearing for the steering mechanism. Fig. 8^a is a detail of the same. Fig. 9 is the lower part of the cutterscrew. Fig. 10 is a horizontal section of the same cutterscrew, taken on line 10-10 of Fig. 9. Fig. 11 is a transverse vertical section of the machine, taken on line 11-11 of Fig. 2. Fig. 11^a is a view showing the three frames A-B-C in different positions to each other. Fig. 12 is

a plan view of the steering lever, cords and guide and tightening sheaves for steering mechanism. Fig. 13 is a side view of same steering lever, cords, guide and tightening sheaves. Fig. 14 shows a side view, and Fig. 15 is a rear view, of a part of the tilting mechanism. Fig. 16 shows a side view of the supporting folding rails with gearing, and Fig. 17 is a section through the same.

This invention is a new and improved ditching and tile laying machine, and it consists in the novel construction of the machine and arrangement of parts hereinafter described, illustrated in the drawings and particularly specified in the claims hereto appended.

Referring to the drawings by letters, C'' (shown best in Fig. 4) designates the sharp-edged rotating cutter screw or worm, which derives its motion from the horizontal drive-shaft C''', by means of a pair of bevel gears *p*⁴ and *q*⁴. (See Fig. 4^a.) Shaft C''' and the parallel shaft T get their motion from a stationary motor (not shown), by an endless rope R (see Fig. 1), which passes around the rope wheels or pulleys V and U, which latter are keyed on said shafts C''' and T respectively.

The cutter screw C'' cuts the ditch or trench and elevates the loosened earth to a conveyer-trough G, which is later described. The said cutter screw C'' is at its upper end supported and driven by the bevel wheel *q*⁴, which runs on anti-friction wheels *q*⁵, shown in Fig. 4. Shield plates E and F cover that portion of the screw which extends above the ground, in order to prevent the earth from falling down in front of it, while the rear side of the screw is covered in its entire length by a shield plate or plates *t*⁴. See Figs. 4, 9, and 10.

The half cylindrical shield plate E (Figs. 4, 9 and 10) is (in practice) supported by the links E'' E³ hinge and E' in such a manner that its lower end will always be held near the ground while shield plate F, which surrounds plate E, will slide up and down with the cutter screw C'', without the shield plate E, like a member of a telescope.

The shield plate E is suspended by its links from the frame B and its lower end is thus

always the same distance from the ground, while the shield plate F is hinged at its upper end to the frame C so that as the frame C is raised or lowered to vary the depth of cut of the screw the plates E and F will slide upon each other and will keep the forward portion of the cutter screw covered. It will be seen from the drawings that by reason of the manner in which the shield plates are hinged they will be held normally close to the cutter-screw by their own weight, and so that they can be pressed up and away from the cutter-screw, if a larger stone or hard substance should be carried up by the cutter screw, and allowing such stones or lumps to pass between the screw and the shield plates, without interrupting the work.

The manner of hinging plate F is shown in detail in Fig. 4^a in which it will be seen that the inclined link F' hinges plate F to a fixed upper part of frame C while a tension spring F'' bears against the outer face of the plate and assists the action of gravitation to keep the link and plate in their lower position and in proximity to the cutter screw.

The conveyer trough G, carried by frame C, reaches from the upper end of the cutter screw and passes horizontally straight backward to a directing chute H, which is adapted to be turned either right or left by the handle N, so as to throw the dirt escaping from trough G either into or out of the ditch or trench dug by the machine, when in operation.

G' designates a conveyer belt, which passes over the bottom of the conveyer trough G, and carries the dirt from the cutter screw C' to the directing chute H. The conveyer belt G' is driven by the roller I, which derives its motion from shaft T by a chain K. (See Fig. 3.)

The machine is operated by two men or drivers.

L designates the seat of the upper driver and M the seat of the lower driver.

The tile laying apparatus, shown in Fig. 4 is arranged behind the cutter screw and consists of a curved plate g''', which commences directly below the seat of the lower driver and reaches to the bottom of the trench made by the cutter screw, and is intended to lead the tiles to the bottom of said trench. The lower end of this guide plate g''' has a central beveled point or scorer, (not shown) which marks the bottom of the trench properly for receiving the tile sections and preventing them from rolling sidewise. In order to make sure, that tiles of unequal size will come exactly in line and in the middle of the trench, there has been provided a V-shaped curved guide Q (shown in Figs. 3, 4, and 4^a) which rests on top of the tiles, and can be moved to and from these, by the hand lever R', which is operated by the lower driver. By raising the lever, R, the guide, Q, is separated farther from the plate g''', thus enlarging the diameter or capacity of the tile chute, correspondingly, so that tiles of larger size will enter it. The guide, Q, rests upon the tiles, as they

travel in the chute, and thus holds them in line.

In order to fill up soft places or cavities in the bottom of the trench and make a solid bed for the tiles, the machine has been provided with an apparatus, which will fill sand in such places. This is carried out as shown in Fig. 4, where S is a roller, which by a spring S' is pressed against the bottom of the trench, directly behind the shield plate in rear of the cutter screw. The roller S is fastened to a lever h''' which has another roller o''' (Figs. 4 and 4^c) to the shaft i''' of which the arms h''' are pivoted. The shaft i''' is fastened to and between the plates f''' on frame C. The free end of the lever h''' is connected with the valve k''', which closes the opening in the bottom of a sand reservoir l''' by the rod j'''. When the roller S reaches a cavity or soft place in the ground, it will sink down into this and open the valve k''', whereby sand will fall into the funnel m''' and from thence through the pipe n''' reach the bottom of the trench, where the roller o''' will press it into the cavities. The excess of sand may be shoved aside to leave a level trench by any suitable means such as a plow of suitable shape shown conventionally at p'''. To prevent the sand from sticking in the pipe, n''', and thus clogging it, the pipe is provided with a rod, q''', (see Fig. 4,) which is attached to an oscillating crank fixed on a rocker-shaft, operated through any suitable connections (not shown) from one of the moving parts of the machine so that the said rod is reciprocated continuously in the pipe.

r''' designates a cord, which reaches from the lever of the valve k''' up to a place within easy reach of the lower driver, so that he at any time can stop the flow of sand by pulling in this cord and fasten the end of it to a hook.

a⁴ designates a bar, resting in the eye b⁴ and at its lower end provided with a pair of wheels C⁴, and a handle at its upper end, enabling the lower driver to straighten tiles, which might possibly lie obliquely in the trench. The eye b⁴ is pivotally mounted between the plates f''' hereinafter described.

The machine is also provided with an apparatus, which will feed a continuous strip of prepared paper on top of the tiles to prevent earth from falling in through the opening between said tiles. This is carried out in the following manner: t''' designates a rubber band or belt, which runs over the rollers u''' and v''' and derives its motion from roller u''' which is again driven by the shaft j''' through the medium of suitable gearing (not shown), and at such a speed that the paper strip, which passes down to the bottom of the trench between the rubber band t''' and an iron plate x''' is fed backward on top of the tiles with the same speed as the machine advances.

In order to prevent the dirt from falling down into the trench before the tiles are laid, two parallel plates f''' extend from the shield

plate t^4 in rear of the cutter screw and on both sides of the sand feeding apparatus, the tile laying apparatus and the paper feeding apparatus so far back, that they will prevent the earth from falling from the sides of the trench on top of the tiles until these are covered by the strip of prepared paper, before mentioned, or the tiles have attained a good position in the bottom of the trench. (The latter modification is shown in the drawings.) The parallel plates f''' are fastened at a distance apart, which is a little less than the diameter of the cutter screw C'' forming a box, which is open at the top and in the rear corner, where the tiles and paper strip escape from the machine, and reach from the bottom of the trench to a short distance above the ground when the ditching mechanism is in its lowest position.

All these mechanisms, which have now been described are supported by and form what here is called the inner frame and designated by the letter C. In order to be able to cut the trench of different depths, or raise the cutting apparatus entirely out of the ground, the frame C, carries four spur wheels C' , which work up and down in four tooth racks or bridles B''' secured on frame B. The spur wheels C' are driven from the rear driving shaft T on which the sheave U is fastened, the motion being transmitted through the bevel wheels h'' and i'' (Figs. 3 and 4) and the shaft j'' to the bevel wheel k'' which drives the bevel wheels l'' and m'' in opposite directions on shaft n'' . On shaft n'' and between l'' and m'' is a clutch o'' , which can be shifted so as to engage with l'' or m'' , thereby causing shaft n'' to run in one or the other direction. On both ends of the shaft n'' are fastened the worms p^4 and q^4 which are in gear with the worm wheels r'' and s'' Fig. 11. The last mentioned worm wheels r'' and s'' are again fastened on the same shafts as the spur wheels C' before mentioned. The shifting of clutch o'' is effected by the hand lever O which is operated by the upper driver and is connected with clutch o'' by the connecting rod u'' , the bell crank t'' and the connecting rod v'' . By these devices frame C will be raised when the upper driver lifts the hand lever O and lowered, when O is pushed downward, while it will remain in the same height, as long as the lever O remains in a horizontal position.

The four tooth racks or bridles B''' B'' , previously mentioned, in which the four spur wheels C' work, are held together by the frame B, which here is called the intermediate frame, and which surrounds the inner frame C.

The intermediate frame B is supported on a third frame A, called the outside frame, by the pivots B' , which are near the ground and in line with the trench, so arranged, that the cutting and tile-laying apparatus will always be held in a vertical position. To secure this latter end, frame B is provided with four tooth segments B'' , which are securely fastened to frame B as shown in Fig. 11. In

these four tooth segments B'' work four spur wheels A''' which are worked by an automatic balancing mechanism, to be described later on. The outside frame A which is the main carrying frame, is rectangular in form and can be seen in Figs. 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 15, 16, and 17, and carries besides the supporting pivots B' and the bearings for the spur wheels A''' also the automatic working balancing mechanism and gearing for driving the machine forward or back together with the steering mechanism, which will be described later. The automatic working balancing device is shown in Figs. 5, 6, and 7 and is constructed as follows:

T is a shaft, which derives its motion from the main rear driving sheave or pulley U as shown in Figs. 1 and 3, where a''' indicates a tumbling shaft, which by the bevel wheels b''' and c''' and the shaft d''' on which the bevel friction wheel e''' is keyed, can be driven in one or the other direction by bringing e''' against either the bevel friction wheel f''' or g''' (shown in Figs. 3 and 4). The shaft d''' is guided by yoke d'''' swiveled on shaft T and held in alignment by shaft a''' . These latter bevel friction wheels f''' and g''' are keyed on to the same shaft as the rear driving sheave U from which they derive their motion, as before mentioned. The inner end of the shaft d''' has its bearings in a yoke (Fig. 3) which slides on shaft T, being adjusted and held locked in either position by a lever mechanism not shown. The purpose and function of this portion of the machine are to hold the frame vertical—as hereinafter more fully set forth.

On shaft T' (Figs. 5, 6 and 7) is fastened a spur wheel a' which drives another narrower spur wheel b' keyed on shaft c' . This latter shaft c' is capable of being moved up and down by a shifting lever d' while shaft c' revolves, whereby the friction bevel wheels e' , e' , will drive the friction wheel f' in one or the other direction as the case may be. From f' the motion will be transmitted through shaft g' to the worm h' , which again drives the worm wheel segment i' and thereby the shaft j' with its crank k' . To crank k' is fastened one end of the connecting rod l' while the other end of l' is fastened to the shifting lever m' , pivoted to the stud pin m'' whereby the bevel friction wheel n' or o' will be pressed against the friction wheel p' which is keyed to the lower end of shaft T'.

As the friction wheel p' revolves with shaft T' the motion will be transferred to the friction wheel n' if this is pressed against p' or to o' , if the latter is pressed against p' whereby shaft q' is driven in one or the other direction. On shaft q' are fastened two worms r' r' (shown in Figs. 3 and 7) which are in gear with the worm wheels s' s' fastened on shafts t' t' (shown in Figs. 7 and 8) whereon are also fastened the spur wheels A''' A''' Fig. 11, which work in the tooth segments B''

B". In this way, the spur wheels A"" A"" are made to revolve in one or the other direction by moving the shifting lever d' up or down. This movement of the shifting lever d' is done automatically by the weight u' (Figs. 6 and 7) suspended at the end of the lever v' pivotally fastened to frame x' , Fig. 6 which by the rod y' is always held parallel with the center line of frame B. As soon as B comes out of plumb, frame will also come out of plumb, and the lever v' which is held plumb by weight u' will through the lever Z' , push the shifting lever d' in one or the other direction setting the gears in motion, whereby frame B will always be held in vertical position without the attention of the drivers.

The gearing for the forward movement and steering mechanism is arranged as follows: The worm X (shown in Figs. 7 and 8) is keyed on shaft T' and drives the worm wheel Y. Between the spokes of worm wheel Y are two bevel wheels p which work loose on the pins q and are in gear with the bevel wheels r and s . r is keyed on to shaft t , while s is loose on same shaft, but is in one piece with the sprocket wheel u which by the chain x drives the main wheel A' on the left hand side of the machine, while the main wheel on the right hand side of the machine is driven from the sprocket wheel v which by the clutch y can be coupled to shaft t .

The steering is effected in the following manner:—The cords a^2 and b^2 (shown in Figs. 12 and 13) are operated by the hand lever O. The cord a^2 passes from the hand lever O over the guide sheaves c^2 and $\bar{a}^2$ down to the sheave e^2 , which is fastened on the frame h^2 . This frame h^2 is held in position by the spur pinion i^2 (Fig. 11) working between the tooth racks j^2 fastened on frame B and k^2 fastened on frame C, Fig. 11^a, in such a manner that the frame h^2 is held in its place by the pinion i^2 (Figs. 11 and 13) which in turn is held in position by the toothed racks k^2 and j^2 and whereby the cords are always held tight independent of the different positions of the frames. From the guide sheave e^2 , the cord a^2 passes now up and over guide sheave f^2 , which is journaled on frame B and from thence down to guide sheave g^2 journaled on frame A. From this latter guide sheave it passes over a guide sheave on frame A see Fig. 8 and from thence to the shifting lever n^2 (Fig. 5). The cord b^2 passes in exactly the same manner over guide sheaves to the lever l^2 . The sheaves are arranged in this manner in order to always hold the cords equally tight, when frame C is raised and lowered inside of frame B. The lever $l^2 n^2$ being thus connected with the hand lever O by the cords a^2 and b^2 can thereby easily be operated by the upper driver, by simply moving the hand lever O in one or the other direction. This shifting lever being placed between the clutches p^2 and q^2 it will be seen that by a little movement of the shifting lever O in one or the other direction, the clutches will disengage. To permit of such

movement, the bracket on which the lever O is pivoted is capable of turning on the rod u'' . Clutch p^2 being provided with feathers, which fit inside of sprocket wheel u both will revolve together, but if p^2 were made to stop, u would also have to stop, whereby the bevel wheel p will roll on s and consequently drive the bevel wheel r and thereby also the shaft t and sprocket wheel v faster. As now sprocket wheel u drives the left hand main wheel, and v drives the right hand main wheel, it will be understood, that the machine in this case would turn to the left. If on the other hand the shaft t and thereby the sprocket wheel v was stopped, while u was released, the machine would then turn to the right. The sleeves r^2 and s^2 are supported partly by the shaft t and partly by the projections t^{10} on the shield plate t^2 . The shifting lever l^2, n^2 has a small shifting lever l^{10} (Fig. 8) attached to it and it will be understood that when this lever l^{10} works against the face of either clutch, one of the clutches will be disengaged, and when it stands in the middle both clutches will re-engage and the machine will go straight ahead.

The stopping or retarding of the right or left hand sprocket wheel is effected by ordinary friction plate brakes or clutches p^2 and q^2 loosely mounted on shaft t , the plates carried by these clutches alternating with the plates carried by the sleeves r^2 and s^2 respectively which sleeves are held against rotary movement by the rigid plate t^2 carried by a fixed part of the machine. The clutch p^2 has a spline connection with the gear u and it is normally held so as to keep the friction plates separated by a spiral spring and when so held it will be seen that the gear u will revolve with the shaft t , but when the clutch plates are compressed by the manipulation of the lever the gear u will be retarded or held against movement which will cause the shaft t to be driven faster as before described. In a like manner the clutch q^2 can be operated against the tension of its spring to connect the sleeve s^2 with the sleeve u^2 by frictional contact, and as the sleeve u^2 is fast upon shaft t the result will be to retard or stop the motion of this shaft and gear v with the result before described. When, however, the clutches are unaffected by the operating lever and are forced toward each other by their springs no resistance is offered by the clutches to either the shaft t or the gear u and the gear y revolving would carry with it through the pinions p both the gear r and the gear u and as the gear r is fast on the shaft t the gears u and v would be driven at the same rate of speed thus driving the machine straight ahead.

The hand lever m^2 with the connecting rod v^2 , (Figs. 5 and 8,) shifting lever Z and clutch y is for the purpose of disengaging the gearing so as to be able to haul the machine by horses from one field to another.

The outside or main carrying frame A is at last mounted upon the axles of the carrying wheels A' which roll on folding rails com-

posed of link shoes A''' forming a truss over which the wheels A' and A'' (shown in Figs. 1 to 16 or 17) can pass and in such a manner, that frame A can be tilted independent of the folding rails. The tilting of frame A and thereby also of the whole machine is done in order to make it possible for the machine to work its way down into the ground and besides make it possible to give the machine the same dip as the trench. The tilting is effected in the following manner: The worm *a* (Figs. 14 and 15) is turned by the hand wheel *b*, whereby the sector *c* is moved in one or the other direction as the case may be. On the sector *c* is a small bevel wheel *d*, which on one side is in gear with a segment of a bevel wheel *e* working loose on shaft *f* but in one piece with the crank *g* to which the one end of connecting rod *h* is fastened, while the other end of *h* is fastened to the lever *i* which is keyed on to shaft *j*. Shaft *j* is supported at each end in bearings, which are fastened on frame A. Near the middle of the shaft *j* is keyed another lever *k*, which by the short link *l'* can hold frame A, and the beam *m* in line or at an angle (as shown by broken lines in Fig. 14). The other side of the small bevel wheel *d* is in gear with a segment of a bevel wheel *o* which is keyed on one end of shaft *f* while on the other end of same shaft is keyed the crank *n* to which is fastened the one end of a connecting rod exactly like *h*. The other end of this connecting rod is again fastened to a lever exactly like *i* and so on as just described. The small bevel wheel *d*, will, by this arrangement act as an evener, so that the folding rails on either side of the machine will follow the ground although this may be very uneven. The link shoe, forming the folding rail, is of such construction, that stones and lumps of earth or wood cannot fall in between the jaws of any of them, which is illustrated in Figs. 16 and 17. In order to make sure that the drains get the right depth, a cord has been previously stretched over the field and adjusted by leveling instruments to such a height over the ground, that it permits the whole machine to pass under it, and so that when the pointer on top of the machine, during the advance of the same, follows the cord the bottom of the cutting and tile laying parts will be in such depth under the ground that the finished drains will be in the desired position.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a ditching and tile laying machine, the combination with the running gear including the side bars having the main and auxiliary wheels journaled therein, of the main frame carrying the working parts pivotally suspended from the axles of the main wheels, and means for tilting the main frame independent of the running gear, substantially as described.

2. In combination, the main driving wheels, the main frame pivotally supported from the axles of said driving wheels, the side bars connected with the said axles and having auxiliary wheels, and connections between the main frame and side bars for tilting the main frame, substantially as described.

3. In combination, the main driving wheels, the main frame carrying the working parts pivotally suspended from said driving wheels, the side bars having their central portions connected with the axles of the driving wheels and carrying auxiliary wheels upon their extremities, the endless folding rails passing around said main and auxiliary wheels, and the tipping connections between the main frame and side bars, substantially as described.

4. In combination with the main frame, the two pairs of main supporting and driving wheels journaled centrally of the sides thereof, each pair comprising the two independent wheels having a common axle, the side bars suspended between each pair of wheels and carrying auxiliary wheels at their extremities, the endless track passing around said wheels, and the tipping connections between the main frame and side bars, substantially as described.

5. In combination, the running gear, the main frame mounted thereon with means for tipping it endwise independent of said running gear, the intermediate frame mounted on the main frame with means for rocking it thereon and the inner frame carrying the working parts and vertically adjustable of said intermediate frame, substantially as described.

6. In combination, the main frame and running gear, the frame B mounted thereon to rock laterally, and means for automatically retaining said frame in a vertical position independent of the inclination of the main frame, substantially as described.

7. In combination, the running gear and main frame, the independent frame B hinged longitudinally thereof, the working parts mounted adjustably on said frame B, and connected with a source of power, the rack and pinion connection between the frame B and the main frame, the operating connections from said pinions to a working part of the machine, said operating connections including a normally disengaged clutch, and an automatic governor for said clutch whereby when the main frame is inclined the clutch will cause the pinions to be operated to straighten frame B, substantially as described.

8. In combination, the running gear, the main frame, the rocking frame B, the frame C vertically adjustable on said frame B, the cutterscrew journaled vertically in said frame C, with means for driving it, and the shield plates inclosing said cutter screw, but having its advanced cutting edge exposed, substantially as described.

9. In a ditching and tile laying machine, the combination with the supporting frames, the vertically arranged cutter screw for excavating and elevating the earth, the tile chute for permitting the tiles to be laid in rear of said cutter screw, the paper feeding mechanism for feeding a strip of paper upon said tiles, and the conveyer and discharge spout for conveying the earth from the screw to the trench in the rear of the machine upon the tiles, substantially as described.

10. In a ditching and tile laying apparatus the combination with the excavating apparatus of a tile chute having an open upper side and an adjustable guide plate covering said open side, substantially as described.

11. In a ditching and tile laying apparatus, the combination with the excavating apparatus, of a tile chute, and means for straightening crooked or misplaced tiles, substantially as described.

12. In a ditching and tile laying machine, the combination with the excavating apparatus, the tile chute for feeding tiles to the excavating trench, the sand reservoir, and

means for automatically evening the bottom of the trench in advance of the tiles by supplying sand from said reservoir to fill up depressions, substantially as described.

13. In a ditching and tile laying machine, the combination with the independently journaled main driving wheels, the main frame and the working parts, of the means for driving the machine, said means including a gear connection from each wheel to a continuously operating part of the machine, and an interposed clutch mechanism whereby the said wheels may be normally driven at the same rate of speed; or the clutch may be shifted to retard one of the wheels to permit the machine to turn, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in, presence of two witnesses, this 9th day of October, 1891.

ODILON BALTZAR HANNIBAL HANNEBORG.

Witnesses:

SEVERIN CHRISTIAN ANKER HOLTH,
AXEL GOTTFRED GRÖNN LAHN.