No. 820,152. PATENTED MAY 8, 1906.

J. K. SWEENY.

EXCAVATING AND DITCHING MACHINE.

APPLICATION FILED DEC. 29, 1905.

4 SHEETS—SHEET 1.

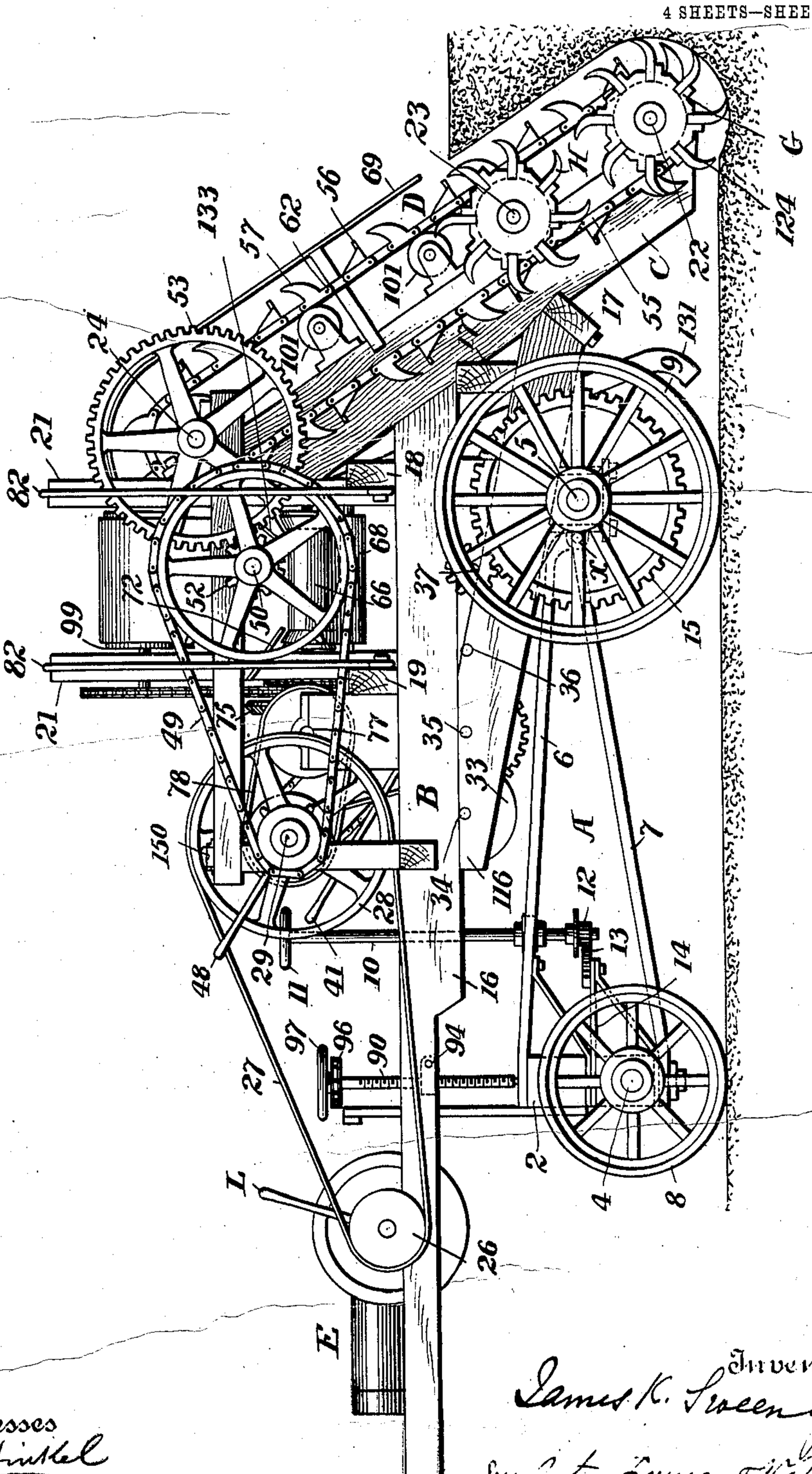

Fig. 1.

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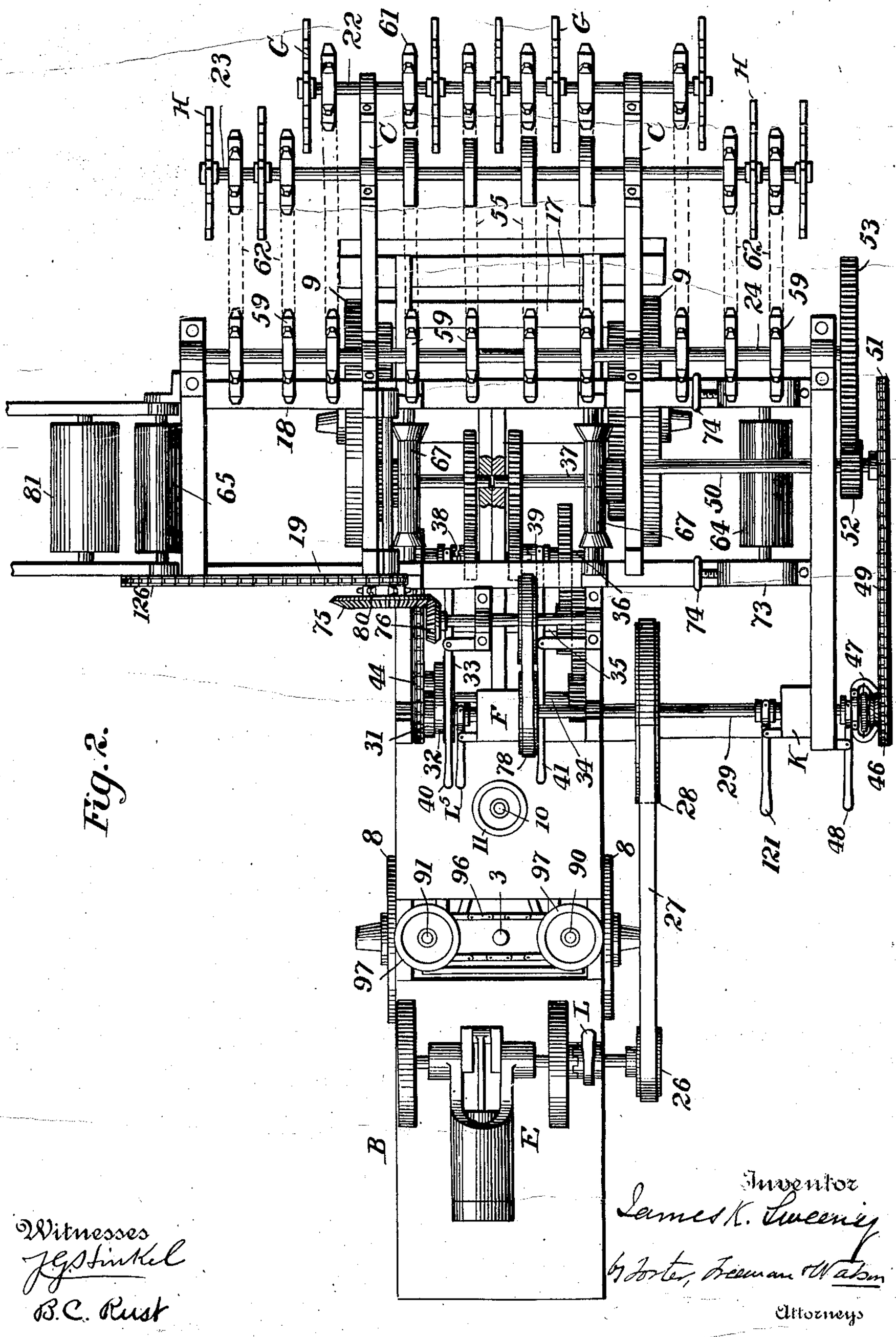
4 SHEETS—SHEET 2.

Fig. 2.



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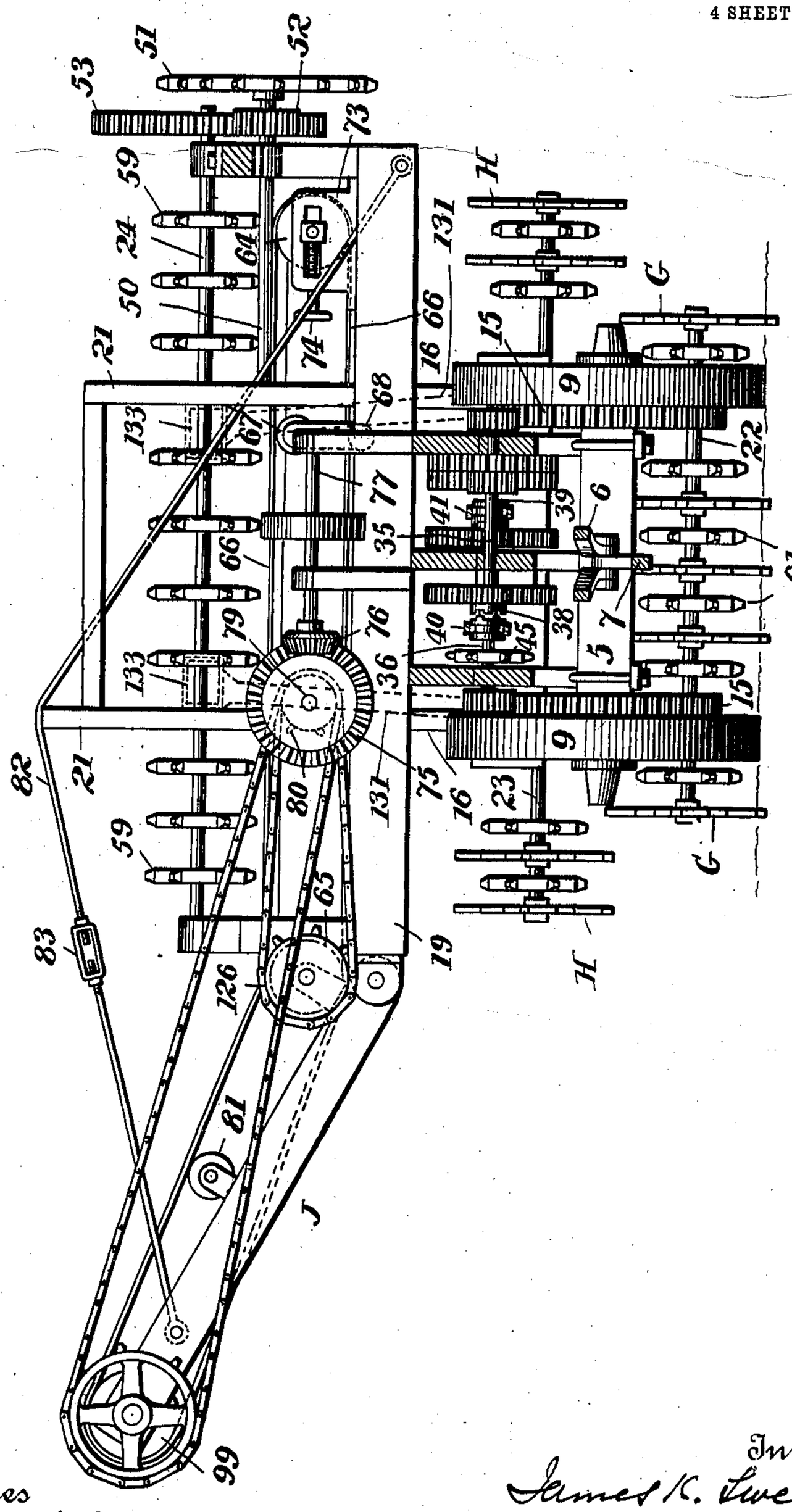
4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 4.

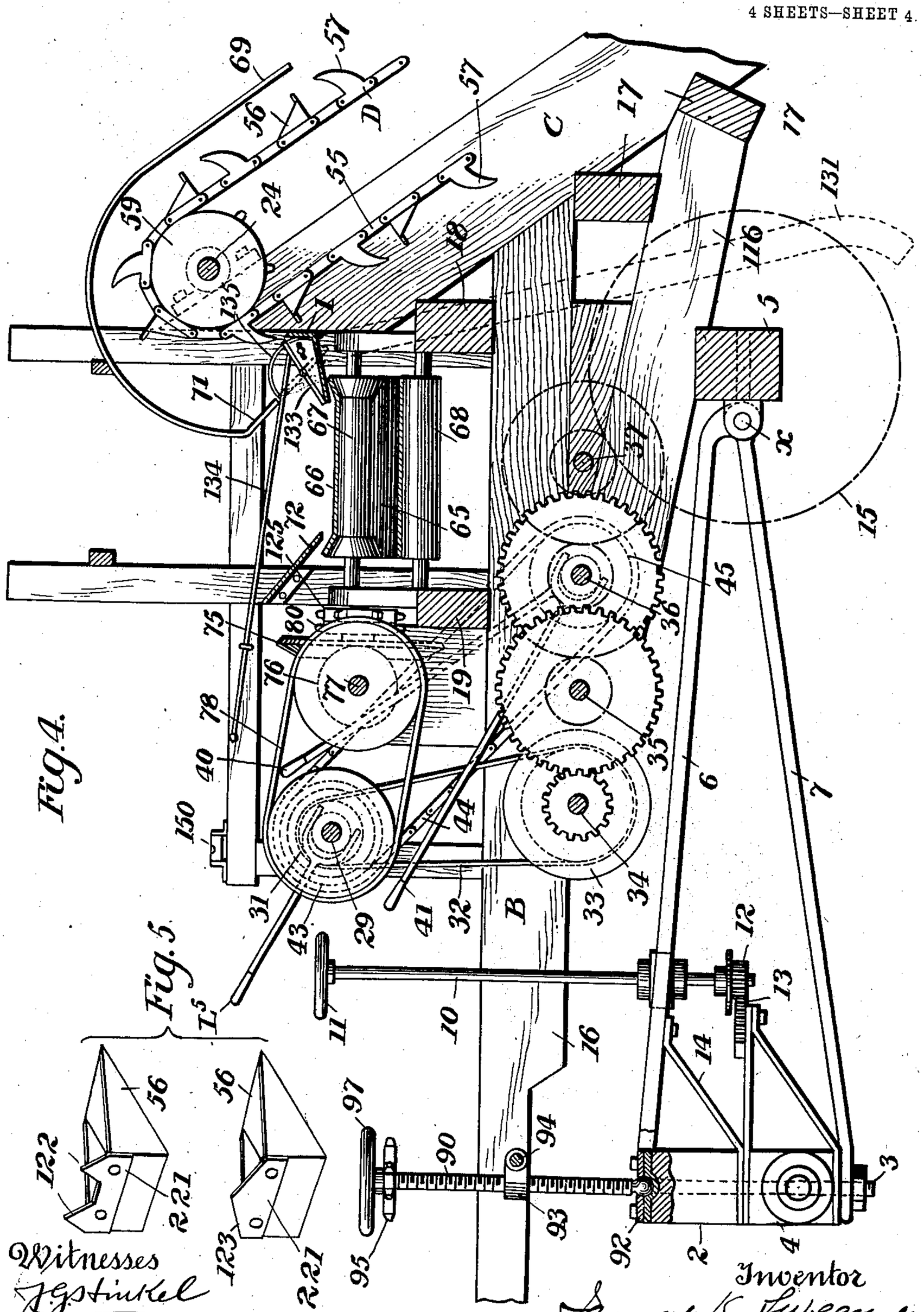

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES K. SWEENY, OF PUEBLO, COLORADO.

EXCAVATING AND DITCHING MACHINE.

No. 820,152. Specification of Letters Patent. Patented May 8, 1906.

Application filed December 29, 1905. Serial No. 293,811.

To all whom it may concern:

Be it known that I, JAMES K. SWEENY, a citizen of the United States, residing at Pueblo, in the county of Pueblo and State of Colorado, have invented certain new and useful Improvements in Excavating and Ditching Machines, of which the following is a specification.

This invention relates to excavating and ditching machines; and it consists in an apparatus in which excavating means are carried upon a wheel-supported frame and are adjustable and operated to effect the various operations required in excavating and ditching, as fully set forth hereinafter and as illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a ditching-machine embodying my improvement; Fig. 2, a plan; Fig. 3, a rear elevation; Fig. 4, a longitudinal sectional elevation of part of the apparatus; Fig. 5, a perspective view illustrating the different forms of excavating-buckets.

There is a running-gear frame A, to which the main frame B, supported by wheels 8 9, is pivoted at a point x in such position that the weight of the complete machine will be practically uniformly distributed fore and aft of said point, so that the frame B may be tilted upon its pivot by the application of comparatively little force. These frames may be constructed in any suitable manner; but, as shown, the frame A has a bolster 2, through which extends the king-bolt 3 downward through the rear axle 4, and the bolster 2 is connected to the front axle 5 by perches or bars 6, and a draw-bar 7 also extends from the front axle back and below the rear axle 5 in position to receive the lower end of the king-bolt 3. The axle 4 can therefore swing about the king-bolt to any desired position to guide the machine.

Any suitable means may be employed for swinging the rear axle 4 from an operating handle or wheel 11. As shown, the said handle or wheel is upon a shaft 10, turning in bearings upon the frame A and carrying at its lower end a pinion 12, which engages a toothed arc 13, carried by arms 14, extending forward from the rear axle.

The forward wheels 9 constitute the driving-wheels and are provided with spur-gears 15, and, as shown, the axle 5 is connected to the frame B, the frame A being pivoted to the rear of the said axle.

The frame B has longitudinal stringers or beams 16 connected at suitable intervals by cross-bars and resting on subbeams 116 and supports the cross-beams 17 18 19, extending laterally to any desired length, the beams 18 19 supporting standards 21, properly trussed and connected, and to the forward part of the frame B is connected an inclined excavator-frame C, which is bolted at the top to the front standards 21 and also to the cross-beams 17 and 18 and extends downward in front of the machine to a short distance from the ground and supports the different shafts 22 23 24 of an endless-chain and bucket excavator D of any suitable construction and also the shafts of idler-rollers 101, that support the endless chains in their upward course with their loads of material.

Any suitable means may be employed for tilting the main frame and holding it in position. As shown, there are two screws 90 91, each having a spherical lower end to fit a socket 92, carried by the bolster 2, so that the screws can turn in said sockets, but are retained in connection with the bolster. Each screw passes through a nut 93 upon the frame B. Preferably the nuts are pivoted to the frame by being hung to a cross-bar 94, and at the upper ends the screws have sprocket-wheels 95, receiving a sprocket-chain 96, which compels them to turn together, either screw being turned by means of a hand-wheel 97, by means of which the operator can readily tilt the main frame to any desired position, in which it will then be firmly held.

The frame B carries a motor E of any suitable character, preferably a gas-engine, the shaft of which has a band-pulley 26, from which a belt 27 passes to a pulley 28 upon a shaft 29, supported by suitable standards of the frame B, and this shaft through suitable gears and connections drives the operating parts of the machine and also the driving-wheels 9. The motor is started, stopped, and regulated by usual means.

It is desirable to impart two different characters of movement to the driving-wheels 9.

First, the wheels 9 are driven at the proper movement to propel the machine in traveling from place to place; second, the said wheels 9 are driven at a slower movement in order to feed the machine forward in proportion as the excavation proceeds. I therefore have two independent means or gears between the shaft 29 and the wheels 9, and I also prefer to so construct these connections that each of the wheels 9 may be driven independently from the shaft 29.

The movement to drive the wheels 9 in excavating is effected as follows: There is upon the shaft 29 a transmission-gear F, the construction of which need not be shown, as it is a casing with the usual gearing and a lever L^5 and other means of adjustment whereby different speeds may be secured, and with the driven member of the transmission-gear is connected a cone-pulley 31, from which a belt 32 passes to a cone-pulley 33 upon the shaft 34 below the stringers or beams 16, and a reduced speed is transmitted through spur-gears from the shaft 34 to parallel shafts 35 36 37 and to the spur-gears 15 on the wheels 9. In order that each wheel 9 may be driven independently, there may be two clutches 38 39 in the line of gearing. One member of each clutch is a pinion gearing with the gear on the shaft 37 and turns loosely on the shaft 36, while the other member slides on the shaft under the action of a lever 40 or 41, but turns with the shaft, so that by moving the sliding member into engagement with the pinion member the latter may be driven from the shaft, so as to drive its connected shaft 37 and gear 15. The line of gears between the driving-shaft 29 and the driving-wheels 9 is so proportioned as to secure the desired speed, which, however, may be varied within certain limits by shifting the belt onto different pulleys of the reverse cone-pulleys 31 33 and by adjusting the differential gearing F.

The movement of the wheels 9 to carry the machine forward in transporting it from place to place is effected from the shaft 29, which carries a sprocket-wheel 43, from which a sprocket-chain 44 extends to a sprocket-wheel 45 on the shaft 36, and when it is desired to transport the machine the chain 44 is set in place, the belt 32 removed, both clutches 38 39 being shifted to connect the shaft 36 with the shaft 37, and the shaft 36 will therefore be driven at a higher speed than when driven through the shafts 34 35, the machine being steered by means of the steering wheel or lever 11 and by means of the front wheels, as before.

Motion is transmitted to the upper shaft 24 of the excavating apparatus so as to carry the forward portions of the chains upward. While any suitable gearing may intervene between the driving-shaft 29 and the shaft 24, I prefer to extend the shaft 29 to a differential-speed-transmission gear K, and to the driven shaft of this transmission-gear is attached a friction-clutch 47, operated by a lever 48 and engaging a friction-ring on a loose sprocket-wheel 49, which receives a sprocket-chain 49, extending to a sprocket-wheel 51 on a counter-shaft 50 and carrying a pinion 52, gearing with a spur-wheel 53 on the shaft 24. By operating the lever 48 the excavating apparatus may be thrown into and out of gear with the driving mechanism without arresting the movement of the engine and the speed increased or reduced within certain limits by shifting the transmission-gear by means of its adjusting-lever 121.

It will be seen that the lower end of the frame supporting the excavating means is projected forward, and as a result the unexcavated portion of the earth overhangs the excavating apparatus, so that as the particles of earth become detached they will fall upon and be broken up by the excavating appliances and will pass into the buckets or lifting-blades carried by the chains.

Preferably the chains 55 carry buckets or blades 56 and spurs or teeth 57, the latter tending to break up the earth, and the buckets receive the particles, and I also secure upon the shaft 22 excavating-wheels G, having teeth which preferably extend beyond the spurs and buckets and which serve to break up the earthy material and reduce it to a condition to fall in or be scooped up by the buckets. To secure most effective action, each bucket is provided with a detachable blade 221, which may have one or more projections. As shown, some have a central projection 123, while others have two side projections 122. The wheels G have detachable teeth 124, connected in any suitable manner to bearings of the wheels. As shown, each tooth 124 has a radial shank bolted to a lug of the wheel-body and a curved and pointed end which will readily penetrate and break up the hard earth.

While the parts of the excavating apparatus may be differently constructed and arranged, there is a series of chains 55 carried by sprocket-pulleys 59 on the shaft 24 and 61 on the shaft 22, and the excavating-wheels G are arranged intermediate the sprockets 59. I prefer also to arrange excavating-wheels H upon shafts 23, which turn in bearings at a higher level than the shaft 22 and project outward at each side to support supplemental series of chains 62, which pass to sprocket-wheels on the shaft 24, so that the supplemental excavating chains and devices do not excavate to so great a depth as those at the center, which facilitates the excavating of trenches the sides of which have to be inclined.

With the excavating means there may be employed any suitable appliances for conducting to one side the material excavated. As shown, the frame B carries rollers 64 65, receiving a conveyer-belt 66, which may be supported by idlers 67 68, the rollers preferably being concave, so as to impart a dished form to the belt, which better enables it to hold the material, the rollers being so positioned that the belt will travel transversely of the machine and below the top of the excavating devices, so that the material discharged fram the latter will fall onto the belt. To properly direct the said material as it falls from the buckets, I make use of a shelf I, arranged so that the material which drops from the buckets will first pass onto the shelf and will then be deflected rearwardly onto the conveyer. The shelf is inclined to insure the discharge of the material from it to the conveyer; but the inclination is such that a certain portion of the material will remain upon the shelf, thereby preventing the wear of the metal which would result if the material fell directly upon the shelf and immediately passed therefrom and also reducing the noise which would result if the falling material struck the shelf instead of the body of material on the shelf. The angular position of the shelf will depend upon the character of the material operated upon.

A shield 69, of any suitable material, extends over the excavating apparatus at the upper part as a guard and is prolonged or extended to form a guard 71, preventing the material from being thrown beyond the shelf, while a plate or guard 72 at the opposite side is arranged to prevent the material from being thrown beyond the opposite edge of the conveyer.

The conveyer-belt is maintained taut by mounting the shaft of the roller 64 in bearings 73, which may be carried outward by means of screws 74 or other adjusting devices. The conveyer-belt may be driven from the shaft 29 in any suitable manner; but, as shown, a counter-shaft 79, at right angles to the main shaft 29, carries a sprocket-wheel 80 and a bevel-gear 75, engaging a bevel-pinion 76 on a shaft 77, which is driven through the medium of a belt 78 from the shaft 29, and the shaft 79 also carries a sprocket-wheel 125, from which a chain extends to a sprocket-wheel 126 on the shaft of the roller 65.

In some cases it is desirable to carry the material to a greater extent beyond the side of the apparatus than the position of the roller 65, and to effect this I make use of a jointed frame J, carrying additional rollers 99 and 81. The roller 99 is driven from the shaft 79 by a sprocket-chain and sprocket-wheels. To support the frame J in its position, I make use of truss-rods 82, extending from the frame to the adjacent standards 21, with turnbuckles 83 for securing minor adjustments, the standards being suitably braced.

In order to bring the machine up to a level in case the bearing-surface is of such an irregular character as to tilt it to one side, I provide any suitable means whereby a portion of the excavated material may be thrown onto the ground in front of the lower wheel, so that when the latter travels upon the material so deposited it will be raised. To this end I make use of two conduits 131, each of which extends to a position to discharge the material in front of one of the wheels 9, and the upper end of the conduit is arranged to receive a portion of the material raised by the elevator and discharged toward the conveyers. Any suitable means for directing the material to the conduits may be employed; but, as shown, each conduit extends to one end of the shield I and is expanded to the funnel-shape illustrated in dotted lines, Fig. 3. Above the mouth of the funnel is pivoted a wing 133, which in the position shown at full lines, Fig. 4, will deflect any material that falls upon the same onto the conveyer 66, but in the position shown in dotted lines will deflect the material into the conduit. This wing may be shifted in any suitable way, as by means of a rod 134, extending rearward to a position to be manipulated by the operator of the machine. A grid or screen 135, consisting of parallel wires or an open mesh, may be extended above the mouth of the conduit to prevent the entrance of pieces so large as to become wedged therein.

It will be evident that while I have shown certain arrangements of gearing for the purpose of driving the different parts from the motor the construction and arrangement of these features may be varied to a great extent, and it will also be evident that different forms of excavating devices may be employed while securing the advantages of the main features of my invention.

It will be seen that by the use of the apparatus having the general features described it is possible to make excavations under varying conditions of topography and earth compositions by merely varying the adjustments and speed of operation of the parts so as to secure a maximum speed and efficiency at a minimum consumption of energy and expense; that the machine can in many instances use its own completed road-bed as a support in its operations; that the completed machine on the working frame is so balanced that it may be readily tilted, so as to cut upon a level or cut upon either upward or downward inclines. It will further be seen that the adjustments of the various parts may be readily made without undue exertion by a single operator who can control both the

speed of the excavating device and the feed of the machine, and that by undercutting in excavating the material excavated will to a great extent fall by gravity into the buckets, avoiding the waste of energy requisite in excavating and lifting the material or detaching it from its fixed formation, and that by the alternate arrangement of excavating-wheels with sprockets and chains with digging cups and spurs the excavating operations are greatly facilitated.

Without limiting myself to the precise construction and arrangement of parts shown, I claim as my invention—

1. The combination in an excavating apparatus, of a frame, wheels supporting the same, and a second frame extending over the first and supporting the working parts and pivoted on the front axle of the running-gear frame to permit the forward end of the supporting-frame to be raised and lowered, the pivotal point being about midway of the weight of the frame and apparatus, substantially as set forth.

2. The combination with the running-gear frame of an excavating apparatus, of a frame supporting the excavating and driving means and above and pivoted to the running-gear frame so as to be counterbalanced on opposite sides of the pivotal point, with means whereby the upper frame may be tilted and secured in position, substantially as set forth.

3. The combination with the running-gear frame, of a frame supporting the driving and excavating means, horizontally pivoted to the running-gear frame, and the excavating means provided with an inclined frame projecting downward and forward at the lower end, substantially as set forth.

4. The combination with the running-gear frame, of a frame supporting the driving and excavating means, horizontally pivoted to the running-gear frame, and the excavating means provided with an inclined frame projecting downward and forward at the lower end and carrying a series of chains with excavating appliances, substantially as set forth.

5. The combination with the frame of an excavating apparatus, of an excavating device consisting of an inclined frame projecting forward at its lower end and downward below the main frame, and carrying a series of endless chains and excavating devices, with excavating-wheels arranged between the chains, substantially as set forth.

6. The combination in an excavating device, of a central portion and side portions, the latter constructed and arranged to excavate at a less depth than the central portion, substantially as set forth.

7. The combination with the supporting-frame of an excavating apparatus, of shafts 22, 23 carrying sprocket-wheels, excavating chains and appliances supported by the sprocket-wheels, and other chains and excavating appliances arranged at the sides of the first to excavate to a less depth than the first, substantially as set forth.

8. The combination with the main frame and inclined excavating-frame with its chains and buckets, of a shield extending over the upper portion of the excavating appliances, substantially as set forth.

9. The combination with the main frame and excavating chains and buckets, of a conveyer extending transversely of the apparatus, and an inclined shelf arranged to receive the material discharged from the excavating devices and to discharge it onto the conveyer, substantially as set forth.

10. The combination with the main frame and excavating chains and buckets, of a conveyer extending transversely of the apparatus, an inclined shelf arranged to receive the material discharged from the excavating devices and to discharge it onto the conveyer, and a guard 71, substantially as set forth.

11. The combination with the main frame and excavating chains and buckets, of a conveyer extending transversely of the apparatus, an inclined shelf arranged to receive the material discharged from the excavating devices and to discharge it onto the conveyer, and guards 71 and 72, substantially as set forth.

12. The combination with the main frame and working appliances of an excavating apparatus, of a running-gear frame provided with axles and wheels, the rear axle pivoted to the frame and provided with a toothed arc, and a hand-shaft having a pinion engaging said arc, substantially as set forth.

13. The combination with the running-gear frame and the main frame pivoted thereto and carrying the operating parts of an excavating apparatus, of screw-shafts connected to but turning in the running-gear frame and passing through nuts upon the main frame and geared to turn together, substantially as set forth.

14. The combination with the running-gear frame and the main frame pivoted thereto and carrying the operating parts of an excavating apparatus, of screw-shafts connected to but turning in the running-gear frame and passing through pivoted nuts upon the main frame and geared to turn together, whereby the main frame and the excavating apparatus thereon is adjusted to excavate to the desired vertical grade-lines, substantially as set forth.

15. The combination with the wheel-supported frame and operating devices of an excavating apparatus, of means whereby a por-

tion of the material excavated may be discharged in front of either of the forward wheels, for the purpose set forth.

16. The combination with the wheel-supported frame and excavating and elevating devices of an excavator, of conduits arranged to receive a portion of the material excavated and each extending to a position in front of the front wheels, substantially as set forth.

17. The combination with the wheel-supported frame and excavating and elevating devices of an excavator, of conduits arranged to receive a portion of the material excavated and each extending to a position in front of one of the front wheels, and wings adjustable to permit or prevent the material from being received by the conduits, substantially as set forth.

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

JAMES K. SWEENY.

Witnesses:

WM. L. HARTMAN,

C. A. BALLREICH.