Sept. 3, 1935. A. J. PENOTE 2,013,170

BACKFILLER MECHANISM

Filed Dec. 10, 1932 4 Sheets-Sheet 1

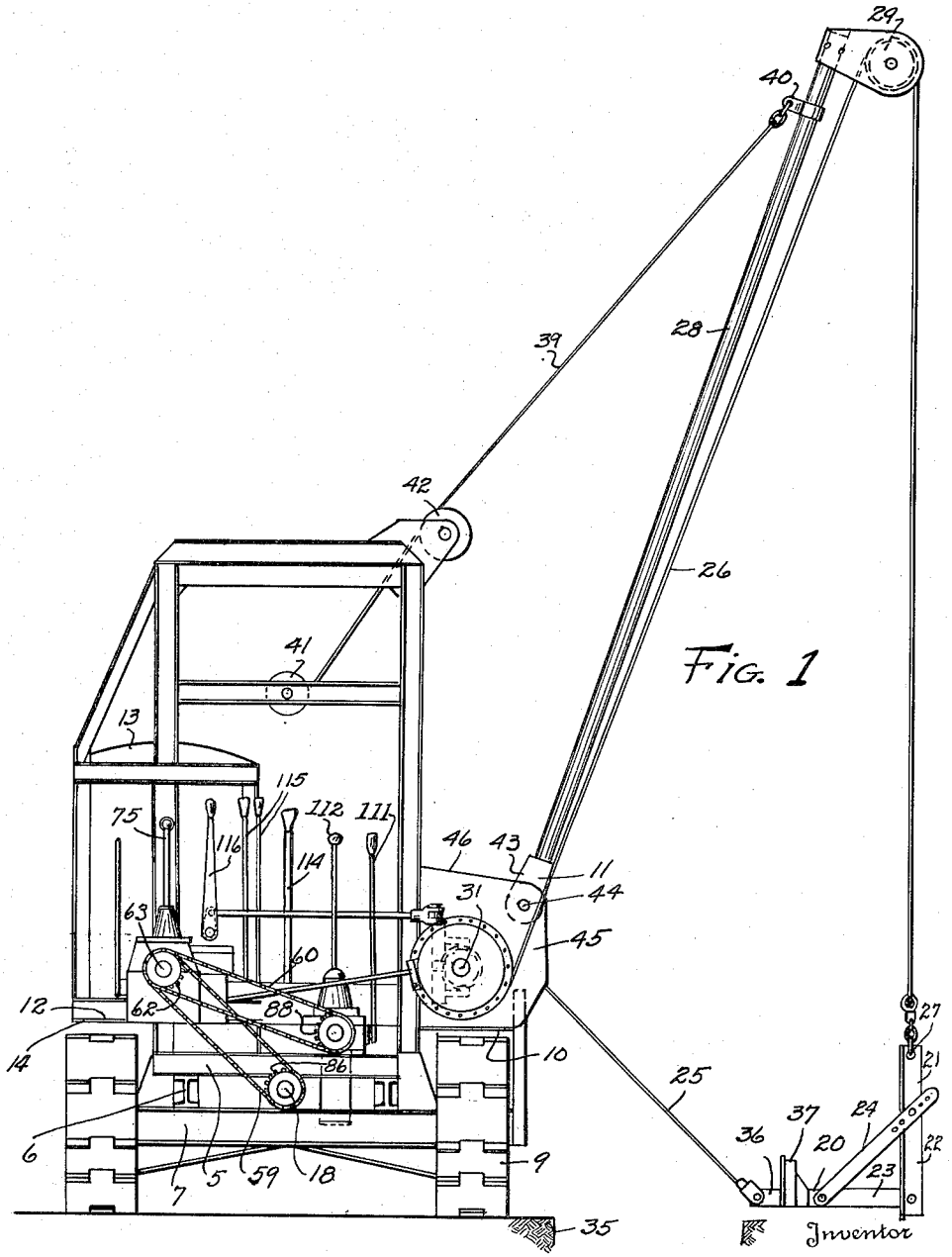

FIG. 1

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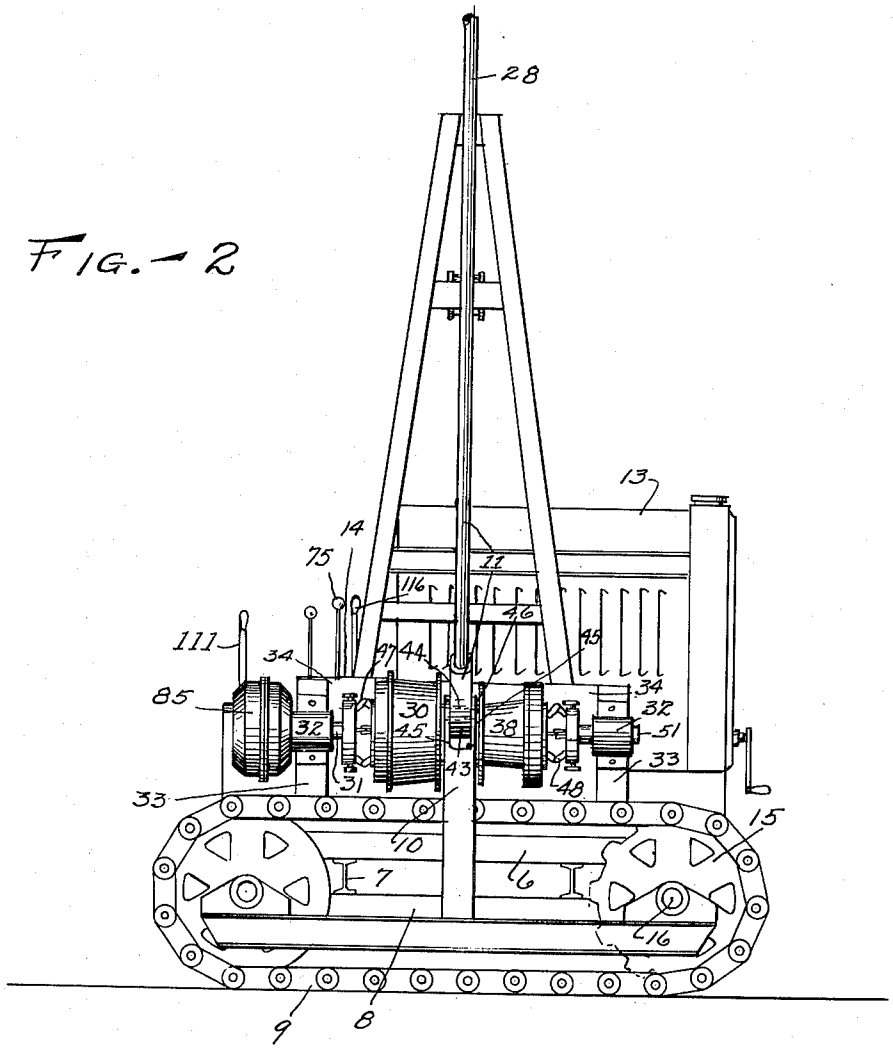
FIG. 2



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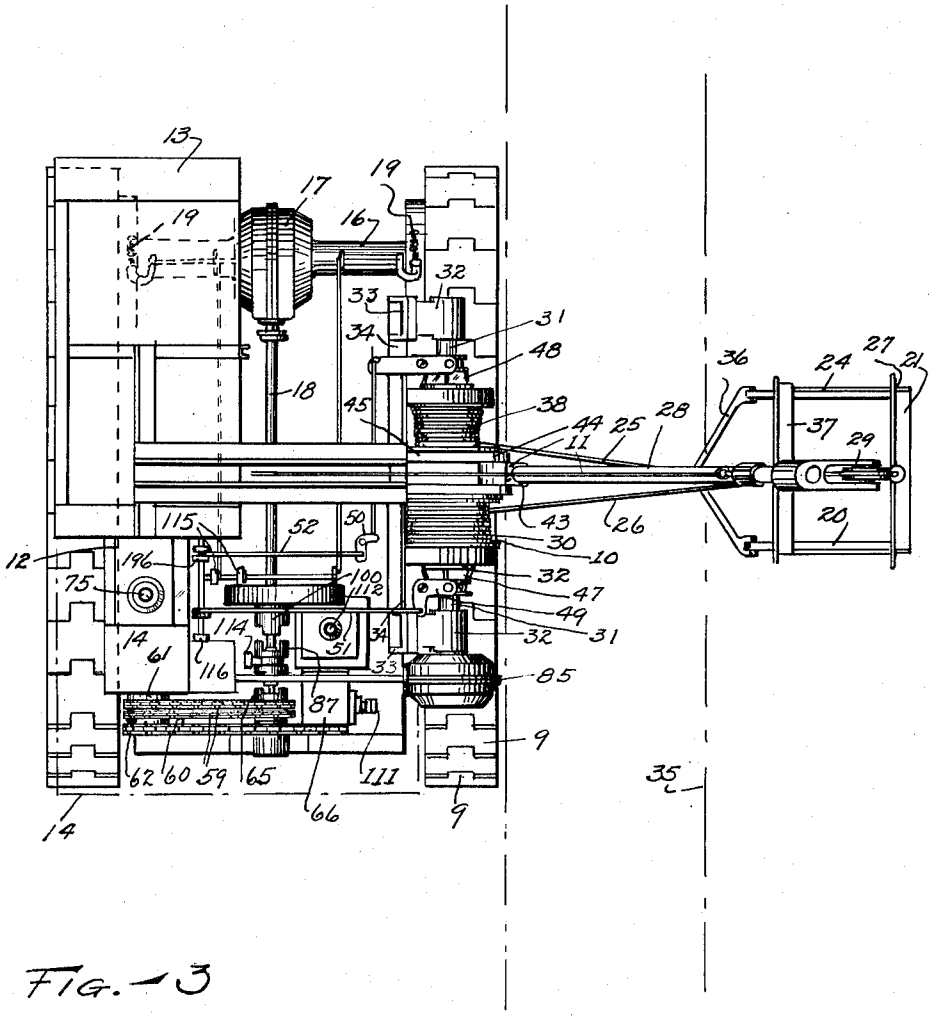

FIG. 3

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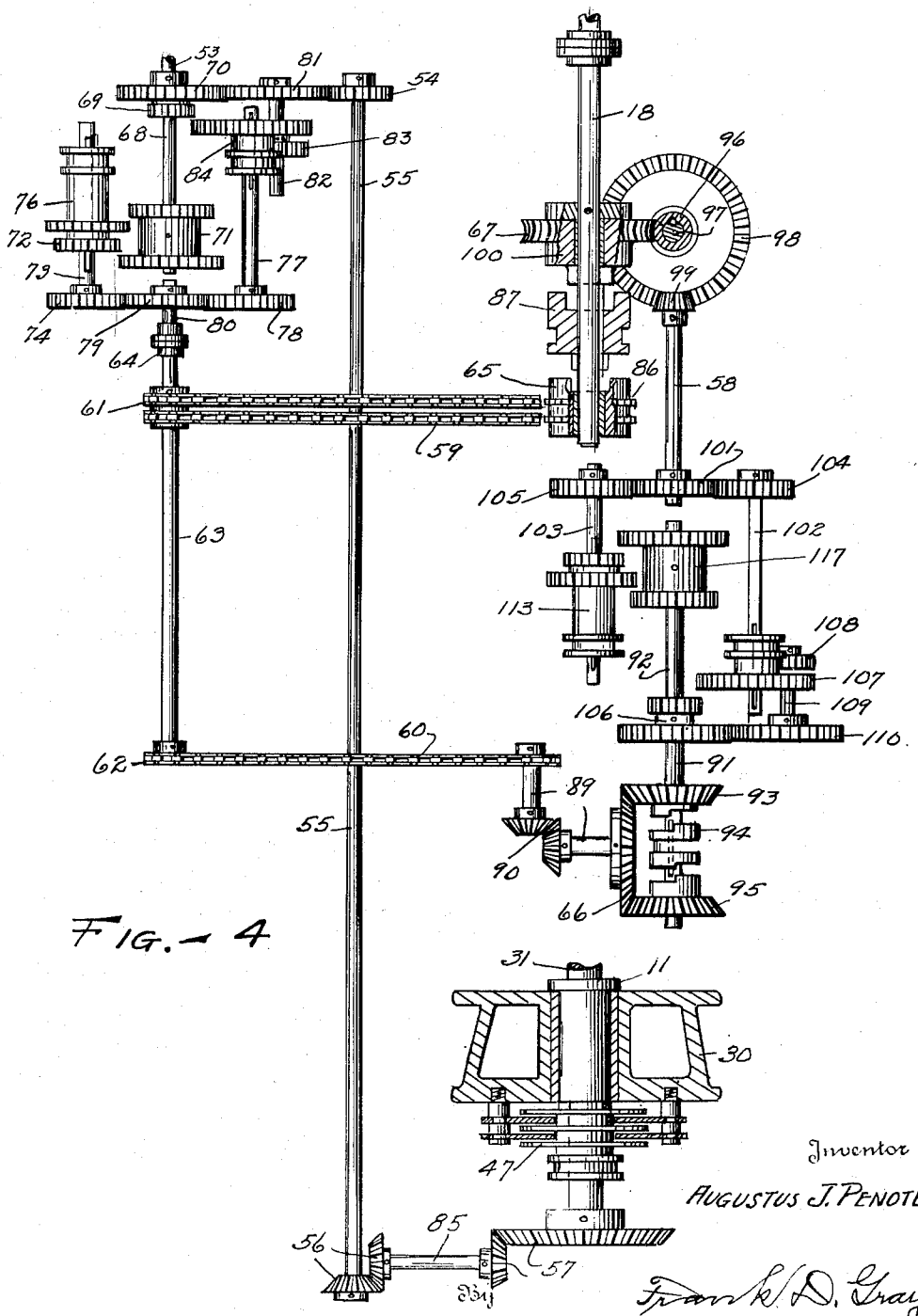

FIG. - 4

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BACKFILLER MECHANISM

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Application December 10, 1932, Serial No. 646,631

1 Claim. (Cl. 37—144)

My invention relates to improvements in tractor mechanism for filling an open trench with material lying on the surface adjacent one side of the trench and parallel of the latter, and extending longitudinally of the trench, such material for which vehicular machines of this character are adapted for operation in filling trenches, being generally dug by excavator machines which throw the material from the trench and to one side thereof. The tractor backfiller mechanism is usually driven along the surface adjacent the upper edge of the empty trench on the side opposite the piled material previously excavated.

It is a general object of my invention to provide an improved machine wherein the back-filling mechanism may be moved in a plane at right angles to the length of the machine and vertical thereof, and which is power operated to move the material toward the machine and into the trench.

It is a special object of my invention to provide a mechanism for filling a trench with material lying on the surface adjacent the trench, and comprising means for driving a scraper toward and from the trench, and operating in this manner while the machine as a unit is gradually advancing along the trench parallel thereto, and on the side thereof opposite the moving scraper. The scraper operating means will be mechanically driven to raise the scraper when moved away from the trench, and lowered when drawn toward the trench for engaging the surface material to be filled into the trench.

It is a further object of my invention to construct the mechanism including the driving motor, tractor mechanism, transmission mechanism and the backfiller mechanism so as to be readily controlled by a single operative of a common unit, both for reversing direction of power drive and for varying speed ratio over a wide range of speed limit. The scraper device in my improvement is supported by a suitable boom which is pivoted for swinging in a vertical plane normal to the longitudinal axis of the machine as a unit, no means being provided to swing the backfiller boom in an angular movement about a vertical pivot, and; since the scraper mechanism may be actuated to engage the material on the ground surface both, on the forward and also on the rearward movement of said machine, and to engage varied portions of the piles of such material.

It is a special object of my improvement that the boom employed is always pivoted for said normal movement relative to the length of the machine, thereby resulting in a very positive movement of the latter at right angles to the trench and while travelling lengthwise of the ditch and at the opposite side from the piles of filling material, thereby avoiding the development of uncertain and indefinite control of the machine body resulting from the otherwise angular pivoting of the boom toward and from the trench.

It is a special provision of my improvement to readily reverse the direction of transmission of power from the motor to the tractor members; while at the same time to make possible the change in speed over a wide range of limits when it is desired to duplicate the scraper action upon the material mounds for further filling such material into the trench, as when the first operation of the scraper is not complete. In fact, I have found it especially efficacious to move the machine back in a direction parallel to the trench and on the opposite side thereof from the position of the scraper adjacent the material mounds, to a former position on the trench preparatory to advancing along the trench a second time, the scraper mechanism being operated in both directions of movement of the machine body, and thereby operating the scraper a third time over the same surface, when necessary. There is no limit to the number of scraper operations possible with my improved machine over the same surface.

A still further object of my invention is to make possible a selection by the operative, of a speed from several different ones at his disposal, for using either direction of travel of the machine unit, so that the machine may be advanced more slowly lengthwise along the trench, either forwardly or rearwardly, and on the opposite side from the mound, when operating upon very hard clay, or upon material that may have dried and hardened in the mound since excavation; or may be advanced either way when acting upon lighter earth, such as sand, at a much faster speed. This combined wide range of speed with such a reverse, has apparently not been appreciated heretofore for this purpose.

Other objects of my invention will be evident from the following description of a preferred embodiment illustrated in the accompanying drawings, in which,

Figure 1 is a rear elevation of the machine in operation when scraping the material into the trench;

Figure 2 is a side elevation of the machine with the scraper and boom removed in part;

Figure 3 is a plan view, and

Figure 4 is a diagrammatic view showing the

transmission, including the several reverse and speed control mechanisms.

In the drawings, a main carriage has a base frame 5 resting upon parallel longitudinal rails 6 supported on cross rails 7 which are in turn supported upon longitudinal frame members 8, the entire body being carried by tractor mechanism comprising caterpillar chains 9 forming the sole travel support.

On a horizontal plane just above the caterpillars 9, a platform extends laterally on either side of the machine substantially within the vertical outline of the tractors. On extension 10 is supported the scraper mechanism 11, and on the opposite side the extension 12 supports at the forward end a motor 13, and rearward thereof suitable platform 14 for the operative who may look forwardly or rearwardly of the machine, may view the scraper mechanism on the opposite side of the machine, and conveniently control the operation of the machine as a unit as well as the particular operation of the scraper.

The tractors 9 are mounted upon suitable sprocket wheels 15, the forward pair of which are driven directly by cross shafts 16 through required differential mechanism 17 and a drive shaft 18 longitudinal of the machine and suitable transmission mechanism later to be described. Brakes 19 are mounted as shown in Fig. 3, for applying upon drums coaxial with the wheels 15, to render possible relative change in power drive to the tractors. This permits angular movement of the machine unit on the ground surface.

To provide in my mechanism a backfilling means to engage piles of dirt or other material on the adjacent surface of the trench, opposite the tractors and discharge the dirt into the trench, I make use of a scraper designated as an entirety by numeral 20 to be operated by the driver of the machine so that the scraper device is raised mechanically from the ground, moved outward, away from the trench, beyond the dirt pile and lowered to draw material from the pile, and discharged into the trench. Such scraper 20 comprises a back scraper member 21 having suitable reinforcing ribs 22. It also includes an open bottom frame 23. The angle between the frame members 21 and 23 is determined by suitable braces 24.

The scraper 20 is operated by a pair of cables 25 and 26 and requires no manual handling. Cable 26 lifts the scraper away from the trench and beyond the pile of material. Cable 26 is attached to the scraper at the upper end 27 of the member 21, and is supported above the machine by a boom 28 which carries at its upper end a sheave 29 over which the cable 26 passes upwardly from the scraper and thence down to a winding drum 30 rotatably mounted on a shaft 31 supported by a bearing 32 secured to frame members 33 and 34.

The cable 25 serves to drag or draw the scraper 20 towards the trench 35 carrying with it material from the dirt pile. This cable 25 is secured to a suitable bail 36 whose opposite ends are secured to a bracket member 37 which braces the forward ends of the scraper 20. The cable 25 passes directly from the scraper 20 to a winding drum 38, and is secured thereto, such drum being rotatably mounted on the shaft 31 heretofore mentioned.

The boom 28 is retained in an adjusted position by a cable 39 one end of which is secured to the boom at 40, and the other end secured to the reel 41 after passing over the guide pulley 42.

The boom 28 may be adjusted as to its inclination by winding the reel 41, and will ordinarily remain at the angle at which it is set when work is begun. In adjustment, the boom will swing in a vertical plane normal to the length of the machine and to the drum shaft 31, there being an advantage in a positive mounting of the boom in this single plane to securely guide the movement of the scraper 20 toward and from the approximate center of the machine. For this purpose, I have pivoted the base 43 of the boom on a horizontal pivot 44 between spaced vertical plates 45 which are securely mounted on their lower edges on the extension 10, and extend upward at 46 substantially higher than the drums 30 and 38. The pivot pin 44 is horizontal and extends through the plates 45 adjacent the upper and outer angle thereof, as shown in Fig. 1.

The drums 30 and 38 are rotatably mounted on shaft 31 to actuate the cables 26 and 25, respectively, and may be driven simultaneously or individually as desired. Power from the shaft 31 is transmitted to the drums 30 and 38 by clutch members 47 and 48 which engage or disengage said drums by bell cranks 49 and 50 which are connected with the respective clutches by links 51 and 52. Hence each drum may be driven, stopped or released, independently of the other, as desired, and thereby selectively drawing the scraper 20 backwardly loosely behind the dirt piles, or drawing the scraper toward the trench, to empty the dirt into the latter.

The drum shaft 31 is driven from the motor 13 through the shaft 53 through a take-off gear 54, a longitudinal shaft 55 and bevel gears 56 and 57, one of the latter being mounted directly on the shaft 31. Through said shaft 53 and its main transmission gearing, later to be described, and the coupling 64, drive shaft 18 may be driven selectively, by transverse sprocket chain 59 leading thence from sprocket 61 and clutch 65, or by chain 60 leading from sprocket 62, through reverse mechanism 66, speed transmission gearing later to be described, shaft 58 and worm gearing 67.

The sprocket chains 59 and 60 lead from alined sprockets 61 and 62 which may be termed a triple sprocket mounted upon the main shaft 63, as clearly shown in Figs. 3 and 4 of the drawings. Such choice of gear connections provides for a very desirable power drive of shaft 18 and the tractors, at a very high speed through clutch 65, or a positive lower speed through shaft 58 and the reduction afforded by the worm 67, as well as the reverse mechanism 66. This choice is especially desirable because of the selective speed and reverse drive mechanism which is thereby afforded for the direction in which the machine as a unit may be driven, as well as the wide range in speed in either direction; and without necessarily varying the speed of the backfilling mechanism which latter is separately driven from shaft 53 through shaft 55.

The main transmission gearing, earlier mentioned briefly, for driving shaft 18 directly from motor shaft 53, includes the shaft 68 alined and coupled with the motor shaft and having a rear gear 69, a forward and larger gear 70 and a rear double gear 71 pinned to the shaft and readily coupled to either of the double gears 72 slidable on the gear shaft 73 upon which the gear 74 is fixedly mounted, and the latter shaft speed controlled by a suitable shift lever 75 operating the shift collar 76, and thus providing a selection of two speeds for the gear 74.

Parallel with the shaft 73, shaft 77 is provided with a gear 78 which is continually in mesh with the middle gear 79 mounted on shaft 80 carrying the coupling 64. Gear 54 is driven by standard transmission 81 mounted on reverse shaft 82 carrying gear 83, which has a different size from gear 69. On shaft 77 a gear integral with sleeve 84 is slidably mounted for selectively connecting with gear 69 or 83.

The combinations of the shifts 76 and 84, as shown diagrammatically in Fig. 4, and related parts, provide an initial selection from three speeds, as will be understood. The sprocket 86 is driven from the chain 59 so it may drive shaft 18 by shifting the intermediate clutch element 87 into engagement with clutch 65 integral with said sprocket 86; while sprocket 88 receiving power from chain 60 may, through shafts 89 and bevel gears 90, drive shaft 91 and its extension 92, through a reversing mechanism 66 which is readily controlled by shifting the intermediate clutch collar 94 which is keyed upon the shaft 91 between the bevel gears 93 and 95.

Shaft 18 may be alternatively driven by worm and gear mechanism 67, the worm 96 being keyed upon the stub shaft 97, and integral with the bevel gear 98 receiving power from the small bevel gear 99 on the shaft 58. The gear 67 may be bound to shaft 18 by shifting clutch member 87 into engagement with clutch 100 which is secured to the worm gear 67. A standard transmission gear 101 may be selectively driven by either of the shafts 102 or 103 which are pinned to the gears 104 and 105, respectively. Upon the reverse shaft 91 is mounted double gear 106 pinned thereon for driving shaft 102 through slidable gear 107 selectively engaging the said double gear 106 or gear 108 pinned on shaft 109 permanently mounted to be driven from said double gear by means of gear 110.

A lever 111 is provided for shifting the reverse clutch collar 94, and control lever 112 may shift gear 113 for changing speed of shaft 58. Lever 114 is provided for shifting clutch collar 87, while levers 115 will operate the brakes 19 to control the tractors, as before explained. Levers 116 and 196 are also provided for operating the links 51 and 52 to control drum clutches 47 and 48, as will be understood.

It will now be understood that by the selective engagement of the double gear 113 with the double gear 117 which is pinned to shaft 92; and by the change in speed afforded by shifting the gear 107, a choice of three speeds is provided from the reverse mechanism 66 to the shaft 58 which by means of the reduction gearing provided by the worm gears 67—96, may drive shaft 18 when the clutch shift 87 engages the clutch member 100 and power is applied through chain 60. Since a large number of different speeds may be used in driving shaft 18 through the shaft 58, all of which are attained by power drive through chain 60, and consequently through shaft 80 and gear 79, it is evident that each of such speeds driven through the agency of shaft 58 may be applied to anyone of the three speeds originally driven through the intermediacy of the chain 80, thereby resulting in a possible selection from nine speeds, when the drive power of chain 59 is not utilized.

It is also obvious that the large choice of selective driving speeds available through the agency of parts 60, 58 and 18, for varying the driving speed of the tractors, is also operative for rotation in either direction, since anyone of these speeds may be used whatever position the clutch collar 94 may have; and therefore the machine may be driven forwardly or rearwardly at many varying speeds, all of which selection may be made by the operative stationed on the platform 14.

My improved machine has great merit also because the reeling drums 30 and 38 are driven from motor shaft 53 through agency of their own independent transmission gearing 54, 55 and 85 together with their separate clutches 47 and 48. The scraper cables 25 and 26 are therefore driven and capable of control by the operative independent of the direction or speed of tractors.

This independent control of tractors and reeling drums, permits operation of the scraper mechanism while the machine as a whole is either advancing forwardly or moving rearwardly, in a direction parallel with the trench, and the speed of travel of the machine unit in either direction may be varied widely, although the scraper may be operated at a substantially uniform speed. This advantage is one that seems not to have been appreciated in the past. Heretofore, while the machine provided with scraper mechanism may possibly have means for driving the unit slowly during operation of the scraper and more rapidly when traveling over a track or on the highway, it has not been possible heretofore to operate the scraper while the machine was travelling rearwardly, and at different speeds.

For this reason, the excavated material on the sides of the trench may only be drawn by the scraper toward the trench while the machine is moving forwardly. If therefore, the operation of the scraper is not complete during the first forward advance of the machine along the trench, it has heretofore been quite difficult to repeat the operation over the same pile of material, without returning the machine while its scraper is idle, to its first position along the trench, and then repeating the scraping operation. This difficulty of a substantially continuous operation of the scraper and travel in completing the filling-in operation has been found almost prohibitive in obtaining a perfect result.

The above described disadvantages have been wholly overcome by my improved structure including the combination of the varied speeds of drive for the tractors, of the reverse of the drive of the tractors, and of an independent control of drive for the reeling drums for operating the scraper while the machine unit is traveling in either direction. The result obtained enables the operative to repeat the scraper operation in both directions of travel of the machine until the material has been wholly discharged into the trench.

In operation, the machine is driven to a position parallel with the trench and with the scraper approaching the pile of material to be operated upon for discharging the material into the trench; and one of the slower speeds selected for advancing the machine from the motor shaft 53, such drive mechanism including the chain 59, if the material to be acted upon is not too hard, or the chain 60 if the advance speed must be greatly reduced. The lever 111 may be operated to shift the clutch 94 for forward travel of the machine, if the chain 60 is used. The machine may be readily steered by tightening either of the brakes 19 by shifting the corresponding lever 115, thereby rotating sprockets

15 at relatively different speeds and driving the caterpillar treads 9 at the relative speed desired.

The machine will now be driven forwardly while the scraper is operated in a transverse plane normal to the axis of the drums 30 and 38, and repeating such operation for the desired distance, which will ordinarily be such distance in a substantially straight line, and in which the material is substantially uniform in character. If now, the surface over which the scraper has been acting thus far, has not been adequately cleaned or uncovered, the operative may readily actuate the lever 111 to reverse the direction of travel of the machine, at the same time retaining the clutch 87 engaged, so that the machine is driven rearwardly by the chain 60, the reverse mechanism 66, and the shaft 58, the drive mechanism for the scraper actuating cables continuing to be driven through the shaft 55 and gear mechanism 85, so that the scraping action will continue as the machine is driven rearwardly over the same surface before operated upon. Since the surface has now been subjected to two scraping operations, the transmission levers may be again shifted to drive forwardly, and at a much higher speed.

When the material has a softer quality and lower piles of the same remain on the surface at the side of the trench, the speed of the tractors for advancing in either direction may be correspondingly increased while the operation of the scraper continues to discharge the material efficiently into the trench. The operation of the improved machine will therefore, be one involving repeated forward and backward travel, while scraper action continues until the ground surface is cleared. When the direction of the piled material along the trench includes angles and more or less sharp curves, it is desirable to not advance the machine continuously too far in one direction before returning to the first position, the provision of the elements of control available for the operative, making the possible efficiency of operation exceedingly high, and positive.

The accurate control of the machine, including the steering mechanism, the choice of direction of travel thereof as well as the selective qualities afforded, combined with the desirable continuity of scraper operation, is further advantageous in making possible and desirable the movement of the scraper and its supporting boom in substantially a single plane, that which is normal to the length of the machine. By my improved combination of plural mechanisms mounted on a single frame, a great advantage results from the positive limitation of the movement of the boom cables, thereby holding the scraper mechanism under control of the body of the machine itself, and avoiding the undesirable lurching of the tractors, when the boom and related parts are permitted to swing around in an arc, either forwardly or rearwardly from the pivot of its base. The possible travel of the machine back and forth along the trench while the scraper is operating, no longer makes such swinging action essential or desirable.

From the foregoing description it is evident that I have now provided a machine for filling-in a trench by scraping material which has been piled along the surface adjacent thereto by a former operation; and have made it possible to operate the scraper in a plane toward and away from the machine to discharge the material, and without changing the plane of such operation, but maintaining the movement of the scraper wholly under the control of the operator. I have also constructed this machine so that the scraping action may be continued under control of the operator, while selectively driving the machine forwardly or rearwardly, and at different speeds.

I have therefore provided a machine having very large capacity for operation due to the possible choice of speeds depending upon the character of material to be operated upon, and upon the surface over which the machine must travel. My improved machine is compact, and the entire mechanism, including the various transmission gears, steering brakes, reverse mechanism and the several clutches therefor, is readily controlled by a single operative.

Having set forth the principles of my invention, and described and illustrated an embodiment thereof for practical use, what I claim and desire to secure by Letters Patent, is:

A machine of the class described comprising a supporting framework supported on tractor members, a scraper device movable laterally toward and away from said framework and solely in a vertical plane normal to the length of said machine, a common source of power on said framework for driving both the scraper device and the tractor members, said members being driven from said source by transmission mechanism including a tractor drive shaft and a main power shaft in parallelism, a drive chain connecting said shafts together by a sprocket gear normally idle on said tractor shaft, a reduced speed shaft connected with an idle gear on said tractor drive shaft for driving the latter when said sprocket is idle, clutch means for positively connecting the tractor drive shaft with either idle gear selectively, a reverse mechanism connected with said reduced speed shaft for driving the latter in either direction selectively, a second chain drive connecting said reverse mechanism with said main power shaft, winding mechanism for actuating said scraper device, and gear transmission mechanism independent of either chain drive for driving said winding mechanism from said power source, whereby the scraper device may be operated while the tractor members are driven in either direction.

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