Jan. 8, 1924. **1,479,929**

A. M. RICKS

BEET DIGGING AND CONVEYING MACHINE

Filed June 26, 1920 5 Sheets-Sheet 1

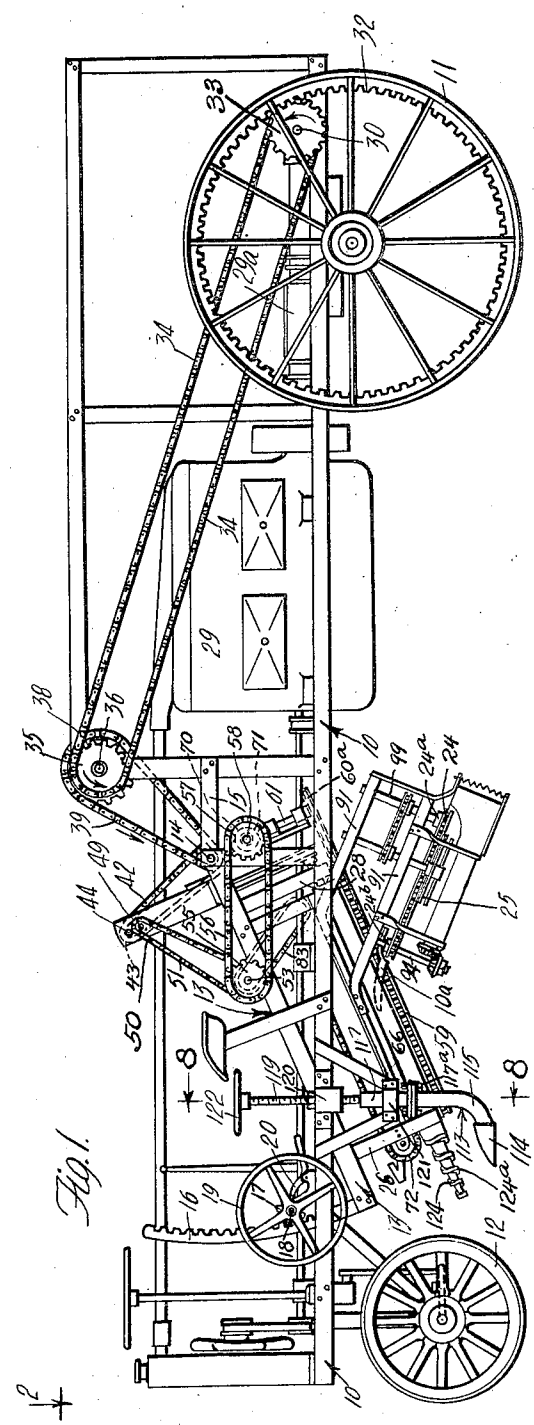


Fig. 1.

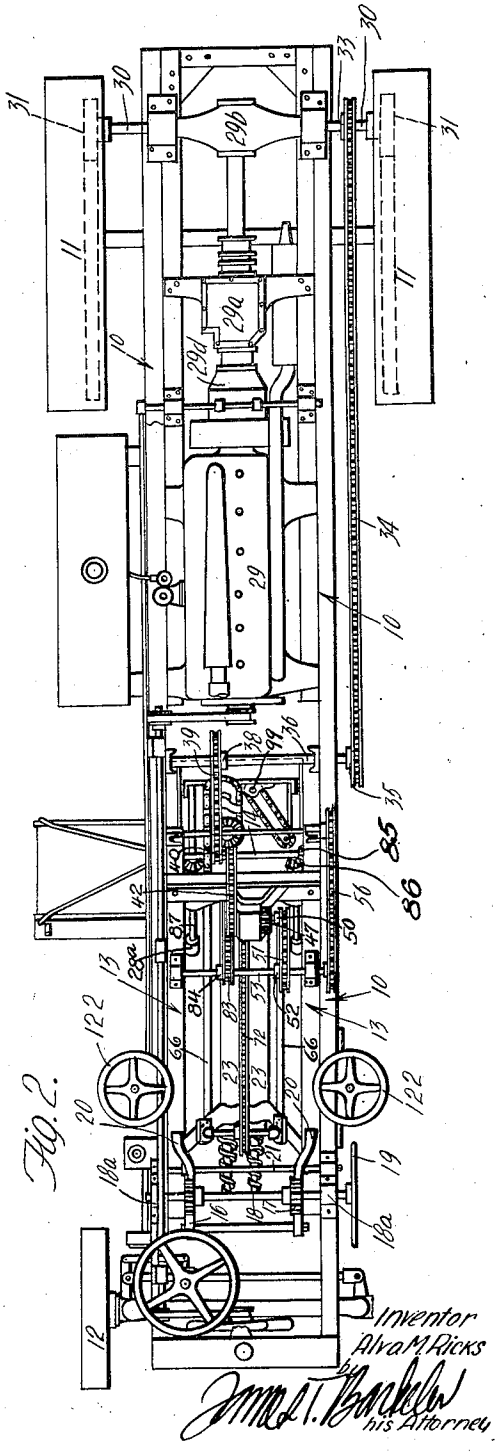


Fig. 2.

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Alva M. Ricks
by
his Attorney

Jan. 8, 1924. **1,479,929**

A. M. RICKS

BEET DIGGING AND CONVEYING MACHINE

Filed June 26, 1920 5 Sheets-Sheet 2

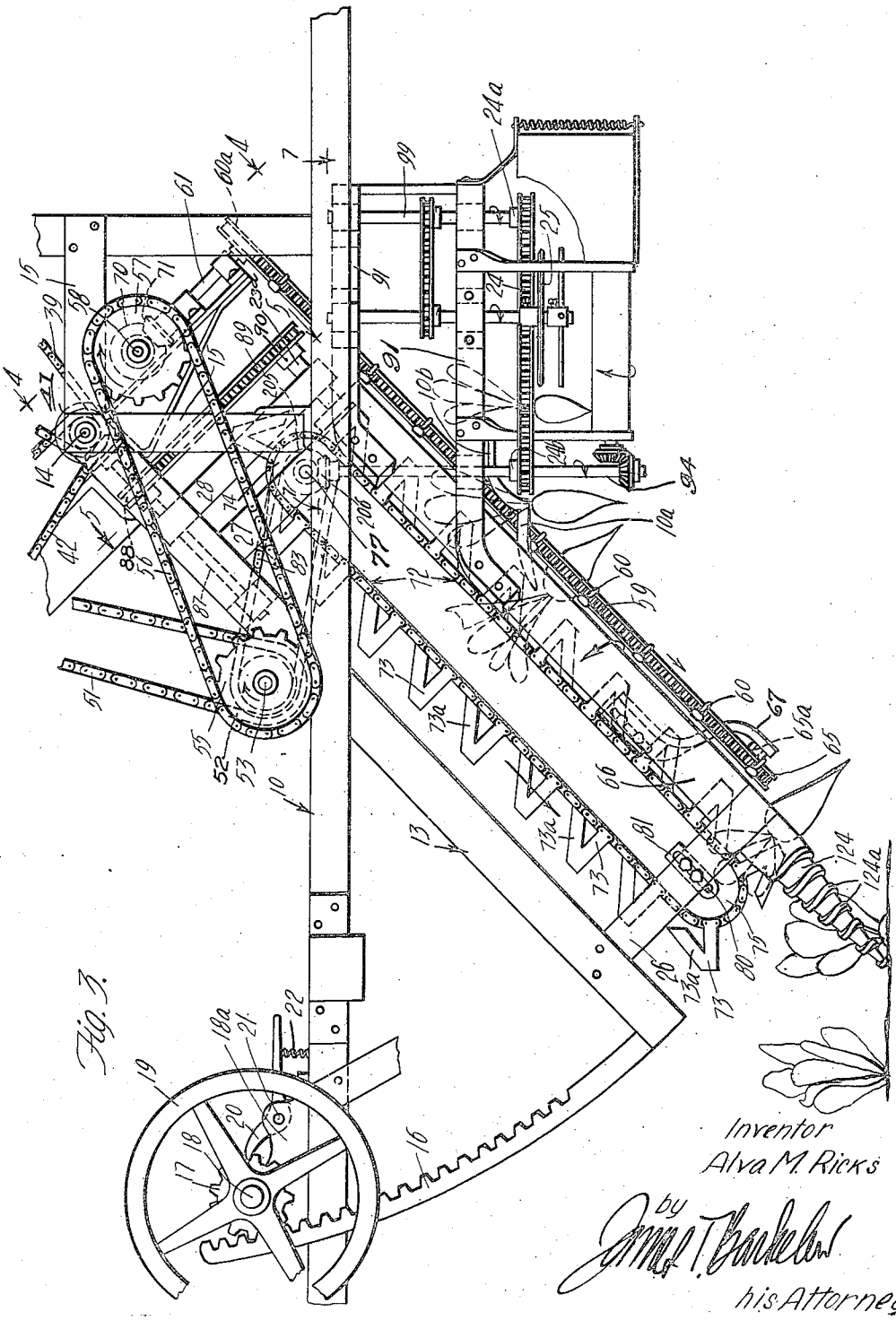


Fig. 2.

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Jan. 8, 1924. 1,479,929

A. M. RICKS

BEET DIGGING AND CONVEYING MACHINE

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Fig. 4.

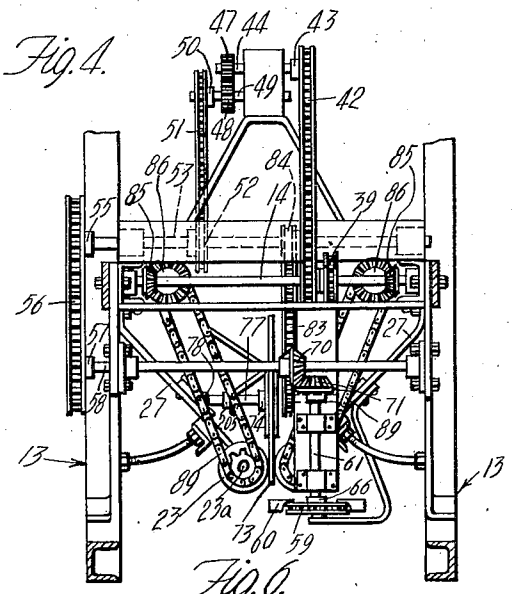


Fig. 5.

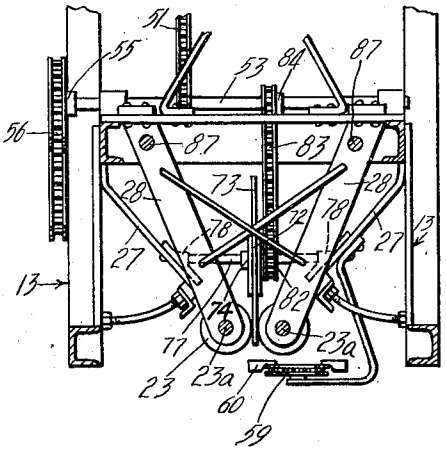
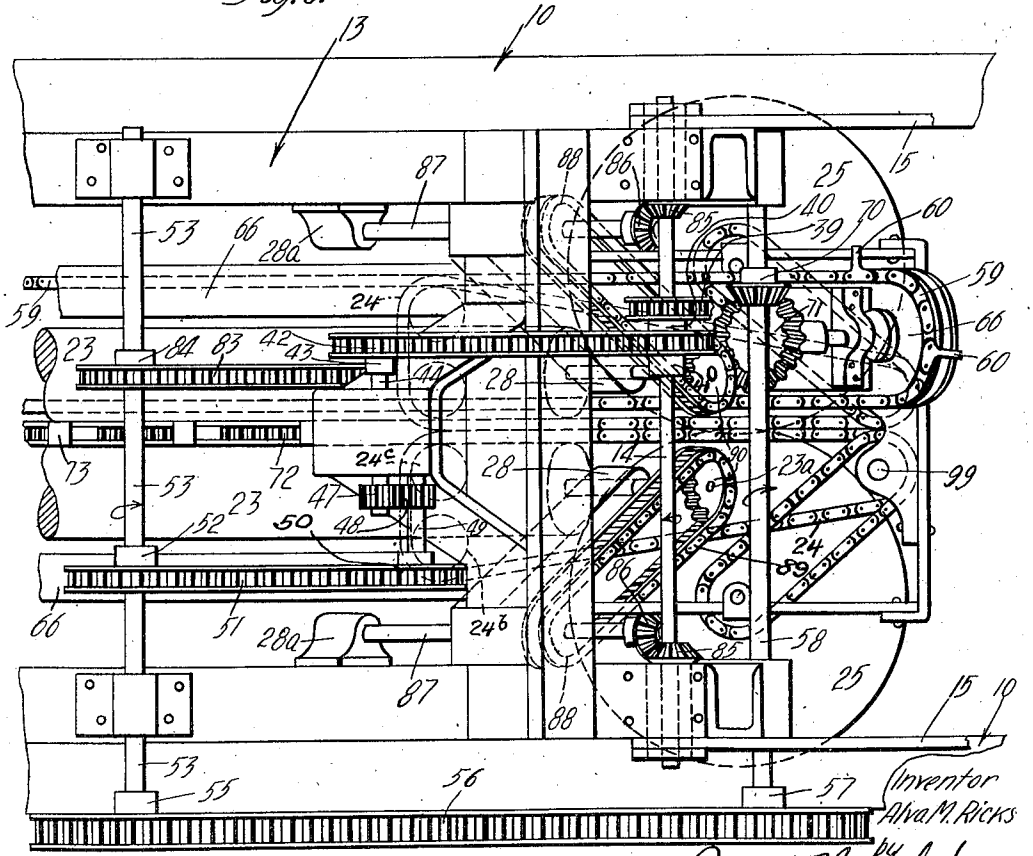


Fig. 6.



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by
His Attorney.

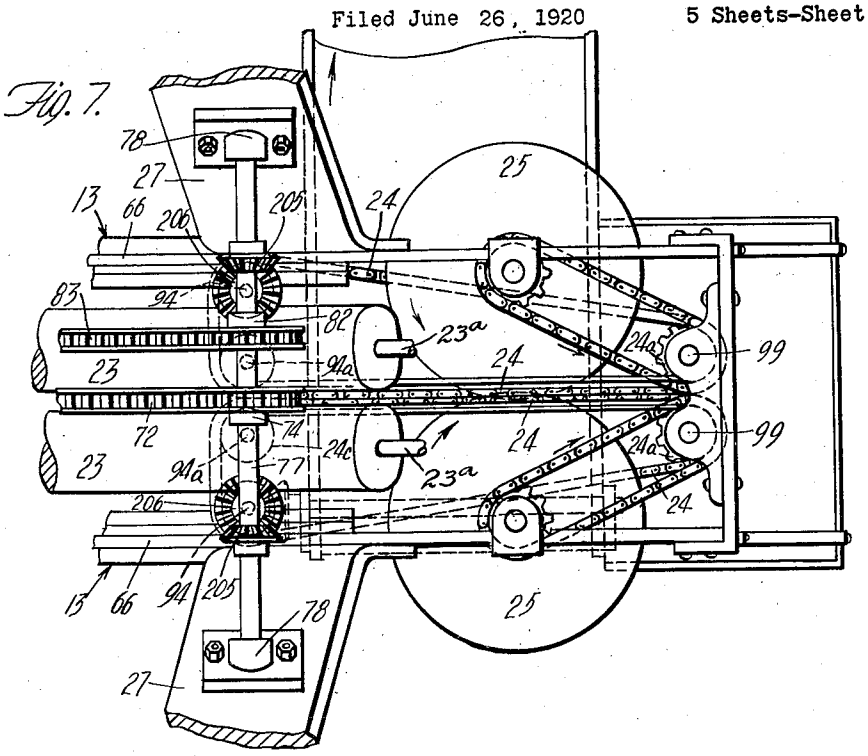
Jan. 8, 1924. **1,479,929**

A. M. RICKS

BEET DIGGING AND CONVEYING MACHINE

Filed June 26, 1920 5 Sheets-Sheet 4

Fig. 7.



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Jan. 8, 1924. 1,479,929

A. M. RICKS

BEET DIGGING AND CONVEYING MACHINE

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Fig. 9.

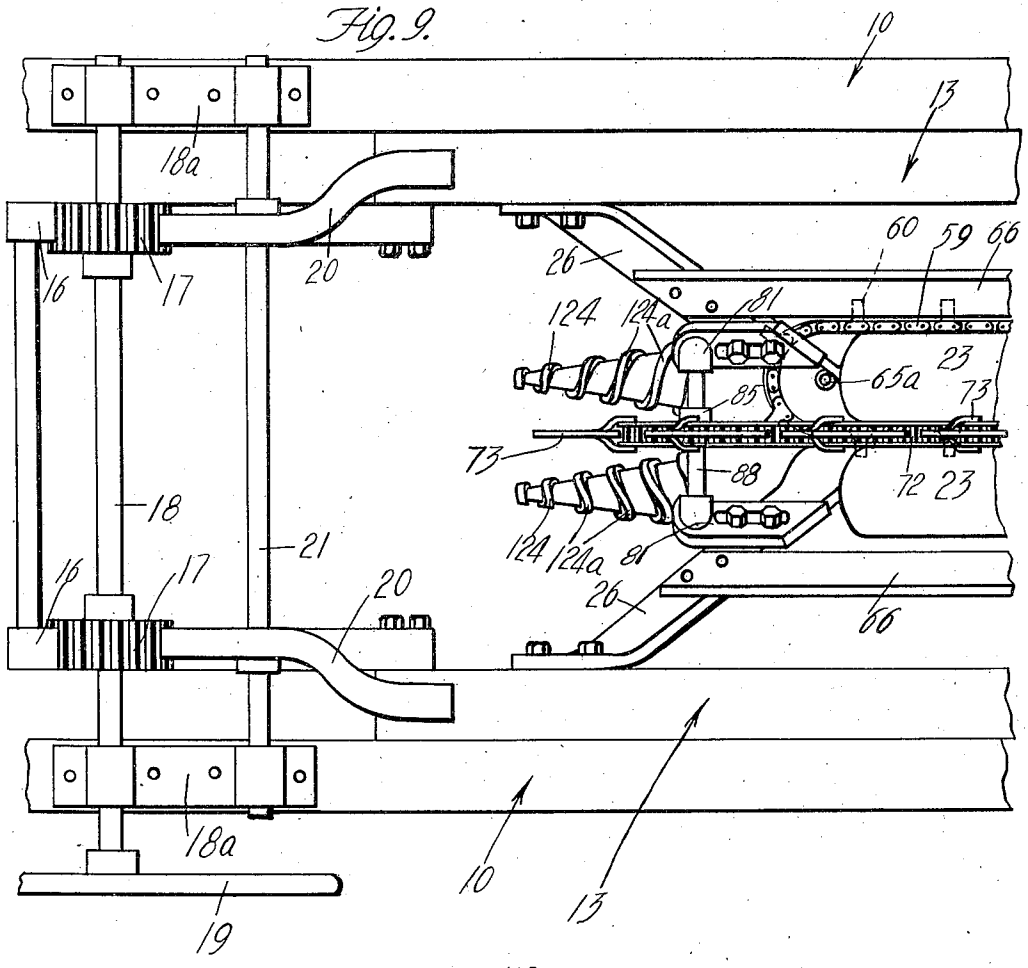
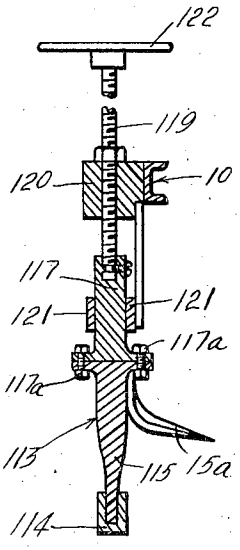


Fig. 8.



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Patented Jan. 8, 1924. 1,479,929

UNITED STATES PATENT OFFICE.

ALVA M. RICKS, OF LOS ANGELES, CALIFORNIA.

BEET DIGGING AND CONVEYING MACHINE.

Application filed June 26, 1920. Serial No. 392,053.

To all whom it may concern:

Be it known that I, ALVA M. RICKS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Beet Digging and Conveying Machines, of which the following is a specification.

This invention has to do with beet digging and handling machines and more particularly beet digging and conveying machines. An object of the invention is to provide a simple and effective machine for removing beets from the ground and delivering them to a topping mechanism, or the like.

The subject of the present application is, as above specified, the digging and conveying apparatus hereinafter described, while the beet topping mechanism, its co-operating parts, etc., herein disclosed in connection with the digging and conveying mechanism, is the subject of my Patent #1,445,449 on "Beet topping machine" granted February 13th, 1923.

The various objects and features of the invention will be best understood from the following detailed description of a preferred embodiment of the invention throughout which reference is had to the accompanying drawings in which—

Fig. 1 is a side elevation of my improved machine showing it in its raised position; Fig. 2 is a plan view of the same being a view taken as indicated by line 2—2 on Fig. 1; Fig. 3 is an enlarged side elevation of the operating portion of the machine showing it in its down or operating position; Fig. 4 is a reduced sectional view taken as indicated by line 4—4 on Fig. 3 showing the various driving connections; Fig. 5 is a reduced sectional view taken as indicated by line 5—5 on Fig. 3; Fig. 6 is a plan view of the upper or rear parts shown in Fig. 3; Fig. 7 is an enlarged sectional view taken as indicated by line 7—7 on Fig. 3, showing the topping knives; Fig. 8 is an enlarged sectional view taken as indicated by line 8—8 on Fig. 1; and Fig. 9 is a plan view of the lower or forward parts shown in Fig. 3.

For simplicity and sake of clearness the leaves or foliage of the beets will be herein termed tops while the bodies will be termed beets.

In the drawings I show a suitable main frame 10 supported at its forward end by a pairs of wheels 12 and at its rear end by a pair of wheels 11. In the specific form of construction herein set forth the machine is arranged to be propelled by an engine 29 through the rear wheels 11. The engine 29, which is preferably an ordinary internal combustion engine mounted on frame 10, is connected with the wheels 11 through a transmission mechanism, or change speed mechanism, 29^a and a differential mechanism 29^b, such as is common in automobile construction. A suitable clutch 29^d is arranged between the engine and the transmission so that the machine can be conveniently controlled. The shaft 30 which extends from the differential mechanism has drive pinions 31 mounted on it to engage internal gears 32 arranged within the rims of wheels 11.

Within the main frame 10 is mounted a sub-frame 13 which carries the beet digging, conveying, and topping mechanism. This sub-frame 13 is pivotally connected at its rear end to the main frame 10 by a horizontal transverse shaft 14, which extends across the main frame 10 and through the sub-frame 13. The shaft 14 is rotatably carried between main frame members 15 and extends through hangers, or bearings, mounted on the sub-frame 13. By this construction the sub-frame 13 is vertically adjustable, that is, it may be swung or adjusted about the shaft 14 as an axis. For adjusting the sub-frame 13 racks 16 are mounted on the forward end of sub-frame 13 to extend upwardly and engage pinions 17 mounted on horizontal transverse shaft 18. The shaft 18 is carried in suitable bearings 18^a and has a hand wheel 19 mounted on one of its ends in order that it may be conveniently rotated by hand. It will be readily understood how rotation of shaft 18 will cause lowering or raising of racks 16 through pinions 17. To afford a locking means, for this adjusting arrangement, pawls 20 are mounted on shaft 21 and are arranged to normally be held in engagement with pinions 17 by springs 22. To release the locking mechanism pawls 20 are released from pinions 17 by pressure on their rear ends.

The sub-frame 13, as before stated, carries the beet digging, conveying and topping mechanisms. The beet digging mechanism is arranged at the extreme forward end of sub-frame 13 and comprises, generally a soil engaging and disturbing element 113, and a pair of bits 124 adapted to pull and lift the

beets. In the particular machine herein set forth the soil engaging member is arranged to be at the forward end of sub-frame 13 when the machine is in operation but it is not mounted on the sub-frame, it being mounted on the main frame 10. The conveying mechanism extends from the bits rearwardly to the topping mechanism, arranged at the rear of the sub-frame, and comprises, generally, a main conveyer mechanism which extends from the bits to a second conveyer extending from the main conveyer to the topping mechanism. The entire beet handling mechanism is arranged so that it is compact and so that the bits 124 can be lowered to the ground, so that they will engage and pick up the tops of the beets, by lowering sub-frame 13 in the manner above set forth. In the operation of the machine the various elements and mechanisms above referred to co-operate in a manner which makes the machine positive, accurate, and efficient in its operation.

The two bits 124 are tapered, or conical shaped, members arranged to be parallel with each other and so that their small ends extend towards the front of the machine. The bits are also spaced somewhat apart, as shown in the drawings, and are arranged to be at an angle of about 45° with the ground when the machine is operating, and are in the form of screws rather than being smooth. The threads or spiral projections 124ª, formed on the bits, are opposite in direction on the two bits so that rotation of the bits in opposite direction will cause both of them to move objects, engaged by them, in the same direction. Further, the threads 124ª are formed so that when the bits are rotating, so that their adjacent sides move upwardly, they move objects, engaged by them, rearwardly. In operating the machine sub-frame 13 is lowered so that the bits are in position to engage and pick up the tops of the beets and feed them rearwardly to the main conveyer rolls 23. The bits not only gather the tops, that are directly in the line of travel of the machine, but also guide the tops of any beets which are out of line inwardly so that those beets will also be picked up. As the tops are caught between the bits and are moved rearwardly and upwardly they are lifted from the ground, and carry with them the beets. After the top of a beet is caught by the bits it is carried upwardly and rearwardly until it engages, or is caught by and between, the conveyer rolls 23.

In practice and under ordinary circumstances the bits 124 are sufficiently effective, in picking up the beets by their tops, to make any other mechanism unnecessary. However, if the ground be particularly hard, or if the beets be particularly hard to remove from the ground, it may become desirable to employ a soil disturbing member in connection with the bits. The soil disturbing member 113 comprises a vertically adjustable carrier 117 carried in a suitable guide 121 secured to the main frame 10. An arm 115 is detachably mounted on the lower end of carrier 117 by means of bolts 117ª and has mounted on it at its lower end a longitudinally arranged plow member 114 and near its upper end a transversely arranged blade 15ª. The carrier 117 is adapted to be moved vertically in guide 121 by a screw 119 which is screw-threaded in a block 120 mounted on frame 10 and which is provided at its upper end with a hand wheel 122. The carrier 117 is so located on frame 10 and the carrier 117, arm 113, and plow 114 are so arranged and proportioned that the plow 114 extends along one side of the row of beets being lifted by the bits, at a point well below the surface of the ground and where the beets begin to be lifted, so that the ground is loosened at one side of the beets thereby making them easily picked up. The blade 15ª when lowered to operative position extends from the arm 115 transversely across under the ground surface and under the bits 124 at a point where it will assist the bits in lifting the beets from the ground. In practice the machine is built with a carrier 117 at each side of the frame 10 so that arm 115, carrying plow 114 and blade 15ª, can be arranged at either side of the machine and so that, if necessary, a plow and blade can be arranged at both sides of the machine. It may be stated, however, that it is not necessary, and in fact not altogether desirable, to provide plows and blades at both sides of the machine as it has been found that best results are had when only one plow and blade are employed. In practice it is preferred that the carrier 117 be adjusted so that the plow 114 is a considerable distance under the ground, or so that it is near the lower portions of the beets, and that it be arranged so that it will not actually engage the beets to mutilate or damage them.

The conveyer rolls 23, which receive the tops from the bits 124, are smooth cylindrical rolls carried at their lower ends by bracket members 26 and at their upper ends by bracket members 28. The bracket members 26 and 28 are mounted on the sub-frame 13 and are spaced and braced by brace members 66 and 66. The conveyer rolls 23 are arranged longitudinally in sub-frame 13 so that when the frame is lowered to the operating position they extend upwardly and rearwardly at approximately 45°. The drive for the rolls 23 causes them to rotate in opposite directions and so that their adjacent sides move upwardly. The rolls 23 are arranged parallel with each

other and are spaced somewhat apart so that the tops are held between them, but they are not sufficiently far apart to permit of the beets being drawn through or between them. In practice, the conveyer rolls 23 and the bits 124 are formed integrally with each other, as shown in the drawings. By constructing the conveyer rolls 23 and bits 124 integrally the machine is materially simplified in that the bits 124 can be rotated by the rolls 23 thereby making it necessary merely to provide a drive means for the rolls 23.

While the tops are held by the conveyer rolls 23, due to the rotation of the rolls in opposite direction, they are moved or advanced along the rolls toward the rear of the machine by advancing fingers 73 carried on a chain 72. The chain 72 is arranged above the conveyer rolls so that the fingers 73 will extend downwardly toward and between the conveyer rolls 23, as clearly shown in the drawings. The chain 72 runs over sprockets 74 and 75 and is positively driven in the direction indicated by the arrow in Fig. 3 through sprocket 74. The sprocket 74 is mounted on a positively driven shaft 77, carried in bearings 78, while sprocket 75 is mounted on a shaft 80 carried in a suitable bearing blocks 81 adjustably mounted on bearing brackets 26, as clearly shown in Fig. 3 of the drawings. The bearing blocks 81 being adjustably mounted on the bearing brackets 26 can be regulated to set or adjust the chain 72 so that it is of the proper length and tightness. The advancing fingers 73, it will be noted, are mounted on the chain 72 to be perpendicular relative to the chain and are formed with rearwardly extending diagonal brace members 73^a which do not connect to the chain but merely engage it when it is straight. The brace members 73^a brace the fingers 73, allow the chain to pass over the sprockets, and also brace the chain 72 and prevent it from sagging to allow the fingers 73 to extend too far between the conveyer rolls 23. The chain 72 is driven, in the manner hereinafter described, at a speed which will cause the beets to be advanced along the conveyer rolls 23 sufficiently fast to prevent them from becoming clogged, or sufficiently fast that the beets are disposed of as fast as they are supplied to the rolls by the bits 124.

While the tops are being held between the conveyer rolls 23 and are being advanced towards the rear of the machine by the advancing fingers 73 the beets are preferably supported and advanced towards the rear of the machine by horizontally disposed advancing fingers 60 carried on a chain 59, which operates in synchronism with the chain 72. The advancing fingers 60 are arranged at suitable intervals on the chain 59 and the chain 59 is carried on sprockets 65 and 60^a so that the fingers 60 on the rearwardly moving portion of the chain are in position to engage and advance the beets. The sprocket 60^a, which drives the chain 59, is mounted on a drive shaft 61 at the rear of sub-frame 13 while the sprocket 65, which carries chain 59 is carried on a spindle 65^a which extends from a bracket 67 adjustably mounted on one of the brace members 66, as clearly shown in the drawings. The chains 72 and 59 are operated in synchronism, or so that their linear velocities are the same, thereby causing the tops and the beets to be moved rearwardly at the same speed, preventing the advancing fingers from having any tendency to displace or dislodge the tops from between the conveyer rolls 23. In practice, the co-operation of the advancing fingers 73 and the advancing fingers 60 positively prevents clogging or choking up the conveyor rolls 23 and makes the machine positive and particularly effective in its operation.

When the tops reach a pre-determined point near the upper ends of the conveyer rolls 23 they are transferred from the conveying mechanism, just described, to conveying chains 24. To transfer the beets from the conveyer mechanism above described to the conveyer chains 24 without allowing them to drop, a guide finger 10^a is arranged to extend partially between the conveyer rolls 23 from their undersides. The finger 10^a is arranged a little to one side so that it will not interfere with the advancing fingers 60 and is arranged to engage the top portions of the beets to prevent further upward movement of the beets and thereby cause the tops to be withdrawn from between the conveyer rolls 23. It is preferred that the finger 10^a be somewhat curved, as shown in the drawings, so that the tops will be gradually withdrawn from the rolls 23. In practice, when the machine is operating the conveyer rolls 23 are at an angle of about 45° relative to the ground while the guide finger 10^a is arranged to be substantially horizontal. The arrangement of conveyer rolls and guide finger and the shape of the guide finger cause the tops to be removed from the rolls 23 gradually rather than suddenly. This is important in that it prevents the tops from being torn or stripped from the beets and prevents jarring or sudden shocks that might cause the beets to be dislodged from the machine. The guide finger 10^a may be mounted on the sub-frame 13 in any suitable manner. For instance, it may be formed with arms 10^b which are secured to horizontal frame members 91, arranged to extend rearwardly from the braces 66, as clearly shown in Fig. 3.

The conveyer chains 24, which receive the

tops from the guide finger 10ª, are arranged horizontally and their forward portions are sufficiently close to the conveyer rolls 23 that the upper portions of the tops are still gripped by the conveyer rolls 23 when they are caught by the conveyer chains. The fact that the tops are caught by the chains 24 before they have been completely removed from the conveyer rolls 23 prevents them from being dropped during the transfer from the rolls to the chains. Each of the conveyer chains 24 is carried by a sprocket 24ª, a sprocket 24ᵇ, and a sprocket 24ᶜ. The sprockets 24ᵇ are mounted on vertical driven shafts 94 while the sprockets 24ª and 24ᶜ are mounted on vertical shafts 99 and 94ª respectively. The shafts 94 are at the sides of the machine, or at the sides of the sub-frame 13, in order that they may extend from the upper portion of the sub-frame to the lower portion of the sub-frame, where the topping mechanism is arranged, without interfering with the conveyer rolls 23. The several sprockets which carry the chains 24 are arranged so that the chains have parallel rearwardly moving portions arranged close together to grip the tops and carry them rearwardly. Shafts 94 are rotated in opposite directions and at the same speed so as to cause the parallel portions of chains 24 to move rearwardly at the same speed. It will be readily understood how tops, delivered to the chains 24 from conveyer rolls 23 by guide finger 10ª, are firmly gripped, between the chains 24 and are moved rearwardly carrying with them the beets.

The chains 24 in carrying the beets rearwardly carry them into engagement with rotary knives 25, arranged close under the chain 24, and thereby cause the beets to be cut from the tops. The topping mechanism and the mechanism which handles the beets and tops after they have passed the topping mechanism are fully described in the above mentioned patent.

Having set forth generally the various parts and mechanism which operate upon the beets from the time that they are removed from the ground until they are topped, I will now proceed to set forth a form of drive mechanism that may be employed to operate the above mechanism and parts. For instance, as shown in the machine herein disclosed, the entire mechanism may be operated from shaft 30 through a chain 34 which runs over a sprocket 33 mounted on shaft 30 and a sprocket 35 mounted on shaft 36. The shaft 36 is a horizontal transverse shaft mounted on main frame 10 and carries a sprocket 38 which carries a chain 39 arranged on a sprocket 40 mounted on shaft 14. This manner of driving the shaft 14 from the shaft 30 causes it to rotate in a counter-clockwise direction, as indicated by the arrows throughout the drawings. The shaft 14 has mounted on it two oppositely faced bevel gears 85 which mesh with and drive bevel gears 86 mounted on shafts 87 which are carried in suitable bearings 28ª. The arrangement of bevel gears 85 and 86 causes the shafts 87 to rotate in opposite directions, as indicated by the arrows in the drawings. Sprockets 88 are mounted on the shafts 87 to carry and drive chains 89 which are arranged over sprockets 90 mounted on the spindles 23ª which extend from the rear ends of rolls 23 through mounting brackets 28 as clearly shown in Fig. 6 of the drawings. This driving mechanism constitutes the drive for rollers 23 and causes them to rotate at the same speed and in opposite directions and so that their adjacent sides move upwardly.

To drive the chain 72 a shaft 44 is driven from shaft 14 through chain 42 running over sprocket 41, mounted on shaft 14, and sprocket 43, mounted on shaft 44. The shaft 44 has mounted on it a gear 47 which meshes with and drives a gear 48 mounted on shaft 49. The gear connections between the shaft 44 and shaft 49 cause the shaft 49 to rotate in the proper direction and in a direction opposite to that in which shaft 44 rotates. A sprocket 50 is mounted on shaft 49 and carries a chain 51 which runs over a sprocket 52 mounted on shaft 53 thereby causing shaft 53 to rotate in the same direction as shaft 49. The shaft 77 on which is mounted sprocket 74 which carries chain 72, is driven from shaft 53 through a chain 83 carried on a sprocket 84 mounted on shaft 53 and a sprocket 82 mounted on shaft 77, as clearly shown in Fig. 5 of the drawings.

To drive the chain 59 a shaft 58 is rotated from shaft 53 through chain 56 which runs over sprocket 55, mounted on shaft 53, and sprocket 57, mounted on shaft 58. The shaft 58 drives shaft 61, on which is mounted sprocket 60ª, through bevel gears 70 and 71 mounted on the shaft 58 and shaft 61 respectively.

The shafts 94, which drive conveyer chains 24, and knives 25, are driven from shaft 77 through bevel gears 205 and 206 mounted on shafts 77 and 94, respectively. It will be noted from the above description that the entire beet handling mechanism is driven from, or through, shaft 14. By thus driving the entire mechanism through shaft 14 and by arranging the sub-frame 13 to be pivotally mounted on shaft 14 the sub-frame can be adjusted or swung to any desired position without in any way effective or changing any of the knives or drive-mechanisms.

Having described a preferred form of my invention, I claim:

1. In a machine of the character described

beet digging means embodying soil disturbing means embodying a plow member adapted to be arranged well below the surface of the ground, and a blade adapted to be arranged nearer the surface of the ground.

2. A machine for digging beets comprising a longitudinally arranged plow member adapted to be arranged well below the surface of the ground, and a transverse blade adapted to be arranged nearer the surface of the ground.

3. In a machine of the character described a main frame, a sub-frame adjustably mounted in the main frame, power means mounted on the main frame, two conical shaped spiral bits rotatably mounted on the sub-frame, drive means connecting the power means and the bits to rotate the bits so that their adjacent portions move upwardly and soil disturbing means adjustably mounted on the main frame to co-operate with the bits, said soil disturbing means comprising an adjustable arm, a longitudinally arranged plow member mounted on the arm and adapted to be arranged well below the surface of the ground at one side of the row of beets, and a transversely arranged blade mounted on the arm to be nearer the surface of the ground and to extend under the bits.

4. In a machine of the character described the combination of beet digging means, comprising soil disturbing means, and two oppositely rotated parallel conical shaped spiral bits, and conveying means comprising two parallel rolls arranged end to end with the large ends of the bits and rotated in the same direction as and in synchronism with the bits, the rolls being adapted to receive beets from the bits and hold them by their tops and means for engaging the tops of the beets and the bodies of the beets to move them longitudinally of the rolls while they are being held by the rolls, said means comprising fingers carried on chains.

5. In a machine of the character described a main frame, a sub-frame adjustably mounted in the main frame, power means mounted on the main frame, soil disturbing means adjustably mounted on the main frame, said soil disturbing means comprising an adjustable arm, a longitudinally disposed plow member mounted on the arm and adapted to be arranged to one side of the row of beets and well below the surface of the ground, and a transversely disposed soil engaging blade mounted on the arm to extend across the line of the row of beets, two opposite conical shaped spiral bits rotatably mounted in the sub-frame to co-operate with the soil disturbing means in digging beets, two conveyer rolls rotatably mounted in the sub-frame to be parallel with each other and connected to the large ends of the bits so that the bits and rolls will rotate together, the rolls being adapted to receive beets from the bits and hold them by their tops, drive means connecting the power means and the rolls to rotate the rolls so that their adjacent sides move upwardly, means for moving the tops of the beets longitudinally of the rolls while they are held in the rolls, said means comprising a driven chain carrying fingers to engage the tops, and means for moving the bodies of the beets in synchronism with the tops, said means comprising a chain driven in synchronism with the above mentioned chain and having fingers to engage the bodies of the beets.

6. In a machine of the character described beet digging means embodying soil disturbing means, embodying a vertically adjustable carrier, a plow member mounted on the carrier, and adapted to operate well below the surface of the ground, and a blade mounted on the carrier and adapted to operate near the surface of the ground.

7. In a machine of the character described beet digging means comprising in combination, soil disturbing means, two co-operating bits operating above the ground, and a transverse soil engaging member operating under the surface of the ground and extending under the bits, said member and bits cooperating to handle beets.

8. In a machine of the character described beet digging means comprising in combination, disturbing means, two cooperating bits operating above the ground, and a soil engaging member operating near the surface of the ground and extending transversely under the bits, said member and bits cooperating to handle beets.

9. In a machine of the character described, two parallel oppositely rotating rolls cooperating to hold beets by their tops, fingers extending between the rolls and moving longitudinally of the rolls to engage and move the tops of the beets, and means operating in synchronism with said fingers to engage the bodies of the beets to move them with the tops.

10. In a machine of the character described beet digging means comprising in combination a plow adapted to plow a furrow alongside a row of beets, a transverse soil engaging blade adapted to extend across the row of beets and to assist in lifting the beets, and means to engage the beet tops and lift them.

In witness that I claim the foregoing I have hereunto subscribed my name this 5th day of June, 1920.

ALVA M. RICKS.

Witness:
VIRGINIA BERINGER.