Oct. 4, 1966 G. KNAP 3,276,152

SUBMARINE SCRAPER

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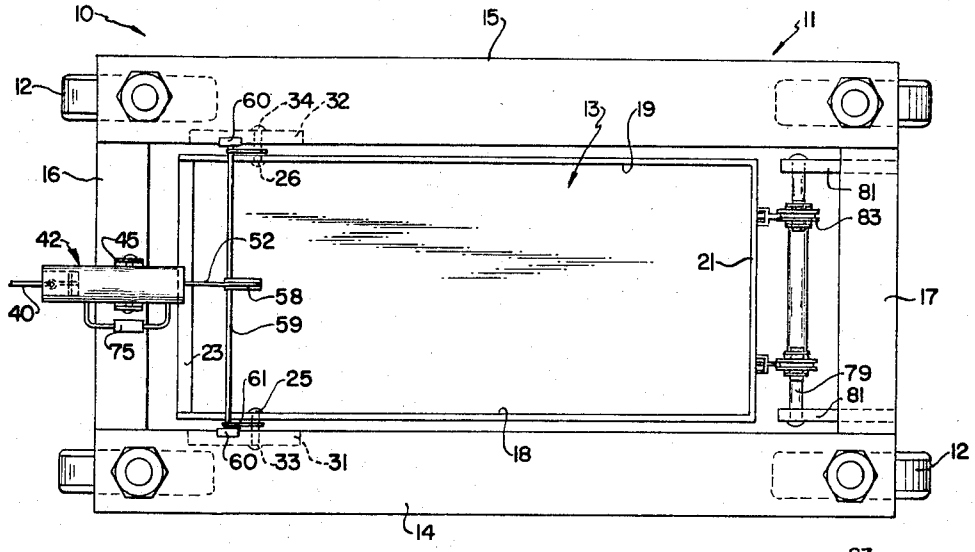


FIG. 1.

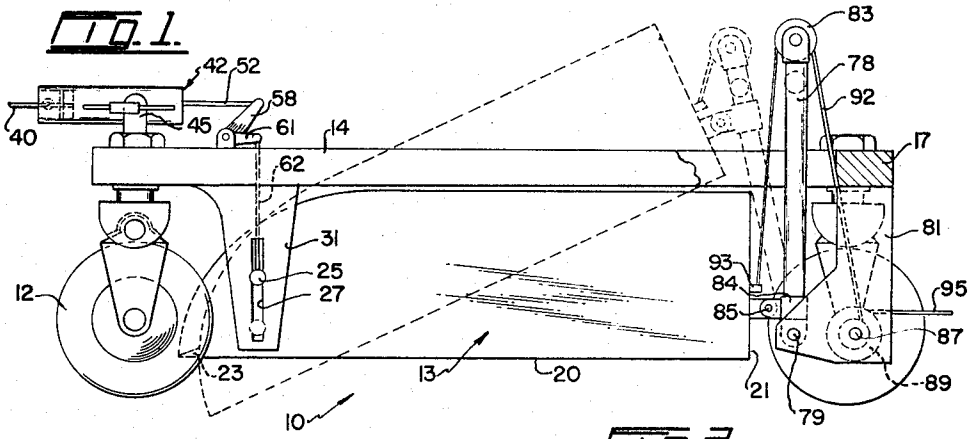


FIG. 2.

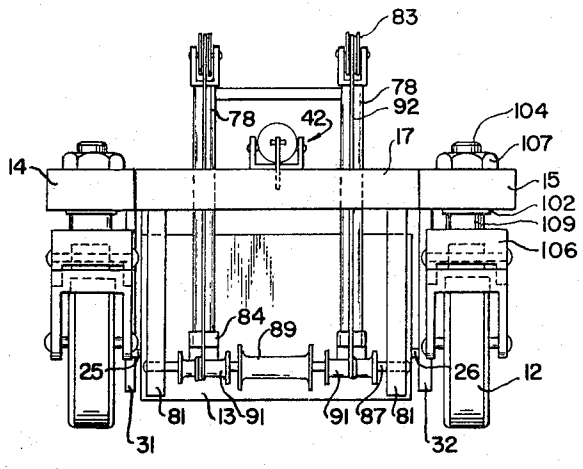


FIG. 3.

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SUBMARINE SCRAPER

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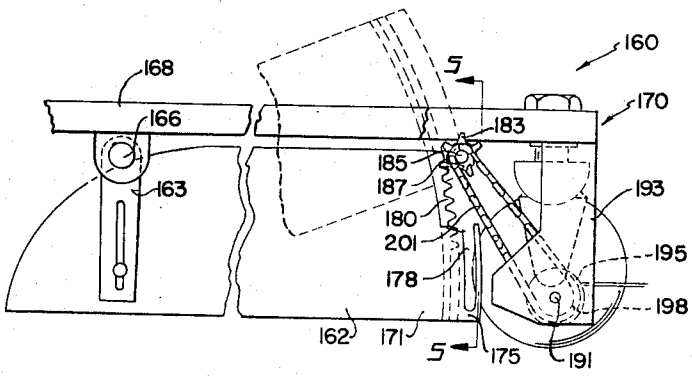


Fig. 4.

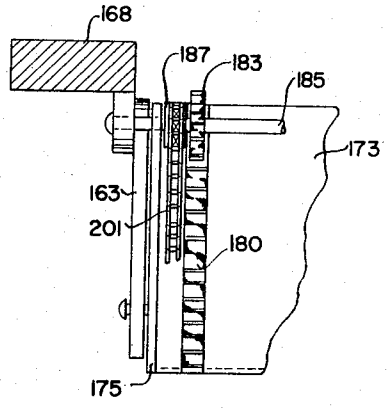


Fig. 5.

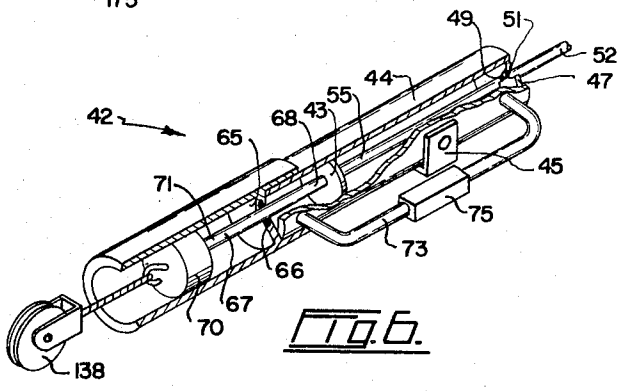


Fig. 6.

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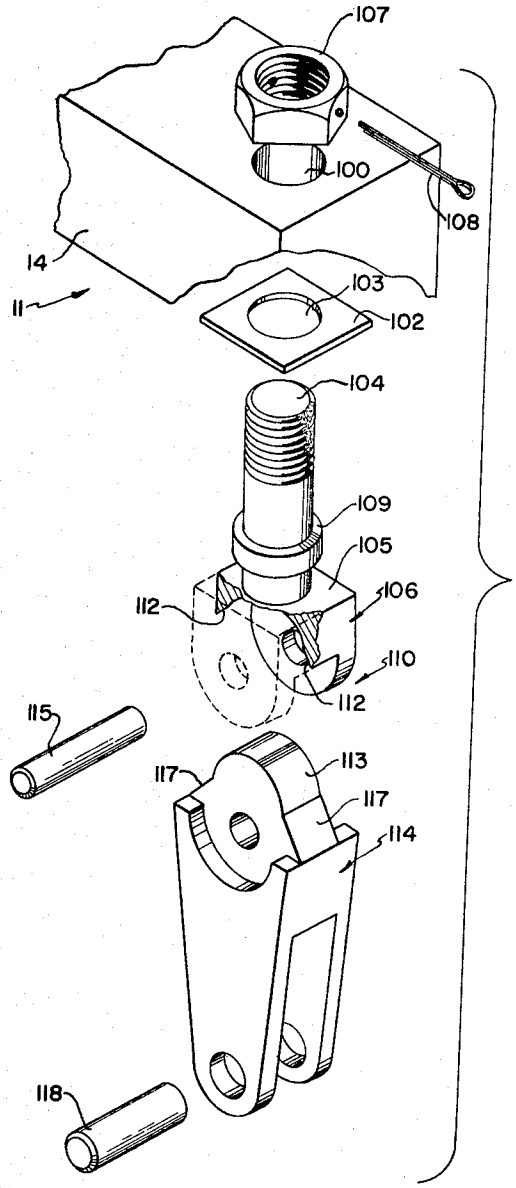


FIG. 7.

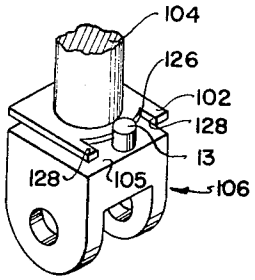


FIG. 8.

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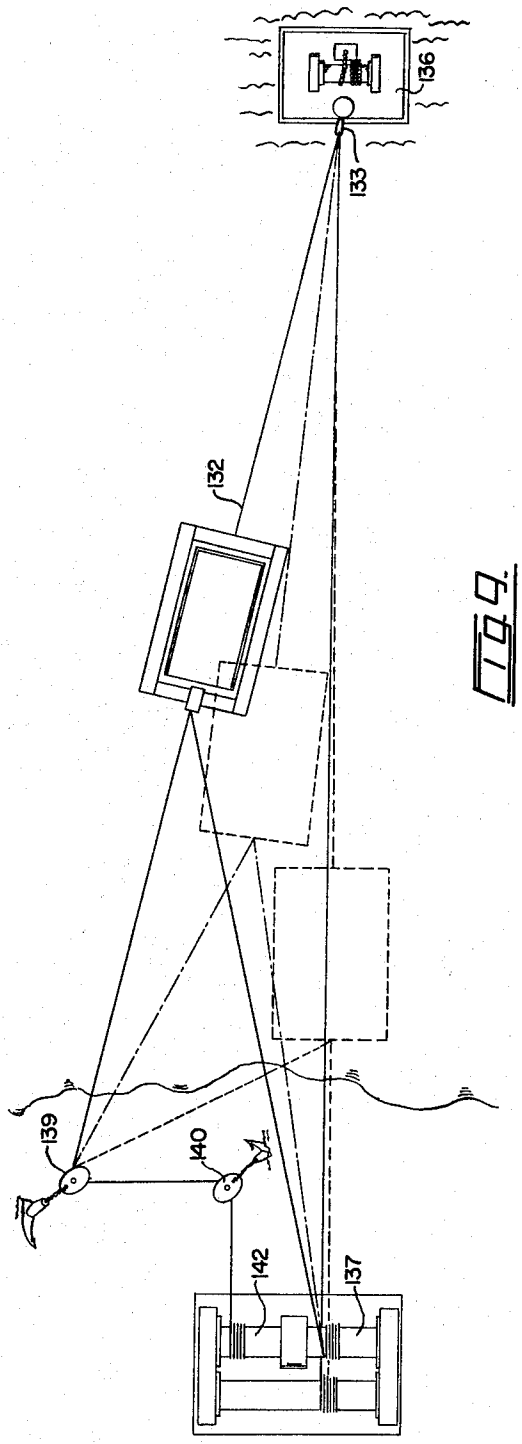


FIG. 9.

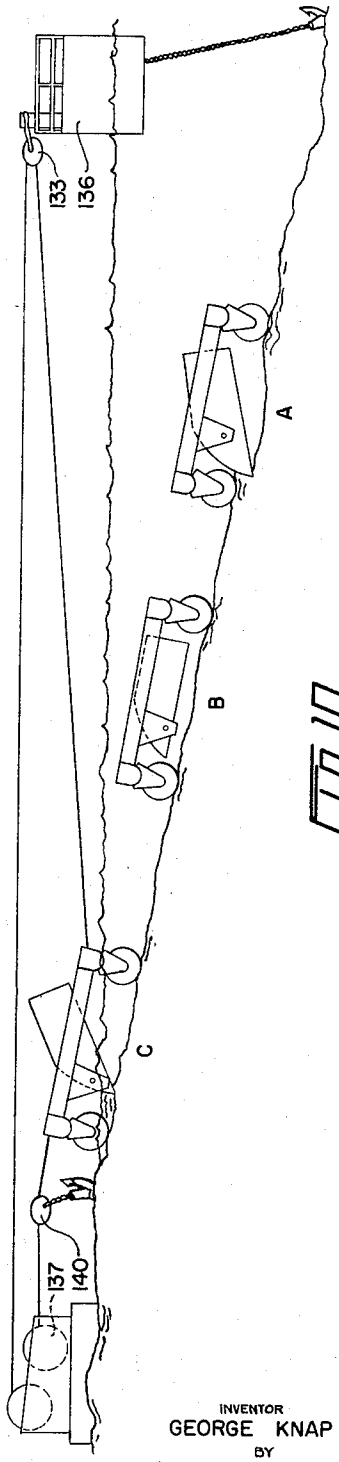


FIG. 10.

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SUBMARINE SCRAPER

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Filed Feb. 10, 1964, Ser. No. 343,872
8 Claims. (Cl. 37—125)

This invention relates to earth moving scrapers particularly to the type which are drawn by cables operated remotely from the scraper itself, a function which makes this type of scraper peculiarly adapted to submarine evacuation.

Earth movers of the cable drawn type are usually constructed having a bucket or bowl with a cutting edge at its fore end to dig into the earth as the scraper is drawn thereover and to lower the bucket into the body of the scraper. When the scraper reaches the end of its forward travel, means are provided, operated by the control cable to empty the bucket of its contents. The bucket is then returned by means of a haulback cable to the digging site from which point the scraping cycle again commences.

In certain scrapers, the cutting edge of the bucket remains in a digging position throughout the entire forward travel of the scraper, however, this method is wasteful of power as the cutting edge of the scraper is continually digging into the ground. Certain earth scrapers have been developed to overcome this problem by providing a means operable by cables to lift the cutting edge of the bucket from the ground after the bucket is filled, thereby decreasing its resistance to forward motion. Most of the scrapers of this latter type are quite complicated in construction and operation. They are, therefore, by reason of their complexity, not adapted for simple rugged construction, and may therefore be easily damaged if the operator is not extremely careful in this matter of operation.

The present invention overcomes the above difficulties by providing an earth scraper which, simple of operation and construction, and which automatically moves from a digging position to a carrying position when loaded in order to permit the earth to be carried with the expenditure of minimum power. This invention also provides an earth scraper which automatically discharges its load when the operator commences to return the scraper to the digging site. The automatic features of the present invention permits earth moving operations to be carried out by operators of little expericen and due to its simplicity of construction may be ruggedly constructed to stand very rough handling during its digging operations.

The present invention comprises a chassis having a haul forward cable secured at its fore end and a haulback cable secured at its aft end, wheels on the chassis to support the scraper for movement over the ground, a bucket mounted on the chassis in an fore and aft position, said bucket being movable between a normal digging position, a carrying position and a dumping position, a cutting edge on the fore end of the bucket which, in the latter digging position, extends below the ground and in the carrying position lies above the ground, means connecting the bucket and said haul forward cable to move the latter from its normal position to its carrying position as tension is applied to said haul forward cable to move the scraper over the ground, means connected to the bucket to retard the movement from the digging position to the carrying position as the scraper is moved forwardly, said mean being timed to retain the cutting edge in its position extending below the surface of the ground for the bucket to dig into and sufficiently fill itself with earth before said cutting edge is carried above said surface, and dumping means operable by applying tension

to the haulback cable to move the bucket into its dumping position.

In order to provide lateral movability of the scraper, whereby earth may be excavated from the disposed over a large area, the wheels upon which the chassis are mounted are castered, and the haulback and haul forward cables are so arranged that the direction of pull on the scraper may be varied at the will of the operator to thereby vary its path to and from the area in which the earth is excavated and dumped.

In the drawings which illustrate embodiments of the invention,

FIGURE 1 is a plan view of the scraper,

FIGURE 2 is an elevation of one embodiment of the scraper showing, in solid lines, the bucket in its carrying position and in dotted lines the bucket in its stopping position,

FIGURE 3 is an end elevation of the embodiment as shown in FIGURE 2,

FIGURE 4 is a fragmentary side elevation showing another embodiment of the scraper in positions similar to FIGURE 2

FIGURE 5 is a fragmentary section taken on the line 5—5 of FIGURE 4,

FIGURE 6 is an isometric view partially in section of a portion of the apparatus whereby the movement of the bucket from its digging to its carrying position is retarded,

FIGURE 7 is an exploded isometric view of the caster wheel support,

FIGURE 8 is a fragmentary isometric view of an alternate embodiment of the caster wheel support as shown in FIGURE 7,

FIGURE 9 is a diagrammatic representation of a typical cable and winch arrangement to move the scraper, and

FIGURE 10 is a diagrammatic representation in elevation showing the scraper in various positions throughout its path of travel, and also showing the bucket in its digging, carrying and dumping positions.

Referring to the drawings, one form of earth moving scraper generally numbered **10**, as shown in FIGURE 1, 2 and 3, comprises a chassis **11** mounted on wheels **12**, said chassis serving as a support for a bucket **13**. The bucket **13** is arranged for movement of the chassis between various positions, as shown in FIGURE 10, whereby it may be lowered to a digging position fill itself with earth, raised into a position whereby it may be easily transported and then tipped into a dumping position to discharge its contents.

The chassis **11** is essentially a rigid frame having a pair of spaced parallel longitudinal side members **14** and **15**, and spaced parallel fore and aft transverse members **16** and **17**, respectively. The farming members are welded together at the corners to present an extemely rigid framework.

Bucket **13** which is rectangularly shaped and elongated in a fore and aft direction, is formed as a scoop, having side walls **18** and **19**, a bottom **20**, and a rear wall **21**. The fore edge of the bucket is provided with a cutting blade **23** which lies in a horizontal frame transversely to the longitudinal axis of the bucket. The side walls **18** and **19** are each provided near their fore ends with outwardly projecting pintles **25** and **26**, which are adapted to pivotally and slidably ride in vertical slots **27** and **28** formed in a pair of plate-like supporting members **31** and **32**, respectively, which depend downwardly from the longitudinal members **14** and **15**, respectively, near the fore end of the scraper, the connection between the supporting members and said longitudinal members being made by welding or the like. The pintles project

outwardly of the outer faces of the supporting members **31** and **32**, and their ends **33** and **34**, respectively, may be riveted to bear on said outer faces of the supporting members to prevent withdrawal of the pintles through the slots, thereby restraining lateral movement of the bucket relative to the chassis **11**. By referring to FIGURE 2 it will be sen that the slots are of sufficient length, that with the pintles **25** and **26** at the lower extremity of the former, the cutting blade **23** of the bucket will lie below the surface of the ground, and when the pintles are at the upper extremity of the said slots, the said cutting blade will lie above the ground. Also it will be noted that the bucket **13** is free to pivot on the pintles, whereby the bucket **13** may be disposed from a position as shown in solid lines in FIGURE 2 to a position as show in dotted lines in the same figure.

The fore end of the bucket **13**, due to the weight of the bucket, will normally assume a position in which the pintles **25** and **26** are at the lower ends of the slots **27** and **28**. The fore end of said bucket is therefore secured to the haul forward line **40** through a retarding mechanism **42**, whereby upon the application of tension to said line, the pull will be transferred to the bucket to lift the forward end thereof, the pintles **25** and **26** sliding upwardly to the upper ends of slots **27** and **28**.

The retarding mechanism **42** comprises a piston **43** mounted for reciprocation in a cylinder **44**, the latter being mounted in a fore and aft direction for oscillation in the vertical plane between brackets **45** fixed to the forward transverse member **16** of chassis **11** centrally thereof.

The cylinder **44** is provided at its after end with a head **47** having an aperture **49** formed centrally therein, said aperture being provided with a suitable gland **51**. The gland is of sufficient size to slidably and sealably receive a rod **52**, one end **55** of the rod being connected to the piston **43** and the other end of the rod **56** being pivotally connected to a lever **58**, the latter being secured fixedly intermediate of the ends of a transverse bar **59** which is journalled for rotation in bearing blocks **60** secured to the longitudinal members **14** and **15** of the chassis **11**.

Near the ends of the transverse bar **59** are secured for rotative movement therewith a pair of levers **61**, the latter being coupled to the pintles **25** and **26** by vertical rods **62** and **63**, respectively.

The forward end of the cylinder **44** is provided with a head **65** and gland **66** adapted to slidably receive a rod **67**. One end **68** of the rod being secured to the fore end of the piston **43**, the other end projecting forwardly beyond the gland **66**. The walls of the cylinder **44** are extended forwardly beyond the head **65** and serve as guides for a piston-like runner **70**, the latter being secured to the rod **67** near its other end **71**. The cylinder **44** is also provided with a by-pass conduit **73**, said conduit communicating at each end thereof with the interior of the cylinder near each of the heads **47** and **65**. Said conduit providing a means whereby hydraulic fluid with which the cylinder is filled may be transferred from one end to the other dependent upon the movement of the piston **43**. The conduit **73** is also provided with a valve **75** which may be manually adjusted to control the rate of flow of fluid from one end of the cylinder **44** to the other. The valve may be of any type needle or gate, to provide the necessarily fine regulation of flow of hydraulic fluid.

In the scraper **10** the after end of the bucket **13** is connected to a pair of substantially vertical stanchions **78**. The stanchions are pivotally connected at their lower ends to a transverse shaft **79** which is secured between a pair of supporting members **81**, which depend downwardly from the after transverse member **17**, being secured thereto by welding in order to ensure rigidity. The stanchions are formed as yokes at their upper ends in which sheaves **83** are journalled for rotation.

The bucket **13** is connected to the stanchions by means of sleeves **84** slidable on the stanchions and having a pivotal connection as at **85** with the rear end **21** of the bucket, said sleeves permitting elevation of said bucket from a position as shown in solid lines in FIGURE 2, to the dumping position as shown in dotted lines in the same figure. Another transverse shaft **87** is supported for rotation between the supporting members **81** and carries a winding drum **89** centrally thereof and fixedly secured for rotation in unison therewith. A pair of smaller drums **91** are also fixedly secured to the shaft for rotation therewith on either side of the drum **89**. Cables **92** extend from each of the drums **91** over the sheaves **83** and are secured as at **93** to the bucket **13**. The haulback line **95** is secured at one end to the drum **89**, being wound around in such a manner that upon tension being applied to the haulback cable to rotate shaft **87**, the drums **91** will rotate thereby winding cable **92** thereon and elevating the bucket **13** to its dumping position as shown in dotted lines in FIGURE 2. It will be appreciated that upon release of tension to the haulback line **95**, the bucket, due to its weight, will return to its position as shown in solid lines in FIGURE 2, thereby unwinding cables **92** from drums **91** and winding the haulback cable on drum **89**.

In accordance with the objects of this invention, it is the purpose to provide a scraper which may be guided by altering the lateral direction of pull of the haulback cable to permit the operator of the scraper to dump the contents thereof over a relatively large area. The wheels **12** of the scraper are therefore connected to the chassis in a manner whereby they will caster.

It is apparent that if a type of caster were used whereby the wheels would have to rotate on a vertical axis a full 180° in order to provide lateral movability of the scraper to and from its dumping area, the longitudinal members **14** and **15** would have to extend sufficiently far enough beyond the fore and aft ends of the bucket **13** to provide sufficient clearance. A scraper constructed in this manner necessitates the provision of long and consequently heavy side members and will result in a machine having an excessive overall length compared to the length of the bucket. It would also result, due to the fact that the wheels would have to swivel about their vertical axis for approximately 180° every time the direction of movement of the scraper were reversed, in excessive wear of the rolling contact surface of the wheel. In the operation of the scraper, only a minimum amount of caster of the wheels about a vertical axis is necessary, for steerage. The forward wheels of the scraper, and the rear wheels if desired, are secured to the chassis on a caster mechanism which permits the mechanism to reverse its caster upon the reversal of the direction of movement of the scraper without necessitating the wheels to be rotated 180° about the vertical axis. The caster arrangement also provides for a minimal swivelling action of the castered wheels about the vertical axis sufficient to permit a minimal amount of steerage.

In accordance with the present inventon, the chassis **11** is provided at each corner thereof with a passage **100** extending vertically therethrough, welded to the underside of the chassis at each corner is a bearing plate **102** with an aperture **103** lying in registry with said vertical passage. Said aperture and passage are adapted to receive an elongated boss or pintle **104** formed on the upper surface **105** of a bearing member **106**, said pintle extending above the upper surface of the chassis to accept retaining means. In this example, pintle **104** is threaded and drilled to accept a nut **107** and cotter pin **108**. Any retaining means will suffice, which keeps pintle **104** engaging passage **100**.

The lower end **110** of the bearing member **106** is bifurcated, the lower surface of the bearing member lying between the bifurcations being shaped to form a pair of outwardly diverging downwardly facing shoulders **112**. The said lower end **110** is adapted to receive the upper end portion **113** of a wheel supporting bracket **114**, the

latter being pivotally secured between the bifurcations of the said lower end **110** on a horizontal shaft **115**. The upper end portion **113** of the bracket is formed with angular shoulders **117**, each of which is so arranged that it will engage one of the corresponding shoulders **112** upon the bracket being tilted a few degrees on either side of its truly vertical position. The bracket **114** is provided with a shaft **118** at its lower end thereof upon which one of the wheels **12** is rotatably mounted. It will be apparent that the arrangement foregoing has given the desired caster effect to the wheel **12**, whereby the direction of caster thereof may be reversed without the necessity of rotating the said wheel 180° about its vertical pivotal axis.

It is apparent that the castered wheel as described is freely pivotal through 360° on the boss or pintle **104**, and in certain circumstances dictated perhaps by the manner in which the scraper is to be employed, this type of caster may be advantageously used. However, where only limited lateral movement of the scraper is desired, the pivotal movement of the caster may be limited. This may be accomplished, as indicated in FIGURE 8, by forming an elongated slot or indentation **126** on the periphery of the bearing plate **102** to form spaced shoulders **128** to serve as stops for a dog **130** projecting upwardly from the upper surface **105** of the bearing member **106**. The slot or indentation **126** may be made as long as necessary to provide a spacing between shoulders **128** sufficient for the desired rotation of the caster wheel about its vertical axis.

In the operation and use of the scraper to dig, carry and subsequently discharge the earth from the bucket, reference should be had to FIGURES 1, 2 and 10 of the drawings. In position A or digging position, both the haul forward and haulback lines are slack, thereby permitting the bucket, by its weight to assume a position in which the forward edge of the bottom thereof lies below the surface of the ground to be excavated and the after end of the bucket is in its non-elevated position, the cable **92** being wound on drums **91**. Tension is then applied to the haul forward cable to move the scraper forwardly, the forward edge of the bottom of the bucket cutting into the earth to fill the bucket. Simultaneously with the forward motion of the scraper, the fore end of the bucket, being linked to the haul forward line through the retarding mechanism **42**, lifts upwardly until the forward edge of the bottom **20** thereof is above the surface of the ground, the scraper assuming its carrying position, as indicated by the letter B. It will be appreciated that the upward movement of the forward end of the bucket may be regulated by the valve **75** of the retarding mechanism **42**, whereby said upward movement may be correlated with the forward movement of the scraper so that the forward edge of the bottom **20** of bucket will not rise above the surface of the ground until the bucket has been filled with earth.

The scraper is then moved forwardly by means of the haul forward cable until the scraper has reached its dumping point. The haul forward cable is then slacked off and the haulback cable taken in. The forward end of the bucket will drop to the surface of the ground and the haulback will rotate drum **91**, thereby rotating transverse shaft **87** to which drums **93** are secured, and winding up cables **92** to elevate the after end of the bucket, the scraper assuming a dumping position as indicated by the letter C on FIGURE 10 to permit the earth carried by the bucket to be discharged from the open front end thereof. The scraper, of course, is then moved rearwardly by the haulback line to its excavating site.

FIGURE 9 indicates one manner of cable arrangement which is especially suitable for submarine excavation and which provides a degree of lateral control of the scraper. In this figure, a cable **132** secured to the chassis of the scraper at the rear end thereof and passed around a pulley **133** which is secured to an anchored float **136**. The cable **132** is then carried to a windlass **137** on shore and which is powered by any suitable source of power, not shown. The cable is then passed around a pulley **138** which is secured to the end **71** of rod **67** in the manner shown in FIGURE 6, then passed around pulleys **139** and **140** anchored on shore fixed to a powered winding drum **142**. Both the winding drum **142** and windlass **137** are provided with controls whereby the amount of cable payed out and taken in by each may be correlated a transverse as well as fore and aft pull on pulley **138** to move the scraper laterally as well as longitudinally. When lateral force is applied to the said pulley, the force is transferred to the scraper unit through the runner **70** acting on the walls of the cylinder **44**, thereby relieving any lateral strain which would ordinarily be applied by the rod **52** against the gland **51**.

It is to be understood that the operation of the scraper is not limited to the arrangement as shown in FIGURE 7, said figure showing only one arrangement which will provide lateral as well as longitudinal movement of the scraper.

FIGURES 4 and 5 indicate an alternative form of scraper **160**. Scraper **160** is constructed in the same manner as scraper **10**, the only difference lying in the manner in which the bucket is elevated at its rear end and in the manner in which the front end thereof is suspended. In scraper **160**, the bucket **162** is pivotally and slidably secured to supporting members **163** and **164** in the same manner as bucket **13** of scraper **10** is secured to supporting members **31** and **32** thereof. Supporting members **163** and **164** are pivotally secured at their upper ends to a shaft **166**, the latter being secured between the longitudinal members herein numbered **168** and **169** of the chassis **170**.

Side walls **171** and **172** of bucket **162** are extended rearwardly beyond the rear wall **173**, the projecting portion **175** and **176** each being provided with an arcuate slot **178** and **179** extending from near the top to near the bottom thereof. Secured to the end wall **143** of the bucket **162** and parallel to the slots **178** and **179**, are a pair of elongated gear racks **180** and **181** which are adapted to mesh with gears **183** and **184** fixedly secured to a shaft **185** which extends through the slots **178** and **179** and are rotatably secured at each end thereof to longitudinal members **168** and **169** of the chassis **170**. The shaft **185** also carries, inwardly of gears **183** and **184**, sprockets **187** and **188** fixedly secured thereto for rotation in unison therewith.

A transverse shaft **191** is secured for rotation between a pair of supporting members **193** and **194** secured to the chassis much in the same manner as are supporting members **81** and **82** of scraper **10**, and has fixedly secured thereto for rotation in unison therewith, a central drum **195** to which the haulback cable **196** is secured in the same manner as the haulback cable is secured to drum **91**. The shaft **191** has also fixedly secured thereto for rotation in unison therewith a pair of sprockets **198** and **199**, each of which is operatively connected to sprockets **187** and **188**, respectively, by chains **201** and **203**, respectively. In the operation of scraper **160**, it will be seen that when tension is applied to haulback cable **196** to rotate drum **195**, transverse shaft **191** will rotate thereby rotating sprockets **198** and **199**. The rotation of the latter sprockets will in turn rotate sprockets **187** and **188**, thereby rotating shaft **185** and gears **183**, and **184**, the latter rotating against the gear racks **180** and **181**, respectively, to elevate the bucket **162**. When tension on haulback cable **196** is relieved, the weight of the bucket **162** will allow it to return to its lower position, thereby counter rotating sprockets **187** and **188**, the rotative movements of the latter being transferred to the drum **195** to rewind a portion of the haulback cable **196** thereon.

During the elevating and lowering of the after end of bucket **162**, the forward end of the bucket is free to swing on the pivoted support members **163–164** thereby

eliminating any tendency of the shaft 185 to bind in the slots 178 and 179.

What I claim as my invention is:

1. An earth moving scraper comprising a chassis, wheels on which the chassis is supported for movement in a fore and aft direction over the surface of the ground, an earth carrying fore and aft bucket having a cutting edge at its fore end slidably and pivotally secured at its fore end and after end to the chassis for vertical movement of said fore end between a first position in which the cutting edge extends below the surface of the ground to a second position in which said cutting edge lies above said surface, said bucket being normally biased by weight thereof to said first position, said after end being movable from a normal weight-biased lower position to an upper position in which said after end is elevated above the fore end, a haul-in cable secured to the scraper at its fore end to move the latter forwardly, means connecting the fore end of the bucket and said cable and operable upon tension being applied to said cable to move said fore end from its normal position towards its second position, retarding means connected to the bucket to retard the latter movement, said retarding means being adjustable to correlatedly time the upward movement of the cutting edge with the forward movement of the scraper to permit the bucket to load itself before the cutting edge is lifted out of the ground, a haulback cable secured to the after end of the scraper to pull the latter rearwardly, and bucket dumping means connecting the haulback cable and the after end of the bucket operable as tension is applied to the haulback cable, to elevate said after end above the fore end to thereby dump the load.

2. An earth moving scraper comprising a chassis, wheels on which the chassis is supported for movement in a fore and aft direction over the surface of the ground, an earth carrying fore and aft bucket having a cutting edge at its fore end slidably and pivotally secured at its fore end and after end to the chassis for vertical movement of said fore end between a first position on which the cutting edge extends below the surface of the ground to a second position in which said cutting edge lies above said surface, said bucket being normally biased by weight thereof to said first position, said after end being movable from a normal weight-biased lower position to an upper position in which said after end is elevated above the fore end, a transverse shaft journalled for rotation in the chassis, a first lever fixedly connected to the transverse shaft whereby the latter may be rotated, a second lever connected at one end to the transverse shaft for rotation therewith and linked at the other end to the fore end of the bucket whereby upon rotation of the shaft the bucket may be moved from its first to its second position, a haul-in cable connected to the first-mentioned lever to simultaneously rotate the shaft and move the scraper forwardly, retarding means connected to the fore end of the bucket to retard the movement of the latter from its first to its second position as the shaft rotates, said retarding means being adjustable to correlatedly time the upward movement of the cutting edge with the forward movement of the scraper to permit the bucket to load itself before the cutting edge is lifted out of the ground, and a haulback cable secured to the after end of the scraper to pull the latter rearwardly, bucket dumping means connecting the haulback cable and the after end of the bucket operable as tension is applied to the haulback cable, to elevate said after end above the fore end to thereby dump the load.

3. An earth moving scraper comprising a chaisss, wheels on which the chassis is supported for movement in a fore and aft direction over the surface of the ground, an earth carrying fore and aft bucket having a cutting edge at its fore end slidably and pivotally secured at its fore end and after end to the chassis for vertical movement of said fore end between a first position on which the cutting edge extends below the surface of the ground to a second position in which said cutting edge lies above said surface, said bucket being normally biased by weight thereof to said first position, said after end being movable from a normal weight-biased lower position to an upper position in which said after end is elevated above the fore end, a haul-in cable secured to the scraper at its fore end to move the latter forwardly, means connecting the fore end of the bucket and said cable and operable upon tension being applied to said cable to move said fore end from its normal position towards its second position, retarding means connected to the bucket to retard the latter movement, said retarding means being adjustable to correlatedly time the upward movement of the cutting edge with the forward movement of the scraper to permit the bucket to load itself before the cutting edge is lifted out of the ground, said retarding means comprising an elongated hydraulic cylinder connected to the chassis, a fluid by-pass passage providing communication between each end of the cylinder, a piston in the cylinder movable from one end to the other thereof and having a connection at one end with the fore end of the bucket, said piston being adapted upon being moved between said ends of the cylinder to transfer the hydraulic fluid from one end to the other, and a regulating valve in the passage whereby the rate of flow of the fluid through the passage may be controlled to thereby control the rate of movement of the piston, and a haulback cable secured to the after end of the scraper to pull the latter rearwardly, bucket dumping means connecting the haulback cable and the after end of the bucket operable as tension is applied to the haulback cable, to elevate said after end above the fore end to thereby dump the load.

4. An earth moving scraper comprising a chassis, wheels on which the chassis is supported for movement in a fore and aft direction over the surface of the ground, an earth carrying fore and aft bucket having a cutting edge at its fore end slidably and pivotally secured at its fore end and after end to the chassis for vertical movement of said fore end between a first position on which the cutting edge extends below the surface of the ground to a second position in which said cutting edge lies above said surface, said bucket being normally biased by weight thereof to said first position, said after end being movable from a normal weight-biased lower position to an upper position in which said after end is elevated above the fore end, a haul-in cable secured to the scraper at its fore end to move the latter forwardly, means connecting the fore end of the bucket and said cable and operable upon tension being applied to said cable to move said fore end from its normal position towards its second position, retarding means connected to the bucket to retard the latter movement, said retarding means being adjustable to correlatedly time the upward movement of the cutting edge with the forward movement of the scraper to permit the bucket to load itself before the cutting edge is lifted out of the ground, a transverse shaft secured for rotation on the chassis at the after end thereof, a first winding drum secured to the chassis for rotation therewith, a haulback cable wound on the winding drum to rotate the latter upon tension being applied to the former, a second winding drum secured on the shaft for rotation in unison with the first, and a second cable connected at one end to the after end of the bucket and wound on the said second winding drum, whereby upon tension being applied on the haulback cable to rotate the first drum and thereby rotate the second drum, the said second cable will be wound on the second drum thereby drawing the after end of the bucket to its upper position to thereby dump the load, said bucket returning to its normal position upon release of tension on the haulback cable to rotate the shaft and rewind haulback cable on the first drum.

5. An earth moving scraper comprising a chassis, wheels on which the chassis is supported for movement in

a fore and aft direction over the surface of the ground, an earth carrying fore and aft bucket having a cutting edge at its fore end slidably and pivotally secured at its fore end and after end to the chassis for vertical movement of said fore end between a first position on which the cutting edge extends below the surface of the ground to a second position in which said cutting edge lies above said surface, said bucket being normally biased by weight thereof to said first position, said after end being movable from a normal weight-biased lower position to an upper position in which said after end is elevated above the fore end, a haul-in cable secured to the scraper at its fore end to move the latter forwardly, means connecting the fore end of the bucket and said cable and operable upon tension being applied to said cable to move said fore end from its normal position towards its second position, retarding means connected to the bucket to retard the latter movement, said retarding means being adjustable to correlatedly time the upward movement of the cutting edge with the forward movement of the scraper to permit the bucket to load itself before the cutting edge is lifted out of the ground, a transverse shaft secured for rotation on the chassis at the after end thereof, a first winding drum secured to the chassis for rotation therewith, a haulback cable wound on the winding drum to rotate the latter upon tension being applied to the former, a substantially vertical gear rack secured at the after end of the bucket, and a gear fixedly secured to the shaft for rotation in unison therewith, said grear meshing with the gear rack to move the latter upwardly when the former is rotated as tension is applied to the haulback cable to thereby elevate the bucket to its upper position and to dump the load therefrom, said bucket being adapted to return to its normal position upon release of said tension on the haulback line to rotate the shaft and rewind the haulback cable on the drum.

6. An earth moving scraper comprising a chassis, caster wheels in which the chassis is supported for movement in a fore and aft direction over the surface of the ground, said caster wheels providing a means whereby the chassis may be directed laterally, an earth carrying fore and aft bucket having a cutting edge at its fore end slidably and pivotally secured at its fore end and after end to the chassis for vertical movement of said fore end between a first position on which the cutting edge extends below the surface of the ground to a second position in which said cutting edge lies above said surface, said bucket being

normally biased by weight thereof to said first position, said after end being movable from a normal weight-biased lower position to an upper position in which said after end is elevated above the fore end, a haul-in cable secured to the scraper at its fore end to move the latter forwardly, means connecting the fore end of the bucket and said cable and operable upon tension being applied to said cable to move said bucket from its normal position towards its second position, retarding means connected to the bucket to reard the latter movement, said retarding means being adjustable to correlatedly time the upward movement of the cutting edge with the forward movement of the scraper to permit the bucket to load itself before the cutting edge is lifted out of the ground, a haulback cable secured to the after end of the scraper to pull the latter rearwardly, and bucket dumping means connecting the haulback cable and the after end of the bucket operable as tension is applied to the haulback cable, to elevate said after end above the fore end thereby dumping the load.

7. An earth moving scraper as claimed in claim **6** in which the caster wheels each comprises a bearing member pivotally connected to the chassis for rotation about a vertical axis, an elongated bracket having a wheel carrying axle secured at one end and hingedly secured at the other end to the bearing member for pivotal movement about a horizontal axis, shoulders formed on the bracket on both sides of the latter's pivotal axis, and stops formed on the bearing member and lying in the path of the shoulders as the bucket is rotated about its horizontal axis, said stops and shoulders being spaced apart to permit rotation of the bracket in an arc of predetermined length extending on both sides of a position in which the wheel axle lies vertically below the pivotal axis of said bracket.

8. An earth moving scraper as claimed in claim **7** including means to limit the rotation of the bearing member about its pivotal axis.

References Cited by the Examiner

UNITED STATES PATENTS

1,017,293	2/1912	Johnson	37—135
1,242,320	10/1917	Burkett	37—135
2,873,871	2/1959	Waite	37—116

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