United States Patent [19]

Larsen

[11] **3,885,688**

[45] **May 27, 1975**

[54] **DEVICE FOR LAYING FLAGSTONES**

[76] Inventor: **Albert Johannes Larsen,** Roskildevej 52, Vaerebro, 3650 Oelstykke, Denmark

[22] Filed: **Sept. 1, 1972**

[21] Appl. No.: **285,569**

[30] **Foreign Application Priority Data**

Sept. 2, 1971	United Kingdom	41083/71
July 11, 1972	United Kingdom	32418/72
Aug. 7, 1972	Denmark	3885/72

[52] **U.S. Cl.** ..... **214/384;** 254/8 R; 254/124; 254/131; 294/62

[51] **Int. Cl.** **B60p 1/54**

[58] **Field of Search** ..... 214/370, 371, 380, 381, 214/382, 383, 384; 294/62; 254/8 R, 8 B, 8 C, 124, 131

[56] **References Cited**

UNITED STATES PATENTS

729,939	6/1903	Jones	294/63 R
2,697,584	12/1954	Klinefelter	254/44
3,039,632	6/1962	Wise et al.	214/370

Primary Examiner—Albert J. Makay
Assistant Examiner—Lawrence J. Oresky

[57] **ABSTRACT**

A device for laying of flagstones forming a double-armed lever structure carried by wheels forming the tilting axis, the one arm carrying a pair of tongs for carrying a flagstone in horizontal position and releasing the same by hitting a firm object, the other arm being provided with handles for operating the device. The lever structure comprising a beam carrying the pair of tongs and pivotally connected to a main frame carrying the supporting wheels and handles, spring means for lifting the beam when unloaded, and hydraulic means for manually controlling the movements of the beam.

7 Claims, 11 Drawing Figures

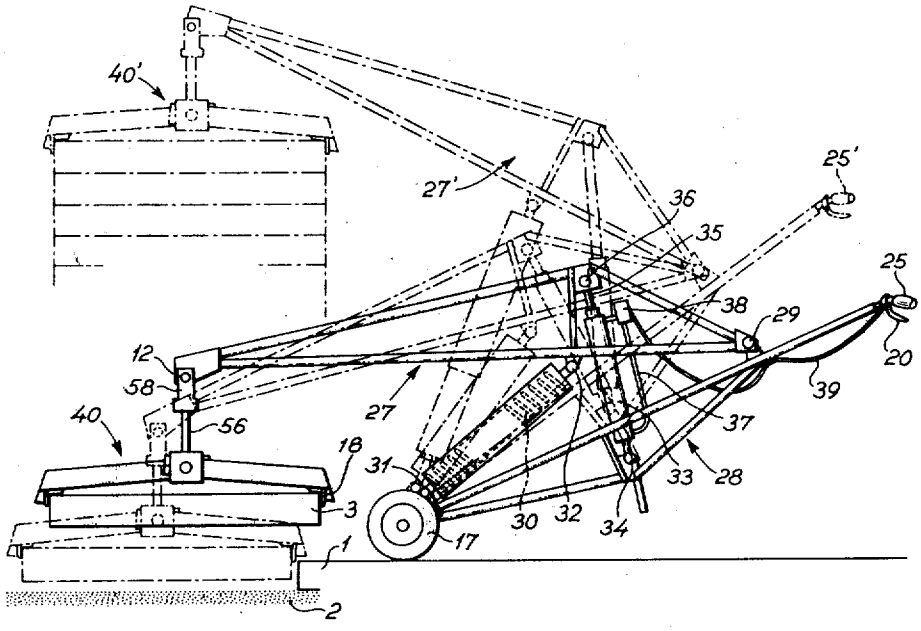


Fig. 1.

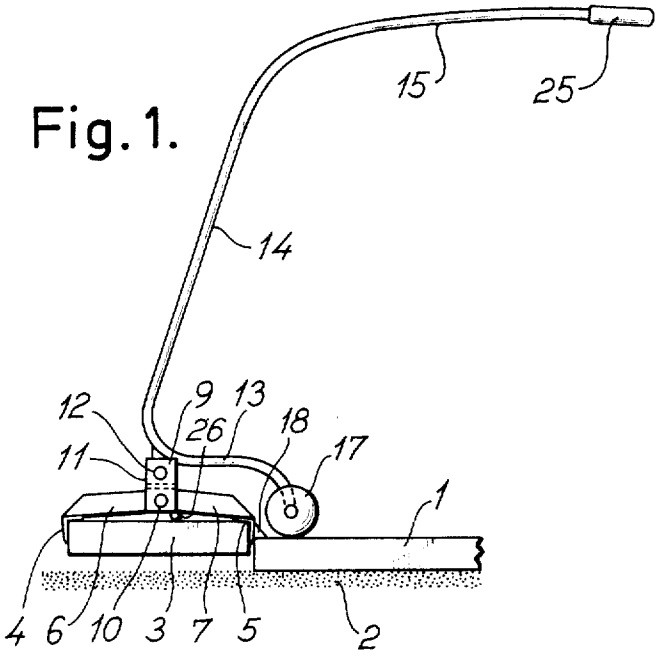


Fig. 2.

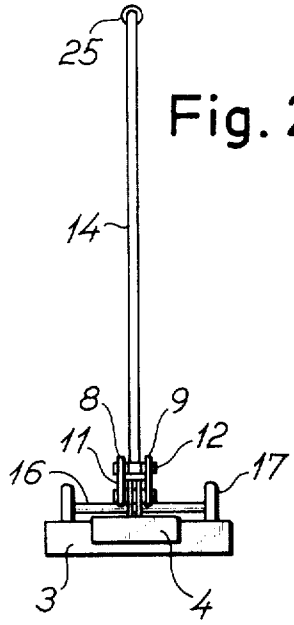


Fig. 3.

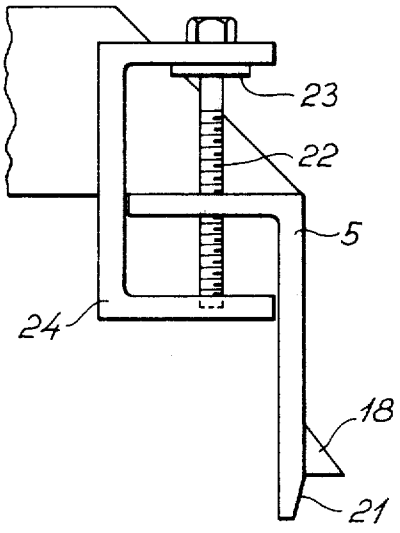
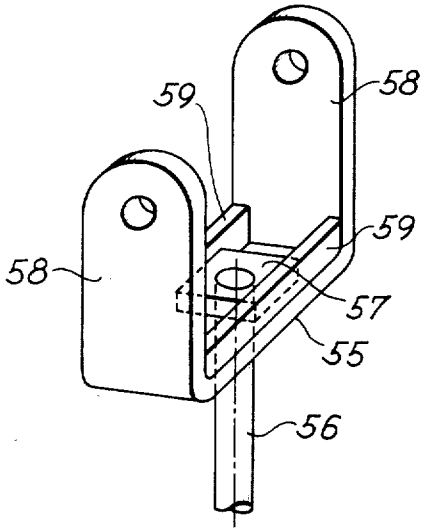


Fig. 7.



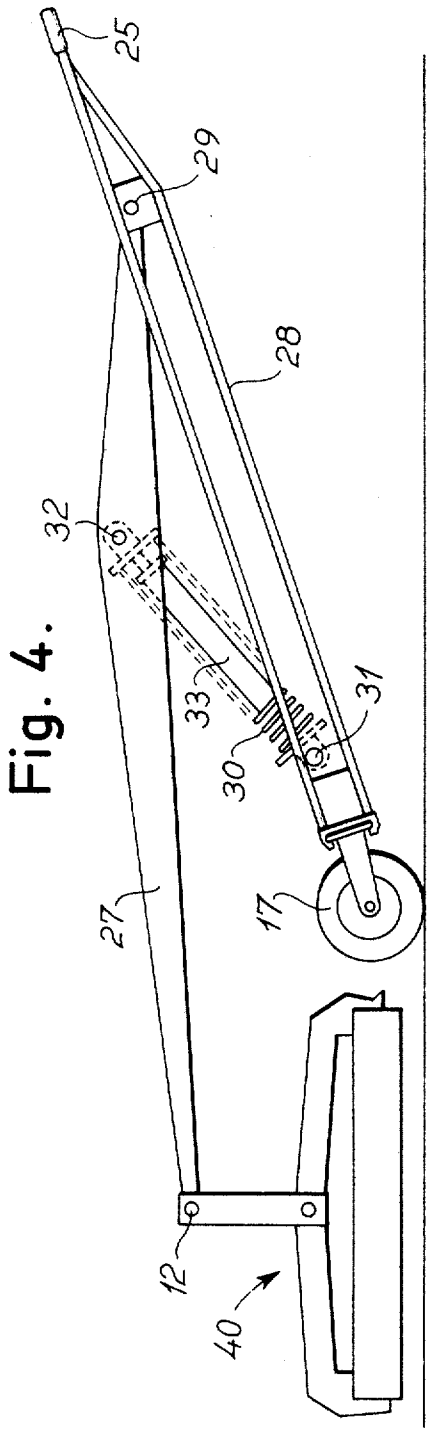


Fig. 4.

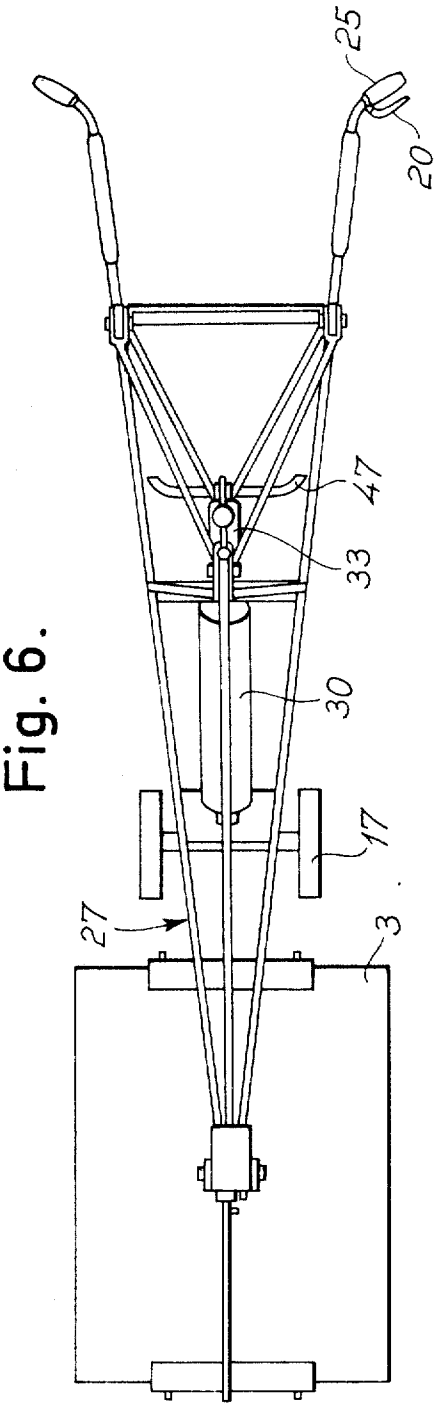
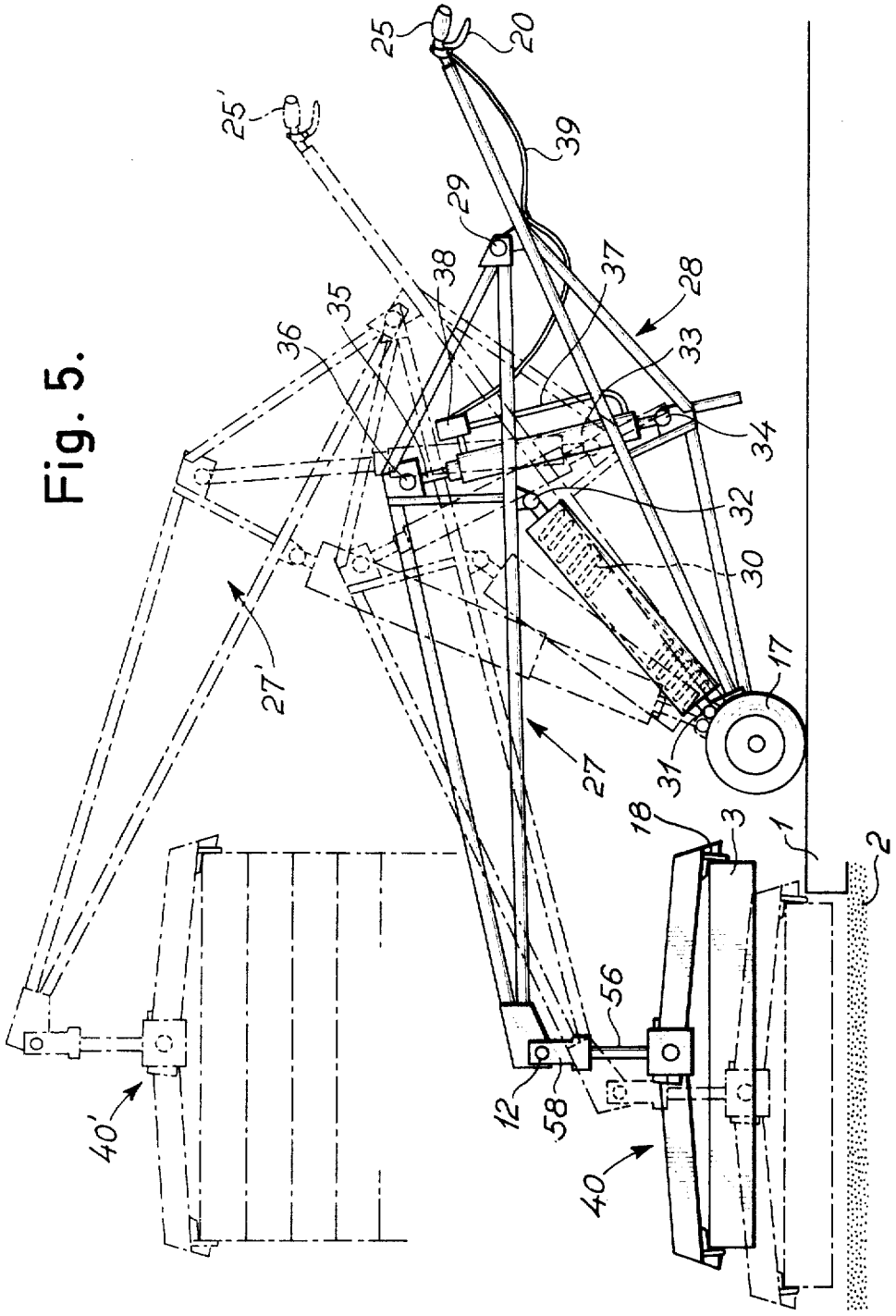


Fig. 6.

Fig. 5.


25
20
25'
39
29
38
37
28
35
36
33
34
32
30
27'
17
27
31
18
3
1
2
56
12
58
40'
40

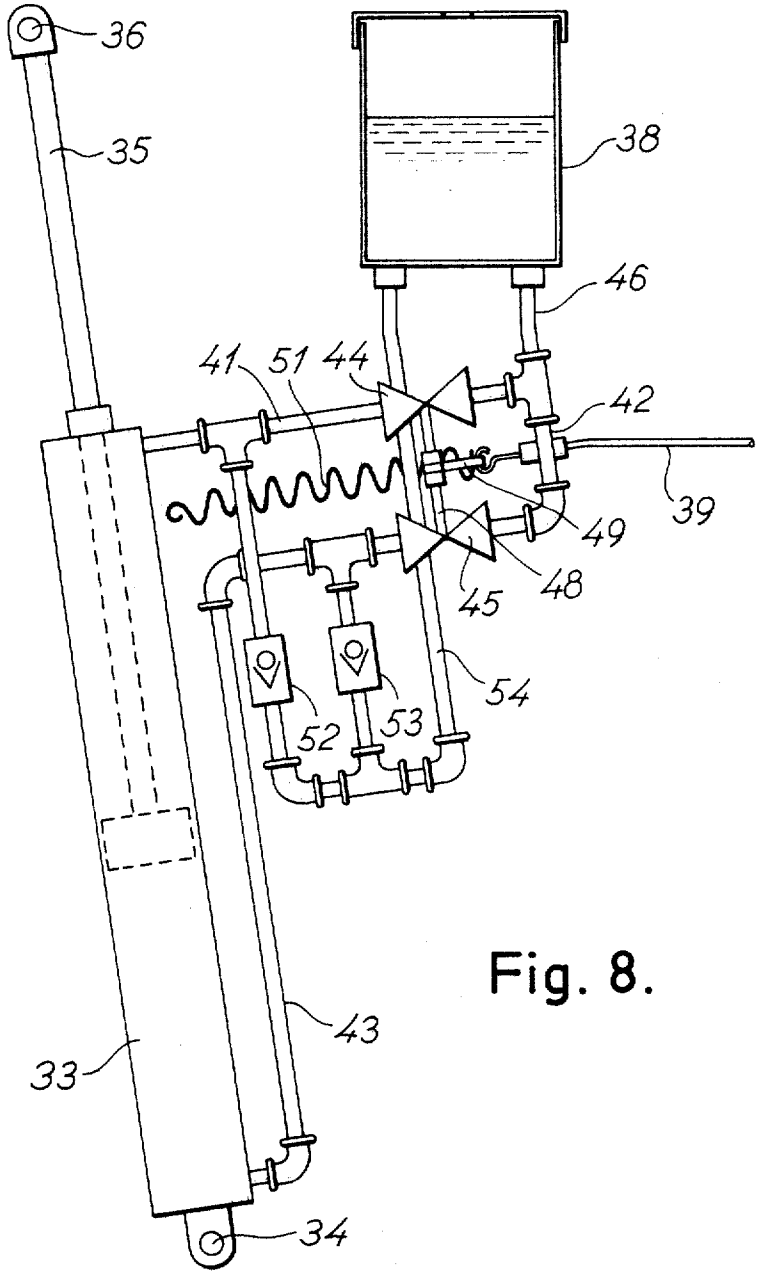


Fig. 8.

Fig. 9.

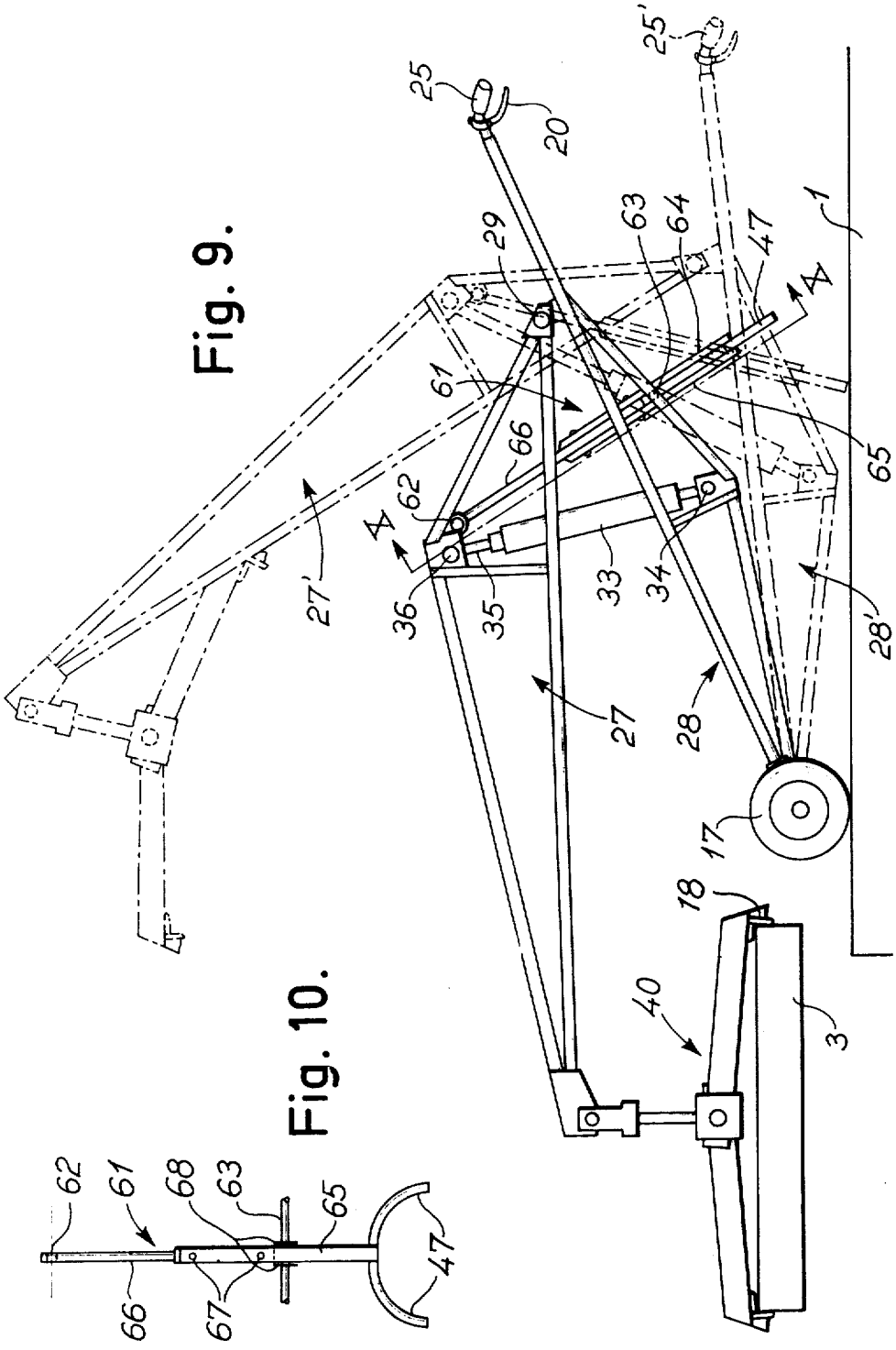
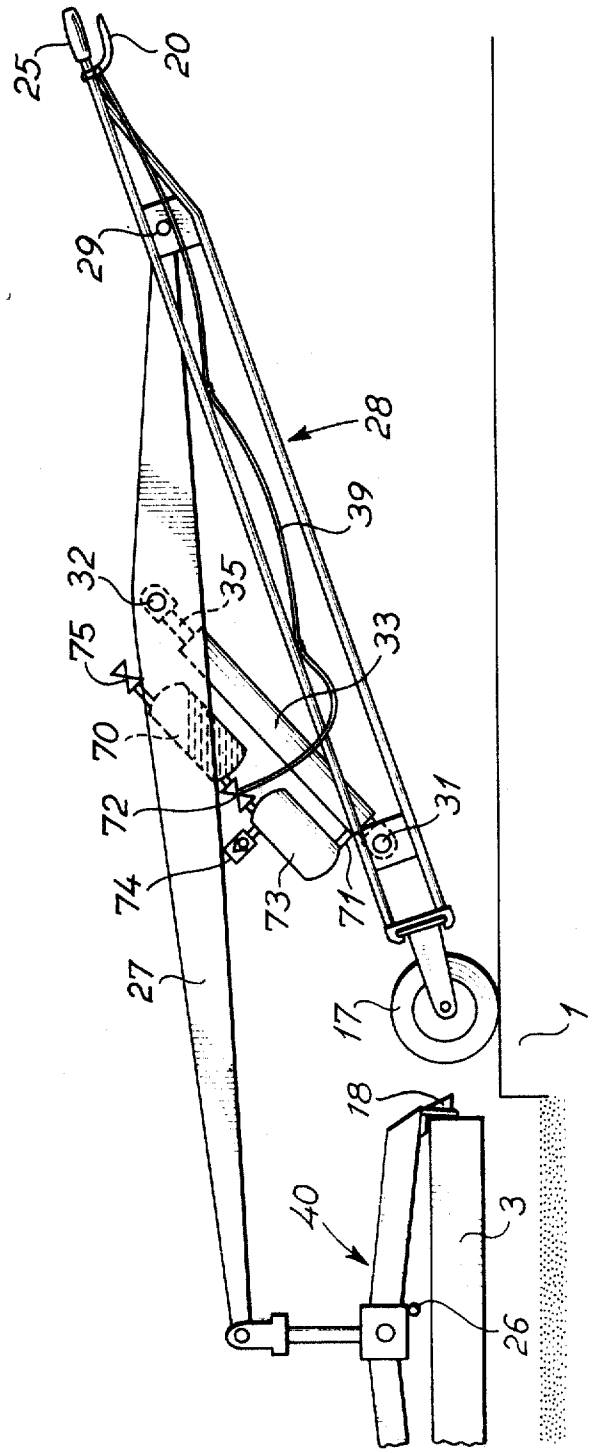

25'
25
20
1
29
63
64
47
4
61
66
65
62
4
27'
36
35
33
34
28'
27
28
17
18
40
3

Fig. 10.

62
61
68
63
65
47
66
67

Fig. 11.



DEVICE FOR LAYING FLAGSTONES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a device for laying especially of flagstones, and it will in the following be described in connection herewith. However, it will be understood that the device may also be used for laying of other pavement elements as e.g. kerbstones.

2. Description of the Prior Art

Heretofore the laying of flagstone has been done manually by the worker or paver carrying the flagstone in his hand to the spot where it is to be laid and where before a carefully levelled sand layer has been prepared, and dropping the flagstone immediately over the spot in continuation of the pavement already laid. To avoid disturbance of the levelled surface on which the flagstone is going to be laid, this should be dropped from a substantially horizontal position. Owing to the weight of the flagstone, however, this is a difficult task which further due to the awkward stooping position to be assumed by dropping the flagstone, causes a harmful stress to the human body which may result in serious spinal disorder. Further it will generally be necessary for the paviour to step outside the flagstones already laid making it necessary to renew the levelling of the sand layer. By the laying of heavy flagstones it is generally necessary to support it with one edge against the edge of the flagstone previously laid and then gripping it at the other end lowering the same in a swivelling motion. In such case, however, it cannot be avoided that the flagstone will drop from a tilted position, as a result of which the carrying capacity and appearance of the pavement will be reduced.

It has been proposed to carry a flagstone to be laid in a horizontal position by means of a pair of tongs carried by a crane which involves a heavy vehicle to be driven up to the place where the flagstone is to be laid down. Also a pair of tongs has been proposed by which the flagstone is carried manually by means of a handle positioned in vertical alignment with the centre of gravity of the flagstone which on the spot of placing means a certain distance away from the flagstones already laid. It is obvious that this will only be possible with small and light flagstones. With the commonly used pavement flags weighing about 80 kgs a man of considerably more than average strength would not be able to perform this.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a device whereby the laying of flagstones can be performed more quickly and with a less strain on the human body and whereby it will be unnecessary for the worker or pave to step outside the flagstones already laid. Further the device should be simple and sturdy and of light weight as the flag pavement before the joints are filled up with sand and the flagstones rammed, will only be able to take a moderate load.

According to the invention there is provided a device for laying of flagstones or the like block-formed paving elements as e.g. kerbstones by means of a pair of tongs adapted for temporary carrying of said elements in horizontal position, the said device comprising a double-armed lever structure, the tilting axis of which is provided by a pair of wheels or other supporting means, and whereby the pair of tongs is suspended at the end

of the one arm pivotally about an axis, parallel with the tilting axis whereas the other arm at its end is provided with one or more handles for manual manoeuvring of the device or a universal joint for connection to mechanically driven manoeuvring means.

As the flagstones are generally delivered in piles e.g. on pallets, the device should preferably be able to grip the flagstone from a level higher than that which may be achieved by tilting the device about the tilting axis. Thus, according to a further feature of the invention the leverage structure may consist of a number of mutually movable parts provided for displacement of the pair of tongs in vertical or substantially vertical direction beyond that which can be achieved by tilting of the device.

As the flagstones are hereby always moved from a higher to a lower level, the energy released may advantageously be used for moving the mutually movable parts of the leverage structure.

According to a preferred embodiment of the invention this may be achieved by the device comprising a main frame extending from the tilting axis to the handle end and a beam which at its backward end is pivotally mounted on the main frame and which at its forward end carries a pair of tongs and provided with spring means arranged for within the angular moving interval of the beam to exert on the same a small and substantially constant lifting force and partly a braking- and locking mechanism provided for locking the beam in any position in relation to the frame and releasing the same by manual actuating of a control lever as well as damping the movement between the beam and the frame. Thus by just actuating the control lever the beam will move in the desired direction i.e. upwards when in unloaded condition and downwards when it is carrying a flagstone and be stopped immediately in any desired position when the control lever is released.

To achieve a correct and firm placement of the flagstone this should advantageously be placed by dropping the same from a certain height whereby the kinetic energy serves to compress and levelling out small irregularities in the sand layer. On the other hand the height of fall should not be so great that the flagstone during the fall will be able to deviate from the horizontal position. Thus the pair of tongs should be able to release the flagstone at the desired moment when still carried by the same. When using pairs of tongs of the devices of the prior art this can only be obtained by activating a special releasing mechanism which, owing to the great forces acting between the movable parts of the pair of tongs, requires a relatively great effort and just at the moment when the greatest accuracy is required in the manoeurving of the device.

To avoid this the device may, according to the invention, be provided with a pair of tongs whereby at least the backward jaw has on its outward side at least one abutment with a downward facing abutment surface positioned between the lower edge of the jaw and the upper surface of a flagstone carried by the pair of tongs, and whereby the jaw in, when level with said abutment surface has a thickness corresponding to the width of the joint in the pavement to be laid and is tapering downwards.

By the provision of this feature that the pair of tongs will automatically release the flagstone at the desired moment during the tilting of the device about the tilting axis i.e. in the moment when the abutment on the back-

ward jaw hits the upper surface of the previously laid flagstone in continuation of which the flagstone carried by the pair of tongs has to be placed. It has unexpectedly been experienced that such abutment is sufficient to cause the pair of tongs to release their grip when hitting a firm object.

According to a further feature of the invention the braking-and-locking mechanism may comprise a double-acting hydraulic cylinder with a piston and piston rod which is pivotally connected to the frame and the beam and whereby the spaces on either side of the piston are interconnected by a by-pass in which is inserted a stop-valve manoeuvred by the control lever.

To ensure immediate locking of the beam in the desired position no air pocket must be present in the hydraulic system. However, hydraulic oil generally contains about 8 per cent by volume of air in solution which will immediately be liberated when the oil is subjected to a vacuum.

To ensure that a pressure sufficient to stop the movement of the beam is built up on either side of the piston by the lifting force of the spring means or the load carried by the pair of tongs repectively, the by-pass may be provided with the two stop-valves connected in series and so arranged as to be opened and closed simultaneously, and whereby the interconnection between the two stop-valves communicates with an expansion tank which serves to store the hydraulic oil displaced by the piston rod and further comprising two non-return valves connected in parallel with each of the stop-valves so as to allow hydraulic oil to flow from the expansion tank to each space of the cylinder to prevent the formation of vacuum in any of said spaces.

By a further embodiment according to the invention the helical spring for lifting the beam may be replaced by a depending rod which at its upper end is pivotally connected to the beam and at its lower end provided with supporting legs for the device and at its mid part slideably guided in relation to the main frame.

By this embodiment the beam may be raised by lowering the rear end of the device and when the supporting legs hit the ground, the locking mechanism will be released.

By a further embodiment of the invention the spring means and the braking- and-locking means are combined and comprise a single-acting hydraulic cylinder which at its lower end is pivotally connected to the main frame and the upper end of the piston rod pivotally connected to the beam in such a way that the axis of the cylinder in the uppermost position of the beam is substantially perpendicular to a line from the pivot axis between beam and frame and the connection point between the piston rod and the beam and in the lower position of the beam will form an acute angle with an extension of the said line whereas the lower space of the cylinder through a stop-valve which, against the action of a spring may be opened by means of the control lever, is communicating with a closed receptacle containing a certain amount of compressed air so as to act as an air vessel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view of a device intended to handle small and light flagstones and shown in position for dropping the flagstone at the proper spot,

FIG. **2** a front view of the same,

FIG. **3** in enlarged scale a side view of the rear jaw of the pair of tongs,

FIG. **4** a side view of another embodiment intended for the handling of heavy flagstones,

FIG. **5** is a side view of another device according to the invention shown in three working positions,

FIG. **6** a plan view of the same,

FIG. **7** in perspective a detailed view of the suspension for the pair of tongs,

FIG. **8** diagramatically the valve system for the hydraulic cylinder,

FIG. **9** a side view of another embodiment,

FIG. **10** a part of the same is viewed along the line X—X in FIG. **5**, and

FIG. **11** a side view of another embodiment of a device according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to FIG. **1** and **2** a pavement of flagstones already laid is indicated by **1** and a levelled supporting layer of sand by **2**, whereas **3** is a flagstone to be placed in continuation of the pavement already laid. The flagstone **3** is held by a pair of tongs comprising a front jaw **4** and a rear jaw **5**, made for instance of angle iron and welded transversely to the end of levers **6** and **7** respectively. The levers **6,7** which may be made of flat iron are at their other ends provided with a bore whereby they are freely pivotally mounted between two plates **8** and **9** by means of a bolt **10**. The plates **8,9** are interconnected by a horizontal plate **11** which also serves as an abutment for the free end of the levers **6,7** to limit their swinging in downward direction. The upper end of the plates **8,9** also have a bore for inserting of a bolt **12**, whereby the pair of tongs are pivotally mounted on the frame structure.

In the embodiment shown in FIG. **1** and **2** the frame structure may be made of a steel tube bent at the point of attachment of the pair of tongs to form a horizontal or nearly horizontal branch **13** and a vertical or preferably slightly backward inclined branch **14** as shown in FIG. **1**, which at its upper end is bent backwards as at **15** and at its end provided with a handle **25**. The tube **13** is at its other end bent slightly downwards and welded to a transverse tube **16** to the end of which is attached a pair of wheels **17**. The span of the wheels is slightly less than the width of the flagstone and may be adjustable to accomodate the device for working with flagstones of different width.

The rear jaw **5** has on its outer side one or more abutments **18** which when hitting the pavement **1** during lowering of the flagstone **3**, will cause the pair of tongs to loosen their grip on the flagstone **3** releasing the same for dropping down on the levelled sand layer **2**.

To facilitate the releasing of the pair of tongs from the flagstone **3** thus laid, there may be provided within the plates **8,9** a transverse rod **26** serving as an abutment which keeps the backward extending lever **7** at a somewhat higher level than the forward extending lever **6** when in unloaded condition.

During the handling of the flagstone **3** by the above described device it may be raised or lowered by altering the inclination of the handle bar **14,15**, as the structure will act as a double-armed lever tiltable about the axis of the wheels **17**. Simultaneously the pair of tongs will pivot about the bolt **12** so that the flagstone **3** will be maintained in a horizontal position.

To take off a flagstone from a pile the described implement being of moderate weight is lifted by hand to bring the pair of tongs **4,7** into engagement with the uppermost flagstone of a pile, which is then brought down to the pavement level by grasping the tube **13,14.** By keeping the tube **14** in adequate backward inclination, the flagstone **3** may be wheeled on the pavement **1** to the spot of destination.

A preferred embodiment of the rear jaw of the pair of tongs is shown in greater scale in FIG. **3.** In this embodiment the jaw comprises mainly an angle-iron **5.** The lower end **21** of its vertical leg may have a reduced thickness or at least a thickness corresponding to the desired width of the joint between the flagstones. Furthermore, the end **21** is slightly tapered or wedge-shaped to ensure the releasing of the tong.

To ensure the proper working of the pair of tongs the length of the jaw's vertical leg should be about three-fourths of the thickness of the flagstone. Preferably, therefore, the jaws are provided with means for adjusting this distance. By the embodiment shown in FIG. **3** this is achieved by U-shaped channel member **24** which embraces the horizontal leg of the angle-iron **5** and held in place thereagainst by some threaded bolts **22.** The bolts are screwed into a threaded bore in the horizontal leg of the angle-iron **5** and resting with their lower end in a blind bore in the lower flange of the U-shaped channel member **24** and freely rotating in a bore in the upper flange of the U-shaped channel member. At this place the bolts are held against axial displacement by the bolt head and a set-ring **23** inserted in a recess (not shown) in the bolt **22.** Thus by turning the bolts **22** the height of the U-shaped channel member **24** in relation to the angle-iron **5** can be adjusted.

Furthermore, the pair of tongs may be adjustable for different sizes of flagstones by providing the levers **6,7** with a series of bores for the bolt **10.**

For certain working conditions it may be desirable to have the driection of the pair of tongs turned 90° about a vertical axis in relation to the other part of the device. This may be achieved by providing vertical side-walls between the upper part of the plates **8,9** above the horizontal wall **11,** so that this upper part will show a square horizontal cross section, and provide the additional walls with bores for the bolt **12.** Another preferred embodiment whereby this turning may be achieved will be described in the following manner with reference to FIG. **7.**

Some further embodiments of the device according to the invention for the laying of flagstones which are too heavy to be taken off from a pile in the manners described before, are shown in FIG. **4–11.**

By these embodiments where corresponding components are indicated with the same reference numbers, the lever structure comprises mutually movable parts to enable the pair of tongs to be raised sufficiently to grip the top flagstone of a pile as delivered from the manufacturer and lower the same to a level about the ground from which the laying operation per se can be performed as described above by tilting the device about the tilting axis which in this case is identical with the axis of the wheels of the device.

By the embodiments now to be described the lever structure comprises a main frame generally indicated by **28** provided at its forward end with a pair of wheels **17,** the tread of which may be adjustable, and at its backward end provided with two handles **25** for operating the device. Adjacent the backward end of the frame a beam **27** is mounted pivotally as by **29** and carries at its forward end in some distance ahead of the wheels **27** a pair of tongs generally indicated by **40** and of a construction as mentioned above with reference to FIG. **1–3.** The pair of tongs is secured to the beam by means of a bolt **12** pivotally about an axis parallel with the axis of the wheels **17.**

FIG. **4** shows an embodiment of this kind in the transport position i.e. the position wherein a flagstone **3** carried by the device is moved from the supply of flagstones to the spot where the flagstone is going to be laid down which is performed by tilting the device about the wheel axis by lifting the handles **25** until the abutment **18** on the backward jaw of the pair of tongs hits the flagstone already placed so that the pair of tongs gives up their grip on the flagstone.

When the next flagstone is going to be taken up from the pile, the pair of tongs **40** is raised to the desired level by turning the beam **27** upwards in relation to the frame **28,** and if necessary by simultaneously lifting the backward end of the device by means of the handles **25.**

By the embodiment shown in FIG. **4** said turning of the beam **27** is accomplished by means of a helical compression spring **30** inserted between the beam and the frame **28** in the following way:

The lower end of a hydraulic cylinder **33** is connected to the frame **28** adjacent its forward end pivotally about an axis **31,** and the piston rod **35** extending from the cylinder is by its free end connected to the beam **27** pivotally about an axis **32.** The cylinder and the piston rod further serve as a guide for the helical spring **30** placed around said components.

As will appear from FIG. **4,** the axis **32** is placed in shorter distance from the pivot axis **29** between the beam and the frame than the axis **31** so that the axis of the spring at the bottom position of the beam **27,** as shown in the figure, and where the spring **30** is compressed, will form an acute angle with an extension of a connecting line from the axis **29** through the axis **32.** When the beam **27** is in its top position in relation to the frame **28,** and where the spring **30** has been expanded and thus acting with less force, the axis of the spring **30** will be nearly perpendicular to said connecting line. By this arrangement it will be possible, provided that the maximum angular movement between the frame and the beam is about 40°–45°, by proper dimensioning to achieve a lifting force on the beam which is nearly constant. If the maximum angular movement of the beam in relation to the main frame is for instance 42°, the acute angle should be about 34°. The value of this lifting force is such that is will be sufficient to lift the beam when in unloaded condition, but insufficient to keep the beam in raised position when a flagstone is carried by the pair of tongs.

The hydraulic cylinder **33** further serves to dampen the movement of the beam as the hydraulic fluid of the two spaces of the cylinder separated by the piston is allowed to flow through a by-pass connection. This by-pass may for instance be arranged in the piston (not shown in the drawing), and in the by-pass is inserted a stop-valve which in a convenient way can be controlled by the operator. By closing said stop-valve the movements of the beam **27** in relation to the frame **28** will be stopped, and it will thus be possible for the operator to lock the beam **27** in any desired position in relation

to the frame **28.** As the force exerted on the hydraulic piston will be the same independent of the position of the piston in the cylinder, the pivotal connections between the hydraulic system and the frame **28** and the beam **27** respectively may be placed substantially the same distance from the axis **29** as will appear from the embodiment shown in FIG. **5** and **6.** This arrangement provides a further advantage in that more space will be available for the by-pass with valves and expansion tank as will appear from the following:

Referring now to FIG. **5** and **6** an embodiment is shown which apart from the above-mentioned special arrangement of the hydraulic cylinder **33** corresponds to that described above with reference to FIG. **4.** In FIG. **5** the device is shown in different working positions of which the transport position where the beam **27** is in its bottom position is shown with full lines whereas two other positions as will appear from the following, are shown with dot-and-dash lines:

By this embodiment the main frame **28** as well as the beam **27** may be in the form of a triangular lattice structure as shown in the drawing and made of steel which are welded-together.

The helical compression spring **30** may be placed within a telescopic tube **30***a* (FIG. **6**) serving as a guide for the spring and further protecting the same against the influence of the weather.

The upper and lower spaces of the hydraulic cylinder **33** communicate through a by-pass **37** in connection with valve means and an expansion tank **38** as will be more fully described below. The valve means is controlled through a bowden-wire **39** by a control lever **20** placed adjacent to one of the handles **25** so that it may be activated without loosing the grip on the handle **25.**

The device described is used in the following way. The device is wheeled by the operator to a supply e.g. a pile of flagstones as shown in the figure. By pulling the control lever **20** the beam **27** is allowed to ascend to the desired level depending upon the height of the pile, whereafter the pair of tongs **40** is lowered in proper position over the uppermost flagstone of the pile by lifting the backward end of the device from the position shown with full lines in the figure to the position **25',27',40'** shown with dot-and-dash lines, whereby the pair of tongs will automatically grip the flagstone which is then lifted and removed from the pile by lowering the handles **25** and wheeling backwards. When the flagstone is clear of the pile, the beam **27** is allowed to descend to its lowermost position by pulling the control lever **20** whereby the speed of descending may be controlled by more or less opening of the by-pass valve. Then the device is wheeled on the pavement **1** already laid to the spot where the flagstone is to be laid down on a levelled supporting layer of sand **2.** When in proper position the backward end of the device is again raised to the position **25'** until abutments **18** on the backward end of the pair of tongs hit the pavement already laid causing the pair of tongs to loosen the grip as described above and allowing the flagstone to drop down on the prepared sand layer **2.** The device is then ready for repeating the operational cycle described above.

The device may be provided with supporting legs **47** which may be tied up so as to be clear of the groun while working with the device.

The pair of tongs **40** is suspended at the forward end of the beam **27** pivoting about the bolt **12** by means of a U-formed fitting and a rod **56** so as to allow the pair of tongs to be turned 90° about a vertical axis. The U-formed fitting shown in greater scale in FIG. **7** comprises a bottom plate **55** with a bore through which the rod **56** is inserted. The bottom plate **55** is at its two ends continued upwards in vertical plates **58** with bores for inserting the bolt **12.** The rod **56** terminates at its top end in a protruding flange **57** with a square outline and which serves to carry the pair of tongs by resting on the bottom plate **55.** Two vertical walls **59** a little higher than the thickness of the flange **57** are placed symmetrically on either side of the bore on the bottom plate **55,** and so that the distance between the sides facing each other is equal to the edge length of the square flange **57.** After lifting the pair of tongs so that the flange **57** is free of the walls **59,** it may be turned 90° and will be securely held in this position when the flange **57** is again brought down between the walls **59.**

A preferred embodiment of the by-pass and valve system for the hydraulic braking cylinder will now be more fully described with reference to FIG. **8.** the upper and lower spaces of the cylinder **33** are interconnected through a by-pass comprising three tube sections **41, 42,** and **43** with stop valves **44** and **45** inserted between the two sections **41, 42** and **42, 43** respectively. The valves **44** and **45** are arranged so as to be opened and closed simultaneously. In the embodiment shown the valves **44** and **45** are of the cock-valve type and arranged with their spindle axis in alignment, and connected by a shaft **48** carrying an arm **49** whereby the valves may be opened by a pull of the bowden wire **39** against the action of a spring **51** which acts to close the valves when the pull of the bowden wire **39** is released.

The tube section **42** between the valves communicates with a branch tube **46** which in turn communicates with an expansion tank **38** which serves to store the hydraulic oil displaced from the cylinder **33** by the piston rod **35** when the piston is lowered within the cylinder and to replace this volume of oil when the piston is raised.

It will be understood that the hydraulic brake system described serves to dampen the movements of the beam; **27** and immediately upon closing the valves stop this movement by the pressure built up on the lower or upper side of the piston respectively when the beam **27** is loaded by carrying a flagstone or when unloaded forced upwards by the spring **30.** However, to ensure immediate stopping of this movement it is essential that no air cushions are present in the hydraulic system.

To avoid this the oil must not be subjected to a vacuum which may occur when the load on the piston changes direction e.g. when dropping the flagstone or lifting the same from the supply or when the valves **44** and **45** are not closing or opening exactly simultaneously. To avoid this undesirable formation of a vacuum in the hydraulic cylinder, each of the tube sections **41** and **43** is in communication with a non-return valve **52** and **53** respectively which, in turn, through a pipe **54** communicates with the oil content in the expansion tank **38** and so arranged that the oil may flow only in a direction from the expansion tank to the tube sections **41** and **43.**

Preferably the tubing is so arranged that when the hydraulic cylinder **33** is in its vertical or nearly vertical position, as shown in FIG. **8,** any air bubbles formed within the oil will be able to rise by its natural buoyancy

to the valves **44** and **45** and through these valves when in open position to the expansion tank **38.** In view of this the non-return valves **52** and **53** should preverably be arranged so that their direction of flow is upward.

FIG. **9** and **11** show a further embodiment of the invention which is similar to those shown in FIG. **4-6** with the exception that the spring for lifting the beam has been dispensed with. In these figures identical parts are indicated by the same numerals.

By this embodiment supporting legs **47** are secured to a rod generally indicated by **61** which extends upwardly and at its upper end at **62** is journaled to the beam **27.** The lower part of the rod **61** is guided for sliding displacement on a crossbar **63** fixed on the main frame **28.** This may be achieved by forming the lower part of the rod **61** of two parallel bars **64** and **65** surrounding the crossbar **63** and between the upper part of which a bar **66** forming the upper part of the rod **61** is secured by means of bolts **67.** The crossbar **63** is provided with abutments **68** to provide lateral displacement of the bar **61.**

The device described works in the following way: In FIG. **9** the device is shown by full line in the transport position. When after dropping the flagstone the beam **27** has to be raised, the rear end of the device is lowered until the legs **47** rest on the ground. Then by releasing the hydraulic brake by operating the control lever **20** the rear end is further lowered e.g. to the position shown by the dot-and-dash line whereby-the rod **61** will push the beam upwards to the position **27'**. It will be noted that in the normal working position of the device as shown by full lines in FIG. **9,** the legs **47** will be clear of the ground.

A further embodiment of the invention by which the spring has been deleted and whereby an air pressure produced by the hyraulic braking system is utilized for lifting the beam **27** in unloaded condition will be described in the following.

This embodiment corresponds to the one described with reference to FIG. **4** with the exception that the spring **30** is deleted and the hydraulic cylinder **33** connected to an air vessel as will be more fully described in the following with reference to FIG. **11.**

By this embodiment the hydraulic cylinder **33** is at **31** and **32** pivotally connected to the main frame **28** and the beam **27** repectively in the same way as the spring by the embodiments descirbed above. The lower space of the hydraulic cylinder is through a tubing **71** connected to a closed receptacle **70** acting as an air vessel over an auxiliary receptacle **73** and a stop-valve **72** in such a way that air collected in the receptacle **73** by the normal position of the system will be able to rise through the stop-valve **72** when open to the air vessel receptacle **70.**

By this embodiment the increased pressure in the air vessel **70** produced by the downward movement of the piston when the beam in loaded condition is lowered, will be used to force the piston upwards and raise the beam when this is in unloaded condition.

To ensure proper working a certain amount of air should be entrapped in the air vessel **70** the volume of which must be sufficient to exclude any possibility that the entrapped air in the expanded condition may pass the stop-valve.

To enable re-adjustment of the amount of entrapped air in the air vessel **70,** the auxiliary receptacle **73** is provided with a non-return valve permitting atmospheric air to be drawn into the receptacle **73** when a sub-pressure is produced in the same. This is produced by closing the stop-valve and lifting the beam manually and hereafter opening the stop-valve and pressing the beam downwards. In this way the auxiliary receptacle **73** serves as a pumping device whereby it will be possible at any time to increase the amount of air entrapped in the air vessel. To enable this amount to be reduced the air vessel **70** has at its upper part an air-escape valve **75.**

The device according to the invention enables a man to lay flagstones on the already laid sand layer more quickly and accurately maintaining a natural and convenient working position using the flagstones already laid as a support and without the necessity of stepping outside these. Further, the device according to the invention will make it possible to use flagstones which are greater and thus heavier than those heretofore used with resulting economical benefit and possible new fields of application of flagstone pavements.

What is claim is:

1. A device for laying of flagstones or the like block-formed paving elements comprising:

a double-armed lever structure comprising a main frame being at its front end provided with supporting means adapted for resting on a supporting surface so as to allow tilting of the structure about a transverse axis and at its rear end provided with means for manoeuvring the device by hand or by mechanically driven manoeuvring means;

a beam being at its rear end connected to said main frame pivotally about a transverse axis and with its front end extending in front of said supporting means and carrying pivotally about a transverse axis a pair of tongs adapted for temporary carrying a flagstone or the like paving elements in a horizontal position;

spring means for lifting the beam in relation to the frame when in unloaded condition;

and means for selectively controlling the movement of the beam in relation to the frame.

2. A device in accordance with claim **1** wherein:

said spring means are a helical compression spring pivotally connected to the main frame and the beam in such a way that the axis of the spring in the uppermost position of the beam will be nearly perpendicular to a line drawn from the pivot axis between the beam and the main frame and through the pivot axis between the spring in the lowermost position of the beam will form an acute angle with an extension of said line.

3. A device in accordance with claim **1** wherein:

said means for controlling the relative movement of the beam comprises a double-acting hydraulic cylinder pivotally connected to the beam and the main frame respectively, and whereby the two spaces of the cylinder on both sides of the piston are intercommunicating through a by-pass having a stop-valve to be controlled by the operator.

4. A device for the laying of flagstones, block-formed paving elements, and the like, comprising, in combination,

a double-armed lever structure carrying at its front end pivotally about a transverse axis a pair of tongs adapted for temporarily carrying a flagstone or the like in a horizontal position

said double-armed lever structure being provided at its rear end with means for manoeuvering the device by hand or by powerdriven manoeuvering means

said double-armed lever structure being also provided with supporting means adapted for resting on a supporting surface so as to allow tilting of said structure about a transverse axis.

a fitting for suspending the pair of tongs pivotally from said double-armed lever structure including a suspending bolt

said fitting being provided with two sets of bores for the suspending bolt arranged perpendicularly to each other in a horizontal plane so as to suspend the pair of tongs either with the arms in the longitudinal direction of the device or perpendicularly to said direction, abutment means connected to said tongs for abutting the top of the said flagstones, block-formed paving elements and the like, whereby the contact between said tongs and said flagstones, block-formed paving elements and like can be varied.

5. A device for the laying of flagstones, block-formed paving elements, and the like, comprising, in combination,

a double-armed lever structure carrying at its front end pivotally about a transverse axis a pair of tongs adapted for temporarily carrying a flagstone or the like in a horizontal position

said double-armed lever structure being provided at its rear end and with means for manoeuvering the device by hand or by power-driven manoeuvering means

said double-armed lever structure being also provided with supporting means adapted for resting on a supporting surface so as to allow tilting of said structure about a transverse axis

said pair of tongs being carried by a vertically extending circular rod which at its top end terminates in a protruding flange with a square outline

said rod being inserted in a corresponding cylindrical bore in the bottom of a U-formed fitting, the ascending legs of which are arranged for the pivotal mounting of the pair of tongs on the double-armed lever structure

and whereby the U-formed fitting is provided with vertical abutment surfaces for at least two opposite sides of said square flange which when lifted over these abutment surface together with the pair of tongs may be freely rotatable about its longitudinal axis.

6. A device for laying of flagstones or the like block-formed paving elements comprising:

a double-armed lever structure including a main frame being at its front end provided wth supporting means adapted for resting on a supporting surface so as to allow tilting of the structure about a transverse axis and at its rear end provided with means for maneuvering the device by hand or by mechanically driven maneuvering means;

a beam being at its rear end connected to said main frame pivotally about a transverse axis and with its front end extending in front of said supporting means and carrying pivotally about a transverse axis a pair of tongs adapted for temporary carrying a flagstone or the like paving elements in a horizontal position;

abutment means connected to said tongs for abutting the top of the said flagstones or block-formed paving elements and the like, whereby the contact between the said tongs and said flagstones or block-formed paving elements and the like can be varied;

a depending rod being at its upper end pivotally connected to the beam;

said rod being at its lower end provided with supporting legs for the device;

and the intermediate part of said rod being slidably guided by guiding means secured to the main frame;

and means for selectively controlling the movement of the beam in relation to the frame.

7. A device in accordance with claim **5**, together with abutment means provided on the jaws for abutting the top of a flagstone etc. as previously laid and operable to cause the release of another flagstone or the like from a level which is a small distance above the ground.

* * * * *