Aug. 23, 1927. 1,639,871

J. S. WALCH

DITCH DIGGING MACHINE

Filed July 30, 1925 3 Sheets-Sheet 1

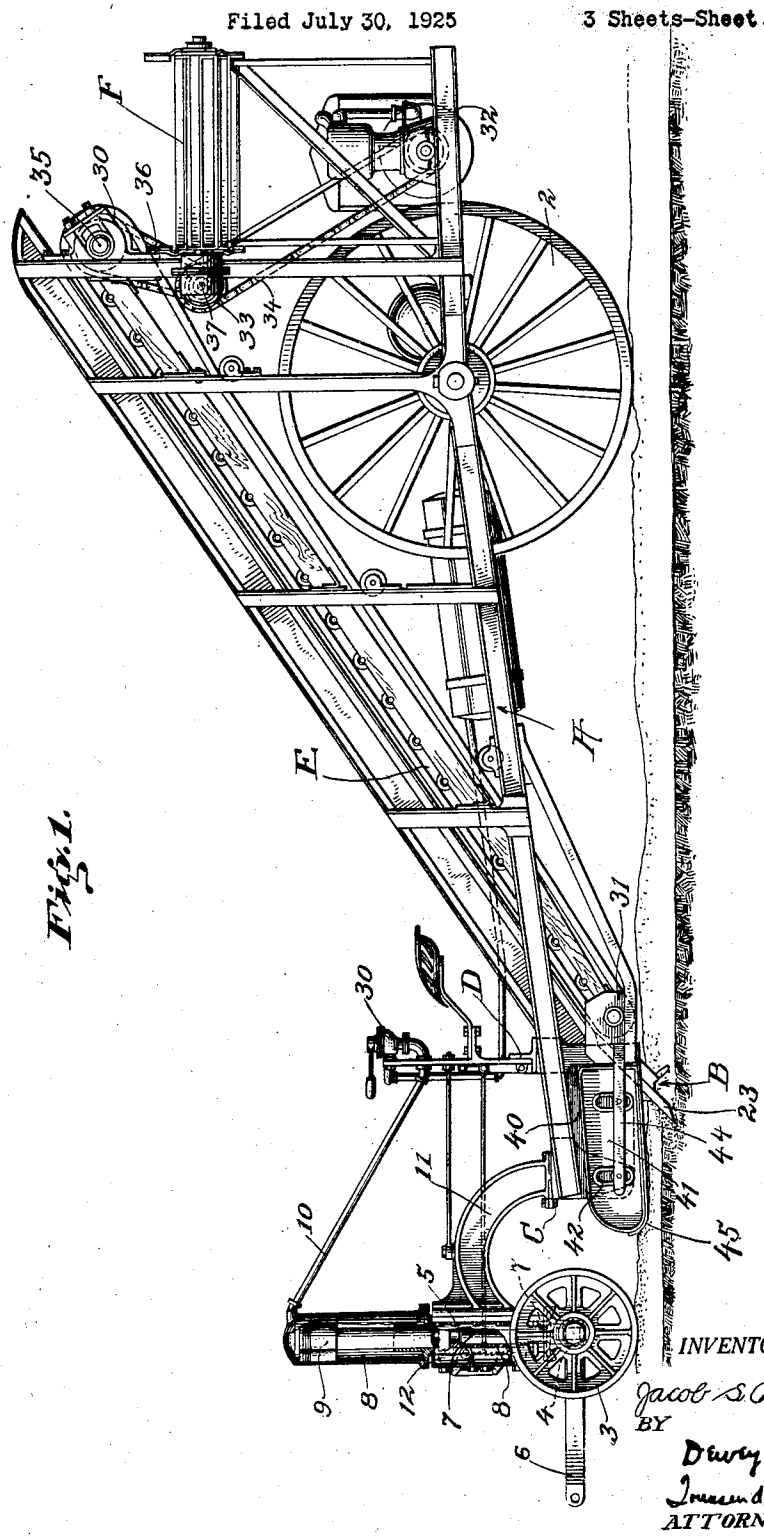


Fig. 1.

INVENTOR.
Jacob S. Walch.
BY
Dewey, Strong,
Ingersoll & Loftus
ATTORNEYS

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Fig. 2.

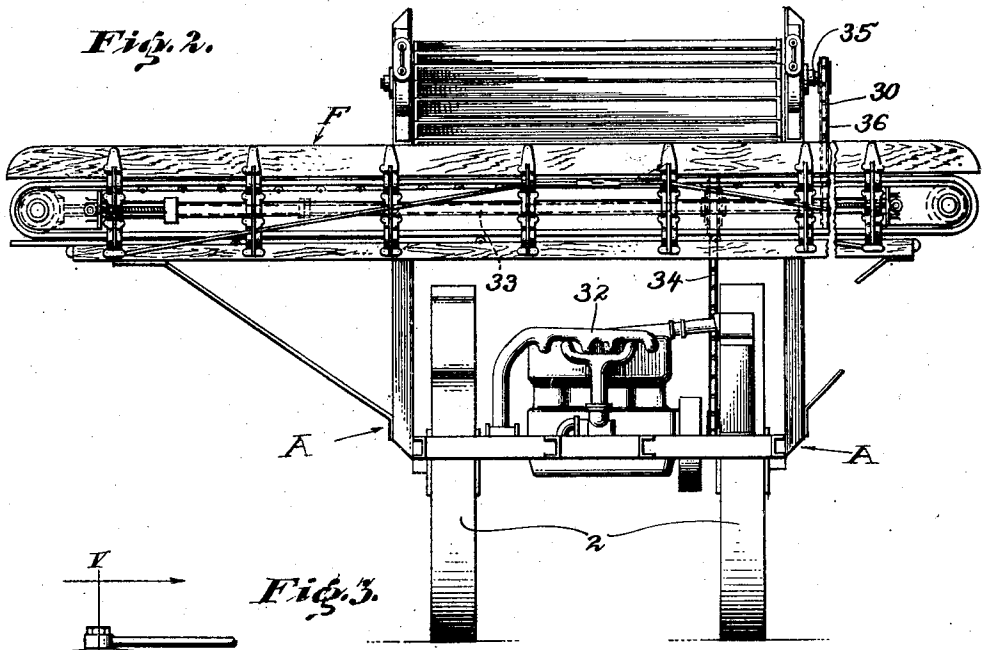
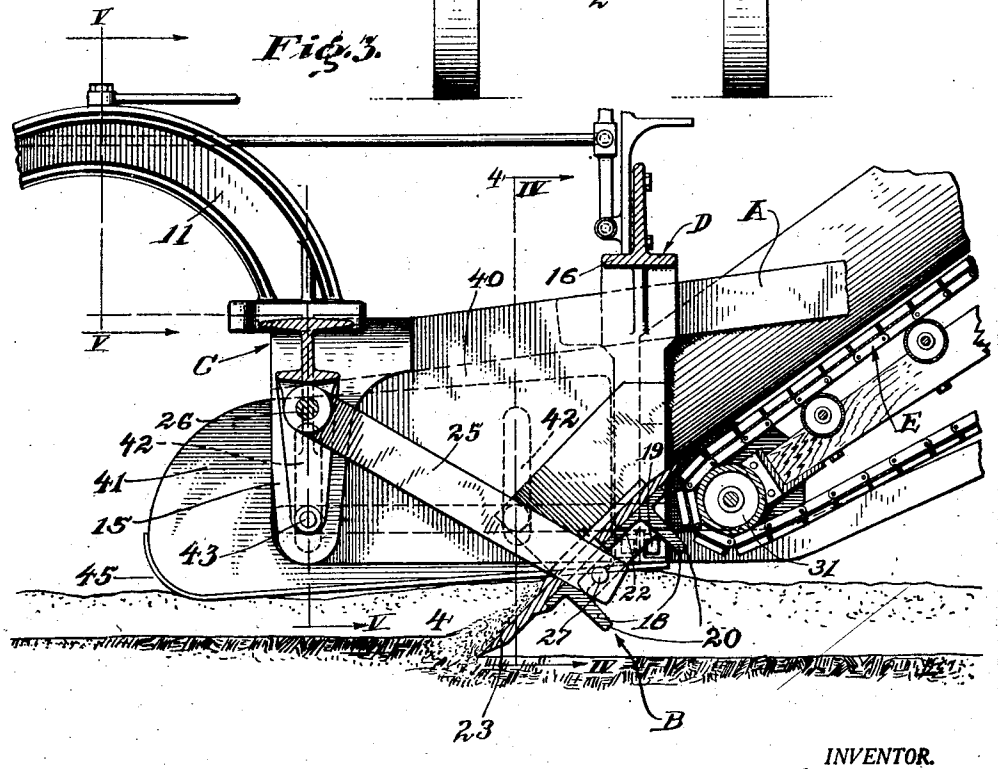


Fig. 3.



INVENTOR.
Jacob S. Walch
BY Dewey, Strong, Townsend & Loftus
ATTORNEYS

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J. S. WALCH

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Fig. 4.

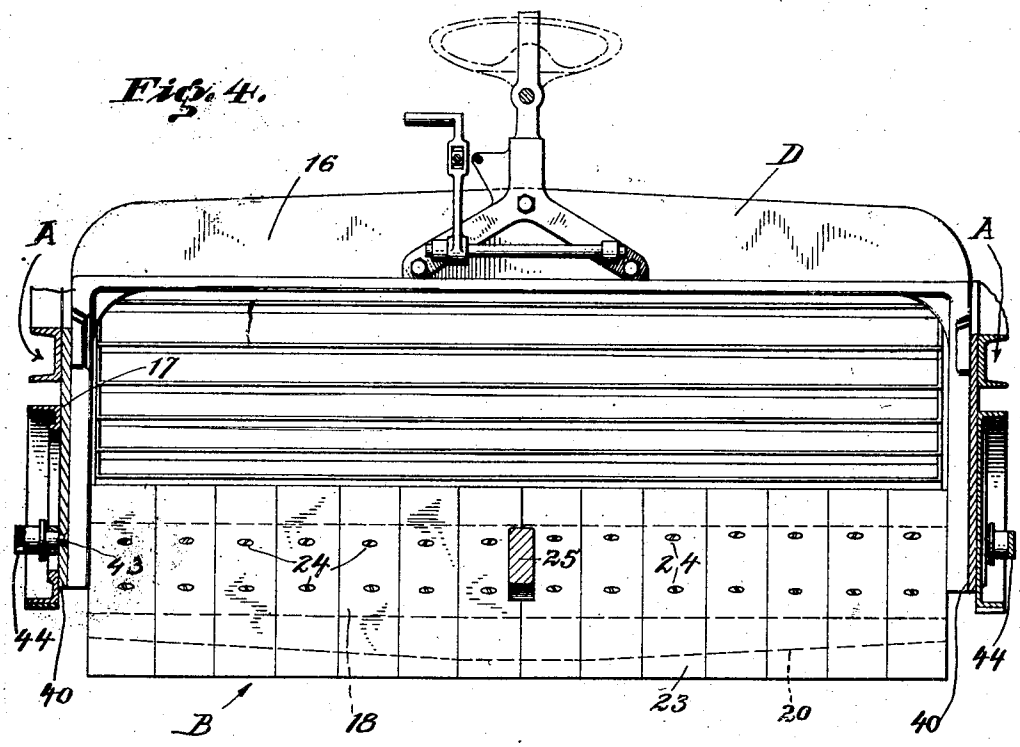
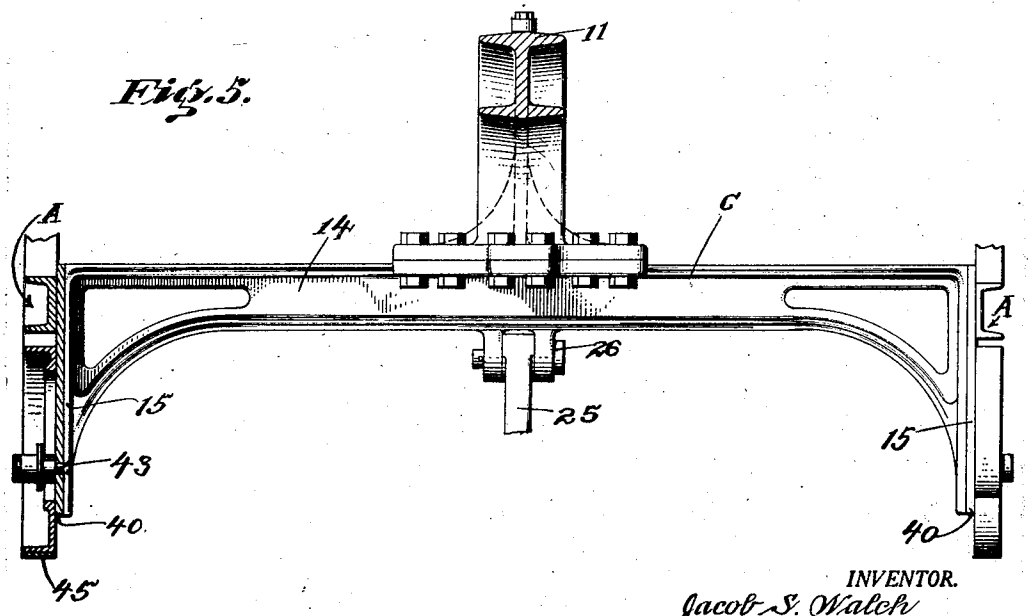


Fig. 5.



INVENTOR.
Jacob S. Walch
BY Dewey, Strong, Townsend & Lapsley.
ATTORNEYS

Patented Aug. 23, 1927. 1,639,871

UNITED STATES PATENT OFFICE.

JACOB S. WALCH, OF OAKLAND, CALIFORNIA.

DITCH-DIGGING MACHINE.

Application filed July 30, 1925. Serial No. 47,051.

This invention relates to excavating or digging machines and especially to a type which is particularly adapted for digging irrigation ditches and the like.

The object of the present invention is to generally improve and simplify the construction and operation of excavating or digging machinery, and to provide a machine which is adapted to be attached to and drawn in a forward direction by a tractor or the like, to provide a cutter or digging implement which is exceedingly rigid and substantial in construction, to provide means whereby the digging implement may be quickly raised or lowered when large rocks, bowlders, or other obstructions are encountered, and further to provide means whereby the earth or soil raised by the digging implement is elevated or deposited at the side of the machine or the ditch.

One form which my invention may assume is exemplified in the following description and illustrated in the accompanying drawings, in which—

Fig. 1 is a side elevation of a ditch digging machine.

Fig. 2 is an end view of the same.

Fig. 3 is an enlarged vertical longitudinal section of the digging implement and the mechanism supporting the same and cooperating therewith.

Fig. 4 is a cross section of the digging implement taken on line 4—4, Fig. 3.

Fig. 5 is a cross section taken on line 5—5, Fig. 3.

Referring to the drawings in detail, and particularly to Figs. 1 and 2, A indicates in general a main frame supported by a pair of rear wheels 2 and a pair of front wheels 3. The front wheels are carried by an axle 4 which is centrally pivoted in a head member generally indicated at 5. The axle is provided with a draw-bar 6 and as such may be attached to a tractor or like device. The pivotal mounting of the front axle 4 is for the purpose of permitting steering of the machine, for instance, when digging a ditch which is curved or otherwise. The front axle is furthermore supported in such a manner that the forward end of the frame which carries the digging implement generally indicated at B may be quickly raised and lowered, for instance, to clear obstructions such as large rocks, bowlders, or the like. This may be accomplished in any suitable manner, but the mechanism employed in this invention consists of a shaft or pin 7 which carries the front axle. This shaft passes through the head member 5 and enters the cylinder 8. It has a piston 9 on its upper end and air under pressure is admitted to the upper end of the cylinder through a pipe 10. The cylinder 9 is carried by the head member 5 to which the main frame A is secured through a yoke 11 and if air under pressure is admitted the cylinder together with the head 5, yoke 11, and frame A will be lifted in an upward direction with relation to the pin 7 and the piston. It is thus possible to quickly raise or lower the digging implement B. It is also possible to lock the frame in its raised position by means of a pawl and rack generally indicated at 12. A further detailed description of this mechanism is thought unnecessary as it forms the subject matter of a co-pending application entitled Lifting device, filed July 30th, 1925, Serial No. 47,050.

The main novelty of the present invention is the digging implement and the mechanism employed in conjunction therewith for removing the earth or soil as it is raised by the digging implement. The detailed construction of the digging implement, the manner in which it is supported with relation to the yoke 11 and the main frame A, and the means for removing the soil and depositing it on the side of the machine or ditch will now be described, and particular reference will be made to Figs. 2, 3, 4, and 5.

The yoke member 11 carried by the head 5 is secured at its rear end to a cross-frame C which consists of a horizontal cross-bar 14 and a pair of side bars 15. The forward end of the main frame A is secured to the side members 15 and also to a second cross-frame generally indicated at D. This cross-frame also consists of a horizontal cross-bar 16 and side arms or legs 17. Connecting the lower ends of the side-arms or legs 17 is a lower cross-bar 18, this bar being bolted or otherwise secured to the lower ends of the legs 15 as at 19. The cross-bar 18 is reinforced with longitudinally extending ribs 20 and as such is exceedingly rigid. This is of particular importance as the cross-bar 18 serves the purpose of supporting the digging implement which consists of a series of teeth 23 which are bolted or otherwise secured as indicated at 24. To further support the teeth 23 and to take as much of the strain off the cross-bar 18 as possible, a link

25 is employed. This link is pivotally secured at its upper end as at 26 to the cross-frame C and it is similarly pivotally secured at its lower end as at 27 to the cross-bar 19. A single link 25 is employed and is centrally disposed with relation to the frames C and D and as such takes up the major portion of the digging strain or load imposed on the teeth 23 and the cross-bar 18. This link is fairly thin in cross section and is nothing more nor less than a flat bar, and as such does not interfere with the soil which is dug up or raised by the teeth 23 when the machine is being pulled in a forward direction.

For the purpose of removing the soil or dirt as it is piling up in front of the teeth 23, an endless conveyor or elevator generally indicated at E is employed. This elevator passes over upper and lower sprockets or pulleys as indicated at 30 and 31 and is continuously driven as will hereinafter be described. This conveyor deposits the dirt or soil on a cross-conveyor F mounted on the rear end of the main frame and as these conveyors are driven in unison the soil elevated will be deposited on the cross-conveyor and this will in turn deposit the soil to one side or another of the machine or the ditch which is being dug.

The driving mechanism employed is in this instance illustrated by an engine generally indicated at 32. This engine drives a shaft 33 through means of a sprocket chain 34 or other suitable means and power is in turn transmitted from shaft 33 to a shaft 35 which carries the upper sprockets 30, power being transmitted through a chain or the like indicated at 36. In one end of the shaft 33 is disposed a gear box 37. A pair of bevel gears is mounted in this box and these transmit power to the pulleys which carry and drive the cross-conveyor. Any other suitable mechanism may, however, be employed for this purpose.

From practical experience it has been found that when a machine of this character is being pulled in a forward direction, the soil broken up or lifted by the teeth 23 has a tendency to work out side-ways and that unless means were provided for preventing the soil from thus escaping, comparatively little soil would be delivered to the elevator E. A pair of stationary side plates 40 are for this reason employed, these plates being secured to the opposite sections or legs of the cross-frames C and D. A pair of auxiliary plates such as shown at 41 are also employed for the same purpose. These side plates are slotted as indicated at 42 and are guided by pins 43 secured in the legs of the respective frames C and D, the outer ends of the pins being braced or otherwise supported by side arms 44. In other words, the auxiliary plates 41 are freely movable upon the pins 43 between the stationary plates 40 and the guide arms 44. The lower edges of the plates 41 are provided with runners 45 to take up wear and tear as the auxiliary side plates are supported on the ground and are free to rise and fall with relation to any obstructions or undulations formed in the surface. The real importance of the auxiliary side plates will be realized when it is considered that there is a fixed distance between the lower edge of the side plates 40 and the lower ends of the digging teeth 23; for instance, when starting in to dig a ditch, it is seldom possible to cut to a depth of more than one foot; and as the distance between the lower edge of the plates 40 and the teeth may be four or five feet or more, it will be obvious that open spaces will be left through which the dirt will escape. Such escape, however, is prevented as the auxiliary plates 41 drop down to the ground surface and ride over the same, thus closing this space when the first cut is taking place. After the digging implement reaches the position shown in Fig. 3, the sides of the ditch prevent escape of the soil and so do the stationary plates 40. The auxiliary plates will then merely ride free and unobstructed and serve no particular useful purpose except to fill in spaces where the ground is fairly uneven.

In actual operation, the draw-bar 6 is connected to one or more tractors disposed in a forward direction. If a ditch four feet deep is to be dug, the forward end of the frame is lowered by the pneumatic control until the teeth enter the ground approximately a foot. The forward movement of the tractor and digging implement causes the teeth to break and raise the soil, and it is thus deposited on the conveyor belt E which delivers it to the cross-conveyor and this deposits the soil at the side of the ditch. After one cut has been completed, the implement is raised out of the soil and the machine is turned around and again placed in line with the ditch. The teeth are then lowered another foot, and the same operation takes place. If at any time rocks or bowlders are encountered which might cause injury or breaking of the teeth, it is possible to quickly raise and lower the forward end of the frame and the teeth by merely applying air to the cylinder 9 through the control valve indicated at 41, exhausting the same when the obstruction is cleared. The auxiliary side plates 41 prevent escape of the soil when the first few cuts are taken, while the stationary plates 40 take care of such escape when the cut begins to reach a certain depth.

While the machine here illustrated is particularly adapted for digging irrigation ditches having a rectangular cross section, it is obvious that a cross section of any shape may be obtained by merely changing the

shape and arrangement of the digging teeth. The machine may thus be used for other purposes, and while certain features of the present invention are more or less specifically illustrated, I wish it understood that various changes in form and proportion may be resorted to within the scope of the appended claims. I similarly wish it understood that the materials and finish of the several parts employed may be such as the experience and judgment of the manufacturer may dictate or various uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a machine of the character described, a pair of side frames, a front and a rear cross frame connecting the forward ends of the side frames, a bottom cross-bar, a plurality of digging teeth secured thereto, and a link secured to the cross bar at one end and to the front cross frame at the other end.

2. In a machine of the character described, a pair of side frames, a front and a rear cross frame connecting the forward ends of the side frames, a bottom cross-bar, a plurality of digging teeth secured thereto, a link secured to the cross bar at one end and to the front cross frame at the other end, a pair of stationary side plates secured to the side frames, one on each side of the digging teeth, and a conveyor rearwardly of the digging teeth and adapted to remove soil raised by the digging teeth.

3. In a machine of the character described, a pair or side frames, a front and a rear cross frame connecting the forward ends of the side frames, a bottom cross-bar, a plurality of digging teeth secured thereto, a link secured to the cross bar at one end and to the front cross frame at the other end, a pair of stationary side plates secured to the side frames, one on each side of the digging teeth, a conveyor rearwardly of the digging teeth and adapted to remove soil raised by the digging teeth, and means for raising and lowering the side frames, the cross frames and the digging teeth in unison.

4. In a machine of the character described, a main frame, a pair of interspaced vertically disposed stationary plates at the forward end of said frame, angularly disposed digging teeth positioned between said plates and at the rear end of said plates, and a pair of auxiliary plates freely movable in a vertical direction with relation to the stationary plates and the digging teeth.

5. In a machine of the character described, a main frame, a pair of interspaced vertically disposed stationary plates at the forward end of said frame, angularly disposed digging teeth positioned between said plates and at the rear end of said plates, a pair of auxiliary plates freely movable in a vertical direction with relation to the stationary plates and the digging teeth, and means for raising and lowering the frame, the side plates, and the digging teeth with relation to said means.

6. In a machine of the character described, a main frame, a pair of interspaced vertically disposed stationary plates at the forward end of said frame, angularly disposed digging teeth positioned between said plates freely movable in a vertical direction with relation to the stationary plates and the digging teeth, means for raising and lowering the frame, the side plates, and the digging teeth with relation to said means, and an endless conveyor disposed rearwardly of the digging teeth and adapted to remove soil raised by the digging teeth.

7. In a machine of the character described a main frame, a pair of interspaced vertically freely movable plates at the forward end of said frame, angularly disposed digging teeth positioned between said plates and cross frames on the main frame upon which the interspaced plates are guided and movable.

8. In a machine of the character described a pair of interspaced main frame members, cross frames connecting the forward ends of said frames, said cross frames having downwardly extending arms, a bottom cross frame, a plurality of digging teeth secured thereto, a link connecting said bottom cross frame and one of the first named cross frames and a pair of side plates vertically movable upon the downwardly extending arms of the first named cross frames.

JACOB S. WALCH.