A. N. HABBERLEY.

ICE HARVESTER.

APPLICATION FILED JAN. 31, 1906.

945,781.

Patented Jan. 11, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

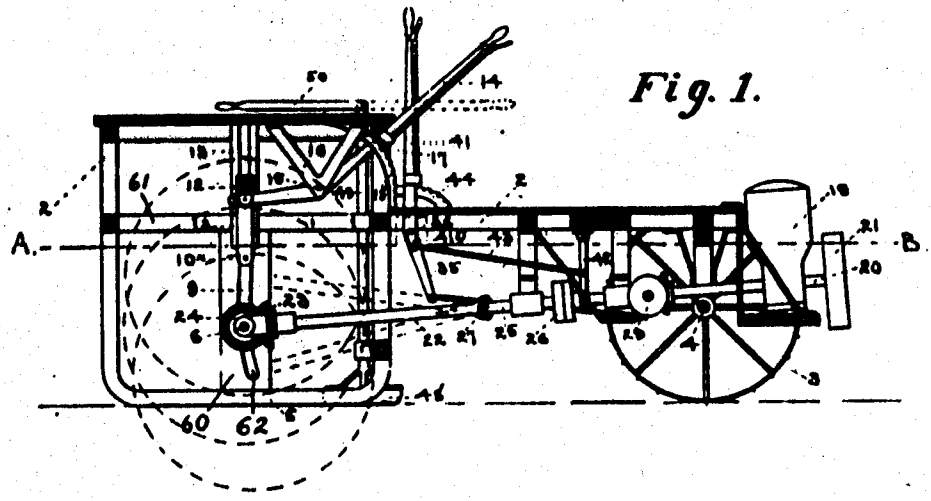
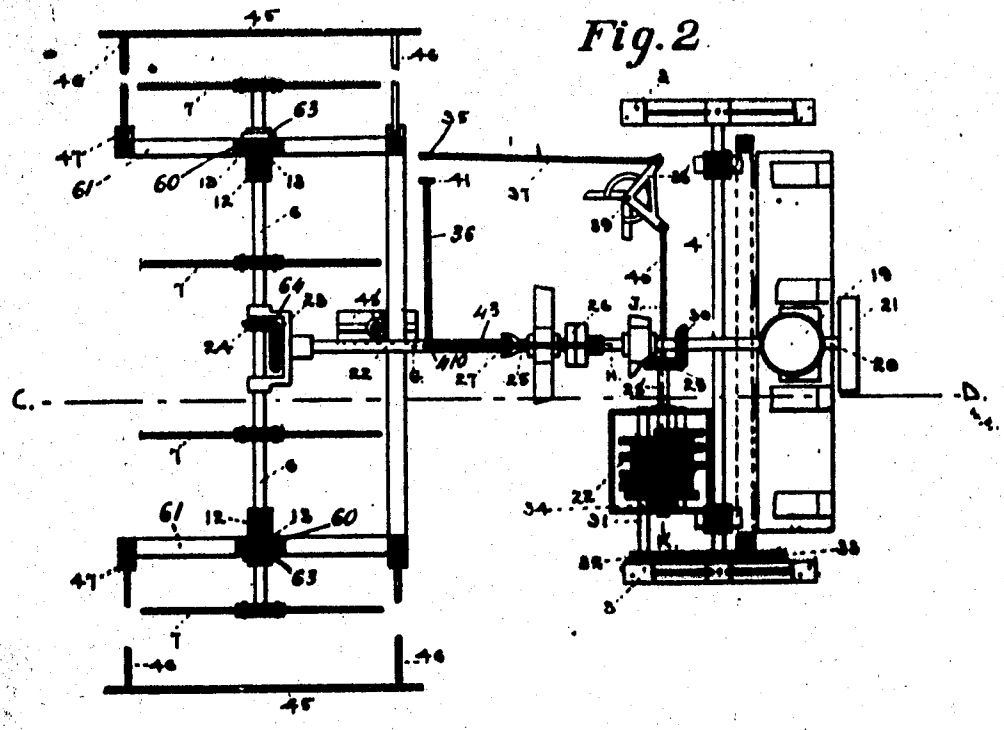


Fig. 2.



WITNESSES

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ICE HARVESTER.
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945,781. Patented Jan. 11, 1910.

2 SHEETS—SHEET 2.

Fig. 3.

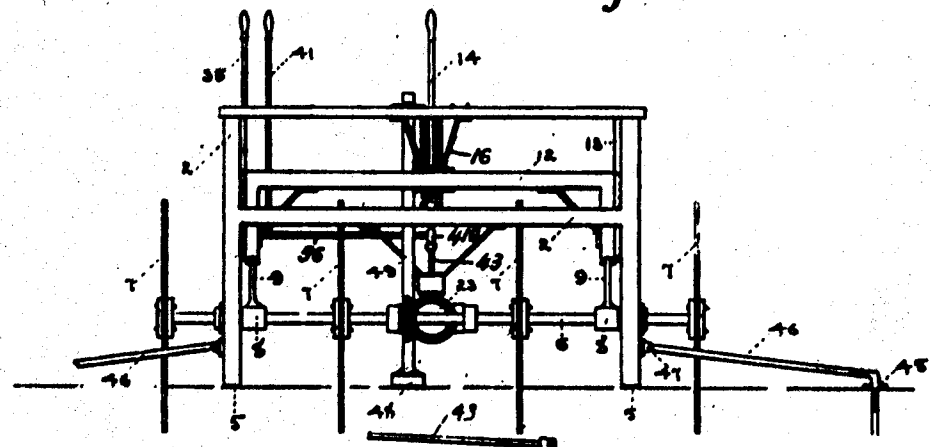


Fig. 6.

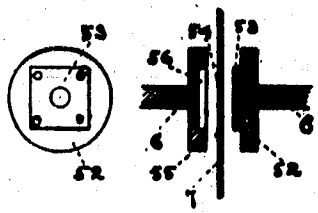


Fig. 4.

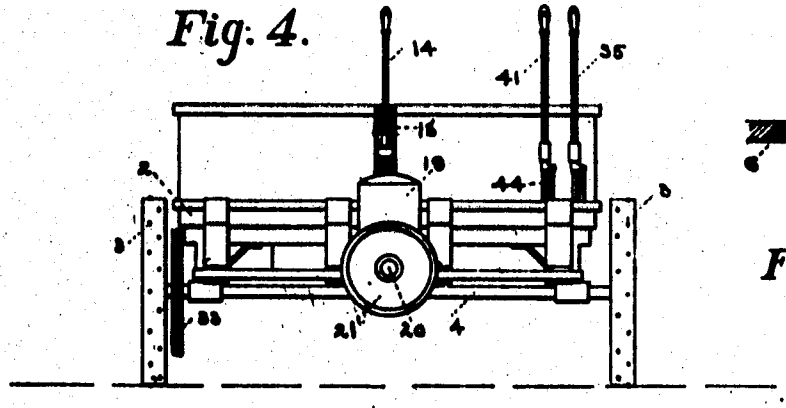
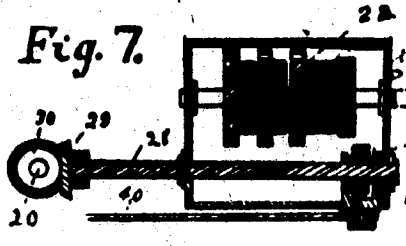


Fig. 5.

Fig. 7.



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UNITED STATES PATENT OFFICE.

ALBERT N. HABBERLEY, OF NEWTON, MASSACHUSETTS.

ICE-HARVESTER.

945,781. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed January 31, 1906. Serial No. 413,862.

To all whom it may concern:

Be it known that I, ALBERT N. HABBERLEY, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Ice-Harvesters, of which the following is a specification.

This invention relates to power mechanism for cutting parallel grooves in fields of ice preparatory to converting the ice into blocks, it being the practice to cut intersecting grooves in the upper surface of the ice field about two-thirds of the thickness of the ice, and then complete the detachment of the cakes of ice by splitting the ice in continuation of said grooves.

My invention is embodied in a vehicle adapted to run upon an ice field, and provided with a motor, traction wheels driven thereby for impelling the vehicle, a transverse saw shaft movable vertically relatively to the frame of the vehicle, and provided with a plurality of saws adapted to cut grooves of any desired depth in the ice, and connections between the motor, the saw shaft and the driving wheels, said connections being adapted to rotate the saw shaft in any position or at any height to which it may be adjusted, and to impel the driving wheels at a speed proportionate to the depth of the cut of the saws, so that the machine may be driven at its minimum speed when the saws are at their maximum depth, and at a maximum speed when the saws are at their minimum depth.

The invention consists in the several improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification,—Figure 1 represents a longitudinal vertical section of an ice-harvesting machine embodying my invention, the said section being on the plane of line C D of Fig. 2. Fig. 2 represents a horizontal section on the plane of line A B of Fig. 1, and a plan view of the parts below said line. Fig. 3 represents a front end elevation of the machine. Fig. 4 represents a rear end elevation. Fig. 5 represents in separate views, certain details of the saw shaft and saws. Figs. 6 and 7 represent sectional details hereinafter referred to.

The same numerals of reference indicate the same parts in all the figures.

The frame 2 of the machine, which may be of any suitable form, is supported by traction wheels 3 affixed to a driving axle 4, and runners 5 which are located at opposite sides of the frame.

6 represents a horizontal saw-carrying shaft, which extends through the space between the runners 5 and across said runners, and is provided with a series of circular saws 7. The saw shaft 6 is journaled in bearings 8 8 having shanks or arms 9, which are pivoted at 10 to the end portions of a vertically-movable carrier 12, said carrier being movable in guides 13 affixed to the supporting frame. Means are provided for raising and lowering the carrier 12 to correspondingly raise and lower the saw shaft and its saws, and thus cause the latter to enter the ice to any desired depth, the said means comprising a lever 14 pivoted at 15 to a hanger 16, said lever having a movable dog 17 adapted to engage a notched segment 18 to lock the lever, and hold the carrier 12 and the saws at any desired height.

19 represents a gasolene or other suitable motor, supported by the frame, the shaft of the motor being shown at 20, and provided with a fly wheel 21. The motor shaft 20 forms one member of a sectional shaft which imparts rotary motion from the motor to the saw shaft 6, said sectional shaft including a section or member 22 having a bevel gear 23 meshing with a bevel gear 24 affixed to the saw shaft, and an intermediate section or member 25 which is connected with the member 20 by a clutch 26, and with the member 22 by a universal joint 27, see Figs. 1 and 6. When the members of the clutch 26 are engaged with each other, the sectional shaft imparts motion from the motor to the saw shaft, the universal joint 27 permitting the saw shaft to rise and fall as indicated by dotted lines in Fig. 1. Provision is thus made for driving the saw shaft at any height to which it may be adjusted, and for causing each saw to cut a groove of any desired depth in the ice. The clutch 26 enables the saw shaft to be disconnected from the motor when it is desired to impel the machine over the ice without driving the saws.

Connections are provided between the motor shaft 20 and the driving axle 4, said connections including change speed gears 22 or other suitable means for driving the axle 4 and traction wheels 3 at different speeds, so that the speed of the machine may be pro-

portioned to the depth of cut of the saws, the machine being driven at a minimum speed when the saws are at their maximum depth, and at a maximum speed when the saws are at their minimum depth. Any suitable system of change gears may be employed for this purpose, and as such mechanism is well known, I have deemed it sufficient to illustrate the same only conventionally, as indicated in Fig. 2, it being sufficient to say that motion is communicated from the shaft 20 to the acting change gears 22, through a shaft 28 having a bevel gear 29 meshing with a bevel gear 30 affixed to the shaft 20, motion being communicated from the change gears to the driving axle 4 through a shaft 31 having a gear 32 meshing with a larger gear 33 affixed to the driving axle. The shaft 28 may be provided with a slidable gear 34, see Figs. 2 and 7, which may be moved to effect the desired change of speed of the driving axle by means of a lever 35 suitably mounted on the supporting frame, one arm of said lever being connected by a rod 37 with a bell crank lever 38, which is pivoted at 39 to the supporting frame, and is connected by a rod 40 with the slidable gear 34.

The members of the clutch 26 may be engaged and disengaged by means of a lever 41 secured to the rock shaft 36, said rock shaft having at its inner end a short arm 410 connected by a rod 43 with a lever 42 fulcrumed on the frame of the machine and operatively connected with one of the clutch members, the lever 41 being provided with a dog engaging a suitable locking quadrant 44.

45 represents a guide adapted to run in a previously formed groove in the ice, and having arms 46 which are pivoted at 47 to the frame of the machine, the guide causing the machine to be moved in a direction parallel with grooves cut by a previous trip.

48 represents a steering shoe, which is affixed to a vertical steering post 49 journaled in bearings on the frame of the machine, and provided with a steering handle or tiller 50 which may be adjusted to different positions, so that it may be accessible from the front or rear as shown by full and dotted lines in Fig. 1. The face of the shoe 48 which bears on the ice is preferably provided with suitable sharp-edged runners, adapted to cut into the ice, and effect a steering engagement therewith, when the steering post is turned by means of its handle.

The saw shaft 6 is preferably composed of sections, each section having at one end a head 52 provided with a square projecting boss 53 adapted to enter a square orifice 54 in the center of a saw 7, the other end of each section having a head 55 provided with a square recess 56 adapted to receive the boss 53 of the adjacent section. In assembling the parts of the saw shaft, the bosses 53 are inserted in the holes in the saws, and then in the sockets 56, the two heads 52 and 55 being then securely connected by bolts 57. Provision is thus made for detachably securing the saws to the saw shaft, and for giving the shaft the desired strength and stiffness.

The described machine may be operated as follows: The saws being raised clear of the ice, and the members of the clutch 26 being disconnected, the engine is started, to propel the machine to the point where the cutting is to be commenced. A suitable line having been marked at the outer edge of the field, the machine is run into position with the saw at one end of the series on said line. The driving gear connecting the motor with the driving axle, is then disconnected, and the members of the clutch 26 are connected to cause the rotation of the saws. These are gradually lowered until the saws have entered the ice to the desired depth. The machine is then started ahead on the slowest speed, the speed being gradually increased until it is sufficient according to the depth of cut. If it is found that the saws become blocked, the speed of the machine should be reduced. When the end of the row is reached, the members of the clutch 26 are separated, and the saw frame is raised. The machine is then run into position to cut in the opposite direction, and is such a distance from the last-mentioned cut that the guide 45 at one side of the machine, will drop into that groove. The saws are then lowered, and the machine operated as before.

The slidable gear 34 and the means for moving it, enable the driving axle to be disconnected from the motor in order that the saws may be operated alone, while the frame of the machine is stationary, until the saws have entered the ice to a sufficient depth. It will be seen, therefore, that provision is made for disconnecting either the saw shaft or the driving axle from the motor, so that either of said parts may be operated independently.

Uprights 60 connect cross bars 61 of the frame with the runners 5, and said uprights are formed with segmental or curved slots 62 through which the saw shaft 6 passes, said shaft having collars 63 (see Fig. 2) which coact with the outer sides of the uprights to prevent endwise movement of the shaft. The center of the curve of the slots 62 is at the universal joint 27 to permit the saw shaft to be raised and lowered, the side walls of the slots serving as guides and to prevent endwise thrust on the universal joint. When the machine is at work, the resistance to the advance of the saws through the ice exerts a backward pressure on the saw shaft, but that pressure is not transmitted to the universal joint through the bracket 64 which holds the adjustable shaft section 22 in its proper relationship to the saw shaft 6,

because of the uprights 60 through the slots of which said shaft 6 passes.

I claim:

1. An ice harvester comprising a frame having supporting means bearing on the ice, a vertically movable shaft having ice-cutting saws, a motor mounted on the frame, and a longitudinally-extending sectional shaft driven by the motor, and geared to the saw shaft, said sectional shaft including a universal joint connecting two members of the shaft, whereby the section geared to the saw shaft is permitted to swing with said shaft, means for raising and lowering the saw shaft, and means for guiding said saw shaft as it is raised and lowered and preventing end thrust on said universal joint.

2. An ice harvester comprising a frame having supporting means bearing on the ice, a vertically-movable shaft having ice-cutting saws, a motor mounted on the frame, and a longitudinally-extending sectional shaft driven by the motor and geared to the saw shaft, said sectional shaft including a universal joint connecting two members of the shaft, whereby the section geared to the saw shaft is permitted to swing with said shaft, a verfically movable carrier having bearings in which the saw shaft is journaled, means for moving said carrier to raise and depress the saws, and means for guiding said saw shaft as it is raised and lowered and preventing end thrust on said universal joint.

3. An ice harvester comprising a frame having supporting means bearing on the ice, a vertically-movable shaft having ice-cutting saws, a motor mounted on the frame, and a longitudinally-extending sectional shaft driven by the motor, and geared to the saw shaft, said sectional shaft including a universal joint connecting two members of the shaft, whereby the section geared to the saw shaft is permitted to swing with said shaft, a vertically-movable carrier having bearings in which the saw shaft is journaled, a lever fulcrumed on the frame and engaged with said carrier, means for locking the lever in different positions to support the carrier and saws at different heights, and means for guiding said saw shaft as it is raised and lowered and preventing end thrust on said universal joint.

4. An ice harvester comprising a frame having supporting means bearing on the ice, a vertically movable shaft having ice-cutting saws, a motor mounted on the frame, and a longitudinally-extending sectional shaft driven by the motor, and geared to the saw shaft, said sectional shaft including a universal joint connecting two members of the shaft, whereby the section geared to the saw shaft is permitted to swing with said shaft, a carrier movable vertically in guides on the frame bearings for the saw shaft pivoted to said carrier, means for moving the carrier to raise and depress the saws, and means for guiding said saw shaft as it is raised and lowered and preventing end thrust on said universal joint.

5. An ice harvester comprising a frame having runners, slotted uprights above the runners, a driving axle, traction wheels affixed to the axle, a vertically-movable transverse shaft extending through the slots of said uprights and having collars which coact with said uprights to prevent endwise movement of the shaft, saws on said shaft, a motor mounted on the frame, and driving connections betwen the motor, the axle and the saw shaft.

6. An ice harvester comprising a frame having supporting means bearing on the ice, a vertically movable shaft having ice-cutting saws, a motor mounted on the frame, and a longitudinally-extending sectional shaft driven by the motor, and geared to the saw shaft, said sectional shaft including a universal joint connecting two members of the shaft, whereby the section geared to the saw shaft is permitted to swing with said shaft, a clutch whereby the swinging section may be disconnected from the motor, and means for guiding said saw shaft as it is raised and lowered and preventing end thrust on said universal joint.

In testimony whereof I have affixed my signature, in presence of two witnesses.

ALBERT N. HABBERLEY.

Witnesses:

ELMER E. BICKFORD,

ARTHUR H. HARDY.