I. BOONE.

Ice-Plow.

No. 225,791. Patented Mar. 23, 1880.

Fig. 1

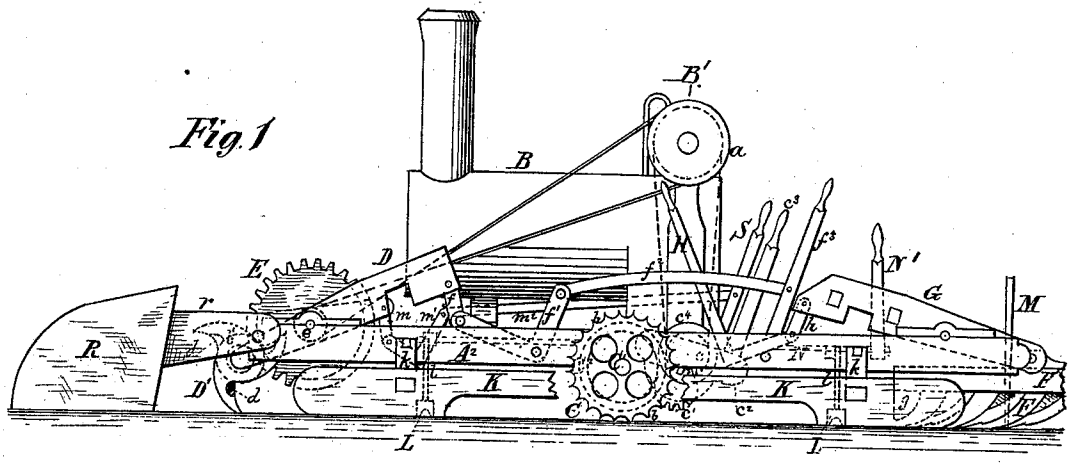


Fig. 2

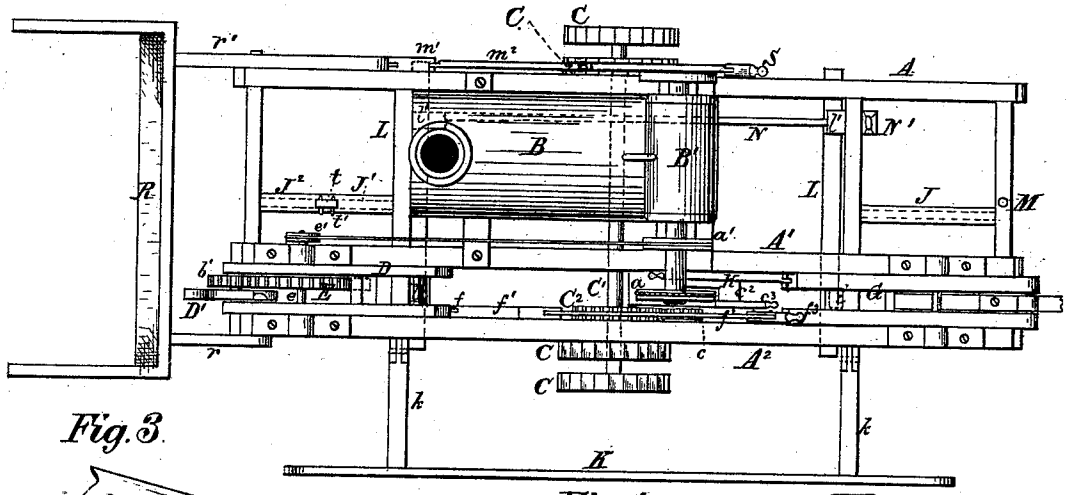


Fig. 3.

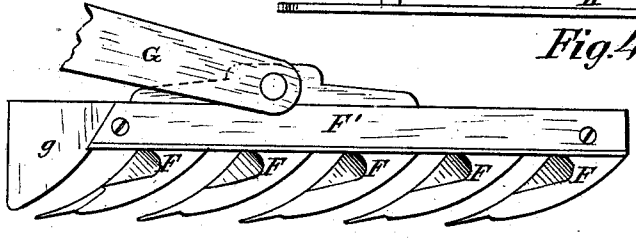


Fig. 4

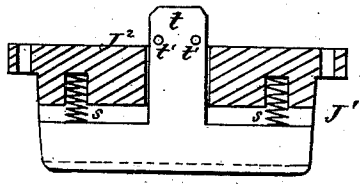
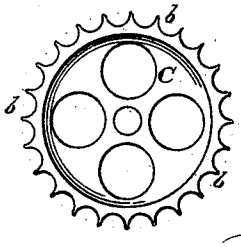


Fig. 5



Witnesses.

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ICE-PLOW.

SPECIFICATION forming part of Letters Patent No. 225,791, dated March 23, 1880.

Application filed February 11, 1880.

To all whom it may concern:

Be it known that I, ISAAC BOONE, of Troy, in the county of Miami and State of Ohio, have invented certain new and useful Improvements in Ice-Plows; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to machines which are propelled by steam-engines acting on traction-wheels and provided with means for cutting channels or kerfs in ice preparatory to housing the blocks.

The nature of my invention consists, mainly, in combining with a suitable frame or carriage which is mounted on propelling or traction wheels driven by a steam-engine a series of rotary plows or cutters, which are driven from the main engine-shaft, and which are mounted in a vertically-adjustable frame which can be raised or lowered at pleasure whether the machine be moving or at rest.

It also consists in a pivoted vertically-adjustable snow clearer or scraper arranged at the front of the transporting frame or carriage, and placed under the control of a person located on the rear end of the carriage, as will be hereinafter explained.

It also consists in means for giving either a forward or a backward movement to the carriage without stopping or reversing the engine, as will be hereinafter explained.

It also consists in means by which the attendant can move the machine laterally, either to the right or left, for the purpose of running any number of parallel channels or kerfs at any desired distance apart, as will be hereinafter explained.

The invention will be further and more particularly pointed out in the claims.

Referring to the annexed drawings, Figure 1 is an elevation of one side of my improved machine with all the parts adjusted ready for operation, a portion of the hinged guide or runner and rear plows being broken away. Fig. 2 is a top view of Fig. 1. Fig. 3 is an enlarged view of the rear cutters. Fig. 4 is an enlarged section of the yielding front guide. Fig. 5 shows one of the self-clearing traction-wheels.

Similar letters of reference indicate corresponding parts.

The transporting frame or carriage is constructed of three longitudinal beams, A A′ A^2, which are suitably connected together by transverse beams, so as to form a rigid frame. On this carriage is suitably mounted a steam-boiler, B, preferably of the horizontal kind, and over the rear of this boiler is mounted a rotary engine, B′, of suitable construction.

The horizontal shaft of the engine B′ bears on one end two belt-wheels, *a a′*, hereinafter referred to.

The carriage is mounted on traction-wheels C, the peripheries of which are formed by scalloping, as shown at *b*, Fig. 5, so that they will take firm hold on the ice and will not clog, owing to the semicircular concavities between the penetrating edges.

Wheels C are fast on an axle, C′, journaled on the under side of the carriage, and on this axle C is keyed a spur-wheel, C^2, adapted to be engaged by either one of two pinions, *c c′*, which have their bearings on a vibrating frame, c^2, located between the frame-beams A′ A^2, and having a hand-lever, c^3, rigidly fixed to it.

The two pinions *c c′* engage with each other at all times, and the shaft of pinion *c* has keyed on it a belt-wheel, c^4, which is driven by a belt that runs on the wheel *a* on the shaft of engine B′.

It will be seen that when the pinion *c′* is in gear with wheel C^2 the carriage will be moved forward, and that when this pinion is disengaged from wheel C^2 and pinion *c* is engaged with it the carriage will be moved backward. This reversing is effected by moving lever c^3. Of course, when both pinions *c c′* are disengaged from wheel C^2 the carriage will stop, although the engine B′ may be running.

At the front of the carriage, and located between the beams A′ A^2, is a vibrating frame, D, bearing on a transverse shaft at its front end rotating cutters or plows D′, of a curved form shown, and a pinion spur-wheel, *b′*. The end and face of each one of the cutters D′ are flat transversely, terminating in a self-

clearing beveled gullet or throat, *d*, which will throw the chips of ice off laterally. The pinion *b'* engages with a large spur-wheel, E, keyed on the pivotal shaft *e* of frame D, on which shaft is also keyed a small belt-wheel, *e'*, that receives rotation from the belt-wheel *a'* on the shaft of engine B' by means of a crossed belt. (Shown in Fig. 1.) By these means the curved cutters D' receive a very rapid rotary motion from the engine. By means of a link, *f*, angular lever *f'*, connecting-rod f^2, and a hand-lever, f^3, the attendant can vibrate the frame D and adjust the cutters D' higher or lower, according to the depth he desires to have the cutters D' run into the ice. When hand-lever f^3 is moved forward as far as it will go the cutters D' will be raised free from the ice.

Following in the channel or kerf made by the cutters D', and located at the rear end of the carriage, is a straight row of curved ice plows or teeth, F, which are suitably fixed into a bar, F', one behind the other, and which are constructed with chisel-edges and self-clearing gullets, substantially like the cutters D' at the front of the machine.

If desired, the body of each cutter or tooth may be made of cast-iron, and the broad joints of steel suitably secured in place.

At the front of the row of cutters or teeth F is an angular piece, *g*, which has a straight front edge, and which operates to clear the channel or kerf of snow or chips, and also to gage the depth of cut of the teeth F. The bar F' is pivoted at a point a little in advance of the middle of its length to the rear end of a frame, G, so that the cutters or teeth F can freely accommodate themselves to their work of deepening the channel or kerf made by the rotary cutters D'. The frame G is pivoted between the beams A' A^2, near their rear ends, and it is connected to an angular hand-lever, H, by means of a link, *h*. By moving hand-lever H the frame G can be vibrated and the cutters or teeth F raised or depressed, according to the depth of cut required or to remove the teeth from the ice.

The teeth F may be secured into a dovetail groove in the bar F' by making their shanks of the form of a dovetail, or other suitable means may be adopted for the purpose. The teeth at the ends of the row or gang will be held in their places by screws or bolts passed through their shanks and the bar F'.

To the bottom side of the carriage I secure two guides, J J', having their lower edges grooved longitudinally. The rear guide, J, is simply a flat plate arranged parallel to beams A A' A^2 and perpendicular to the plane of the bottom of the carriage, to which it is rigidly secured. The front guide, J', is similar to guide J, but arranged inside of box J^2, like the center-board of a boat, and held down by one or more springs, *s*. (Shown in Fig. 4.) This yielding guide J' is prevented from being thrown down out of its box by means of a tongue, *t*, and pins *t' t'*. These guides take hold of the ice and prevent lateral displacement of the machine, or, in other words, they allow the machine to follow lines made on the surface of the ice by a marker, M, fixed into the rear cross-bar of the carriage-frame and arranged in rear of and a little on one side of guide J. The two guides J J' are in the same longitudinal plane and located at or near the middle of the width of the carriage.

K designates a long runner or guide, which is arranged outside of the carriage and connected thereto by two hinged arms, *k k*. This guide K can be thrown up out of the way when not in use, and when it is down on the ice it runs parallel with the carriage in the last cut made by the plow. It is clearly shown in Figs. 1 and 2.

L L are two shifting bars or runners having their lower edges grooved longitudinally. These bars L L are located near the ends of the carriage and beneath the same, and they are arranged at right angles with respect to the length of the carriage. Each bar L is pivoted to the arms *l l'* of equal length. The upper ends of arms *l* are pivoted to the carriage-frame direct, and the upper ends of the arms *l'* are secured rigidly to a longitudinal rock-shaft, N, having a hand-lever, N', keyed on one end near the fire-door of the boiler-furnace.

By moving the hand-lever N' laterally the carriage can be raised on the bars L L, and then moved sidewise on the ice any desired distance.

At the extreme front end of the carriage is a snow-scraper, R, formed of a back piece and two end cheeks. This scraper, which, as its name implies, removes snow from the ice preparatory to cutting it, is pivoted by means of two arms, *r r'*, to the front ends of beams A A^2 of the carriage. The arm *r'* is extended some distance in rear of its pivot, so that it forms a lever, and it is connected to a hand-lever, S, by means of a link, *m*, angular lever *m'*, and rod m^2. These connections allow an attendant to depress the scraper R hard down upon the ice, or to raise it free from the ice by operating lever S.

It is obvious that cutters or plows may be arranged on both sides of the transporting-carriage, and that power may be taken from both ends of the shaft of engine B' to drive the two sets of rotary cutters.

It is also obvious that the straight row of teeth F may be substituted by rotary cutters D', or vice versa.

Having described my invention, I claim—

1. The cutter D' with its propelling devices, consisting of wheels *b'*, E, *e'*, *a'*, and *a*, and a driving-engine, in combination with vibrating frame D, and its operating devices *f*, *f'*, f^2, and f^3, substantially as and for the purpose set forth.

2. The snow-scraper R, pivoted by arms *r r'* to the carriage-frame, in combination with hand-lever S, link *m*, angular lever *m'*, and connecting-rod m^2, substantially as set forth.

3. The ice-cutter carriage mounted on traction-wheels C, the axle of which carries a spur-wheel, C^2, in combination with pinions c c', belt-wheel c^4, and hand-lever c^3 on vibrating frame c^2, and with belt-wheel a on the shaft of engine B′, substantially as and for the purpose specified.

4. Shifting bars L L, their arms l l', rock-shaft N, and hand-lever N′, in combination with the carriage of an ice-cutting machine, substantially in the manner and for the purpose described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ISAAC BOONE.

Witnesses:
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