Aug. 12, 1941. O. SCHWIMMER 2,252,334

ICE-CUTTING APPARATUS

Filed July 27, 1937 2 Sheets-Sheet 1

Fig. 1.

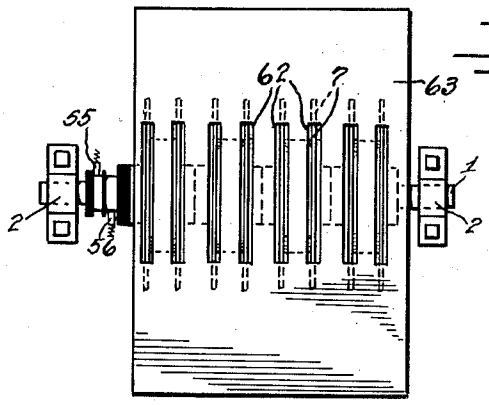


Fig. 2.

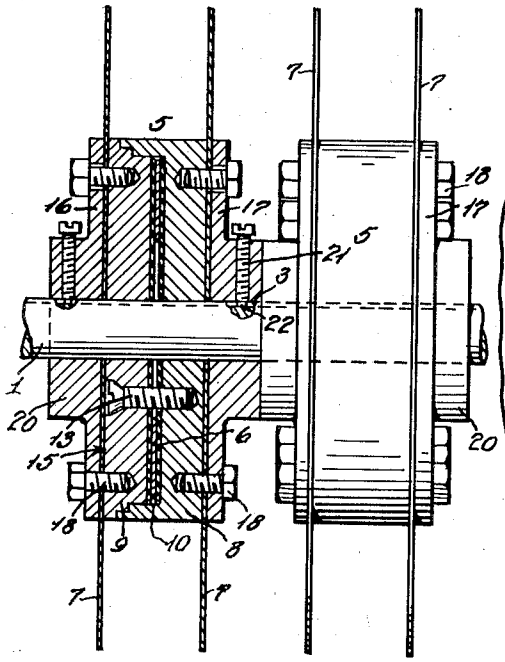
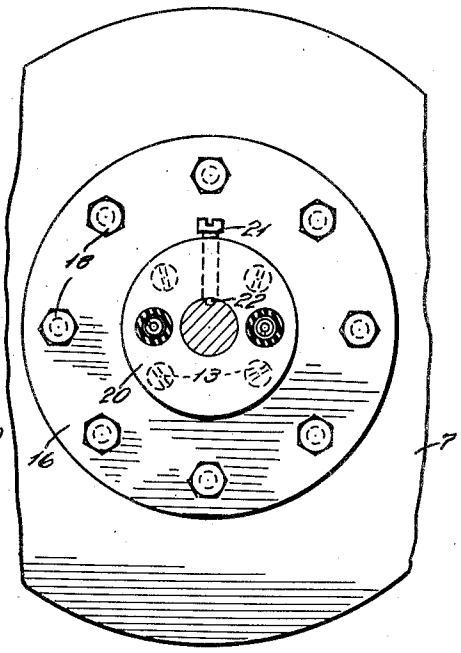


Fig. 3.



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ICE-CUTTING APPARATUS

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Fig. 5.

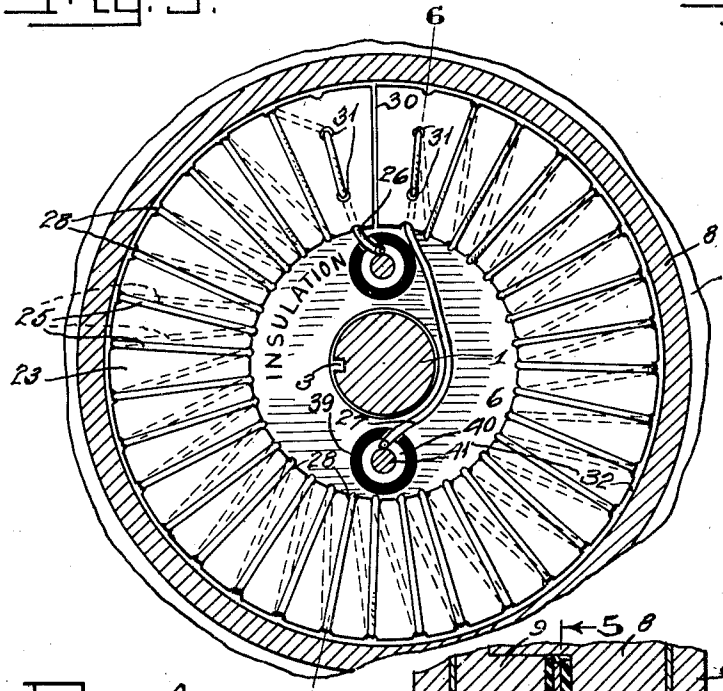


Fig. 6.

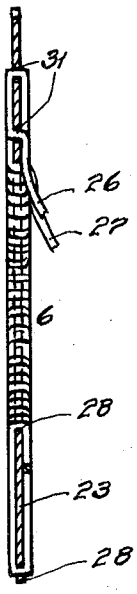
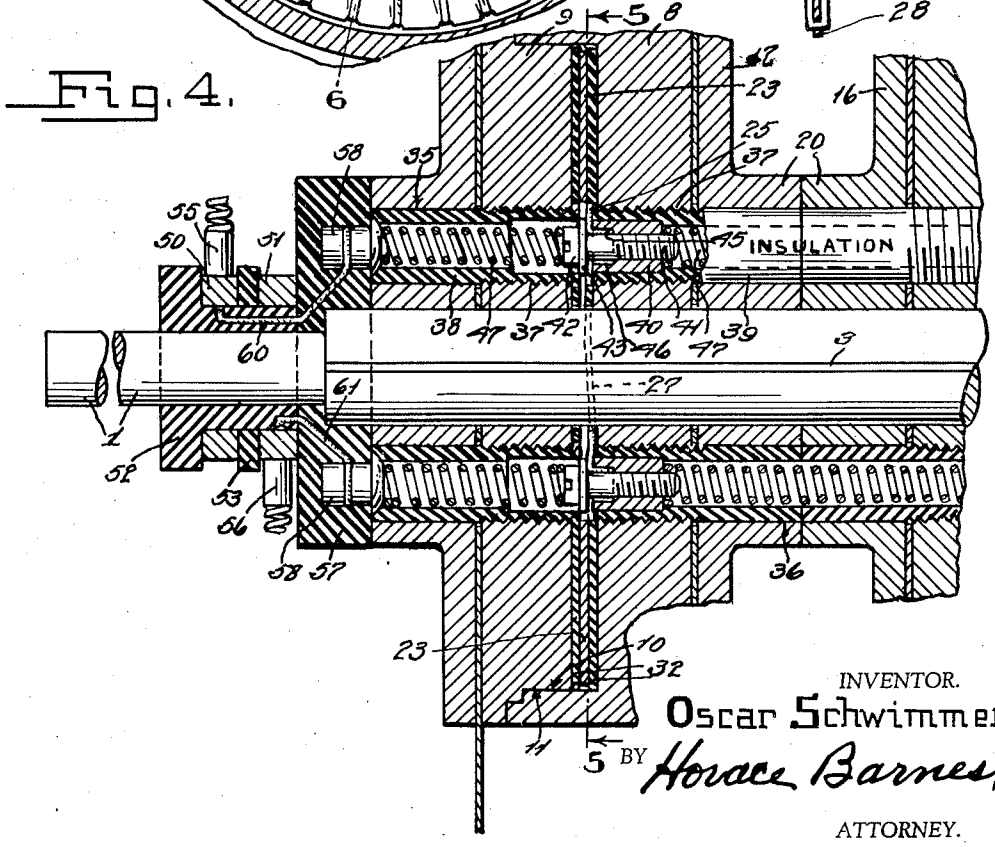


Fig. 4.



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2,252,334

UNITED STATES PATENT OFFICE

2,252,334

ICE-CUTTING APPARATUS

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Application July 27, 1937, Serial No. 155,903

12 Claims. (Cl. 62—112)

This invention relates to improvements in apparatus for cutting and grooving or scoring ice.

The principal object of my invention is to provide apparatus of simple, safe and practicable construction for cutting and scoring ice-blocks through the employment of heated revolving, unserrated circular disks mounted and operated in the manner of saws and causing the incising of the blocks through the application of heat by conduction to their peripheral edges when brought into engagement with the ice and melting the same, and whereby the operator is safeguarded from accidental injury to his hands through inadvertent contact with the disk edges by reason of the circular and smooth perimeter of the disks.

A further object of the invention is the provision of an improved revoluble ice-cutting implement utilizing heat generated by an electrical resistance element contained in the body thereof and applied through one or more cutting-disks in operative engagement at their peripheral edges with an ice-block, and affording an ice-cutting element of increased capacity, efficiency and economy of operation in the cutting of ice as contrasted with circular-saw apparatus now in use, the moderate expenditure of power in the radiant energy consumed at the peripheral edges of the disks in melting and cutting ice being more than compensated by the substantial absence of friction therein whereas the consumption and waste of power entailed in the physical cutting and removal of the ice by saws is relatively large.

A still further object of the invention is to provide an efficient machine for cutting and scoring ice-blocks including a rotative power-driven arbor, a plurality of ice-cutting devices or units mounted for rotation with said arbor, each unit having an electrical resistance element for generating and storing heat therein, electrical communicative devices between said elements and a source of electrical energy, and a plurality of metal blades or disks arranged and adapted to conduct the heat residing and stored in the body of said units through the operation of said heating elements and utilize such heat at their peripheries in the slotting and cutting of ice.

A still further object of my invention resides in the provision of an ice-cutting device which is economical in conserving ice largely by reason of the narrow kerf formed in the ice by its severing operations through the relatively thin construction of the cutting disks, such losses in the present devices amounting on the average to only seventeen percent as compared to losses of forty-three percent by the use of saws when ice-blocks of average size are dissected into the customary cubes.

Other objects and advantages residing in my invention, and objects relating to details of construction and various arrangements of parts thereof, will be readily apparent in the course of the detailed description to follow.

The accompanying drawings illustrate by way of example a representative form of my invention, in which:

Figure 1 is a plan view of apparatus embodying my invention.

Fig. 2 is a view on an enlarged scale showing a pair of units of my improved ice-cutting apparatus, one said unit being shown in elevation and one shown in diametrical section.

Fig. 3 is a partial view in side elevation of one of said units.

Fig. 4 is a view in cross-section on a still further enlarged scale of the terminal units of the invention.

Fig. 5 is a fragmentary view in section taken on line 5—5 of Fig. 4.

Fig. 6 is a detached view in cross-section of the heating-element of my invention, as upon line 6—6 of Fig. 5.

Referring to said views, the reference numeral 1 indicates an arbor rotatably mounted in bearings, such as 2, and connected directly to the armature-shaft of an electric motor, not shown, or driven by any other suitable means. Said arbor is formed with a longitudinal key-slot 3. A plurality of ice-cutting units are mounted on said arbor intermediate the bearings 2, each comprising, generally, of a metal body 5 of considerable cubic and heat-absorbing capacity, including therein a heat-generating electrical-resistance element 6, and heat-conducting circular disks or blades 7 through which the heat is transmitted from the body to the perimeter of the disks for action upon the ice in grooving or cutting the same.

Specifically, said body comprises a pair of circular metal plates 8 and 9 centrally apertured to be mounted upon said arbor. The plate 8 is concentrically chambered at 10 to receive the heating-element 6 and the plate 9 is formed with a corresponding circular interfitting boss 11 arranged to enter the chamber 10 to bear upon the heating element and forming a closely fitting joint 12 between the outer edges of the plates. Said plates are rigidly connected together by screws 13 whose heads are flush with or counter-

sunk within the plane of the outer face 15 of the plate 9.

The disks 7 are clamped upon the face 15 of the body-plate 9 and the corresponding outer face of the plate 8 by cap-plates 16 and 17, respectively, said disks and plates being centrally apertured to receive the arbor 1. Clamping-screws 18 extend through the cap-plates and disks 7 and are screw-threaded into the body-plates 8 and 9, respectively. Each said cap-plate is formed with a central hub 20 through which a set-screw 21 is radially screw-threaded bearing at its inner end upon the arbor and having a dog-point 22 entering the key-slot 3.

The heating-element 6 consists of an annulus 23 of mica, or other suitable dielectric material, having wound spirally or otherwise evenly thereabout a continuous ribbon 25 of electrically resistant metal, such as nickel-chrome alloy, terminating in connecting-leads 26 and 27 disposed in an electrical circuit, as will be presently explained. To facilitate the stability and ease of winding said coils the inner and outer perimetern of said annulus are indented, as at 28, to receive the respective coils while the annulus is severed at 30 to enable the wire to be coiled about the annulus with greater ease. Upon opposite sides of said slit spaced holes 31 are formed in the annulus through which the wire 25 is laced to retain the ends thereof and from whence the lead-ends 26 and 27 extend.

The inner circular opening of the annulus 23 is of dimensions to admit of the extension of the screws 13 therethrough without contact, and upon each side of the annulus a circular sheet 32 of dielectric material, such as mica, is interposed therebetween and the respective walls of the chamber 10.

A plurality of ice-cutting units just described are mounted upon the arbor 1 in abutting relation with respect to their hubs 20, the combined thickness of the adjoining cap-plates 16 and 17 of the proximate units being equal to the distance between the exterior faces of the body-plates 8 and 9 of the individual units whereby all of the cutting-disks are spaced apart at equal or predetermined distances along the arbor.

In the embodiment of my invention illustrated the electrical current is conducted to the several heating elements 6 in parallel course, positive and negative terminals being included in each body 5 for connection with the respective lead-ends 26 and 27, and means are provided for connecting the like terminals of the several units.

Each said unit is formed with a pair of cylindrical bores 35 and 36 extending therethrough within the perimeter of the hubs 20 and disposed upon diametrically opposite sides of its axis and housing respectively the positive and negative electrical connections for the heating elements. As said terminals and connections are similar in each unit a description of one will serve for all.

Thus the bore 35 extends in parallel alignment with the arbor 1 and is screw-threaded at its inner portions, as at 37, within the body-plates 8 and 9 and fitted with tubular bushings 38 and 39 in screw-threaded engagement therewith. Said bushings are formed of insulating, heat-resistant material, such as Bakelite, and are counterbored at their inner ends.

Said counterbore formed at the inner end of the bore 39 is press-fitted with a brass or other metal tubular sleeve 40 which is internally screw-threaded at its outer end to receive a screw 41 whose head 42 extends into the counterbore of the bushing 38. A washer 43 is interposed between the screw-head 42 and the inner end of the sleeve 40 between which the end of the lead-in wire 26 or 27 of the resistance-wire 25 is jammed through pressure of the screw while the end 45 of said wire is frictionally retained in a shallow counterbore 46 formed at the inner end of the sleeve 40.

Through the similar location of the set-screws 21 relatively to the bores 35 and 36 in the several ice-cutting units the respective bores are disposed in alignment when said set-screws are clamped within the key-slots 3. Spiral-springs 47 of electrically conductive materials such as phosphor bronze, are positioned in the aligned tubular bushings 38 and 39 under some compression engaging at their opposite ends the head 42 of the binding-screw and the outer end of the sleeve 40 in adjacent units. Thus with the bores 35 and 36 provided with current conductor devices in the manner described the heating elements may be energized through the flow of current through one series of such conductors, passage through the several resistance elements, and return through the opposite conductor.

Electrical current may be supplied to said conductors through any suitable means such as that illustrated in Fig. 5, wherein collector-rings 50 and 51 are mounted to rotate with the arbor 1 and are insulated therefrom by a thimble 52 of dielectric material and from each other by a similar ring 53. Brushes 55 and 56 are utilized to conduct electric current to and from a source of electrical supply in the usual manner. A circular insulating block 57 is keyed to the arbor and interposed between the adjacent collector ring 51 and the abutting hub 20 of the proximate ice-cutting unit. A pair of terminal studs 58 are mounted in said block positioned, respectively, in opposition to the bores 35 and 36 and to be engaged by the outer ends of the spring-conductors 47. Wire-conductors 60 and 61 are secured to the studs 58 at one end and extending through the block 57 and thimble 52 are connected for the transmission of current to the rings 50 and 51, respectively.

In operation, the apparatus formed and assembled in the manner described may be utilized to score ice-blocks or sever them into cubes in a wide variety of applications. The heat generated by the heating elements of the several units is communicated to the metal bodies 5 thereof and retained therein at a relatively high temperature, serving in effect as a reservoir of heat to provide a constant flow by conduction to the perimeters of the blades 7, as it were under pressure proportioned to the degree of temperature stored in the bodies 5.

Upon the relatively rapid rotation of the units and upon a block of ice being brought into contact with the blades the ice is instantly melted in narrow kerfs but little wider than the blades, the ice-cuting action at the peripheral edges of the blades being as rapid as desired according to the amount of heat supplied and the amount of pressure applied on the advancement of the ice-block thereon, the cutting efficiency of the implements being favorably comparable with the action of toothed saws now ordinarily used.

An application of the invention to the scoring of ice-blocks or the formation of ice-cubes from slabs of ice is shown in Fig. 1, wherein a table 63 is mounted over the arbor 1 and formed with a plurality of spaced slots 62 wherethrough the

blades 7 protrude at their uppermost perimeters. Blocks of ice, not shown, mounted upon said table and moved transversely thereof and against the rotating blades will be instantly scored on their under sides by the melting and rotary action of said blades thereon to the depths of the projection of said blades above the table. Similarly, slabs of ice of thickness equal to or somewhat greater than the projection of said blades will be entirely severed or scored to a depth equal to said projection.

Having described my invention, what I claim is:

1. An ice-cutting instrument, comprising a metal disk having a smooth peripheral edge mounted for rotation, and an electrical resistance element associated with said disk to supply heat thereto for conduction to the peripheral edge of the disk for melting and thereby cutting ice brought into contact with said edge.

2. An ice-cutting implement, consisting of a revoluble metal body, an electrical-resistance heating-element received in said body to communicate heat thereto, means to supply electrical current to said element, and an ice-cutting blade having an unbroken circular periphery connected to said body to receive heat therefrom and conduct the same to its peripheral edge.

3. An ice-cutting implement, consisting of a chambered metal body, means to rotate said body, an electrical-resistance heating-element included in the chamber of said body, means to supply electrical current to said element, and a circular blade having a smooth peripheral edge mounted in said body and adapted to receive heat therefrom and to conduct the same to its peripheral edge for melting and cutting ice.

4. Ice-cutting apparatus, comprising an arbor, means to rotatably actuate said arbor, a metal disk having a smooth peripheral edge connected to said arbor to rotate therewith, and means to heat said disk for melting and cutting ice at its peripheral edge.

5. Ice-cutting apparatus, consisting of an arbor, means for rotatably actuating said arbor, a plurality of disks having unbroken perimeters mounted on said arbor in spaced relation to rotate therewith, and means to heat said disks for melting and cutting ice at their peripheral edges.

6. Ice-cutting apparatus, consisting of an arbor, means to rotatably actuate said arbor, a metal body keyed on said arbor, said body comprising a plurality of circular plates, an electrical-resistance heating element chambered in said body, to heat the same, means to supply electrical current to said element, and an unserrated circular disk secured between plates of said body and extending peripherally therefrom arranged to receive heat from the body and conduct the same to its peripheral edge for melting and cutting ice.

7. Ice-cutting apparatus, consisting of an arbor, a plurality of ice-cutting units mounted for rotation with said arbor, each said unit comprising a body, an electrical element within each said body to heat the same, a circular metal disk having a smooth periphery extending from each said body to receive and conduct heat therefrom to its peripheral edge, and means to supply electrical current to said heating elements.

8. In ice-cutting apparatus, a rotatably mounted ice-cutting unit comprising a pair of metal body-plates having a chamber formed therebetween, an electrical heating element in said chamber, means to supply electrical current to said element, and a metal cutting-disk having a smooth circular perimeter secured to each of said body-plates and extending peripherally therefrom.

9. In ice-cutting apparatus, the combination with a plurality of ice-cutting units, each comprising a heat-receptive body, an ice-melting and cutting blade of circular configuration and having an unserrated outer edge in heat-conductive relation with said body, and an electrical resistance heating element, the said bodies each having a pair of aligned bores therethrough, of electrical terminals in each of said bores with which the ends of said heating elements are connected, respectively, and resilient connectors positioned in the bores of the adjacent bodies and engaging under compression the said terminals for passage of electrical current between said bodies and elements.

10. In ice-cutting apparatus, a plurality of rotatable ice-cutting units, each comprising a metal body and a metal ice-melting and cutting disk in heat-conductive relation thereto, each said disk having a smooth outer perimeter, an electric-resistance heating-element included in each said body, said body having a pair of aligned insulated bores, a metal sleeve in each said bore, a washer abutting each said sleeve, the lead-ends of said element extending between the end of the respective said sleeve and said washer, and a screw threaded in said sleeve and arranged to bear upon said washer to confine the respective lead-in in electrical contact therebetween.

11. In ice-block cutting apparatus, a cutting blade, means to rotate said blade in contact with an ice block to be severed, and means to heat the cutting edge of said blade to sever the ice block by melting a kerf through said block.

12. An ice-cutting apparatus comprising a cutting blade, bearings to rotatably support said blade, means to rotate said blade in said bearings while said bearings remain stationary, and a heating element to heat the blade.

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