Oct. 1, 1940. O. SCHWIMMER 2,216,604

ICE-CUBING APPARATUS

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Fig. 5

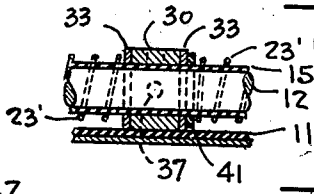


Fig. 1

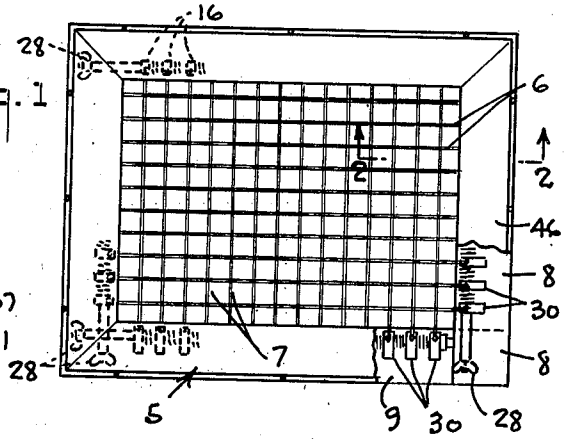


Fig. 4

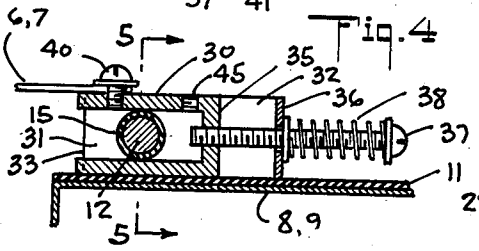


Fig. 2

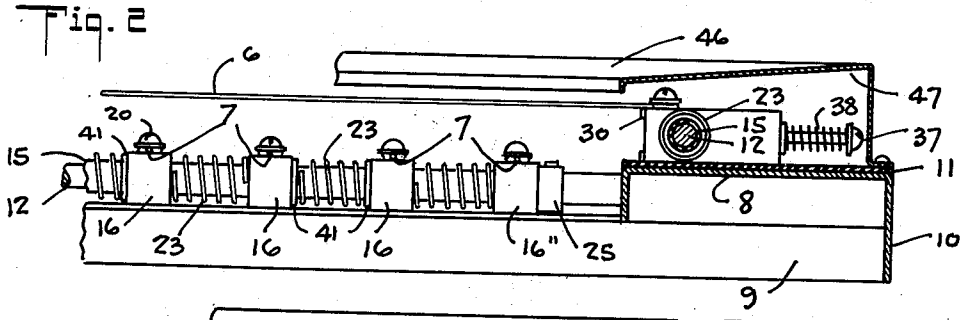
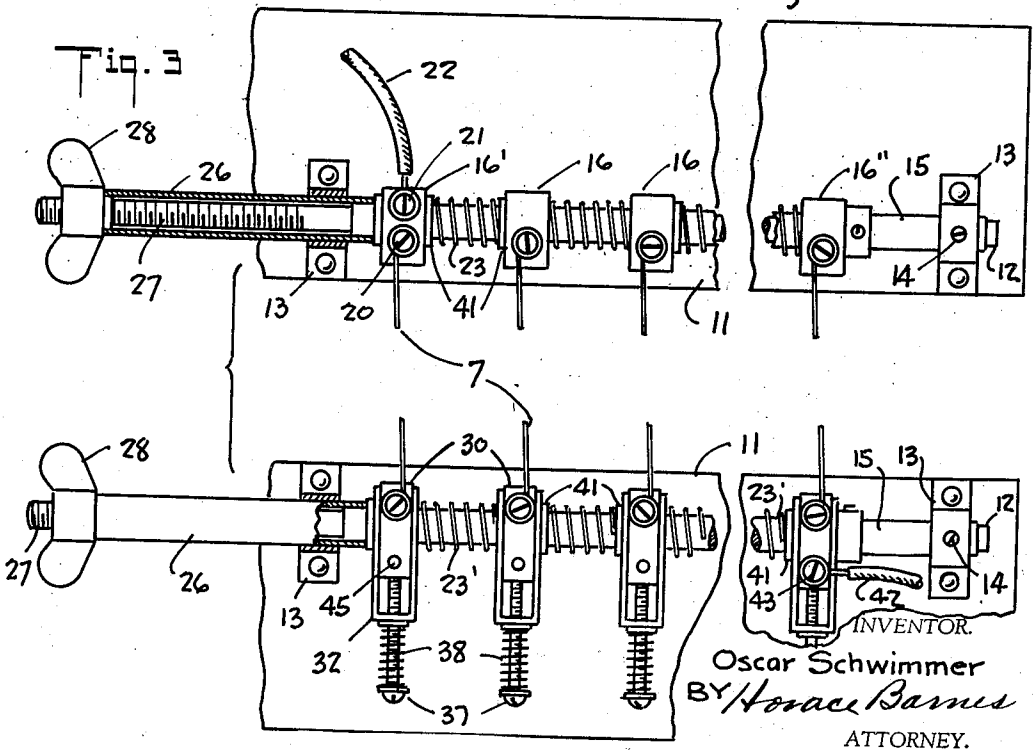


Fig. 3



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Fig. 6

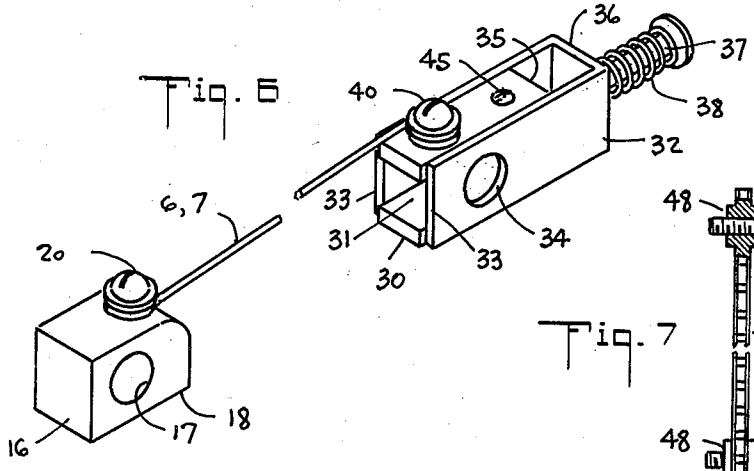


Fig. 7

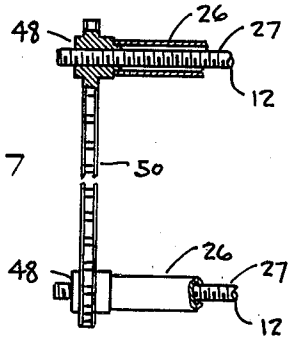


Fig. 8

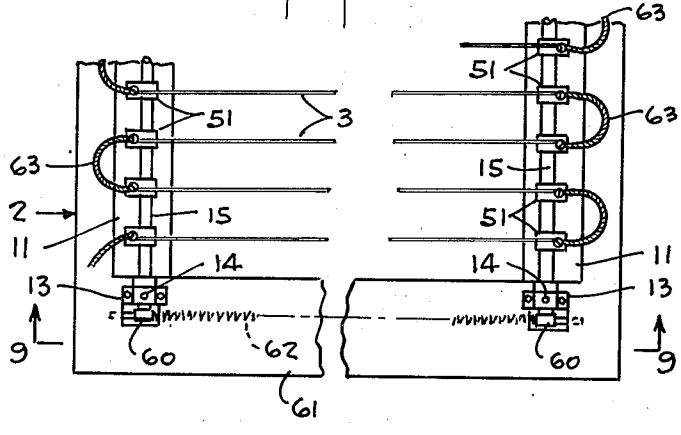


Fig. 10

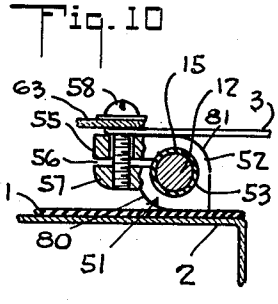


Fig. 9

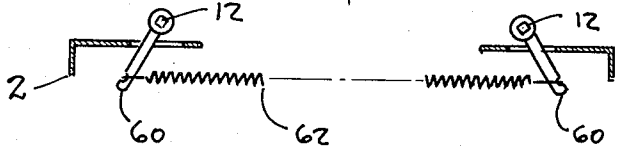
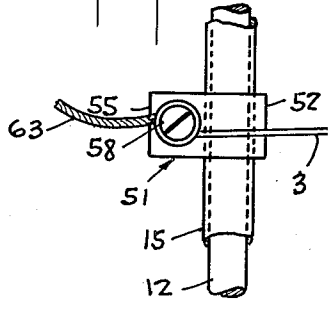


Fig. 11



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Fig. 12

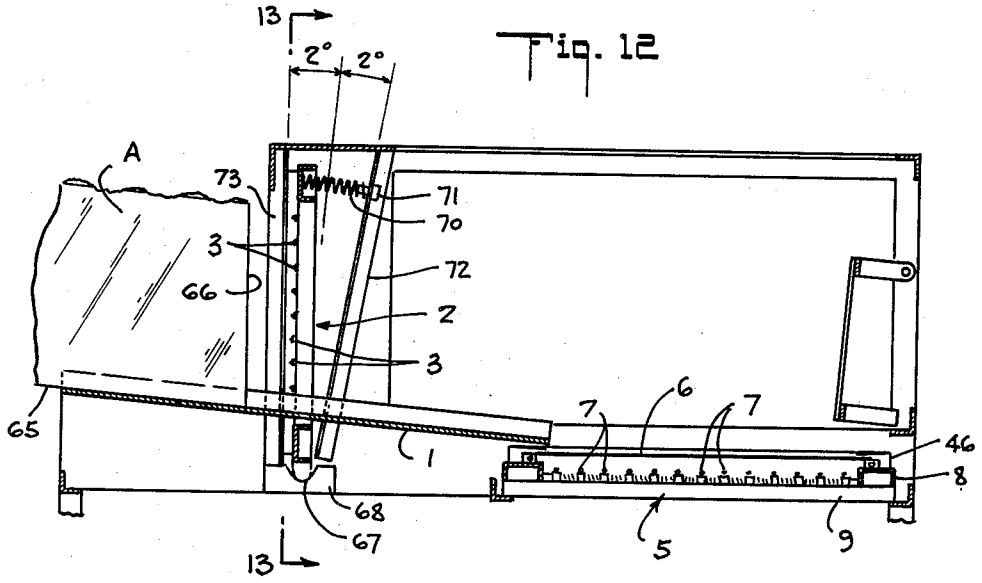
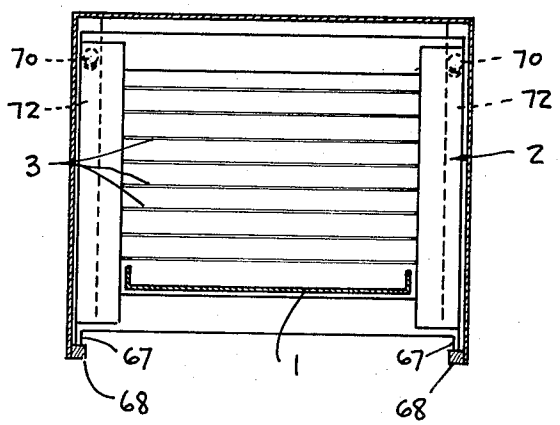


Fig. 13



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2,216,604

UNITED STATES PATENT OFFICE

2,216,604

ICE-CUBING APPARATUS

Oscar Schwimmer, Los Angeles, Calif.

Application November 6, 1937, Serial No. 173,185

25 Claims. (Cl. 219—19)

This invention relates to improvements in apparatus for cutting ice-blocks into smaller cubes by means of electrically heated wires.

The principal object of my invention is the provision of an improved grid-frame structure wherein the ice-cutting wires are individually supported, adjusted and tensioned.

An especial object of my invention is to provide a grid-frame having bars or rods mounted in parallel upon opposite sides thereof upon which terminal blocks securing the opposite ends of each wire are adjustable longitudinally of the bars for spacing the wires, said blocks including tensioning means or devices for each wire individually.

A further object of the invention is to provide means for simultaneously and evenly spacing the wire-terminal blocks along their supporting bars to readily effect changes in size of ice-cubes cut thereby.

A still further object of my invention resides in the provision of means for mounting the foremost or vertical grid-frame in the supporting structure for yieldingly adjustable angular movements with respect to the chute upon which the ice-block moves so that any inclination of the advance wire-contacting surface of the ice-block may be accommodated and that said advance surface will contact evenly against the wires.

Other objects and advantages residing in my invention, and objects relating to variations and details of construction thereof will be fully set forth in the detailed description to follow.

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

Figure 1 is a plan view of a frame of the double-grid type embodying my invention.

Fig. 2 is a fragmentary view on an enlarged scale, partly in elevation and partly in cross-section, taken on line 2—2 of Fig. 1.

Fig. 3 is a partial plan view of the opposite frame-members and wire-supporting mechanism of the type shown in the preceding views, said mechanism being shown partly in section.

Fig. 4 is an enlarged detail view in longitudinal section of a wire-terminal tensioning element as shown in the preceding views.

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

Fig. 6 is a perspective view of the terminal elements upon opposite ends of the ice-cutting wires as illustrated in the foregoing views.

Fig. 7 is a fragmentary view partly in plan and partly in section illustrating an alternative means for adjustably spacing the ice-cutting wires in unison.

Fig. 8 is a partial plan view of an ice-cutting grid-frame showing a modified form of wire-supporting and tensioning elements mounted thereon.

Fig. 9 is a view in cross-section taken on line 9—9 of Fig. 8.

Fig. 10 is a view in side elevation, partly broken away, of a wire-supporting element as shown in Fig. 8.

Fig. 11 is a plan view of Fig. 10.

Fig. 12 is a view in longitudinal section of the upper portion of an ice-cutting structure illustrating improved means of mounting the vertical cutting-grids therein.

Fig. 13 is a view in vertical section taken on line 13—13 of Fig. 12.

The plan of construction and mode of operation of the type of ice-cubing machines to which the present invention pertains is illustrated in Figs. 12 and 13 in which the reference numeral 1 indicates an inclined chute upon which a block A of ice may move by its gravity against a substantially vertical grid 2 having a single set or series of horizontally spaced wires 3 electrically heated to cut their way into the ice-block and thus form the same into slabs as it passes therethrough. When fully severed into slabs the ice moves still by its gravity upon a horizontally disposed grid 5 having two series or sets of electrically heated wires, 6 and 7, spaced apart and directed at right angles to each other, supporting the ice-slabs and adapted to melt thereinto until the ice-slabs are severed in turn into ice-cubes of dimensions determined by the spacing of the wires.

Referring now to Figs. 1 to 6, inclusive, the rectangular frame of the grid 5 is formed of oppositely disposed channel-bars 8 of sheet-metal supporting the wires 6, and similarly formed and disposed channel-bars 9 supporting the cross-wires 7. Said bars are rigidly connected at their extremities with the bars 8 superposed upon the bars 9 and each having an outer flange 10 extending over and closing the ends of the bars 9. A sheet 11 of insulating material, such as Bakelite, is secured to the upper surfaces of the frame bars 8 and 9. Thus upon said upper surfaces of the frame-bars suitable bases for the support of the two series of cross-wires 6 and 7 are respectively provided at proper distances apart for the separation of said two wire circuits.

Considering either series of wires 3, 6 and 7 in detail, they are formed of suitable high-resistance wire to provide the heat or radiant energy re-

quired to melt through the ice coming in contact therewith, and are adjustably connected through terminal-blocks to be hereinafter described mounted in said frames upon relatively rigid metal rods 12 supported in brackets 13 secured rigidly upon said dielectric sheets 11 and the respective bars 8 or 9, or upon opposite frame-members of the grid 2. Said rods as shown in Figs. 2 and 3 are rigidly secured in the brackets 13 by set screws 14 at one end. A tubular sheath 15 of insulating material is provided about said rods extending therealong between the brackets 13.

Individual terminal-blocks are adjustably mounted upon said rods to which the opposite ends of the grid-wires of the respective series 3, 6 or 7 are connected. The blocks 16 mounted upon one rod of each pair are formed of bronze or similar electrical conductive material each having a transverse bore 17 to receive the rod with its enveloping sheath 15 therein and with a flat underside 18 to slide upon the insulating sheet 11. A wire-binding screw 20 is screw-threaded in the inner upper edge of the block about which a looped end of the respective wire is connected and secured. One of said terminal-blocks 16' is provided with an additional binding-screw 21 to which a circuit-wire 22 leading from a source of electrical energy, not shown, is connected.

Coil-springs 23 of substantially equal form and tension are mounted about the rod 12 and interposed between the blocks 16 under compression and for the purpose of separating them at equal distances apart. The outermost block 16'' upon one end may abut upon a set-collar 25 secured to the rod while at the opposite end the block 16' is engaged by a sleeve 26 extending through the proximate bracket 13 and about the extremity of the rod which is formed with screw-threads, as at 27, and provided with a nut 28 bearing upon the sleeve and thence upon the outermost block 16'.

It will thus be seen that the even separation of the blocks 16 may be accomplished by the manipulation of the nut 28 and through the interaction of the springs 23 thereon the blocks 16 may be adjusted evenly along the rod. The oppositely disposed rod 12 of each pair is similarly mounted and equipped for connection with the opposite ends of the grid-wires, excepting that the terminal-blocks 30 thereon are of especial construction for the purpose of exerting a proper degree of tension upon the wires.

The blocks 30 are not directly connected to the rod 12 but are formed with a horizontal recess 31 open at its inner end to receive the rod. A U-shaped yoke 32 extends at its two arms 33 about and in sliding engagement with the side walls of the block and is perforated with aligned apertures 34 to receive the rod therethrough. The rear walls 35 and 36 of the block and yoke, respectively, are spaced apart and an adjusting screw 37 extends through an aperture in the latter and is screw-threaded in the wall 35 of the block. A coil-spring 38 is interposed between the head of said screw and the wall 36 of the yoke whereby a predetermined amount of tension may be applied upon the block and grid-wire attached thereto by threading the screw 37 in or out of the block 30. The respective grid-wire is secured beneath a binding-screw 40 in the block.

It will be understood that the individual grid-wires are each provided with a pair of terminal blocks 16 and 30 at its ends and that one of these is adapted to exert a predetermined amount of tension upon the wire. The current conducted to the block 16' through the circuit-wire 22 is directed to pass over the grid-wire connecting it with the opposing block 30 by washers 41 of dielectric material interposed between the adjacent coil-spring 23 and the block. Conversely the opposite spring 23' between the two outermost blocks 30 is unprovided with such insulation so that the current does pass through such spring into the second block 30 and thence across the connected grid-wire to the second block 16. This block is insulated from the block 16' as described by the washers 41 but not from the third block in line therewith and so the current is permitted to pass to the third grid-wire and so on as the current is caused to flow through the resistance wires 3, 6 or 7 in connected series to the opposite terminal 42 of the circuit connected to a binding-screw 43 on the outermost terminal-block 30.

To provide that certain grid-wires, the last in the respective series, may be removed from the circuit all of the terminal blocks 30 are formed with screw-threaded holes 45 into which the binding-screw 43 may be threaded and the terminal wire 42 connected thereto thus cutting out the outer grid-wires undesired in the circuit.

The construction of the grid-frame shown in Fig. 2 provides two elevations for the support of the rods 12 and a sufficient separation of the grid-wires of the two series of grids arranged at right angles from each other. As the double grid thus formed lies in a horizontal plane a rectangular sheet-metal cover 46 is secured at its outer perimeter to the upper frame-bars 8 and is shaped to extend upwardly and inwardly, as at 47, to cover the terminal-blocks and to slope inwardly to drain therefrom all melted ice or water.

I have described means through which all of the terminal-blocks 16 upon a rod 12 may be adjusted evenly apart simultaneously and in Fig. 7 I have illustrated additional means whereby the blocks upon both rods may be similarly adjusted at one time and whereby the grid-wires are at all times maintained in parallel. Such devices comprise sprocket-wheels 48 having internally screw-threaded hubs engageable with the screw-threads 27 of the rods and taking the place of the nuts 28, and about which an endless sprocket-chain 50 is engaged and through which the terminal-blocks upon the opposite rods of each grid may be actuated in unison to separate or approach each other in a well understood manner.

In Figs. 8 to 11, inclusive, I have shown a somewhat modified form of my invention as applied to a single grid-frame, that is to say, having grid-wires extending in but one direction as exemplified at 2 in Fig. 12, although it will be understood that the same is applicable to a double grid with equal effect in the same manner that the grid-structure previously described may be utilized in a single-grid.

In the present instance the grid-frame is composed of rectangular members in a single plane and the rods 12 are mounted thereon in substantially the same manner excepting that they are mounted in the brackets 13 to allow for at least partial rotation, or they may be alternatively secured, as by the set screws 14. The resistance grid-wires 3 are connected at their opposite ends to terminal-blocks 51 of distinctive construction consisting of a body 52 pierced by a bore 53 to receive the rod 12 and sheath 15. A horizontal offset or ear 55 extends outwardly from the upper portion of said body and is spaced from the

frame-surface upon which the body is in contact. Said ear is horizontally severed, as in 56, into the bore 53 and a circular aperture 57 is extended vertically therethrough, the aperture in the lower ear-portion being screw-threaded while the upper portion is counterbored to receive a binding-screw 58 which is threaded into said lower ear-portion.

Said terminal-blocks, best seen in Figs. 10 and 11, are mounted in equal number on the rods 12, as shown in Fig. 8, with their ear-offsets 55 extending outwardly. Grid-wires 3 are engaged by their terminal loops about the binding-screws 58 at their opposite ends. With the set-screws 14 holding the rods firmly the operator will tighten all of the blocks upon one rod in turn while simultaneously clamping the binding-screws 58 upon the wire by pressing down with a screw-driver in the normal manner upon the screw thus closing the gap in the ear to an extent to clamp the rod and secure the wire at one operation.

With all of the terminal-blocks upon one rod thus secured, those upon the opposite rod may be similarly secured excepting that in the latter case the pressure downward upon the screws 58 is measured in intensity to effect the desired degree of tension upon the several wires as the offset relation of the ears causes them to serve as a lever to effect the partial rotation of the block upon the rod prior to its being secured thereto by the turning of the screw, thus tensioning the wires to the desired extent and securing them in such regulated condition at practically one operation.

With the wires thus evenly tensioned the same may be retained in such condition by the permanent securement of the rods by the set-screws 14, or, as indicated in Figs. 8 and 9, said screws may be loosened and further tension applied thereon through the levers 60 rigidly secured to the ends of the rods 12, which may extend downwardly at diverging angles through the lateral frame-bars 61 and to whose lower ends the ends of coil-springs 62 are respectively connected, thus maintaining a constant common pressure constraining the wire at all times and compensating for any slackness that may occur from their extension or expansion in longitudinal directions when heated.

The lower surfaces of the blocks 51 are formed inwardly of a vertical line extended axially through the rod 12 in planes parallel and normally in contact with the dielectric sheet 11. Such plane surface in contacting relation with the sheet 11 prevents the rotation of the respective block in the direction to relieve the tension upon the wire 3. Upon the outer, opposite side of said axial line the lower surface of the block is rounded concentrically with the rod, as at 80, so that the block may be partially rotated upon or with the rod in the direction to tighten the wire 3. The upper surface of the block diagonally of the surface 80 is similarly rounded concentrically of the rod, as at 81, so that in the rotation of the block to tighten the wire the level of the wire will not be changed and that no projecting portion of the block may weaken the wire.

The several wires 3 of the grid shown in Fig. 8 are connected in series through the use of flexible braided wire conductors 63 allowing of the setting of the terminal blocks at desired intervals.

In Figs. 12 and 13 I have illustrated means for mounting the vertical grid-frame 2 to more efficiently perform its cutting operations, and particularly to accommodate the inclination of the vertical grid 2 to the varying inclinations of the ice surfaces presented thereto by the ice-block A so that all of the heated wires therein will bear evenly thereon while the block is being cut into slabs.

Ice is usually manufactured in three hundred pound cakes having slightly tapered sides to aid in the removal of the cake from the cans in which the water is frozen. Such taper may vary in different ice-making establishments but is usually about two degrees from the major axis of the ice-cake. Thus in dividing the ice into smaller block there are at all times at least two adjoining sides that are smooth and which may be inclined from said axial line. One of these smooth sides, as 65, in the block A is laid upon the chute 1 and another smooth side 66 is presented to the grid-frame 2. The side 66 may thus vary from the plane of the side 65 and the chute 1 as much as four degrees in inclination.

To ensure that the side 66 of the ice-clock encounters the cutting wires of the grid-frame evenly I pivot the frame 2 at its lower end either upon pins, not shown, extending into the lower frame-members from the side of the machine-structure, or, as shown, by forming rounded extensions 67 on the lower end of the grid-frame and supporting such extensions in suitably formed saddle-blocks 68 whereby the frame may pivot at its lower end therein. At the top of the machine I have mounted a pair of coil-springs 70 borne on studs 71 in an angle-member 72 of the machine-frame, said springs bearing at their forward ends upon the upper cross-member of the grid-frame 2 and urging the frame towards or upon a vertical angle-member 73. The angular divergence between the members 72 and 73 is approximately four degrees so that in the engagement of the ice-block A with the grid-frame the latter may move rearwardly at its upper end against the yielding pressure of the springs 70 until all of the cutting wires bear evenly upon the front surface 66 of the ice-block, and hence the cutting operations of all of the wires upon the block will begin and end at substantially the same time.

A desirable effect accomplished by the adjustability of the individual wires in the grid-frames is that the cutting of prismatic ice-sticks of other than of strictly cubic configuration and of any desired dimensions may be readily provided for and with but minor adjustments of the wires. Thus the end wires, one or more, of any series but preferably of the upper series 6 in the double grid, may be moved to the extreme limits of the grid-opening to remove them from contact with the ice-cakes, and the intermediate wires may be re-set to divide the space occupied by the ice-cakes evenly, thereby causing the dimensions of the resultant ice-sticks to be of oblong form of any desired proportions to meet the needs of the user.

Having described my invention, what I claim, is:

1. In ice-cubing apparatus, a frame, a pair of rods secured upon opposite sides of said frame, a plurality of wire-terminals, means mounted slidably on each said rod to carry said wire-terminals individually movable axially on said rods respectively relative to one another, and electrical-resistance wires connected at their opposite ends respectively to said last named means.

2. Ice-cubing apparatus, consisting of a frame, a pair of rods rigidly mounted in parallel relation upon opposite sides of said frame, a plu-

rality of wire-terminal blocks on said rods, means to move said blocks, respectively, in directions parallel to the axis of said rods, electrical-resistance wires connected at their ends to oppositely disposed of said blocks, and means to adjust said blocks upon said rods in evenly spaced relation.

3. Ice-cubing apparatus, consisting of a frame, a pair of rods mounted in parallel relation upon opposite sides of said frame, a plurality of wire-terminal blocks slidably mounted on said rods, electrical-resistance wires connected at their ends to oppositely disposed of said blocks, and springs interposed under variable tension between said blocks to adjust said blocks in evenly spaced relation.

4. Ice-cubing apparatus, consisting of a frame, a pair of rods mounted in parallel relation upon opposite sides of said frame, a plurality of wire-terminal blocks slidably mounted on said rods, electrical-resistance wires connected at their opposite ends to said blocks and extending across said frame, and springs interposed under variable tension between said blocks to adjust said blocks in evenly spaced relation, certain of said springs in alternately opposite relation being in electrical contact with the respective blocks to conduct the electrical current in alternately opposite directions through said wires.

5. In ice-cubing apparatus, a frame, a rod mounted in said frame, a plurality of wire-terminal blocks slidably mounted on said rod, coil-springs mounted on said rod and interposed between said blocks, and block-adjusting means bearing upon an end one of said blocks for shifting the same in opposition to said springs and whereby all of said blocks on said rod may be evenly spaced thereon.

6. In ice-cubing apparatus, a frame, a rod mounted in said frame having screw-threads upon one end, a plurality of wire-terminal blocks slidable on said rod, coil-springs mounted on said rod and interposed under tension between said blocks, and a nut threaded on said rod and arranged to shift the outer one of said blocks and thereby through the reaction of said springs readjust all of said blocks evenly along said rod.

7. In ice-cubing apparatus, a frame, a pair of rods mounted upon opposite sides of said frame having screw-threads upon one end, a plurality of wire-terminal blocks slidably mounted on said rods, electrical-resistance wires connected at their opposite ends to said blocks and extending across said frame, springs interposed under tension between said blocks, nuts threaded on said rods and bearing on the outer ones of said blocks to vary the space evenly between the said blocks upon a rod through the reaction of the springs therebetween, and means to actuate said nuts in unison.

8. Ice-cubing apparatus, consisting of a frame, a pair of rods mounted upon opposite sides of said frame, a plurality of wire-terminal blocks connected to each said rod and individually movable longitudinally of said rods, an electrical-resistance wire connected to each said block at one end and to a corresponding block at its opposite end and extending across said frame in parallel relation, one of each said pair of wire-connected blocks being provided with means to exert and vary the tension upon the respective wire.

9. Ice-cubing apparatus, comprising a frame, a wire-terminal block slidably mounted for longitudinal movements on said frame having an end of an electrical-resistance wire connected thereto, a yoke slidably engaged with said block and connected to said frame, means insulating said yoke from said frame, an adjustment-screw extending through said yoke and threaded into said block, and a spring interposed between said yoke and the head of said screw to apply yielding tension upon the resistance-wire.

10. Ice-cubing apparatus, comprising a frame, a wire-terminal block mounted for longitudinal and lateral movements on said frame and having an end of an electrical-resistance wire connected thereto, a yoke engaged with said block for relative longitudinal movements and connected with said frame for lateral movements thereon, an adjustment-screw extending through said yoke and threaded into said block, and a spring interposed between said yoke and the head of said screw to apply yielding tension upon the resistance-wire.

11. In ice-cubing apparatus, a wire-terminal block comprising a body having a transverse bore adapted to receive a rod therethrough for rotary and lateral movements thereon, an offset extending from said body having an incision extending into said bore, means for attaching a wire to said block, and a screw arranged to close said incision and clamp the body upon said rod at adjusted rotary positions, and means to limit the rotary movements of said block upon the rod to one direction only.

12. In ice-cubing apparatus, a frame, a pair of rods rotatably mounted upon opposite sides of said frame, a plurality of wire-terminal blocks rigidly mounted on said rods at adjusted positions, electrical-resistance wires connected at their opposite ends to the several blocks and extending in parallel relation across the frame, a lever connected upon an end of each said rod, and a spring connected at its opposite ends to said levers tending to rotate said rods in opposite directions to apply tension upon all of said wires simultaneously.

13. Ice cubing apparatus, consisting of a rectangular frame, a pair of rods mounted upon opposite sides of said frame, wire-terminal blocks adjustably mounted along said rods, electrical-resistance wires connected at their opposite ends to the several blocks in parallel relation across the frame, means to adjust the spaces between said blocks upon said rods, and means to individually adjust the tension upon each said wire.

14. In ice-cubing apparatus, a grid-frame adjustably mounted to swing at its upper end in an arc approximately two degrees upon each side of a line drawn perpendicularly to the plane upon which the ice-block moves thereagainst, and spring-pressed means to yieldingly maintain said grid-frame at its foremost position.

15. Ice-cubing apparatus, consisting in combination with a machine-frame having an inclined ice-chute upon which an ice-block is caused to move against an ice-severing grid-frame, said grid-frame, means to admit of arcuate movements of said grid-frame, stops limiting the movements of said grid-frame to an arc extending for a limited distance upon each side of a line perpendicular to the plane of said ice-chute, and a spring tending to yieldingly maintain said grid-frame against the forward of said stops.

16. In ice-cubing apparatus, a frame, a plurality of wire-terminal blocks mounted for adjustable lateral movements upon opposite sides

of said frame to vary the separative distances therebetween, electric-resistance wires connected at opposite ends to said blocks, respectively, and flexible connections between adjacent terminal blocks in alternately opposite relation to provide an electrical circuit through said wires in series.

17. In ice-cubing apparatus, a stationary frame, a pair of wire-terminals, means to mount said terminals movable in two straight line directions relative to the frame at opposite sides of the frame, respectively and an electrical-resistance wire connected at its opposite ends to said terminals.

18. Ice-cubing apparatus, consisting in a frame, a plurality of wire-terminal blocks adjustably mounted upon opposite sides of said frame to vary the extent of their separation, electrical-resistance wires connected at opposite ends to aligned pairs of said blocks, respectively, located at opposite sides of the frame, and electrical conductors connecting the blocks of alternate pairs thereof upon each side of the frame respectively, said last-named pairs of blocks at opposite sides of the frame being staggered relative to each other.

19. In ice-cubing apparatus, a frame, a pair of rods secured upon opposite sides of said frame, a pair of wire-terminal blocks slidable on each said rod, means including a resilient element to maintain said blocks in predetermined locations on said rods, respectively, electrical-resistance wires connected at their opposite ends to said blocks and extending across said frame, and means to adjust the tension of each said wire individually.

20. In ice-cubing apparatus, a frame, a pair of rods secured upon opposite sides of said frame, a plurality of wire-terminal blocks disposed and axially movable on each said rod, means to fix said blocks in a predetermined position on said rods, respectively, electrical-resistance wires extending across said frame and connected at their opposite ends to said blocks, and means to adjust the tension of each said wire individually.

21. In ice-cubing apparatus, the combination of a grid-frame having a plane upper surface, a cylindrical rod mounted on said frame in parallel with its said surface, a wire-terminal block formed with a bore and rotatably mounted on said rod, said block having an offset extending therefrom provided with an incision extending into said bore, the lower surface of said block being formed in a plane parallel with and in contact with the plane upper surface of the grid, and a screw to close said incision and to clamp the block upon said rod.

22. In ice-cubing apparatus, the combination as set forth in claim 21, and wherein the block is formed intermediate the offset extension and said plane lower surface with a rounded portion substantially concentric with the bore.

23. In ice-cubing apparatus, the combination as set forth in claim 21, and wherein the block is formed intermediate the offset extension and said plane lower surface with a rounded portion substantially concentric with said bore, and a further rounded portion is formed on said block diagonally opposite said first named rounded portion and substantially concentric with said bore.

24. Ice cubing apparatus comprising a frame, means to support said frame in a horizontal position, terminals mounted on two opposite sides of said frame, electrical resistance wires connecting terminals at opposite sides of the frame, and a guide hood overhanging said terminals sloping inwardly and downwardly to center an ice block in said frame and position the block on said wires.

25. Ice cubing apparatus comprising a frame, means to support said frame in a horizontal position, terminals mounted on two opposite sides of said frame, electrical resistance wires connecting terminals at opposite sides of the frame, and a hood overhanging said terminals sloping inwardly and downwardly to direct water melted from an ice block moved thereon through the frame.

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