April 4, 1939. H. C. SHELDON ET AL 2,153,438

ICE CUBING MACHINE

Filed Oct. 14, 1937 2 Sheets-Sheet 1

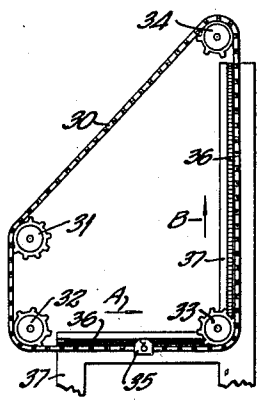

FIG. 7

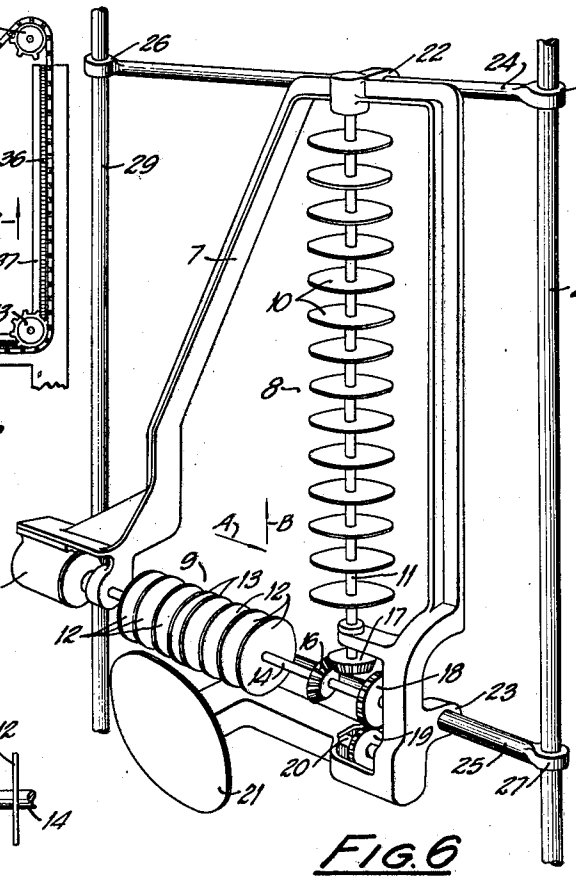

FIG. 6

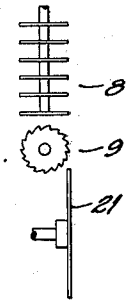

FIG. 8

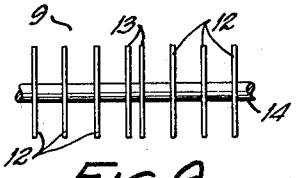

FIG. 9

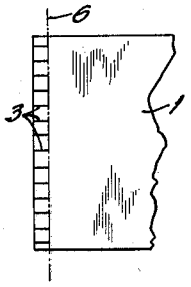

FIG. 5

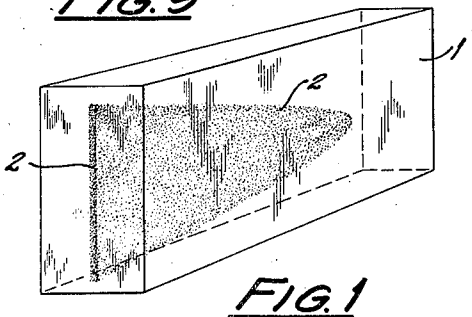

FIG. 1

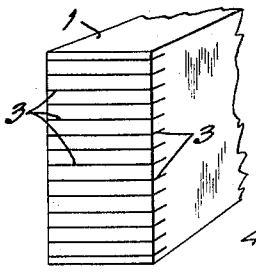

FIG. 3

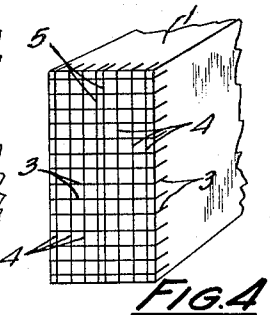

FIG. 4

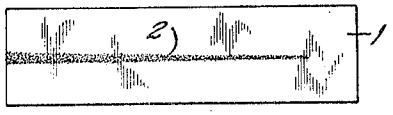

FIG. 2

INVENTORS
Henry C. Sheldon
Willis H. Towne
BY
ATTORNEY

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ICE CUBING MACHINE

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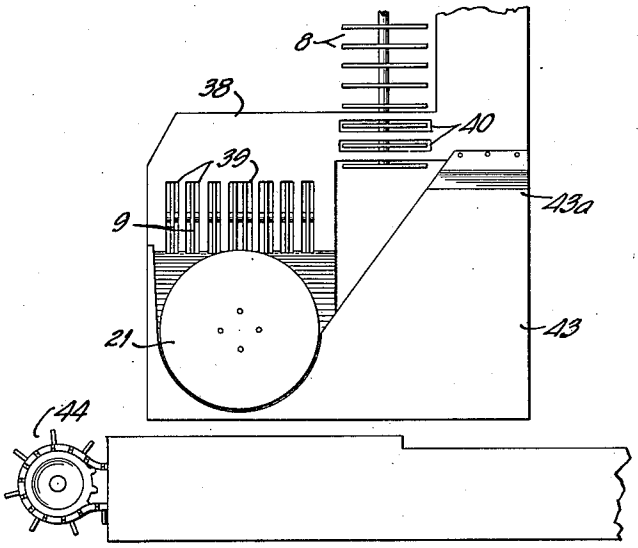

FIG. 10

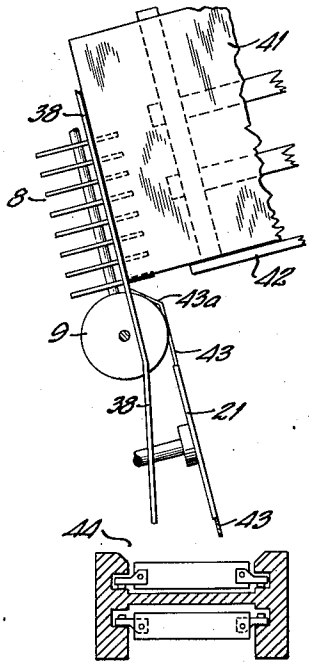

FIG. 11

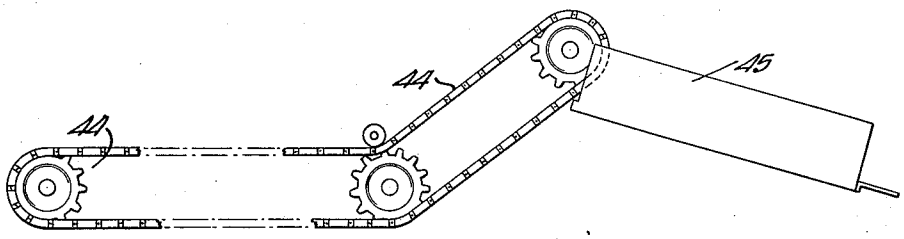

FIG. 12

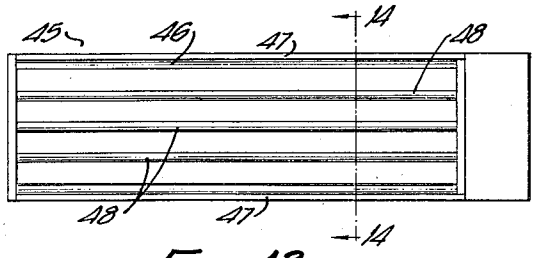

FIG. 13

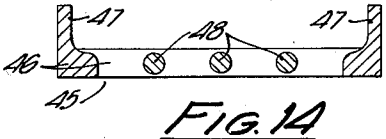

FIG. 14

INVENTORS
Henry C. Sheldon
Willis H. Towne
BY
ATTORNEY

Patented Apr. 4, 1939

2,153,438

UNITED STATES PATENT OFFICE

2,153,438

ICE CUBING MACHINE

Henry C. Sheldon, Oak Park, and Willis H. Towne, Wilmette, Ill., assignors to Gifford-Wood Company, Hudson, N. Y., a corporation of New York

Application October 14, 1937, Serial No. 168,960

2 Claims. (Cl. 143—38)

Our invention particularly relates to the method of severing a multiplicity of comparatively small prisms from a cake of ice and differentiating the clear and core-ice prisms whereby they may be easily segregated and our invention includes a machine for attaining the result obtained in the practice of the foregoing method.

Artificially prepared ice cakes contain a clouded zone extending through the central portion of the cake from or adjacent one base thereof toward the opposite base. For example, it is common practice to utilize artificially manufactured, three-hundred pound ice cakes for cubing purposes. When an ice cake of this character is cubed to form prisms of substantially uniform size as in former practice, those cubes formed from the central zone of the ice cake which are cloudy and objectionable can only be segregated from clear-ice prisms by inspection and removal by hand.

A primary object, therefore, of our invention resides in the method of cubing or producing prisms from a comparatively large cake of ice and differentiating in magnitude those formed from the core-ice zone from those formed from the zones of clear ice adjacent thereto whereby said prisms may be automatically segregated.

For illustration, a machine adapted to carry out the former practice of producing ice cubes of uniform size from comparatively large ice cakes is disclosed in the patent to A. Happel, No. 1,796,151, and issued March 10, 1931.

Our invention has for another object the provision of a machine for forming ice prisms from a cake of ice, the prisms so formed in the central zone of said ice cake which includes the clouded or core-ice being of a magnitude differing from those prisms formed from the clear-ice zones of the cake. More particularly, an object of our invention resides in the provision of a machine comprising a plurality of laterally spaced cutting elements which are adapted to score an ice cake in planes parallel to the zone of core-ice thereof, the majority of said cuting elements being equally spaced but those cutting elements which are adapted to score the ice in or about the core-ice zone having a spacing unequal to that of the majority of said elements.

With the method, hereinafter set forth, and with other objects in view, our invention includes the novel steps and the combinations and arrangements of elements described below and illustrated in the accompanying drawings in which—

Fig. 1 is a perspective view of an ice cake showing the typical clouded or core zone thereof;

Fig. 2 is a plan view of the ice cake of Fig. 1;

Figs. 3, 4 and 5 illustrate the successive steps followed in defining and severing the ice prisms from the cake;

Fig. 6 is a fragmentary, perspective view of a preferred arrangement of the cutting elements of our invention, illustrating a supporting carriage or frame therefor;

Fig. 7 illustrates somewhat diagrammatically a driving and guide mechanism for the carriage of the cutting elements;

Fig. 8 schematically illustrates the preferred relative arrangement of the ice cutting elements;

Fig. 9 is a fragmentary, elevation view of the series of cutting elements adapted and arranged to differentiate the core-ice from clear-ice prisms;

Fig. 10 is a fragmentary elevation view of the cutting elements and associated ice guides or baffles viewed from the ice feeding end of the machine;

Fig. 11 is a fragmentary illustration, partially in section, of the elements of Fig. 10 viewed from the left thereof;

Fig. 12 illustrates an ice cube conveyor and associated screen element;

Fig. 13 is a plan view of the screen element of Fig. 12; and

Fig. 14 is a sectional view of the screen of Fig. 13 taken in about the plane 14—14 thereof.

Artificially prepared ice cakes employed for cubing purposes, as above indicated, contain a clouded, central zone, termed core-ice, which results from the presence of impurities such as lime deposits in the water used in forming the cake. When a cake of ice of this character is reduced to a multiplicity of cubes of practically equal size, those which are clouded and formed from the core-ice, which are objectionable, can only be separated from the desirable, clear cubes by inspection and separation by hand. Our invention principally relates to the following method for reducing a cake of ice to a multiplicity of prisms and forming the core-ice and clear-ice prisms of different magnitudes whereby they may be automatically segregated.

In Figs. 1 and 2, we have illustrated a typical ice cake, indicated generally at 1, wherein the stippled portion represents the core-ice zone thereof. In common three-hundred pound ice cakes, for example, which are approximately 11" x 22" and 45" in length, the core-ice zone is centrally located in the cake and approximately

½" in thickness at one base thereof, extending substantially across the cake in width and tapering both in width and thickness longitudinally or lengthwise of the ice cake.

In former practice, it was customary to produce approximately 1½" ice cubes from all portions of the ice cake. In accordance with our present invention, ice prisms are produced from the central, core zone of the ice cake which, preferably, are of a lesser width, or, of a different magnitude from those prisms formed from the clear-ice zones of the cake. To obtain prisms of different magnitudes, a series of substantially parallel scores, indicated at 3 in Fig. 3, are formed in one face of the ice cake. Thereafter, as illustrated in Fig. 4, a plurality of substantially parallel scores are formed in planes intersecting and at right angles to the planes of the scores 3. The scores, indicated at 4, which lie in the clear-ice zones of the ice cake are preferably equally spaced, the spacings thereof being equivalent to the spacings of the scores 3. The two central scores 5, however, are spaced preferably closer together than scores 4 and inasmuch as they lie in the zone of the core-ice those prisms in part defined thereby will be of a width substantially less than the width of those prisms formed in the clear-ice zones. After initially defining prisms in the foregoing manner, the ice cake is then cut in a plane perpendicular to the planes of the scores 3, 4 and 5, for example, in the plane represented by the dot-dash line 6 in Fig. 5, to effect a complete severance of the ice prisms from the ice cake.

Obviously, the prisms so severed from the ice cake will comprise two groups of different magnitudes or more particularly widths, those being formed from the core-ice zone being smaller in magnitude than those formed from clear-ice zones. These prisms may then be passed over a suitable screen of a mesh to uphold the cubes of equivalent size formed from the clear ice but permitting the core-ice prisms of smaller magnitude to pass therethrough.

For example, in three-hundred pound ice cakes, the two central scores 5 may be spaced approximately ½" apart and the prisms, so defined thereby and by the scores 3, which differ in width from the cubes defined by scores spaced approximately 1½" apart in the clear-ice zone may, therefore, be severed from the cake and automatically segregated to obtain the desired elimination of ½" wide core-ice prisms from 1½" cubes of clear ice.

In connection with the drawings and following description of a device for carrying out the above described method, it will be understood that the general design thereof is similar to the machine disclosed in the patent to Happel, above referred to, and, therefore, a minute description of various details, the arrangement and operation of which are apparent from a knowledge of the Happel machine, is not herein presented.

Generally speaking, an ice cubing machine of the type herein contemplated comprises two series of laterally spaced cutting elements arranged in planes substantially at right angles to each other and a single cutting element disposed in a third plane at right angles to the two first mentioned planes for completely severing the ice cubes from the cake of ice. In the operation of the machine, the two series of cutting elements successively score the ice cake in parallel planes in one direction and in parallel planes in a second direction at right angles to the first. The single cutting element, which preferably consists of a circular saw of a diameter at least equal to the width of the cake of ice, thereafter operates to sever the cubes so initially defined by the parallel ice cutters.

All of the cutting elements are arranged to be carried on a carriage which in turn successively introduces these elements and moves them across a surface of the ice cake.

With the foregoing brief description directed to the general arrangement and operation of the cutting elements in mind, a detailed disclosure of the general arrangement of which is contained in the said Happel patent, the following description of our present invention will be best understood with reference first to Fig. 6, in which is illustrated a frame or carriage 7 upon which are mounted two angularly disposed series of cutting elements, indicated generally at 8 and 9. The series 8 comprises a plurality of substantially equally spaced discs or circular saws 10 which are mounted upon and adapted to be driven by shaft 11. Inasmuch as it is intended to present the ice cake to the cutting elements with the larger axis of the base thereof in a vertical plane, the saws 10 are equally spaced to score the ice cake in planes at right angles to the zone of core-ice therein. On the other hand, the series 9 of cutting elements are adapted to score the ice in planes substantially parallel with the core-ice zone of the cake. The series 9, therefore, comprises a plurality of spaced discs or circular saws 12 and 13 which are mounted upon and adapted to be driven by shaft 14. Those of the saws, such as 12, which are designed to score the clear-ice zones of the cake are substantially equally spaced and preferably to the same degree as the saws 10 of series 8. However, in the preferred form of our invention, the two central saws 13 are more closely spaced than the saws 12 with, of course, the spacing between the saws 13 and the adjacent saws 12 equal to the spacing of the respective saws 12 (see also Fig. 9).

Assuming therefore that the series of saws 8 and 9 are actuated to score the surface of an ice cake in parallel and intersecting planes and with the ice cake disposed relative thereto in the above described manner, it will be evident that the prisms so initially defined thereby and disposed in the core-ice zone of the cake will be unequal in width to those prisms or cubes formed in the clear-ice zones contiguous the core-ice.

An electric motor 15 is preferably mounted on the carriage 7 and the shaft thereof is suitably coupled with shaft 14 to rotate the saws of the series 9. A bevel gear 16 is secured to shaft 14 and adapted to mesh with and drive bevel gear 17 which in turn is secured to shaft 11. Also mounted on shaft 14 is a gear 18 disposed to mesh with a gear 19 mounted on a shaft 20 which through suitable gearing, not illustrated, is designed to rotate a comparatively large disc or saw 21. The cutting element or saw 21 is preferably of a diameter equal to or larger than the width of the cake of ice so that the ice prisms, initially defined therein by scoring, may be completely severed.

In effecting a cubing operation on our machine, the ice cake is presented to the cutting elements but preferably held stationary while the saws are adapted to be moved relative thereto. A disposition of the ice cake is illustrated in Fig. 11 and it will be seen from an inspection thereof that the carriage 7 is disposed in an oblique plane. The oblique disposition of frame 7 permits the ice to be presented to the cutting elements under gravity and held thereby

in position to be cut. It will be understood therefore that the carriage and associated elements have been illustrated in Fig. 6 as lying in a vertical plane merely to assist in a clearer illustration of our present invention.

The series of saws 8 is adapted to be moved horizontally against the ice surface to produce the first series of parallel scores in the ice cake. This is accomplished through driving means hereinafter described which is associated with and connected to the carriage 7 and by providing the carriage with a bearing 22 at the top thereof and bearings 23, only one of which appears in Fig. 6, adjacent the bottom thereof through which shafts 24 and 25, respectively, pass. Shafts 24 and 25 terminate at both ends in bearings 26 and 27, respectively, which serve slidably to mount the carriage on upwardly extending rods 28 and 29 constituting a part of or securely affixed to the frame of the machine. The foregoing arrangement for mounting the carriage permits it to be moved vertically on the rods 28 and 29 and at the same time moved horizontally on the shafts 24 and 25.

One form of means for imparting movement to and directing the course of travel of the carriage is disclosed in Fig. 7. An endless chain 30 passes over sprocket wheels 31, 32, 33 and 34 which are suitably mounted in the frame of the machine. The axes of rotation of sprockets 32 and 33 are preferably in the same horizontal plane while the axes of sprockets 33 and 34 are preferably in the same vertical plane. The chain 30 is provided with a connecting element 35 adapted to be connected to the carriage 7 and also a projection disposed to pass between the side walls of a groove 36 of a guide 37. The groove 36 extends in a substantially horizontal direction between sprocket wheels 32 and 33 and in a vertical direction between sprockets 33 and 34. Driving means may be associated, for exemple, with the shaft of sprocket wheel 34 in order to move the chain continuously in a path as defined by the positions of the respective sprockets.

Obviously, with the frame 7 connected to chain 30 through connector 35 and due to the arrangement of shafts 24 and 25 and rods 28 and 29 the carriage and its associated cutting elements may move transversely and vertically relative to the frame of the machine. As the carriage 7 moves horizontally in the direction indicated by the arrow A (see Fig. 7) the series of saws 8 will score a cake of ice in substantially parallel, horizontal planes and during this cutting operation the projection of connector 35 will engage the walls of the groove 36 and guide the carriage during the scoring operation of the saws 10. It will be understood that the horizontal movement of the carriage is sufficiently great to move the saws 10 entirely out of engagement with the ice cake. Hence, after the completion of the horizontal movement of the carriage, the series 9 of cutting elements is free to move vertically in the direction of arrow B and score the ice cake in substantially vertical planes. Furthermore, the cutting element 21 being disposed slightly below and in a plane tangent to the peripheries of the saws of both series 8 and 9, will pass upwardly and sever the prisms initially defined in the ice cake. The disposition of saw 21 relative to the others is clearly shown in Fig. 8.

Figs. 10 and 11 illustrate the manner in which the depths of the scores are determined and one manner of conveying the severed prisms from the machine. A baffle plate 38 is suitably mounted to move with the carriage 7 and is provided with openings 39 and 40 through which respectively extend the cutters of series 9 and the lower cutters of series 8. The ice cake 41 which in cutting position rests upon a support 42 is adapted to rest with the face thereof against the baffle 38. The cutting element 21 is disposed in front of baffle 38 and in the plane of a second baffle 43. The baffle 43 is cut away to permit the unimpeded severance of the ice cubes from the cake and the portion 43a thereof is preferably inwardly bent and secured to the baffle 38, preferably merging with the plane of the ice-contacting face thereof in a zone substantially adjacent or slightly below the lowermost cutting element of the series 8. The baffle 38 serves to limit the penetration of the cutting elements of series 8 and 9 while scoring the ice cake and the baffle 43 engaging the ice cake following a severance of the ice prisms therefrom prevents movement of the ice cake toward the cutting elements until all of the prisms initially defined in the face thereof are severed.

Upon severance, the ice cubes or prisms fall between the baffles 38 and 43 and preferably upon a conveyor indicated generally at 44. A simple belt conveyor may be employed or a chain and flight type conveyor may be used where it is desired to convey the prisms to a higher elevation. With reference to Fig. 12, it will be understood that the conveyor there shown may be of any desired type and a representative screen, indicate at 45 is shown positioned adjacent the discharge end of the conveyor. This arrangement permits the conveyance of all the ice prisms from the machine to a screening device over which the prisms may pass and those formed from the core-ice zone of the cake may be segregated from the clear-ice cubes. As shown in Figs. 13 and 14 the screen 45 may comprise a frame 46 having upstanding sides 47 and longitudinally extending bars 48 which are spaced sufficiently to uphold the clear-ice cubes but permitting the smaller core-ice prisms to fall therebetween.

From the foregoing, it is evident that the device, above described, is designed and arranged to practice the method herein set forth. Briefly, in its operation, the movement of carriage 7, in a path defined by the disposition of chain 30, successively introduces the series 8 and 9 of cutting elements and the saw 21 to the stationary ice cake to effect a formation and severance of ice prisms from the cake as herein particularly described. In other words, the series 8 of cutters move horizontally with the carriage to form horizontal scores, the movement of carriage 7 being arranged to free the cutters from engagement with the ice after scoring, and thereafter, the vertical movement of the carriage effects a vertical scoring of the ice by the series 9 of cutters and a severance of the prisms so formed by cutter 21. The carriage is then moved horizontally and downwardly by chain 30 to position the cutters in readiness for a second operation.

While we have described our invention in its preferred embodiment, it is to be understood that the words which we have used are words of description rather than of limitation and that changes within the purview of the appended claims may be made without departing from the true scope and spirit of our invention in its broader aspects.

What we claim is:

1. In a device of the character described for forming prisms from a cake of ice, the combination with ice-cutting means disposed in planes substantially at right angles to each other, said means including a plurality of laterally spaced cutting elements for parallelly scoring said ice cake in one direction, the central cutting elements being more closely spaced than the remaining, substantially equally spaced elements whereby prisms may be severed from a central zone of said ice cake of a lesser width than those from zones contiguous thereto, of means for segregating the prisms of different widths.

2. In a device of the character described, a plurality of rotatably mounted cutting elements laterally and substantially equally spaced from two, more closely spaced, elements along the axis of rotation thereof, a plurality of substantially equally spaced cutting elements rotatably mounted substantially at right angles thereto and a third cutting element mounted substantially at right angles to said first and second mentioned cutting elements, said cutting elements being operable to score and sever from said ice cake relatively small prisms in two groups of different widths, and means for separating said groups.

HENRY C. SHELDON.
WILLIS H. TOWNE.