April 7, 1970 E. R. THOMSEN 3,504,434

ICE EDGER AND LINE CUTTER

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Fig. 1

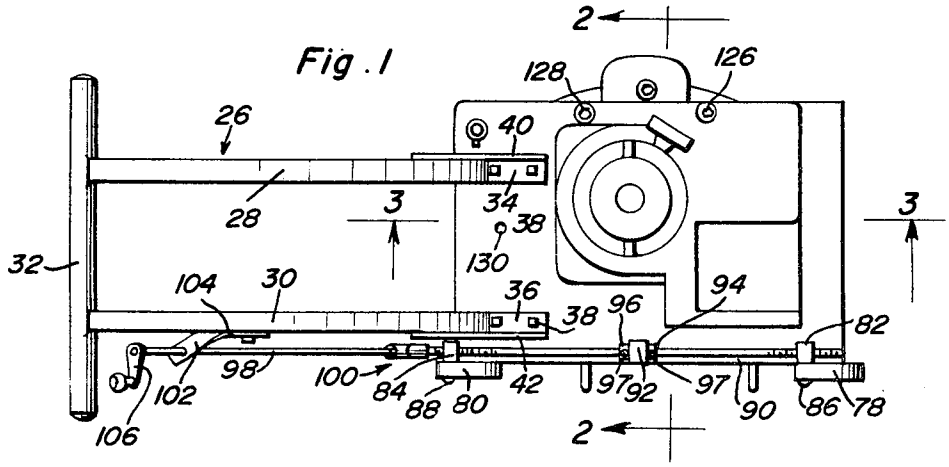


Fig. 5

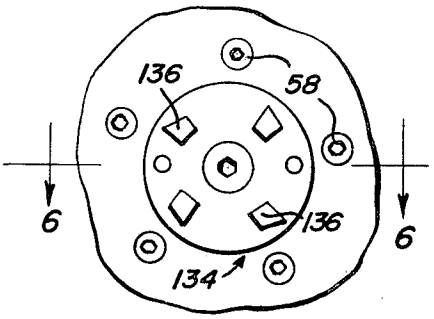
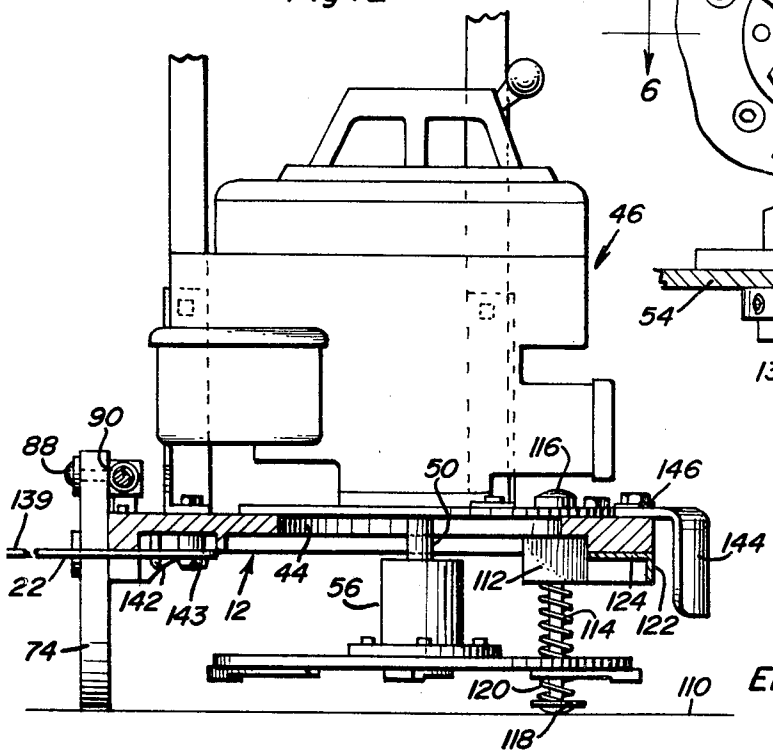


Fig. 2



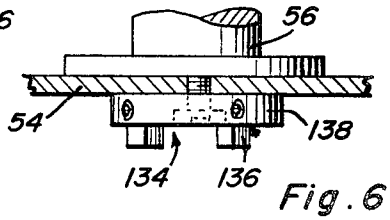


Fig. 6

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Fig. 3

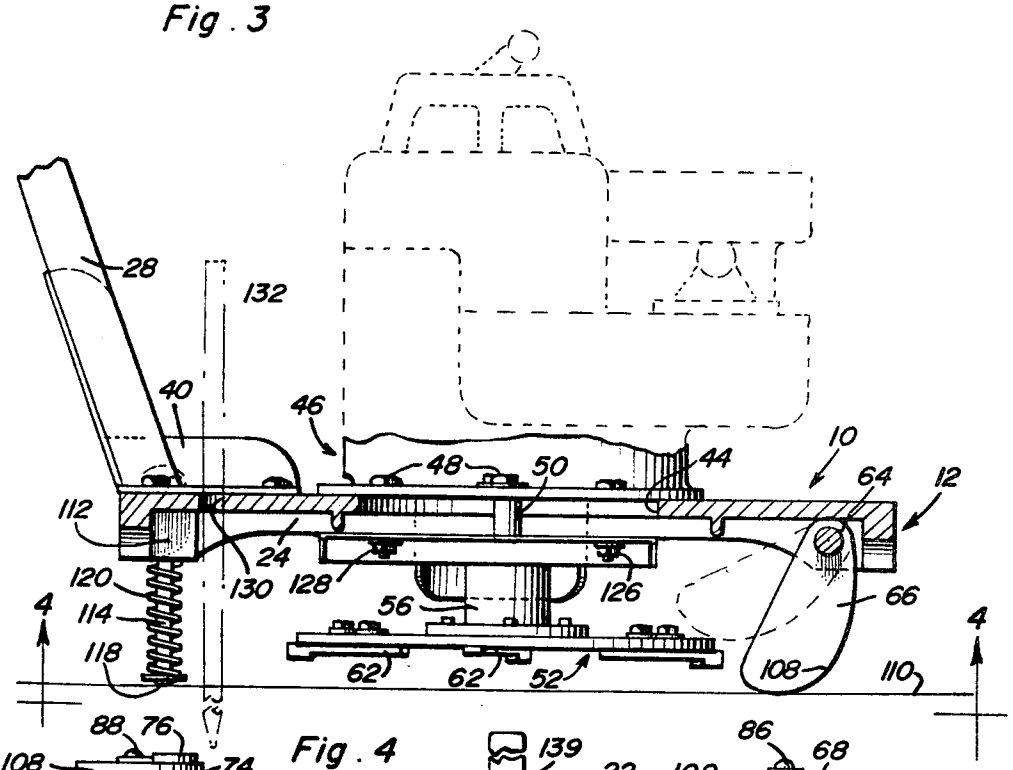
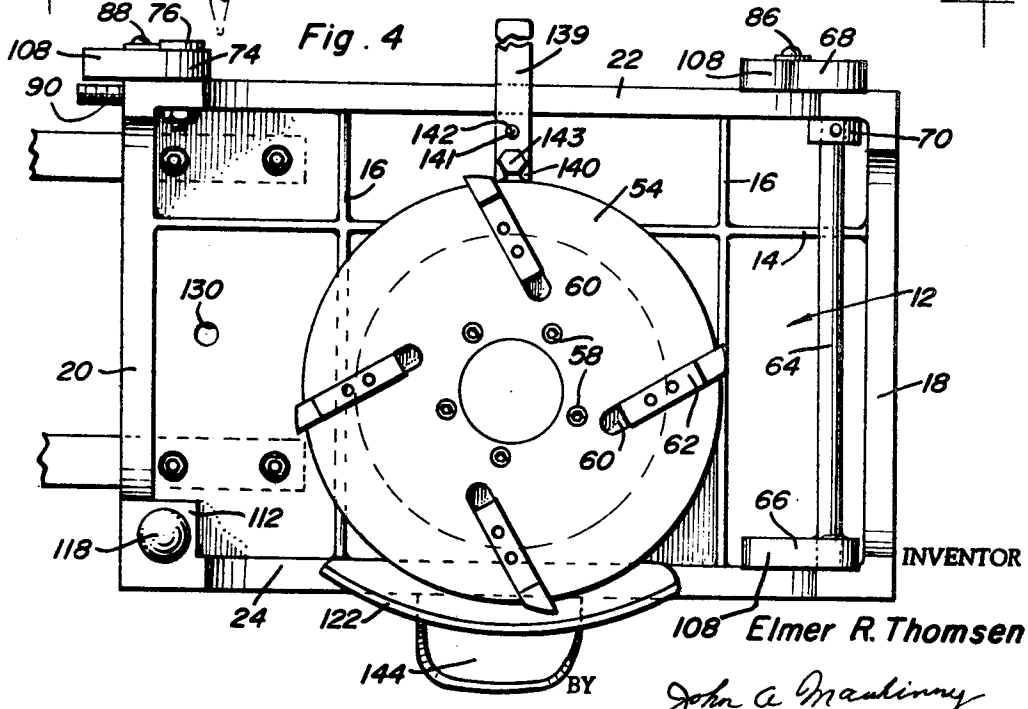


Fig. 4



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ICE EDGER AND LINE CUTTER

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U.S. Cl. 30—170 9 Claims

ABSTRACT OF THE DISCLOSURE

A base adapted to be moved over the surface of a body of ice and including an upstanding driven rotary shaft projecting downwardly below the base and having a rotary cutting assembly mounted on the lower end portion thereof, the base including a plurality of first depending support members spaced about the shaft and supported from the base for vertical adjustment in stationary position relative to the base and an additional support member spaced outwardly from the cutting assembly and from the first support members and supported from the base for free vertical shifting relative thereto with means provided for biasing the additional support member downwardly relative to the base, the thrust effected by the biasing means on the additional support member being generally equal to the portion of the weight of the base which would be supported from the additional support member if it were stationarily mounted and the lower ends of all of the support members were disposed in a single plane.

The ice edger of the instant invention is designed to edge or cut the ice to a proper surface around the perimeter of an ice sheet such as the ice surface of a skating ring or ice hockey rink. In all ice rinks ice builds up next to the boards and this build-up of ice is difficult to remove and prevents the conventional ice surfacing machine, sometimes referred to as an ice making machine, utilized to resurface the entire sheet of ice from performing a clean operation adjacent the perimeter of the rink. The ice edger is constructed so as to be particularly well adapted to remove the build-up of ice in an area within ten inches from the face of the boards at the perimeter of the ice surface and to also level high spots present anywhere on the ice surface.

The ice edger includes four depending support members, three of which being stationarily but vertically adjustably supported from the base of the ice edger and the fourth of which being supported from the base of the edger for free vertical adjustment and biased downwardly with a thrust generally equal to the portion of the weight of the edger which would be supported from the fourth support member if it were stationarily mounted and the lower ends of all of the support members were disposed in a single plane. The three stationarily supported support members are adapted to engage the ice which has not been resurfaced by the ice edger or surfacer and the fourth freely vertically shiftable support member is adapted to engage the ice which has been resurfaced by the edger during movement of the latter along the boards of an ice rink.

The main object of this invention is to provide an ice edger which will be capable of removing the build-up of ice immediately adjacent the boards at the perimeter of an ice rink.

Another object of this invention, in accordance with the immediately preceding object, is to provide an ice edger which may be readily pushed by a person moving along the boards of an ice rink and equipped with either ice skates or shoes on his feet.

A still further object of this invention is to provide an ice edger that may be readily adjusted, during use, to control the depth of the cut to be made by the edger.

Still another object of this invention is to provide an ice edger utilizing a small internal combustion engine or electric motor as the motive force for the cutting assembly of the edger whereby the edger will be operative independent of a remote power source.

A final object of this invention is to provide an ice edger which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a device that will be economically feasible, long lasting and relatively trouble free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a top plan view of the ice edger;

FIGURE 2 is an enlarged fragmentary vertical sectional view taken substantially upon the plane indicated by the section line **2—2** of FIGURE 1;

FIGURE 3 is an enlarged fragmentary vertical sectional view taken substantially upon the plane indicated by the section line **3—3** of FIGURE 1;

FIGURE 4 is a fragmentary bottom plane view of the ice edger;

FIGURE 5 is a bottom plan view of a modified form of rotary cutter to be utilized in conjunction with the edger for the purpose of cutting shallow channels in a surface which may be subsequently filled with colored water and frozen to form colored lines on an ice rink or the like; and

FIGURE 6 is a fragmentary vertical sectional view taken substantially upon the plane indicated by the section line **6—6** of FIGURE 5.

Referring now more specifically to the drawings, the numeral **10** generally designates the ice edger of the instant invention. The edger **10** includes a generally panel-like base referred to in general by the reference numeral **12** which may be constructed of any suitable material such as lightweight cast metal so as to include longitudinal and transverse reinforcing ribs **14** and **16**. The base further includes depending opposite end skirts **18** and **20** as well as depending opposite side skirts **22** and **24**.

An elongated handle assembly generally referred to by the reference numeral **26** is provided and includes a pair of longitudinal members **28** and **30** which are generally parallel and interconnected at one pair of corresponding ends by means of a transversely extending hand grip **32**. The ends of the longitudinal members **28** and **30** remote from the hand grip **32** include angulated end portions **34** and **36** which are removably secured to the upper surface of the rear portion of the base **12** by means of suitable fasteners **38**. The angulated end portions **34** and **36** are braced relative to the adjacent portions of the longitudinal members **28** and **30** by means of suitable gusset plates **40** and **42**.

The center of the base **12** is provided with a large diameter opening **44** over which the flanged base of a conventional air cooled internal combustion engine generally referred to by the reference numeral **46** is removably secured by means of suitable fasteners **48**. The internal combustion engine **46** includes a downwardly projecting drive shaft **50** which projects downwardly through the opening **44** and has a rotary cutting assembly generally referred to by the reference numeral **52** secured thereto.

The rotary cutting assembly **52** includes a generally circular mounting disk **54** secured to an adapter **56** carried by the lower end of the shaft **50**, a plurality of threaded fasteners **58** being utilized to secure the disk **54** to the adapter **56**. The disk **54** includes a plurality of downwardly opening grooves **60** formed in its under surface

in which a plurality of carbide tipped cutting members **62** are removably secured.

A forward transverse shaft **64** is journalled through the forward end portions of the skirts **22** and **24** and has a first support arm or foot **66** secured thereto immediately inwardly of the skirt **24** and a second support arm or foot **68** secured to the end portion of the shaft **64** which projects outwardly of the skirt **22**. A single thrust collar **70** is secured to the shaft **64** immediately inwardly of the skirt **22** and coacts with the support arm or foot **68** to limit axial shifting of the shaft **64**.

A third support arm or foot **74** is pivotally supported from the rear end of the skirt **22** by means of a suitable pivot fastener **76** and the support arms or feet **60** and **76** include upwardly projecting arm portions **78** and **80** which have front and rear internally threaded sleeves **82** and **84**, respectively, pivotally secured thereto by means of pivot fasteners **86** and **88**.

The sleeves **82** and **84** are internally threaded and threadedly receive therethrough the opposite end portions of a screw shaft **90**. The shaft **90** is journalled at its opposite ends from the sleeves **82** and **84** and the center portion thereof is rotatably received through an upstanding slot (not shown) formed in a journal boss **92** carried by the base **12**. A pair of abutment collars **94** and **96** secured in position on the screw shaft **90** on opposite sides of the journal boss **92** by means of set screws **97** and prevent axial shifting of the screw member or shaft **90** relative to the base **12**.

The rear end of the screw shaft **90** is coupled to an adjusting shaft **98** by means of a universal joint assembly generally referred to by the reference numeral **100** and the adjustment shaft **98** is journalled from the handle assembly **26** by means of a simple strap member **102** secured to the longitudinal member **30** by means of a suitable fastener **104** and through which the adjustment shaft **98** is rotatably received. The adjustment shaft **98** generally parallels the longitudinal member **30** and has a crank handle **106** secured to its upper end whereby the screw shaft **90** may be rotated from the upper end of the handle assembly **26** during operation of the edger **10**.

The support arms or feet **66**, **68** and **74** each include curved surface portions **108**, see FIGURE 3, which are adapted to rest upon the upper surface **110** of the ice which is to be cut by means of the edger **10** and the surfaces **108** are curved so that the elevation of the base **12**, and thus the cutting assembly **52**, relative to the surface **110** may be adjusted by swinging the support arms or feet **66**, **68** and **74** about the axes of rotation. The angular displacement of the support arms or feet **66**, **68** and **74** may, of course, be simultaneously adjusted by means of the screw shaft **90**.

In addition to the three support arms or feet **66**, **68** and **74**, the base **12** includes a thickened corner portion **112**, see FIGURE 4, through which an elongated rod-like support arm or foot **114** is slidingly receiver, the upper end of the support arm or foot **114** including a diametrically enlarged head **116** to limit downward movement of the support arm and the lower end of the support arm **114** being provided with an enlarged head portion **118** for engagement with the surface **110**. A compression spring **120** is disposed about the support arm **114** intermediate the lower head portion **118** and the under surface portion of the thickened corner portion **112** and thereby biases the support arm **114** toward its lowermost position illustrated in FIGURE 2 of the drawings. The stiffness of the spring **120** is such that the portion of the weight of the edger **10** supported from the spring **114** is generally equal to the portion of the weight of the edger which would be supported from the enlarged head portion **118** if the support arm **114** was stationarily supported from the base **12** and the lower end faces of all of the support arms **66**, **68**, **74** and **114** were disposed in a single plane.

The edger **10** further includes a generally arcuate abutment plate **122** including an upper horizontal flange portion **124** which is pivotally supported from the base **12** by means of a pivot fastener **126**, see FIGURES 1 and 2. The flange portion **124** includes an arcuate slot (not shown) through which a fastener **128** extending through the base **12** is received and accordingly, the fastener **128** may be loosened so as to allow the arcuate abutment plate **122** to be angularly adjusted so as to project different distances outwardly from the outermost peripheral portion of the path of movement of the rotary cutting assembly **52**. The arcuate abutment plate or member **122** is provided for engagement with the boards of an ice rink or the like which extend about the periphery of the rink and in this manner the positioning of the cutting assembly **52** relative to these boards when the arcuate abutment member **122** is in engagement with the boards may be adjusted.

The rear portion of the base **12** is provided with a vertical bore **130** through which a pivot pin or shaft **132**, see FIGURE 3, may be rotatably received, the pivot pin **132** being adapted to be driven into and frozen in the ice. In this manner, the ice edger **10** may be pivoted about the pivot pin **32** so as to cut a circular groove in the ice.

If it is desired to cut a narrow groove in the ice, the cutting assembly **52** may have a modified form of cutting assembly generally referred to by the reference numeral **134** and illustrated in FIGURES 5 and 6 of the drawings secured thereto in depending fashion. The cutting assembly **134** projects below and has an effective diameter considerably less than the effective diameter of the cutting assembly **52** and includes carbide tipped cutting elements **136** removably secured to a mounting disk **138** which may be secured to the disk **54**.

If it is desired to cut straight grooves in the surface **110**, suitable straight guide means may be provided and the edger **10** may be moved along these guide means to cut the desired grooves which may subsequently be filled with colored water and frozen to form colored guide lines in the ice. Further, if it is desired to cut large diameter circular grooves in the ice, the pivot pin **132** may be embedded and frozen in the ice at the center of the desired circle and a flexible tension member may be connected between the pivot pin **132** and the edger **10**. Further, more accurate cutting of circular grooves may be obtained by using a single rigid radius arm such as arm **139**, see FIGURE 4. The arm **139** may be of any desired length and includes an endwise outwardly opening notch **140** in one end and an aperture **141** adjacent notch **140**. The end of the arm **139** remote from notch **140** is adapted, by any suitable means, for connection with the pivot pin **132** and the base **12** includes a depending locating pin **142** receivable through the aperture **141** and a headed bolt **143** or other fastener receivable in the notch **140** which may be tightened so as to coact with pin **142** to releasably secure the arm **139** in position aligned with the axis of rotation of shaft **50** against angular displacement relative to the base **12**. Also, any suitable guide means such as planks may be laid upon the ice surface and engaged by the arcuate abutment plate **144** secured to the base **12** by a fastener **146** and disposed outwardly of abutment plate **122**, see FIGURES 1 and 2, for guiding the edger **10** when cutting straight grooves in the ice. Further, straight grooves of any width may be cut in the ice by making successive overlapping passes.

The depth of the grooves to be cut and the amount of ice which is to be removed from the perimeter of an ice rink may be readily adjusted by rotating the screw shaft **90** so as to simultaneously angularly adjust the support arms or feet **66**, **88** and **74**.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described,

and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is:

1. An ice edger including a base, an upstanding driven rotary shaft projecting downwardly below said base, a rotary cutting assembly carried by the lower end portion of said shaft and adapted to engage and cut, in resurfacing manner, the ice surface from which said base is supported, said base including dependingly supported ice surface engaging support means spaced about and outwardly from said cutting assembly for limiting the depth of cut made by said cutting assembly and supporting said base from said ice surface, said support means including a plurality of first depending support members spaced about said shaft and supported from said base for adjustable vertical stationary positioning relative to said base and an additional support member spaced outwardly from said cutting assembly and from said first support members and supported from said base for free vertical shifting relative thereto, and means biasing said additional support member downwardly relative to said base, the downward thrust effected by said biasing means on said additional support member being generally equal to the portion of the weight of said edges which would be supported from said additional support member if it were stationarily mounted and the lower ends of all of said support members were disposed in a single plane.

2. The combination of claim 1, wherein said edger includes adjustment means operatively connected to said first depending support members for simultaneously vertically adjusting the latter.

3. The combination of claim 2, wherein said edger includes elongated handle means projecting endwise outwardly from said base and control means on an outer end portion of said handle means operatively connected to said adjusting means for adjustment thereof from said handle means.

4. The combination of claim 3, wherein said first support members equal three in number and the four support members are spaced generally equally circumferentially about said shaft.

5. An ice edger including a base, an upstanding driven rotary shaft projecting downwardly below said base, a rotary cutting assembly carried by the lower end portion of said shaft and adapted to engage and cut, in resurfacing manner, the ice surface from which said base is supported, said base including dependingly supported ice surface engaging support means spaced about and outwardly from said cutting assembly for limiting the depth of cut made by said cutting assembly and supporting said base from said ice surface, said support means including a plurality of first depending support members spaced about said shaft and supported from said base for adjustable vertical stationary positioning relative to said base and an additional support member spaced outwardly from said cutting assembly and from said first support member and supported from said base for free vertical shifting relative thereto, said base including at least one side extending longitudinally of said base and along which two of said support members are spaced, said cutting assembly including outer cutting portions thereof swingable through a circular path of which a straight line extending between two support members comprises a chord whereby said outer cutting portions are adapted to cut closely adjacent the sides of an ice rink.

6. The combination of claim 5, wherein said base includes an abutment member supported therefrom for adjustable positioning along a path extending transversely of said line, disposed generally centrally intermediate said two support members and generally coinciding with a radius of the axis of rotation of said shaft.

7. The combination of claim 6, wherein said support means includes a plurality of first depending support members spaced about said shaft and supported from said base for adjustable vertical stationary positioning relative to said base and an additional support member spaced outwardly from said cutting assembly and from said first support members and supported from said base for free vertical shifting relative thereto, and means biasing said additional support member downwardly relative to said base, the downward thrust effected by said biasing means on said additional support member being generally equal to the portion of the weight of said edges which would be supported from said additional support member if it were stationarily mounted and the lower ends of all of said support members were disposed in a single plane.

8. The combination of claim 7, wherein said edger includes adjustment means operatively connected to said first depending support members for simultaneously vertically adjusting the latter.

9. An ice edger including a base, a powered cutting assembly dependingly supported from said base and adapted to engage and cut, in resurfacing manner, the ice surface from which said base is supported, said base including dependingly supported ice surface engaging support means spaced about and outwardly from said cutting assembly for limiting the depth of cut made by said cutting assembly and supporting said base from said ice surface, a plurality of first depending support members spaced about and outwardly of said cutting assembly and supported from said base for adjustable vertical stationary positioning relative to said base and an additional support member spaced outwardly from said cutting assembly and from said first support members and supported from said base for free vertical shifting relative thereto, and means biasing said additional support member downwardly relative to said base, the downward thrust effected by said biasing means on said additional support member being generally equal to the portion of the weight of said edges which would be supported from said additional support member if it were stationarily mounted and the lower ends of all of said support members were disposed in a single plane.

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