P. F. STEIN.

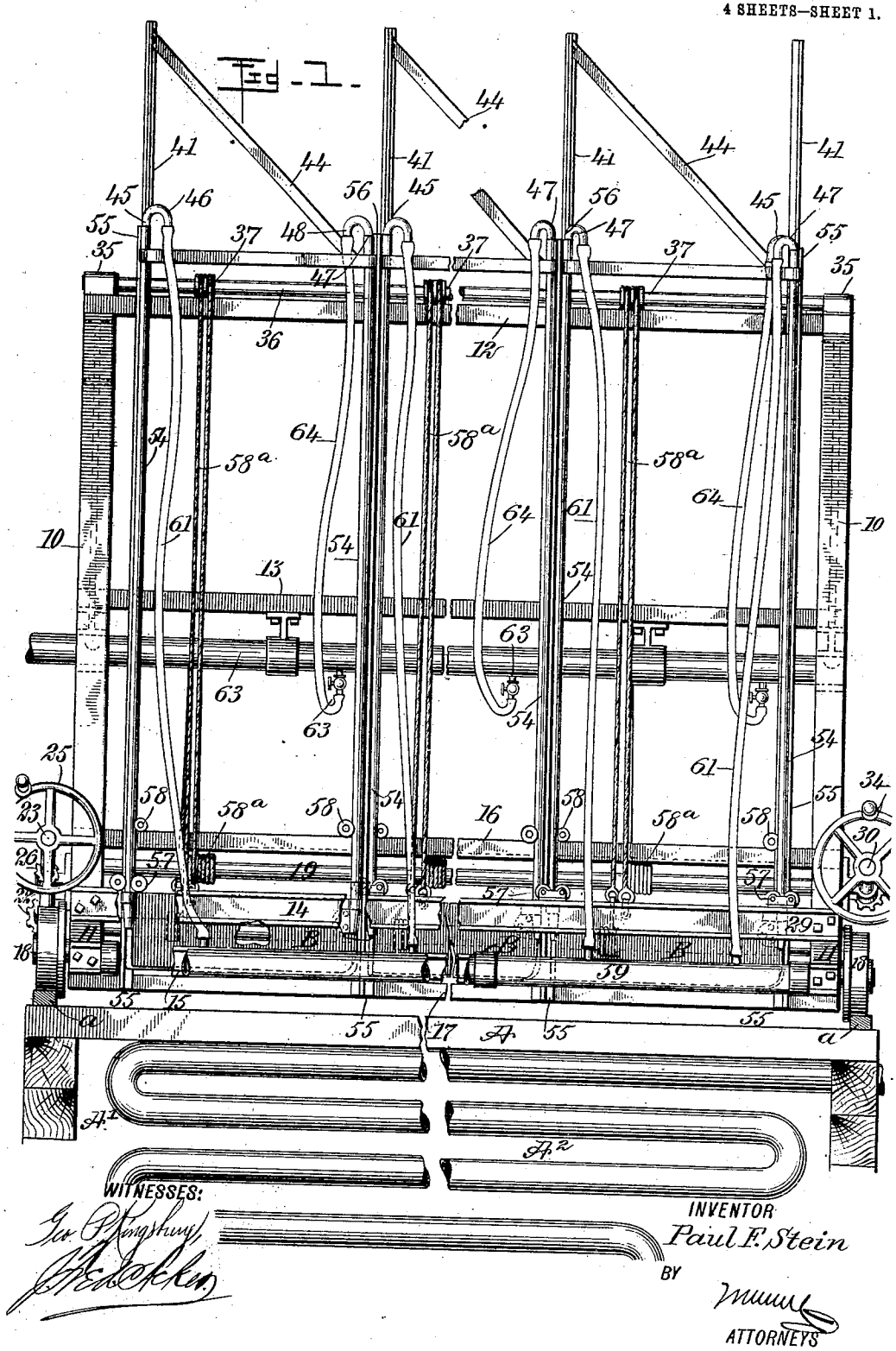
APPARATUS FOR CUTTING PLATE ICE.

APPLICATION FILED AUG. 23, 1905.

904,569.

Patented Nov. 24, 1908.

4 SHEETS—SHEET 1.



THE NORRIS PETERS CO., WASHINGTON, D. C.

P. F. STEIN.

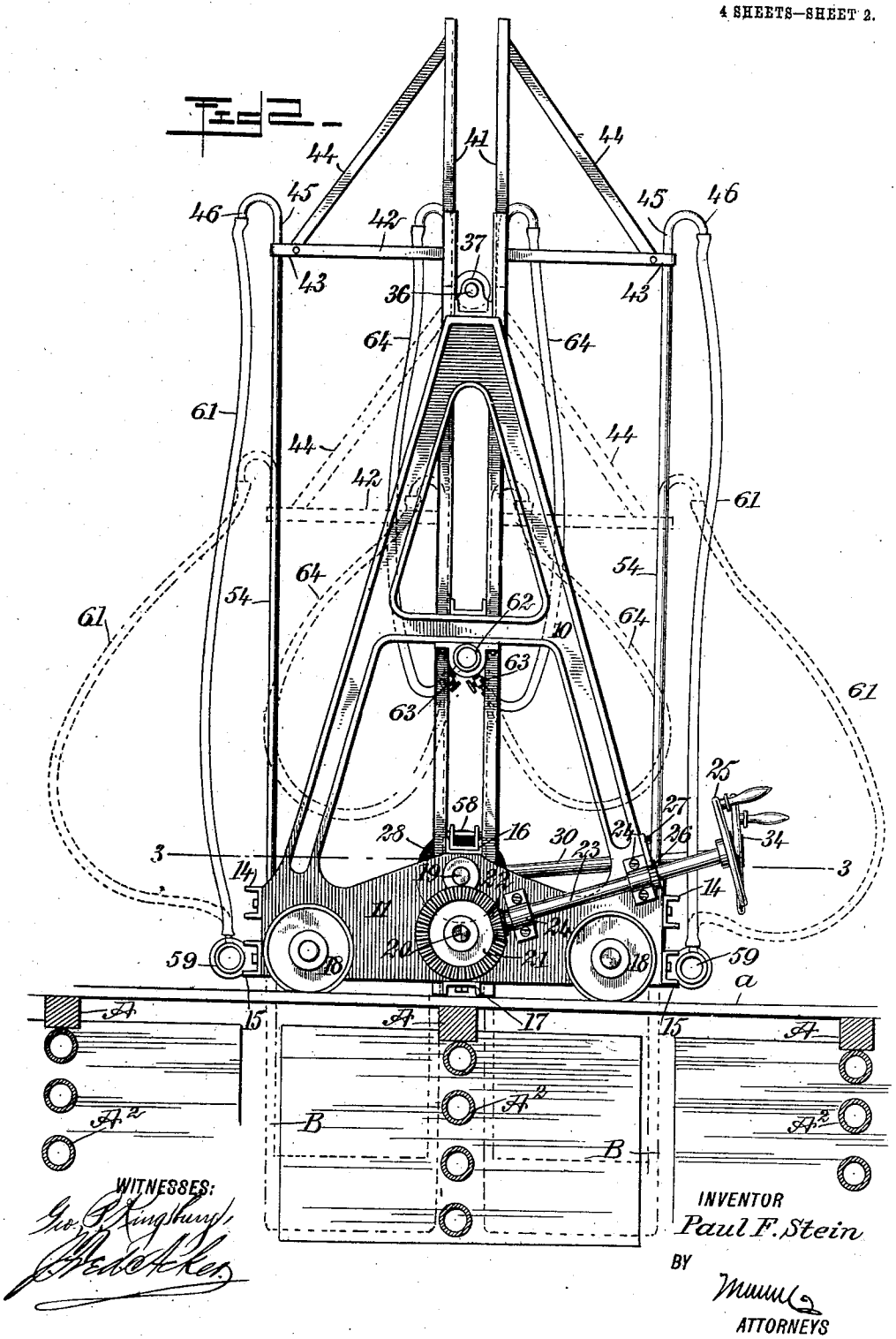
APPARATUS FOR CUTTING PLATE ICE.

APPLICATION FILED AUG. 23, 1905.

904,569. **Patented Nov. 24, 1908.**

4 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

Geo. P. Kingsbury

Wm. Baker

INVENTOR

Paul F. Stein

BY

Munn & Co

ATTORNEYS

THE NORRIS PETERS CO., WASHINGTON, D. C.

P. F. STEIN.

APPARATUS FOR CUTTING PLATE ICE.

APPLICATION FILED AUG. 23, 1905.

904,569.

Patented Nov. 24, 1908.

4 SHEETS—SHEET 3.

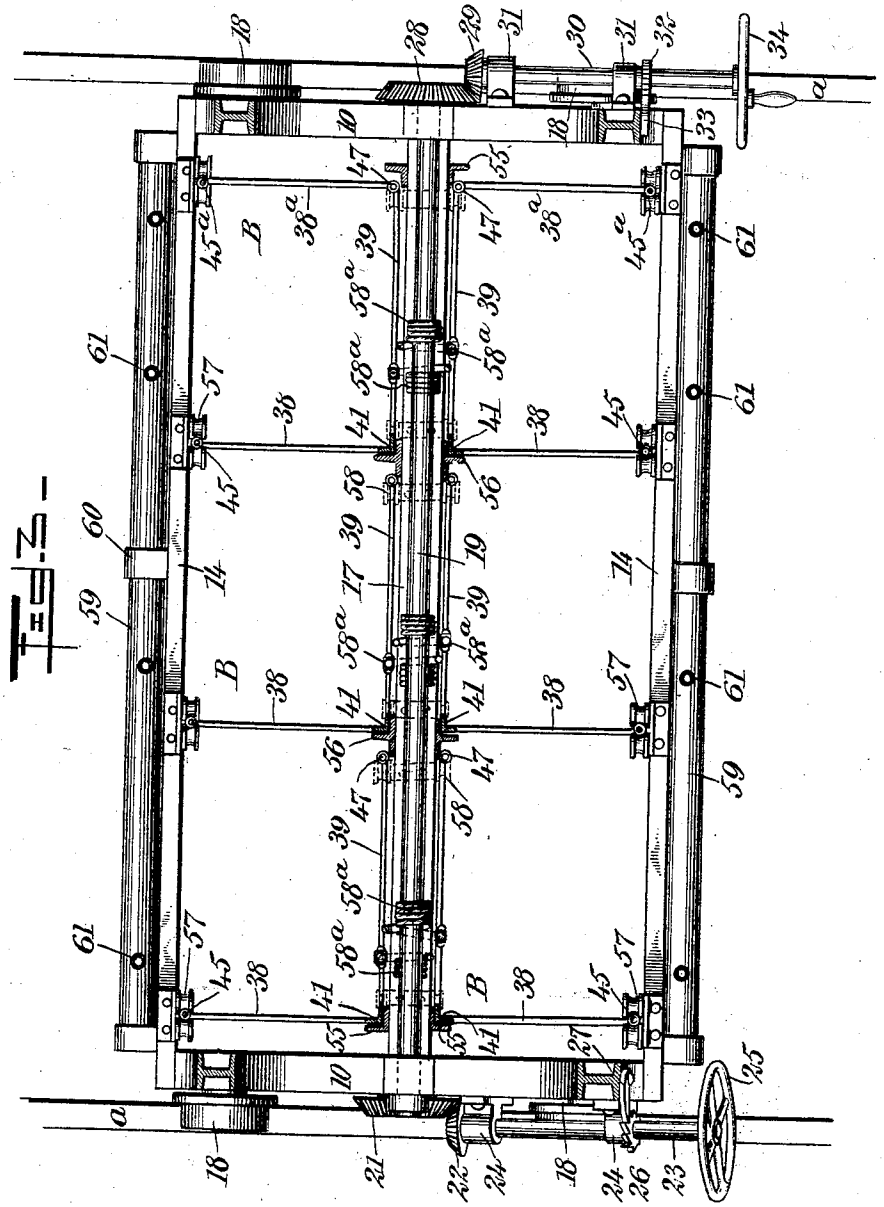


FIG. 3.

WITNESSES:

Geo. P. Kingsbury.

J. E. Hopkins.

INVENTOR

Paul F. Stein

BY

ATTORNEYS

THE NORRIS PETERS CO., WASHINGTON, D. C.

P. F. STEIN.

APPARATUS FOR CUTTING PLATE ICE.

APPLICATION FILED AUG. 23, 1905.

904,569.

Patented Nov. 24, 1908.

4 SHEETS—SHEET 4.

Fig. 4.

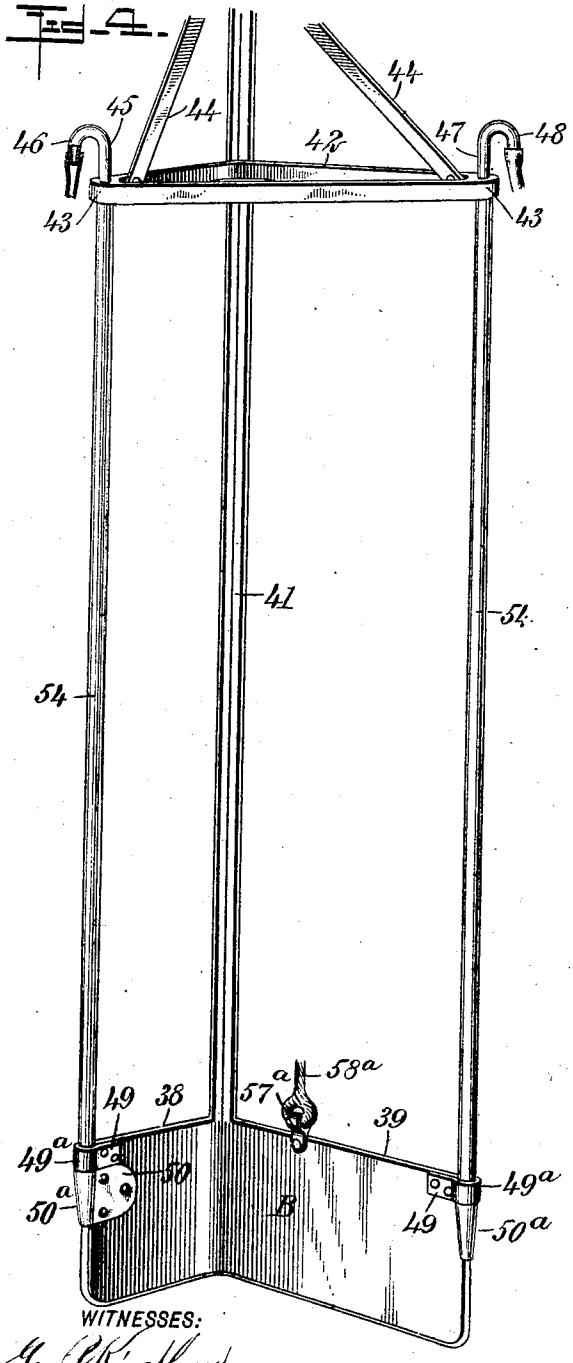


Fig. 5.

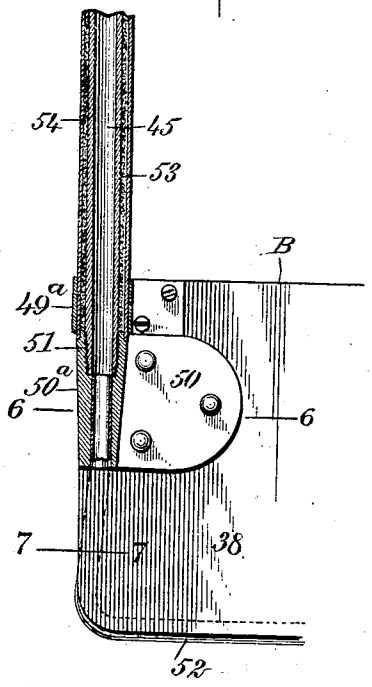
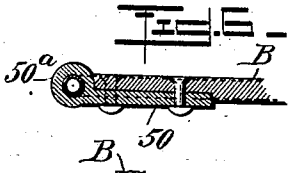


Fig. 6.



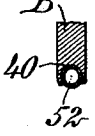


Fig. 7.

WITNESSES:

Geo. C. Kingsbury,

H. E. Acker

INVENTOR

Paul F. Stein

BY

ATTORNEYS

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PAUL FERDINAND STEIN, OF NEW YORK, N. Y., ASSIGNOR OF ONE-THIRD TO ADELGUNDE M. PIEL AND ONE-THIRD TO GEORGE C. SCHNEIDER, OF BROOKLYN, NEW YORK.

APPARATUS FOR CUTTING PLATE-ICE.

No. 904,569. Specification of Letters Patent. Patented Nov. 24, 1908.

Application filed August 23, 1905. Serial No. 275,394.

To all whom it may concern:

Be it known that I, PAUL F. STEIN, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Apparatus for Cutting Plate-Ice, of which the following is a full, clear, and exact description.

My invention relates to an apparatus for cutting ice in plate and block ice plants, in which the ice is formed in a tank on both sides of a vertically disposed coil through which the freezing agent is circulated. In such plants it is necessary after the formation of the ice to dislodge it from the coil and this is usually effected by steam heated cutters which descend along the sides of the coil and melt off or sever the ice in cakes.

It is to such a device that my invention relates and the invention relates more particularly to those cutters in which two sets of cutters are provided and arranged to descend simultaneously on opposite sides of the coil, whereby to free one coil at a single operation.

An important object of my invention is to arrange the cutters, whether they are in one or two gangs so that each gang of cutters will be made up of a number of individually and independently movable units, the advantage of which is that should one of these units meet with any obstruction in the ice, the other units will continue their operation and the action of only one will be delayed rather than the whole body or gang as would be the case were the cutters connected to move non-independently.

My invention involves various other features of importance relating to the construction and organization of the apparatus, all of which will be fully set forth hereinafter, and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the machine, broken away at the center; Fig. 2 is an end view of the same; Fig. 3 is a horizontal section taken practically on the line 3—3 of Fig. 2; Fig. 4 is a detail perspective view of one of the cutters drawn upon an enlarged scale; Fig. 5 is a side elevation of a portion of a cutter blade and a longitudinal section through a portion of a steam supply pipe for the cutter, the view being also drawn upon an enlarged scale; Fig. 6 is a detail longitudinal section taken practically on the line 6—6 of Fig. 5; and Fig. 7 is a detail horizontal section taken substantially on the line 7—7 of Fig. 5.

A represents beams having suitable supports A′, and beneath the said beams A freezing coils A^2 are longitudinally arranged, as is shown in Figs. 1 and 2. On the said beams A tracks *a* are laid, extending transversely of said beams A and of the coils A^2, the tracks being slightly beyond the ends of the coils, as is illustrated best in Fig. 1.

The frame of the machine consists of end uprights 10, which are preferably of an A-pattern, and the legs of the said uprights are connected at the bottom by a transverse base plates 11. The said end uprights 10 are connected at the top by a beam 12, and about centrally between their ends by a second beam 13, and beams 14 and 15 arranged one above the other connect the base portions of the end uprights at the front and at the rear. At the center of said uprights a beam 16 is secured to the upper central portion of the base plates 11, and at the bottom portion of said base plates 11, beneath the beam 16, a second connecting beam 17 is secured.

All of the beams above mentioned are preferably made of channel iron, but I do not confine myself to any given shape of material.

The frame of the machine is provided with wheels 18 suitably mounted on journals extending out from the base plates 11 of the end standards 10, and the said wheels 18 are adapted to travel on the aforesaid tracks *a*, as is shown in Figs. 1 and 2.

A winding shaft 19 is journaled in the base plates 11 at their central portions near the top, and a second winding shaft 20 is similarly journaled below the upper winding shaft 19. The lower winding shaft 20 is provided at one end with a gear 21 outside of the adjacent base plate 11 of the frame, and this gear 21 is engaged by a beveled pinion 22, secured on a shaft 23 mounted in suitable bearings 24 carried by the end upright 10 at which the shaft is located, as is shown in Figs. 2 and 3; and at the outer end of the said shaft 23 a hand wheel 25 is secured. At a convenient point in the length

of the shaft 23 a ratchet wheel 26 is fast to the shaft, engaged by a pawl 27. At the opposite end of the upper winding shaft 19 a beveled gear 28 is secured, engaged by a beveled pinion 29 secured to the shaft 30 mounted in bearings 31 carried by the upright 10 adjacent to the shaft; and the said shaft 30 is provided with a ratchet wheel 32 engaged by a pawl 33 pivoted on said standard, while on the opposite end of the shaft 30 a hand wheel 34 is secured.

A drum shaft 36 is located over the upper connecting beam 12, being journaled in suitable bearings 35 carried by the ends of the said connecting beam 12, and the said drum shaft 36 is provided with a series of partition drums 37 corresponding in number to the number of cutters employed, which cutters will be hereinafter specifically described.

The end cutters employed are what I term double cutters and the intermediate cutters are single cutters. Both forms operate in the same manner and both are of practically the same construction. The single form of cutter is illustrated in detail in Fig. 4 and is constructed as follows: The blade B is vertical and is horizontally of L-shape, comprising a short member 38 and a longer member 39; and at the bottom and under edges of said blade a preferably semi-circular groove 40 is produced. A vertical angle iron 41, constituting a guide, extends upward from the point where the members 38 and 39 of the blade join, and near the upper end of the angular guide bar 41 the contracted or corner portion of a triangular skeleton horizontal yoke 42 is secured in any approved manner. The terminal portions 43 of the base member of the yoke 42 are rendered solid. The said yoke 42 is held fixedly in position by brace bars 44 attached to its thickened ends 43 and to the upper end portion of the guide bar 41.

An exhaust pipe 45 is passed down through one thickened end 43 of the yoke 42, which pipe has an outwardly and downwardly curved upper end 46, and a corresponding steam feed pipe 47, having an outwardly and downwardly curved upper end 48 is passed down through the opposing end 43 of the yoke. A bracket 49 is secured to the blade B, adjacent to its upper edge at each end, which brackets have eyes 49^a at their outer ends, and larger brackets 50 are likewise secured to the blade B just below the brackets 49. The lower brackets 50 are shown secured to the opposite sides of the blade, and each is provided at its outer end with a socket member 50^a, conically shaped exteriorly. The bores of the socket members 50^a are enlarged at the top and threaded, as is shown at 51 in Fig. 5; and this portion of one bracket 50 receives the threaded lower end of the steam feed pipe 47, while the corresponding portion of the opposing bracket 50 receives the threaded lower end of the exhaust pipe 45. The socket members 50^a of the brackets 50 and the eyes 49^a of the brackets 49 are practically in vertical alinement with the end grooves 40 of the blade B, as is shown in Fig. 4. The socket members 50^a are given the conical formation shown in order that they may readily pass through the ice.

A cutting tube 52, adapted to contain steam and by its radiant heat to cut its way through the ice, has its end portions entered into the bores of the socket members 50^a of the brackets 50, and the ends of the said cutting tube 52 are carried up to meet the lower ends of the steam feed pipe 47 and the exhaust pipe 45. The cutting tube 52 fits snugly into the groove 40 in the bottom and the side edges of the blade, about one-half of the exterior surface of the said tube extending out from the said groove at the bottom and at the corners, while the terminal portions of the cutting tube are preferably carried inward from the end edges of the blade.

In order that the steam in the pipes 45 and 47 shall not be affected by the ice through which the tubes may pass, the said tubes are provided with a cover 53 of asbestos or other insulating material, and this insulating covering 53 is surrounded by an outer or jacket tube 54; but the cutting pipe 52 is fully exposed, so that all of the heat contained therein may be brought to bear upon the ice through which the blade B is adapted to pass.

Vertical angle bars 55 are secured to each side of the central beams 16 and 17 near each end of the beams within the frame, adapted as slide-ways for the angle guide bars 41 of the end cutters as is shown in Fig. 3; and between the ends of said beams 16 and 17 T-bars 56 are secured at each side of the said beams 16 and 17 at regular distances apart, which T-bars serve as slide-ways for the intermediate cutters and for the inner end or feed sections of the end cutters. The cutters are arranged in series, the series being at each side of the central beams 16 and 17, and the arrangement of the cutters relative to each other is such that adjoining cutters of a series coact to cut a rectangular cake of ice from the freezing coils, and this is accomplished by causing the guide bars 41 of one cutter and the feed pipe 47 of the next cutter to engage with the same T-slide-way, as shown in Fig. 3. The cutters are further guided in their vertical movement by causing their exhaust pipes 45 to pass between friction rollers 57, located at the upper edge of the upper side beam 14 of the frame, and the feed pipes 47 to engage with friction rollers 58 located on the upper central beams 16 of the frame.

While the cutters act independently in

their cutting operation, all of the cutters of a series are simultaneously raised; but the cutters feed themselves automatically downward, namely, through gravity.

The longitudinal member 39 of each blade B is provided with an eye 57ª, as is shown in Fig. 4, to which eye one end of a rope 58ª is attached, which rope is carried over a drum 37 on the overhead shaft 36, and then down to one of the winding shafts 19 or 20 to which the rope is secured.

By reference to Fig. 3 it will be observed that corresponding cutters of the series are in transverse alinement, and as is illustrated the ropes 58ª of the first series of cutters are attached to the upper winding shaft 19 while the ropes of the rear series of cutters are secured to the lower winding shaft 20, the ropes being wound in opposite directions on the two shafts, as is shown in Fig. 3. The two winding shafts are independently operated by the shafts 23 and 30 located at opposite ends of the frame, as has been described. It may be here stated that the pawl and ratchet mechanisms of the operating shafts 23 and 30 are brought into action only when the cutters are to be raised. When the cutters are in action the ropes 58ª are free to unwind from the winding shafts 19 and 20. The ropes 58ª of corresponding cutters of the series pass over the same drum 37, being separated by a partition formed exteriorly on the drum, as is shown in Fig. 1.

Exhaust cylinders 59 are supported by suitable hangers 60 preferably at the outer faces of the lower side beams 15, and flexible tubes 61 connect with the said cylinders 59 and with the exhaust pipes 45 of the cutters.

A steam supply pipe 62 connected with any source of steam supply is suitably supported at about the central portion of the end uprights 10, which supply pipe 62, is provided with a number of valved branches 63, and each of said branches 63 is connected with a feed pipe 47 of a cutter by means of flexible tubes 64, so that the supply and the discharge of the steam is in no manner interfered with while the cutters are being raised or while the cutters are dropping while in action.

All of the cutters are of the same construction with the exception of one pair of end cutters; and in order that these cutters may also cut a rectangular cake of ice from the freezing coils, these cutters are provided with two transverse parallel sections, a section 38 and a second and outer section 38ª; consequently two exhaust tubes are employed, the regular exhaust tube 45 connected with the section 38 of the blade, and an exhaust pipe 45ª, connected with the additional transverse section 38ª of the blade, as shown in Fig. 3. Friction rollers 57 are also provided for the added exhaust pipes 45ª. Each of the exhaust pipes 45 and 45ª are connected by a flexible tube 61 with the exhaust cylinders 59.

In the operation of the machine it is carried over the coil in such manner that the coil will be longitudinally beneath the central beams 16 and 17, as is shown in Fig. 2. The pawls are then disconnected from the ratchet wheels on the operating shafts 23 and 30, and the lower edges of the blades are brought down in engagement with the upper surface of the ice at each side of a freezing coil. The steam is then turned on and passes down through the feed pipes 47 of the cutters, heating the cutting tubes 52; and as said tubes 52 become heated they melt or cut their way down through the ice, the longitudinal members 39 of the blades being quite close to the coils, and in this manner the cutters gradually work themselves down, and cut or melt their way simultaneously at each side of the coil down to the bottom of the block of ice formed on the coil, separating the said block simultaneously into cakes, which after the cutters have been raised can be elevated and disposed of in the customary manner. It has been found best, in practice, to make the groove in the blade sufficiently deep to extend over half the diameter of the tube and to crimp or clamp the said edges upon the tube, but other means of attachment may be employed.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent,—

1. In a machine for cutting plate ice, a wheel-supported frame, angular cutters arranged in gangs, one gang opposite the other, and the cutters of each gang being capable of individual action and vertical movement in the said frame, guides for the said cutters, a tubular penetrating edge for each cutter, a steam feed pipe and a steam exhaust pipe for each cutter, said pipes being connected with opposite ends of the tubular penetrating edge of the cutter, a source of steam supply, receivers both of which are carried by the wheel-supported frame, flexible connections between the receivers and the exhaust pipes of the cutters, flexible connections between the steam feed pipes of the cutters and the said steam supply pipe, and means for raising the cutters and for permitting them to operate downward by gravity.

2. An apparatus for cutting ice comprising a frame and a gang of independently movable cutters vertically guided on the frame in transverse alinement with each other and adapted to descend along one side of the coil to sever the ice therefrom in cakes.

3. An apparatus for cutting ice comprising a frame and a gang of independently movable cutters vertically guided on the frame in transverse alinement with each

other, and adapted to descend at one side of the coil to sever the ice therefrom in cakes, said cutters being juxtaposed to each other and certain of them being L-shaped and the cutter at one end being U-shaped.

4. An apparatus for cutting ice comprising a frame and a gang of independently movable cutters vertically guided on the frame in transverse alinement with each other and adapted to descend on one side of the coil to sever the ice therefrom in cakes, said cutters being juxtaposed to each other and certain of them being L-shaped and the cutter at one end being U-shaped, steam pipes and exhaust pipes respectively extending along the side edges of the L-shaped cutters, a steam supply pipe communicating with the U-shaped cutter at a point intermediate its edges and two exhaust pipes for the U-shaped cutter respectively extending along its vertical edges.

5. An ice cutter having a metal plate, a steam pipe running along the lower edge and one side thereof, a bracket secured to said side of the plate and having a socket member in which said steam pipe is entered, a second steam pipe extending downward to the plate and also entered into said socket member, insulation surrounding the second pipe, a jacket surrounding the insulation and a second bracket secured to said side edge of the plate and having a socket member receiving the lower end of the said jacket.

6. An apparatus for cutting plate or block ice comprising a wheeled frame adapted to travel over the tank and having two transverse gangs of cutters arranged to descend on opposite sides of the coils, a steam supply pipe centrally located on the frame between said gangs, flexible connections between said pipe and the cutters to supply steam thereto, exhaust pipes mounted at each side of the lower portion of the frame, outside of the cutters and respectively adjacent to said gangs of cutters, two winding shafts arranged one above the other centrally in the lower portion of the frame, connections between the said shafts and the respective gangs of cutters and means for manually rotating said shafts, whereby to raise the cutters.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL FERDINAND STEIN.

Witnesses:

ISAAC BERNKOPF,

JACOB H. BERNKOPF.