

while in the apparatus I have shown connections for four local users, such number may be increased or lessened, as may be desired, by adding or taking off the appliances described as belonging to each local circuit and shortening or lengthening or keeping in proper proportion the contact-faces of the rotating disks. Each local user is to have telephone apparatus and battery, as indicated at R^3 ; but by preference a relay, R^4 , is to be inserted in the line of his battery-wires s^3 , and with a calling key or button at r^5 . The relay will operate a bell-ringing apparatus, r^4 , in the usual way.

That the operation of this apparatus may be fully understood, I will assume, first, that a local user—say No. 1—desires to converse with the operator at the main exchange, or to send some message through him. To do this he closes his circuit in the usual way, electrical action then taking place through his circuit, by wire s^3 to post 3, by wire b' , contact-piece e' , its tail-piece e^8 , knob x , arm d^2 of lever D' , armature-lever h , magnet H , plate 10, post 7, to the ground. This results in depressing the rear end of lever h , releases the hooks at h^2 , and thereupon the lever D' turns on its pivot in the post D^2 to the position shown by the dotted lines in Fig. 2, with the following results: First, the pin d^3 on the locking-arm d' , passing down the underlying slot g of the locking-bar G , shifts the latter to the right, so as to lock out all other co-users, substantially in the manner described in Patent No. 223,201, above referred to; second, the knob x ceases to bear on the switch-spring e^8 and moves clear of it, so as to break that line of electrical communication, and also let it spring over till the bent or hook end comes in contact with the switch-post i . From that point a new circuit is thus established for the local user through switch-post i , its foot i' , wire a^2 , plate 8, wire a' , post o , magnet A , wire a , post 1, and wire s , to the central exchange. As a third result, the shifting of the locking-bar breaks the connection of the support G' with the set-screw g' , and breaks the previously-existing main-line circuit. Hence one and only one circuit now exists—viz., from local user No. 1 to the main exchange, through the auxiliary exchange. Conversation may be had or messages sent over this circuit in the usual way, and if the local user desires it, he may be switched into communication at the main exchange with any other telephone user having a wire connection of any kind with such main exchange. After conversation is through, the main operator restores the apparatus to the normal or zero position by rotating the shaft P' until the wrist n on the disk B' engages the unlocking-arm d and shifts the lever D' back to its previous position, whereby the local circuit is restored through the re-engagement of the hooks at h^2 , the locking-bar G is reversed, so as to unlock the connections of other co-users, the main-line circuit through $G' g'$ is restored, and the circuit from the local user to the main

exchange through the post i and switch-spring e^8 is broken.

Assuming, now, as a second operation that the main operator desires to call for any purpose any one of the local users—say, for example, No. 1—to this end he operates his key R^2 by a quick motion, so as to bring his main battery R into circuit. Making and breaking circuit in this way results through the intervention and action of the magnet A in giving one revolution to the escapement-shaft P^2 , (the weight attached to the cord p , of course, being the actuating-power,) so that the shaft P' and the disks thereon (all being of metal) are rotated a distance which I term herein "one step." As a result of this, the wrist n on the first disk, B , Fig. 5, is rotated away from the unlocking-arm d of the lever D , so that the pin d^3 of the locking-lever D drops into the underlying slot g' of the locking-bar G and shifts it to the right, with the result already set forth, both as to locking out local users and, by shifting the support G' away from the screw g' , breaking the previously-existing main circuit. The first half of the step which produced this rotation, or the movement of the escapement P^3 which results from depressing the key R^2 into contact with the contact-post r^5 , and thereby closing the circuit at that point, also brings the projection e' of the disk B' , which is properly arranged with reference to that end, into contact with the corresponding contact-piece e' , whereby a new main-line circuit is made from the central exchange to the plate 8, as before, thence by the wire a^2 , contact-piece e^8 , disk B^8 , shaft P' , disk B' , projection e' , contact-piece e' , wire b' , post 3, and wire s^3 , to the bell-ringing relay of user No. 1. By keeping the key depressed the bell will be caused to ring as long as may be desired. The projection e' is long enough to keep up contact with e' , even after the key R^2 is raised and after the latter part of the rotary movement of the shaft P' is completed. The main exchange and user No. 1 are then in telephonic communication. At the same time, however, the electrical charge which rings the bell of user No. 1 will operate the armature-lever h , so as to unlock or disengage the hooks at h^2 , as already described; but as the lever D' cannot turn far before being caught by the locking-bar G , (already shifted,) I leave room for it to drop a short distance—far enough at least to bring the upper end of the escapement-arm d^2 under an insulator, o , arranged for the purpose in the end of the armature-lever h . The local circuit or ground-connection of No. 1 is thereby broken. This position of the devices named is illustrated in Fig. 5.

To restore the apparatus to a zero or neutral position the main operator, by operating his key R^2 by quick motions, rotates the shaft P' until the wrist n on the disk B' engages the arm d of the disengaged lever D' and tilts it back to position, so as to restore the local circuit, and also by tilting back the lever D to

UNITED STATES PATENT OFFICE.

JOSEPH T. MARTIN, OF NEWARK, NEW JERSEY.

ICE-CUTTER.

SPECIFICATION forming part of Letters Patent No. 237,567, dated February 8, 1881.

Application filed August 24, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH T. MARTIN, of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Ice-Cutters, of which the following is a specification.

My invention relates to ice-cutters arranged in connection with a boat, having in it, also, the propelling machinery; and it consists, first, in constructing the boat with a well in which is hung the ice-cutting mechanism, adapted to be let down into working position or be raised out of the ice by means of an adjusting-screw; second, in hanging upon one shaft the cutters and boat-propellers, with proper driving mechanism derived from one shaft to move them at different rates of speed; third, in runners on the bow and swivel-runners under the boat adjustable to the line of draft.

Figure 1 is a plan, and Fig. 2 is a longitudinal section on a line of x on Fig. 1.

My boat is constructed with a well, A, near the bow, at the top of the rear side of which, on the main driving-shaft B, is hung a frame, C, carrying the ice-cutting machinery, having the front adjusted vertically by means of a screw, D, turning in the swivel or rocking nut E, which adapts itself to the changing positions of the screw in raising or lowering the frame carrying the saws, &c.

On the shaft F are hung rigidly saws G, used for cutting the ice, and the propeller-wheels H, turning on the axle, having teeth on the periphery to catch in the ice. The saws and wheels H are arranged at a different rate of speed, giving the saws four times the speed, more or less, of the wheels. The saws get their motion from the driving-shaft B and the pulley I by means of the connecting-belt K and small pulley I'; but the propellers get their motion from a small pulley, L, on the driving-shaft, connecting by the belt M with the larger pulley N on the intermediate shaft O, and the small pulley P on the shaft O, carrying belts M', to a similar pulley, Q, secured to the side of the wheels H, and between the two sets of appliances any varying rate of speed may be established between the saws and the propellers.

In use the saws are let down, as seen in Fig. 2; but at the end of a field, or where it is desirable to make a change, the screw is turned and the saws raised wholly out of the ice; then

the boat may be readily turned about on the ice and make another cutting alongside of the first. The metal runners R under the bow facilitate the movement, and the swivel-runners S under the sides of the boat, which readily yield to the line of draft, do the same. After the field, or a portion of it, has been cut lengthwise the boat may be moved crosswise and cut the whole up into blocks; or, if occasion requires, the boat may be run in water, with one or more saws in operation in the edge of the field.

T are rudders in the stern or sides of the boat, made to enter a saw-kerf and guide the motion of the boat.

Any suitable power may be employed to drive the machinery, which propels the boat and does the cutting at the same time.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An ice-cutting boat having a well in which is hung the cutting and propelling apparatus, substantially as and for the purpose specified.

2. The frame C, hung in the well A, and carrying the cutters and propellers, substantially as set forth.

3. The cutters G and propellers H, arranged on the shaft F, and graduated to different rates of speed by means of suitable connecting mechanism.

4. The cutters G, deriving their motion by means of the connecting-belt K, and the propellers H theirs by means of connecting-belts M and M' and the intermediate shaft O, both from the one driving-shaft, B, substantially as specified.

5. The frame C, carrying the cutters and propellers, raised or lowered by the screw D in the rocking nut E.

6. In a boat having the cutters and propellers hung in a well, the rudders T, substantially as set forth.

7. In combination with an ice-boat having a well in which is hung the cutting and propelling apparatus, and these elements raised or lowered by means of the screw D, the runners R and S, substantially as and for the purpose specified.

JOSEPH T. MARTIN.

Witnesses:

HORACE HARRIS,
NATHAN HARPER.