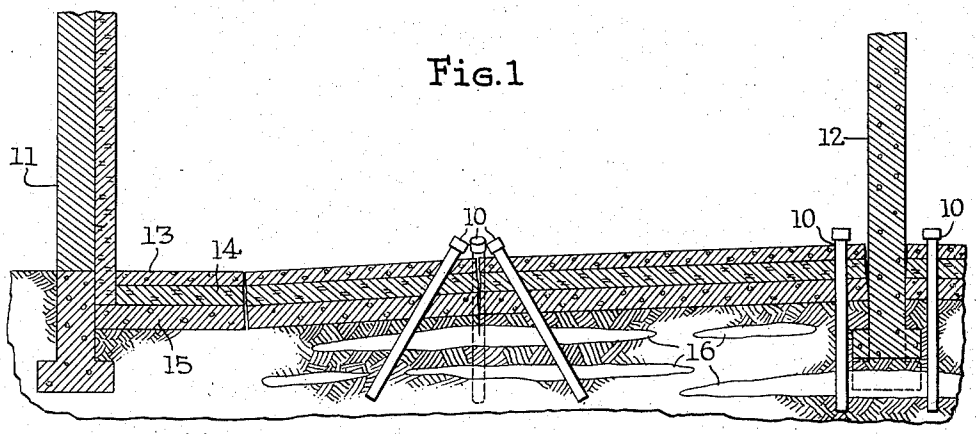
May 19, 1959 A. W. RUFF 2,886,952

APPARATUS AND METHOD OF LOWERING ICE-BUCKLED COLD ROOM FLOORS

Original Filed April 2, 1954

Fig.1



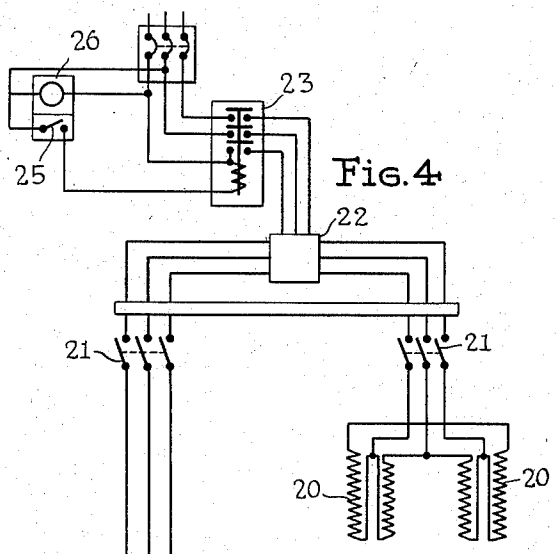


Fig.4

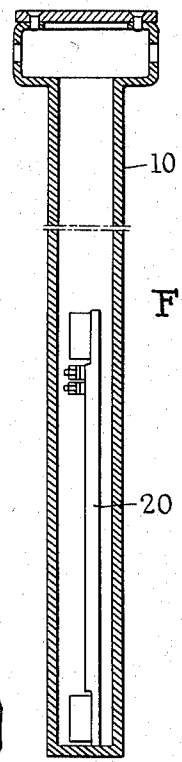


Fig.3

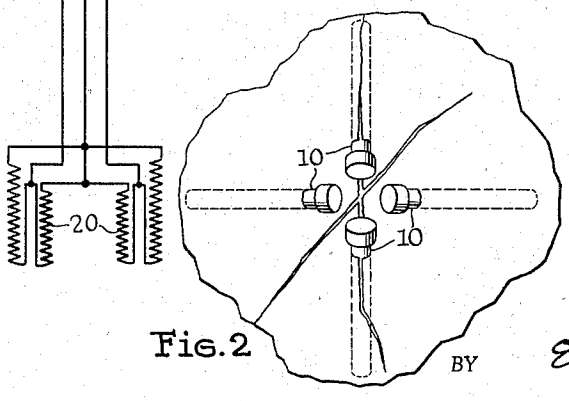


Fig.2

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APPARATUS AND METHOD OF LOWERING ICE-BUCKLED COLD ROOM FLOORS

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Continuation of application Serial No. 420,567, April 2, 1954. This application December 30, 1957, Serial No. 706,096

2 Claims. (Cl. 61—36)

This invention relates to refrigerated cold storage or freezing rooms, in which the floors of such rooms have been laid directly upon the ground. This application is a continuation of my copending application Serial No. 420,567, filed April 2, 1954. These floors will be hereinafter referred to as earth-laid floors. More particularly, this invention pertains to a method of lowering such floors, or portions thereof, which have buckled upwardly due to the formation of ice in the subjacent earth. The lowering of buckled floors may be accomplished using the method and apparatus of this invention, without the necessity of entirely tearing up and replacing a buckled floor. This invention is particularly applicable in the very low temperature storage buildings in which the temperatures to be maintained are of the order of 0° F. and lower.

A complete discussion of the conditions which give rise to this particular problem may be found in my prior U.S. Patent No. 2,561,676 of 1951. The method and apparatus to be disclosed herein constitute an improvement over the disclosure of my prior patent.

Accordingly, it is an object of this invention to provide a simpler and less expensive method, involving a minimum of time and labor, for lowering and settling an earth-laid floor of a refrigerated room, which floor or a portion thereof, has buckled upwardly due to the accumulation of ice in the subjacent earth.

It is a further object of this invention to provide a method and apparatus which will also prevent the further accumulation of ice in the soil, following the hereindescribed floor lowering operations. It is also applicable to cold storage buildings and may be installed at the time that the building is initially constructed.

Other objects and advantages will be apparent from the following description and accompanying drawing, in which:

Figure 1 is a side elevation, partly in section, of a typical buckled floor, and further illustrates the positioning of heating elements to effect the necessary repair operation;

Figure 2 is a top plan view of a portion of Figure 1;

Figure 3 is a side elevation in section showing one of the heating elements housed in its conduit; and,

Figure 4 is a somewhat schematic wiring diagram showing the control circuit connections applied to two electrical heating circuits.

In practicing the invention of my prior patent, it was first necessary to excavate a relatively large portion of the buckled floor and carry such excavation to a substantial depth in the subjacent earth below such floor. This was necessary in order that steam or electrical heating elements could be inserted into the subjacent earth or fill, in a substantially horizontal plane beneath the earth-laid floor. By the practice of the instant method, however, this costly excavation is eliminated.

The first step in practicing the method of this invention, is to drill or otherwise conveniently form a plurality of small holes which extend downwardly through the

floor and a substantial distance into the subjacent earth. It is not necessary that the holes extend below the frost or ice level which may reach a depth of as much as twelve feet in some cases. Once these holes have been formed, an electrical heating element, housed in a conduit, is inserted in each hole so that the heating element is positioned in heat exchange relation with the frozen subsoil. These conduit members are shown at **10** in Figures 1, 2 and 3. That portion of an insulated refrigerated cold storage room which is shown in Figure 1 includes an outside wall **11**, a column member **12**, and the flooring itself. The latter consists of an upper or wear slab **13**, usually concrete, an intermediate layer **14** of thermal insulating material, and an under layer **15** which is also generally of concrete. As shown in the drawing, a typical installation includes the placing of groups of heating elements **20**, at laterally spaced points, in the floor. The several units which make up a group are divergent downwardly from each other in order to cover a maximum area to which heat can be applied. Adjacent the building columns **12**, the heaters are preferably placed in vertical position, one on each of the four sides of the column.

Once the heating units have been place in position, as shown in Figures 1 and 2, they may be connected to a common source of electrical energy through, for example, a switching circuit such as is shown in Figure 4. The heat thus generated by the elements **20**, serves to melt ice formations in the subjacent soil, such for example as those indicated at **16**. With the melting of these ice formations, the floor will gradually settle to its original position, or the settling may be aided by application of pressure to the upper surface of the floor.

The circuit shown in Figure 4 represents a convenient means for controlling individual heating units during the floor lowering operation. While only two heater banks are shown, it will be understood that to show the complete circuit for an entire installation would be mere duplication. During the actual floor lowering operation, it is convenient to have electrical energy permanently connected between the source and the switches **21** in order that selected portions of the floor may have heat applied therebeneath continually to the exclusion of other floor portions.

Once the floor has returned to its original position, the installation is completed by joining the upper ends of each group of the conduits in a junction box, which is set flush in the upper surface of the floor and grouted in.

To prevent the further accumulation of ice formations in the subjacent soil, it is necessary to maintain the subsoil at a temperature above the freezing point. Figure 4 illustrates a preferred circuit for accomplishing this purpose. The resistors **20**, which comprise the heating units, are connected through switches **21** in order that one or more of the units may be manually connected to a source of electrical energy. Reference numeral **22** represents a circuit breaker of the conventional type which will open the circuit to any bank of the heating units should a short circuit develop. A master solenoid operated switch **23** controls application of power to the entire heater network. The solenoid is controlled through the medium of a further switch **25**, which in turn is controlled by means of a timing mechanism **26**. The latter, of course, can be set to supply energy to the heating circuit at regularly recurring predetermined time intervals.

From the foregoing, it will be apparent to those skilled in the art that there is herein disclosed a new and useful method and apparatus for the solution of the particular and special problems which arise in connection with the earth-laid floors of cold storage room installations wherein such floors were not initially provided with a source of heat.

Variations in both the method and apparatus are contemplated within the scope of the appended claims.

I claim:

1. The method of lowering the earth laid floor of refrigerated rooms or portions of said floor, which has or have been buckled upwardly by the formation of ice accumulations in the subjacent earth, the steps comprising: adjacent the buckled areas, forming a plurality of substantially vertical holes through said floor, and into the subjacent frozen earth, said holes being only slightly larger in cross-section than the cross-section of electrical heaters to be later inserted therein; lowering a plurality of electrical heaters, one into each such hole, thereby to support said heaters within and in axial alignment with said holes and to thereby position said heaters in operative heat exchange relation with the frozen earth; and

supplying electrical energy to said heaters for a period sufficient to melt the ice accumulation and dry the earth beneath said buckled floor to thereby permit the floor to settle to normal position under its own weight.

2. The method defined in claim 1 including the additional step of continuing to supply heat to the subjacent earth at periodically recurring intervals to maintain said earth at above freezing temperature to prevent the reformation of ice accumulations once they have melted and after the room is back in service.

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