No. 620,112. Patented Feb. 28, 1899.

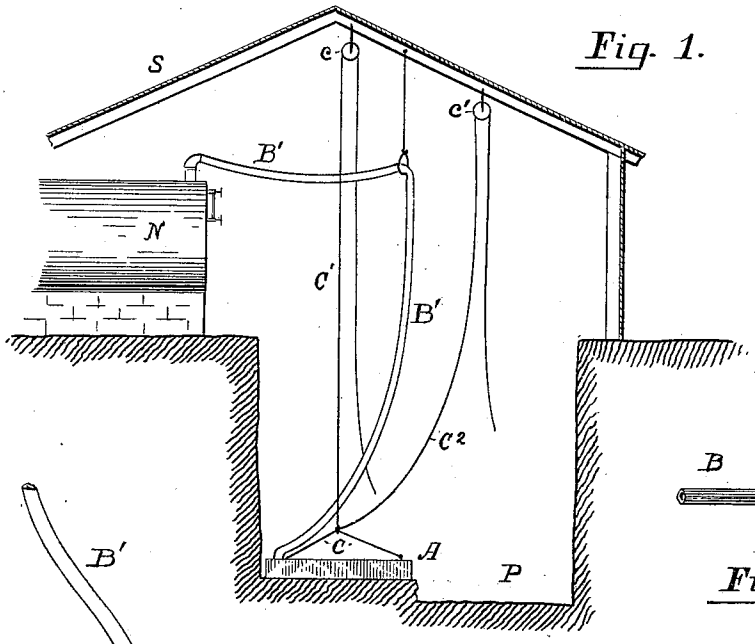
G. R. ELLIOTT.

STEAM THAWING APPARATUS.

(Application filed Feb. 2, 1898.)

(No Model.)

Fig. 1.



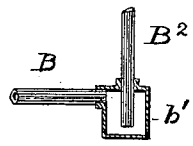


Fig. 5.

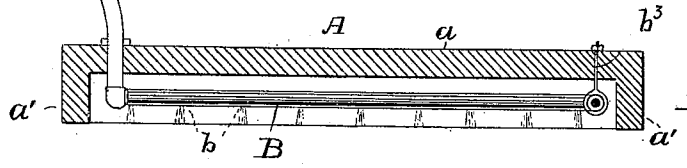
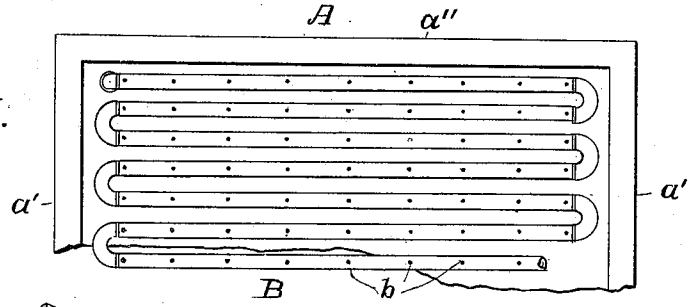


Fig. 2.

Fig. 3.



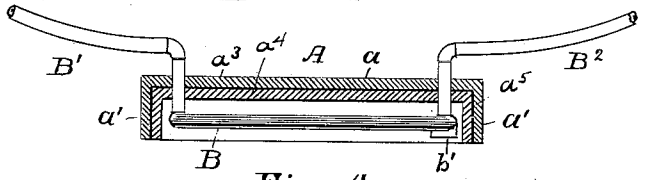


Fig. 4.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GILBERT R. ELLIOTT, OF BOSTON, MASSACHUSETTS.

STEAM THAWING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 620,112, dated February 28, 1899.

Application filed February 2, 1898. Serial No. 668,797. (No model.)

To all whom it may concern:

Be it known that I, GILBERT R. ELLIOTT, a subject of the Queen of Great Britain, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Steam Thawing Apparatus, of which the following is a full, clear, and exact description.

The object of this invention is the construction of apparatus by means of which steam can be applied to thawing out frozen ground, and it is especially designed for use in mining operations in subarctic regions, where the frozen condition of the soil renders the extraction of gold therefrom an otherwise exceedingly slow and difficult job.

In the drawings forming part of this specification, Figure 1 is an elevation of the entire apparatus in the course of operation. Fig. 2 is a sectional elevation of the hood and steam-coils therein. Fig. 3 is a view from beneath of the hood and coils. Fig. 4 is a sectional side view of a modification of the hood and coils, and Fig. 5 is a detail view of a portion of said modification.

The hood A is preferably built up from heavy planking and comprises the flat top a, with ends a' and sides a''. It is made quite shallow and may be of any convenient superficial area. Suspended within this hood is a steam-coil B, held by the hangers b^3, as shown in Fig. 2. In the under side of the piping composing said coil are numerous small holes b, designed to permit the passage of fine steam-jets, which by their impact and condensation upon the frozen ground beneath rapidly thaws the same to a depth of several inches.

In the form of steam-coil shown in Fig. 2 one end of the same is closed, but the other receives a continual supply of live steam from the boiler N through a flexible tubing B'; but in the form illustrated in Fig. 4 the steam-coil B is connected at each end to the boiler through flexible tubing B' B^2, and said coils are not perforated, as in the construction previously described. Here instead of the thawing being accomplished by the direct contact of the live steam with the ground the heat is transmitted by radiation from the coils to the soil. This latter arrangement I design to employ in cases where the water of condensation from the steam-jets might give trouble by accumulating in the pit during the work of excavation. In this continuous-circuit coil I furnish the same with a water-trap b' at the end of the coil connecting with the return-pipe B^2. This trap is shown in Fig. 5, and consists of a pocket b', depressed below the level of the steam-coil and having the extremity of the return-pipe B^2 reaching nearly to the bottom thereof. By this device the water condensing in the coil from the chilled steam accumulates in said trap and is blown out by the steam-pressure upon the instant its level reaches the mouth of the return-pipe.

A further improvement which I effect is in the construction of the hood. It is, as indicated in Fig. 4, made with double walls a^3 a^4, between which is laid a layer of asbestos a^5 or other non-conducting material. This more thoroughly economizes the heat supplied beneath the hood and increases the thawing ability thereof.

My method of using this apparatus is as follows:

Referring to Fig. 1, S indicates a shed or other building erected for the better protection of the apparatus and men and for facilitating the work. This shed is of course erected over the spot at which it is desired to sink the shaft for the removal of the auriferous deposits. Said shaft P is made slightly more than double the width of the hood, and if the steam-supply is sufficient its other dimension may also be double the other dimension of the hood. The hood being placed over one section of the shaft-floor and the steam turned on, it is allowed to remain there until the ground beneath it has been thawed to a depth suitable for digging. It is then removed to another section of the shaft, and while it is engaged in thawing the soil at that point the men proceed to excavate such softened earth. The hood being returned to this just-dug section, the men then go on with their work in the now thawed section from which it was removed, thus making the work of thawing and digging practically continuous and uninterrupted.

It will be observed that the top of the hood being flat and made of heavy timber or planking, the hoisting-buckets can be stood thereon while the men are at work upon the thawed

ground, and thus leave them ample room for wielding their shovels and picks.

My preferable way for moving the hood is to sling it from a bail C, from which a rope C′ passes up over a pulley *c* and thence down into easy reach of the men. A second rope C^2, tied to the same point of the bail C, passes over a pulley *c′*, and these two pulleys are each suspended from the shanty-roof at a point directly over the center of the hood when in a working position. In other words, these two pulleys are located at a distance apart equal to the width of the hood. As shown in Fig. 1, the pulley *c* is in the same vertical line with the center of the hood, while the pulley *c′* is directly over the center of the other half of the shaft. By pulling on the rope C′ the hood is elevated a short distance and is held thus suspended until its weight has been taken by pulling the rope C^2. When this second rope is sustaining part of the weight of the hood, the first rope is slackened until the entire weight is supported by said rope C^2, and the hood is therefore hanging directly below the pulley *c′* and above the right-hand part of the shaft. It is now but the work of a moment to lower the hood to its place and permit its work to continue. In doing this it is usually best to elevate the hood far enough above the heads of the men to enable them to pass from the section upon which the hood is to be lowered to the part from which it has been raised. This is not, however, necessary when the floor-space of the shaft is four times the area of the hood and four shiftings of the hood are needed to cover the entire shaft-bottom, for the men can pass from point to point beside the hood, and so raise it but a few inches.

In the method in general use for thawing out the ground in a subarctic country it is customary to sink two shafts side by side and to have a fire burning in one while the man is working in the other, changing from one to the other as the soil becomes thawed in either. This is open to many objections, among which is the extreme slowness of the operation and its lack of economy in fuel. Not only does the greater part of the heat from the burning wood pass upward and fail of warming the ground beneath, but the ashes from the combustion itself serve as a non-conductor to guard the earth from the fire. Moreover, since escape must be given for the smoke from the fire it is impossible to roof over the shaft, and thereby conserve the heat for the comfort of the miners and the better thawing out of the soil. Another difficulty arises from the multiplied labor required in climbing up from one shaft and descending into the other at the intervals intervening between the thawings of the respective shafts, the time lost in kindling each new fire in the just-dug shaft, and in waiting in the smoke until the combustion has made sufficient headway, and in other difficulties and drawbacks too numerous to mention.

Although I have described steam-coils as the source of heat suspended within the hood, it is in many cases an equally practical arrangement to omit said coils and to introduce the steam through the flexible pipe B′ directly into the interior of the hood. In this case, however, it is of course necessary to use the steam at a very low pressure in order to keep it from displacing the hood. This is more convenient and inexpensive for sinking a small shaft, but it is not so rapid in its work on account of the less amount of latent heat at the disposal of the steam. Further, some form of electric heating device can be substituted for the steam-coils and electric conducting-wires take the place of the flexible steam-pipe. For instance, we will suppose B in Fig. 4 illustrates an electric heater, and B′ B^2 the conducting-wires communicating therewith. Further, my apparatus as shown and described is not necessarily restricted to steam, but other forms of heated fluid can also be employed.

What I claim as my invention, and desire to secure by Letters Patent, is as follows, to wit:

1. In a thawing apparatus for sinking vertical shafts in frozen ground, the combination of the strong, flat, shallow box open at its under side and adapted to support men, tools and other heavy weight, coils of piping secured therein, an exterior supply of heated fluid and a flexible pipe joining said coils with said supply, said box or hood being not more than half the area of the shaf-tfloor, and transferring means whereby said box or hood being shifted back and forth upon the shaft-floor, the latter can be contiuously excavated and the work of the men not be materially interfered with, substantially as and for the purpose set forth.

2. In a thawing apparatus, the combination of the hood, the steam-coils suspended therein, a source of steam-supply, a flexible connection uniting said steam source to said coil, a structure supporting two pulleys at a distance apart equal to the width of said hood, and ropes extending from said hood over each pulley, substantially as and for the purpose set forth.

In testimony that I claim the foregoing invention I have hereunto set my hand this 31st day of January, 1898.

GILBERT R. ELLIOTT.

Witnesses:
F. E. CALLER,
A. B. UPHAM.