

advantageous seasons for breasting. Labour was paid \$1 per hour. No charge is made for wood beyond cost of cutting and hauling. Distance hauled, one-half mile down hill.

Thawing by Steam.—In the fall of 1898 a small boiler was erected on claim No. 2, Eldorado creek, to experiment on thawing ground with steam, the idea having suggested itself that by a direct application of dry steam more economical results could be obtained than by firing.

The crude test showed that sinking could be rapidly and cheaply done, but it was not considered to be applicable to drifting. Several other trials of steam thawing were made on Sulphur creek in the winter of 1898-9. Although the apparatus used was most inefficient the results were so encouraging that the idea was quickly grasped, and the opening of navigation in 1899 found nearly every scow and steamboat arriving at Dawson carrying in their cargoes boilers of all sizes, from 5, 10, 20, 25 to 40 horse power. The West coast had been scoured for small hoists and boilers; the pipe boiler, on account of its light weight, being the type generally selected. Small hoisting engines and pipe fittings made their appearance, and with the opening of winter work steam whistles echoed all along the creek.

The advantages of steam thawing seemed soon to be recognised by all claim owners who, though they were not familiar with its workings, were afraid some other person might work more economically, so rushed into the market and purchased the plants even before they arrived.

First Experience with Thawers.—The experience with "steam thawers" demonstrated in nearly every case that the capacities of the boilers were insufficient to meet the requirements of the "points" they were using. In general the steam plants were poorly mounted and unprotected against the elements. The boilers and steam pipes were uncovered, and the steam from the boilers to the breasts underground (sometimes 200 feet distant) passed through bare iron pipes.

With the temperature of these creeks far below zero Fahrenheit, it can be readily understood how great must have been the waste of fuel and losses due to condensation. Injectors feeding the small boilers did not keep up the water supply and permit the generation of sufficient steam to feed the "points," resulting in loss of time and frequent deluging of the pipes.

Steam Thawing in 1899-1900.—During the winter of 1899-1900, steam thawing, as the plants were perfected, gradually showed what could be achieved, and the great advantages over the old system of firing, to wit:

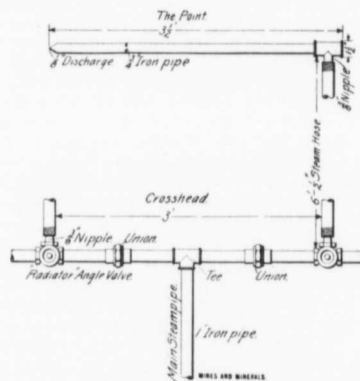
1. It can be used at all seasons.
2. Absolute security to life.
3. No loss of time, can be prosecuted continuously.
4. Dead work reduced to a minimum.
5. Saving in handling waste.
6. Absolute control of the heat.
7. Economy in fuel—direct application of the heat.
8. Expeditious and economical extraction of the gravel. Gravel better thawed and with the use of a small hoist, there is additional economy of labour with an increased output.

Thawing Plants.—A thawing plant should consist of a boiler, pipes, set of points, and a hoisting engine with drums complete. The requirements determine the horse power of the boiler, each point used requiring at least two-horse power. The additional power necessary for the hoist depends upon the amount of work to be performed. A 10-point plant should have a 30-horse power boiler. The boiler should supply dry steam.

The pipe boilers, which have been extensively used, are short lived, large consumers of fuel and undesirable.

Locomotive boilers have given the best results, but any good boiler will do the work; it is only a question of cost, \$100 per horse power being the prevailing rate at Dawson.

Steam Outfit.—The boiler should be fitted complete with steam drum, mud drum, gauges, valves, feed-pump, oilers, wrenches, complete set of tools, including taps and dies, and sufficient asbestos or magnesia cov-



STEAM THAWING APPARATUS.

ering to thoroughly protect the plant and steam pipes to be used under ground. Special attention should be given to the thorough protection of the main steam pipe leading from the boiler to the shaft.

Feed Pipe.—The size of the main feed pipe is regulated by the number of points; with 10 points a one-inch diameter pipe is necessary.

In the drifts the steam pipe is fitted with unions at convenient distances for disconnecting and drainage purposes. The feed pipe is carried down the shaft, and along the drift to the breast where a T is put in, and a cross-head run the full length of the face to be thawed.

Cross-head.—The cross-head is fitted with valves three feet apart, each point having its own valve. A six-foot length of half-inch steam hose connects the point with the valve.

Points.—The points are made of $\frac{3}{4}$ -inch diameter iron pipe, $3\frac{1}{2}$ feet long, drawn to a point at one end, with 1-8 inch diameter discharge, having on the other end a heavy steel head $1\frac{1}{2}$ inch diameter, 4 inches long welded or screwed on, and into its side is placed a 3-8 inch nipple connecting with the hose.

As the points must be drained each morning a "radiator" valve with a union attached is found most convenient. The hose is fastened to the nipple with baling wire, having first heated the nipple and inserted it hot in the hose. Experience has proven that clamps are of no value. When the pipes have all been connected steam is turned on.

In starting the points they are held against the face one by one, and worked into it as the ground thaws, for about $1\frac{1}{2}$ feet, being driven with a wooden maul the remainder of their length.

The starting of the point (that is to make the point hold its own weight) only requires about five minutes, the point man inserting them one after another, but it will take fully three hours to work ten points in their full lengths. When the points are in a full head of steam is turned on, and they are allowed to remain in the breast until 5.30 a.m., the following day, supposing that the point man commenced his shift the previous evening at six o'clock. When the points are withdrawn