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An Efficient Sluice Box

The size of sluice boxes, the grade, and the type of riffles all have an important bearing on gold recovery. While these factors must be varied in accordance with the particular gravel being handled, the essential features of design are given by the author.

The impression prevails that to install a sluice box, calk the seams, insert any one of the several types of riffles and commence sluicing solves the problem of recovery of placer gold. This is incorrect because the gravel from each placer offers its own peculiar problems.

Gold from placer mines ranges from nuggets weighing ounces or pounds, in some cases worth thousands of dollars, to flour gold weighing thousands of particles to the cent. Problems in recovery of coarse gold are simple, those of fine and flour gold complex and in many cases economically impossible. In placers, gold is found as nuggets, grains, and flakes; in the leaf, fine, and flour varieties; and in varying proportions. Each combination requires study, not of a superficial nature, but in sufficient detail to accurately determine the method best suited to recovery. Moreover, it should be determined at what point economical recovery is reached.

Where sufficient water is not available, either as a natural flow or from impounding, placer mining, with few exceptions, is uneconomical. The multitude of new or special apparatus constantly being sold to placer mines, only to be eventually abandoned, is sufficient argument that sluicing remains the best practice. Certainly it follows methods similar to those employed by nature in original deposition. As dry placers offer different problems than do the wet gravels, they are not considered in this discussion.

The usual sluice box has a gradient varying from one-quarter inch to one-inch to each foot of length. When gold is coarse the grade may vary up to one and one-half inches per foot. Generally, sluice boxes maintain a uniform grade for their entire length, but such boxes involve but one factor of precipitation, a multitude of checks by riffles.

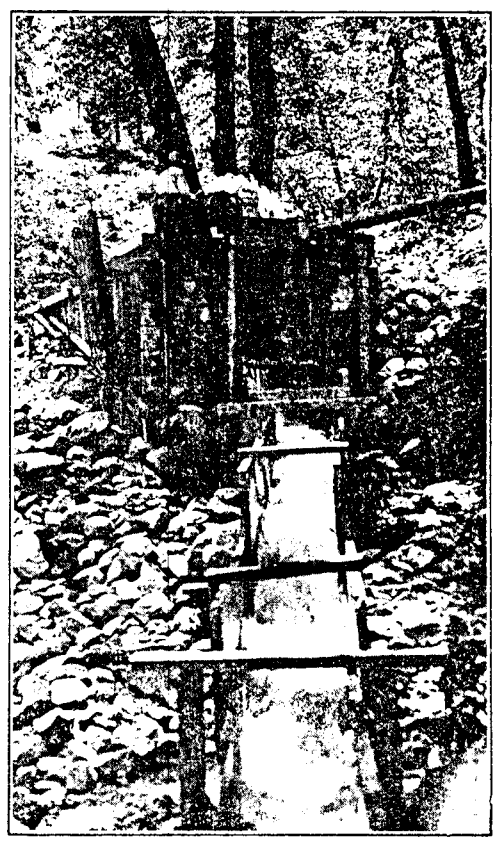
The design of a sluice box embodying essential features of stream precipitation is not difficult. General construction, so far as carpentry is concerned, needs no modification. Joints must be close and leak proof, inside surfaces planed smooth. The old type of square nails should be used. Nails are not to be driven in the bottom of the box. Bracing must be adequate to make all parts rigid. Grade should be exact and the floor section level.

A bin of convenient size should be built to receive gravel as it comes from the mine. It should be metal lined with all cracks calked, and a grizzly installed to prevent boulders and cobbles from going through to the sluice box. Water for sluicing should first be utilized for wetting the gravel before both pass on to the boxes.

Although some operations require a sluice box 12 inches wide, it is better practice, when necessary water is available, to have boxes 18 inches wide. Widths mentioned are inside measurments. The following will describe the larger size.

From the bin, gravel is admitted to the boxes by means of a gate two feet six inches square. The gate permits gravel to discharge into a metal lined chute 10 feet long with a grade three inches per foot. The chute tapers from the gate to 18 inches where it discharges into the first riffle box.

The floor of the first box should be 12 inches below the chute lip, and riffle boxes not less than eight feet or more than 12 feet in length. In the type of sluice box described the longer length is not ordinarily desirable. Each succeeding box should be 12 inches lower, floor to floor, and so framed as to come 12 inches under the preceeding box, allowing a hollow portion beneath the end of the upper box and the box following. The head of each box must be tightly sealed. The boxing does not require riffles.



Looking up an 18-inch sluice box of the type described. The succession of drops is plainly shown. The man on the bin has just dumped a car of gravel and is washing off the boulders and cobbles.

There are several types of riffles, the ordinary or "Hungarian," which cross the box; pole riffles which extend in the direction of the box; and zig-zag riffles which are placed in diagonal position. Combinations including each of the three named may be used, but the Hungarian or ordinary riffle is most satisfactory in the type of sluice described.

The riffles are made of ordinary eight or 12-pound T rail and should be one inch shorter than the width of the box into which they are fitted. On the bottom of the box, along each side, stringers of one by three-inch material are placed. Upon these the riffles are set, ball up, and spaced at from two to four-inch intervals depending on the size of material to be handled. To hold riffles in place a block is set at a point under the lip of the preceeding box, the first riffle set solidly against it, and wooden blocks of the required dimensions, but not over three inches wide, set between them so as to rest over the base and under the ball. The following riffle is brought up to these spacers, set solidly into position, and the same proceeding followed until the end of the box is reached. At the box end another supporting block is set on the floor and the line of riffles thoroughly tightened. Sand boards, one and one-half by six inches, are set tightly on the riffles and nailed to the sides.

The first box has a grade of one and one-half inches per foot. Four boxes follow, each succeeding one reduced in grade by one-fourth inch per foot. This results in the last box having a grade of one-half inch. Following this box there should be as many succeeding boxes of the one-half inch grade as are necessary to economically recover gold. Each box should have a drop of six inches rather than the 12 inches of those of steeper grade. When the length of boxes necessary to economical recovery is determined one additional box, on the same level as the last box of one-half-inch grade, is installed and grade reduced to one-quarter inch per foot.

This type of sluice box permits all material to be first saturated with water in the bin and slide before entering the riffle boxes. All water is introduced from the bin. Material under these conditions is quickly and evenly distributed. At the end of each sluice box gravel is dropped and checked. The final reduction of grade permits further checking and gold precipitation without sanding the boxes.

In this sluice box the greatest concentrations of gold will be found directly under each drop and only small particles, or larger grains which have adhered to clay or other material, will be carried down to the last boxes.

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EARLY PRODUCTION SLATED FOR CHELAN COPPER COMPANY

Instructions to go on production as soon as possible have been given by the officials of the Chelan Copper Mining Company, a Howe Sound Company subsidiary, near Lucerne, Washington. Plans for the construction of the first 100-ton unit of the concentrating plant are being drawn and additional units will be constructed as conditions warrant to bring the total capacity to 1,000 tons daily.

Negotiations are in progress regarding the installation of an adequate transportation system and power requirements are being worked out. Equipment has been purchased to keep the road in good condition and the company expects to be employing around 100 men by spring.

Development in the mine will consist of a series of raises starting on the 1,500-foot level and extending upward to the 300 or top level of the mine. Values are principally copper, with some gold.

John P. Lee of Lucerne is chief engineer at the mine, which has been closed for about two years, and C. P. Browning of Britannia Beach, British Columbia, is general manager.

BUILDING AN EFFICIENT SLUICE BOX

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The progressive drops release the support which even irregular riffling permits, allowing gold to more readily precipitate. The arrangement of drops and lesser gradient of succeeding boxes check the material and assure gold being quickly precipitated, 80 per cent of the gold being recovered within the first 50 feet of riffling. Quicksilver may or may not be required, but it can be added if experiments on recovery so indicate.

The application of this particular type of box is not for flour gold which, at each drop, would have a tendency to be frothed with air-film which floats it off. Fine gold, however, may be recovered in this type of sluice box but grades should not exceed one-half inch per foot, drops from one box to the next not over three inches and the flow of water controlled to the extent of permitting as little gravel as possible to be carried at one time. The length of box sections should be 16 feet.

It is important to gauge the flow of water correctly and in this much depends on the type and character of gravel. The required amount of water in an 18-inch sluice box will vary from 40 to 100 miners inches. The water should be gauged to permit uniform distribution of gravel throughout. There must be sufficient excess water to prevent blocking or sanding. Feed from the bin must be constant and free.

The box described will permit quicker precipitation of gold than any other sluice box of the riffle type. Only experimentation with gravel to be washed will disclose the ultimate length of boxes required. However, it is improbable, in any case, that the total length will exceed 150 feet while the average should be less than 100 feet. In one sluice box of the type described and 60 feet in length, not enough gold was recovered in the last 12-foot box section to pay the labor for cleaning it up.