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PROSPECTING FOR PLACER GOLD

IN

SOUTH DAKOTA

Data Compiled

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TABLE OF CONTENTS

	Page
Introduction	1
Formation of Placer Deposits	2
Types of Placer Deposits	4
Residual Placers	4
Hillside Placers	4
Creek Placers	4
Gulch Placers	4
River-bar Placers	5
Bench or Terrace Placers	5
Placer Mining Districts of the Black Hills	5
Placer Mining Laws	7
Placer Mining Methods	9
Panning	9
Rockers	10
Long Tom	13
Sluices	13

PROSPECTING FOR PLACER GOLD

IN SOUTH DAKOTA

Introduction

The following material has been compiled from various sources in answer to many requests for information concerning placer mining in the Black Hills. It is intended primarily for the inexperienced prospector, with little technical training, but interested in trying his luck at placer gold mining.

"Technical or scientific education, although it would be helpful, is not necessary for the prospector. However highly he is educated, he has to learn by experience. He cannot, by reading books, set forth into the mountains a full-fledged prospector."[1] A prospector, however, must have "courage, natural resourcefulness, good powers of observation, but most of all, tireless patience and physical energy. A new mine is not likely to be found on a summer's holiday or a casual vacation."[2]

"The number and wide range of old workings lead to the conclusion that few recognizable surface indications of metal-bearing deposits have been overlooked."[3] However, there are still chances of success for those who, with assured resources, stamina, and equipment, will study the record of placer mining and choose favorable regions for their prospecting.[4]

It is impossible to give a definite answer to the oft repeated question as to how much can be earned by placer mining. A few strikes made in early days paid very well. Most placer miners, however, have been content to make a "day's wages" which seems to mean something between fifty cents and two or three dollars per day.

"The pay streaks of the southern Hills placers are not continuous, but limited and somewhat erratic in their occurrence. They have therefore yielded profitable returns to the individual or small group, working on a small scale, following the runs carefully and avoiding the intervening poor ground. They are pre-eminently "poor man's" placers, and have not been extensive or rich enough to warrant the expenditure of large sums of money.

"The northern Hills placers have been the richer because they have resulted from the disintegration of the extensive Homestake lode and the widespread cement ores, which in turn, we believe, were derived chiefly from the Homestake. Southern Hills placers

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1. Finch, John W.,Prospecting for Gold, Idaho Bureau of Mines and Geology Pamphlet No. 36, Moscow, Idaho, p. 3. (1932)
2. Ibid., p. 3.
3. "Prospecting for Gold in the United States Exclusive of Alaska, --Present Outlook, U. S. G. S. Press Notice 69312, p. 1. (1933)
4. Ibid., p. 1.

were supplied by much smaller veins and lodes, and by the cement ores of limited extent in the vicinity of Hayward and Rockerville.

"In comparison with other well known placer districts, such as California, Colorado, Australia or Alaska, the placer gold of the Black Hills has not been of outstanding prominence. Nevertheless, it yielded rich returns to some individuals, contributed a fairly important share to the gold output of the district, and led to the occupation and development of the country. There is even today a small gold production from the river and bench gravels of the Hills, and there are those who state that a combination of the methods of large scale production and those of the small scale miner will some day yield profitable returns from some of the stream beds. They suggest the use of the newer, small, portable gasoline shovels or dredges that can move a great deal more dirt than a miner's hand shovel, but at the same time, operating in a small space, and with a limited supply of water, can "nose through", follow the pay run, and avoid barren ground about as faithfully as the miner with his shovel and pan."[1]

Placer mining production in the Black Hills in 1932 amounted to about $22,800, mainly from the steam-shovel operations of one company.[2]

Formation of Placer Deposits

"The formation of gold placers is determined by (1) the occurrence of gold in bedrock to which erosion has access, (2) the separation of the gold from the bedrock by weathering or erosion, and (3) the transportation, sorting and deposition of the auriferous material derived from erosion."[3]

"The gold found in placers originally existed in place as deposits of various forms in areas intruded by igneous rocks. In some cases it was deposited in the igneous rock itself in finely disseminated particles; in other cases it was originally in quartz veins, cutting through the igneous and other rocks and formed as a result of the igneous intrusions. Due to disintegrating processes (change of temperature, wind, rain, earth movements, and chemical action), the rock containing the gold has been reduced to such a state that it is easily broken and the gold freed. Through the action of running water, and of glaciers in some instances, the gold-bearing rock is transported away from its source. The moving water causes the heavier gold particles to work slowly toward the bottom of the stream bed. On reaching bed rock, or hard pan, the gold moves slowly down stream until it lodges in crevices, cracks, or other irregular openings in the stream bed.

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1. Connolly, J. P. and O'Harra, C. C., The Mineral Wealth of the Black Hills, South Dakota School of Mines Bulletin 16, pp. 181-182. Rapid City, S. Dak. (1929).
2. U. S. G. S. Press Notice 69312, p. 4.
3. Wimmler, Norman L., Placer Mining Methods and Costs in Alaska, U.S.Bureau of Mines Bulletin 259, p. 11. (1927).

"Placer deposits may be moved many times, depending upon the volume of water and the velocity with which it is flowing, and this generally depends upon the rising and subsiding of that particular part of the earth's crust. There is no fixed rule as to where the gold is apt to occur in the stream bed. The velocity of the stream is not the same at all points in its cross section. Points where the bed has widened, with resultant decrease in velocity are most favorable. The reason for this is that the gold is given the chance to settle to the bottom; when velocity of water decreases. Placers may be found in old dry stream beds. At the time of this formation, water was, of course, present. Later disturbances may have caused the stream to change its course. Or climatic conditions may have been responsible for its drying up.

"There have been very few instances where the gold in a placer deposit has been traced back to its source. The reason is that the source has been either completely eroded away, or has been deeply covered with other material, such as lava flows, sediments, etc., or the gold may have traveled great distances. It has been rather definitely proven that there are cases where placer gold was found over one hundred miles from its original source."[1]

The search for placer gold should be guided by the fact that it is usually deposited where the current of a stream has been checked, slowed down or changed in direction. For example, "a broad basin above a steep-walled canyon is more likely to carry gold than the valley below, provided the bedrock source of the gold is above the basin. Moreover, coarse gold is more likely to be found at the head of a filled basin than near its outlet."[2]

"In most placers the greatest concentration of gold occurs at or near bedrock. Impervious beds within the gravels may have gold concentrated just above them and are spoken of as "false bedrock". The rich gravels usually are in ribbon-like "pay streaks" which may or may not follow the course of the present drainage channels. The gold varies in size from nuggets to minute flakes called "colors". Fine, flaky gold is difficult to save. Placer gold is usually accompanied by "black sand", consisting of magnetite, ilmenite, hematite, garnet, zicron and other heavy minerals. Because of their high specific gravity, these minerals usually collect with the gold during concentration, even though not closely associated with it in the gravel."[3]

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1. Staley, W. W., Elementary Methods of Placer Mining, Idaho Bureau of Mines and Geology Pamphlet No.35, p. 2. Moscow, (1931).
2. Brooks, Alfred H., The Gold Placers of Parts of Seward Peninsula, Alaska, U.S.G.S. Bulletin 328, p. 133. (1901).
3. Wells, E.H. and Wooten, T.P., Gold Mining and Gold Deposits in New Mexico, State Bureau of Mines and Mineral Resources Circular 5, p. 7. Socorro, New Mexico (1932).

Types of Placer Deposits

"Placers may be derived solely by rock weathering without water sorting, but more commonly are the result of water transportation, sorting, and deposition. Some of the richest placers are those formed by the erosion of older placers and the reconcentration of their gold."[1]

The following are types of placer deposits:[2]

Residual Placers:

"These are placers in which the gold is accumulated in places by disintegration of the rock containing it. It is not transported from its original source."

Hillside Placers:

"These are very old deposits, occurring on the tops and sides of hills. They may have been left in this elevated position because of earth disturbances which lifted the area above the former stream bed, or the original stream which deposited them may have changed its course or have meandered to a new bed." These deposits are "intermediate between the creek and bench placers. Their bedrock shows no indication of benching."[3]

Creek Placers:

The creek placers are "gravel deposits in the beds and intermediate flood plains of small streams."[4] These placers from which most of the gold has been taken constitute the best-known type of deposits. Brooks described this form of placer as follows:

"The pay streak in these deposits is usually on bed rock, though it sometimes is found on a clay which overlies the bed rock. Where no clay is present the gold is found not only on the bed rock, but also where the rock is broken, the gold has worked its way down into the joints and crevices. Streams are often found to have a layer of clay on bed rock, which gradually thins out upstream and finally disappears entirely. The presence of the clay on the bed rock usually indicates that no gold will be found in the weathered rock below, as the impervious layers prevent the gold from working its way down."[5]

Gulch Placers:

"These are very similar to creek placers, except that there is now little, if any, flowing water present."

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1. Brooks, p. 131.
2. Staley, p. 4
3. Brooks, p. 142.
4. Wimmler, p. 11.
5. Brooks, p. 144.

River-bar Placers:

"These are bars of gold-bearing sand or gravel that have been laid down by large streams or rivers. The gold is usually distributed throughout the bar. There is oftener more fine (flour gold) than coarse. The deposits are usually very low grade as compared to creek placers."

Bench or Terrace Placers:

These are more or less ancient placers, occurring in bench or terrace form, on the sides of valleys or courses of ancient streams, from 50 to 300 feet or more above the present stream level. The presence of well rounded gravel is indicative of material carried and sorted by water.

Placer Mining Districts of the Black Hills

OF

South Dakota

"Placer gold is found in the gravel bars of all of the present streams (in the Black Hills) and in the various terraces which line their valleys. Few of these deposits have failed to yield gold in paying quantity and many have produced handsomely."[1] "Many of the high-level gravel deposits on the east side of the Black Hills contain considerable placer gold."[2]

The following placer districts were mentioned in Bulletin 3 of the South Dakota Geological Survey:

Deadwood Area --including the following important gulches
- Deadwood Gulch
- Whitewood Gulch
- Gold Run Gulch
- Bobtail Gulch
- Blacktail Gulch
- (Two Bit Creek should be included in this area)

Battle Creek (Keystone region)

Spearfish Creek

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1. O'Harra, C. C., "The Mineral Wealth of the Black Hills", in Bulletin 3, South Dakota Geological Survey, p. 45. Vermillion. (1900).
2. Darton, N. H. and Paige, Sidney, Central Black Hills of South Dakota, U.S.G.S. Folio 219, p. 29. (1925).

Nigger Hill (Tinton) District--principal placer deposits are found in

- Bear Gulch
- Potato Gulch
- Sand Creek
- Nigger Gulch
- Poplar Gulch
- Mallory Gulch
- Beaver Creek

Rockerville Area--made up chiefly of a high terrace several square miles in extent, together with various small gulches leading off the terrace.

French Creek--its valley winds down through Custer and Fairburn.

Rapid Creek--placer deposits line its course for forty miles and range from creek bed to heights above.

- Big Bend
- Nielsen's
- Placerville
  - Placerville Bar
  - The Swede Bar
  - Stockade Bar

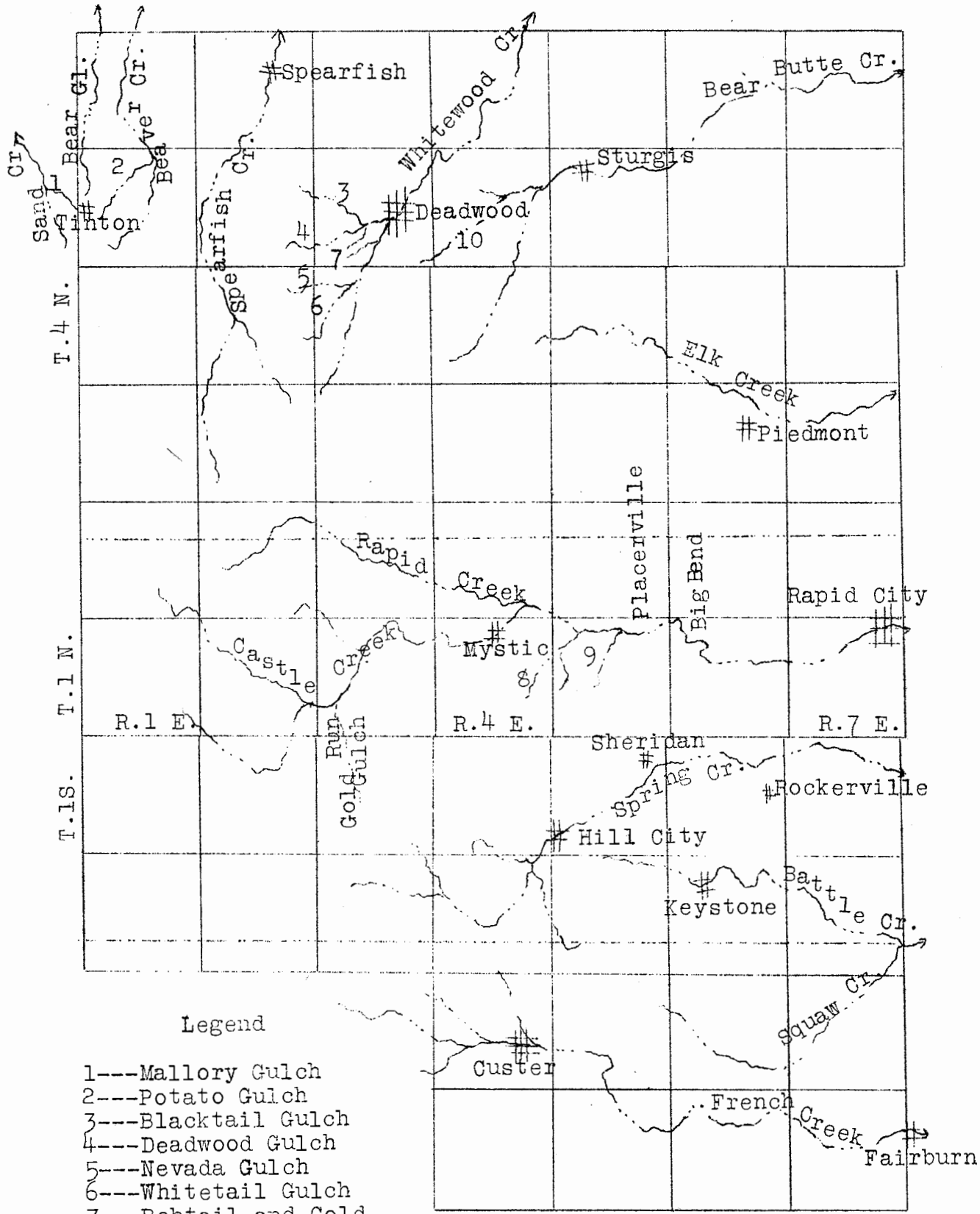
Castle Creek--made up of terraces or bars of quartz gravel, and has the following important placer regions

- Crooked Gulch
- Hoodoo Gulch
- Cheese Hill

Spring Creek--placer operations in and around Sheridan on the creek.

The locations of these places may be found on the maps in the United States Geological Folio No. 219, and on the following map. (Figure 1.)

Prospecting may be done in the National Forests as on other government land, but cannot be done in National Parks.



Legend

1---Mallory Gulch
2---Potato Gulch
3---Blacktail Gulch
4---Deadwood Gulch
5---Nevada Gulch
6---Whitetail Gulch
7---Bobtail and Gold Run Gulches
8---Nugget Gulch
9---Bear Gulch
10---Two Bit Creek

INDEX MAP OF

BLACK HILLS PLACER REGIONS

Placer Mining Laws

As the laws of South Dakota do not have anything to say on the subject, placer mining in the Black Hills is regulated entirely by Federal Law. The regulations in regard to placer mining may be summarized as follows:

"The placer claim is limited by law to 20 acres (43,560 x 20 square feet) per person or a corporation or to 160 acres for unincorporated association of 8 individuals. No definite shape of the claim is required, since the placer usually conforms to the shape of the river bed, or of a deposit. Mark the corners of the claim by stakes about 4 feet high and 4 inches square, or if wood is not available, by so-called nonuments which are piles of stone 3 square feet at the base and about 4 feet high. These dimensions are not infrequently slighted and they are never contested if they are placed right and the owner tried to do his best. In about the center of the claim, or near a place of digging or even in one of the monuments put a notice of the claim in a dry tin can, fastened with the bottom up to protect the paper from exposure to weather. * * * * (A form of the notice of location of a placer claim is included in the back of this booklet.) Make out two copies of the claim paper, deposit one on the claim and keep the other copy for recording in county or district recorder's office. Fee for filing is usually $1.00. For completing and recording the location, the law allows you 30 days. To keep the legal right to the claim afterwards, it is necessary to do at least $100 worth of labor or invest $100 in improvements on the claim each year, beginning with noon of July 1st after the discovery. It is advisable to note on your placement paper the dates between which the so-called assessment work was done. This work should also be recorded, but it is not mandatory. If not recorded and should anyone contest it, the burden of proof rests on you to prove that it was done. If it is recorded, the burden of proof rests on the claimant to prove that you recorded your work falsely. If all these requirements are fulfilled, the placer may be held indefinitely, although if quite valuable, it is preferable to have it patented. This is somewhat complicated procedure, requiring surveying, publication, of notices in newspapers, affidavit as to $500 worth of work done or improvements made, payment of $5 per acre and proof of citizenship of the person applying for the patent. Inquire as to the details of this procedure in the land office of the district. Patented claims are subject to state and county taxes like any other real estate, while unpatented ones are free from taxes."[1]

"The necessary steps in acquiring title to a placer claim are:

a. Discovery of mineral
b. Posting notice of location
c. Establishing corners within thirty days
d. Performing discovery work within sixty days
e. Filing certificate of location within sixty days
f. Performing annual assessment work ($100.00 per year).
g. Applying for patent after $500 has been expended for development."[2]

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1. Stolfa, pp. 127-128. Prospecting for Gold, 1932.
2. Dingman, Oscar A., Placer Mining Possibilities in Montana, Mont. Bur. of Mines and Geology Memoir 5, p. 19. Butte (1932).

The following sections are taken from Mason's United States Code Annotated, 1926, Vol. 2, pp. 238-39, Title 30, Chapter 2.

Section 35. Placer claims conforming to legal subdivisions and surveys; limitation of claims.

Claims usually called "placers," including all forms of deposit, excepting veins of quartz or other rock in place, shall be subject to entry and patent, under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims; but where the lands have been previously surveyed by the United States, the entry in its exterior limits shall conform to the legal subdivisions of the public lands. And where placer claims are upon surveyed lands, and conform to legal subdivisions, no further survey or plat shall be required, and all placer claims located after the 10th of May, 1872, shall conform as near as practicable with the United States system of public-land surveys the rectangular subdivisions of such surveys, and no such location shall include more than twenty acres for each individual claimant; but where placer claims can not be conformed to legal subdivisions, survey and plat shall be made as on unsurveyed lands; and where by the segregation of mineral land in any legal subdivision a quantity of agricultural land less than forty acres remains, such fractional portion of agricultural land may be entered by any party qualified by law, for homestead purposes.

Section 36. Same: subdivisions of ten-acre tracts; maximum of placer locations.

Legal subdivisions of forty acres may be subdivided into ten-acre tracts; and two or more persons, or associations or persons, having contiguous claims of any size, although such claims may be less than ten acres each, may make joint entry thereof; but no location of a placer claim made after the 9th day of July, 1870, shall exceed one hundred and sixty acres for any one person or association of persons which location shall conform to the United States surveys; and nothing in this section contained shall defeat or impair any bona fide preemption or homestead claim upon agricultural lands, or authorize the sale of the improvements of any bona fide settler to any purchaser.

Section 37. Same: proceedings for patent.

Where the same person, association, or corporation is in possession of a placer claim, and also a vein or lode included within the boundaries thereof, application shall be made for a patent for the placer claim, with the statement that it includes such vein or lode, and in such case a patent shall issue for the placer claim, subject to the provisions of this chapter, including such vein or lode, upon the payment of $5 per acre for such vein or lode claim, and twenty-five feet of surface on each side thereof. The remainder of the placer claim, or any placer claim not embracing any vein or lode claim, shall be paid for at the rate of $2.50 per acre, together with all costs of proceedings; and where a vein or lode, such as is described in Section 23 of this title, is known

to exist within the boundaries of a placer claim, an application for a patent for such placer claim which does not include an application for the vein or lode claim shall be construed as a conclusive declaration that the claimant of the placer claim has no right of possession of the vein or lode claim; but where the existence of a vein or lode in a placer claim is not known, a patent for the placer claim shall convey all valuable minerals and other deposits within the boundaries thereof.

Section 38. Evidence of possession and work to establish right to patent.

Where such person or association, they and their grantors, have held and worked their claims for a period equal to the time prescribed by statute of limitations for mining claims of the State or Territory where the same may be situated, evidence of such possession and working of the claims for such period shall be sufficient to establish a right to a patent thereto under this chapter, in the absence of any adverse claim; but nothing in this chapter shall be deemed to impair any lien which may have attached in any way whatever to any mining claim or property thereto attached prior to the issuance of a patent.

Placer Mining Methods

"Shallow placer material is mined in open cuts with picks and shovels, plows and horse scrapers, power scrapers, drag-line excavators, and power shovels."[1] "Manual mining methods are suitable where small isolated areas are to be mined with a minimum outlay of capital. Such methods will always be popular with many miners who are content with small returns."[2] The pan, the rocker and the sluice box, the equipment and operations of which are described herein, are the three simplest methods of recovering gold from placers.

Panning

"The simplest apparatus of all for recovering gold from placers is the miner's pan, and it is indispensable in prospecting."[3] The pan is a circular dish with sloping sides. It varies from 15 to 18 inches in diameter and from 2 to 2½ inches in depth. The typical American gold pan weighs about two pounds. "The pan should be light, but stiff enough to stand rough usage, inner surfaces must be smooth, bright and free from grease and rust. If properly cared for, pans of polished steel meet these requirements,

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1. Wells and Wooten, New Mexico Circular 5, p. 3.
2. Wimmler, U. S. Bureau of Mines Bulletin 259, p. 8.
3. Wells and Wooten, p. 3.

and are cheap. Agateware does not rust, but easily chips. Aluminum pans are light, do not rust, but lack stiffness. Pans of copper, or with copper bottom and steel rim, are sometimes used for gold which will amalgamate; the bottom is coated with mercury."[1] But not all sources are agreed on the point of having the inner surfaces free from rust. Stolfa in his book on "Prospecting for Gold" states that "gold pans are made of different materials, but one made of sheet iron with a rolled edge is quite satisfactory. It should be rusted and pitted to better catch and hold back fine gold."[2]

"The object of panning is to concentrate the heavier materials by washing away the lighter. To do this most efficiently all material should be of as even a size as possible."[3] Panning is slow, back-breaking work, but since the mastery of the art of panning is essential to success, the following detailed instructions are given:

"1. Fill the pan about two-thirds full with 'dirt' (gold bearing sand and gravel), immerse in water and holding it horizontally, soak its contents well, then with fingers crush under water all lumps and mix the contents thoroughly into thin, uniform mash.

"2. Holding the pan with one hand on each side and still keeping it horizontal under the water, rotate it briskly in circles slightly larger than the pan itself, swinging the arms freely, the motion being more in the shoulder and elbow joints than in the wrists. Pick the larger pebbles out of the pan and discard them. By this time the coarser gravel and the lightest particles (dust, clay) should have been removed and the water in the pan is much clearer than at the start of panning.

"3. Holding the pan in the same way under water, shake and rotate it with motions closely resembling those of sifting. Repeat several times.

"4. Now begin to incline the pan slightly in such a way that the rim away from you remains under water, while the one close to you barely emerges above the water level. In this position shake and rotate the pan with sifting-like motions, allowing always a little of the contents to wash over the depressed rim.

"5. Remove from water and rotate in such a way as to produce a wave of water travelling around the sides of the pan from the depressed rim upwards and then sideways down towards the lower rim and carrying with itself over the lower rim always a little more of the lighter materials in the pan. This phase of the work has to be done gently and smoothly without jerking in order to save as much of the fine gold as possible. Keep always enough water in the pan, repeatedly adding as necessary, and continue this washing until about a teaspoonful or less of clean, sandy material is left in the pan. If gold is present, this residue will be chiefly gold sand or gold or gold dust and "black sand" which is composed of minute dark grains of various minerals, chiefly iron

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1. Peele, Mining Engineer's Handbook, p. 755. New York (1918).
2. Stolfa, p. 20, (1932).
3. Symons, H. H., "The Pan, Rocker and Sluice Box" in Mining in California for April, 1932, p. 207.

minerals (magnetite, ilmenite, chromite), tinstone (cassiterite), tourmaline, etc.

"6. When about a teaspoonful or even less of the material is left, the pan is given a sliding motion which is arrested with a sudden jerk. This procedure partially separates the worthless sand from the gold."[1]

"This material is dried and the magnetite removed with a magnet. Other material such as stream tin and heavy non-magnetic minerals are separated from the gold either by amalgamating the gold or by picking out the gold, piece by piece."[2]

"On the average it takes the beginner at least 15 minutes to wash one pan properly, while an expert may be able to do it in 10 minutes or even less. Basing our estimates on these figures we may say that it takes about three days to wash one cubic yard of dirt at the beginning and, with more experience less time will be sufficient."[3] "A good panner rarely handles more than 1 cubic yard of gravel per 10 hours."[4]

Rockers

"There are many forms and sizes of rockers. The rocker handles about three to five cubic yards of material per 10 hours, its capacity depending upon the size of the gold and the amount of clay present. Large amounts of clay slow the operation down. It is necessary that all the clay be washed free of the gold, otherwise, the fine gold is floated away. The sketch, shown as Figure 2, illustrates a convenient form of knockdown rocker.[5]

"Description of Rocker -

"The inside of one side of the rocker and an end view of the rocker is shown.

A - Cleats for holding the back of the rocker.
B - Cleat for holding bottom of rocker, L.
C - Cleats for holding back of rocker.
D - Cleat for holding canvas-apron frame.
E - Cleats for holding brace at top of rocker.
F - Cleat for holding sieve box.
X - Bolt holes for ½ inch iron bolts used in holding rocker together.
I - Riffles 3/4 inch high by 1 inch wide.
K - Rockers
H - Handle for rocking apparatus .
L - Bottom board of rocker.
M - Spike projecting 1½ inches to prevent rocker from slipping down grade.

"The bottom board, L,of the rocker should be in one piece. This is to prevent leakage of fine gold which might occur if two poorly fitted boards were used. Material of construction is

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1. Stolfa, pp. 100-101.
2. Staley, p. 7.
3. Stolfa, p. 106.
4. Peele, p. 755.
5. Storms,W.H.,"How to Make a Rocker",Eng.& Min.Jnl,June,1911, p.1243

(Taken from Idaho Bureau of Mines and Geology, Pamphlet 35)

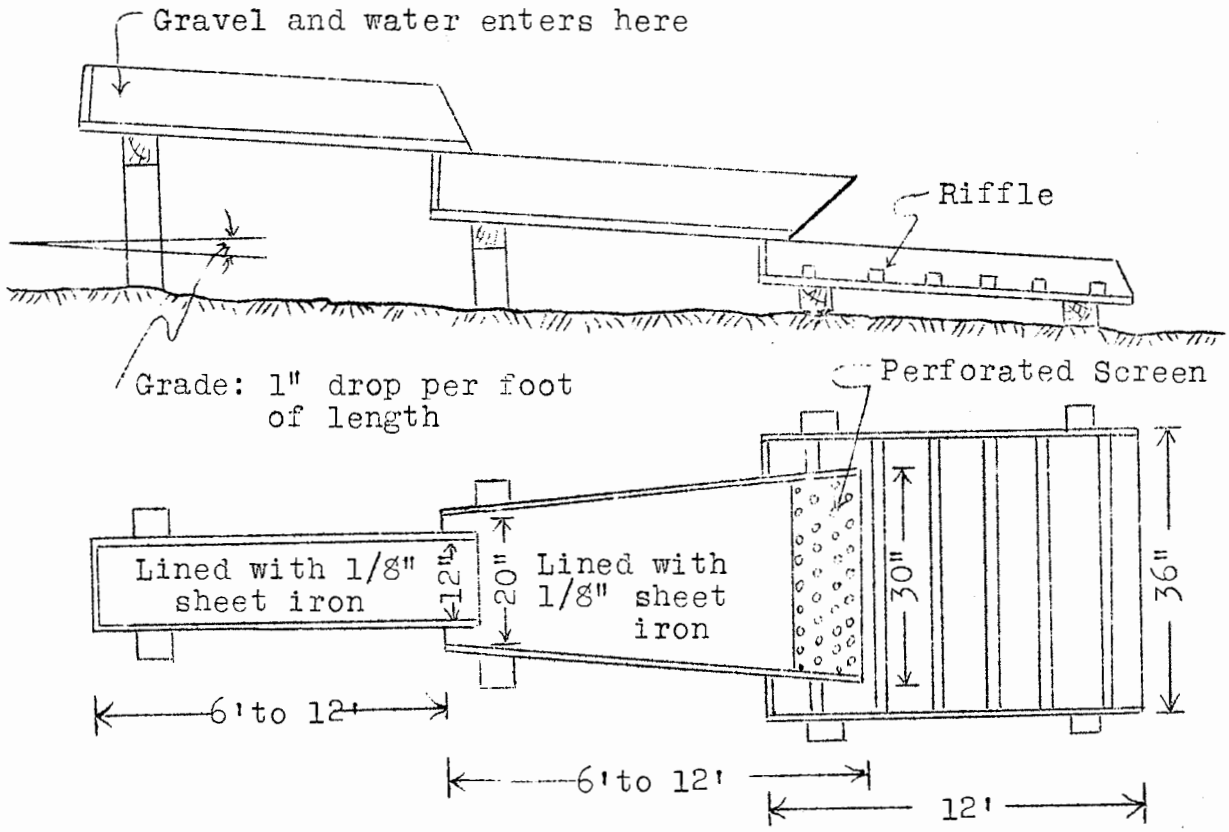

Figure 3. Tom

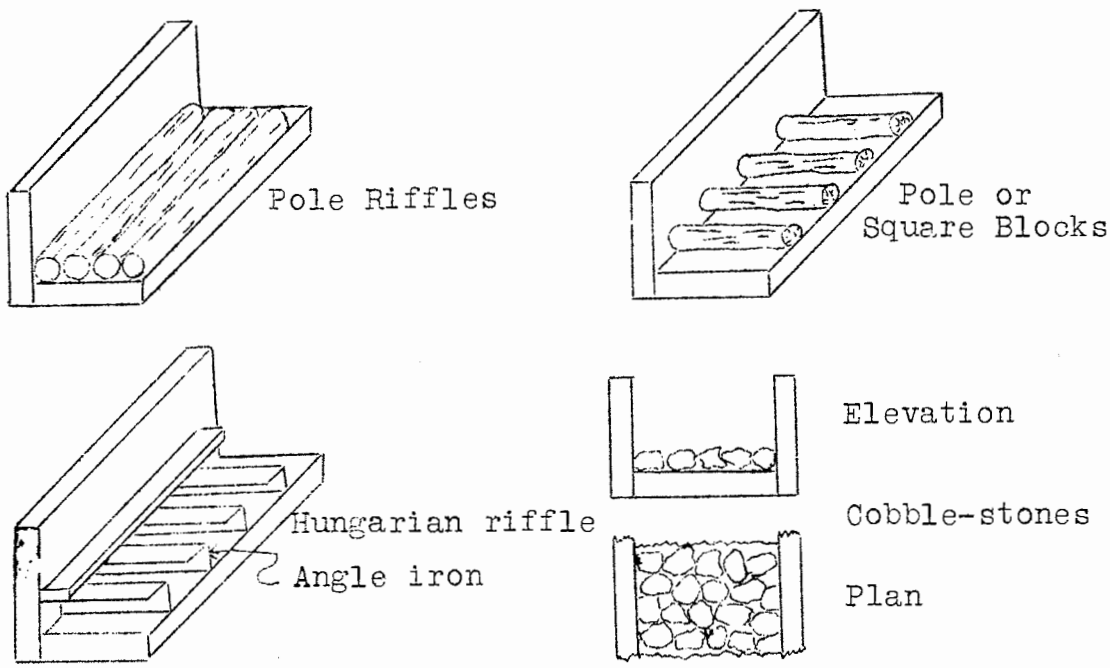

Figure 4. Various Types of Riffles

preferably finished $\frac{3}{4}$ inch. The six $\frac{1}{2}$ inch rods should have nuts and washers for the ends. This permits tearing the rocker down for transportation purposes.

"The dimensions of the sieve box are as shown in the sketch. It should just fit loosely in the top of the rocker. The bottom is made of heavy sheet iron perforated with about $\frac{1}{2}$ inch diameter holes.

"The apron is a framework made of 1 inch by $1\frac{1}{2}$ inch material well fitted together and covered with canvas. The canvas is not stretched tight, but allowed to sag somewhat at the bottom. This gives a slight depression in which gold is caught.

"The grade or inclination of the rocker is obtained as follows:

"Two heavy planks are firmly placed on the ground such a distance apart that each of the rockers will fall about in the center of a plank. The planks must have holes in them to receive the spike in the bottom of the rockers. The plank under the front or discharge end of the rocker is placed two inches lower than the rear plank. This arrangement, therefore, gives a drop of two inches in three feet. The grade is influenced directly by the following conditions:

1. Rapidity with which material can be fed to the rocker.
2. Amount of clay present.
3. Fineness of gold.

"If the gravel is finely bound together with clay, the grade should not be less than two inches. If very little clay is present, and the gold is not too fine, the grade can be increased. In any event, the grade must be such that the clay is completely removed from the gold before discharge is reached, and if the gold is very fine it should be given a chance to settle. In cases of very fine gold and considerable clay, it might be advisable to add one more riffle.

"Operation of the Rocker:

"For the operation of the rocker much more water is required than for the gold pan. Where there is a shortage of water it is usually better to carry the gravel to a point near the source of water. The gravel is placed in the screen box and the rocker is shaken back and forth with a vigorous motion. At the same time, water is poured over the gravel, or a small stream of water is permitted to run over it. If water is scarce, the discharge can be caught in a small pool and rinsed. Good judgment must be exercised in the use of the water. If too rapid a flow is used, the smaller particles of gold will be washed over the riffles and lost with the discharge. At the same time, sufficient water must be used to completely disintegrate the gravel and remove the clay. An attempt should be made to keep a fairly steady stream flowing, rather than an intermittent, surging supply. The amount of water must be just sufficient to carry the tailings over the riffles. The motion of rocking is a quick jerk with a sudden stopping of the motion. The heavy sands must not be permitted to build up

back of the riffles. If this is allowed, the gold will wash over these sands and be lost.

"Clean up:

"The canvas or blanket forming the apron is rinsed off in a tub of water two or three times a shift. The gold and sands back of the riffles are removed as often as thought necessary. The concentrates are dried and the gold removed in the same manner described under panning.

"The rocker is not very efficient. It permits the handling of more material than does the gold pan. Mercury sometimes is placed back of the riffles to catch some of the fine gold.

"When the oversize material is removed from the sieve box, it should be inspected for nuggets before being discarded."[1]

Long Tom

"There are several forms of the long tom. The usual one is an inclined trough or modified sluice box. The long tom requires more water than the rocker; although of larger capacity than the rocker, it is not so efficient."[2] It is illustrated in Figure 3.

"The long tom is placed in position as near the ground as possible and the water allowed to enter at the upper end, either thru a hose or trough. Two or more men shovel the gravel into the upper end and the water carries it downward to the middle section where a third man stirs the gravel about on the tom iron until all except the larger stones has passed through. These are forked out and thrown aside. The smaller particles of gravel and gold pass through the tom iron and into the riffle box where the gold is help by the riffles, while the gravel passes out the lower end."[3] "Clean up is made in the same manner as for the rocker."[4]

Sluices

"In the use of sluice boxes two conditions may arise. First, where the box rests on the ground, and second, where it is necessary to elevate the sluice on trestles, necessitating also the elevating of the gravel. Only the first case will be discussed. The construction of the boxes and the manner of retaining the gold are the same in either case.

"Material:

"The material from which the sluice box is made is rough-finished lumber. There are some instances, such as dredging and

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1. Staley, pp. 7-8.
2. Smith, A.M. and Vanderburg, W.O., Placer Mining in Nevada, p. 27, University of Nevada Bulletin, Dec. 1932, Reno.
3. Ibid., p. 27-28.
4. Staley, p. 8.

large scale hydraulicking, where metal boxes are used. In many cases the box will be made of lumber which has been hewn out by the prospector himself.

"Dimensions:

"The sluice is made up in sections. These sections vary from 12 to 16 feet in length, depending upon the locality. Twelve foot sections are the most common. The width varies from one foot to five feet, but usually between 12 and 18 inches. The depth is from eight to ten inches. The boards from which the boxes are made are about one and one-half inches thick.

"Construction:

"The boxes are made of rough lumber. For ordinary work the following dimensions are sufficient:

Length:	12 feet
Width:	1 foot inside measurement
Depth:	8 inches inside measurement
Thickness of Material:	1½ inches

"One end of each box should be narrower than the other. This permits the telescoping of the boxes. As the gravel bank recedes, boxes from the discharge end are brought to the head end. Thus, it is not necessary to move the entire sluice in order to keep close to the working face.

"Head Box:

"The box into which the gravel is shoveled is called the "head box". It is equipped with a grizzly or bars to prevent the large boulders and rocks from entering the sluice. This is also where the water enters the sluice.

"Grizzly:

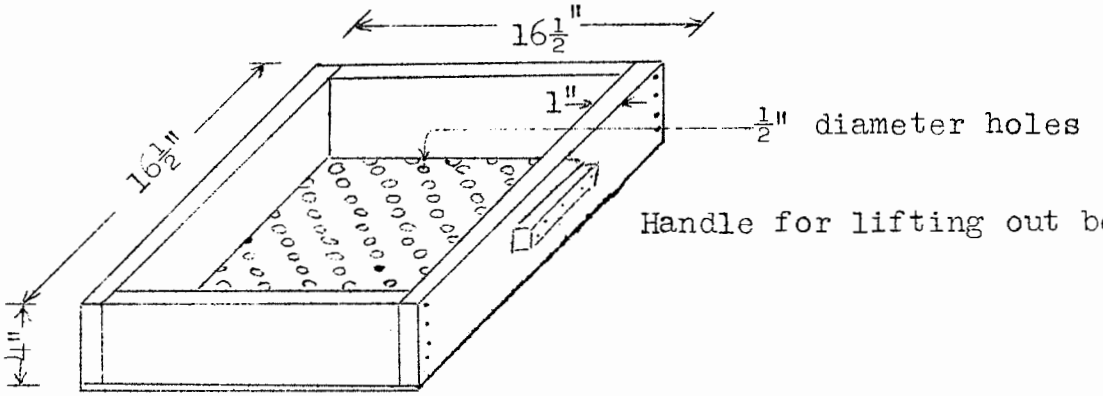
"The grizzly is made of iron boxes or heavy pipe. The spacing between the bars will depend upon the size of the gravel. If only medium sized gravel with very few large rocks will be encountered, a perforated sheet may be used.

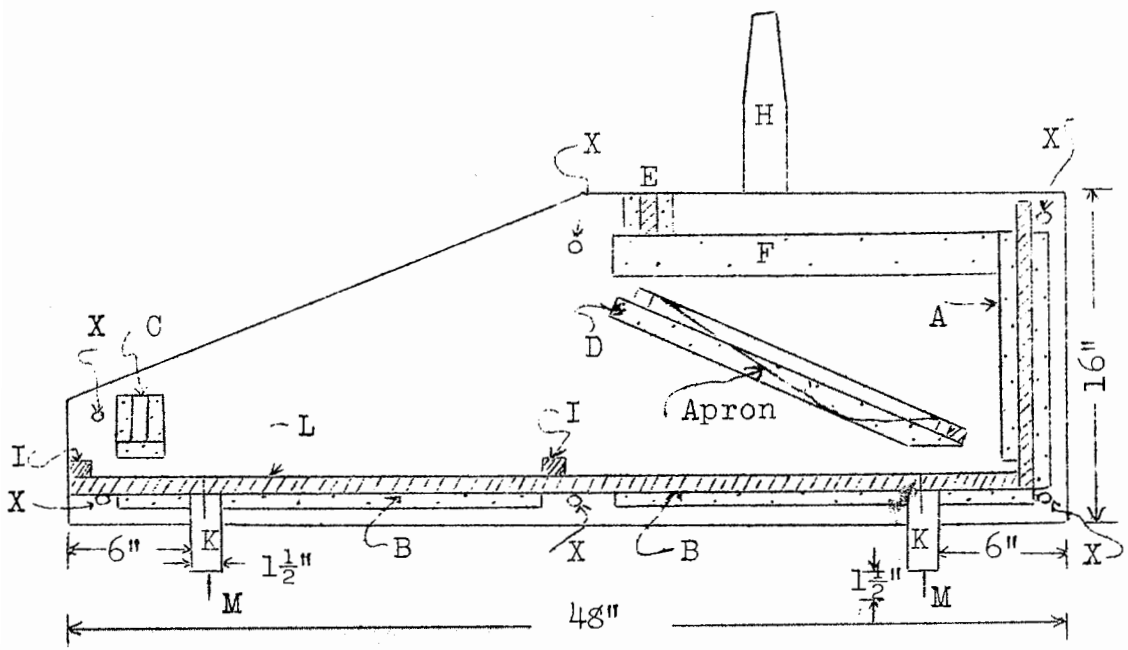
"Riffles:

"The riffles can be constructed of many different things; wooden blocks, angle iron, poles, cobblestones, boulders, etc. have been used. They may run the length of the box or across it. Figure 4 shows some of the riffles in common use. The boxes are shown with one side removed.

"In Figure 4 is shown a section of a sluice. The number of boxes making up the sluice depends upon the amount of material to be handled and the size of the gold. Fine gold requires more time to settle.

"When real fine gold is present, the last sluice box may be replaced by a very wide table (about 16 feet) from 10 to 20 feet in





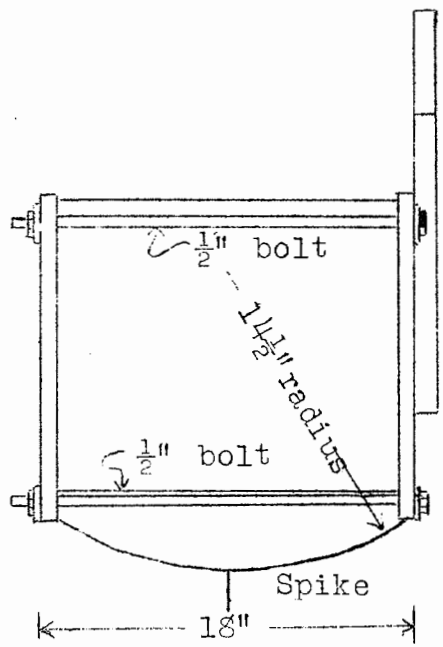


Figure 2. KNOCK DOWN ROCKER (From Eng. amd Min. Jourl.)

(From Idaho Bureau of Mines and Geology, Pamphlet 35)

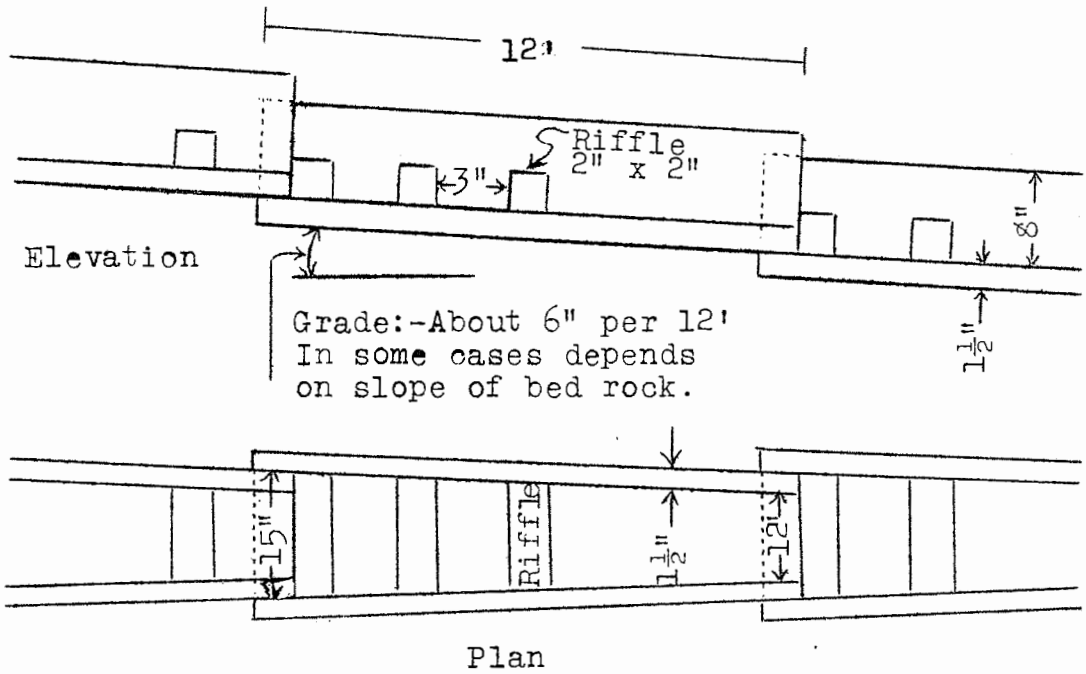


Figure 5. Section of Sluice

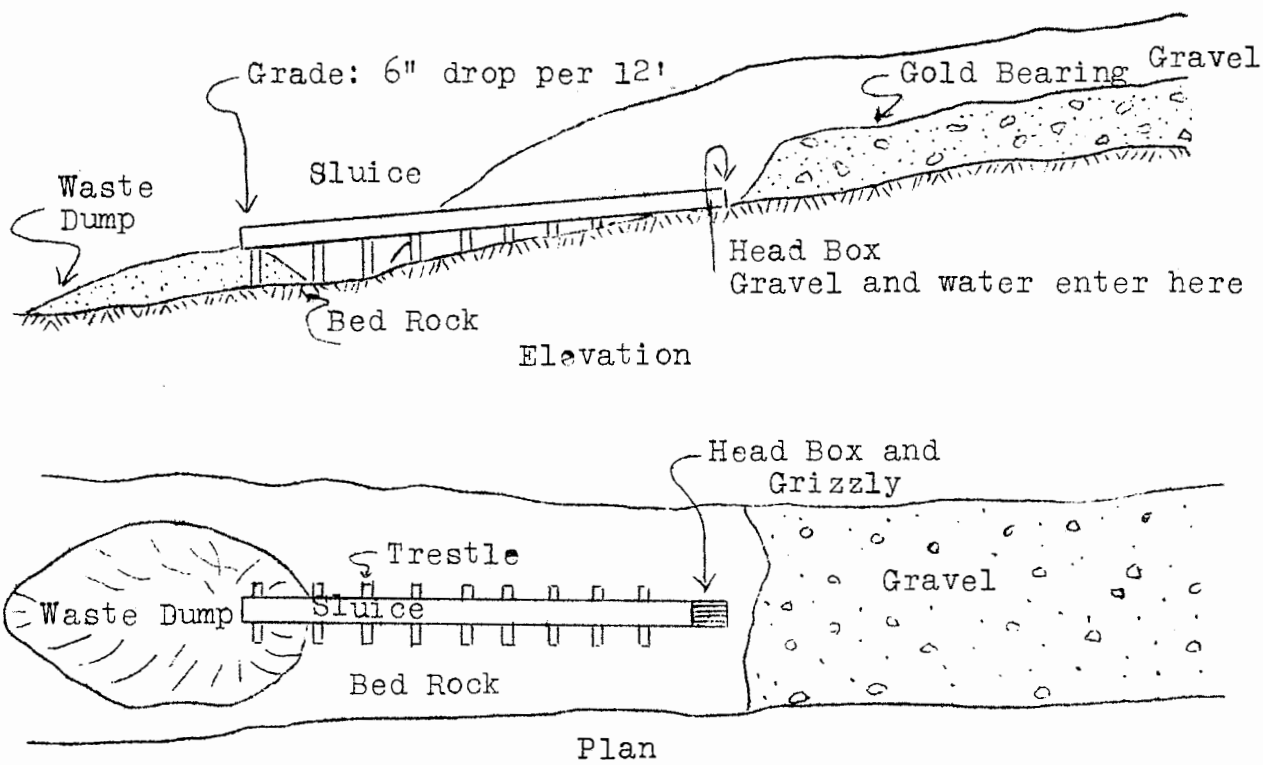


Figure 6. Sluice Lay-Out

length. A screen is placed over the end of the sluice box so that only the sands and fine gold can get onto the table. The table is divided into sections eight feet wide, and each half covered with burlap tightly stretched. The material is allowed to flow over one half for about 12 hours. Then it is changed to the other side. The burlap is (then) removed and washed off in a tub.

"In some instances, mercury may be placed back of the riffles in the boxes near the discharge end of the sluice. This helps to retain the fine gold through amalgamation. If the gold is not clean, it will not amalgamate.

"It may be necessary to elevate parts of the sluice on trestles or other devices to maintain approximately a grade of six inches drop for each twelve feet of sluice.

"The riffles should not be fastened in the sluice box permanently as it is necessary to remove them for the clean up. They may be held in place by nailing the side boards of the box to the ends of the riffles. The nail should not be driven all the way in. Or they may be wedged in place.

"Clean up:

"The frequency of the clean up depends upon the richness of the gravel being washed. It may vary from a few days to the entire season. The first few riffles should be cleaned up at least once every two weeks. In making the clean up the gravel is discontinued and a stream of water, just large enough to wash the heavy sands, mercury, and amalgam, is permitted to flow down the sluice.

"The riffles are taken up and the sand washed down the sluice. Occasionally, contents are scraped up with a spoon. All cracks and crevices are thoroughly clean. Blankets and burlap, that may have been used, are washed in a tub.

"Operation:

"In order to use a sluice, plenty of water must be available as a continuous stream is run through the system. If sufficient water is not at hand, it is useless to construct the sluice. For large scale operations, water may be brought to the gold-bearing deposit by means of a flume.

"The gravel is shoveled onto the grizzly at the head box and the water run over it. The oversize is raked or shoveled off to one side. The amount of water flowing down the sluice should be just enough to wash the gravel, passing through the grizzly, over the riffles, and out the end of the sluice. For this reason, the grizzly bars should not be spaced too far apart. If so, the velocity of the water may have to be so great as to prevent the settling of the fine gold. When the wooden riffles become so worn that they no longer hold back the heavy sands, they should be replaced. This condition exists when the riffles become rounded or are worn thin.

"Figure 6 illustrates the method of working a gravel bed where it is not necessary to elevate the material.[1]

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1. Staley, pp. 9-10.

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