March 5, 1929. J. STEPHAN 1,704,265

CONCENTRATOR

Filed Dec. 5, 1927 2 Sheets-Sheet 1

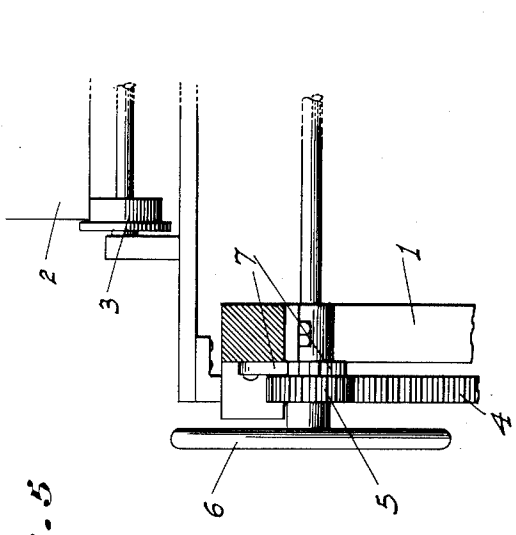



Fig. 5




Fig. 1

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CONCENTRATOR

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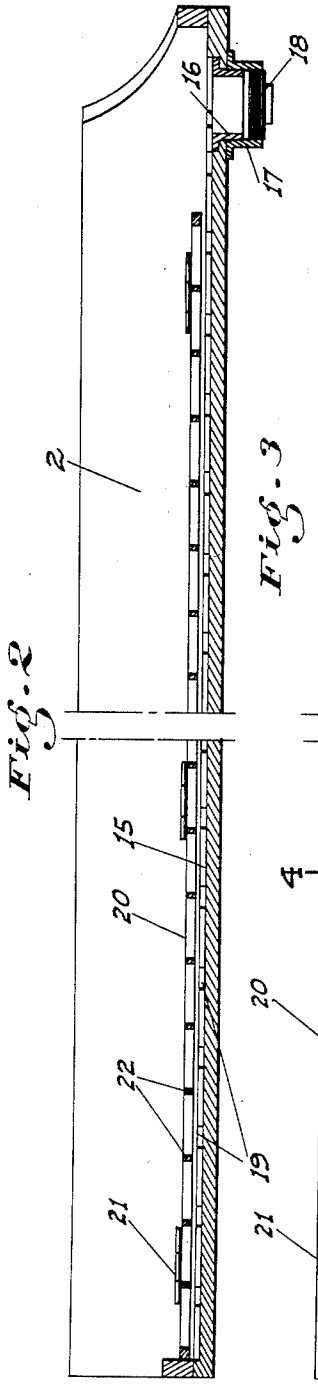



Fig. 2

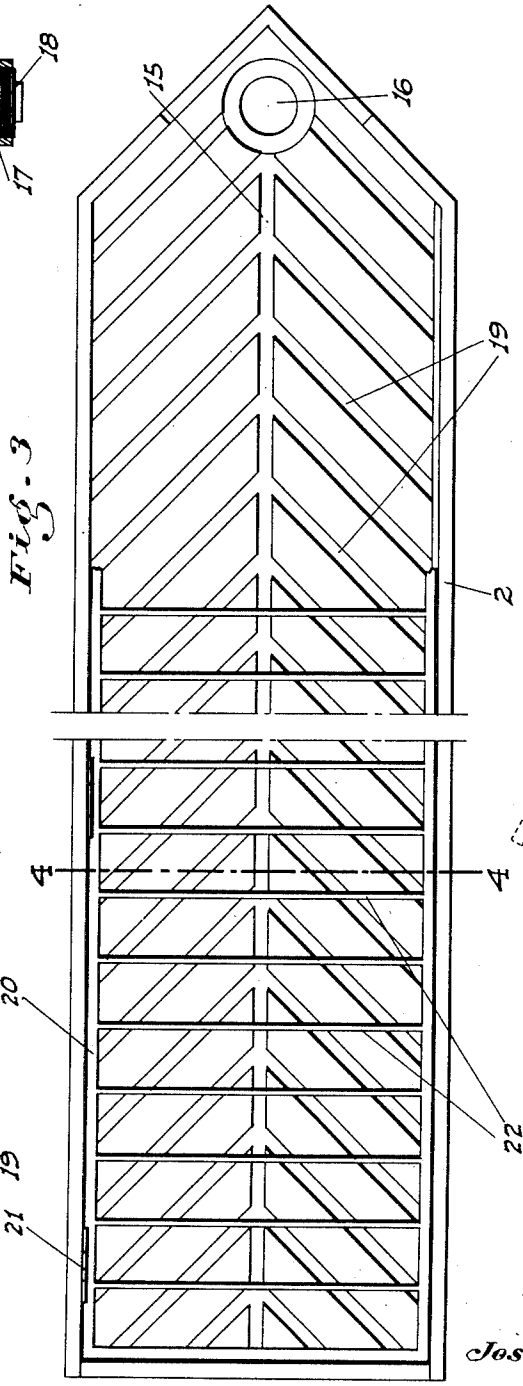



Fig. 3

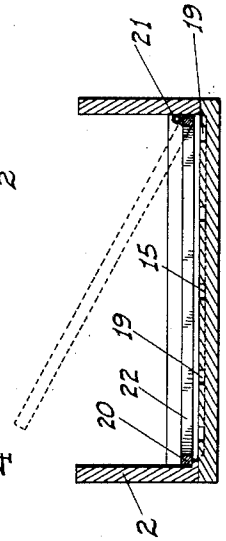



Fig. 4

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Patented Mar. 5, 1929. 1,704,265

# UNITED STATES PATENT OFFICE.

JOSEPH STEPHAN, OF CHICO, CALIFORNIA.

## CONCENTRATOR.

Application filed December 5, 1927. Serial No. 237,795.

This invention relates to the mining industry and particularly to the concentration and saving of precious metals by the placer process.

The principal object of my invention is to provide a concentrator so constructed and arranged that it will handle more gravel with comparatively little water and with a smaller loss of gold, etc., than is the case with any device at present in operation, and without the expensive process of amalgamation being resorted to.

As far as I am aware the most efficient method at present in use for saving values with the placer process is the old fashioned pan, yet skilled operators of such pans cannot possibly save gold in particles finer than 1000 to 1¢ of value, and the saving of finer particles or of what is known as flour gold has been considered impracticable without using the amalgamation method. With my improved concentrator on the other hand, values up to 3000 particles per 1¢ may be saved, with a possible loss not exceeding 1%.

A further object of the invention is to treat the wood of which the floor of the concentrator is made so that it is waterproof, will not warp, swell, nor open at the pores and is hardened so that it will last indefinitely in service. This is an important feature since wood which tends to warp or open up and to be scored impairs the concentrating action, and causes a large percentage of the minute gold particles to be lost.

My special treatment of the wood also renders any gold particles thereon easily seen.

Due to the special features of construction of the concentrator, its mode of operation and control as will be clearly seen from a perusal of the following description, it has been proved to be capable of retaining all precious metal particles to the fineness of 3000 particles to 1¢ of value, without an amalgamation process or extensive technical training on the part of the operator being necessary.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specifications and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Fig. 1 is a side elevation of the concentrator showing the preferred method of mounting the same.

Fig. 2 is a longitudinal section of the concentrator.

Fig. 3 is a top plan view of the same.

Fig. 4 is a cross section taken on the line 4—4 of Fig. 3.

Fig. 5 is a fragmentary end view of the table elevating mechanism.

Referring now more particularly to the numerals of reference on the drawings, the apparatus comprises a suitable frame 1 on which the concentrator 2 is mounted. This concentrator is a long and relatively narrow sluice-like structure preferably set at a slight downward angle to a horizontal plane toward its discharge end. Adjacent its upper end the concentrator is supported for longitudinal movement in a fixed horizontal plane by rollers 3 which are mounted in connection with vertical racks 4 and slidable relative to the frame. The racks are raised and lowered by means of pinion 5 engaging the same and mounted in connection with a hand wheel 6; a pawl and ratchet mechanism 7 of common character being employed to prevent undesired downward movement of the racks. Toward its lower end the concentrator is supported by a rocking arm 8 pivoted thereon at its upper end and onto the frame 1 at its lower end. An arm 9 is connected to the arm 8 in common with the pivotal connection of said arm with the frame and extends lengthwise of the concentrator to one side of the same. At its free end the arm 9 is engaged by a cam 10 mounted on a transverse shaft 11 disposed above the concentrator. This shaft is driven at a suitable speed from any desired source of power through the medium of a longitudinally extending shaft 12 connected to the shaft 11 by gearing 13 or the like. A spring 14 between the arm 9 and the frame acts to constantly maintain said arm engaged with the cam. The arms 8 and 9 and the operating mechanism of the latter are so arranged that as the arm 8 is intermittently moved or oscillated by the cam controlled movement of the arm 9, the concentrator will move back and forth through a short distance and with each stroke of the arm 8 the concentrator will be raised some-

what at the end to which said arm is connected, so that the slope of the concentrator is intermittently lessened for the purpose hereinafter seen. The shape of the cam is such that the concentrator movement will take place with a sharp kick-like action.

The floor of the concentrator is provided with a longitudinal centrally located groove 15 extending from end to end thereof and leading to an outlet at the lower end of the floor. This outlet is preferably in the form of a flange fitting 16, the flange of which is countersunk into the floor so that it is level with the bottom of the groove as shown in Fig. 2. Another flange fitting 17 is connected to the fitting 16 from below the floor, the fitting 17 having a plug 18 therein removable from below. This device forms a discharge from which the valves pass from the various grooves during the clean-up, the plug being then removed.

Extending laterally of the floor and leading from the central groove to the sides of the concentrator are other grooves 19 parallel to each other. These grooves are arranged in opposed angle or herringbone fashion, the slope toward the central groove being in the direction of the outlet. The end of the concentrator at the outlet is preferably parallel to the grooves 19 as shown in Fig. 3, so as to avoid the formation of any blind corners or pockets.

Mounted in the concentrator a short distance above the floor is a frame 20 hinged to the concentrator along one side as at 21 so that it may be raised to a vertical position. Transverse riffle bars 22 are mounted on the frame 20 and extend in suitably spaced relation lengthwise of the concentrator for practically the full length thereof. The sides of the concentrator are of any desired height but the ends are low so as to hold only a shallow layer of water above the riffle bars.

The floor of the concentrator is treated in a particular manner. This floor is made of wood preferably of maple or any other hard wood, the grooves being first cut therein. After the grooves are cut the floor is sponged with boiling water. It is then kiln dried and sanded. The wood is then submerged in a solution of black nigrosene aniline dye and vinegar and is boiled until the wood is dyed through its entire thickness. The wood is then again kiln dried and is then submerged and boiled in a mixture of 50% glycerine and 50% raw linseed oil. All surplus oil is then drained off the wood and the same is wiped clean and is then left to dry in a natural way. The floor is put through the above process to first get the desired jet black effect clear through the wood, to water-proof the same and to add approximately 30% to its strength, toughness and durability. This treatment also prevents swelling and warping of the wood and opening of the pores. The initial boiling brings any pitch to the surface and the subsequent sanding removes such pitch, etc. Treating the wood with the dye enables any gold particles thereon to be quickly seen and the dye being entirely permeated through the wood eliminates any wearing off of the black color being possible such as would be the case if the wood were merely surface stained.

The concentrator is positioned on the frame so that it receives the material to be concentrated together with a certain amount of water at its head end from the initial separating unit 23.

In operation the sand or gravel, together with a certain amount of water, coming from the initial separating unit, are discharged into the concentrator at the head end thereof as above stated and for the full width thereof, the concentrator being constantly agitated as previously described by the movement of the arm 8. The concentrator having a normal downward slant toward the sump, a gentle flow of the water toward the sump is of course set up. Owing to the raising and back-kick movement intermittently imparted to the concentrator, which reduces the slope of the same, the flow of water is momentarily retarded causing a flushing action to be had when the slope is restored. This movement of the concentrator in connection with the positioning of the riffle bars (which permit a gentle flow of water along the concentrator above the floor and under said bars) causes any metal particles mingled with the sand and water to settle and congregate in the lateral grooves. From these grooves the concentrated materials, consisting principally of solid metals, are removed during the clean-up. The particular positioning of the bars prevents the packing of black sand or other objectionable material which is acted on by said bars and is maintained in suspended relation in the water and is carried over the end of the concentrator along with the water.

The hinging of the grate frame in the concentrator enables said frame to be raised out of the way when it is desired to clean up the grooves of the floor of the concentrator.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claim.

Having thus described my invention what I claim as new and useful and desire to secure by Letters Patent is:

A concentrator including a substantially horizontal floor having a bottom outlet adjacent one end, lateral concentrating riffle-

grooves in the floor sloping in the direction of the outlet, and a central longitudinal riffle-groove connecting the adjacent ends of all said lateral grooves with the outlet, means supporting the floor toward one end to permit of longitudinal movement thereof, a longitudinally and upwardly movable member supporting the floor at its opposite end at a normal downward slope from end to end toward the outlet, and means for actuating said member in a manner to cause a longitudinal movement of the floor in a direction away from the outlet to be accompanied by a decrease in the slope of the floor.

In testimony whereof I affix my signature.

JOSEPH STEPHAN.