June 11, 1940.

W. W. GRAY

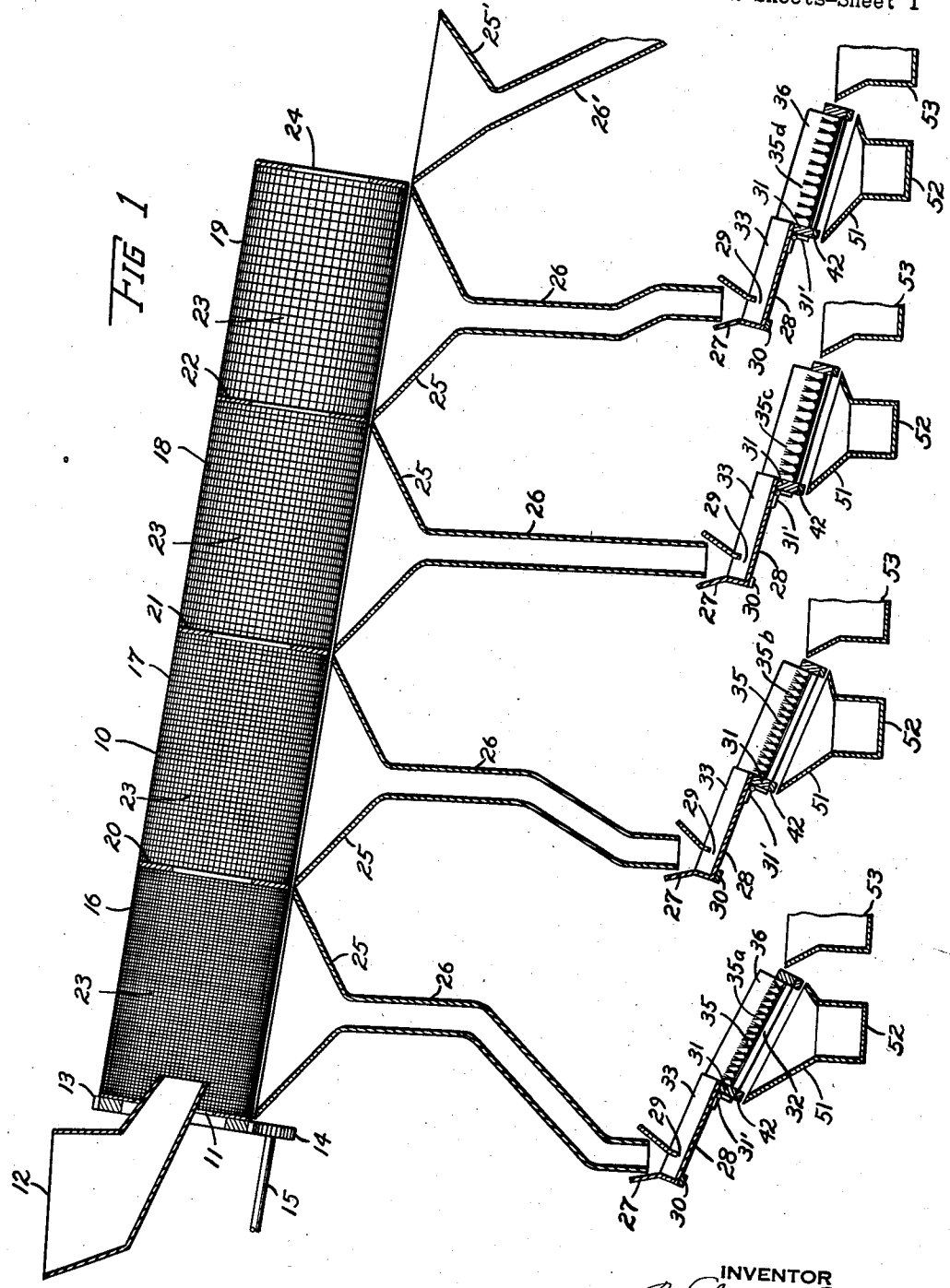
2,204,489

PLACER GOLD MINING DEVICE

Filed June 9, 1938

2 Sheets-Sheet 1

FIG 1



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2 Sheets-Sheet 2

FIG 2

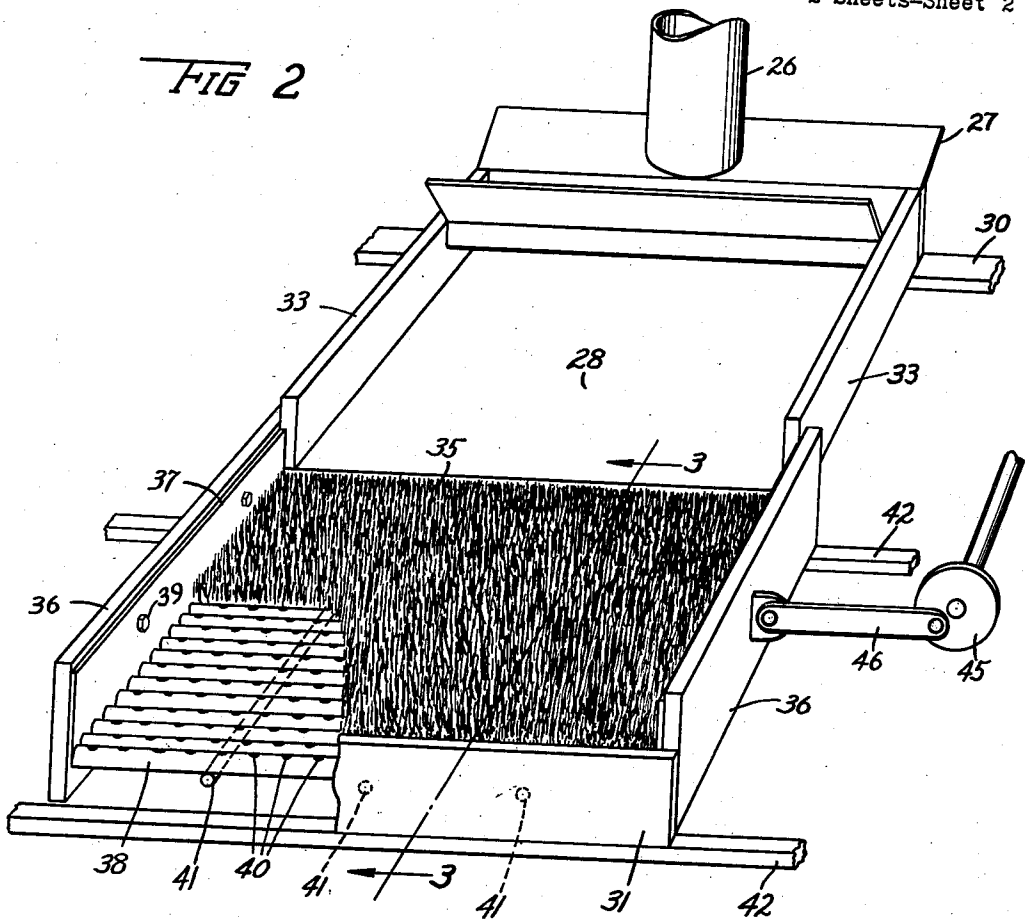
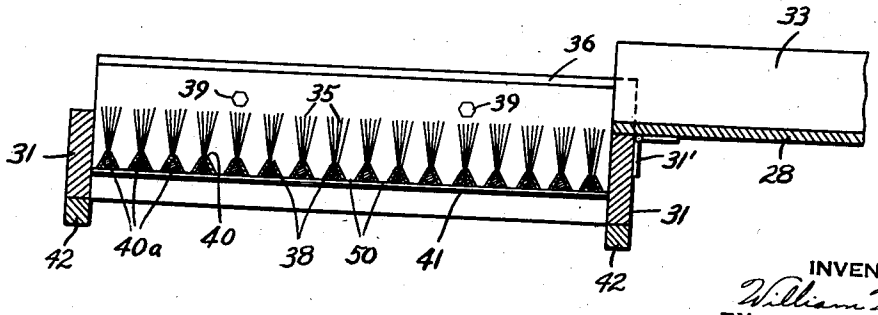


FIG 3



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UNITED STATES PATENT OFFICE

2,204,489

PLACER GOLD MINING DEVICE

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Application June 9, 1938, Serial No. 212,766

9 Claims. (Cl. 209—479)

This invention relates to mining and more particularly to a process and apparatus for the dry placer mining of gold and other values.

In the placer mining of gold and the like the values are found in mechanical mixture with rocks, gravel, sand and other undesired materials, and since the values form a relatively small proportion of the mixture it is necessary for economical reasons to effect a substantial separation of the values from the other material at substantially the place where the placer deposit is found. When the placer deposit is located within or near a stream or other available supply of water the water may be used to assist in the separation of the values from the waste material, such as in the panning process of the prospector, and several types of fairly successful apparatus have been developed for this purpose. In other sections of the country, however, in which substantial placer deposits of gold and the like are found in locations, there is no available water supply. Thus in certain mountainous sections of the Rocky Mountains gold in the form of nuggets of various sizes is found in mixture with rock, shale, gravel and the like in localities where there is either no water nearby or that which is nearby is not available for mining use. So also in certain sections of the desert, gold, generally in the form of fine grains or flakes and of a size substantially smaller than the nuggets found in mountainous regions, is found in mixture with the sand and other deposits of the desert. While the process and apparatus of the present invention are adapted to be successfully used in the mining and separation of values in the presence of water, it is of particular utility in the field of dry placer mining where the placer deposits occur in localities which are often relatively inaccessible and in which there is no available supply of water.

It is, accordingly, a primary object of the invention to provide a simple and inexpensive process adapted to be used in the dry placer mining of gold and other values and providing for the separation of values in a dry or substantially dry state.

A further object is the provision of a process in which placer deposits of gold or other values having different sizes ranging from a fine grain or flake to a relatively large nugget are separated from a substantial portion of the rock, gravel, sand and the like with which it is mixed for the economical transportation thereof or other use to form a greatly enriched or concentrated product, and in which no water or other liquid is required to effect such separation.

A further object is the provision of a dry placer mining process which requires no water or other liquid and which provides for the continuous discharge of the separated values and the tailings into separate receptacles or the like.

A still further object is the provision of simple and inexpensive apparatus adapted to carry out the process of the invention.

Other objects and advantages will be apparent from the following description, the appended claims, and the accompanying drawings, in which:

Fig. 1 is a schematic illustration of apparatus adapted to carry out the entire process of the invention;

Fig. 2 is a perspective view, partly broken away, of a riffle and shaker feed plate constructed in accordance with the invention and adapted to be used in the process of Fig. 1; and

Fig. 3 is an enlarged section taken substantially along the line 3—3 of Fig. 2 and showing the construction of the riffle in greater detail.

In accordance with the invention the mixture of values and waste material which comprises rock, gravel, sand and the like is first divided according to size into a plurality of fractions or grades in each of which the values and the waste material are of substantially the same size. For this purpose the mixture as it comes from the placer deposit may be successively passed through a plurality of screens having different sized openings therein to cause the mixture to be separated into a plurality of graded or classified fractions in each of which the size of the values is substantially the same as the size of the waste material. Each of these fractions is then separately fed to the upper end of an inclined reciprocating shaker plate which causes the classified mixture of values and waste material to spread out across the surface of the plate and flow downwardly in a relatively thin stream at the lower side of the plate. The shaker plate continuously feeds the relatively thin stream of values and waste material to an inclined riffle surface which comprises the tops of a plurality of relatively stiff, elongated bristles, preferably of metal wire, which are supported in a substantially upright position and have spaces between upper ends of the bristles of a size substantially the same as and coordinated with the size of the values and the waste material fed thereto. The riffle is vibrated or reciprocated in a direction substantially transverse to the movement of material thereover and this reciprocation together with the inclination of the riffle causes the mixture of values and waste ma-

terial to move over the top of the riffle in a relatively thin stream. The stream of values and waste material which is fed to the riffle by the shaker plate and passes thereover preferably comprises a single layer of the sized material as distinguished from a deep bed of the product. The inclination of the shaker feed plate and the inclination of the riffle surface may be separately adjusted to provide the desired thinness in the stream of material fed to the riffle and to effect the continuous passage of material over the bristle surface in a substantially uniform thin layer. The vibration of the riffle causes the values which are of relatively heavy specific gravity compared to the waste material mixed therewith to work their way downwardly into and through the spaces between the bristles, while the relatively lighter waste material is maintained on top of the bristles and passes downwardly over the surface formed by the tops of the bristles. Openings are provided in the riffle at the lower end of the bristles to provide for the continuous discharge of the values into a suitable receptacle or the like. The tailings of waste material which have passed downwardly over the top of the bristle surface are discharged at the remote end of the riffle into a suitable trough or the like for disposal as desired.

In the preferred form of the invention the mixture of values and waste materials from the placer deposit are continuously fed to the screens and the classified fractions of values and waste material are continuously fed to a plurality of separate reciprocating shaker plates which continuously feed the segregated fractions to a plurality of separate riffles of the character described. In this manner each of the sized fractions is simultaneously processed to separate the values from a substantial portion of the waste material and the values and tailings from each fraction are continuously discharged into their respective receptacles or the like. The number of screen sections and the size of the openings therein will depend upon the size of the gold or the like contained in the placer mixture, the important feature of this portion of the process being to obtain classified fractions of the mixture in which the values and the waste material are of substantially the same size. Thus in mountainous regions where the nuggets vary from a very small to a relatively large size a relatively large number of screens having different sized openings therein may be required to provide the desired separation into fractions. In other localities such as in the desert where the particles of gold or other values are usually very fine and of substantially uniform size a single separation into a sized fraction and the tailings may be found satisfactory. It will be evident from the foregoing that only such screened fractions as contain an economical quantity of gold will be passed to a shaker plate and riffle. Where, however, the deposit contains or may contain values of larger sizes the tailings from the screening operation may be also fed to a shaker plate and riffle.

The process as thus described requires no water or other liquid and is accordingly particularly adapted for use in dry placer mining and in localities where water is not available for mining use. The apparatus required to carry out the process is simple, inexpensive, and may be made in relatively small sections of light weight which can be readily transported by pack or hand to relatively inaccessible places. The process effects a substantial separation between the values and the waste material providing a greatly enriched product as compared with the original deposit, and thus provides for a dry placer mining operation in which the values may be economically transported over a relatively long distance for further purification and for the ultimate recovery of the pure gold.

Referring to the drawings which illustrate a preferred embodiment of apparatus adapted to carry out the process and in which like reference numerals designate like parts in the several views, there is shown a cylindrical screening device **10** which is inclined to the horizontal and is provided at its upper end with an opening **11** adapted to receive the discharge end of a hopper **12**. The screening device **10** is supported for rotation about its axis by any suitable means (not shown) and is illustrated as being provided with an annular gear **13** adapted to mesh with a pinion **14** carried by a shaft **15**. The shaft **15** is rotated by any suitable means to effect rotation of the cylindrical screening device about its axis.

The screening device **10** is divided into a plurality of screening sections **16**, **17**, **18** and **19** respectively which are preferably separated by means of baffles **20**, **21** and **22**. Each of the screening sections is provided with a plurality of screening apertures **23** which are of a different size in each of the sections. In the type of screening device illustrated in the drawings, the apertures **23** in the screening section **16** will be relatively small, those in the section **17** somewhat larger, those in section **18** still larger and those in section **19** of an even larger size. Thus as an example the screening apertures in the upper section **16** may be approximately the size of a pinhead while those in the lowermost section may have a diameter of ¾ of an inch or more. It will be evident from the foregoing description of the process, however, that these sizes are merely illustrative, and that the actual sizes of the screening apertures as well as the number of screening sections will depend upon the size of the values which are found in the placer deposit with which the apparatus is to be used. The screen device is provided with an opening **24** at its lower end for the discharge of the particles of values and waste material which are too large to pass through the apertures in the last screening section.

Hoppers **25** catch the sized material as it passes through the various screen sections and discharge it into ducts **26** which convey it to a trough **27** provided on a shaker feed plate **28**. Each of the screening sections is provided with a separate hopper which continuously feeds the sized material through the ducts **26** to a separate shaker feed plate. Referring to Figs. 1 and 2 it will be seen that the trough **27** is provided with an opening **29** which permits the sized mixture of values and waste material to pass onto the shaker feed plate **28**. The shaker plate is inclined downwardly from the trough **27** and is adjustably supported by any suitable means such as the guide bar **30** and one side wall **31** of the riffle **32** and is adapted to be laterally reciprocated to cause the material fed thereto to spread out over the surface of the plate and work downwardly in a relatively thin stream, preferably comprising at the lower end a single layer of sized material. Suitable means (not shown) may be provided for adjusting the tilt or inclination of the shaker feed plate to provide the desired thinness of

feed at the lower side. Side members 33 prevent the material from spilling over the sides of the shaker plate.

The shaker plate continuously feeds the thin stream of values and waste material to a surface of the riffle 32 which comprises the upper ends of a plurality of relatively stiff, elongated, brush-like bristles 35. The bristles are preferably constructed from steel wire or the like and are supported substantially upright in the riffle with spaces therebetween at the upper ends of substantially the same size as the size of the values and waste material which are fed to the riffle by the shaker plate 28. Thus in the riffle 32 which is connected to the fine screening section 16 the upper ends of the bristles are relatively close together as indicated at 35a in Fig. 1 to provide spaces between the bristles which correspond in size to the apertures 21 in the screening section 16. The bristles in the riffle connected to the screening section 17 are spaced farther apart at the upper ends as indicated at 35b in Fig. 1 to provide openings corresponding with the openings in this screening section. The riffles which receive the sized material from the screening sections 18 and 19 have openings between upper ends of the bristles which are spaced correspondingly farther apart, respectively, as indicated at 35c and 35d in Fig. 1, to provide spaces therebetween corresponding to the size of the material fed thereto through the openings in these screening sections. The bristles are supported in tufts as shown in Figs. 1 and 3, and in the riffles adapted to receive the finer material the upper ends of the individual bristles are spread apart to provide the desired spacing therebetween as indicated at 35a and 35b in Fig. 1, whereas in riffles adapted to receive coarser material the tufts themselves may be spaced apart to provide the desired spacing therebetween as shown at 35c and 35d in Fig. 1. The bristles adapted to receive the finer material are preferably made of finer wire, or the like, and shorter than those adapted to receive the coarser material, and in Fig. 1 the bristles 35a and 35b are illustrated as being shorter and finer than the bristles 35c and 35d. The length and fineness of the bristles may be varied and graduated as desired or as may be found necessary to effect the continuous separation and discharge of values and waste material.

Referring to Figs. 2 and 3, the riffle is shown as comprising side walls 31 and end walls 36. Metallic plates 37 are attached to the end walls 36 and carry a plurality of transversely extending tuft-supporting bars 38. The plates 37 are attached to the end walls by any suitable means such as bolts 39. The bars 38 are preferably constructed from sheet metal and are substantially V-shaped in transverse cross-section as shown in Fig. 3. The V-shaped bars are attached to the metallic plates 37 by any suitable means such as soldering, welding and the like and are supported in the riffle with the apex portions thereof towards the top of the riffle. The bars 38 are provided with a plurality of apertures 40 which are adapted to receive the lower ends of the bristle tufts and support the bristles in the riffle. The apertures in adjacent bars are preferably staggered as illustrated in Fig. 2, and the bristle tufts extend through the apertures and are secured to the bars 38 by any suitable means such as solder 40a or the like which secures the lower ends of the bristles in the interior of the inverted V-shaped bars. Spaced reinforcing rods 41 extend between the side walls 31 of the riffle beneath the inverted V-shaped bars 38 and serve to support the latter. The bars 38 are preferably soldered or otherwise attached to the rods 41 to provide a rigid structure. The rods 41 are preferably round as illustrated to prevent the accumulation of values thereon.

The riffle is inclined to the horizontal to provide a downwardly sloping surface over which the material fed to the tops of the bristles passes. This surface which is defined by the bristle tops may have the same inclination as the shaker feed plate which feeds the material to the riffle or it may have a greater or less inclination as found necessary in the operation of the device. In Fig. 1 the riffle surface 35b is illustrated as having a greater incline than the shaker feed plate 28 and the surface 35a is illustrated as having a still greater incline. In practice the inclination of the riffle surface will be adjusted to provide the desired continuous flow or movement of material in a relatively thin stream, preferably comprising a single layer of the material, over the tops of the bristles and to effect separation of the values in the spaces between the bristles. The riffle is supported in the inclined position by any suitable means such as the guide bars 42 which extend across the riffle beneath the side members 31 and are provided with suitable means (not shown) for adjusting the tilt of the riffle. In order to cause the waste material to pass continuously downwardly over the tops of the bristles and to effect separation of the values therefrom by causing the heavier values to pass downwardly through the spaces between the bristles, the riffle is reciprocated or vibrated on the guide bars 42 by a suitable means such as the eccentric 45 and pitman 46. This reciprocation is in a direction substantially transverse to the movement of material over the tops of the bristles. The shaker feed plate 28 may be reciprocated by the same eccentric which reciprocates the riffle and for this purpose is shown as being supported at the lower side by one of the side members 31 of the riffle, as hereinabove described, and as having its end walls 33 engaged between the end walls 36 of the riffle. Hinge means 31' or the like may be provided to secure the shaker feed plate to the riffle and at the same time permit separate adjustment of the inclination of the plate and riffle. The side members 31 of the riffle terminate slightly below the plane or surface defined by the tops of the bristles while the end walls 36 extend upwardly a considerable distance above this plane to keep the material passing over the bristle surface from spilling over the ends of the riffle. In a riffle adapted to be supported at considerable inclination in use the bristles may be supported so as to slope towards the upper side member 31 of the riffle so that in the use of the device the bristles will stand substantially vertical with their tops defining a downwardly sloping surface over which the material passes, thereby facilitating the trapping of the values and the downward passage of the values in the spaces between the bristles for discharge at the lower ends thereof. This sloping of the bristles may be readily accomplished by mounting the inverted V-shaped bristle supporting bars 38 at the desired angles to the vertical and with the apexes thereof directed generally towards the upper side member 31.

To provide for the continuous discharge of the values separated from the waste material the bars 38 which support the bristles are spaced apart as

best shown in Fig. 3 to provide openings 50 therebetween through which the values may pass to be received within a hopper 51 of a suitable receptacle 52. The sloping sides of the triangular shaped bristle supporting bars 38 provide trough-like channels for directing the values towards the openings 50 between the bars. The tailings of waste material are continuously discharged from the lower side of the riffle which is remote from the shaker feed plate and pass over the side member 31 into a hopper 53 or the like to be disposed of as desired.

The operation of the apparatus will be apparent from the foregoing description. The screen member 10 is rotated by means of the shaft 15 and pinion 14 and a mixture of values and waste material directly from the placer deposit is continuously fed into the upper end of the screen member by means of the hopper 12. Owing to the inclination of the screen member the material fed thereto gradually works towards the lower end and during such travel is continuously agitated and tumbled by means of the rotation of the screening member. A mixture of values and waste materials sufficiently small to pass through the apertures of the first screening section 16 will be separated and this sized or classified fraction is passed to the first shaker plate 28 by means of the hopper 25 and duct 26. The material which is too large to pass through the apertures of the first screening section travels downwardly into the second screening section 17 where a fraction of larger sized values and waste material is separated and fed onto a second shaker feed plate. The remaining material feeds downwardly into the third screening section 18 where a fraction of still larger size is separated and fed to a third shaker feed plate. The remaining material passes into the lower screening section 20 where a fourth and larger sized fraction is separated and fed to the shaker feed plate of a fourth riffle. The tailings which remain are discharged through the opening 22 in the lower end of the screening member, and in the embodiment of the invention illustrated are received by a hopper 25' which feeds the tailings from which substantially all the values have been removed to a duct 26' for disposal as desired. The vibration of each of the inclined shaker feed plates causes the fraction of values and waste material fed thereto to spread out over the relatively wide surface of the plate and work gradually downwardly towards the lower side thereof where it continuously feeds in a relatively thin stream to the surface formed by the upper ends of the riffle bristles. As hereinabove pointed out it is preferable that the stream of material as fed onto the bristles from the shaker feed plate have a thickness corresponding to substantially a single layer of the sized material.

The inclination of the riffle together with the transverse vibratory movement thereof causes the material fed to the riffle to pass over the surface formed by the tops of the bristles and work downwardly toward the lower side thereof. During this travel the heavier values work their way into and through the spaces between the bristles and are thus separated from a substantial portion of the waste material which is of lighter weight and is retained on the tops of the bristles to pass over the bristle surface and be discharged at the lower side thereof. The vibratory movement of the bristles also causes the values which have been trapped within the spaces to work downwardly therebetween and be continuously discharged from the riffle by means of the openings 50 provided therein at the lower ends of the bristles. The discharged values are received in a suitable receptacle and may be further processed on the spot to further purify them or may be economically transferred over even a relatively long distance for such processing. Thus a placer deposit containing a relatively small proportion of gold particles therein may be so concentrated by the process and apparatus of the present invention that the concentration of gold to sand, gravel and the like may be so increased as to make it commercially practicable to transport the treated product to a point where the final recovery of the pure gold can be effected.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. An apparatus of the character described for the mining of substantially dry placer deposits of gold and the like, comprising means for continuously feeding a mixed fraction of values and waste material having the values and the waste materials of substantially the same size in a relatively thin stream, a riffle surface for receiving said fraction, said surface comprising the upper ends of a plurality of relatively stiff, elongated bristles maintained substantially upright and having spaces between bristles of a size coordinating with the size of the material received on said surface and adapted to permit values of relatively heavy specific gravity to pass downwardly therebetween while maintaining waste material of relatively lighter specific gravity on the tops thereof, means for reciprocating said riffle surface to cause said thin stream of values and waste material to pass over the tops of said bristles and to effect selective separation of values within said spaces between the bristles, means for continuously discharging values from the lower ends of said bristles, and means for continuously discharging tailings of waste material from a side of said bristle surface.

2. An apparatus of the character described for the mining of substantially dry placer deposits of gold and the like comprising means for feeding a mixed fraction of values and waste materials having the values and waste materials of substantially the same size in a substantially dry state and in a relatively thin stream to the upper side of a downwardly sloping riffle surface, said surface comprising the upper ends of a plurality of relatively stiff, elongated bristles maintained substantially upright and having spaces between the bristles of a size substantially the same as the size of the values and waste material fed thereto, means for reciprocating said riffle surface to cause said thin stream of values and waste material to pass downwardly over the tops of said bristles and to effect selective separation of values within said spaces between the bristles, means for continuously discharging values from the lower ends of said bristles, and means for continuously discharging tailings of waste material from the lower side of said riffle surface.

3. An apparatus of the character described for the mining of substantially dry placer deposits of gold and the like comprising means for feeding a

mixed fraction of values and waste material graded according to size and having the values and the waste material of substantially the same size in a substantially dry state to the upper side of a separate vibratory downwardly sloping shaker plate means adapted to cause the values and waste material to spread out and continuously feed downwardly in a relatively thin stream at the lower end thereof, a riffle supported adjacent the lower end of said shaker plate means to receive the mixture of material fed therefrom and having a downwardly sloping surface comprising the tops of a plurality of relatively stiff, elongated bristles maintained substantially upright and having spaces between bristles of a size substantially the same as the size of the values and waste material fed thereto, means for reciprocating said riffle and shaker plate means in a direction substantially transverse to the movement of material thereon to cause the material to feed downwardly over the tops of said bristles and to effect selective separation and downward movement of values within said spaces between the bristles, said riffle having a plurality of openings in the bottom thereof adjacent the lower ends of said bristles to provide for continuously discharging values, and means for continuously discharging tailings of waste material from the lower side of said bristle surface.

4. In an apparatus of the character described for utilization in the mining of substantially dry placer deposits of gold or the like and adapted to provide for the separation of values from waste material without the addition of water or other liquid, a riffle comprising side and end walls, a plurality of stiff, elongated wire bristles supported substantially upright within said side and end walls to provide a brush-like riffle surface at the upper ends of the bristles adapted to receive a mixture of values and waste materials of a predetermined size, said riffle surface lying in a plane which is raised slightly above the tops of said side walls, means for supporting said bristles at the lower ends thereof, said bristles being arranged with spaces therebetween which define value segregating openings of a predetermined substantially uniform size in said brush-like riffle surface and which provide for the downward passage of the separated values within said spaces, the size of said value segregating openings in the riffle surface being coordinated to the predetermined size of the material adapted to be received on said surface to effect selective separation of values within said openings, and said bristle supporting means having openings therein to provide for continuous discharge of values adjacent the lower ends of said bristles.

5. In an apparatus of the character described for utilization in the mining of substantially dry placer deposits of gold or the like and adapted to provide for the separation of values from waste material without the addition of water or other liquid, a riffle comprising side and end walls, a plurality of substantially V-shaped bars extending between said end walls and arranged with their apex towards the top of said riffle, said bars being spaced apart to provide openings therebetween, each of said bars having a plurality of spaced apertures therein at the apex portion thereof, a plurality of stiff elongated bristles arranged in tufts and having the lower ends thereof passing through said apertures and received within the V-shaped portion of said bars, means within said V-shaped portion of the bars for securing the lower ends of said bristles therein, said bristles extending substantially upright and providing at the upper ends a brush-like riffle surface adapted to receive a mixture of values and waste materials of a predetermined size, said bristles being arranged with spaces therebetween which define value segregating openings of a predetermined substantially uniform size in said brush-like riffle surface and which provide for the downward passage of the separated values within said spaces, the size of said value segregating openings in the riffle surface being coordinated to the predetermined size of the material adapted to be received on said surface to effect selective separation of values within said openings, said riffle surface lying in a plane which is raised above the tops of said side walls, and said end walls being provided with extensions rising above the riffle surface formed by the tops of said bristles.

6. In an apparatus of the character described for utilization in the mining of substantially dry placer deposits of gold or the like and adapted to provide for the separation of values from waste material without the addition of water or other liquid, a riffle comprising a frame, a plurality of relatively stiff elongated bristles arranged in tufts and mounted substantially upright in said frame with the upper ends of the bristles providing a substantially flat resilient surface, means for supporting said tufts at the lower ends of said bristles with predetermined spacings between the tufts, said supporting means providing a plurality of openings in the bottom of said frame in direct communication with said spacings between said tufts, and said spacings between the tufts providing a plurality of openings of predetermined size in said resilient surface.

7. In an apparatus of the character described for utilization in the mining of substantially dry placer deposits of gold or the like and adapted to provide for the separation of values from waste material without the addition of water or other liquid, a riffle comprising a frame, a plurality of relatively stiff elongated wire bristles arranged in tufts and mounted substantially upright in said frame with the upper ends of the bristles providing a substantially flat resilient surface adapted to receive a fraction of values and waste material thereon, means for supporting said tufts at the lower ends of said bristles with predetermined spacings between the tufts, said supporting means providing a plurality of openings in the bottom of said frame in direct communication with said spacings between said tufts, and said spacings between the tufts providing a plurality of openings of predetermined size in said resilient surface, the size of said openings and the stiffness of said bristles being coordinated to the size of the work material adapted to be received on said resilient surface to provide for yieldingly receiving values of relatively heavy specific gravity within said openings while maintaining waste material of lighter specific gravity upon the top of said surface.

8. In an apparatus of the character described for utilization in the mining of substantially dry placer deposits of gold or the like and adapted to provide for the separation of values from waste material without the addition of water or other liquid, a riffle comprising a frame, resilient members arranged in said frame to provide a riffle surface adapted to receive a fraction of values and waste material thereon, means for supporting said resilient members in said frame to provide a plurality of openings of predetermined size in

said surface adapted to yieldingly receive values therein, said suporting means providing a plurality of openings at the bottom of said frame communicating with said openings in said surface and providing for discharge of values from said riffle, and said resilient members having an inherent stiffness sufficient to maintain waste material of relatively light specific gravity upon the top of said surface while providing for yieldably receiving values of greater specific gravity within said openings.

9. A value concentrating apparatus of the character described comprising means for feeding a mixture of values and waste material in a relatively thin stream, riffle means for receiving said mixture, said riffle means comprising a plurality of relatively stiff resilient members arranged to provide a substantially flat surface having a plurality of yieldable openings of predetermined size therein, the size of said openings and the stiffness of said resilient members being coordinated with the size of the work material received on said riffle means to provide for yieldingly receiving value of relatively heavy specific gravity within said openings while maintaining waste material of lighter specific gravity upon the top of said surface, means for vibrating said riffle means to cause said thin stream of values and waste material to pass over the top of said surface and to effect selective separation of values within said yieldable openings, means for continuously discharging values from the bottom of said riffle means, and means for continuously discharging tailings of waste material from said surface of the riffle means.

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