No. 825,758. PATENTED JULY 10, 1906.

S. J. ROGERS.

ORE SEPARATOR.

APPLICATION FILED JULY 29, 1905.

2 SHEETS—SHEET 1.

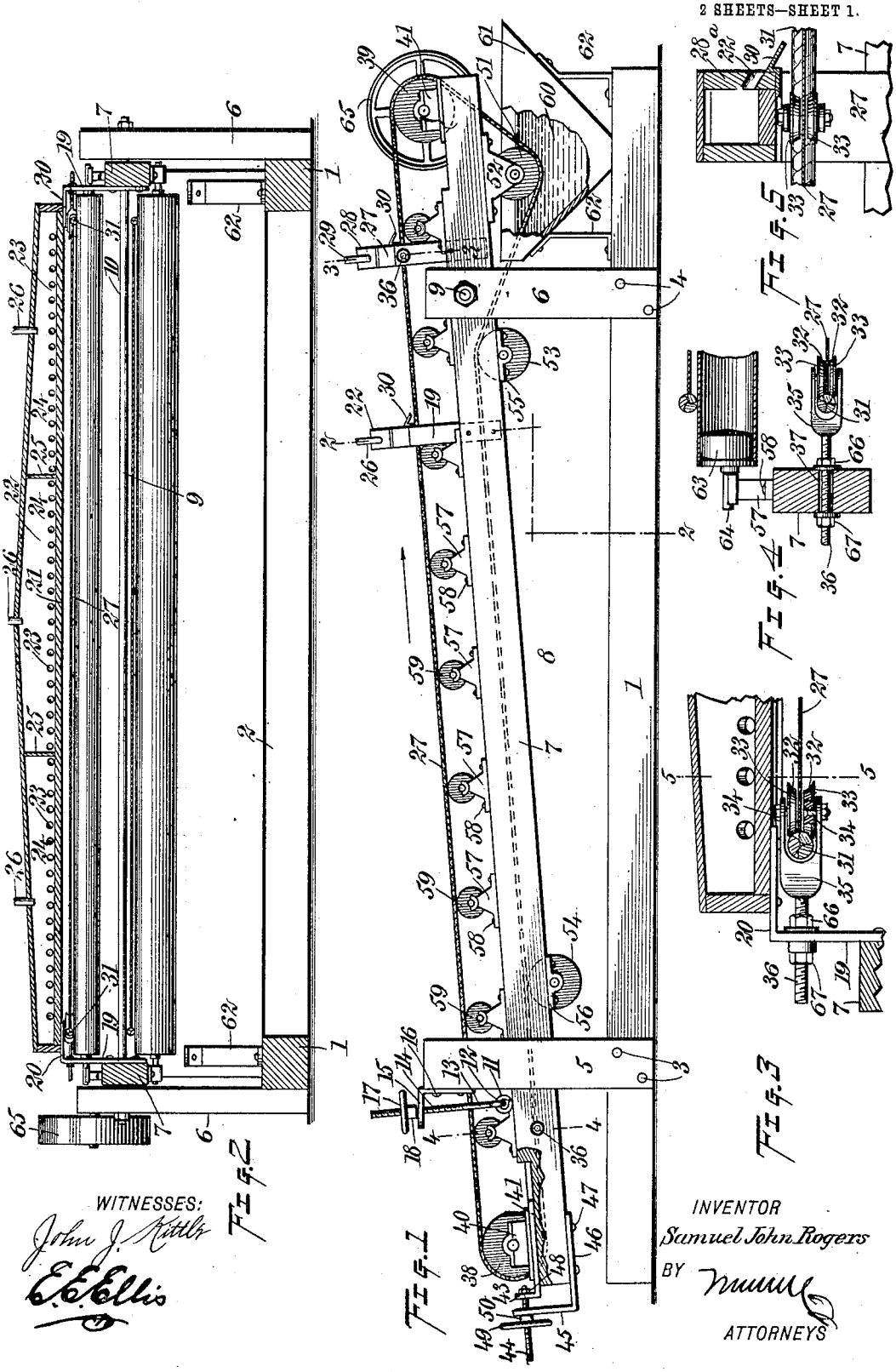


FIG. 1

FIG. 2

FIG. 5

FIG. 4

FIG. 3

WITNESSES:

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THE NORRIS PETERS CO., WASHINGTON, D. C.

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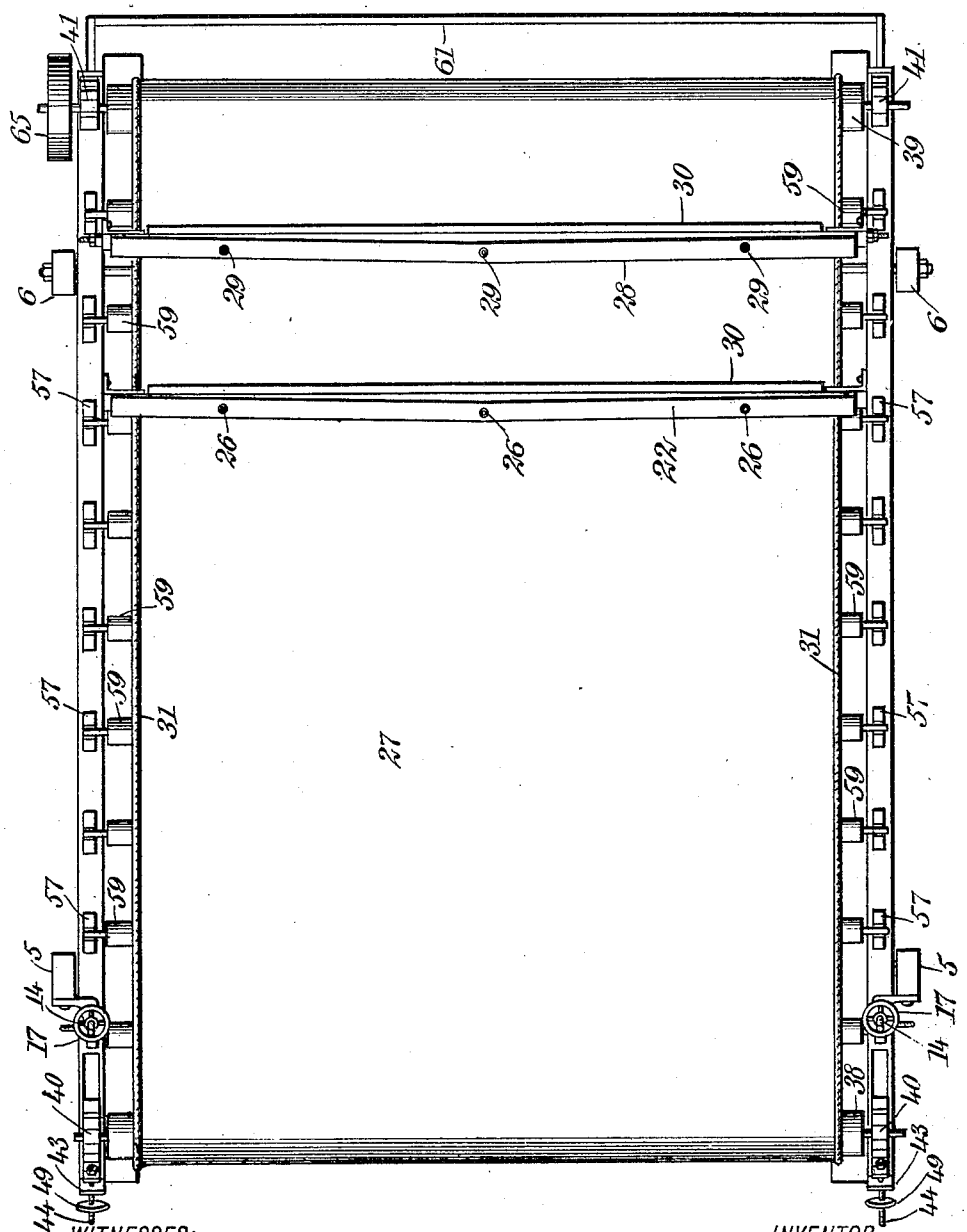


FIG. 5

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UNITED STATES PATENT OFFICE.

SAMUEL JOHN ROGERS, OF BINGHAM CANYON, UTAH, ASSIGNOR OF ONE-HALF TO JOSEPH LERWILL, OF BINGHAM CANYON, UTAH.

ORE-SEPARATOR.

No. 825,758. Specification of Letters Patent. Patented July 10, 1906.

Application filed July 29, 1905. Serial No. 271,783.

To all whom it may concern:

Be it known that I, SAMUEL JOHN ROGERS, a citizen of the United States, and a resident of Bingham Canyon, in the county of Salt Lake and State of Utah, have invented a new and Improved Ore-Separator, of which the following is a full, clear, and exact description.

This invention relates to ore-concentrators; and it consists, substantially, in the details of construction and combinations of parts, as will be hereinafter more particularly described, and pointed out in the claims.

The invention has reference more especially to apparatus for separating minerals from slimes; and one of the principal objects of the invention is to provide an apparatus of this kind of an embodiment to overcome numerous disadvantages and objections frequently encountered in the use of many other apparatus hitherto devised for similar purposes.

A further object is to provide an ore concentrating or separating apparatus which is simple and comparatively inexpensive to construct and operate, besides being thoroughly effective and reliable for its purposes and possessing the capacity for long and repeated service.

The above and additional objects are attained by means substantially such as are illustrated in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a partly broken side view of an ore-concentrating apparatus embodying my improvements. Fig. 2 is a transverse sectional view on the line 2 2 of Fig. 1. Fig. 3 is an enlarged detail view taken on the line 3 3 of Fig. 1. Fig. 4 is also an enlarged detail view taken on the line 4 4 of Fig. 1, and Fig. 5 is a transverse sectional view of Fig. 3 on the line 5 5. Fig. 6 is a top plan view of the apparatus.

Before proceeding with a more detailed description it may be stated that in the form of my improvements herein shown I employ an inclined frame of special construction, associated with which is an endless traveling belt of suitable material, onto which the ore pulp or slimes is fed or supplied, as presently explained, special means being employed for delivering the material to the belt and other special means being also employed for so washing the pulp or slimes upon the belt as to more readily effect the separation of the minerals therefrom by causing the tailings to flow or pass from the belt in a direction opposite to that in which the minerals are conducted.

Special means are employed in connection with the inclined frame by which to effect the raising or lowering of the lower end thereof from either side of the apparatus, thereby correspondingly raising or lowering the endless traveling belt, these adjustments being capable of being effected more delicately or exactly in proportion to the demands of the particular nature of the material to be acted upon.

Other special means are employed for maintaining the endless traveling belt in taut condition throughout its length, thus to aid in the more complete separation of the slimes from the tailings, suitable means being employed for guiding the belt as it travels in the direction of the lower end of the inclined frame to the upper end thereof.

In devising my improved apparatus I have had in mind the superior results to be derived from an apparatus of this kind, wherein the material acted upon is subjected to little or no agitation, such as results from a great many similar apparatus at present in use, and from the description hereinafter following it will be seen that the operation of the movable parts of my apparatus is uniform and steady, so that the ore pulp or material to be acted upon remains practically undisturbed when moving with the belt, thus permitting a more perfect settling of the mineral portions thereof, with a consequent better adherence of the minerals to the material of the belt.

My improved apparatus has a maximum capacity for given dimensions thereof, and while I have herein represented my improvements in a certain preferred embodiment it will be understood, of course, that I am not limited thereto in precise details, since immaterial changes therein may be resorted to coming within the scope of my invention.

Reference being had to the drawings by the designating characters thereon, 1 1 represent parallel base members of my improved ore-separating apparatus, which may be connected at the ends thereof by means of trans-

verse members 2. (See Fig. 2.) Secured to the sides of the said parallel members 1 1 at 3 and 4 are sets or pairs of oppositely-disposed uprights 5 and 6, between which are supported in any suitable manner parallel beams 7 of an inclined frame 8, said beams 7 being disposed a suitable distance apart and being connected together in any suitable way to maintain them rigid relatively to each other. A transverse rod 9 connects the parallel upright 6, said rod passing through the latter and through the said parallel beams 7 of the inclined frame 8 and constituting the pivotal support for the said frame at the upper or higher end thereof, as indicated in Fig. 1. Each of the said parallel beams 7 is provided at its upper edge near the lower end thereof with a loop or ring 11, in which is received the lower bent or crooked end 12 of an upwardly-disposed rod 13, screw-threaded at 14 for the greater part of its length and extending through a suitable opening (not shown) therefor in a bracket 15, secured to the adjacent face of the corresponding one of the uprights 5 by means of bolts 16 or in any other suitable way. Each of the rods is provided with a hand-wheel 17, having a hub 18 resting upon the upper surface of the corresponding bracket 15, and it is apparent that whenever said wheel is turned in one direction or the other the lower end of the inclined frame will be correspondingly raised or lowered, it being obvious that in order to effect the raising and lowering of the said lower portion of the frame to a given extent on either side of the latter the rods 13 on the two sides of the frame should be adjusted equally.

Supported at suitable parts of the parallel members 7 of the inclined frame are parallel oppositely-disposed brackets 19, having horizontal members 20, on which are supported the end portions of the base or bottom 21 of a transversely-extending trough 22, in which the ore-pulp is fed, said trough being preferably closed both at the top and sides thereof, while the latter are of gradually-increasing height from the ends of the trough to the center thereof, thus to prevent sagging of the trough at the center, due to the weight of the ore pulp or material contained therein. What may be termed the "front" of the trough, or rather that side thereof which is located in the direction of the upper end of the inclined frame 8, is provided near the said base or bottom 21 with a plurality of outlet-openings 23, suitably spaced apart and of any desired dimensions. The interior of the said trough 22 is preferably divided into a plurality of compartments 24 by means of partitions 25, and each of said compartments is provided in the upper part thereof with a feed-pipe 26, through which the ore pulp or slimes is supplied thereto for the purpose of delivery to an endless traveling belt 27, through such of the aforesaid openings 23 in the trough as belong to the compartment. Also supported at suitable parts of the parallel members 7 of the inclined frame 8 and at a suitable distance in advance of the aforesaid brackets 19 are parallel oppositely-disposed similar brackets 27^a, which are in all respects identical in construction with the said brackets 19 and which support in parallelism with the trough 22 another trough 28, which is in all respects identical with the construction of the trough 22, excepting that the openings 22^a in the front or upper side thereof, corresponding to the aforesaid openings 23 in the front or upper side of the trough 22, are of slightly less diameter than the said openings 23. This trough 28 is for containing water, and the same may or may not be divided into a plurality of compartments similarly as is the trough 22, but nevertheless is provided with one or more inlet-pipes 29 for supplying fresh water to the trough.

Located or secured to the front or outer forward face of each of the said troughs 22 and 28, directly below the openings therein, is a transversely-extending downwardly-inclined shoe 30, the one for the trough 22 facilitating the even distribution of the pulp upon the surface of the endless traveling belt 27 and the one for the trough 28 being for the even distribution of the fresh water from said trough to the said surface of the belt.

As represented in Fig. 1, and more especially in detail in Figs. 3 and 4, it will be seen that the said endless traveling belt 27 is provided at the longitudinal or side edges thereof with cords or stays 31 of diameter considerably in excess of that of the thickness of the belt, said cords or stays forming guards at the edges of the belt for preventing the material fed to the belt from being displaced therefrom laterally from any cause during the operation of the apparatus. These cords or stays 31 are preferably approximately circular in cross-section, (see Fig. 3,) and each of them is received by the correspondingly curved or beveled faces 32 of a set of guide-pulleys 33, mounted to turn on pins 34, supported by the arms of a block 35, having a screw-threaded stem 36, as shown. There are two duplicate sets of these said guide-pulleys employed at opposite sides of the belt, the stems 36 to the blocks 35 of one of the duplicate sets thereof being supported in bearings 37 therefor in the lower portions of the parallel members 7 of the inclined frame 8, (see Fig. 4,) while the corresponding stems of the other duplicate set are supported in suitable bearings therefor in the parallel brackets 27^a, secured to the said parallel members of the frame, as hereinbefore explained, at a suitable distance from the upper or elevated end of the said frame. In this way the two duplicate sets of guide-pulleys referred to are disposed in such posi-

tion as that both the upper and lower movable portions of the belt 27 will be guided in the manner explained during the travel of the belt in the concentrating operations. The said belt is constructed of "duck" material, since the same has been found admirably adapted for the intended purposes thereof, due to the tendency of the mineral particles of the ore to adhere or cling thereto, which greatly facilitates the separation of said particles, as will be understood. The belt is carried by rollers 38 and 39, supported in bearings 40 and 41, applied to the upper edges of the parallel members 7 of the frame 8 at the lower and upper ends, respectively, of the said frame. Each of the said bearings 40 for the roller 38 is mounted upon a slidable plate 41, seated upon the base of a groove 42, formed in the upper edge portion of the corresponding member 7, said plate being provided with a branch 43, through which extends a screw 44, which also extends through an opening therefor in the branch 45 of a plate 46, rigidly secured by means of bolts 47, to the lower edge or under side of the same member 7. The inner end of this screw is provided with a nut 48, while beyond the branch 45 of the plate 46 the screw is provided with a hand-wheel 49, having a hub 50, which bears against the outer face of said branch 45, so that when either or both of the hand-wheels 50 are turned in the proper direction the plate or plates 41 will be caused to slide outwardly, and in this way the belt 27 will be tightened upon the rollers 38 and 39 in such manner as to move less freely. A reversal of the operation of one or both of the hand-wheels 49 will of course impart slack to the belt accordingly as may be required in the use of the apparatus. The lower movable portions of the belt 27 are also carried beneath a roller 51, supported in suitable bearings 52, secured to the lower edges of the parallel members 7, near the upper end of the frame 8, whence said portions of the belt pass over other rollers 53 and 54, also supported in suitable bearings 55 and 56 therefor, secured to the lower edges of the said parallel members 7 of the frame. The upper edges of the parallel members 7 are provided at intervals thereof with bearings 57, secured in place by means of bolts 58 and between which are supported transversely of the apparatus a series of bearing-rollers 59 for the upper movable portions of the belt, and it will be seen that by this construction and organization of parts the operative surface of the belt will be always maintained truly level, which is extremely advantageous in the separation of the mineral particles of the ore from the tailings. The said roller 51 partly extends beneath the surface of water 60, contained in a washing-trough 61, extending transversely of the apparatus and being suitably supported in position by uprights 62, secured to the base members of the structure. Each of the bearing-rollers 59 may be constructed in any suitable way, being preferably herein shown as consisting merely of pipes or tubes provided at each end thereof with a head 63, projecting from which is a journal 64, which is received in the appropriate one of the bearings 57 for the roller.

The belt 27 may be driven in any suitable manner—as, for instance, from a pulley 65 at the upper end of the frame 8, with which driving connection may be had from any suitable power.

The stems 36 of the said guide-pulleys 32 of the said two duplicate sets thereof are provided on opposite sides of the parallel members 7 of the frame 8 and the brackets 27, respectively, with nuts 66 and 67 (see Figs. 3 and 4) by the adjustments of which on said stems the said belt 27 may be made more or less taut transversely of the apparatus, accordingly as may be required in operation.

From the foregoing description it will be understood that as the ore-pulp is supplied to the trough 22 it is delivered from the latter through the openings 23 onto the upper surface of the belt 27, while at the same time fresh water is being delivered to the said surface of the belt through the corresponding openings in the front of the trough 27. In this way the tailings of the ore will be caused to gravitate or flow downwardly over the surface of the belt, (and may be collected at the lower end of the frame 8 in any suitable way,) while the slimes themselves or the available mineral portions of the ore will be carried upwardly with the belt, and such of said slimes or particles as do not fall from the belt at the upper end of the frame 8 will be caused to be washed therefrom as the movable portions of the belt are successively carried beneath the surface of the water in the said trough 61.

During the operation of the apparatus the belt (and consequently the material acted upon) is not subjected to any undue vibration, with the result that the separation of the ore is effected most economically and expeditiously. At any time desired the frame may be adjusted at its lower end to give to the belt any desired degree of inclination, thus to vary the extent of the separating operations, and it is thought that the effectiveness of my improvements will be thoroughly understood without further detailed explanation.

It is apparent that I am not confined to the dimensions or relative proportions of the different parts of the apparatus, since these may be required to be changed in accordance with the particular character of the material to be treated, as well as for other reasons.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An ore-concentrating apparatus, comprising a frame having side members, an endless traveling belt supported by the frame, a pair of oppositely-arranged brackets carried by the side members of the frame, adjustable guides for the edges of the upper run of the belt carried by said brackets and adjustable guides for the edges of the lower run of the belt carried by the side members of the frame.

2. An ore-concentrating apparatus comprising a frame having side members and movably supported in an inclined position, an endless traveling belt supported by the frame in a corresponding inclined position, oppositely-arranged brackets supported by the side members of the frame and extending upwardly therefrom, guides for the edge portions of the upper run of the belt carried by said brackets, and guides for the edge portions of the lower run of the belt carried by the side members of the frame, the edge portions of the belt being enlarged in thickness and moving against said guides, and means for adjusting said guides.

3. An ore-concentrating apparatus, comprising a frame movably supported in an inclined position and having parallel side members, an endless traveling belt supported by the frame in a corresponding inclined position, a trough near the higher part of said belt for feeding ore-pulp to the upper surface of the belt, a trough in advance of said first-named trough for feeding water to the surface of the belt, the said troughs each having outlet-openings on the side facing the highest end of the belt, pairs of brackets supported on the side members of the frame and having horizontal members supporting the ends of said troughs, guides for the edge portions of the belt carried by one pair of said brackets and by the side members of the frame, respectively, means for adjusting said guides to maintain the belt in taut condition transversely, and means for maintaining the belt in taut condition throughout its length.

4. An ore-concentrating apparatus comprising a frame, an endless traveling belt supported by said frame, means for feeding ore-pulp to the upper surface of the belt, a transversely-extending trough for feeding water to said surface, oppositely-arranged brackets connected with the sides of the frame and extending upwardly therefrom, the said brackets supporting said trough, and adjustable guides for the edge portions of the upper and lower runs of the belt carried by said brackets and the frame of the apparatus respectively.

5. An ore-concentrating apparatus, comprising a supporting-frame having parallel uprights, an inclined frame held in said supporting-frame and having parallel side members, a transverse rod connecting two of said uprights and passing through the latter and through the said parallel side members of the inclined frame near the highest end thereof, the said rod forming a pivotal support for the inclined frame, an endless traveling belt supported by the inclined frame, in a corresponding inclined position, brackets supported on the side members of the frame, the brackets being arranged in pairs, troughs supported by said brackets, adjustable guides for the edges of the upper run of the belt carried by one of said pairs of brackets, adjustable guides for the edges of the lower run of said belt carried by the side members of the frame, means for adjusting said guides to vary the tautness of the belt transversely, and means for raising or lowering the lower end of the inclined frame at either or both sides thereof.

6. An ore-concentrating apparatus, comprising a frame movably supported in an inclined position and having parallel side members, an endless traveling belt supported by the frame, in a corresponding inclined position, end rollers over which the belt passes, the roller at the lower end of the belt having slidable bearings, guide-rollers for the lower movable portions of the belt, a water-trough located beneath the highest end of the inclined frame and into which one of said guide-rollers extends, pairs of brackets carried by the side members of the frame, troughs for feeding ore-pulp and water to the surface of the belt and supported by said brackets, and adjustable guides for the upper and lower runs of the belt, the said guides being carried by one of said pairs of brackets and by the side members of the frame, respectively.

7. An ore-concentrating apparatus, comprising a frame movably supported and having parallel side members, an endless traveling belt supported by the frame, end rollers over which the belt passes, one of said rollers having slidable bearings, means for moving said bearings to vary the tightness of the belt, oppositely-disposed brackets arranged in pairs and supported on the side members of the frame, means for feeding ore-pulp and water to the upper surface of the belt and supported by said brackets, and adjustable guides for the edge portions of the upper and lower runs of the belt carried by one of said pairs of brackets, and the side members of the frame respectively.

8. An ore-concentrating apparatus comprising a frame movably supported in an inclined position and having parallel side members, an endless traveling belt supported by the frame in a corresponding inclined position, oppositely-disposed brackets arranged in pairs and supported on the side members of the frame, the said brackets having horizontal members, troughs for feeding ore-pulp and water to the upper surface of the belt, the troughs being supported at their ends on the horizontal members of said brackets, and adjustable guides for the edge portions of the

upper and lower runs of the belt carried by one pair of said brackets, and by the side members of the frame respectively.

9. An ore-concentrating apparatus comprising a frame normally supported in an incline position and having parallel side members, an endless traveling belt supported by the frame in a corresponding inclined position, parallel oppositely-disposed brackets arranged in pairs and supported on the side members of the frame, the brackets having horizontal members, troughs for feeding ore-pulp and water to the upper surface of the belt and supported on the horizontal members of the brackets, adjustable guides for the edge portions of the upper run of the belt carried by one pair of said brackets, similar guides for the edge portions of the lower run of the belt carried by the side members of the frame, means for adjusting the guides, and means for raising or lowering the lower end of the frame at either or both sides thereof.

10. An ore-concentrating apparatus comprising a frame having parallel side members, an endless traveling belt supported by said frame, oppositely-arranged brackets carried by the side members of the frame, the said belt having the edge portions of increased thickness, and adjustable guides for the edge portions of the upper and lower runs of the belt, the guides for the upper run of the belt being carried by said brackets and the guides for the lower run of the belt being carried by the side members of the frame, and means for adjusting the guides to vary the tautness of the belt transversely.

11. An ore-concentrating apparatus, comprising a frame movably supported in an inclined position and having parallel side members, an endless traveling belt, parallel oppositely-disposed brackets supported on the side members of the frame and having horital members, a transversely-extending trough for feeding ore-pulp to the upper surface of the belt, the trough being supported at its ends on the horizontal members of the brackets, a trough in advance of the first-mentioned trough for feeding water to the surface of the belt, parallel brackets similar to the first-mentioned brackets for supporting the ends of said trough, guides for the edge portions of the belt carried by the last-mentioned brackets, and by the side members of the frame, respectively, end rollers over which the belt passes, bearing-rollers for the upper movable portion of the belt, guide-rollers for the lower movable portion of the belt, a water-trough into which one of said guide-rollers extends, means for varying the inclination of the belt, and means for varying the tautness of the belt.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL JOHN ROGERS.

Witnesses:

CHARLES S. BRINK,

JOHN JIMPSON.