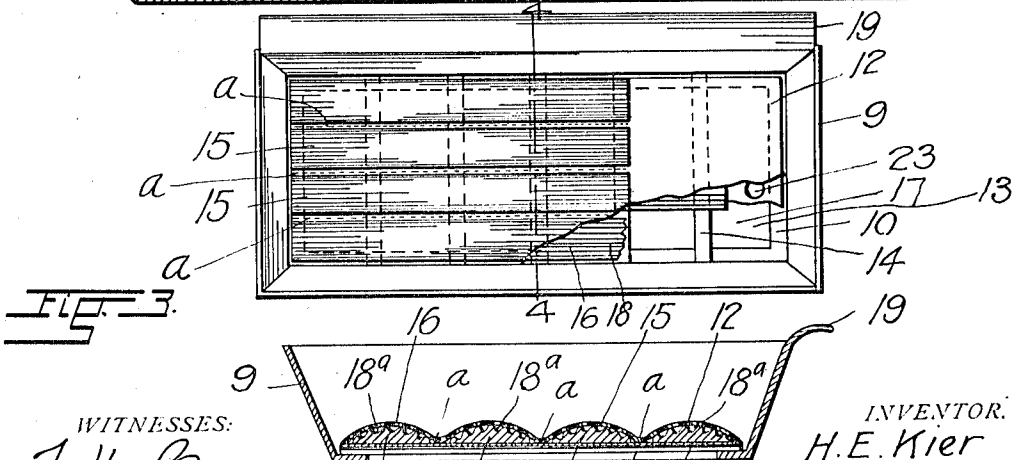
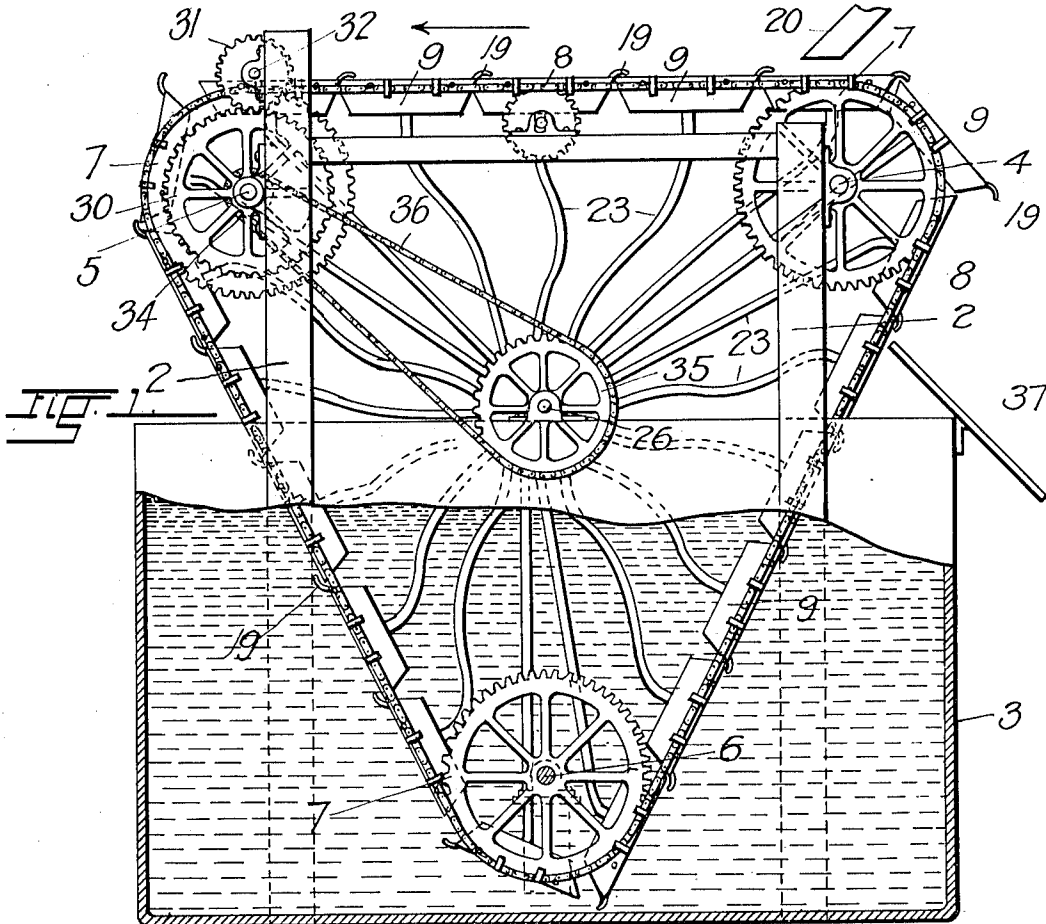


H. E. KIER.
 FILTERING APPARATUS.
 APPLICATION FILED AUG. 16, 1910.

1,026,917.

Patented May 21, 1912.

2 SHEETS—SHEET 1.



WITNESSES:
J. H. Cump.
S. M. Mahler.

INVENTOR:
 H. E. Kier

BY *J. J. Blacett*
 ATTORNEY.

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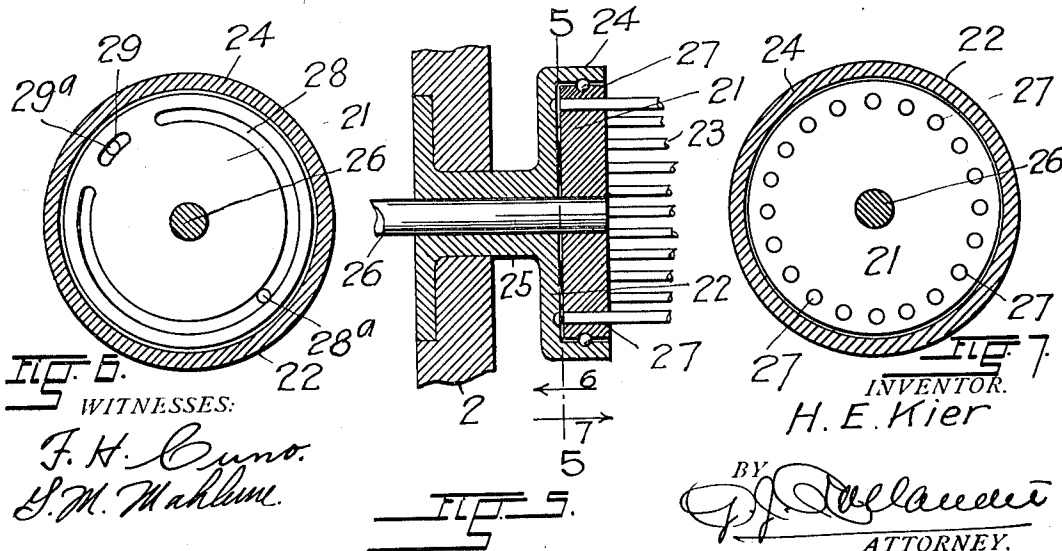
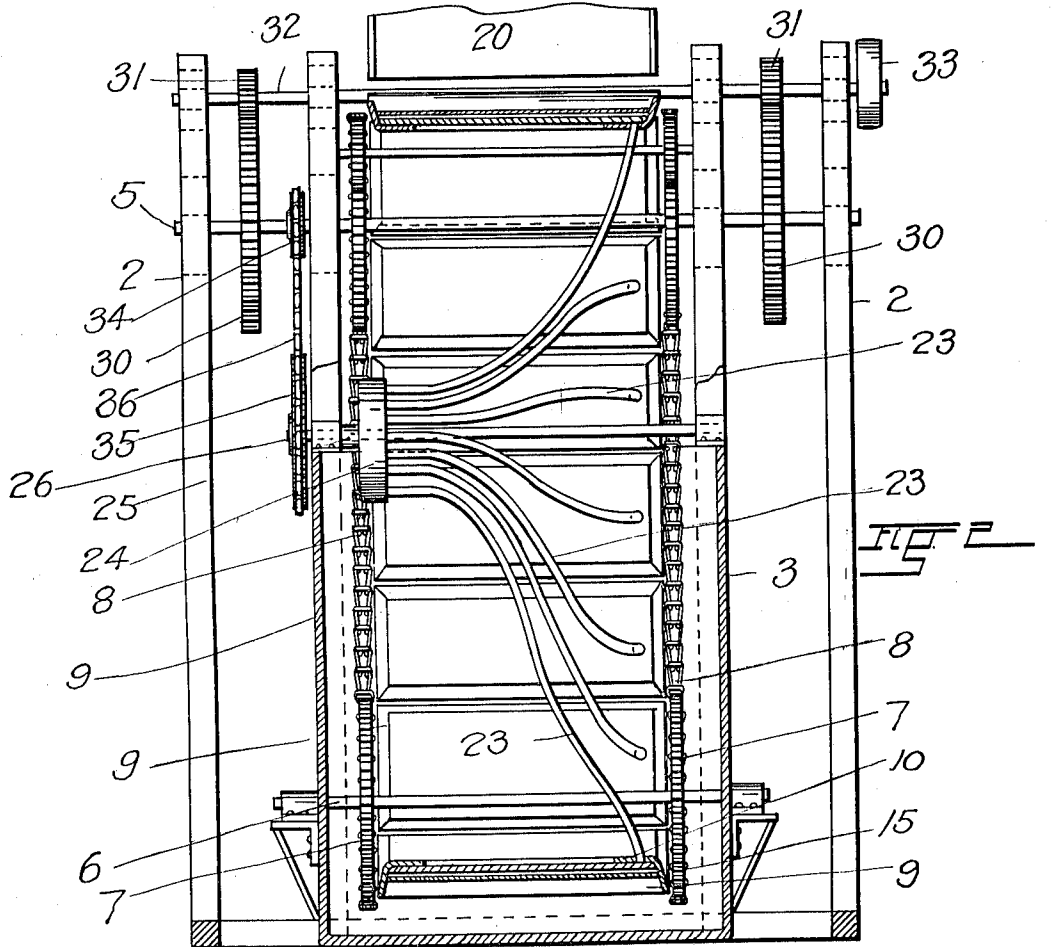


FIG. 6.
 WITNESSES:
 F. H. Cuno.
 E. M. Mahlum.

INVENTOR.
 H. E. Kier

BY
 J. P. [Signature]
 ATTORNEY.

UNITED STATES PATENT OFFICE.

HARRY E. KIER, OF COLORADO SPRINGS, COLORADO.

FILTERING APPARATUS.

1,026,917.

Specification of Letters Patent.

Patented May 21, 1912.

Application filed August 16, 1910. Serial No. 577,407.

To all whom it may concern:

Be it known that I, HARRY E. KIER, a citizen of the United States of America, residing at Colorado Springs, in the county of El Paso and State of Colorado, have invented certain new and useful Improvements in Filtering Apparatus, of which the following is a specification.

This invention relates to certain new and useful improvements in vacuum filters and more particularly in the class of machinery used in the treatment of metalliferous ores by the cyanide process, for separating the solvent which bears the values in solution, from the worthless solids with which it is associated.

The object of my invention is to expeditiously effect a clean separation of the gold-bearing solution from the solids, by the provision of an endless series of filter-units which, in practice, are moved through a tank containing the wash-water. Each of these units is during the greater part of its movement, in connection with a vacuum pump which draws the fluid constituents of the quantity of pulp carried by said unit, into a suitable receptacle, and when the unit reaches the discharge point of the machine, it is temporarily connected with a compression pump for the purpose of removing the cake of solid residue, remaining after all liquid matter has been drawn from the pulp. The units are furthermore constructed to allow the pulp fed therinto through a launder, or other suitable conveying device, to flow from one into the other, whereby the feeding process may be carried on continuously without loss of time or material.

An embodiment of my invention has been shown in the accompanying drawings in the various views of which like parts are similarly designated and in which,

Figure 1, represents a sectional elevation of the apparatus, Fig. 2, a sectional end-view of the same, Fig. 3, a plan view of one of the units comprised in the endless series, Fig. 4, a section taken along the line 4-4 Fig. 3, drawn to an enlarged scale, Fig. 5, a central section through the valve by means of which the units are connected with the suction and compression apparatus and, Figs. 6, and 7 sections taken along the line 5-5 Fig. 5, respectively looking in the direction of the arrows 6 and 7.

Referring to the drawings by numerical

reference characters, the numeral 2 designates a frame work which is erected at opposite sides of a tank 3 which, in practice, contains the wash water. Three parallel rotary shafts 4, 5 and 6, two of which are mounted at the upper portion of the structure 2, and one near the bottom of the tank 2, are arranged at the corners of an imaginary inverted isosceles triangle, the base of which, extends horizontally above the upper edge of the tank. Each of the shafts carries a pair of sprocket wheels 7, which are engaged by two continuous chains 8, between which the filter-units are arranged in an endless series. Each of these units comprises a shallow tray which is composed of a preferably rectangular frame 9, the inclined sides of which are formed at their lower edges, with inwardly directed flanges 10 for the support of a filtering element 12, the construction of which will now be described. The element above referred to comprises a bottom-member 13 which may be composed of metal or of non-porous cloth or other flexible material and which is directly supported upon the flanges 10 and upon slats 14 placed transversely upon the latter.

A cover-member 15 made of porous cloth or other suitable filtering material is secured upon the bottom plate 13, by fastening means applied along their edges and along parallel lines *a* which extending longitudinally from one of the ends of the two members, terminate along a line spaced from their opposite ends, so as to provide a plurality of pockets 16 which communicate with a space 17 which, in the following description, will be termed the suction-chamber of the filtering element. Each of the pockets 16 is occupied by a filler 18, which is plano-convex in cross-section and which is formed in its upper, convex, surface with a plurality of longitudinal grooves 18^a to provide channels through which liquid drawn through the filtering cover 15, may flow to the suction chamber 17. Each of the frames 9, is furthermore provided along the upper edge of one of its sides with an outwardly extending lip 19 which when the various units are assembled on the two chains, projects over the adjoining edge of the next succeeding unit to prevent the pulp which is continuously conveyed to the units at the upper portion of the apparatus through an inclined laun-

der 20 from falling between the units, into the wash water contained in the tank, which obviously would interfere with the operation of the apparatus. The various trays
5 may be attached to the two chains between which they are disposed, by links or by any suitable means which permits their movement around the sprocket wheels 7 and which, not being part of my invention, have
10 neither been shown nor described in detail.

The suction chambers 17 of the various units comprised in the endless series, are independently connected by means of flexible tubes 23, with the rotatory member 21
15 of a valve 22, the stationary, cylindrical housing 24 of which is rigidly secured to the frame, at a point above the tank 3 and axially in a vertical plane with the lowermost shaft 6. The housing 24 which is open
20 at one of its ends, has at its opposite end, an outwardly projecting hub 25 for the support of a shaft 26 at whose extremity the above mentioned member 21 is rigidly secured. The member 21 which is rotatably
25 fitted within the housing, is provided with a plurality of transverse bores 27 which are equidistantly arranged in a circle concentric with its periphery, and which in number, are equal to the units comprised
30 in the series, with which they are respectively connected by means of the above mentioned flexible tubes 23. The stationary member 24 of the valve has in its interior face, two ports 28 and 29 the former of
35 which extends through the greater part of a circle, coincident with that of the bores 27, while the other is disposed in the same circle in between the terminal points of the longer port. The ports 28 and 29 are provided
40 with openings 28^a and 29^a by means of which they are connected respectively with a suction pump and a compression pump or analogous contrivances which have not been shown in the drawings. One of
45 the shafts (5) at the upper portion of the frame, is provided with two gear wheels 30, which mesh with pinions 31 on a driving shaft 32 which is rotatably mounted on the frame, and which carries a pulley 33 for the
50 usual purpose. The shaft 5, is furthermore provided with a sprocket wheel 34 which operatively connects with a corresponding wheel 35 on the valve shaft 26 by means
55 of a chain 36, and these sprockets are proportioned so that the endless series of filter units and the valve will move in unison to continuously maintain the former in the position they occupy relative to the respective bores in the rotary valve member 24.

60 Having thus described the mechanical construction of my improved filtering apparatus, its operation will be readily understood. The endless series of filter units moving slowly in the direction of the arrow,
65 Fig. 1, is supplied with the pulp which con-

tinuously flows through the launder 20, and from one unit into the other. The units are during their movement toward and through the tank 3, connected with the suction pump which draws the solution through
70 the filtering bottoms of the units, while the solids are held in the upper portions thereof by the vacuum continuously maintained in the conduits 23 until the respective units
75 emerge from the wash water, when they are brought in communication with the supply of compressed fluid which ejects the cakes. During the movement of the units through the tank 3, the wash water is, by
80 reason of the vacuum maintained in the conduits 23, continuously drawn through the cakes contained in the upper portions of the units, and greatly aids in thoroughly separating all the auriferous matter from
85 the worthless constituents of the cakes, and this operation is continued until the units emerge from the tank, when they are brought in connection with the compression pump and the cakes are forcibly removed
90 therefrom by the air emitted through the interstices of the porous cover 15. The cakes discharged from the units fall upon an inclined platform 37 secured at the upper edge of the tank 3. After the cakes
95 have been discharged from the units, the orifices of the bores 27 in the moving valve-member which connect with the respective tubes 23, are again brought in connection with the long port 28 of the stationary valve member 24 and the operation is repeated.
100

Having thus described my invention, what I claim and desire to secure by Letters-Patent is:—

1. An apparatus of the class described comprising a tank, an endless series of filtering units mounted to travel along an angular course over and through said tank, suction means for exhausting liquid from said units, while moving toward and through said tank, and a launder disposed
105 to supply material to be treated to the same while moving over said tank.

2. An apparatus of the class described comprising a tank, an endless series of filtering units mounted to move over and through
115 the same, means to supply material to be treated to said units while moving over said tank, suction means for exhausting liquid from said units, and means adapted to bring the latter in communication with said suction-means during the greater part of
120 their travel and to temporarily discontinue said communication after the units emerge from said tank.

3. An apparatus of the class described comprising a tank, an endless series of filtering units mounted to move along an angular course, over and through the same, a launder to supply material to be treated to said
125 units while moving over the tank, a suction
130

device for exhausting liquid from said units, a rotary valve connecting said device with each of said units, and a mechanism for moving said series and said valve in unison.

5 4. An apparatus of the class described comprising a tank, an endless series of filter-
10 ing units mounted to move along an angular course, over and through the same, a launder to supply material to be treated to said units while moving over the tank, a suction de-
15 vice for exhausting liquid from said units, a supply of air under compression, a rotary valve connected with said suction device and with said air supply, flexible conduits be-
20 tween the said valve and the several units, and a mechanism for moving said series and said valve in unison, the latter being constructed to connect each unit with the suction device while moving to and through
25 the tank, and with the supply after emerg-
30 ing from the fluid contained in the same.

5. An apparatus of the class described comprising a tank, an endless series of filter-

ing units mounted to travel over and through the same, means for exhausting liquid from the said units while moving over and through
25 said tank and means for supplying material to the said units while moving over the tank.

6. An apparatus of the class described
30 comprising a tank, an endless series of filter-
ing units mounted to travel over and through the same, means for exhausting liquid from the said units while moving over and through
35 the said tank, means for ejecting the con-
tents thereof after emerging from fluid con-
tained in the same and means for supplying material to the said units while moving over the tank.

In testimony whereof I have affixed my
40 signature in presence of two witnesses.

HARRY E. KIER.

Witnesses:

H. H. LYONS,
F. B. ORGAN.