

(No Model.)

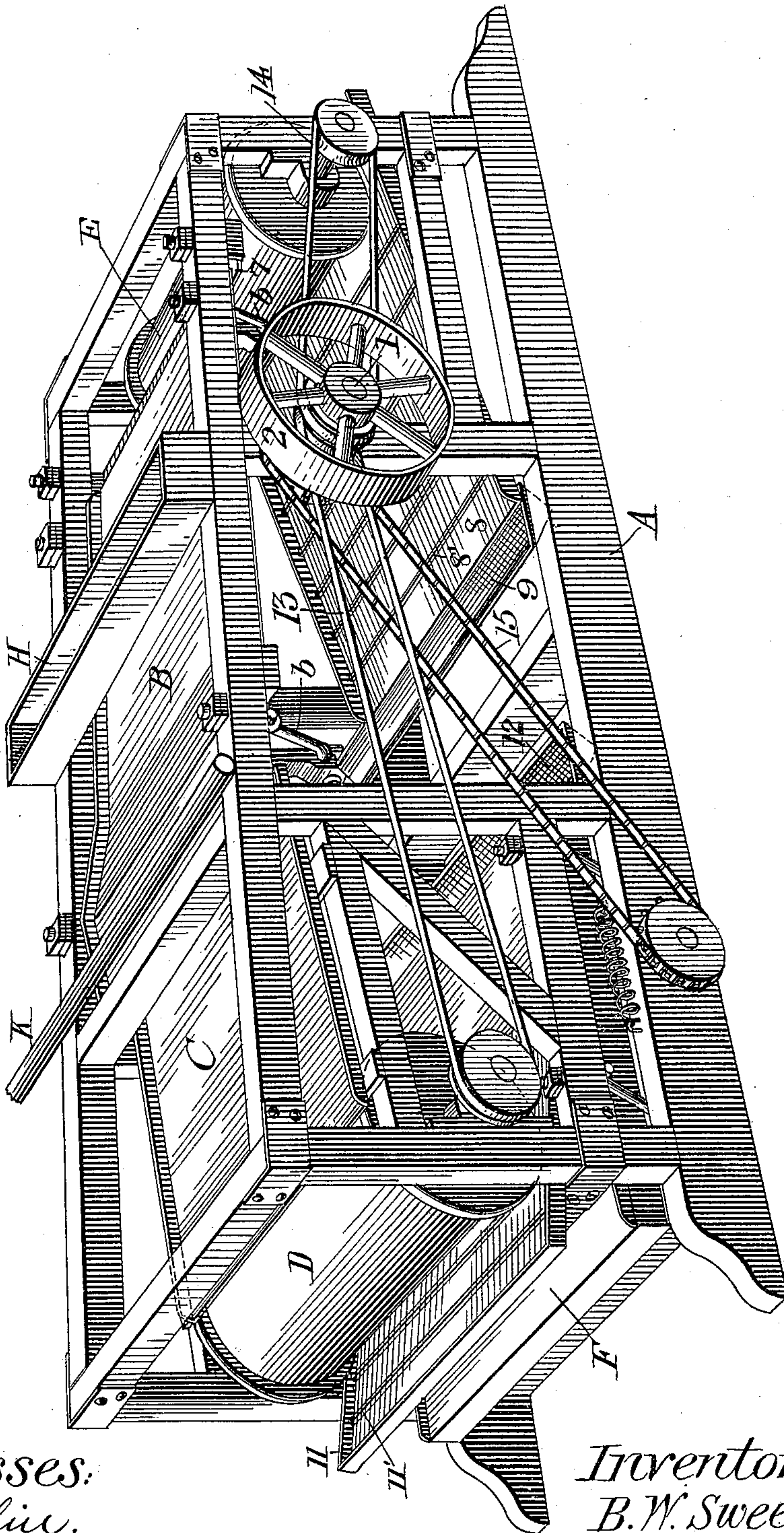
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B. W. SWEET.
GOLD SEPARATING MACHINE.

No. 602,113.

Patented Apr. 12, 1898.

Fig. 1.



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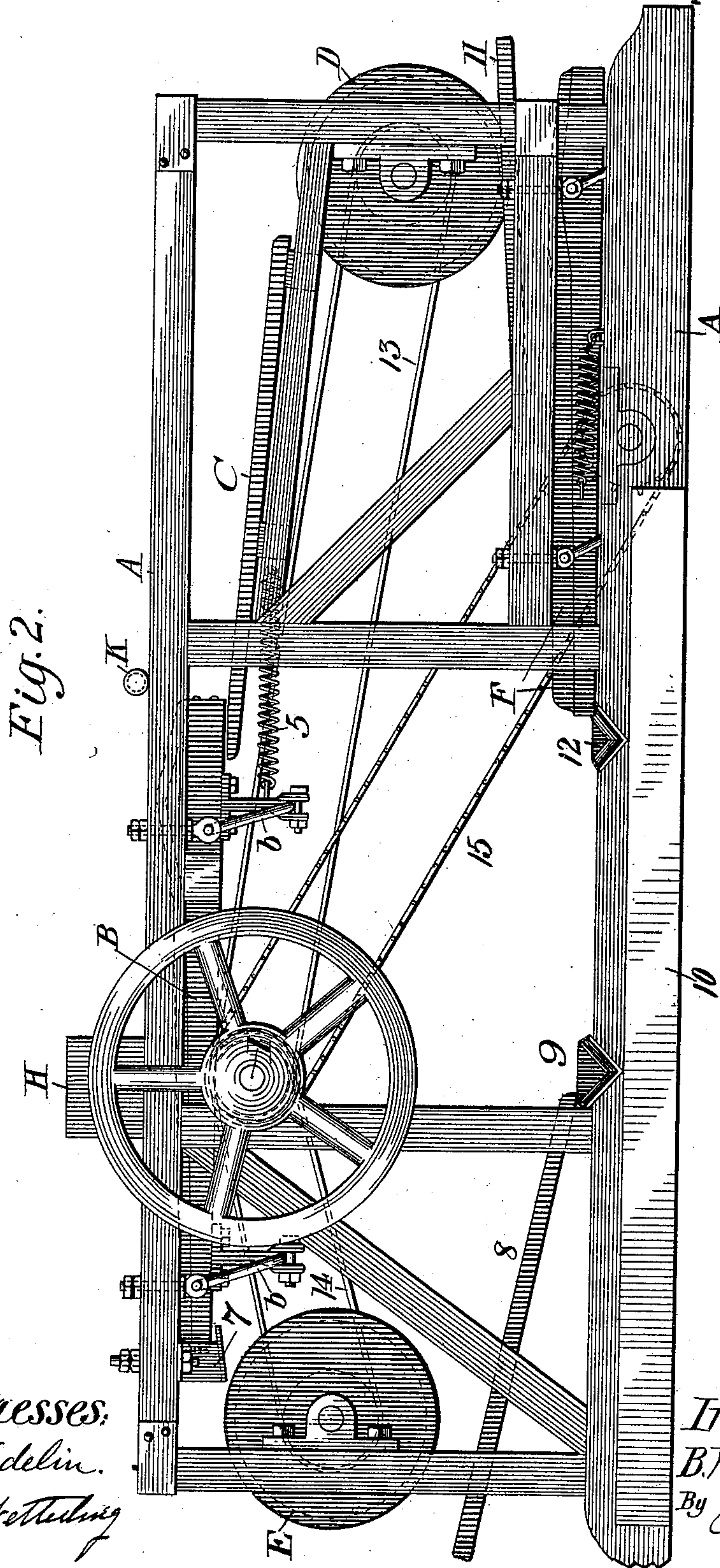
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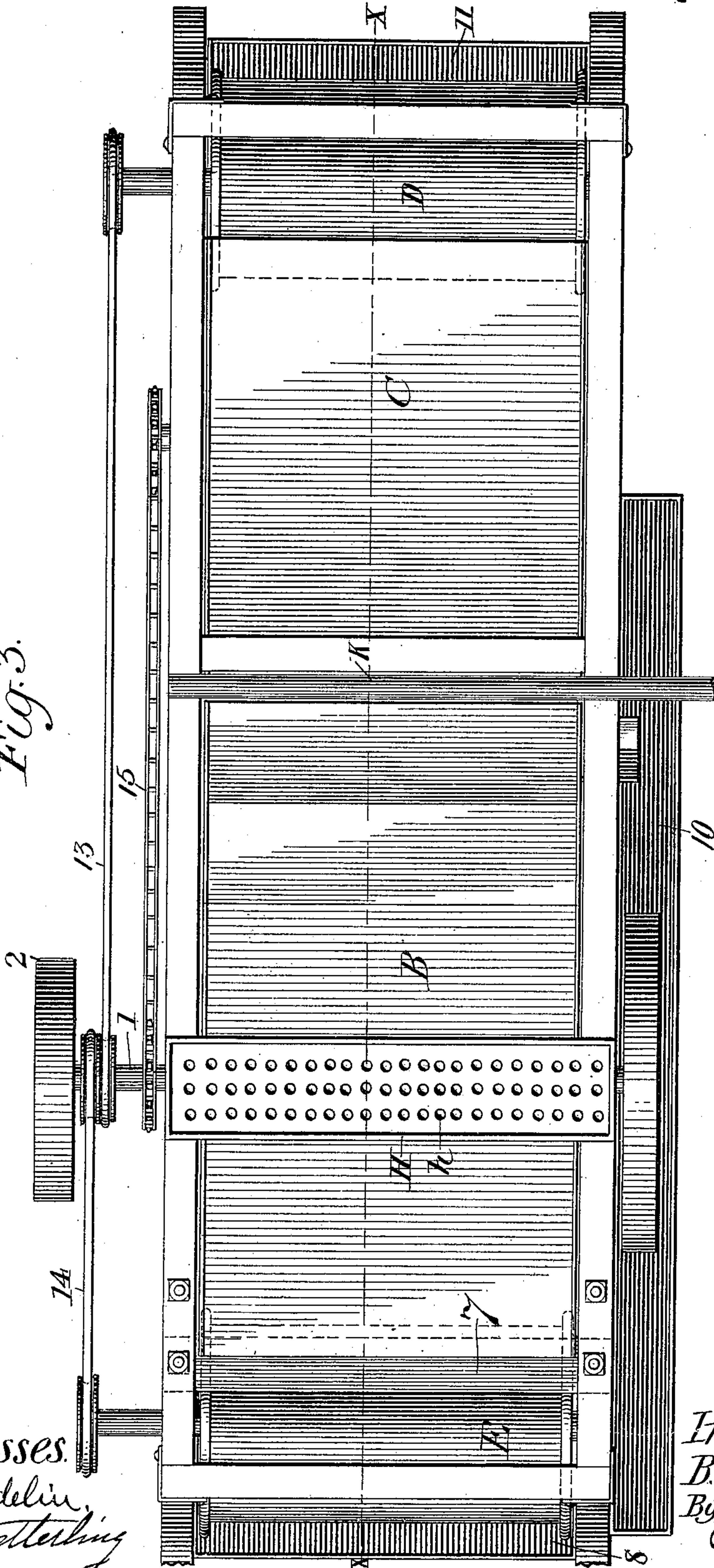
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Fig. 3.



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UNITED STATES PATENT OFFICE.

BENJAMIN W. SWEET, OF KNOXVILLE, TENNESSEE.

GOLD-SEPARATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 602,113, dated April 12, 1898.

Application filed July 14, 1897. Serial No. 644,541. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN W. SWEET, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented certain new and useful Improvements in Gold-Separating Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in machines for separating gold from gold-bearing ore, and particularly to machines of that class in which the gold-bearing ore is first crushed in a stamp-mill and the slimes are then passed over amalgamating-plates and a concentrator in order to effect a separation from the slimes of the free gold and the sulfurets; and it consists in an improved process for effecting the separation of gold from gold-bearing ore and in an improved machine by the action of which the separation is accomplished, both of which will be hereinafter fully described, and particularly pointed out in the claims.

The separation of gold from gold-bearing ore is at present accomplished by crushing the ore through the action of a stamp-mill and then passing the resulting slimes over an amalgamating-plate and onto a concentrator. The free gold is caught and held upon the amalgamating-plate, while the sulfurets are obtained from the concentrating-table. The disadvantages pertaining to this system of collecting the gold are chiefly, first, the escape of the fine or float gold, and, second, the failure to completely separate the silica from the sulfurets.

The escape of the fine or float gold is due to the fact that it floats upon the surface of the slimes and does not come in contact with the amalgamating-plates. The heavy gold sinks to the bottom of the slimes and is caught and held by the amalgamating-surfaces; but the fine gold floating on the top of the slimes does not have an opportunity to reach the amalgamating-surfaces and therefore is lost. Even when more than one amalgamating-plate is used the same inability to save the fine gold is present, for while a ridge or deposit of gold is formed on the successive

amalgamating-plates at the point where the slimes fall upon them the amalgamating-surfaces at this point soon become covered and are unable to catch any more gold, so that the fine gold passes on. It must be remembered that the water of the slimes is mixed in many instances with talc and other substances, so that it is heavier than clear water, heavy enough, in fact, to carry the fine gold upon its surface, although the heavy gold will work to the bottom. In many grades of ore as much as fifty per cent. of the gold is lost in this manner.

The separation of the silica from the sulfurets is effected on the concentrating-table as a result of the differing specific gravity of the two products, the silica flowing down the concentrating-table with the slimes and the sulfurets being jolted forward until they are collected at the high end of the concentrating-table. In actual work a large proportion of the silica is frequently carried over with the sulfurets and only an incomplete separation of the silica is effected. This causes a loss of the sulfurets in proportion to the amount of silica which is not separated therefrom, as in the chlorination process the silica fuses and forms a slag with the sulfurets, from which it is very difficult and expensive to separate the gold.

The object of my invention is to devise a process for treating gold-bearing ore through the action of which all of the free gold can be separated from the slimes and saved and also an effectual separation of the silica from the concentrates effected.

The process consists, broadly, in concentrating the slimes as they come from the battery-screen of a stamp-mill before passing the slimes over an amalgamating-plate and by this concentration separating the sulfurets and heavy gold from the slimes, which carry with them the fine or float gold and the silica, then amalgamating the heavy gold and reconcentrating the concentrates to save the sulfurets, and also passing the slimes carrying the float-gold over amalgamating-surfaces.

Instead of amalgamating the gold and then concentrating the slimes I first concentrate the slimes and treat the slimes and the concentrates, consisting of the heavy gold and the sulfurets, separately. I am thus able to

specialize the form of amalgamating action to which the different grades of ore are subjected, and thus obtain more satisfactory results. I am also able to save in this manner the "rusty" gold, because the scouring to which it is subjected when passing over the first concentrating-table removes the rust and enables the gold to be caught by the amalgamating plates or drums. The separation of the silica from the concentrates which is effected in this manner is also most complete, as I can so adjust the inclination of the concentrating or separating table that all or nearly all will be there removed. Any remaining silica will be separated by the re-concentration of the concentrates, and thus the sulfurets obtained entirely clean.

In the apparatus which I employ to carry out my process the gold-bearing slimes as they come from the battery-screen of a stamp-mill are spread evenly and uniformly over the surface of a concentrating-table, which is so set that the heavy gold and the sulfurets will be discharged from the high end of the table, owing to their greater specific gravity and the jarring action of the concentrator, while the slimes, carrying with them the float-gold and the silica, will pass off at the low end of the concentrator. As both the slimes and the concentrates are subjected separately to amalgamating action, I am able to make the adjustment of the table fine enough to effect a very perfect separation at this point. The slimes fall upon the surface of an amalgamating-cylinder journaled at the low end of the concentrating-table and the fine gold carried with the slimes is thus brought into direct contact with an amalgamating-surface and saved. The concentrates are carried by a stream of fresh water introduced at this juncture over an amalgamating-plate, by the action of which the heavy gold is for the main part removed, then fall upon the surface of an amalgamating-cylinder, when the separation of the free gold is completed, then pass onto a second concentrator, where any remaining silica is separated from the sulfurets. The scouring action to which the rusty gold in the original slimes was subjected in the first concentration acts to scour off the rust and enables the gold to be caught by the amalgamating plate and rolls. This scouring of the rusty gold is here effected in the continual operation of my machine, and no additional machine is necessary, as is the case with methods now employed to treat the gold when it occurs in this state. The introduction of fresh water to carry the concentrates over the amalgamating plate and roll also assists the amalgamating action, for the water of the slimes issuing from the battery-screen of a stamp-mill is often impregnated with talc and other soluble minerals, so that it forms a pasty mass, which interferes with the amalgamation, while the fresh water is entirely free from such impurities. A cleaner amalgam is thus obtained.

Any silica which might remain with the concentrates from the first concentration is removed in the second concentration, so that perfectly clean concentrates are obtained.

The machine by means of which I carry out my process is fully illustrated in the drawings which accompany and form a part of this specification, in which the same reference letters and numerals refer to the same or corresponding parts, and in which—

Figure 1 is a perspective view of my gold-separating machine. Fig. 2 is a side elevation thereof, showing the side not shown in Fig. 1. Fig. 3 is a top plan view of the machine. Fig. 4 is a central section thereof, taken on the line $x x$, Fig. 3.

Referring to the drawings, A represents the machine-frame. In this frame are mounted the concentrating-table B, the amalgamating-plate C, the amalgamating-rolls D and E, and the concentrating-table F. The slimes as they are delivered from the battery-screen of a stamp-mill are conveyed to the trough H. The bottom of the trough is perforated, as shown at h , so that the slimes are spread evenly and uniformly over the surface of the concentrating-table B. The concentrating-table B is pivotally supported by the pivotal rods b , which allow the concentrating-table the vibrating motion requisite for its operation. The power required to operate the concentrating-table is derived from the power-shaft 1, upon which the belt-wheel 2 is mounted and upon which are mounted tappets 3. The tappets 3 at each revolution of the power-shaft strike the shaft 4, which is secured to the under surface of the concentrating-table, as shown, and force the concentrating-table backward against the action of the springs 5, which in their turn draw the concentrating-table forward with a jolt as the points of the tappets pass the shaft 4.

The inclination of the concentrating-table is so adjusted that a separation of the slimes is effected thereon due to the differing specific gravities of the ore carried thereby. The fine or float gold and the silica flow down the plate with the slimes, while the concentrates and the heavy gold are jolted forward on the table and finally discharged upon the amalgamating-plate C. The scouring of the concentrates upon this table serves to remove the rust from the rusty gold and enables that gold to be caught and saved on the amalgamating-surfaces, over which they are subsequently passed. As I subject both grades of ore separated by the concentrator to an amalgamating action, I am able to so adjust the inclination of the table that a very complete separation of the silica from the concentrates is effected.

The slimes fall first upon a plate 7, which is supported at the low end of the concentrating-table, so as to be but slightly above the surface of the amalgamating-roll E, and are by that distributed evenly and uniformly over the surface of the roll. The fine gold is

now brought into direct contact with the amalgamating-roll and saved, while the silica and slimes fall upon the inclined plate 8 and are by that conducted to the discharge-troughs 9 and 10.

The concentrates are washed off of the concentrating-table by a stream of water issuing from the feed-pipe K, which distributes the water across the upper end of the concentrating-table and are by that carried over the amalgamating-plate C, from which they fall upon the amalgamating-roll D and are thence conducted by the inclined plate 11 to the concentrating-table F. The free gold in the concentrates is mainly caught upon the amalgamating-plate C, and any remaining gold is removed from the concentrates by their passage over the amalgamating-roll D. As the water which carries them over the amalgamating surfaces is fresh, a much cleaner amalgam is obtained than is the case with the processes now employed.

The concentrating-table F is similar in all respects to the concentrating-table B and acts to separate the silica and waste from the concentrates. The concentrates are discharged at the high end of the concentrator, while the silica and waste flow from the low end of the concentrator into the trough 12, by which they are conducted into the common discharge-trough 10. Cleats 8' and 11' are secured to the inclined plates 8 and 11 to catch any quicksilver which may fall from the amalgamating-cylinders D and E.

Power is conveyed to the amalgamating-cylinders D and E by belts 13 and 14 and to the concentrating-table F by the link belt or sprocket-chain 15, suitable pulleys and sprockets being mounted upon the power-shaft and the shafts of the amalgamating-cylinders and concentrating-table, as shown. The construction throughout is made adjustable, so as to enable the inclination of the concentrating-table or other parts to be changed to suit differing conditions. Differing grades of ore require slightly-differing treatments, though I have found by practical tests that by the use of my process as much as ninety-eight per cent. of the gold in any grade of ore can be collected. The sulfurets

are obtained entirely free from silica, so that through the chlorination process all of the gold therein can be saved.

I do not limit myself to the unessential details of the construction shown; nor do I limit myself to the use of a single concentrating-table for effecting the separation of the different grades of ores, as more than one table can be used by a mere duplication of the parts of my machine; nor do I limit myself to the separation of gold from gold-bearing ore crushed in a stamp-mill, as any ore which is crushed fine enough to enable concentration to take place may be treated by my process.

One of the uses to which my machine is particularly applicable is in developing new properties. It is only necessary to use in connection with my machine a stamp-mill or a suitable ore-crusher which will crush the ore fine enough for concentration, so that the complete plant is portable and can be transported from place to place.

My machine is inexpensive in construction and extremely durable, as none of the parts are subjected to unusual strain.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a gold-separating machine, the combination with a feed-trough, an inclined concentrating-table, and means for operating the same, of amalgamating-surfaces at each end of said table for receiving the heavier and lighter grades respectively, substantially as described.

2. In a gold-separating machine, the combination with a feed-trough, a concentrating-table, and means for operating the same, of an amalgamating-plate and an amalgamating-roll stationed in series at the head end of said table, and an amalgamating-roll stationed at the tail end of said table, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

BENJAMIN W. SWEET.

Witnesses:

L. M. MARBLE,
S. G. HOPKINS.