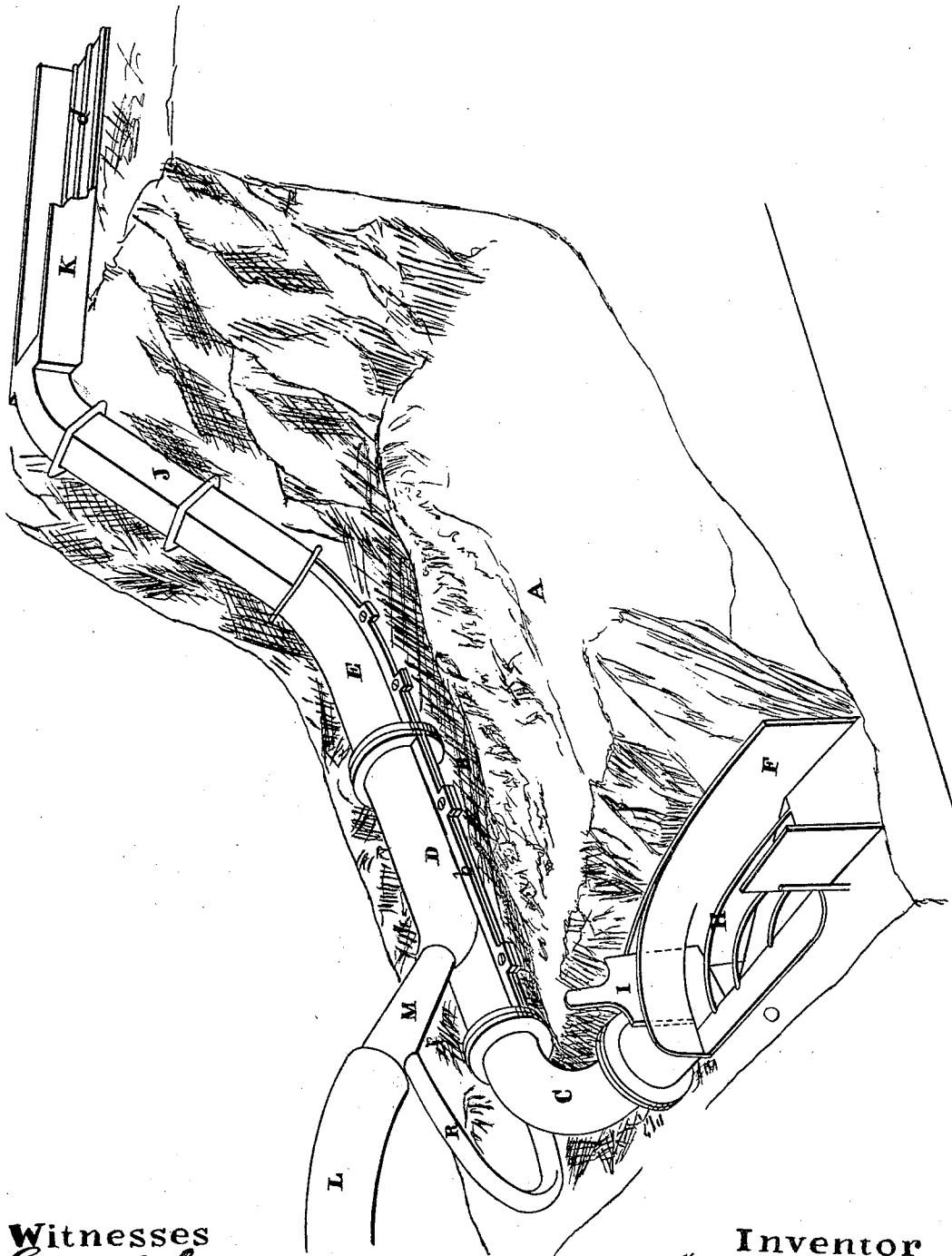


G. W. CRANSTON.

APPARATUS FOR HYDRAULIC MINING.

No. 185,216.

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Witnesses
Geo. H. Strong
Jno. L. Boomed

Inventor
Geo. W. Cranston
Quay & Co
Attys

UNITED STATES PATENT OFFICE.

GEORGE W. CRANSTON, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN APPARATUS FOR HYDRAULIC MINING.

Specification forming part of Letters Patent No. 185,216, dated December 12, 1876; application filed September 28, 1876.

To all whom it may concern:

Be it known that I, GEORGE W. CRANSTON, of the city and county of San Francisco, and State of California, have invented an Improved Hydraulic Earth-Elevator and Mining-Flume; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

In almost every mining country, and especially on the Pacific coast, there are extensive beds of auriferous earth, sand, and gravel that have not heretofore been made available simply because no efficient system and apparatus have been devised for working them economically. In many instances the upper stratum of earth has been worked off to a considerable depth at a fair profit by existing imperfect methods and devices; but the expense of handling, removing, and washing the material at a greater depth became so expensive that the mines were abandoned, even in the face of the well-known fact that the richest deposit of gold is found in the strata nearest the bed-rock. Although it has been previously suggested that earth, sand, and gravel could be raised through a pipe or tube by means of hydraulic force, I am not aware that any successful attempts have been made previous to my experiments to do so. In fact, all of the plans and apparatus suggested, as far as I have been able to learn, were incomplete and incompetent to accomplish the object. My invention not only consists in providing an improved arrangement by which I am able to raise the auriferous material to the required height by means of hydraulic force, but also to a combination of apparatus by which I accomplish the separation of the gold particles from the earthy matter in which it is found, and all this by one continuous process. My invention also includes certain improvements in the construction, arrangement, and application of the devices used for raising the material by a hydraulic stream under pressure, all as hereinafter specified and described.

Referring to the accompanying drawings, Figure 1 is a perspective view of my invention.

Let A represent the bed or surface of the ground from which it is desired to take the earthy material to be treated, raise it to the required height, and subject it to a gold-saving process. I first excavate at some convenient point in this bed or tract a depression or concavity, B, in which to locate my machine, so that I can easily construct a sluiceway from the point or points where I am taking out the earth which will convey the auriferous material to the machine. My improved machine consists of a ground-pipe, which is composed of two or more sections, C D E. A sluice, F, "grizzly" H, regulating-gate I, elevating-spout J, flume K, a hydraulic pipe, L, with nozzle M, all combined, arranged, and operated in the following-described manner: The two ground sections D E can be made in one longitudinal section, if desired, but I prefer to make them in two sections; and in either case I make the sections in two halves—an upper and a lower half. Each half I provide with a flange, b, along each side, so that when the upper half is placed upon the lower half the two halves can be permanently fastened together by bolting the flanges together. This permits me, whenever required, to renew the lower half, upon which the greatest wear comes, without renewing the upper half. The section E is bent upward with a gradual curve toward the end opposite the attachment of section D, and the lower end of the spout J is secured to its upward-bent end, as represented. The sections D E I make of cast-iron, while the spout J can be, and I prefer to construct it, of wood. The spout J can be of any desired length, according to the height it is required to raise the material from the excavation or bed A. The flume K is attached to the upper end of the spout J, and is supported at an inclination downward, so that the water and material raised through the spout J will be carried down through the flume. This flume can be made of any desired length, and is provided with riffles d, or other gold-saving device, in its bottom, in the ordinary manner of constructing mining-flumes, so that the gold and heavy particles which may be raised with the material through the spout will sink and lodge in the riffles or other device as it

flows off down the flume. The hydraulic pipe L leads from some elevated water source or reservoir, and has a nozzle, M, which passes at an angle through the top of the ground section D, and into the interior of the section, so as to terminate at or near its center, as represented, the nozzle being pointed toward the spout J. The water, coming through the pipe L with a velocity and pressure according to the height of its fall or head, will drive through the ground sections and up through the spout J, and thence be carried off down the flume K. It is evident, therefore, that this stream of water will draw into it by suction and carry along with it by force any material, such as earth, sand, gravel, or even large stones, that may be introduced into the rear end of the section D, upon the well-known injector principle. The section C is preferably an elbow, as represented; but it could be made straight or otherwise bent, if found more convenient, and this elbow I attach to the rear end of the ground section D by a swivel-joint, so that it can stand at any desired angle to the ground section to conform to the irregularity upon which it will rest; or it can be turned entirely around, as desired. By means of this elbow or bent section I can also excavate or dig a hole in the ground by standing the ground section upon end, so that it will rest upon the elbow. I then drive a stream of water through the ground section and spout J, by means of which the earth, gravel, and water directly around the lower end of the elbow is drawn into the stream and carried up the spout. By rotating the elbow when it is in this position I can sink a well or accomplish the work known in mining as "bottoming" with great speed. Between the lower end of the sluice F and the elbow I construct a one-sided box, O, in which I place the grizzly or grating, H, so that the water and material from the diggings will pass over and through the grizzly before it enters the elbow. A gate, I, is arranged to slide up and down between the grizzly and elbow, so that the inflow of water and material into the elbow can be regulated, if desired, but which will more frequently be used as a valve to close the space above the inflowing stream, and thus prevent the entrance of air into the elbow with the water and material, as I have discovered that a free entrance of air with the material behind the nozzle M will create a foaming and impair the value of the stream force. The earth, sand, gravel, or other auriferous material thrown into the sluice F, will be carried down the sluice and over the grizzly H, thus separating the large stones, and allowing only the finer portion in which the auriferous particles are held to pass through and go to the stream. The grizzly or grating is constructed on an incline toward the sideless side of the box O, so that the large stones which cannot pass through will roll off to one side out of the way. To pre-

vent the elbow from being clogged by the material, I lead a branch pipe or tube, R, from the hydraulic pipe L, and introduce it into the bend of the elbow and direct it toward the nozzle M. This pipe will carry a small stream of water, and will not only serve to keep the elbow clear, but will materially assist the suction in forcing the material into the main stream. The section D, where the nozzle enters it, I make larger than the section E, so as to form an interior chamber around and in front of the nozzle of sufficient area to admit the material on all sides of the stream and nozzle. This interior chamber gradually contracts toward the section E until the passage corresponds with the passage in that section, thus giving a gradually-decreasing space on all sides of the stream and nozzle, in which the material will fill and be subject to the suction of the stream, and the incoming material at the rear will force the material in this chamber into the stream, thus giving the most positive action.

It will be evident from the above description that the greatest amount of wear upon the sections and spout will be upon the bottoms of the sections D E; and to be able to renew this portion of those pipes economically is one of my objects in making them in two halves, so that the lower section can be replaced, when it is worn out, with new ones at a slight expense; but wearing-plates or false bottoms could be applied, if desired, in which case the false bottom or wearing-plates alone would have to be renewed. A very economical plan would be to cast the lower halves of the sections D E with a longitudinal recess, and then fill this recess with wooden blocks, so that the blocks will receive the wear.

I am aware that it has been attempted to raise tailings from excavations in mines by placing a straight box or spout against the bank, and introducing the hydraulic nozzle into its lower end, so as to lift the material directly in a straight line. It requires the sweep of a curve at the lower end of the spout, so that the material to be lifted will be thoroughly mingled and in moving action with the water before the upward motion is given.

My combination of a gold-saving flume with the spout J enables me to accomplish in the single operation, and with the same stream of water, both the raising of the material and the separation of the gold and heavy metals, thus rendering the process economical, simple, and complete.

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

1. The combination, with a hydraulic dirt and gravel elevator, D E F J L, of a flume, K, provided with gold-saving devices, by means of which the auriferous material can be elevated and the gold particles separated by the same stream, in one continuous operation, substantially as specified.

2. The spout J, having one or more curved sections, D E, at its lower end, and having the nozzle M of the hydraulic pipe introduced in the rear of the curve, substantially as and for the purpose described.

3. The sections D E of a hydraulic dirt-elevator, made in two halves, substantially as and for the purpose described.

4. The section D, enlarged in front of the nozzle M, so as to provide a chamber gradually decreasing in area toward the section E, substantially as and for the purpose described.

5. In combination with the spout J, curved section E, and nozzle-section D, the elbow C, connected with the section D by a water-tight swivel-joint, substantially as and for the purpose described.

6. The adjustable gate or valve I, in combination with the suction-pipe of a hydraulic

earth-elevator, substantially as and for the purpose described.

7. The branch pipe or tube R, arranged to divert a stream of water from the hydraulic pipe L and introduce it into the bend of the elbow C, substantially as and for the purpose described.

8. In combination with a hydraulic earth-elevator, consisting of the spout J, ground sections C D E, and hydraulic pipe L, with its nozzle M, arranged to operate as described, the one-sided box O and grizzly H, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand and seal.

GEORGE W. CRANSTON. [L. S.]

Witnesses:

FRANK A. BROOKS,

E. E. STACY.