

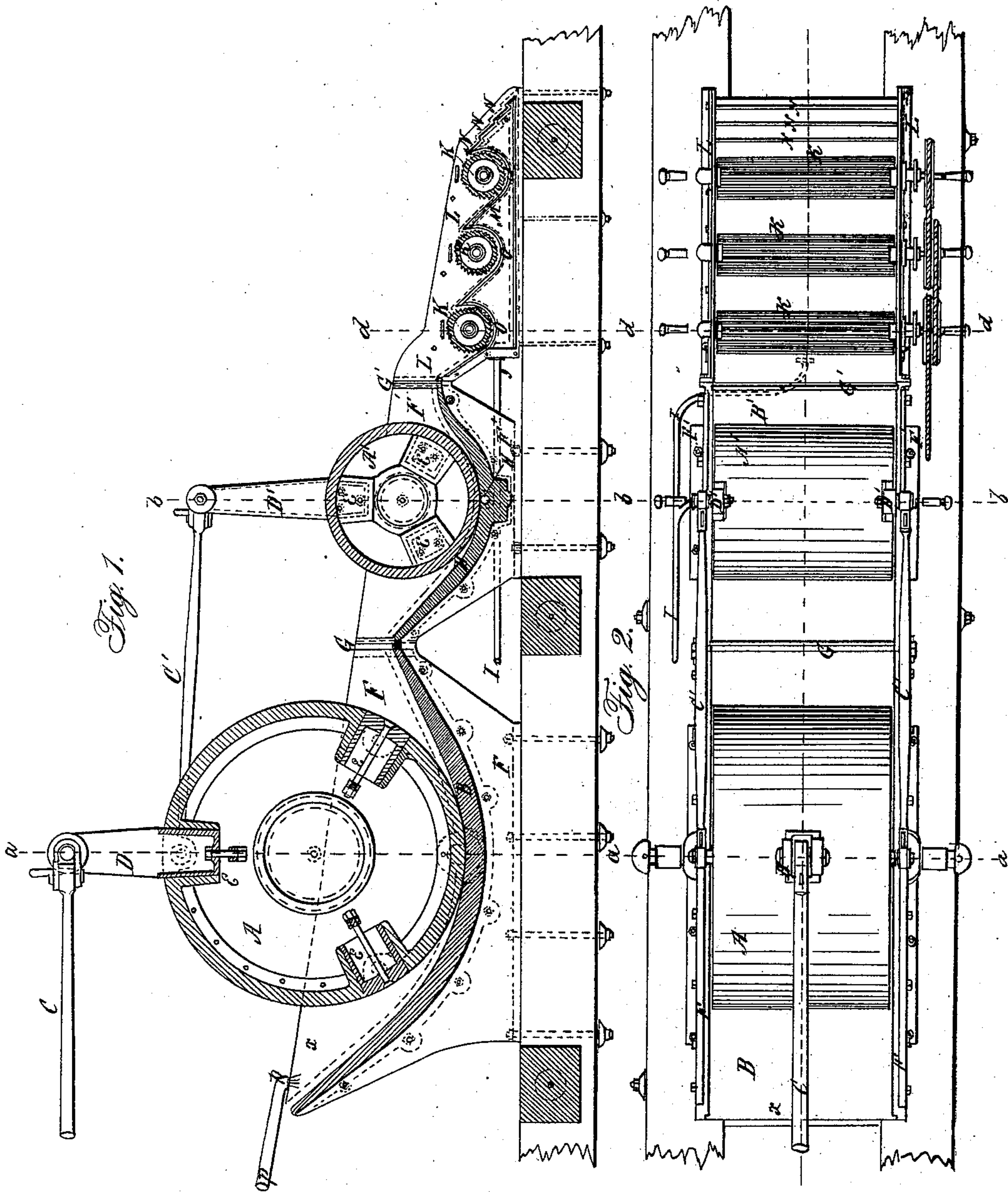
R. H. COLLYER.

Ore. Mill.

2 Sheets—Sheet 1.

No. 10,388.

Patented Jan. 3, 1854.



Witnesses:

Robert Collyer
J. H. Cramer

Inventor:

Robert Collyer

R. H. COLLYER.

Ore Mill.

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Fig. 5.

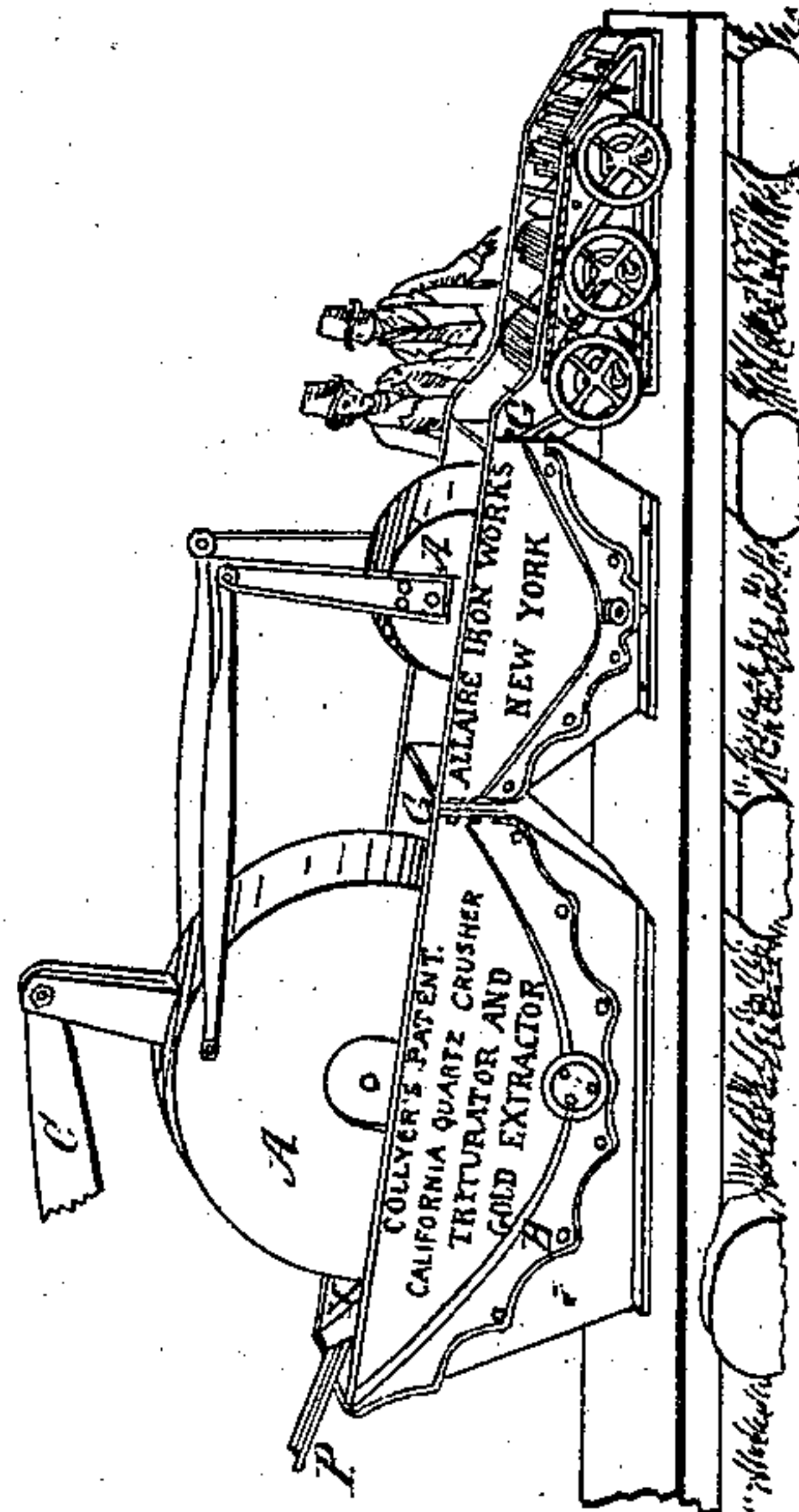
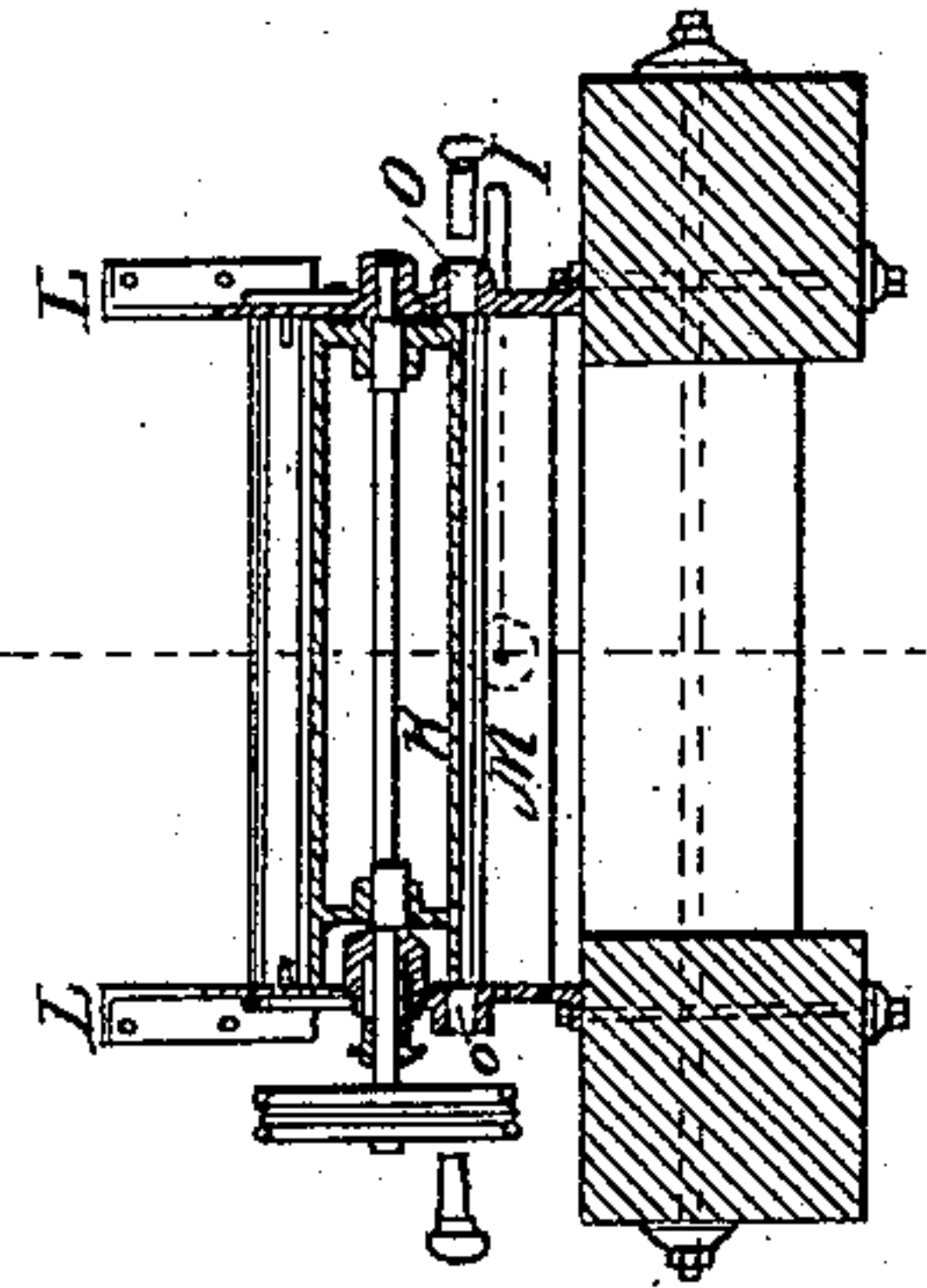


Fig. 3.

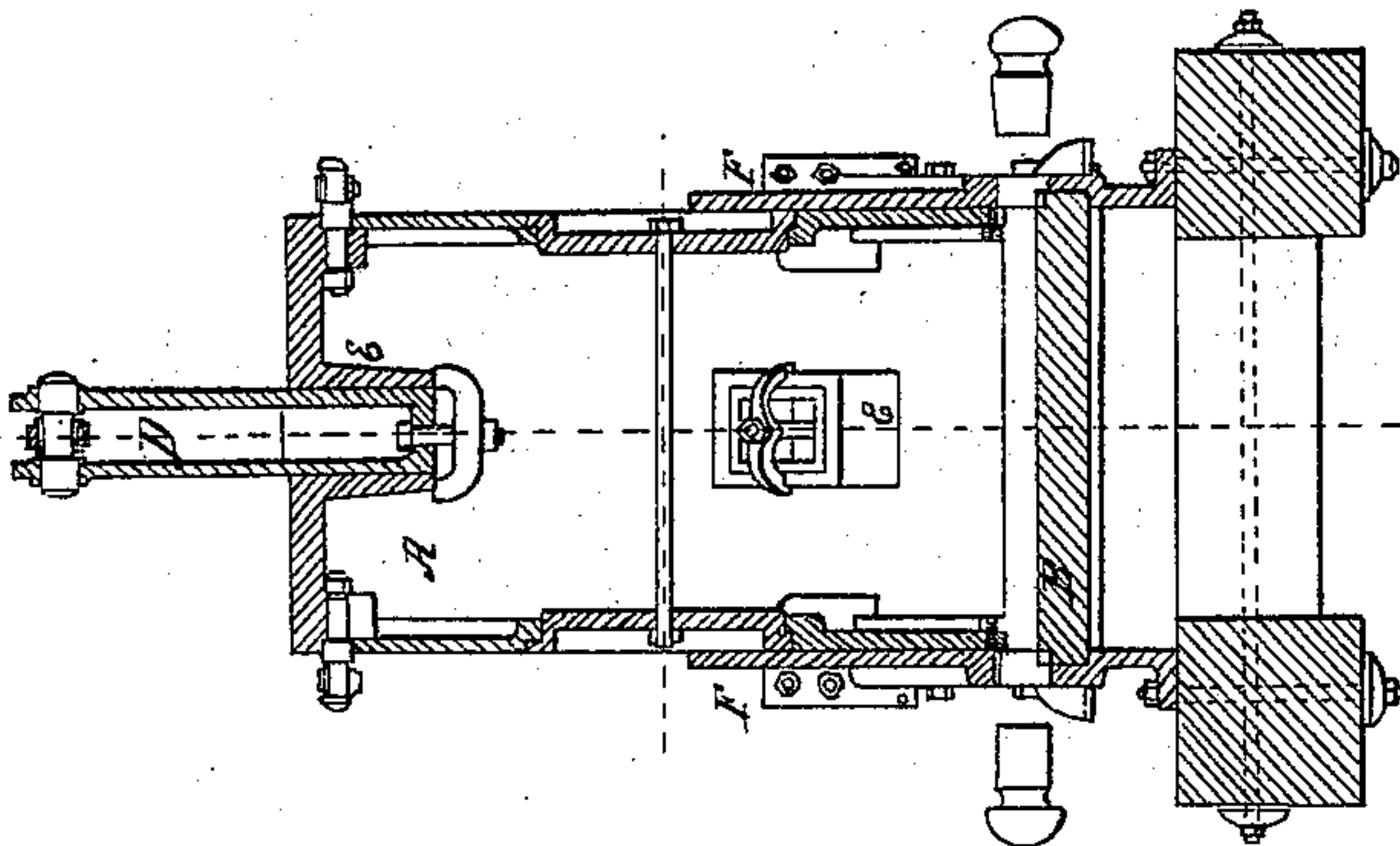
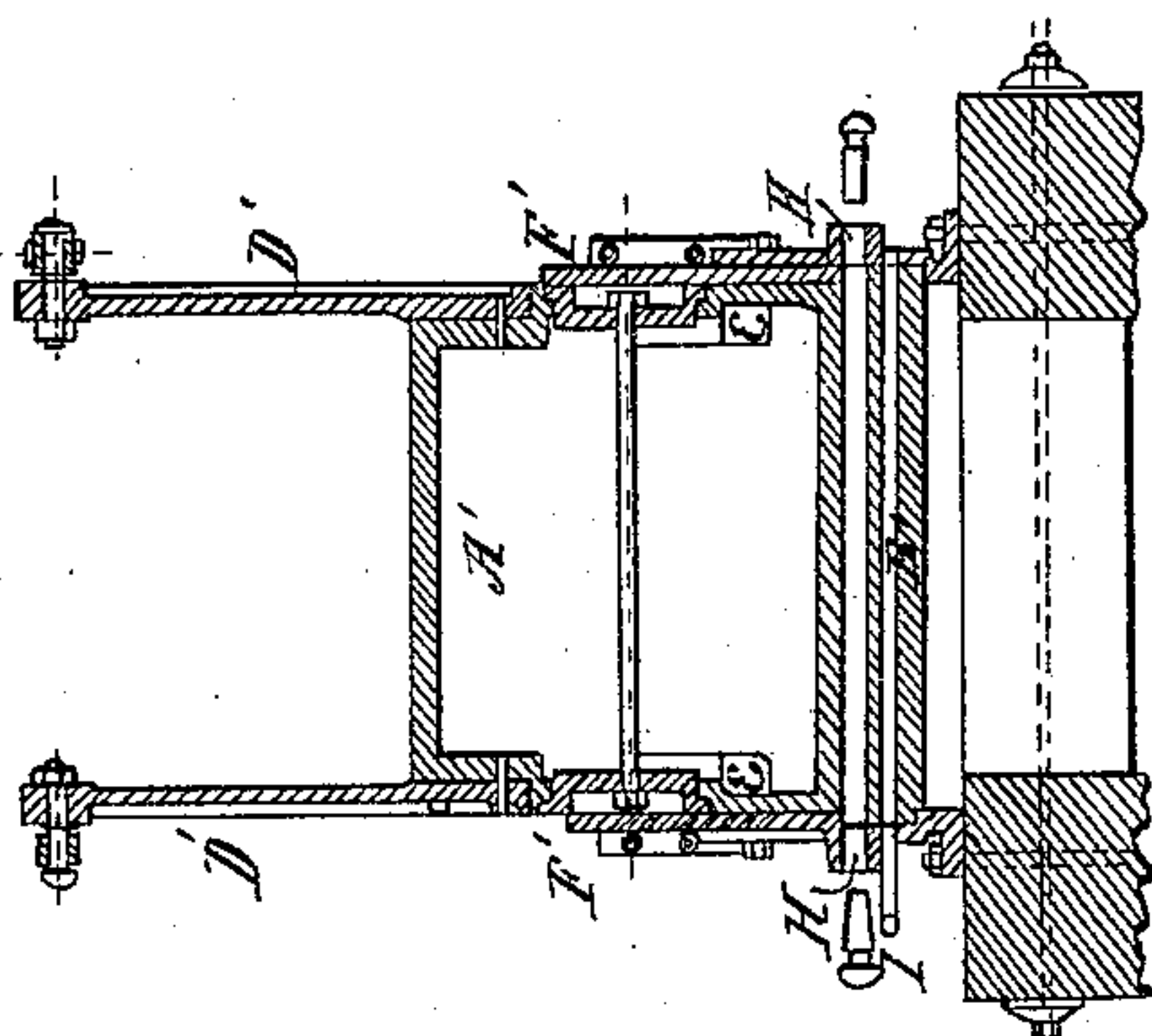


Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

ROBERT H. COLLYER, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN QUARTZ-PULVERIZERS.

Specification forming part of Letters Patent No. 10,388, dated January 3, 1854.

To all whom it may concern:

Be it known that I, ROBERT H. COLLYER, of the city and county of San Francisco, State of California, have invented a new and useful machine for crushing and triturating gold-quartz rock or other ores and separating the gold, silver, or other metals they may contain by amalgamation or otherwise, to be known as "Collyer's California Quartz-Crusher, Triturator, and Gold-Extractor;" and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, and to letters of reference marked thereon, the same letters referring to the same parts, making part of this specification, in which—

Plate I is a perspective view; Plate II, Fig. 1, a sectional side elevation; Fig. 2, plan. Fig. 3 is a transverse section through line *a a*, Figs. 1 and 2; Fig. 4, a transverse section through line *b b*, Figs. 1 and 2; Fig. 5, a transverse section through line *d d*, Figs. 1 and 2.

The nature of this my invention consists in the undulating, vibratory, oscillating, and eccentric motion produced by the cylindrical cast-iron rollers *A A'*, working on the concave bed-plates (cast-iron) *B B'*, actuated by the connecting-rods *C C'*, attached to the levers or arms *D D'*, fixed in the said rollers, whereby a perfect crushing, grinding, and triturating action is produced upon the quartz or other ore submitted to its operation.

E E E represent the various positions in which the arms or levers may be placed, thereby presenting a fresh surface of the roller to the crushing and rubbing action when any one portion is sufficiently worn away.

F F' represent the side or cheek pieces of the machine, which carry or support the bed-plates *B B'* and confine the motion of the cylindrical rollers *A A'* in a direct line.

G G' are screens of various degrees of fineness.

H is a body of quicksilver. The concave bed-plate *B'* may be made and used without the mercury-chamber *H*.

I I I are pipes, into which steam or hot water is admitted in order to heat the mercury and render it more sensitive.

A hole is provided in the cheek-piece, as

shown by the circle at the end of the mercury-chamber *H*, by which the mercury or amalgam may be extracted.

K K K are small cylindrical toothed rollers with projecting teeth on their surfaces. Each roller is carried on a spindle having bearings in the cheek-pieces *L L'*. These rollers are placed in the concave apartments. (See drawings, Plate II, Figs. 1, 2, and 5.) On the revolution of these rollers, each one being partially immersed in mercury contained in the concave apartments, all the crushed ore is carried through the mercury.

N N N are riffles where mercury is placed, over which all the refuse or tailings have to pass before leaving the machine.

O O O are apertures to draw off the mercury or amalgam at pleasure.

M is a steam-chamber for heating the mercury contained in the concave apartments.

To enable others skilled in the art to make and use my invention, I will proceed to describe its operation.

A quantity of quartz-rock or other ore is continually thrown into the main crushing-chamber at *X*, and by a suitable arrangement a constant supply of the necessary quantity is admitted, a stream of water being constantly admitted into the machine from the water-pipes *P P*. (Shown in drawings, Plate II, Fig. 1.) Motion is then given from the driving-power through the connecting-rod *C* to the roller *A*, and at the same time continued to the smaller roller *A'* by the connecting-rods *C' C'*. Thus a constant vibratory, undulating, partial rolling, sliding, and rubbing action is kept up, which reduces the ore into fine particles, and the machine having an inclination in one direction, the pulverized ore, being held in suspension by the agitated water, is passed through the coarse screen *G* into the smaller concave bed-plate *B'*, where it undergoes a more perfect and finer pulverization and trituration. The action of the second roller *A'* corresponds in effect with the larger one. The coarse and fine particles of gold are here scoured, the former caught in the mercury-chamber *H*. The ore, being now finely reduced, is carried with the current of water through the fine screen *G'* into the amalgamator proper. Here all the reduced ore in a thin layer or flake is

forced through the heated mercury by the slow movement of the toothed or fluted rollers K K K. The finest and most minute particles of gold are here amalgamated. If any particles should have escaped the action of the toothed rollers, they will be caught in the riffles N N N. (The large cylindrical rollers being hollow, by placing mercury on their interior a good amalgamating action could be effected.)

All auriferous ores are accompanied by iron, copper, manganese, lead, or some other metal in the form of sulphurets, arsenurets, oxides, or with mica and talc. These compounds are what the Spanish miners call "malatella." This is the great source of annoyance and difficulty experienced in the extraction of gold and silver from their ores, more particularly by the mercurial process—*i. e.*, amalgamation. It is because the gold particles are coated with the oxide of iron, sulphuret of iron, or some other malatella, which causes them to resist the attraction for the mercury, which otherwise would exist were their surface—*i. e.*, gold particles—bright and free from any extraneous coating. Another serious difficulty exists in the talcomicaceous slate and iron, forming a greasy, oily, unctuous substance which floats on the surface of the mercury. Should the mercury be broken up into minute globules, each one of these will be coated with this substance, thereby preventing any affinity for the fine particles of gold, the gold particles being mostly disseminated throughout the ore. More particularly is this the case in the sulphurets, arsenurets, and especially in the ferruginous ochreous decomposed quartz, which is so rich on analysis, yet with the "shaking tables," "whirling pans," "rotating tubs," and "revolving basins and balls" yields hardly any gold. The failure of all these contrivances to recover the gold in practice arises from their not fulfilling the chemico-mechan-

ical conditions so imperatively requisite to success in gold-mining—namely, trituration and friction of the gold particles so as to remove the malatella and preserve the mercury in bulk. The consequence of the ignorance or non-observance of these conditions is that at the gold mines of Virginia, North and South Carolina, Georgia, and California, on washing the tailings or refuse sand a large quantity of amalgam, mercury, and coated gold may be recovered.

The objects to be attained for the perfect extraction of gold from its ore or matrix are, first, to reduce the ore to an impalpable powder, (the finer it is made the larger will be the quantity of gold extracted;) second, trituration or scouring of the auriferous particles, so as to remove the extraneous covering and produce a bright surface, so indispensable to successful amalgamation; third, it is absolutely necessary that the mercury should be kept in bulk and that the pulverized ore should be thoroughly incorporated with it and in such quantities that every particle of gold will be mercurialized; fourth, heating the mercury, so that it is rendered sensitive and quickened, presenting a large surface for amalgamation. Forcing too much ore into the mercury at one time will be attended with great loss of gold. All these conditions are accomplished by the armed rollers and this particular amalgamating process.

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

The arrangement of the cylinder, curved basin, vibrating arm, connecting-rod, and power-wheel attached to it, by which arrangement the cylinder is operated as a pulverizer and triturator without a fixed shaft, as herein set forth.

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Witnesses:

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