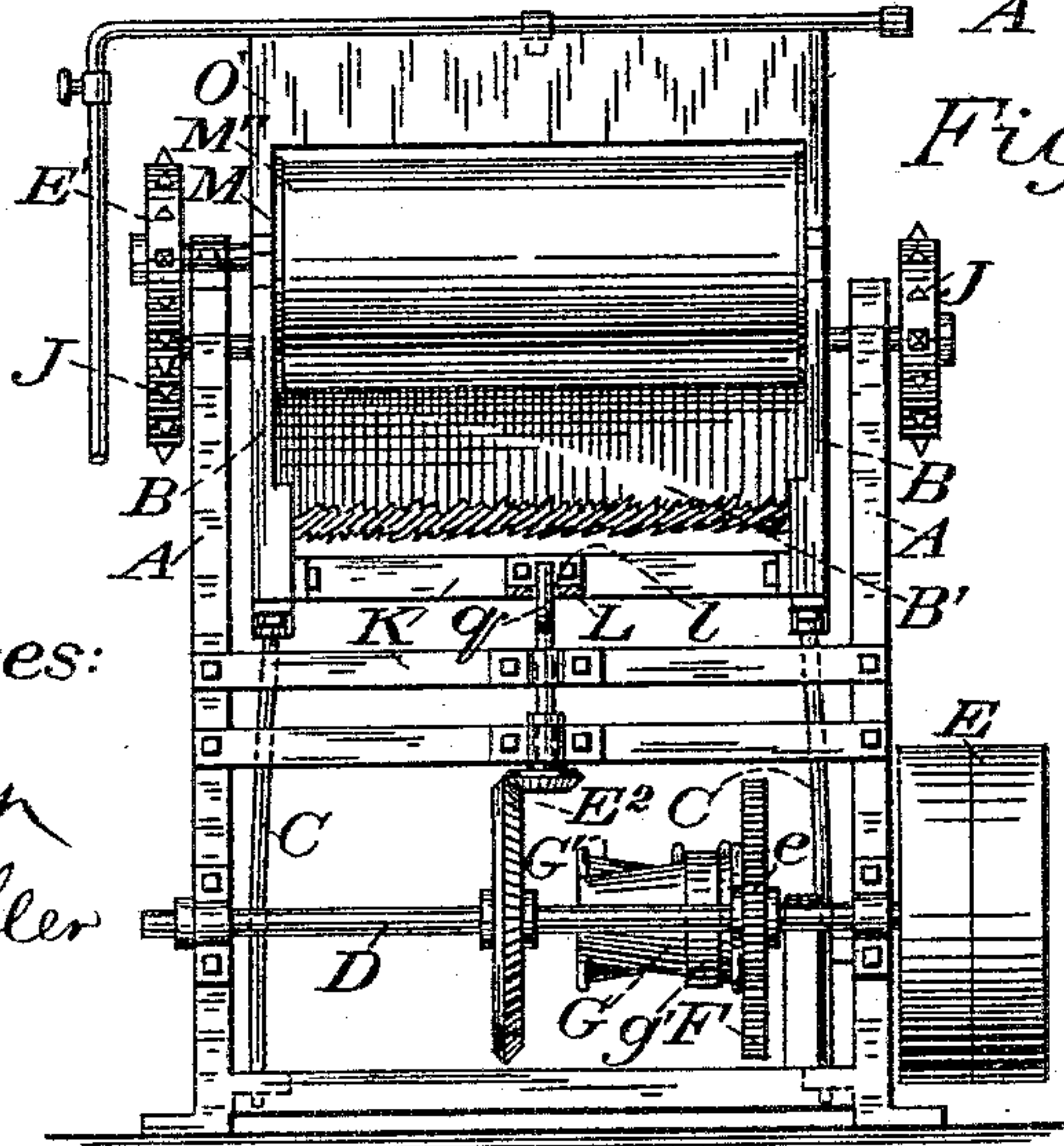
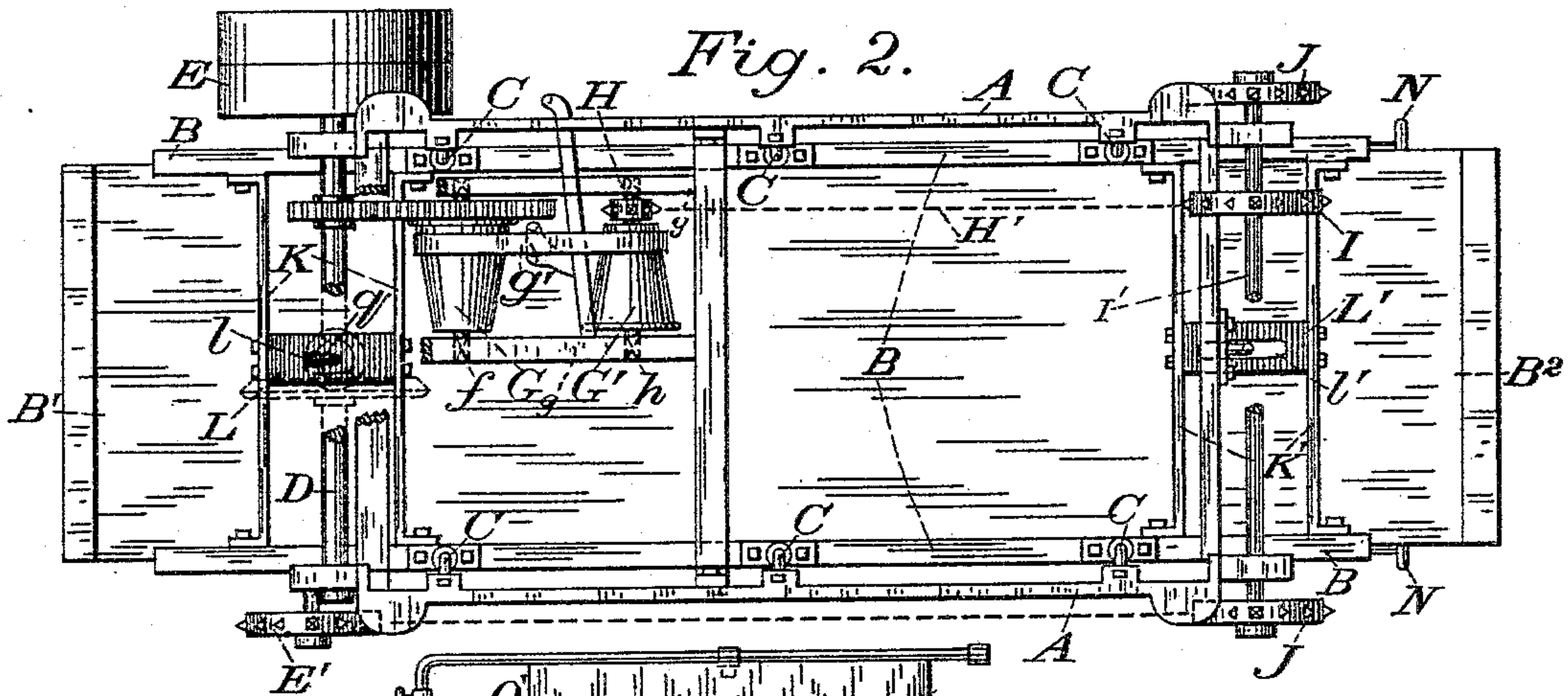
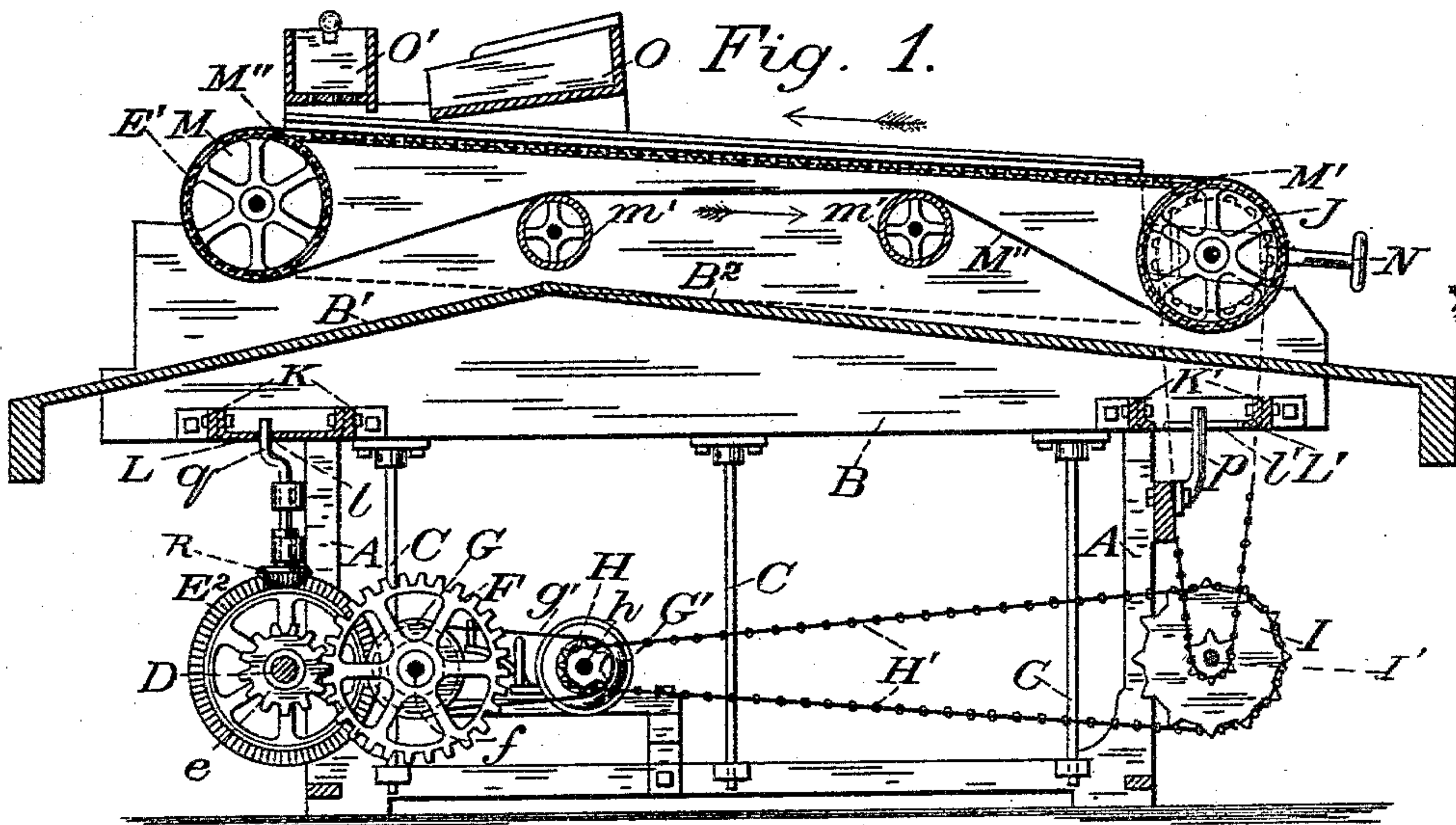


(No Model.)

T. R. GARNIER.  
ORE CONCENTRATOR.

No. 414,394.

Patented Nov. 5, 1889.



Witnesses:

W. A. Lichten  
M. G. Doefler

Inventor:

Thomas R. Garnier  
By John L. Boover  
Attorney



# UNITED STATES PATENT OFFICE.

THOMAS R. GARNIER, OF SAN JOSÉ, CALIFORNIA.

## ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 414,394, dated November 5, 1889.

Application filed August 21, 1889. Serial No. 321,520. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS R. GARNIER, a citizen of the United States, residing at San José, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Ore-Concentrators; and I do hereby declare the following to be a full, clear, and exact description of said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

My invention relates to an improvement in ore-concentrators.

Heretofore in this class of inventions, where-  
in the belt-frame is actuated or moved for the purpose of facilitating the separation of the heavy and light particles, the movement given to the belt-frame has been uniform throughout—that is to say, the same movement is transmitted over the entire area of the frame. This class of machines has been found objectionable, inasmuch as, while of course the vibratory movement will to a great extent effect the separation of the particles, still, notwithstanding this, some of the sulphurets are apt to be carried with the lighter particles, and thus lost.

It is one of the objects of my invention to provide an ore-concentrator of such construction that a violent agitation or vibration is given to that end of the belt over which the heavy particles pass, while a lighter motion is imparted to the end of the belt over which the lighter separated particles are carried. Thereby in the event of any of the sulphurets being contained in the lighter particles they will settle upon the belt, and, as stated, as the movement is very slight at this point they will not be carried with said lighter particles, but will travel with the belt and follow the course taken by the other and heavier sulphurets.

My invention consists, first, of an ore-concentrator having the combination, with a belt-frame, of means for actuating said frame, whereby one end thereof will be caused to be violently agitated or vibrated, while the other end will have but slight movement imparted thereto.

My invention further consists of an ore-

concentrator having the combination, with a belt-frame, of means for actuating said frame, whereby a compound longitudinal and lateral movement is imparted to one end of said frame, while a slight longitudinal movement is imparted to the opposite end thereof; and, furthermore, my invention consists in various other details of construction, as hereinafter more fully set forth and described.

Referring to the drawings forming a part of this application, and in which similar letters of reference are used to denote corresponding parts throughout the entire specification and several views of the drawings, Figure 1 is a longitudinal sectional view of the entire machine; Fig. 2, a bottom plan view showing the front axle broken away, in order to better illustrate the working of the crank-pin; and Fig. 3, an end view in elevation, showing the location of the several parts.

The letter A is used to represent the outer or supporting frame of the concentrator, which frame consists of the vertical and longitudinal pieces. Between the outer frame is secured the movable belt-frame B, which is supported and retained in its adjusted position by means of the springs C. I secure in front of the outer frame within suitable bearings the axle D, upon the outer ends of which are mounted the pulley and sprocket-wheel E E'. Mounted upon the center of said axle is the bevel-wheel E<sup>2</sup>, and to one side of this wheel is located the small cog-wheel e, which engages with the larger cog-wheel F, located to the rear thereof, and which is mounted upon the axle f, which I secure within suitable bearings upon the longitudinal pieces g g. Upon this axle is also mounted the cone-shaped pulley G, which is connected by means of the pulley-belt g' with the cone-shaped belt wheel or pulley G', which is mounted upon the axle h, which is also secured by means of suitable bearings upon the longitudinal pieces.

To one side of the belt-wheel G', and upon the axle h, is mounted the small sprocket-wheel H, which connects by means of the chain H' with the larger wheel I, mounted upon the axle I' at the rear of the outer frame. On each end of this axle is mounted the



sprocket-wheels J, for the purpose hereinafter more fully pointed out.

Supported between the uprights of the outer frame upon suitable springs is the movable belt-frame B, which frame is provided with the front and rear inclined bottom B' B<sup>2</sup>. The metallic rods K K connect said frame at its front and rear and have secured therebetween the metallic plates L L', the front plate of which is provided with the circular opening l, while the rear plate L' is provided with the elongated opening l'.

The letters M M' indicate large belt-rollers located at the front and rear of the belt-frame, the rear one being journaled somewhat lower than the front roller, so as to cause the belt traveling thereon to run upon an incline. To the outer ends of the lower roller I mount the sprocket-wheels m m, which are connected by means of suitable chains with the wheels J, by means of which the rear roller is caused to revolve by means of power imparted from the before-described mechanism.

Within the movable belt-frame is mounted the small belt-rollers m' m', over which and the end rollers the endless belt M'' travels, said belt running at a gradual incline from the rear to the front roller. In order to allow for the tightening or loosening of the belt, I provide the hand-wheels and screw N, which are located at the rear of the belt-frame. The belt M'' is sufficiently wide to cover the entire opening of the movable frame, the side of which frame projects somewhat above the belt, so as to provide against the falling off of the pulp moving thereon.

To the forward end of the movable frame I locate the pulp-receptacle O, and in front of said receptacle I secure the water-reservoir O', which is kept supplied by means of suitable pipes running therein. The bottom of said reservoir is provided with a series of perforations, which permit of the retained water flowing freely therethrough onto the ore or pulp carried thereunder by means of the traveling belt, which passes beneath the same.

Secured to the rear cross-piece of the outer frame is the upwardly-projecting pin or stud p, the upper end of which engages with the elongated opening formed in the rear metallic plate L'. To the front cross-piece of said frame is secured within suitable bearings or hangers attached thereto the crank-pin q, adapted to engage in the circular opening of the metallic plate L. The lower end of the crank-pin has secured thereon the small bevel-wheel R, which engages with the bevel-wheel E<sup>2</sup>, which of necessity imparts rotary motion to the crank-pin, and, inasmuch as the upper end of said pin works in the metallic plate L, it follows that with each throw of the crank-pin a compound longitudinal and side motion is imparted to the front of the movable belt-frame, while the rear end thereof, being limited in its motion by reason of the stationary pin or stud working in the

elongated slot of the metallic plate L', is given a slight longitudinal motion.

By the use of a concentrator constructed in accordance with the above description the pulp or ore containing the metal to be separated is caused to be distributed upon the belt while in rotary motion, by which it is carried forward and exposed to the action of the waterflow, which, in connection with the oscillatory motion of the belt and frame, causes the separation of the lighter particles from the heavier. The heavier particles, remaining upon the belt, are carried beneath the flow of water over the front roller and precipitated upon the inclined bottom B', while the lighter or worthless particles are carried to the rear by the downward flow of the water and deposited upon the inclined bottom B<sup>2</sup>. As the motion imparted to the rear end of the frame and belt is very slight, whatever of the sulphurets may be contained in the lighter particles will fall and settle upon the belt, and, adhering thereto, will be carried forward beneath the water-reservoir over the forward roller, and will finally be deposited upon the inclined bottom B'.

Having thus fully described my invention, what I claim as new, and desire to secure protection in by Letters Patent of the United States, is—

1. In an ore-concentrator, the combination, with a belt-frame, of means for actuating said frame, whereby one end thereof will be caused to be violently agitated or vibrated, while the other end will have but slight movement imparted thereto, substantially as set forth.

2. In an ore-concentrator, the combination, with a belt-frame, of means for actuating said frame, whereby a compound longitudinal and lateral movement is imparted to one end of said frame, while a slight longitudinal movement is imparted to the opposite end thereof, substantially as set forth.

3. In an ore-concentrator, the combination of the water-reservoir, pulp-receptacle, endless traveling belt, movable belt-frame, said frame being provided with belt-rollers and having the front and rear inclined bottom, and of the herein-described mechanism for imparting a rotary and longitudinal motion to the belt and belt-frame, substantially as and for the purpose herein shown and described.

4. In an ore-concentrator, the combination, with the mounted frame provided with a double-inclined bottom, the cross-pieces secured to the frame at its front and rear, the plates secured between the cross-pieces, stationary pin attached to the rear of the outer frame passing into the elongated opening of the rear plate, and of the crank-pin suitably secured to the front of the outer frame engaging with the apertured front plate, so that at each throw said pin will impart a compound side and longitudinal movement to the front portion of the concentrator-frame and



a slight longitudinal motion to the rear end, substantially as set forth.

5 In an ore-concentrator, the combination, with the movable belt-frame, of a vertically-  
10 disposed crank and crank-arm mounted in suitable bearings in the front of the machine for actuating said frame, the lower end of said crank-arm carrying a bevel-gear, the transverse front shaft having mounted upon  
15 opposite ends thereof pulley and sprocket wheels and having centrally mounted thereon a bevel-gear which meshes with the bevel-gear upon the lower end of the crank-arm, the cog-wheel located upon said transverse  
20 shaft to one side of the bevel-gear, the short shaft carrying a cog-wheel meshing with the cog-wheel upon the forward shaft, and also having mounted thereon a cone-shaped pulley, a similar shaft located to the rear and  
25 having mounted thereon a cone-shaped pulley and a sprocket-wheel to one side thereof, an endless belt connecting the two cone-shaped pulleys, the rear transverse shaft having mounted thereon end sprocket-wheels  
30 and an intermediate sprocket-wheel, an endless chain connecting said intermediate sprocket-wheel with the sprocket-wheel upon the rear short shaft, the belt-rollers mounted upon the front and rear of the frame, the sprocket-wheels to each side of the rear roller, and the endless chains connecting the same

with the end sprocket-wheels of the rear transverse shaft, substantially as set forth.

6. In an ore-concentrator, the combination, with the movable belt-frame, of the reservoir, 35 pulp-receptacle, front and rear inclined bottom, cross-bars secured to the bottom of said frame at the front and rear thereof, plates secured between said bars, the forward one of which is provided with a circular opening 40 and the rear one with an elongated slot, outer frame or support, projecting pin or lug attached to the rear of the outer frame engaging with one of said plates, crank-pin secured to the front of the outer frame by means of 45 suitable hangers adapted to engage with the circular aperture formed in the front plate, gear-wheel secured to the lower end of the crank-pin engaging with the bevel-wheel, and of the operating mechanism for impart- 50 ing rotary motion to the crank, thereby causing a compound side and longitudinal motion to be imparted to the forward end of the movable frame and a slight longitudinal rear movement, substantially as and for the 55 purpose herein shown and described.

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

THOMAS R. GARNIER.

Witnesses:

N. A. ACKER,

M. G. LOEFLEER.