

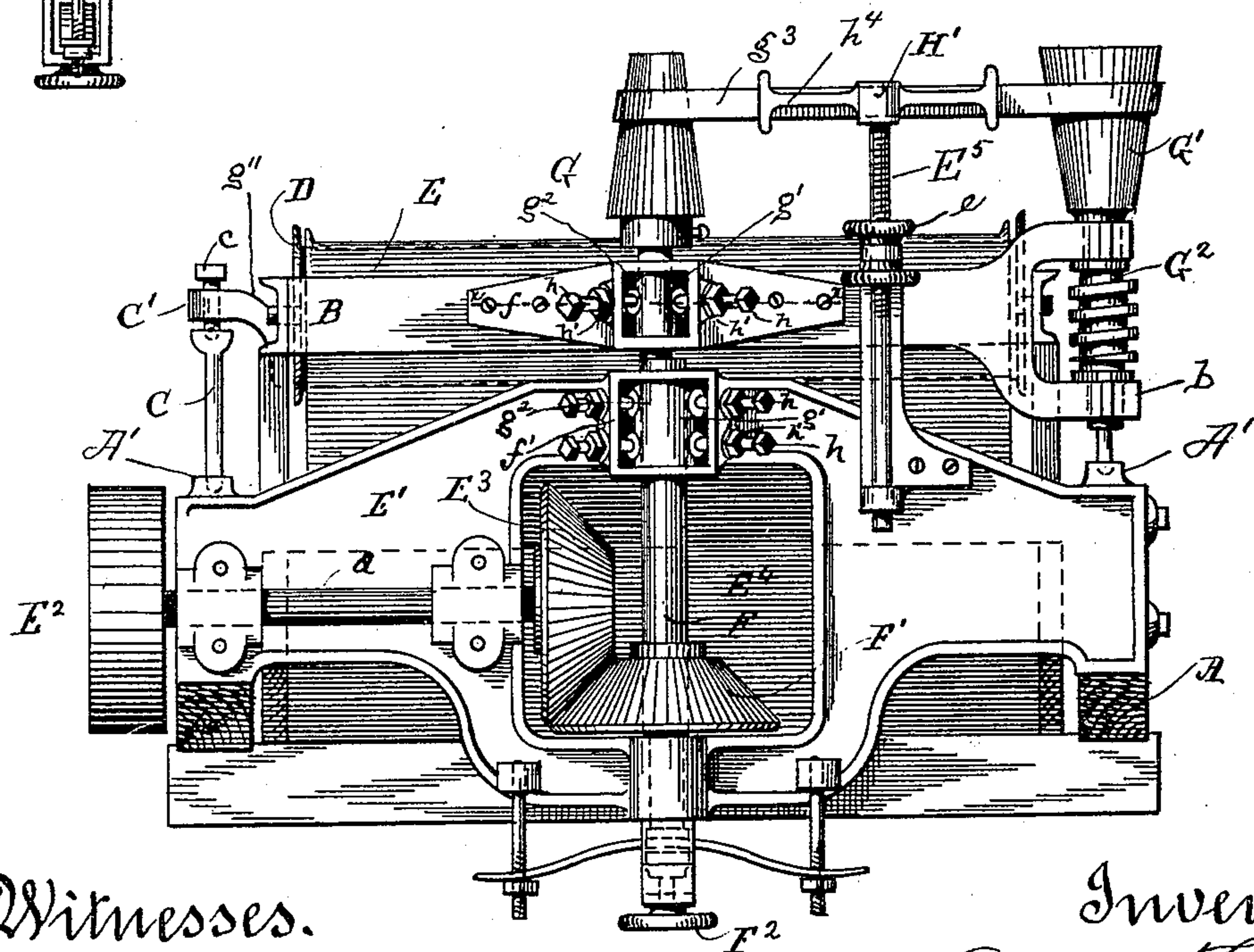
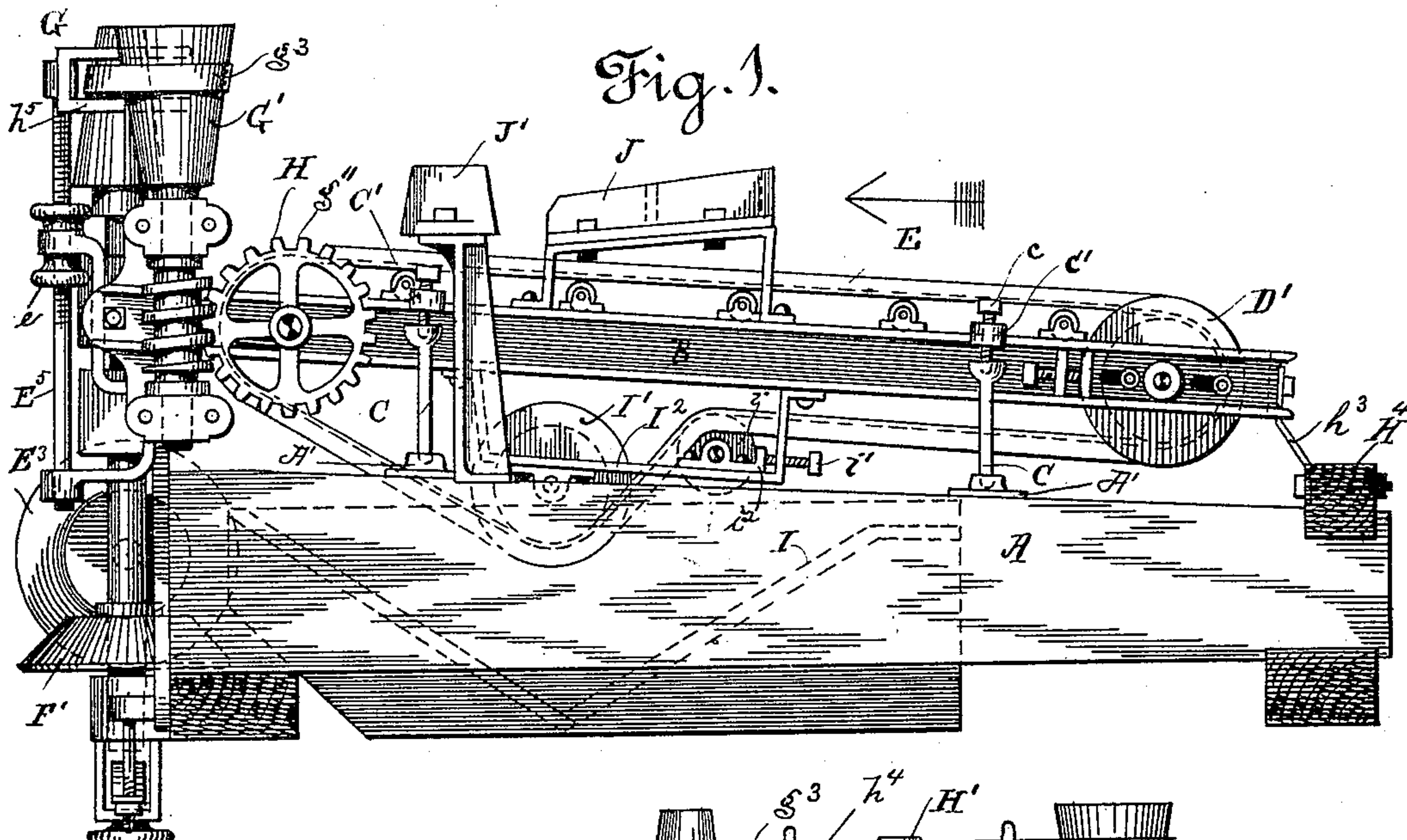
(No Model.)

2 Sheets—Sheet 1.

A. FRASER.  
ORE CONCENTRATOR.

No. 459,684.

Patented Sept. 15, 1891.



Witnesses.

*H. Monteverde.*  
*J. C. McKee.*

Fig. 2.

Inventor.  
*Andrew Fraser*

By *W. A. Carter*  
Atty

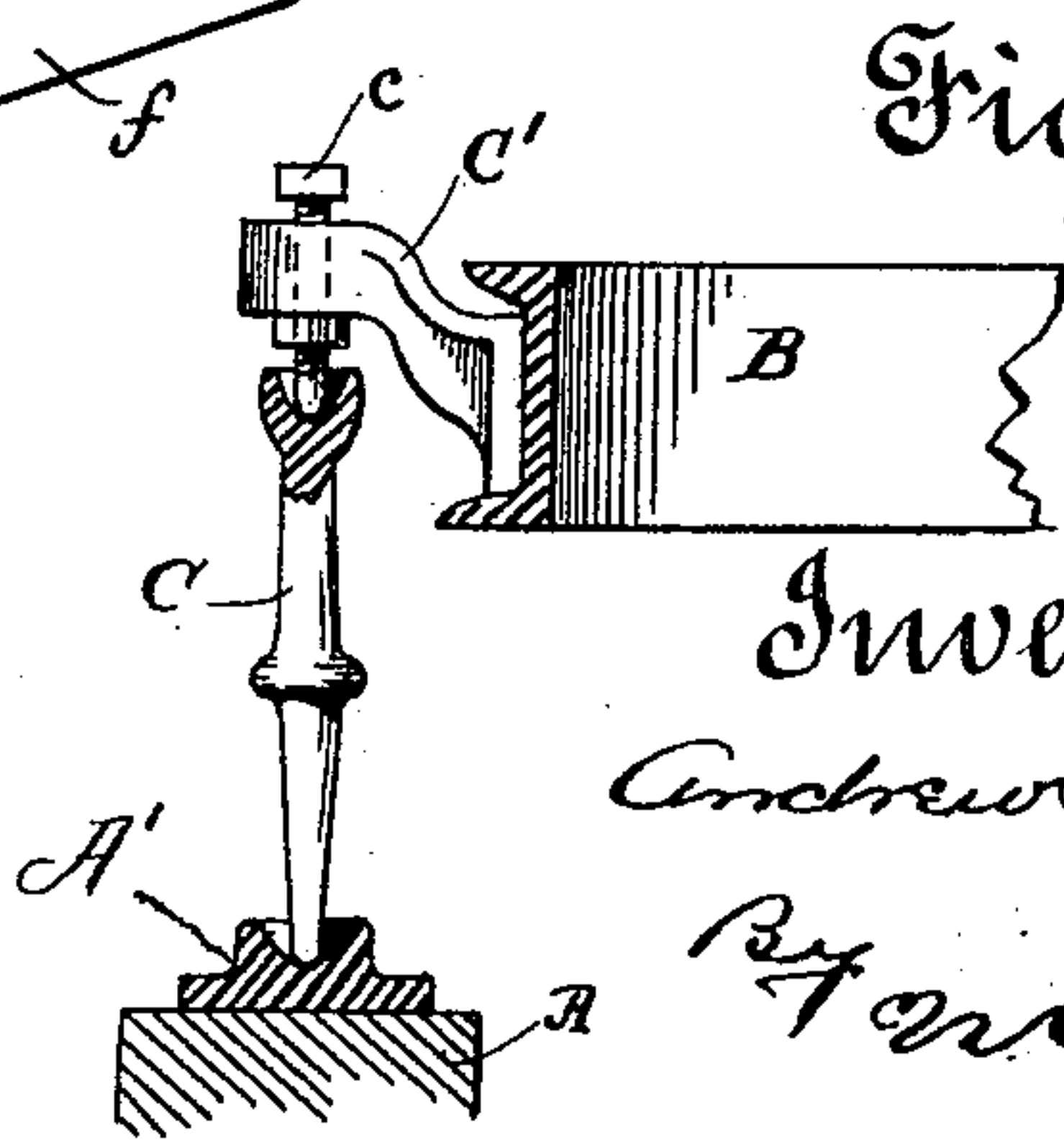
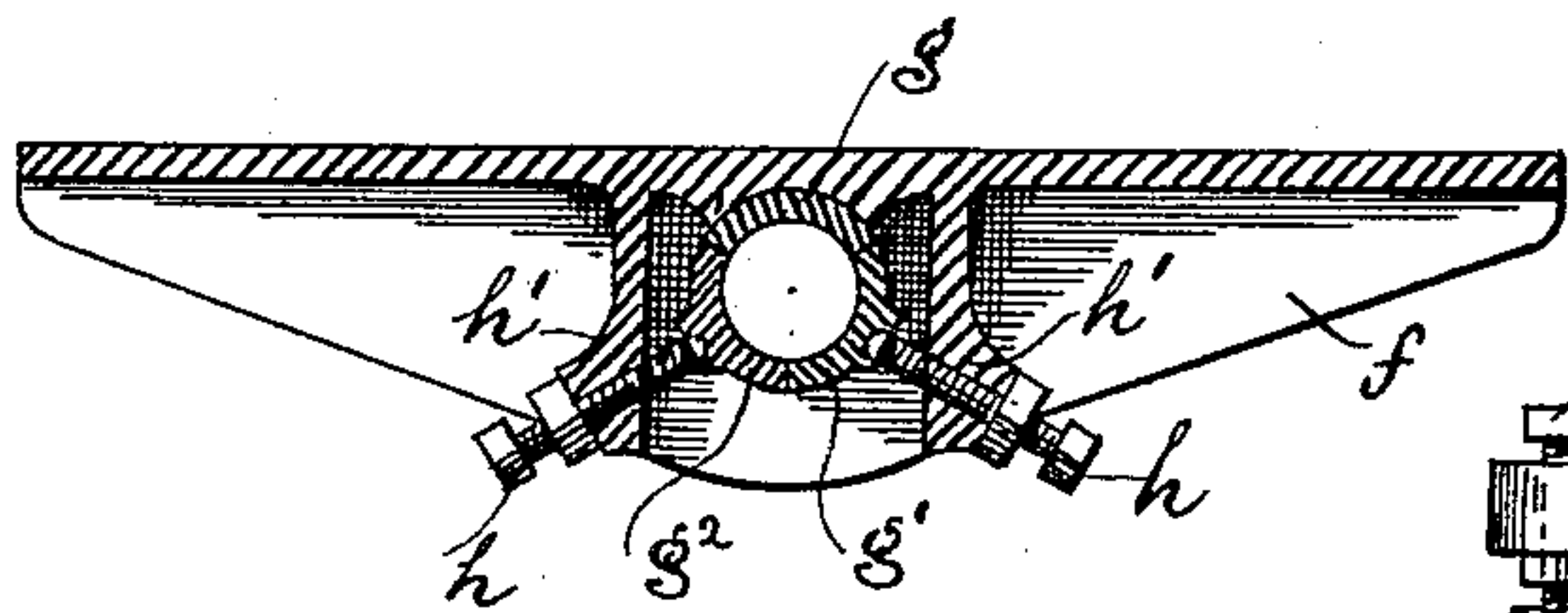
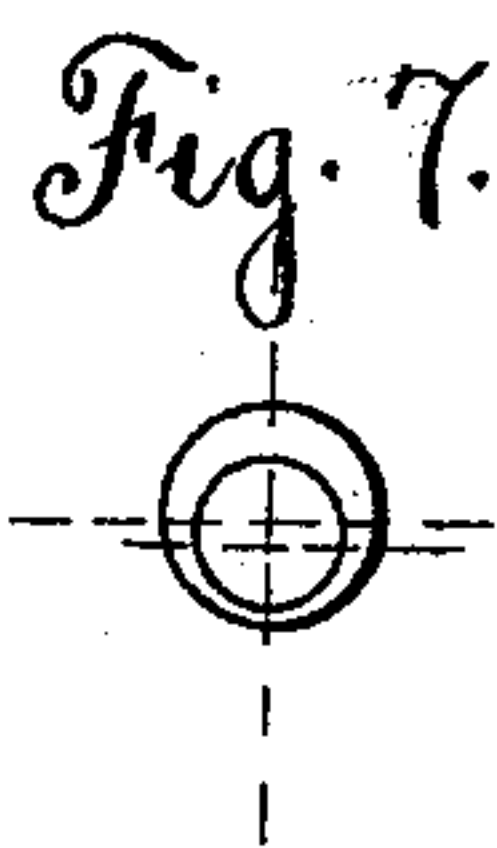
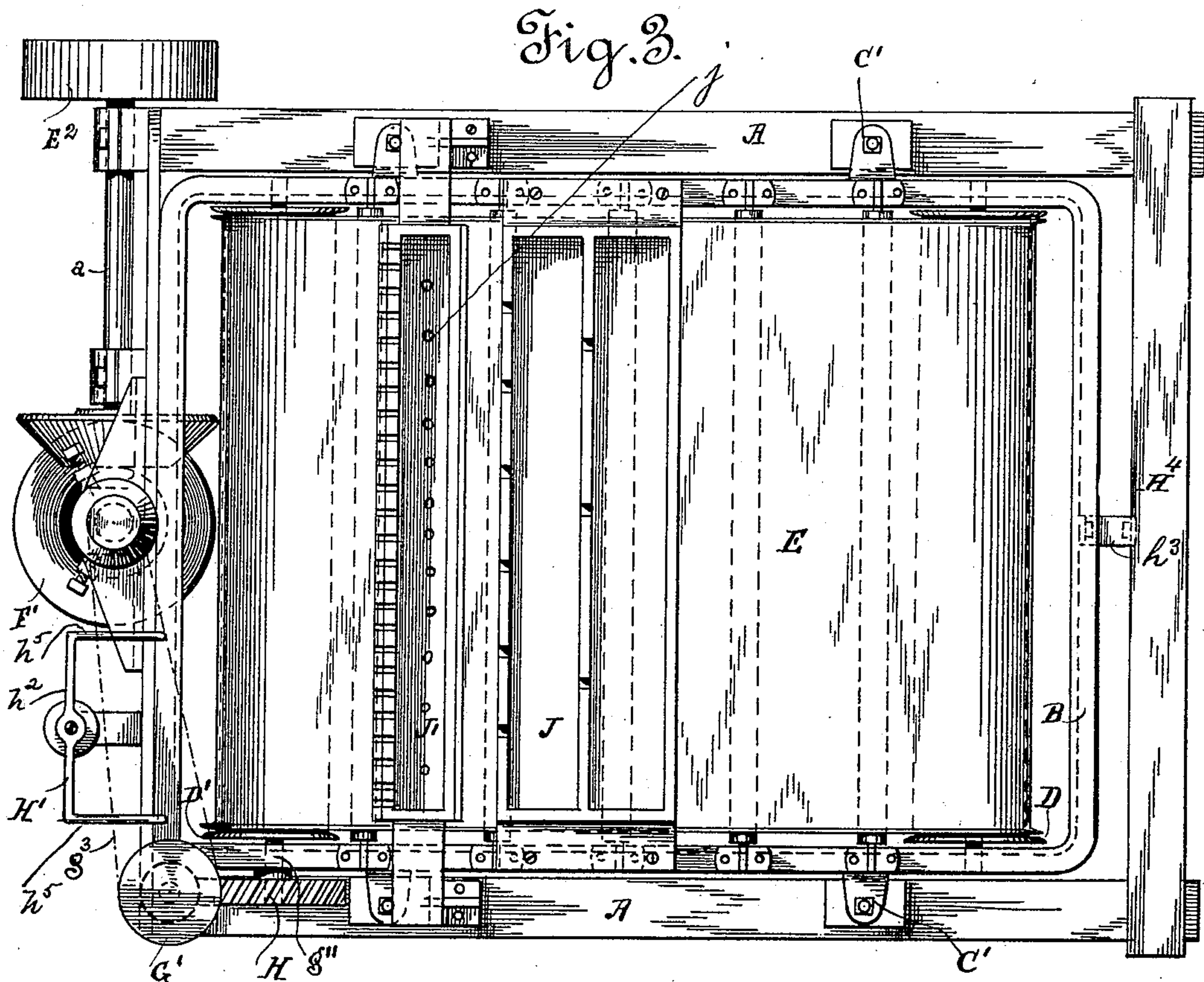
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Andrew Fraser  
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att'y



# UNITED STATES PATENT OFFICE.

ANDREW FRASER, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO THE  
RISDON IRON WORKS, OF SAME PLACE.

## ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 459,684, dated September 15, 1891.

Application filed April 4, 1891. Serial No 387,631. (No model.)

*To all whom it may concern:*

Be it known that I, ANDREW FRASER, a citizen of the United States, residing at San Francisco, in the county of San Francisco 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 certain new and useful improvements upon the operating mechanism fully set forth and described in Letters Patent No. 414,394, granted to Thomas R. Garnier on the 5th day of November, 1889; and it consists in operating mechanism so constructed that a positive and uniform motion may be imparted to the concentrating-bed, and, like said patent, has for its object the production of a compound longitudinal and reciprocating motion of said bed.

Having been engaged in the manufacture, construction, and operation of the Garnier concentrator, I have discovered that, owing to the unnecessary distance existing between the operating mechanism and the concentrating-bed, any lost motion which may result due to wear from working serves to so throw the bed as to cause an irregular movement thereof, consequently resulting in a loss of the compound longitudinal and reciprocating motion desired to be imparted thereto.

The object of my invention is to overcome the above-referred-to disadvantage, and with this in view the invention consists in the improved construction and combination of parts, as hereinafter more fully set forth.

Referring to the drawings forming a part of this specification, wherein similar letters of reference denote corresponding parts throughout the entire specification and several views, Figure 1 is a side view in elevation; Fig. 2, a front end view in elevation; Fig. 3, a top plan view; Fig. 4, a detail view showing the vertical operating crank-shaft. Fig. 5 is a horizontal section through plate *f* on the plane indicated by dotted line *x x*, Fig. 2; Fig. 6, a detail view showing one of the spring-rods secured to the concentrator and support-

ing-frame, and Fig. 7 is a view clearly illustrating the eccentricity of the two shafts.

The letter A is used to represent the outer or supporting frame of the concentrator, which frame consists of cross and longitudinal pieces.

The movable concentrating-frame is indicated by the letter B, which is preferably composed of T-shaped metal, and said frame is supported above the outer frame by means of rods C, through the medium of outwardly-extending arms or brackets C', provided with downwardly-extending bolts *c*, which fit with the cup-shaped end of rods C, as clearly shown in Figs. 1, 2, and 6. By the employment of these bolts (which are threaded) when the sockets become worn said bolts may be adjusted so as to always maintain a firm fit. It will also be seen that the lower end of rod C fits in a cup-shaped socket A', secured to or formed upon the supporting-frame, whereby toggle rods or bars having universal joints are formed.

Within the movable concentrating-frame B, I secure in suitable bearings the front and rear rollers D D', over which the belt E is adapted to travel.

To the front of the stationary frame A, I secure by means of bolts or otherwise the metallic plate E', and within suitable bearings secured thereto works the shaft *a*, upon the outer end of which is located the drive-wheel E<sup>2</sup>, while the inner end is provided with the bevel friction-wheel E<sup>3</sup>, which works within the opening E<sup>4</sup>, formed in the front plate. To said front plate and end of metallic concentrating-frame I bolt or otherwise secure the bearing-plates *f f'*, within which are secured the bearing-blocks *g g' g''* by means of the bolt *h*, working through forwardly-projecting flange *h'* of the plates *f f'*. By means of bolt *h* the bearing-blocks are made adjustable, so as to readily allow of compensation for the wear thereof.

Passing through and working within the bearing-blocks is the vertical crank-shaft F, which has rigidly secured thereon the bevel-wheel F', which works within opening E<sup>4</sup> and is adapted to contact with bevel-wheel E<sup>3</sup>. This crank-shaft is formed of an inner



member and an outer member, held together eccentrically and rotatable in unison. As the upper ends of these two rigid shafts pass through and engage the concentrating-frame, it is obvious that when rotated a crank movement is imparted, which results in a gyratory movement being transmitted to the concentrating-frame. However, if so desired, instead of frictional contact being made between the bevel-wheels, the wheels may be ordinary bevel gear-wheels adapted to mesh one with the other.

Below and secured to the front plate works the hand-screw  $F^2$ , which is adapted to raise or lower the crank-shaft  $F$  sufficiently to throw the bevel-wheels in or out of contact. The upper end of the crank-shaft  $F$  extends above the concentrating-frame and has secured thereon the cone-pulley  $G$ , which is connected to the cone-pulley  $G'$  by means of belt  $g^3$ . Cone  $G'$  is mounted on vertical worm-shaft  $G^2$ , which engages with worm-wheel  $H$ , attached to the extending axle  $g''$  of roll  $D$ . The vertical shaft has its bearing in the laterally-extending bifurcated end  $b$  of plate  $B$ . The belt  $g^3$  is held in place by means of the adjustable guide  $H'$ . This guide consists of an arm  $h^4$ , provided with a central screw-threaded socket and having extending inwardly from each end thereof bifurcated arms  $h^5$   $h^5$ , which embrace the belt and form a guide therefor.

Engaging the central socket of arm  $h^4$  is a vertical screw-bolt  $E^5$ , which has its bearings in a bracket  $E^6$ , secured to plate  $E'$ , the upper end passing through a socket  $e$ , formed upon the bracket. By the employment of this screw-bolt in connection with the guide it will be seen that the vertical adjustment of the latter with reference to the pulley-belt may be regulated. The rear end of the concentrating-frame is provided with the spring-plate  $h^3$ , which is secured to the rear beam  $H^4$  of the outer frame.

Below the concentrating-frame is located the water-tank  $I$ , (shown by dotted lines, Fig. 1,) and within the same projects the roll  $I'$ , which works in bearings formed in bracket  $I^2$ . To the rear of said roll  $I$  locate the smaller roll  $i$ , which is also suspended by said bracket and works within sliding bearings formed therein and by means of hand-screw  $i'$  is made adjustable, so as to regulate the tension of the concentrating-belt. It will be seen that the hand-screw  $i'$  works horizontally through one end of the bracket and engages the upwardly-extending flange  $i^2$ , extending from the sliding bearings. The belt  $E$  passes over the rolls  $D$   $D'$ , under roll  $I'$ , and over roll  $i$ . As it passes under roll  $I'$  it is thoroughly cleaned by the water contained in water-tank  $I$ .

To the forward end of the movable frame  $I$  locate the pulp-receptacle  $J$ , and in front of said receptacle is secured the water-distributor  $J'$ , which is supplied by means of suitable supply-pipes. (Not shown.) The bottom of said distributor is provided with a se-

ries of perforations  $j$ , which permits 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.

The operation of my machine is as follows: Power being applied to drive-wheels  $E^2$  by any suitable mechanism, (not shown,) shaft  $a$  is caused to rotate, carrying therewith bevel-wheel  $E^3$ , which contacting with bevel-wheel  $F'$  transmits motion thereto, which being rigidly secured to crank-shaft  $F$  causes the revolving thereof. Inasmuch as the crank-shaft passes through the concentrating-frame, it is obvious that with the rotation thereof a gyratory movement is imparted to the forward end of the concentrating-bed. The motion of the crank-shaft  $F$  is imparted to the worm-shaft  $G^2$  through the medium of the belt  $g^3$ , which works over the cone-pulleys  $G$   $G'$ , and said worm-shaft in turn transmits its motion to the worm-wheel  $H$ , which being rigidly affixed to shaft or axle  $g''$  necessarily causes the rotation of the roll  $D$ , so as to cause motion to be imparted to the concentrating-belt. Inasmuch as the rear end of the frame is provided with the spring-plate  $h^3$ , secured to the rear beam  $H^4$ , it is obvious that this end of the concentrating bed or frame is confined to a longitudinal movement. Thus I have imparted to the movable bed a compound reciprocating and longitudinal movement. The pitch of the machine is such as to provide a gradual ascent from the rear to the forward end. The adjustable guide  $H'$  serves to maintain the connecting-belt  $g^3$  from slipping off the cone-pulleys during the rotation thereof. By means of the adjustable roll  $i$  the tension of the concentrating-belt may be easily regulated.

By means of a concentrator constructed in accordance with the above description the pulp or ore containing the metal to be separated is distributed upon the belt while in rotary motion, by which it is carried forward and exposed to the action of the water-flow, 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, while the lighter or worthless particles are carried to the rear by the downward flow of the water. 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. If so desired, the bearing-plates may be formed integral with the front plate and concentrator-frame, thereby allowing each to be completed in one casting and of ready packing for shipment.

I am aware that minor changes may be made in the arrangement of parts and details



of construction herein shown and described without necessitating or creating a departure from the nature and scope of my invention.

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 of a supporting-frame, a metallic plate secured to the forward end thereof, said plate having a central opening, therein, a horizontal shaft journaled in suitable bearings in the frame, said shaft provided upon its outer end with a drive-pulley and its inner end extending into the opening of the plate and carrying a bevel-gear, a vertical shaft passing through the opening of the plate and carrying near its lower end and within the opening a bevel-gear meshing with the gear of the horizontal drive-shaft, and a concentrating-frame engaged and actuated by the upper end of the vertical shaft, substantially as set forth.

2. In an ore-concentrator, the combination of a supporting-frame, a metallic plate secured to the forward end thereof, a concentrating-frame, a plate secured thereto and having one end extended and bifurcated, a rotatable vertical shaft engaging and actuating the concentrating-frame and carrying upon its upper end a cone-pulley, a vertical screw-shaft journaled in the bifurcated end of the upper plate, having its lower end stepped in a socket in the lower plate and its upper end carrying a cone-pulley, and a belt connecting the two cone-pulleys, substantially as set forth.

3. In an ore-concentrator, the combination of a supporting-frame, a plate secured at one end thereof, a concentrating-frame, a vertical rotatable shaft engaging and actuating the said frame and carrying upon its upper end a cone-pulley, a plate secured to the concen-

trating-frame having one end extended, a screw-shaft working in bearings in said extended end and carrying upon its upper end a cone-pulley, a belt connecting the cone-pulleys, an arm secured to the lower plate and provided at its upper end with a screw-threaded opening, a threaded bolt working in said opening, and a belt-guide adjustable upon said bolt and consisting of an arm provided with a central eye engaging the bolt and having at opposite ends inwardly-extending bifurcated members engaging the belt, substantially as set forth.

4. In an ore-concentrator, the combination of a supporting-frame having socket-pieces secured thereto, a concentrating-frame provided with laterally-extending eyed arms, set-screws passing through the eyes, and supporting-rods having their upper ends provided with sockets engaged by the set-screws and their lower ends engaging the socket-pieces of the supporting-frame, and means for agitating the concentrating-frame, substantially as set forth.

5. The combination, with the outer frame of an ore-concentrator, of the movable concentrating-frame located thereon, operating-shaft secured within bearings to the front of the outer frame, said shaft carrying a drive and frictional bearing-wheel, vertical adjustable crank-shaft carrying a frictional bevel-wheel adapted to contact and be operated by the bevel-wheel located on the operating-shaft, and the hand-wheel for raising or lowering the vertical crank-shaft, substantially as and for the purpose set forth.

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

ANDREW FRASER.

Witnesses:

N. A. ACKER,  
J. W. KEYS.