

No. 689,252.

Patented Dec. 17, 1901.

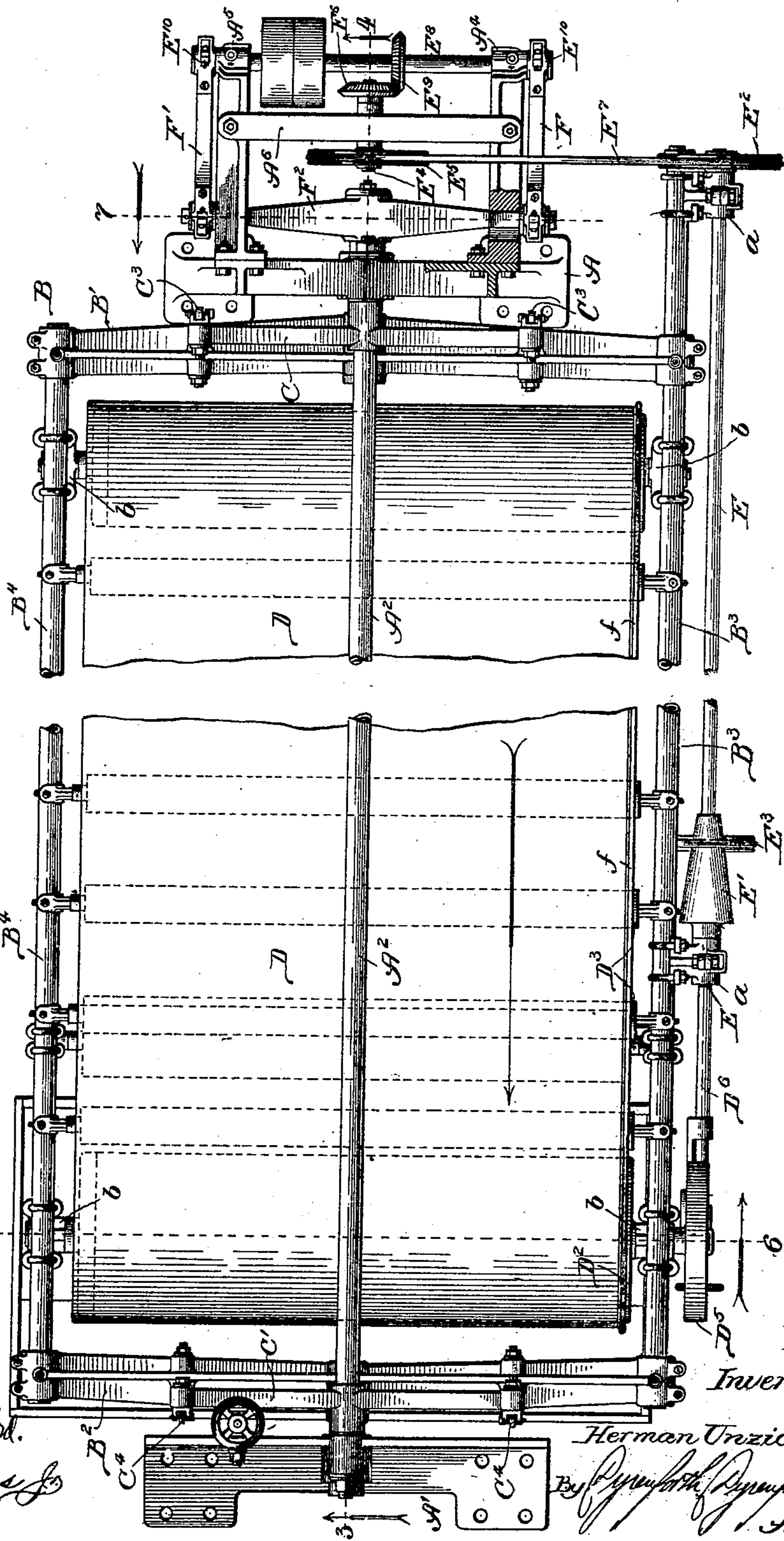
H. UNZICKER.
ORE CONCENTRATOR.

(Application filed June 21, 1901.)

(No Model.)

6 Sheets—Sheet 1.

Fig. 1.



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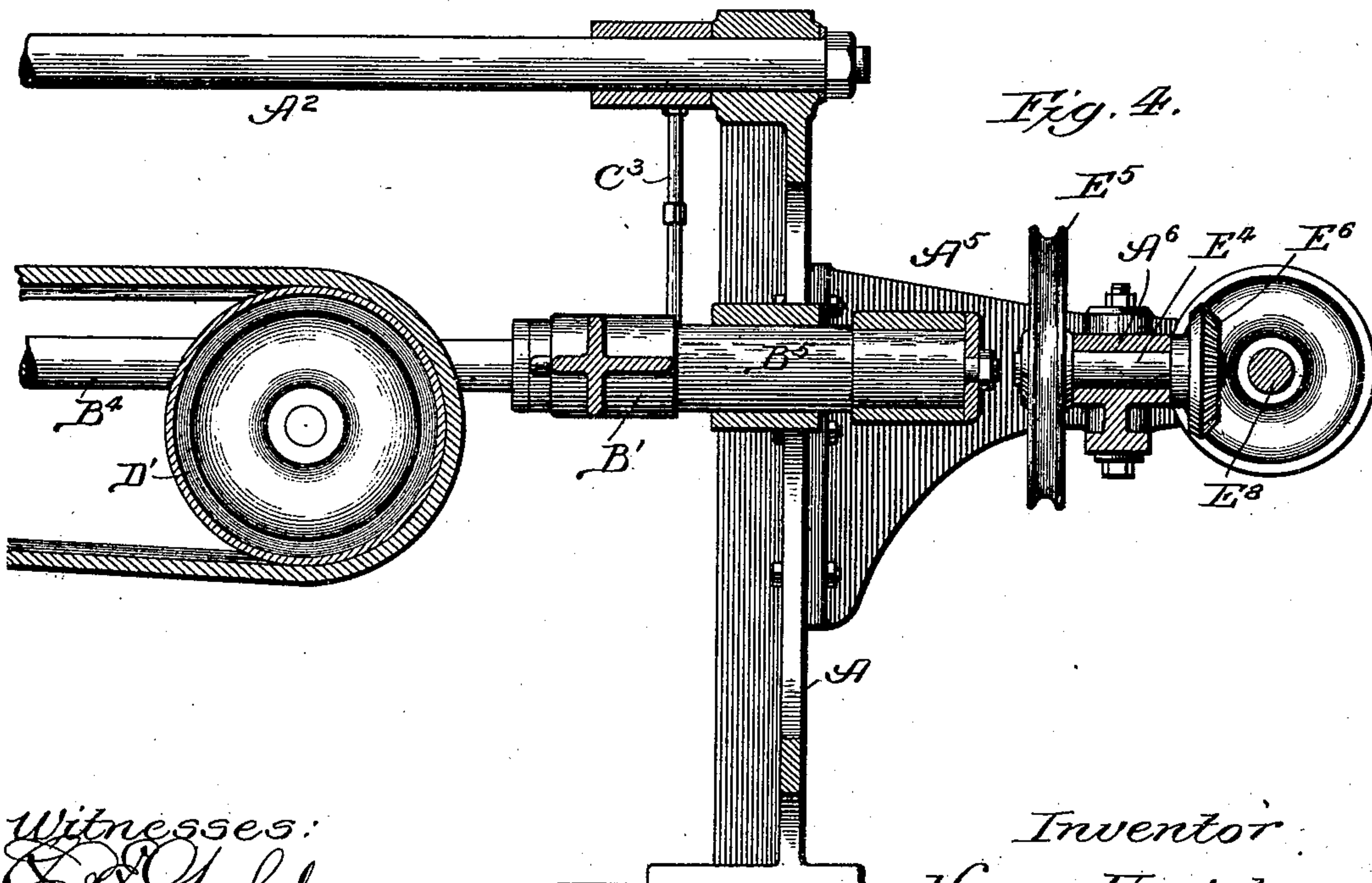
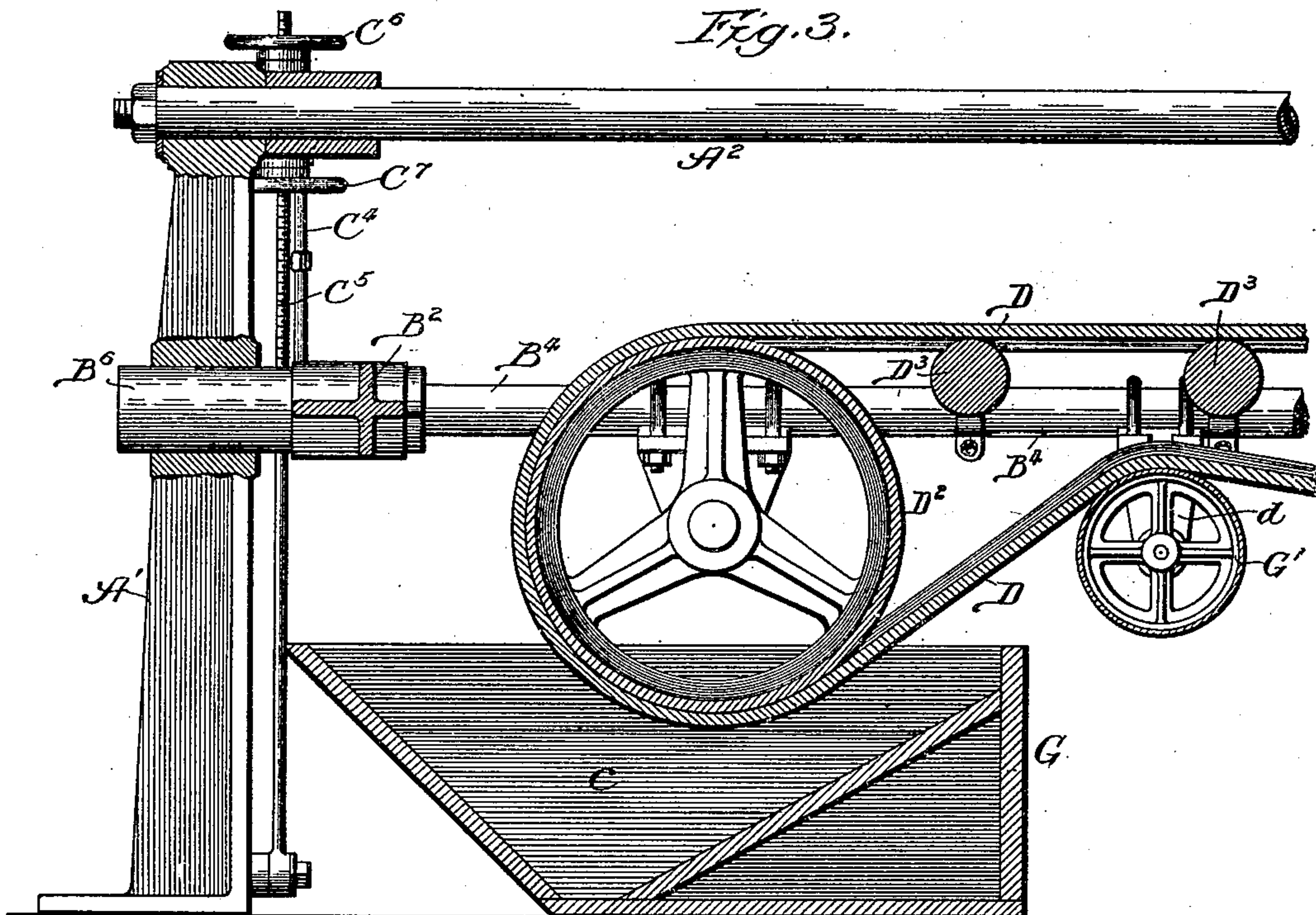
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6 Sheets—Sheet 3.



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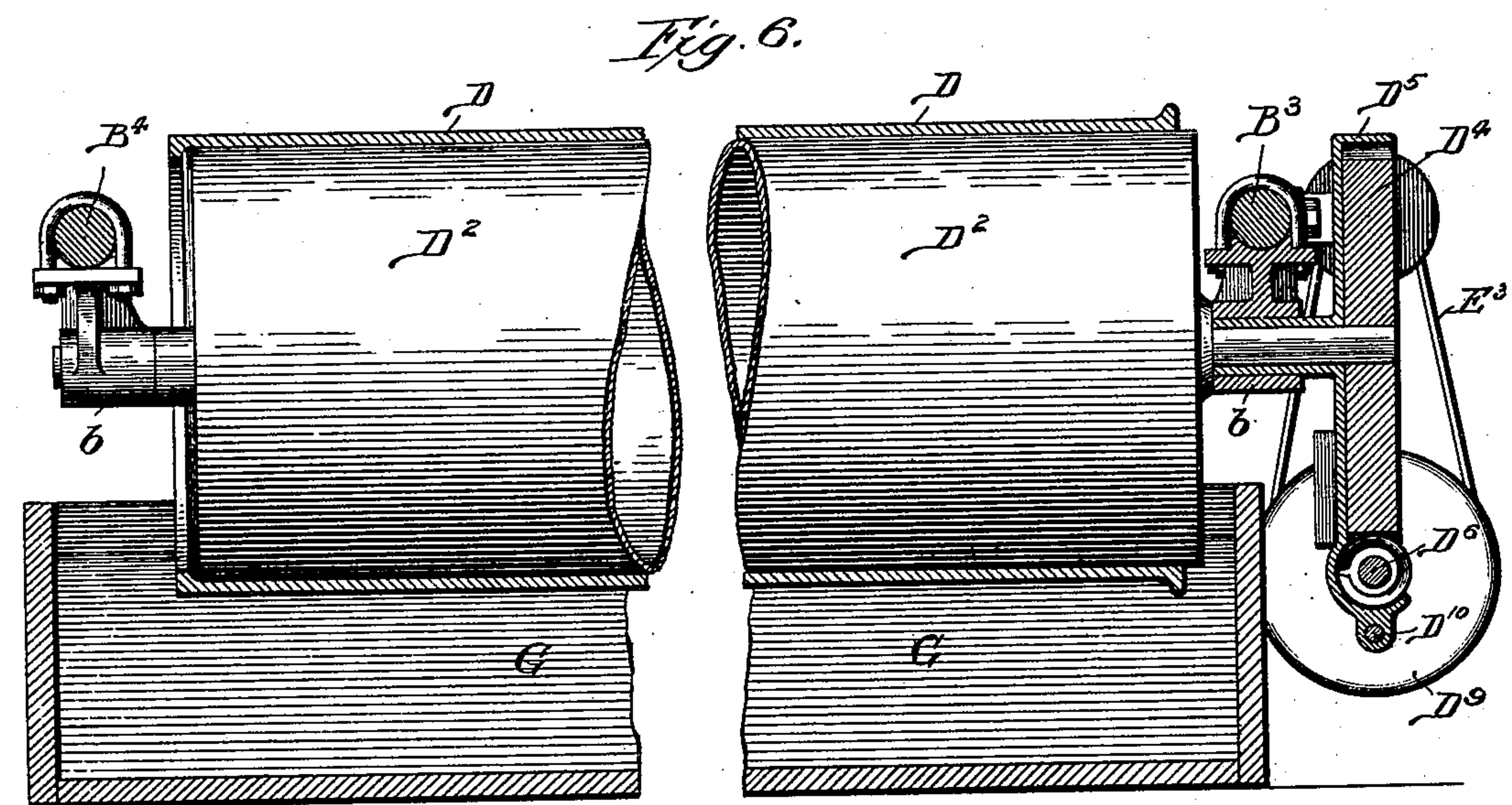
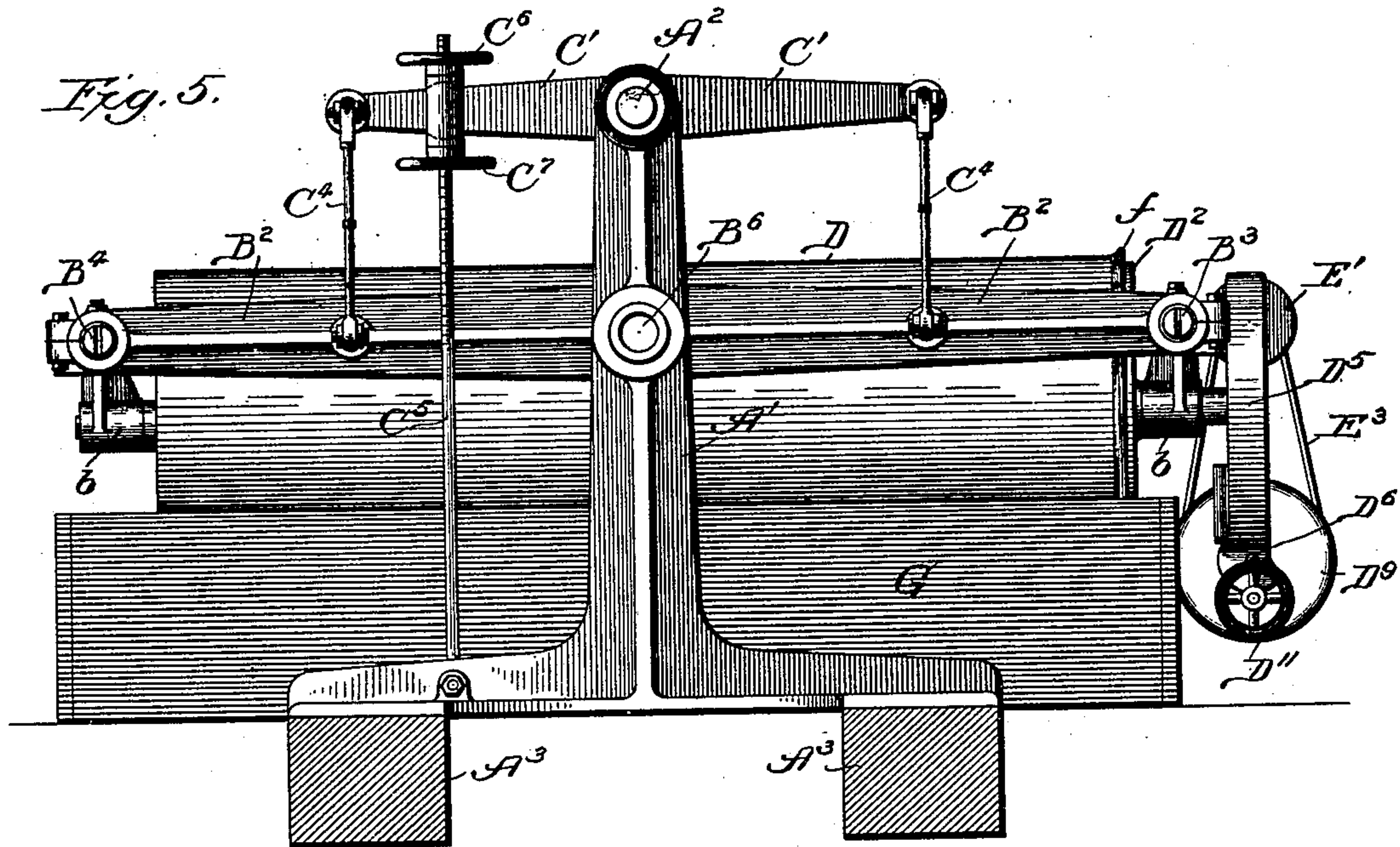
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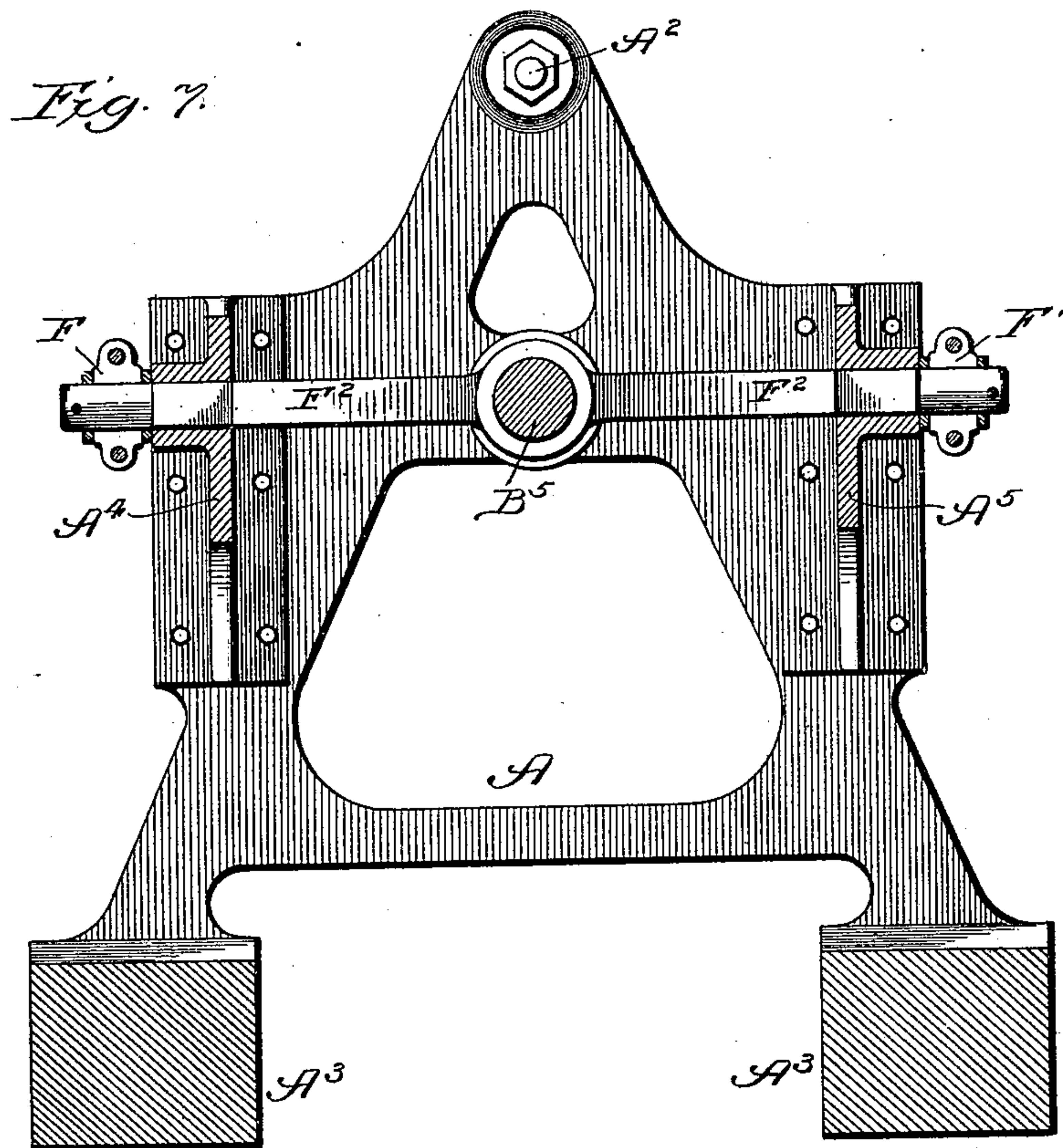
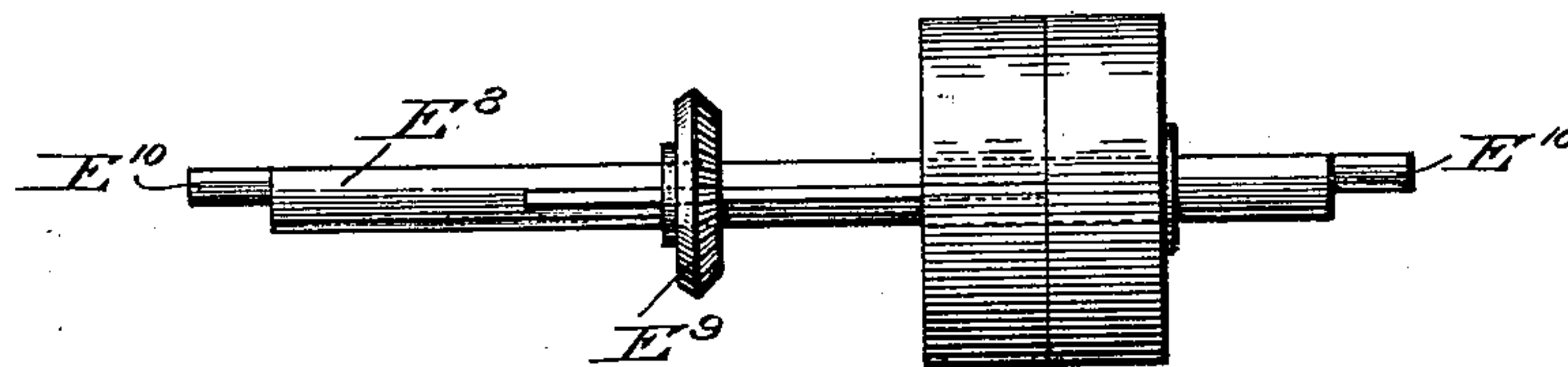


Fig. 8.



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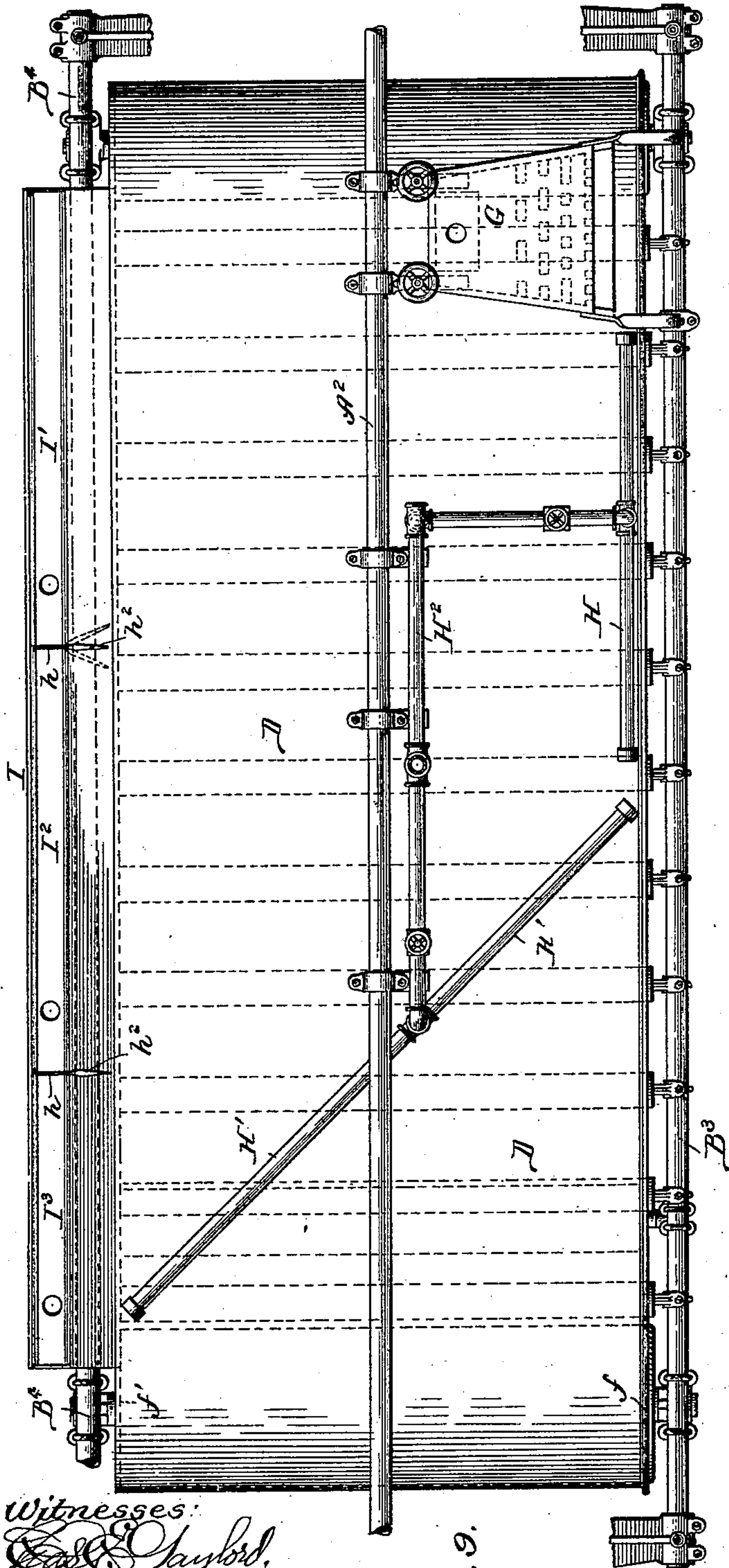


Fig. 9.

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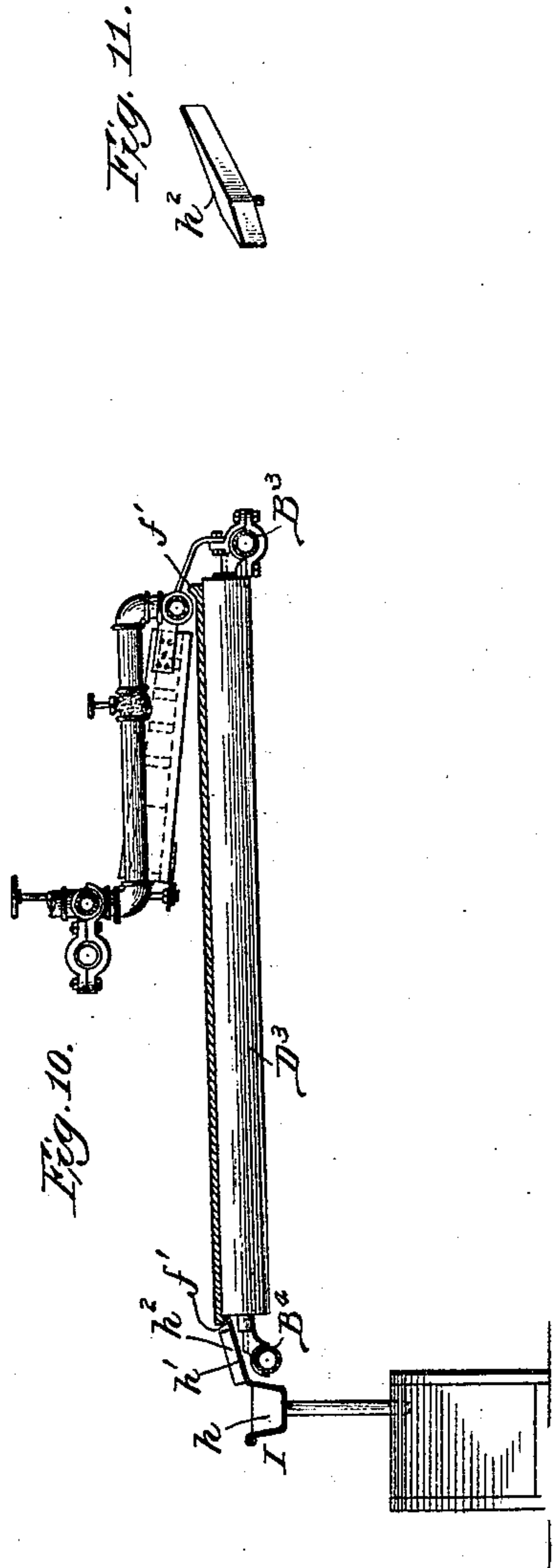


Fig. 11.

Fig. 10.

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UNITED STATES PATENT OFFICE.

HERMAN UNZICKER, OF CHICAGO, ILLINOIS.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 689,252, dated December 17, 1901.

Application filed June 21, 1901. Serial No. 65,416. (No model.)

To all whom it may concern:

Be it known that I, HERMAN UNZICKER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Ore-Concentrators, of which the following is a specification.

My invention relates particularly to ore-concentrators of the class in which an endless belt or conveyer is mounted upon a frame of adjustable lateral inclination, the belt serving to receive the ore-pulp and convey the same during the washing and concentrating process.

My primary object is to provide a concentrator of this type of simple construction, easy adjustment, and efficient operation, the concentrator being particularly adapted for use, where desired, in separating two or more ores from the same pulp and delivering them to separate receptacles.

In the preferred construction there are employed a longitudinally-reciprocable frame of adjustable lateral inclination, an endless belt mounted upon drums carried by said frame, a longitudinally-extending driven shaft carried by said frame and having gear connection with the drum at the discharge end of the machine, a short shaft parallel to said first-named shaft and having its axis coincident with the axis of the pivot of said frame, said two shafts having belt connection, a transverse driving-shaft geared to said short shaft, and cranks or eccentrics on said driving-shaft and connected by pitmen with a cross-head, which serves to reciprocate said frame.

The invention is illustrated in its preferred form in the accompanying drawings, in which—

Figure 1 represents a broken plan view of the machine; Fig. 2, a broken view in side elevation; Fig. 3, an enlarged broken vertical section at the discharge end of the machine, the section being taken as indicated at line 3 of Fig. 1; Fig. 4, an enlarged broken section at the head of the machine, the section being taken as indicated at line 4 of Fig. 1; Fig. 5, a view in rear end elevation; Fig. 6, a transverse vertical section taken at line 6 of Fig. 1; Fig. 7, a transverse vertical section taken at line 7 of Fig. 1; Fig. 8, a view of the transverse driving-shaft at the head of

the machine; Fig. 9, a broken plan view of the belt-frame and belt, showing the disposition of the pulp and water distributors and of a laterally-disposed trough for receiving the gangue and certain grades of ore; Fig. 10, a broken transverse section showing by a different view the parts last enumerated; and Fig. 11, a detached view of a pivoted divider employed.

A A' represent stationary end standards firmly connected at their tops by a shaft A² and suitably mounted upon timbers A³, the standard A being provided with outturned brackets A⁴ A⁵; B, a longitudinally-reciprocable transversely-tiltable frame comprising end members B¹ and B², side members B³ and B⁴, and shaft-stubs B⁵ and B⁶, fixed, respectively, to the end members B¹ and B²; C C', transversely-extending levers fixedly secured to the shaft A²; C³ C⁴, sets of links having pivotal connection with the ends of the members C and C' and having pivotal connection also with the end members B¹ and B² of the frame B; C⁵, a threaded adjustment-rod pivotally connected with the base of the standard A' and having connection with the lever C', being provided thereat with nuts C⁶ C⁷; D, an ore-carrying belt mounted upon drums D¹ D² and rollers D³, all journaled in suitable bearings carried by the reciprocating frame B; D⁴, a worm-wheel fixed to the shaft of the drum D² and inclosed in a housing D⁵; D⁶, a worm-shaft for communicating motion to the gear D⁴, the same being journaled in a bearing D⁷ at one end and suspended by a belt at the opposite end and said shaft being equipped with a flanged pulley D⁹; D¹⁰, an adjusting shaft or rod for pulley D⁹, the same being equipped with a hand-wheel D¹¹; E, a longitudinally-extending shaft carried by the frame B, said shaft being journaled in bearings *a*, supported from the frame member B³ and equipped with a cone E' and a pulley E²; E³, a belt connecting the cone E' and the pulley D⁹; E⁴, a short longitudinally-extending shaft having its axis coincident with the axes of the stubs B⁵ B⁶, said shaft E⁴ being journaled in a suitable bearing on a cross member A⁶, connecting the brackets A⁴ A⁵, said shaft being equipped with a pulley E⁵ and a bevel-gear E⁶; E⁷, a belt connecting the pulleys E² E⁵; E⁸, a transversely-

extending driving-shaft journaled in the brackets $A^4 A^5$ and equipped with a bevel-gear E^9 , meshing with the gear E^6 and having at its ends cranks or eccentrics E^{10} ; $F F'$, pitmen connected with a cross-head F^2 , having swivel connection with the stub B^5 ; G , a pulp-distributor of ordinary construction supported from the shaft A^2 and side member B^3 ; H , a longitudinally-extending laterally-situated water-distributing pipe which serves to wash away the gangue; H' , a diagonally-extending water-distributing pipe which separates the lighter ores from the heavier ores; H^2 , a water-supply pipe carrying the pipes H and H' and itself supported from the shaft A^2 , and I a longitudinally-extending laterally-disposed trough divided by adjustable partitions h into receptacles $I^1 I^2 I^3$. The trough I is adjacent to the member B^4 and has a lateral inclined flange h' , which projects beneath the flange f' of the belt. Adjustable pivoted dividers h^3 are connected with the flange h' adjacent to the partitions h in a well-known manner.

The brackets $A^4 A^5$ are secured to the end frame A by bolts, as clearly shown in Figs. 1, 2, and 7, and said brackets are suitably slotted to receive the cross-head F^2 and permit movement of the same, as shown in Fig. 7. The side members $B^3 B^4$ of the frame B are preferably tubular in form, and the drums $D D^2$ are journaled in bearings b , supported from said tubular members by suitable clips. The rollers D^3 are journaled in bearings b' , secured to said tubular members by suitable clips. The rear drum D^2 is of relatively large diameter and dips into a vat G , having a transverse partition c , Fig. 3, near its center. The lower portion of the belt is held elevated adjacent to the vat G by an idler G' , journaled in bearings d , depending from the tubular members $B^3 B^4$ and secured thereto by suitable clips. The belt may be of any suitable material, but preferably has a rubber surface and is supplied at one side with an upturned flange f and at the opposite side with a downturned flange f' .

The operation will be readily understood from the foregoing description. Power is applied at the shaft E^8 through the medium of one of the pulleys thereon shown and is communicated through the bevel-gears $E^9 E^6$, shaft E^4 , belt E^7 , shaft E , cone E' , belt E^3 , and worm-wheel D^6 to the drum D^2 . At the same time longitudinal reciprocation of the frame B is caused by the pitmen $F F'$, operated by cranks E^{10} . The frame B is adjusted, as desired, to give the proper lateral inclination to the belt through the medium of the hand-wheels $C^6 C^7$, and when so adjusted the side of the belt having the upturned flange is higher than the opposite side, as shown in Fig. 10. The bearing portions of the stubs $B^5 B^6$ are sufficiently long to permit reciprocation of the frame B and the pivotal connections of the links $C^3 C^4$ permit this longitudinal movement, it being understood that the bearings of the main

frame which receive the stubs $B^5 B^6$ are not sufficiently close to prevent said reciprocation. It will be observed that the distances between shaft centers will not be destroyed by tilting the frame B , because of the fact that shaft E^4 is in alinement with the center of oscillation of said frame. Ore-pulp is supplied to the belt at the distributor G in a well-understood manner, and as the pulp is carried toward the foot of the machine it is struck by properly-directed currents from the water-distributing pipe H , which causes practically all of the free gangue to be washed into the receptacle I^1 . The reciprocating movement of the frame B causes the relatively heavy ore to settle down into contact with the belt, while the lighter particles are washed at a more or less rapid rate toward the lower side of the belt. The lightest particles of ore will be deposited in the receptacle I^2 . Still another grade of ore will be deposited in the receptacle I^3 , and the heaviest grade or grades will be deposited in the vat G . The pipe H' is of adjustable angle with reference to the side of the belt, and the water-pressure, belt inclination, and belt speed may be adjusted to secure the desired deposition of the ores. In some instances the several adjustments may be so regulated that ores of different specific gravities may be deposited in the two receptacles of the vat G . Thus sulfurets may be deposited in the compartment of the vat G which is beneath the high side of the belt, while an ore of lower specific gravity, such as sulfid of zinc, may be collected in the remaining compartment of said vat beneath the low side of the belt.

Changes in details of construction within the spirit of my invention may be made. Hence no limitation is to be understood from the foregoing detailed description, except as shall appear from the appended claims.

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

1. The combination of a stationary frame provided with bearings, a tiltable frame provided at its ends with central stubs journaled in said bearings, said bearings permitting longitudinal movement of said tiltable frame, adjustable means securing said tiltable frame at a given angle of transverse inclination, a belt carried by said tiltable frame, a transversely-extending shaft, means for communicating reciprocating motion from said shaft to said tiltable frame, and means for imparting motion to said belt.

2. The combination of a suitable stationary frame, a tiltable belt-frame journaled therein, a longitudinally-extending shaft carried by said tiltable frame, a belt carried by said tiltable frame, gear connection between said shaft and said belt, a shaft parallel to said first-named shaft and having its axis coincident with the axis of oscillation of said belt-frame, connection between said shafts, a transversely-extending shaft serving to communicate motion to said second-named shaft,

cranks on said transverse shaft, and pitmen connected with said cranks and with said tiltable frame and serving to longitudinally reciprocate said tiltable frame.

5 3. The combination of two end standards, a tiltable belt-frame having stubs journaled in said standards, a shaft connecting said standards above said belt-frame, means for turning said shaft, connecting means between
10 said shaft and said tiltable frame, whereby said tiltable frame may be adjusted through the medium of said shaft, a belt carried by said tiltable frame, means for imparting motion to said belt, and means for reciprocating
15 said tiltable frame longitudinally.

4. The combination of end standards, a tiltable frame journaled therein, a belt carried by said frame, a shaft connecting said standards, connecting means between said shaft
20 and said frame, whereby said frame may be adjusted in lateral inclination through the medium of said shaft, brackets carried by one of said standards, a transverse shaft carried by said brackets, a longitudinal shaft having
25 its axis coincident with the axis of oscillation of said frame, said last-named shaft being driven from said transverse shaft, a longitudinally-disposed shaft supported at one side of said frame and driven from the longitudi-

nal shaft which is in alinement with the pivots 30 of said frame, a belt carried by said frame, a drum receiving said belt and equipped with a worm-wheel, a worm-shaft and means for communicating motion from said laterally-disposed longitudinal shaft to said worm- 35 shaft.

5. In combination with a belt, a tiltable belt-frame comprising end members having out-turned central pivotal stubs at its ends and tubular side members supported by said end 40 members, drums supporting said belt, and bearings for the shafts of said drums, connected with said tubular side members by suitable clips.

6. The combination of a suitable stationary 45 frame, a laterally-tiltable belt-frame journaled therein and capable of longitudinal movement, a cross-head having swivel connection with an end of said belt-frame and moving in suitable guides along said station- 50 ary frame, means for imparting longitudinal movement to said cross-head, a belt carried by said belt-frame, and means for imparting motion to said belt.

HERMAN UNZICKER.

In presence of—

D. W. LEE,

ALBERT D. BACCI.