(No Model.) 4 Sheets—Sheet 1.

G. W. WAITT.

ORE CONCENTRATOR.

No. 513,849. Patented Jan. 30, 1894.

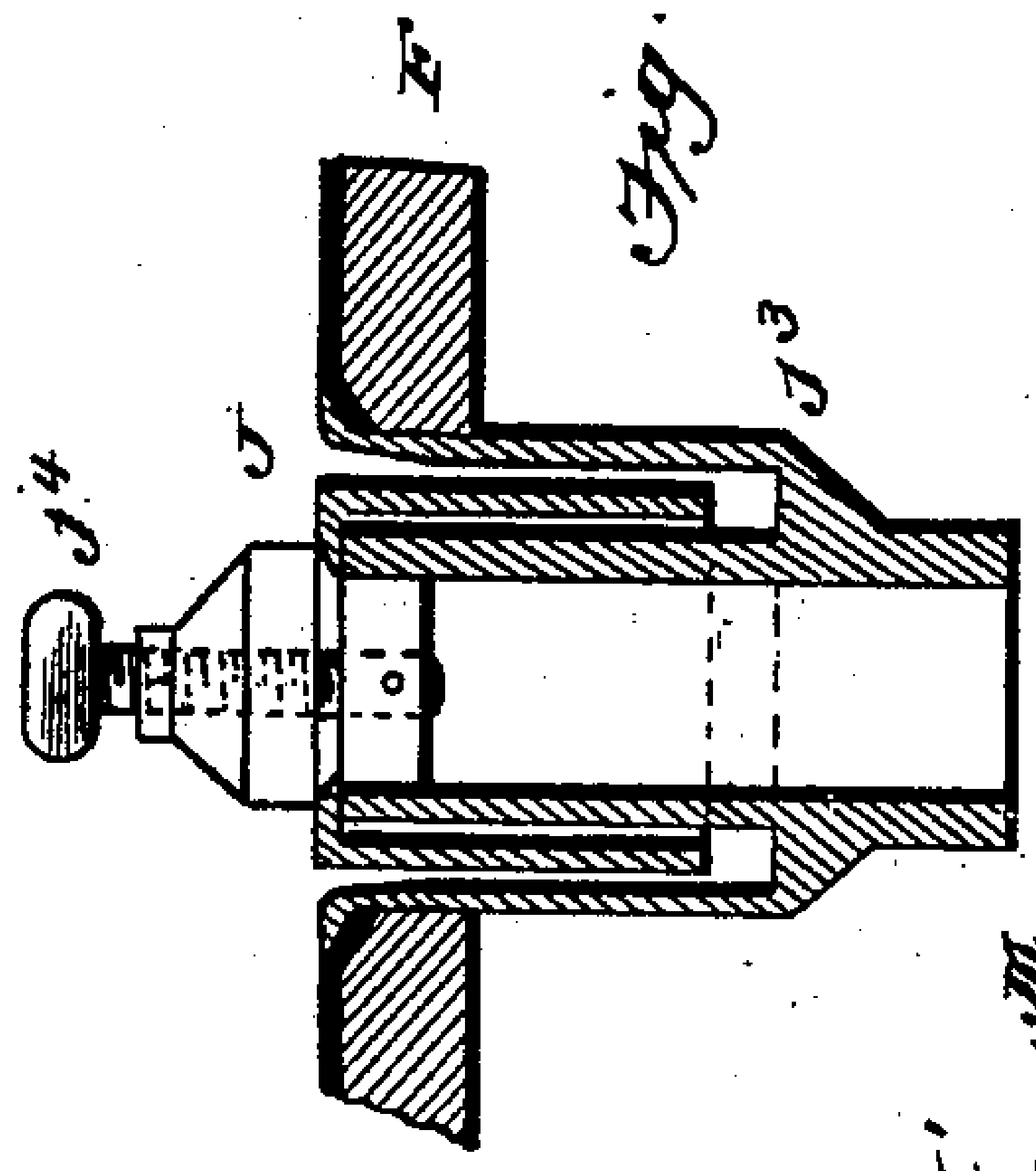
Fig. 12.

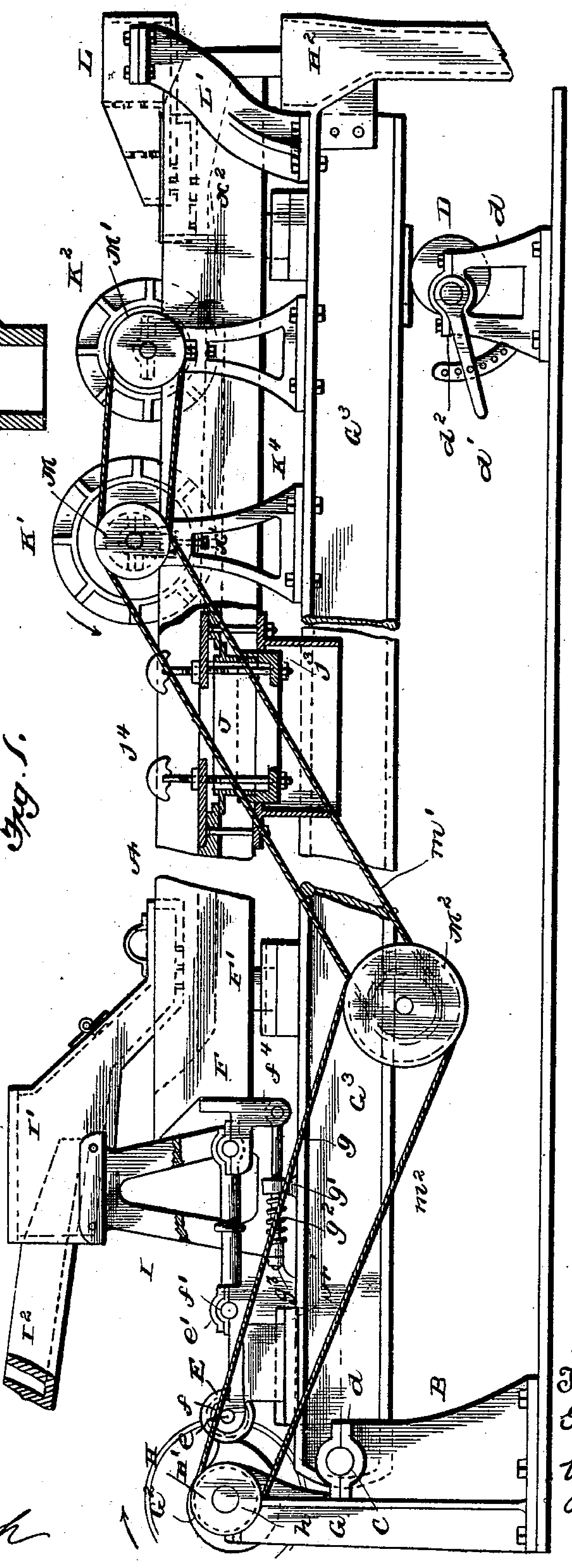
Fig. 1.

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(No Model.)

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G. W. WAITT.

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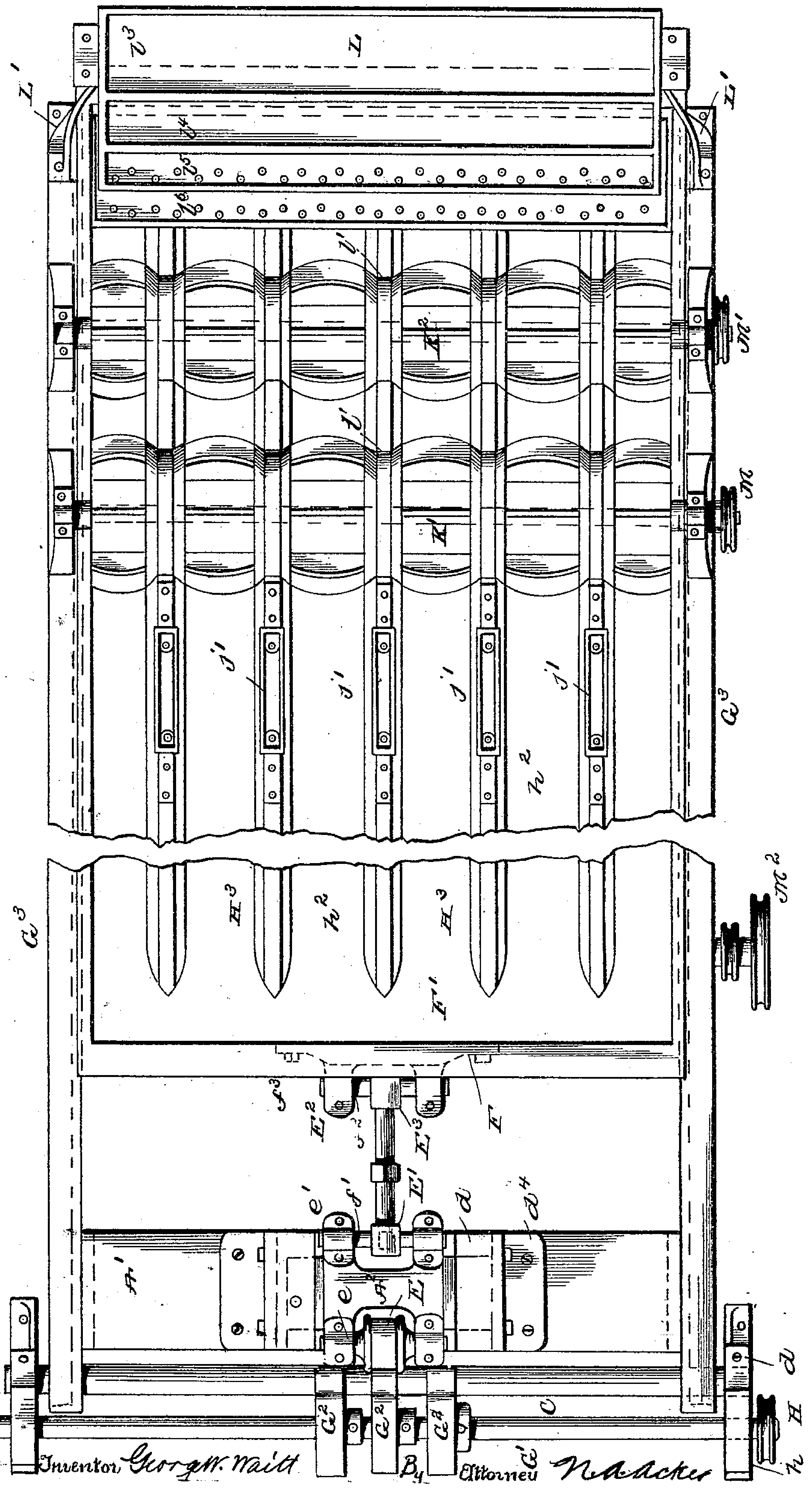
Fig. 2.



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(No Model.)

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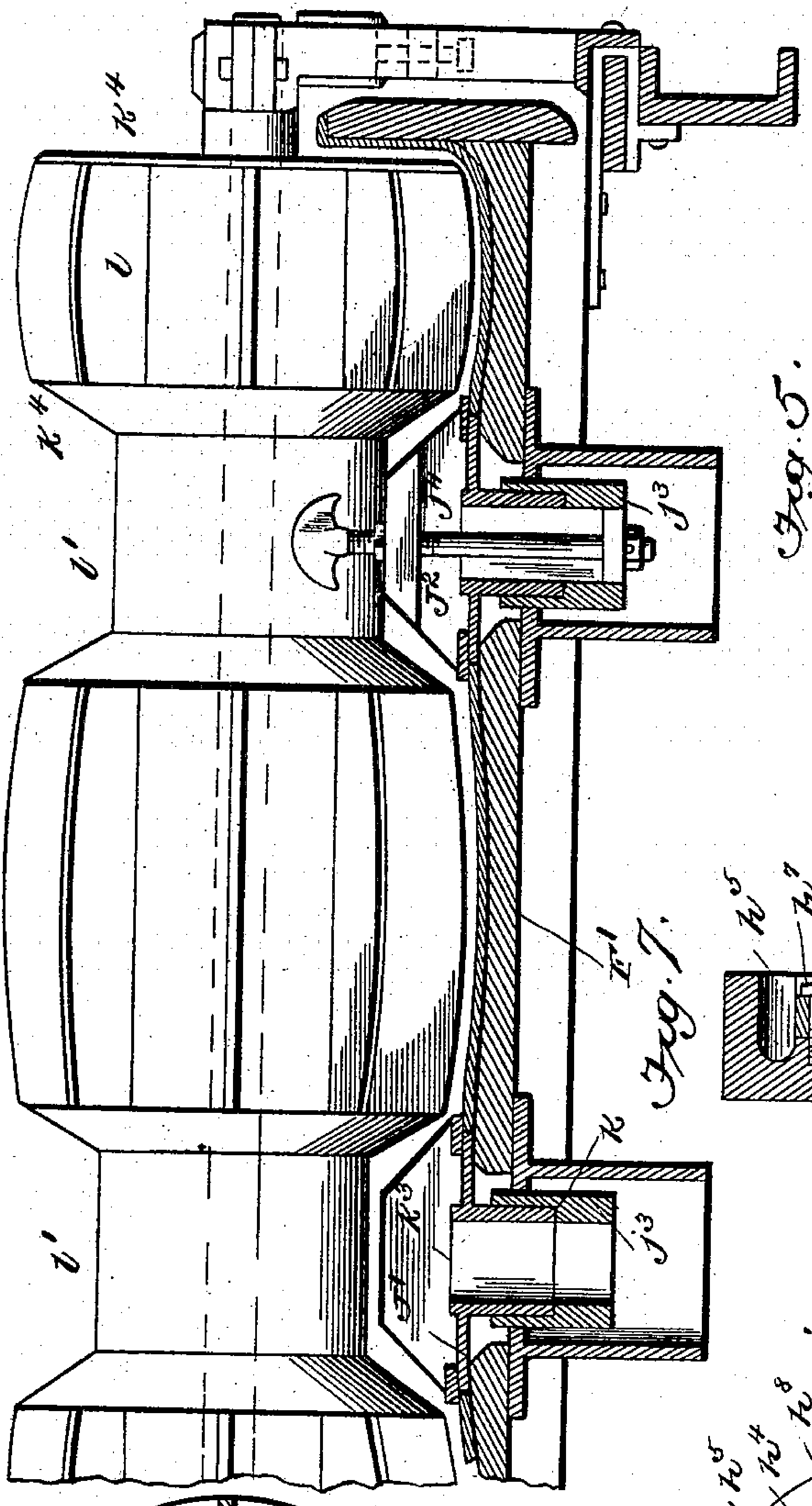
Fig. 3.

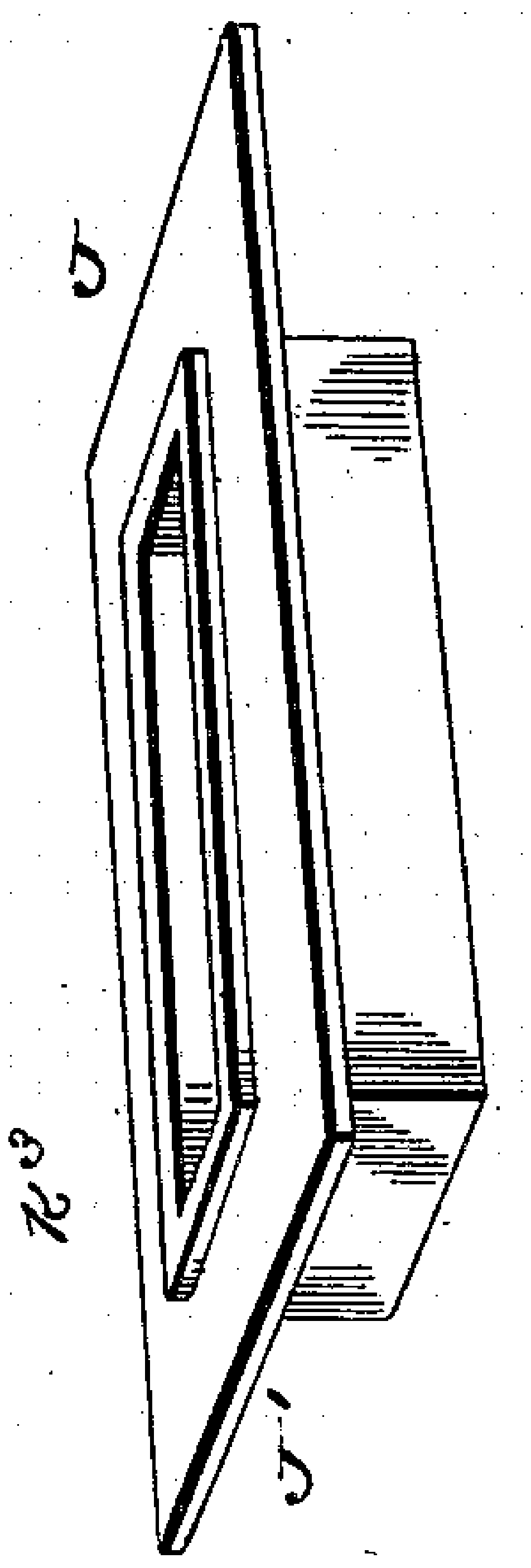
Fig. 5.

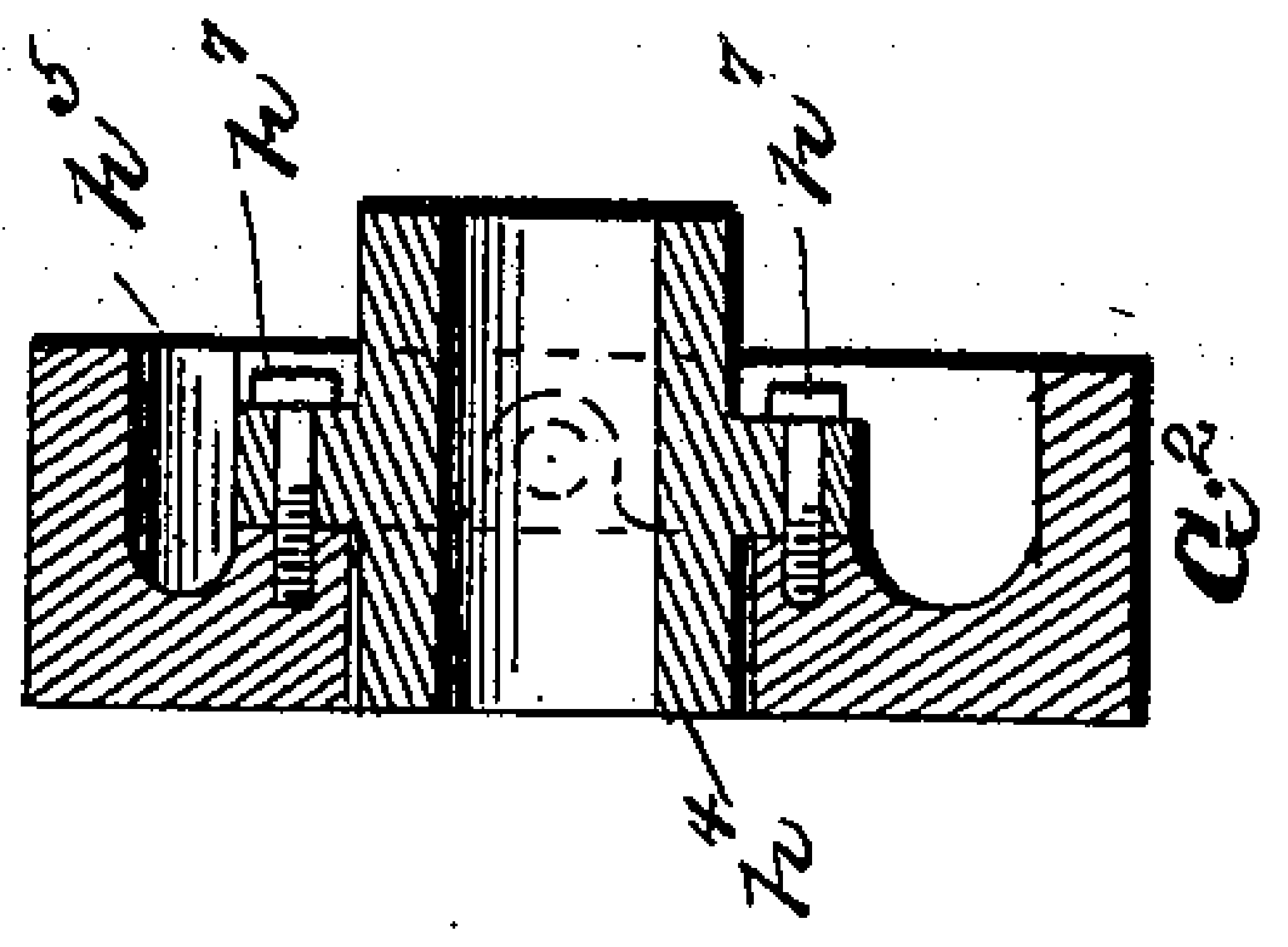
Fig. 7.

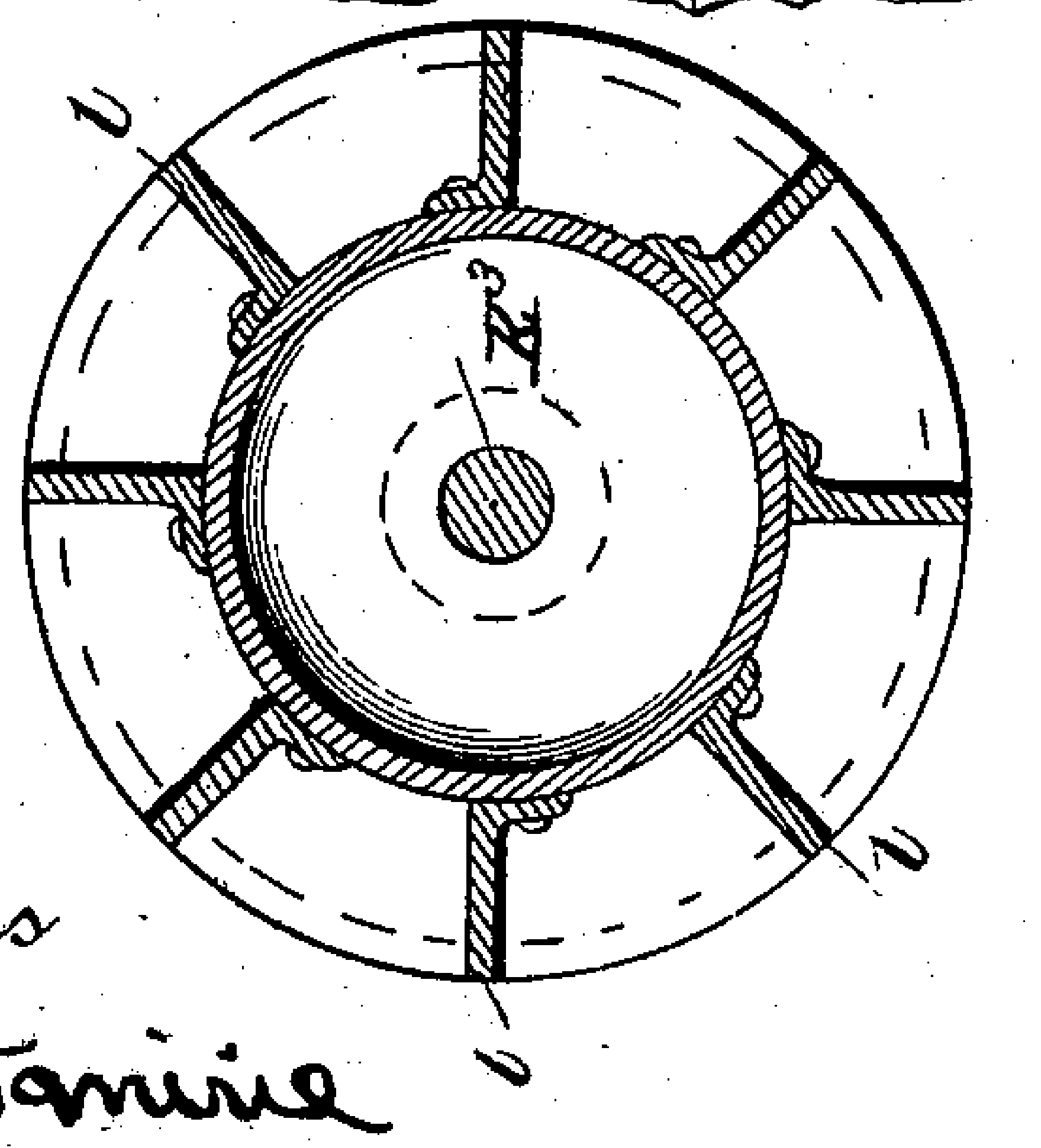
Fig. 4.

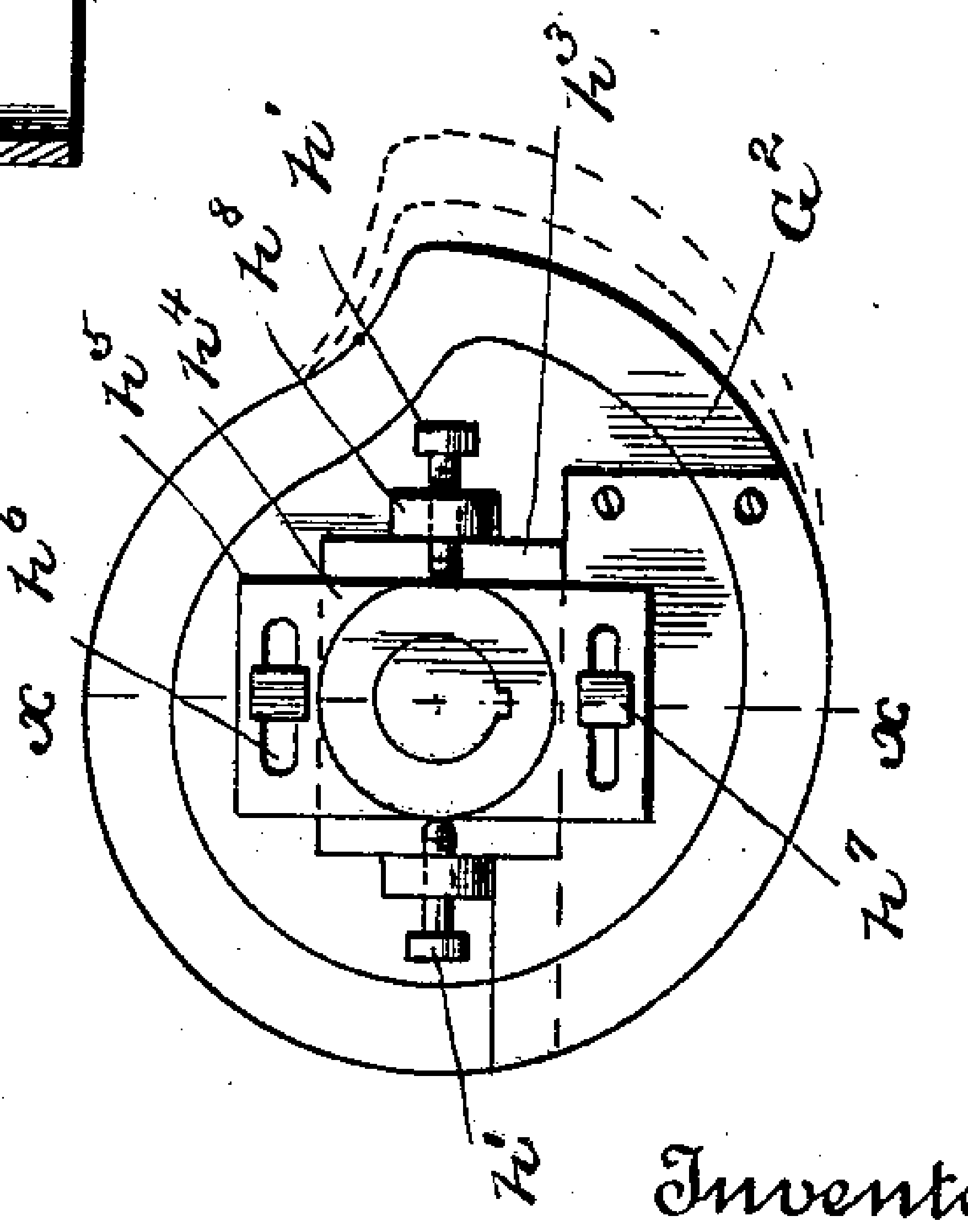
Fig. 6

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4 Sheets—Sheet 4.

G. W. WAITT.

ORE CONCENTRATOR.

No. 513,849.

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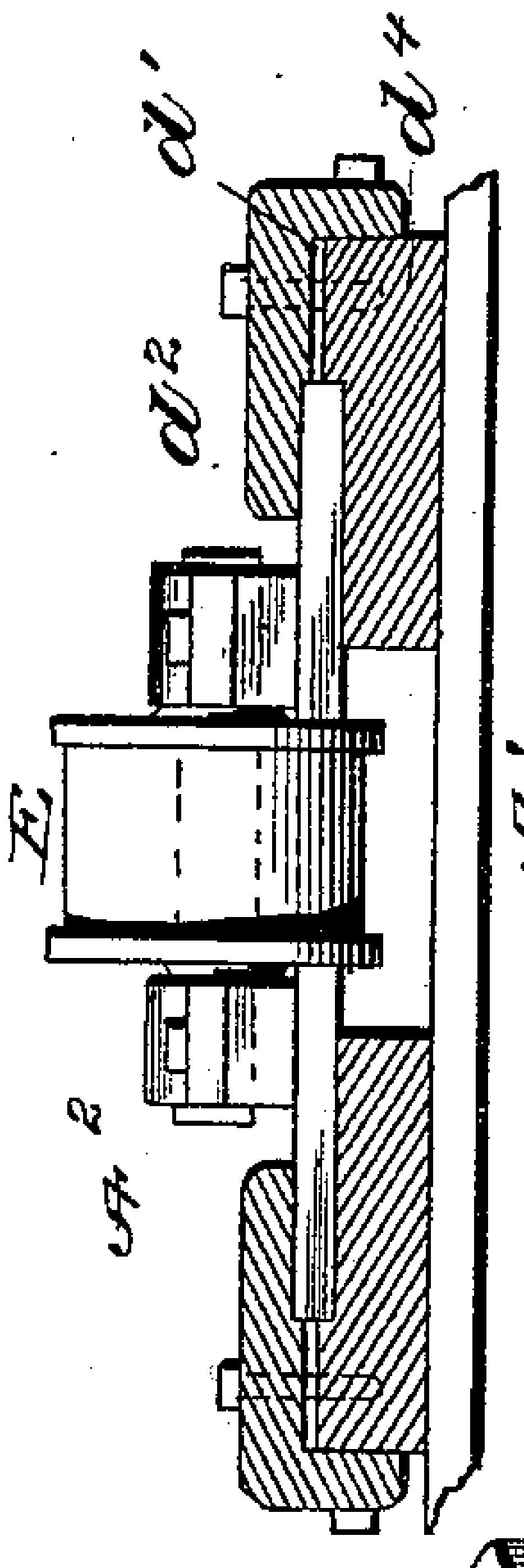
Fig. 10



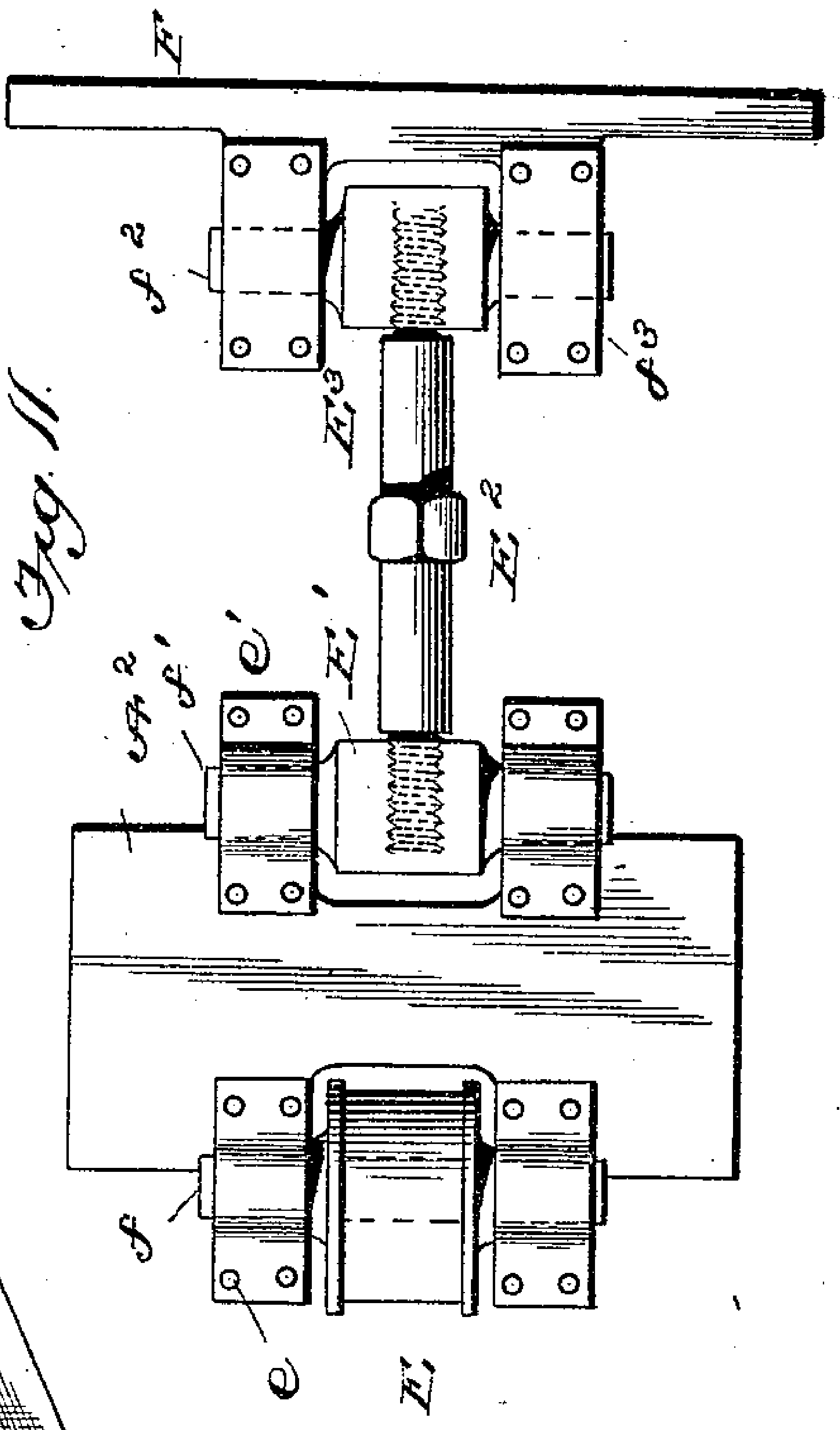


Fig. 8

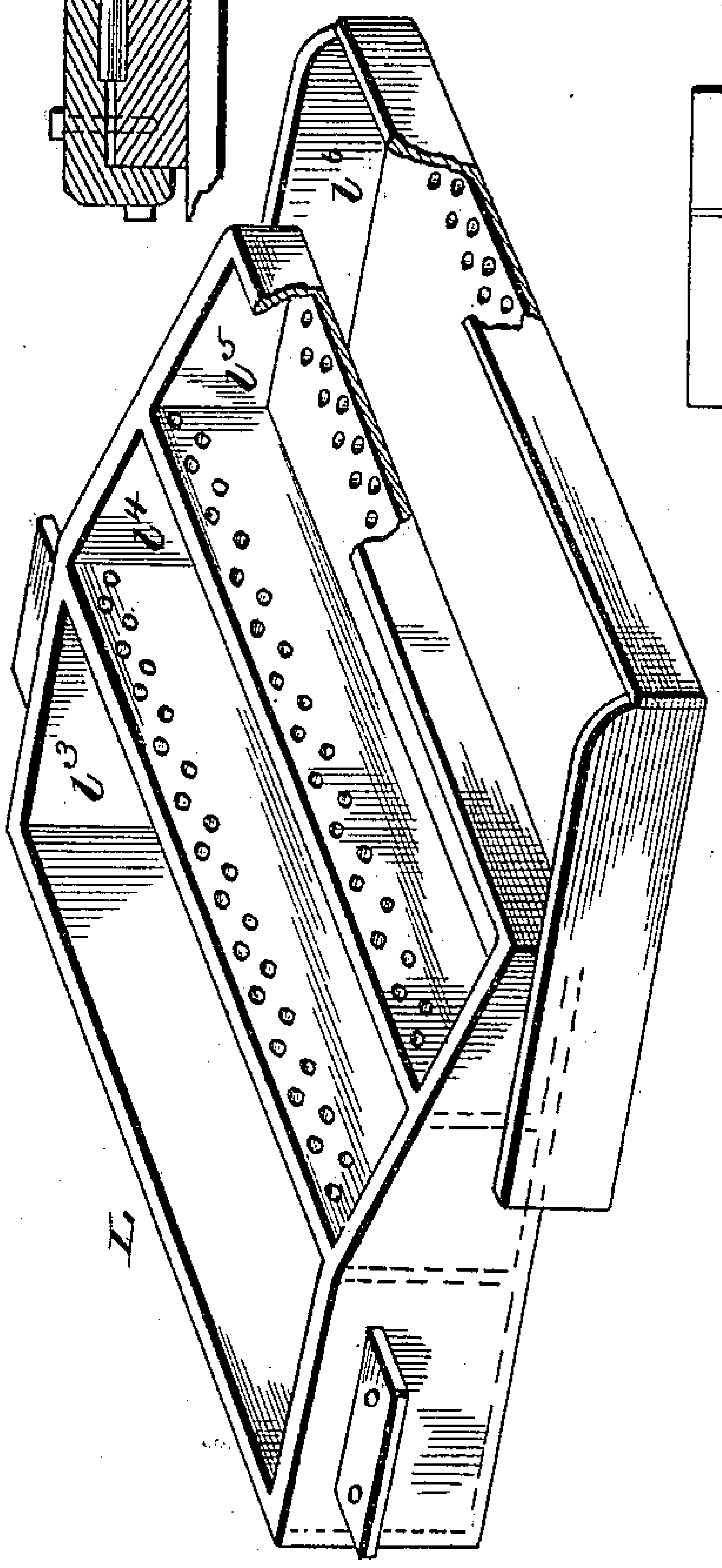
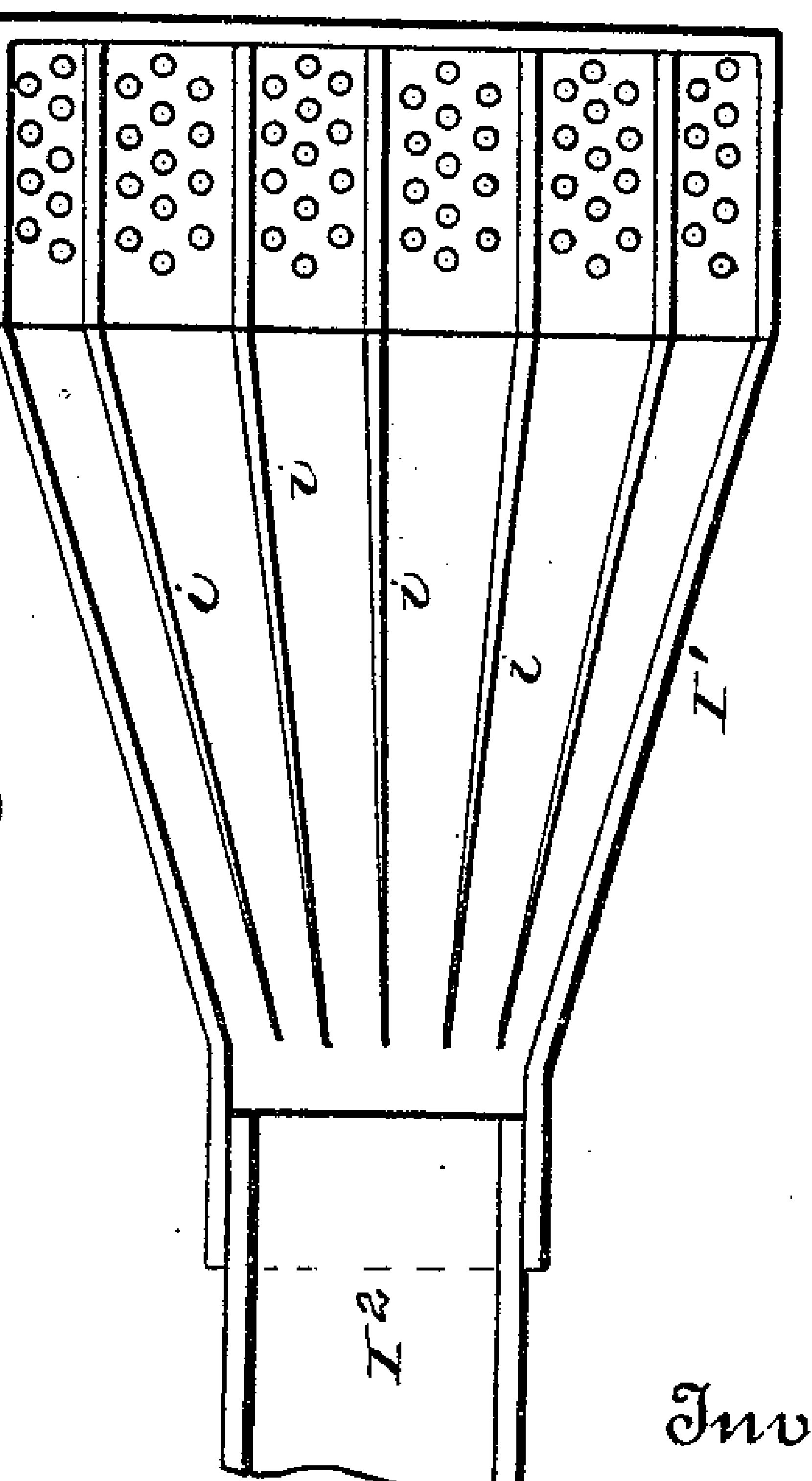


Fig. 9



Witnesses

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UNITED STATES PATENT OFFICE.

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ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 513,849, dated January 30, 1894.

Application filed May 25, 1893. Serial No. 475,515. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. WAITT, 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 in ore concentrators, and it consists of the arrangement of parts and details of construction as will be hereinafter more fully set forth in the drawings, described and pointed out in the specification.

The object of my invention is to provide a concentrator which shall provide for the more perfect separation of the sulphurets from the sand and base material, and at the same time allow for the overflow of the gangue from the concentrating table.

Referring to the drawings forming a part of this application, in which similar letters of reference are used to denote corresponding parts throughout the entire specification, Figure 1 is a longitudinal sectional view of the entire machine. Fig. 2 is a top plan view thereof with pulp feeder removed. Fig. 3 is a detail view of the conveyers mounted above the concentrating bed. Fig. 4 is a similar view in cross section. Fig. 5 is a detail view showing one of the overflow tailing discharges or hoppers. Fig. 6 is a detail view of the adjustable operating cam, the dotted lines indicating the several cams having different contours; Fig. 7 a vertical sectional view of the cam taken on line x—x of Fig. 6; Fig. 8 a top plan view of the water distributer; Fig. 9 a similar view of the pulp feeder and distributer; Fig. 10 a detail view of the cam actuated roller; Fig. 11 an enlarged top plan of the movable frame for the cam actuated roller showing connecting rod attachment to the concentrator bed or table; Fig. 12 a modification of the overflow tailing discharge shown in Fig. 5.

The letter A indicates the concentrator proper, the frame of which is movably secured between the standards B, by means of the rod C, which is secured within bearings a, formed in said standards. The discharge end of said concentrator rests upon the cams D, one located under each of the side beams, which work within bearings formed in the standards d. By means of the handle d' and segment d^2, I am enabled to raise or lower said cam, and inasmuch as the longitudinal beams of the concentrator frame rest thereon necessarily raise or lower the same, which carrying therewith the concentrating bed regulates the inclination thereof. Upon the head cross beam A′, I secure the blocks a^4, and upon said blocks I secure the caps a', so as to form the longitudinal groove a^2, within which the operating frame A^2 slides, as more fully shown in Fig. 10. Within bearings e, e', I secure the short rods f, f', upon the former of which I mount the cam actuated roller E, while on the latter I locate the nut E′. Within said nut works one end of the connecting rod E^2, the other end of which works within the nut E^3, secured to the rod f^2, which is mounted in bearings f^3, formed in the outwardly extending portion of the plate F, which is secured to the concentrator bed F′. Said plate is provided with the downwardly extending tail piece f^4 which has connected thereto the spring actuated rod g. This rod extends through the opening formed in the standard g', which is secured to the side beam G^3, of the concentrator frame. Around said rod, to the outer side of the standard g', I place the spiral spring g^2, which is held securely thereon by reason of the nut g^3. Any number of spring actuated rods may be employed for the purpose of giving backward force to the concentrating bed, as hereinafter more fully set forth.

To the front of the machine I locate the standards G, and secure within bearings h, formed in the top thereof, the driving shaft G′, upon which I locate the single scroll cams G^2, preferably three in number, which are held in their adjusted position by means of the set screws h'. Said cams have the central rectangular opening, h^3, formed therein, which permits of the same fitting upon the rectangular blocks h^4, which are secured or feathered to the driving shaft G′. These blocks are provided with the flanged portion

h^5, which have the elongated slots, h^6, formed therein. Through these slots work the bolts h^7, which secure the cams. By means of the set-screws, h', working through the lip, h^8, and in block, h^4, I am enabled to move the cams forward or backward so as to increase or decrease the throw of the concentrating table. One quarter of the cam is made removable in order to permit the securing thereof upon the sliding blocks of the driving shaft. However, if so desired, all of the cams may be secured by means of long bolts passing therethrough. The blocks are all connected to the shaft, G', by spline and feather arrangement, as shown in Fig. 6, and the cams are secured in their adjusted position upon said blocks, by means of the set-screws h'. Only one cam of the series, of course, engages the cam-actuated roller E, and if it is desired, for the reason hereinafter stated, to change the cams so that a different one of the series may engage said cam-actuated roller, all that is necessary to be done is simply to loosen the set-screws, h', of the engaging cam, and then move the same and its block longitudinally on the feather until a point is reached where it is out of contact. The set-screws of said cam are then tightened, and the cam designed to next engage the roller is free to be moved to a position of contact, by simply loosening its set-screws h'. After the proper adjustment of this last-named cam is secured, the set-screws are then again tightened. To the outer end of the driving shaft the pulley H may be secured by means of which power is communicated to said driving shaft, while at the same or opposite end the driving pulley wheel H', is fastened. The single scroll cams vary in their contour so as to impart a stronger or lighter throw of the concentrating bed, as hereinafter more fully set forth and described.

The concentrating bed or table is indicated by the letter F', as before stated, which is level for a portion of its length, up to about the point x', (about two-thirds of its length) when it gradually inclines to the point x^2, from whence it gradually inclines so as to make its discharge into receptacle H^2. The concentrating bed or table is made movable upon the concentrator frame, and is operated in the hereinafter described manner.

To the beams G^3, of the concentrator frame, I secure the standards I, and between said standards I locate the pulp distributer I', which is divided into distributing ways i, which correspond with the traveling ways formed in the concentrating bed, and are designed to make their discharge into said ways h^2, the surface of which I form slightly concaved between the longitudinal ribs H^3. The lower or discharge end of said distributer is provided with a series of openings through which the pulp fed from the mill through the conveyer I^2, is discharged. However, if so desired, said openings may be dispensed with and the lower end of the distributer left open for such discharge. At suitable intervals I provide the openings j', in the concentrating bed, for the purpose of permitting the overflow water and gangue to pass from the concentrating bed. Within said openings I place the rectangular overflow hopper J, which is provided with the overlapping flange J', said flange resting upon the shoulder formed by providing the opening j'.

The letter J^3 indicates a supplemental or supporting pipe, which is secured to the bed by means of the screws j^4. Within this supplemental pipe the overflow hopper J, is adapted to fit, the lower end of said hopper resting upon a shoulder, k, formed in said supplemental pipe. Said rectangular overflow hopper is provided with the upper flange k^3, which permits the settling therearound of any of the sulphurets which may be washed toward the openings with the overflow of the tailings or waste material. The rectangular overflow hopper by preference I construct of rubber, but any suitable material, such as iron or steel, may be employed for this purpose with equally good results, as shown in Fig. 12. By means of the thumb screws j^4, I am enabled to raise or lower said overflow hopper so as to more effectually provide against the overflow of valuable sulphurets with the sand and water.

The letters K', K^2, indicate the rotary conveyers, which serve the purpose of carrying downward and checking the upward movement or travel of the sand upon the inclined portion of the table, thereby mechanically assisting the movement of the sand without interference with the travel of the sulphurets, and at the same time obviating the necessity of giving greater inclination to the concentrating table, or of using increased flow of water in order to create separation of sand and sulphurets. Said conveyers are mounted within bearings formed in the standards K^4, and the same I secure upon the shaft K^3, which has provided thereon a series of collars k^4. Between said collars I secure the paddles l, and regulate the same so as to just revolve above the concentrating bed level of the sulphurets, on the inclined portion. The collars have their outer faces formed at an incline, and have the space l' therebetween, so as to allow for the longitudinal ribs fitting therebetween.

To the rear of the concentrating frame I locate the water distributer L, which is supported by means of the standards L'. Said distributer is divided into separate compartments l^3, l^4, l^5, l^6, each of which has a series of perforations formed therein, so as to permit communication therebetween, and passage of the water from one into the other until finally discharged upon the concentrating bed. It often happens in the feeding of water, that the openings in the distributer become clogged by reason of leaves or other foreign matter accumulating therein, but by providing the same with separate compartments uniting with one another, this defect is obviated and the leveling of the water in the compartments not prevented. The different compartments run in order of steps, as fully shown in Fig. 8. The point of discharge for the water is directly over the incline of the bed.

Upon the end of the pulp conveyers or shafts I secure the pulley wheels M, M′, which are connected to pulley M^2, by means of the cable m', and said pulley is connected to pulley H′, by means of cable m^2. As said pulley derives motion from driving shaft G′, the same is transmitted by reason of cable m^2, to pulley M^2, which in turn through the medium of cable m', imparts power to pulleys M, M′, which cause the rotation of the conveyers K′, K^2.

The operation of my machine is as follows:—With the rotation of the driving shaft G′, the single scroll cams revolve therewith. With such revolution one of the cams coming in conactt with the roller E, mounted in sliding frame A^2, causes the latter to move forward in the slide groove a^2, which frame being connected to the concentrator bed through the medium of the connecting rod E^2, necessarily causes the same to move in the same direction. When the single scroll cam revolves sufficiently to give the concentrating table its greatest forward travel, the contour thereof allows of a quick, reverse motion to be imparted to said table for a portion of its travel, after which it gradually reduces to a slow motion until it completes its rear throw, the spring actuated rod g always holding the face of roller E in contact with the face of the cam, said rod g being secured to the downwardly extending tail-piece f^4 of the plate F′. As the pulp is discharged upon the bed of the table, it gradually moves forward toward the discharge end of the same by the motion imparted thereto, while the sulphurets of their own gravity, assisted by the motion of the bed, settle and naturally remain together thereon during their travel toward the discharge end of the concentrator. As the pulp reaches the overflow hopper, all sand and water above the adjustable edge thereof, will pass therethrough, while the sulphurets, carrying therewith a portion of the sand, will travel toward and up the inclined portion of the table, whereon the sand will be given a reverse or backward movement by the downwardly flowing current of water, assisted by the conveyer, so as to be finally discharged through the overflow hopper, which, as will be seen by the arrows, moves in an opposite direction to the bed of the table and thus will be separated from the sulphurets. However, the sulphurets, having greater specific gravity, will adhere to the bed of the table, and be carried up the inclined portion until finally discharged into the mineral or sulphurets receptacle. It will thus be observed that the pulp, including sand and sulphurets, travels in the same direction until the incline is reached, when they become separated and travel in opposite directions, the sand, as above stated, being carried by the action of the water and conveyer, toward the overflow hopper J. By providing the driving shaft G′, with an adjustable throw, I am enabled to give to the table or concentrating bed a longer or shorter throw; while by securing a series of cams on the shaft, each having different contour, I am enabled to impart to the table a quick or slow return, or in other words, a stronger or lighter jerk, thereby adapting the motion of the bed to various classes of ores.

I am aware that minor changes may be made in the arrangement of parts and details of construction herein shown and described without creating or necessitating a departure from the nature and scope of my invention.

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

1. The combination with an ore concentrator, of the concentrating table, and of the rotary conveyers located above the concentrating bed and adapted to prevent the upward travel of the sand with the sulphurets, said conveyers being rotated through the medium of suitable mechanism, substantially as set forth and described.

2. In an ore concentrator, the combination of an adjustable supporting frame, standards at one end of said frame a driving shaft mounted in bearings at the upper end of said standards, a cam upon said shaft a sliding frame adapted to be actuated by the cam, a concentrating table or bed, a plate secured thereto, said plate provided with a downwardly-extending tail-piece, a rod for connecting the sliding frame with the plate, and a spring-actuated rod connected to the tail piece of said plate for imparting a reverse or backward movement to the concentrating bed, substantially as set forth.

3. In an ore concentrator, the combination of a supporting frame, standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, a series of cams splined to the shaft, said cams being of different contours, and a sliding frame adapted to be interchangeably engaged by said cams so as to have a variable motion imparted thereto, substantially as set forth.

4. In an ore concentrator, the combination of a supporting frame standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, cams upon said shaft, a sliding frame, a roller mounted in the rear end of said frame and adapted to be engaged by the cams, a concentrating table or bed connected to said sliding frame, and a spring-actuated rod for giving a reverse or backward movement to said concentrating table, substantially as set forth.

5. In an ore concentrator, the combination of a supporting frame provided with an upwardly extending standard, a movable con-

centrating table or bed, a plate secured to the end thereof provided with a downwardly extending tail piece, a rod passing through the standards of the supporting frame and having one end connected to the tail piece, a nut upon the opposite end of said rod, and a spring interposed between the standard and the nut, substantially as set forth.

6. In an ore concentrator, the combination of a supporting frame, standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, a series of cams upon said shaft, a sliding frame, a short shaft mounted in bearings in the rear end of the frame, a similar shaft mounted in the forward end of the sliding frame, said shaft carrying a nut, a concentrating table or bed, a plate secured thereto, a shaft journaled in bearings in the outwardly-extending portion of said plate, said shaft carrying a nut, a connecting rod having one end working in the nut of the sliding frame, and its opposite end working in the nut of the plate, and the spring-actuated rod for giving to the concentrating table or bed a reverse or backward movement, substantially as set forth.

7. In an ore concentrator, the combination of a supporting frame, standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, cams upon said shaft an end cross beam upon the supporting frame, blocks secured to said cross beam, caps secured to the blocks said blocks and caps provided with registering cut-away portions to form ways, and a sliding frame working in said ways, adapted to be actuated by the cam, substantially as set forth.

8. In an ore concentrator, the combination of a concentrating table or bed provided with a series of openings, of hoppers extending through said openings, and vertically adjustable so as to bring their upper ends above the plane of the concentrating table, in order to prevent the escape of the mineral bearing lower stratum, substantially as set forth.

9. In an ore concentrator, the combination of a concentrating table or bed provided with a series of openings therein, rectangular hoppers placed within the openings and provided at their upper ends with outwardly and upwardly extending flanges, supplemental or supporting pipes provided with shoulders forming seats for the lower ends of the hoppers, and screws for adjusting the height of the hoppers, substantially as set forth.

10. In an ore concentrator, the combination with a movable concentrating table provided with a series of longitudinal ribs, of conveyers provided with a series of annular depressions registering with the longitudinal ribs of the table; said conveyers rotating in a direction opposite to the line of movement of the concentrating table, substantially as set forth.

11. In an ore concentrator, the combination with a movable concentrating table provided with a series of longituding ribs, the space between said ribs being slightly concave, of conveyers rotating in a direction opposite to the line of movement of the concentrating table, consisting of a series of collars, and paddles secured between said collars, the space between a set of the collars registering with the longitudinal ribs of the table, substantially as set forth.

12. In an ore concentrator the combination of a concentrating table or bed, conveyers located above said table or bed, adapted to move in a direction opposite to the line of movement of the concentrating table or bed, and a water distributer secured to the rear of the concentrating bed, said distributer consisting of a series of departments arranged one below the other, and having a series of perforations formed therein, substantially as set forth.

13. In an ore concentrator the combination with a movable concentrating frame, said frame inclined upwardly between two given points, and provided with a series of discharge hoppers, of conveyers arranged above the concentrating bed and rotating in a direction opposite to the line of movement of the concentrating frame, substantially as set forth.

14. In an ore concentrator, the combination of a movable concentrating frame, upwardly inclined between two given points, and downwardly inclined from one of said points to the discharge end of the bed, said frame also provided with a series of discharge hoppers, conveyers rotating in a direction opposite to the path of movement of the concentrating bed, and a water distributer located at the discharge end of the concentrating bed, substantially as set forth.

15. In an ore concentrator the combination with a movable concentrating table or bed, provided with a series of longitudinal ribs forming concave spaces, of a pulp distributer divided into a series of distributing ways registering with the spaces of the concentrating table, the lower or discharge end of said distributer being perforated, substantially as set forth.

16. In an ore concentrator the combination of a supporting frame, standards secured thereto, a driving shaft mounted in the upper end of said standards, a driving wheel secured on one end of said shaft, a pulley mounted upon a shaft in bearings beneath the supporting frame, endless belt connecting said pulleys, a concentrating bed or table, rotary conveyers mounted upon shafts above the concentrating bed, said shaft provided with belt pulleys, a belt connecting the pulley beneath the supporting frame with the pulley of the rear conveyer, and a belt connecting the conveyer pulleys, substantially as set forth.

17. The combination of a driving shaft, rectangular flanged blocks feathered upon said shaft, said flanges provided with elongated horizontal slots, cams fitting upon said blocks, and set screws working through the slots, substantially as set forth.

18. The combination of a driving shaft rect-

angular blocks feathered thereon, cams fitting upon the blocks, said cams provided with laterally projecting lips, and set screws working through said lips, so as to bear upon the blocks, substantially as set forth.

19. The combination of a driving shaft, rectangular flanged blocks feathered thereon, said flanges provided with elongated horizontal slots, cams fitting upon said blocks, and provided with laterally extending lips, set screws working through the elongated slots of the blocks into the cams, and set screws working through the lips of the cams, and bearing upon the blocks, substantially as set forth and described.

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

GEORGE W. WAITT.

Witnesses:
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M. G. LOEFLER.