No. 641,977. Patented Jan. 23, 1900.

J. LAMPERT.

ORE CONCENTRATOR.

(Application filed Mar. 16, 1899.)

(No Model.)

4 Sheets—Sheet 1.

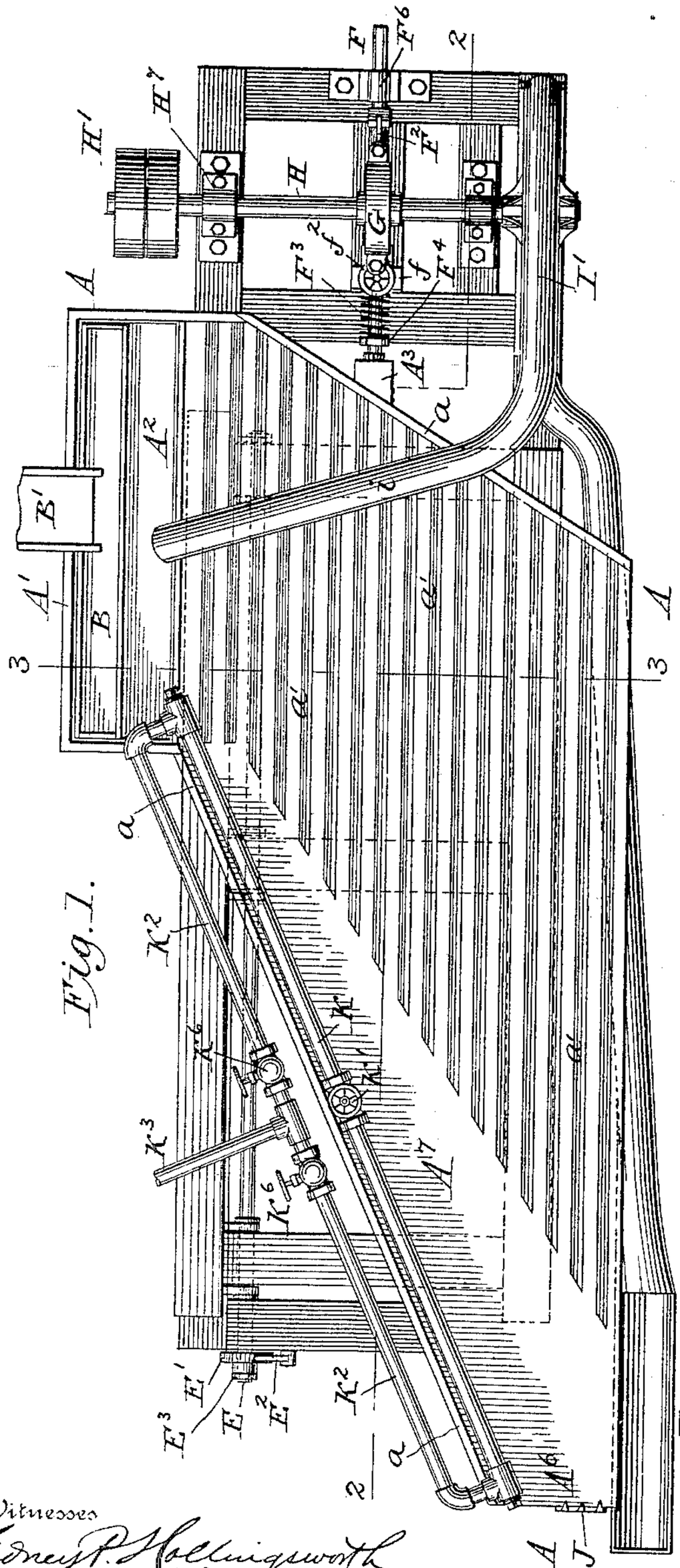

Fig. 1.

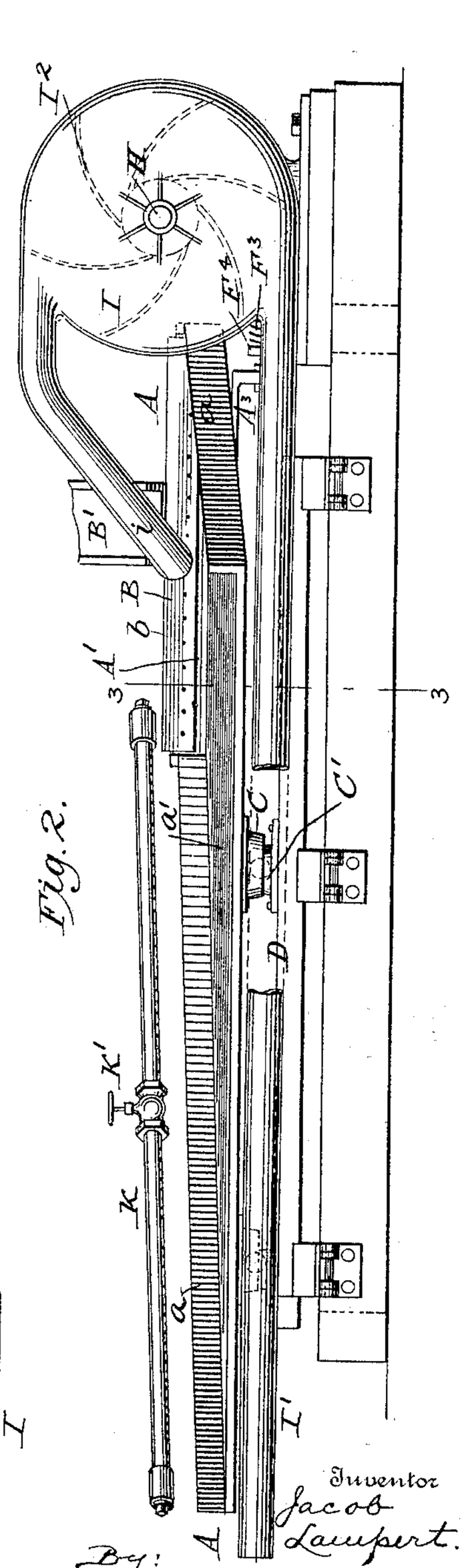

Fig. 2.

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(No Model.) 4 Sheets—Sheet 2.

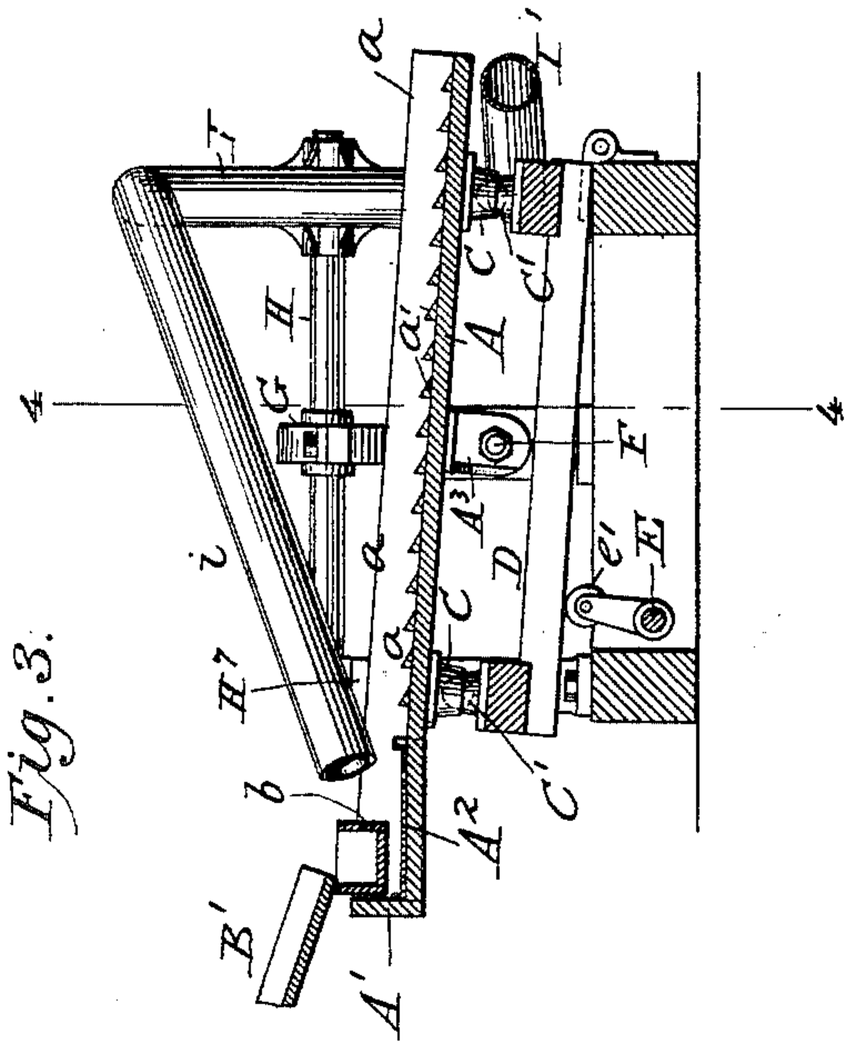

Fig. 3.

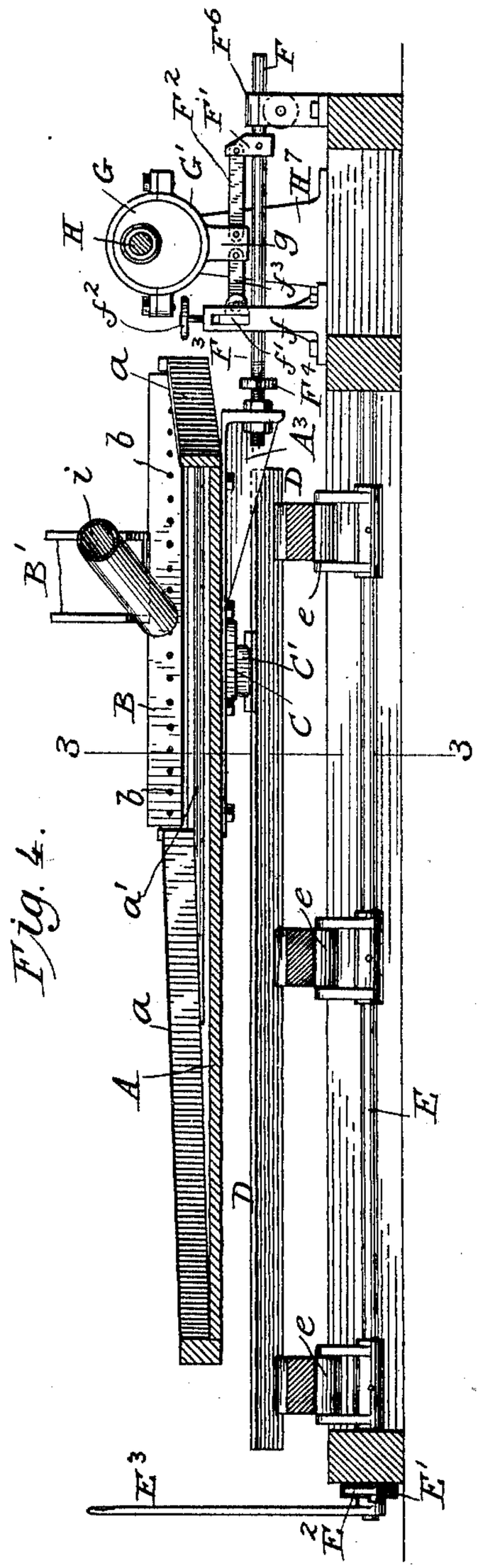

Fig. 4.

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Fig. 5.

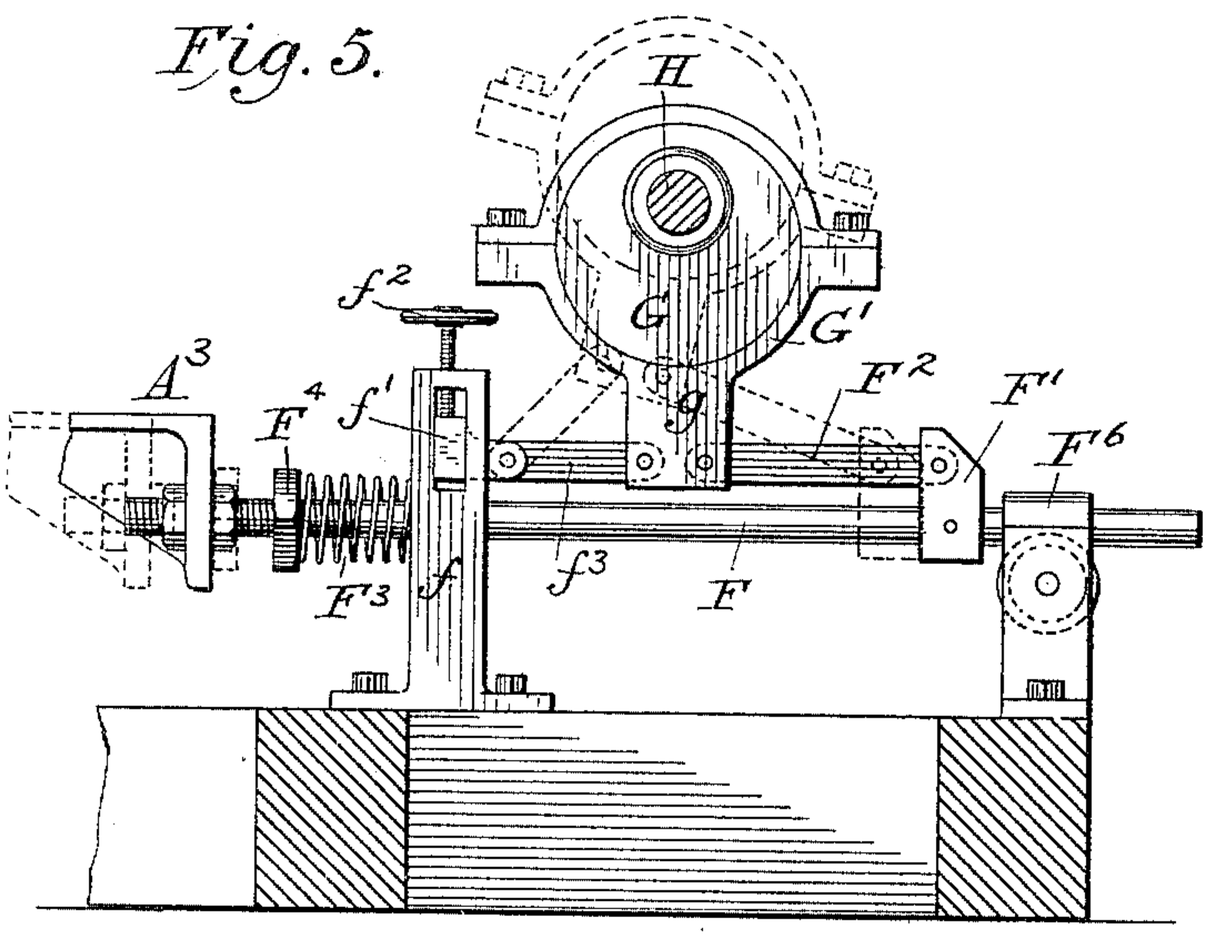


Fig. 6.

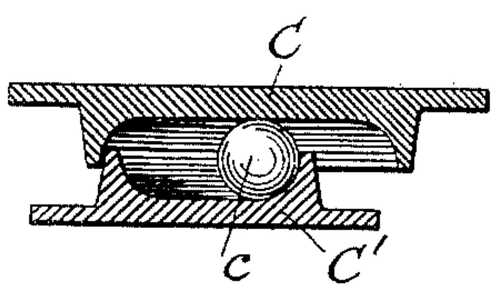


Fig. 7.

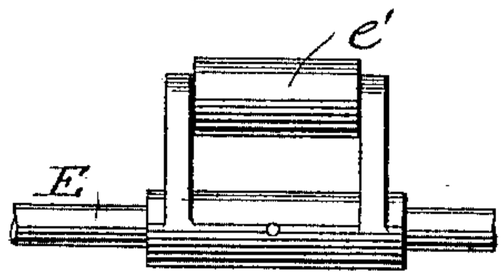
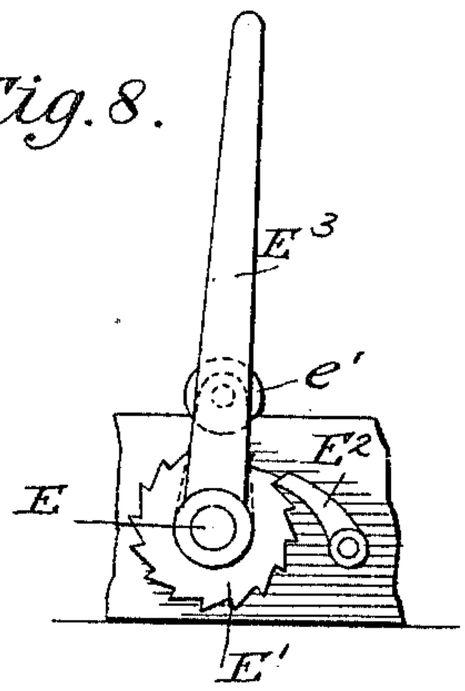


Fig. 8.



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(No Model.) 4 Sheets—Sheet 4.

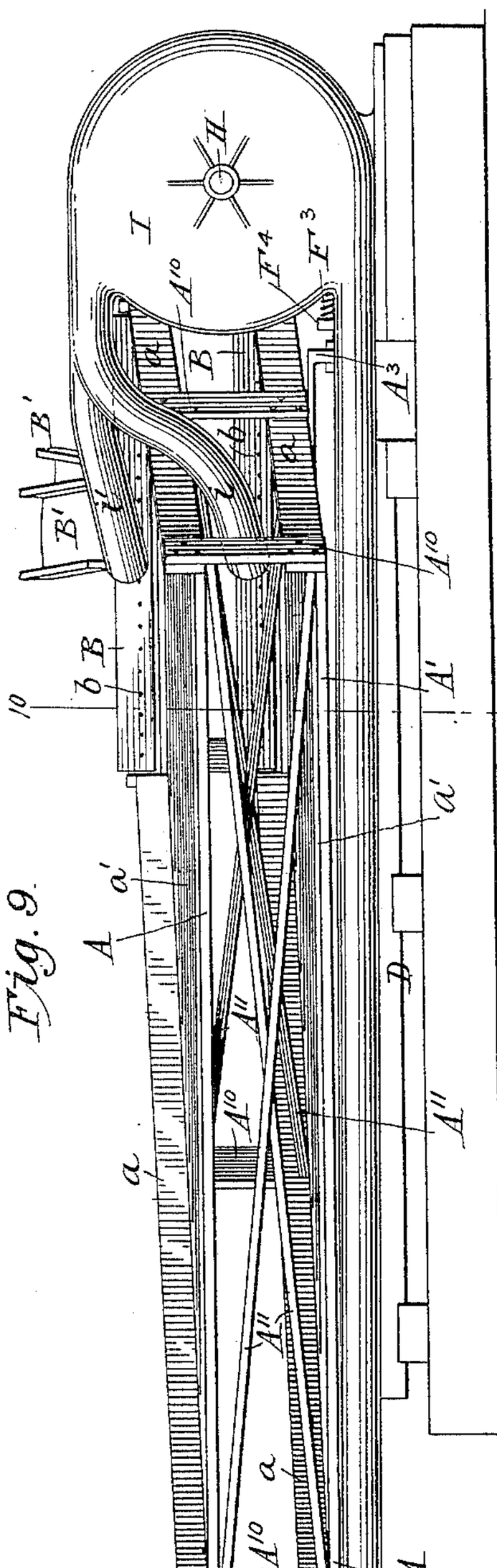

Fig. 9.

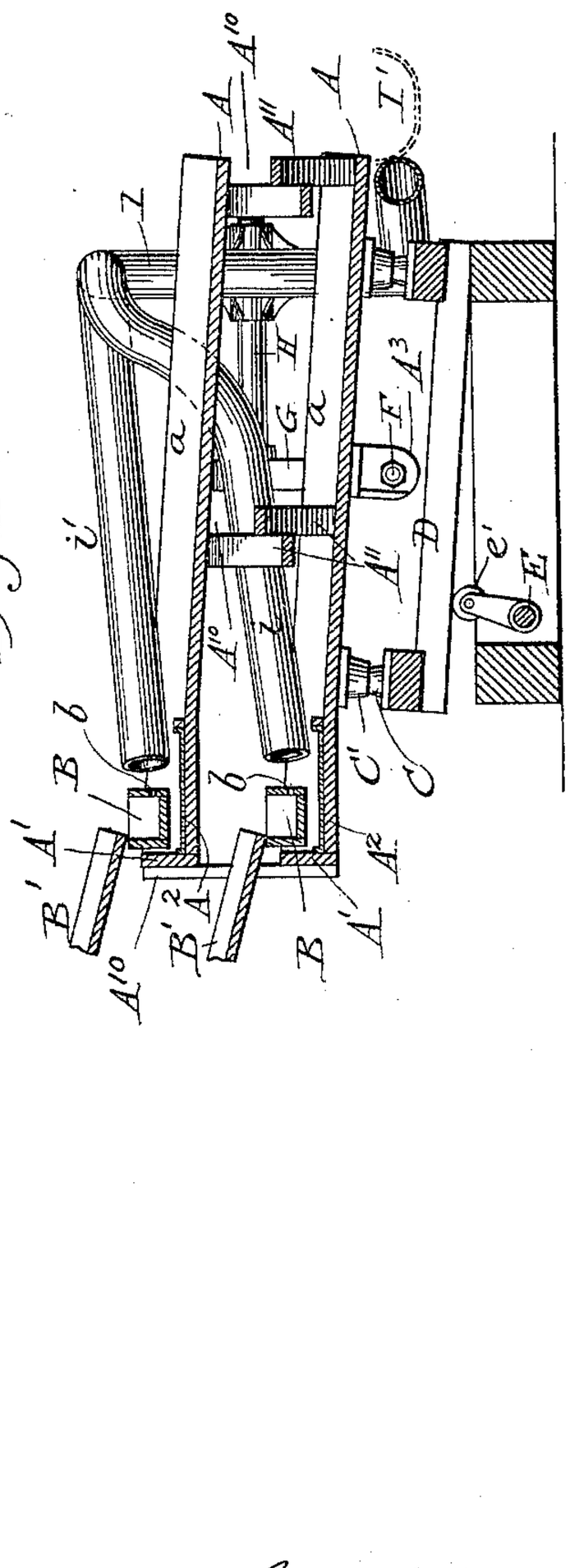

Fig. 10.

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UNITED STATES PATENT OFFICE.

JACOB LAMPERT, OF HILL CITY, SOUTH DAKOTA.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 641,977, dated January 23, 1900.

Application filed March 16, 1899. Serial No. 709,300. (No model.)

To all whom it may concern:

Be it known that I, JACOB LAMPERT, of Hill City, in the county of Pennington and State of South Dakota, have invented certain new and useful Improvements in Ore-Concentrators; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in ore-concentrators of the kind shown in my Patent No. 533,362, of January 29, 1895, and the present invention is more particularly an improvement upon the concentrator shown in my said patent; and it consists in the novel combinations and constructions of parts hereinafter summarized in the claims and illustrated in the accompanying drawings and described with reference thereto, as follows.

Figure 1 is a plan view of the complete concentrator. Fig. 2 is a front side elevation of the device. Fig. 3 is a transverse section on line 3 3, Fig. 1. Fig. 4 is a longitudinal section thereof on line 2 2, Fig. 1. Fig. 5 is an enlarged detail view of the vibrating mechanism. Figs. 6, 7, and 8 are details. Fig. 9 is a front elevation of the device, showing how a tier of concentrating-tables may be operated by a single vibrating mechanism; and Fig. 10 is a transverse section on line 10 10, Fig. 9.

A designates the concentrating-table, which is preferably of the shape shown in Fig. 1, its opposite sides being parallel and its ends diagonal or beveled relatively to its sides, the tail end being beveled at a much greater angle to the sides than the head end and the receiving or rear side being shorter than its discharge or front side. The ends and rear side of the table are provided with upstanding flanges *a*, which will prevent the escape of material therefrom, and the rear side of the table, which is the receiving end, is also provided with a lateral extension forming a receiving-box A′, which box may have a removable plate A^2 in its bottom, preferably of copper. The box A′ is preferably so arranged that when the table is slightly tilted the bottom of the box A′ will be about level, and the metal plate A^2 in the box is used for the purpose of recovering amalgam in free-gold-ore treatment. This plate is removable to allow different plates to be replaced for different processes and different ores. The plate is preferably set in a recess in the top of the table or box and its edges turned up, so as to hold the recovered metals, which can from time to time be removed, as required, therefrom. In ordinary practice a feed-trough B is placed in this box over the plate A^2, ore being fed into this trough B through a spout B′ and escaping from the trough into the box through a series of perforations *b* in the side of the trough, as shown. From the box A′ the material passes onto the table proper, which is preferably slightly inclined from the rear to the front side thereof, as indicated in Fig. 3. This table is provided with a series of parallel riffles *a*′, preferably extending parallel with the feed-box and with the front edge of the table, as shown, the riffles increasing in length toward the front edge of the table, as shown. This table is so mounted upon the main frame of the apparatus as to be capable of longitudinal vibration, and, as shown, it is preferably mounted by ball-bearings upon said frame, the table being provided on its under side with inverted oblong ball-holders or saucers C, which fit over balls *c*, resting in similar smaller saucers C′. Preferably the upper saucers C are larger than the saucers C′ to keep dirt and drippings from the table out of the lower saucers, and thus keep the ball-bearings clean. To provide for easy adjustment of this table without disturbing its bearings, the saucers C′ are fixed to a tiltable frame D, as indicated in the drawings, which frame can be tilted so as to properly adjust the inclination of the table. This frame may be hinged at its front side to the front side of the stationary main frame, and journaled in the main frame, near the rear side thereof, is a shaft E, which is provided at one end with a ratchet E′, engaged by a locking-pawl E^2 on the main frame to lock the shaft in any position desired. On this shaft E are keyed short arms *e*, carrying rollers *e*′, which are adapted to contact with the transverse bars of frame D or the bottom of said frame, near the rear side thereof, and tilt said frame more or less upward when shaft E is rocked, as indicated in Fig. 3. Thus by turning shaft E the frame D can be tilted

and the table adjusted to any desired inclination. The shaft may be turned by a lever E^3 or by any suitable wrench-lever.

The table is vibrated by the following means: To the under side of the table A, near the head end thereof, is attached a bracket A^3, to which is connected the inner end of a longitudinally-movable shaft, the outer end of which is guided in a proper bearing or housing F^6 on the main frame, which will permit free longitudinal movement of said shaft. This shaft passes through a standard *f*, provided above the shaft with a vertically-adjustable block *f'*, which can be adjusted by means of a hand-screw f^2, as shown. Connected to the block *f'* is a short link f^3, which is connected to the tang *g* of an eccentric-strap G', fitted over an eccentric G on the main shaft H of the machine, said shaft H being journaled in suitable bearings H^7 on the main frame, near the head end of the table and above and at right angles to the shaft F, as shown. To the tang *g* is also connected one end of a long link F^2, the other end of which is connected to a block F', secured to said shaft F near the outer end thereof. A spring F^3 is strung on shaft F and interposed between the standard *f* and an adjustable nut F^4 on said shaft, said spring tending to force the table away from the standard *f*. The links F^2 and f^3 form a toggle connection between the shaft F and bracket *f*, and if said toggle is deflected by the lifting of the eccentric-strap the shaft F will be forced longitudinally inward, thereby permitting the spring to push the table quickly away from standard *f*, and when the toggle is extended again the table is drawn back toward the standard and the spring F^3 is compressed. Power is applied to the main shaft H through belt-pulleys H' or any other suitable means, and when this shaft is rotated rapidly the eccentric G opens and closes the toggle-joint, thereby imparting vibratory movement to the table, as described. The link f^3 being shorter than the link F^2, it results, practically, that the inward movement of the shaft F is more rapid and is brought more to an abrupt stop than would be the case if the toggle-links were of equal length, and the abruptness of the stop of the inward movement of the table can be measurably controlled by adjusting the block *f'*. When it is lowered, the stop is made more quickly and abruptly. A further advantage of this form of toggle connection is that the strain upon the shaft E is almost entirely linear and very little strain is brought upon its bearings in the outer journal-box F^6, and the lateral thrust on the shaft is also entirely obviated by this construction. The short link f^3, when the eccentric is turned half-way around from where it is shown in Fig. 1, will, as shown by the dotted lines, stand at about an angle of forty-five degrees upward or more, thus causing the sudden stop of the table, and this causes the mineral thereon to move forward toward the tail end thereof. The adjustable short link f^3 of the toggle renders this table-operating device very sensitive, or, in other words, a very fine adjustment of the stroke of the table can thereby be secured, and the longer link F^2 relieves the objectionable downthrust of the shaft F' on the box F^6.

The riffles *a'*, as shown, do not extend entirely to the tail-end flange of the table, a smooth surface A^7 of gradually-increasing width being left between the ends of the riffles and the rear flange *a'*, as shown. The apex of the tail end of the table is also cut off, as shown at A^6, and at this point should be placed the dividers J, by which the concentrated ores may be graded and directed into proper receivers, as in other machines of this class. A portion of the material on the table also escapes over the front edge thereof, between the dividers and the end of the next riffle, and as such material is more or less imperfectly separated it is customay to return it to the table and pass it thereover again. In order to do this, I employ a catch-spout I, which is adapted to catch this material and return it back under the table to a pump-casing I', within which is a rotary pump-propeller I^2, which may be mounted on one end of the main shaft H, as shown. This pump may be of any suitable construction. It has an outlet at its upper end which discharges into a spout *i*, by which the material is led back into the box A^2 at the head of the table, from whence it is passed again over the riffles, as before. Water may be supplied to the table as usual, and I employ the perforated supply-pipe K along the tail-end flange *a'* to admit water to the smooth surface A^7 at the tail end of the table. This pipe K is connected to any suitable source of supply and, as shown, is provided with a central valve K', and its opposite ends are connected by branches K^2, provided with valves K^6, with a main supply-pipe K^3. By means of the various valves the water may be regulated and supplied in more or less volume from the whole or either part of the pipe K to the table, as is evident.

Operation: In operation the pulp or crushed ore is fed from a spout or pipe to the trough B, from which it is fed onto the metal plate A^2 and then over the riffles on the table, which is inclined toward its front or wider end. A reciprocating movement is imparted to the table by the toggle and eccentric to move the mineral caught between the riffles forward to the tail end of the table, where in the smooth or unriffled portion A^7 the sand or refuse matter yet left in the mineral might be washed off. The mineral being carried forward to the tail end is there cut out by the dividers J into one or more receivers, the separation being so perfect that if there are minerals of different specific gravity in the ore they will come down in streaks, according to gravity, over to the end of the table and can be easily separated. A portion of the minerals not yet

perfectly cleaned from refuse escapes off the edge of the table, between the lowest part of the dividers and the end of the lowest riffle, into spout I and is returned to the elevator I′ and delivered back to the head of the table to be treated again, as shown.

In some cases where a great quantity of material is to be treated or where economy of room is desired the concentrating-tables may be arranged in tiers, as indicated in Figs. 9 and 10. The tables would be duplicate, the upper table being supported on the lower table by means of uprights A^{10}, rigidly braced by the diagonal braces A^{11}, so that the two tables will be vibrated and adjusted together, like the single table above described. In this case each table may be supplied with ore by separate feed-troughs, and the returns or tailings from the table may be returned by the pump I, the outlet from which may be provided with a branch pipe or pipes *i i′*, leading to the respective tables. By this means the capacity of the apparatus can be increased without material addition to the cost thereof and without taking up any more floor-room than would a single table.

One of the particularly valuable and novel features of my concentrator is the peculiar formation of the table with a beveled head and tail ends provided with flanges.

The pulp or wet ore delivered on the table moves forward diagonally down and toward the tail end instead of passing directly down, and its movement carries the concentrates that way also; but the water in the pulp seeks the easiest way to escape, and to prevent the water from directly escaping and to keep the water mixed with the pulp for the better settling of concentrates the head end of my table is cut diagonally and an upstanding flange fastened thereto, thereby saving much water, which in many locations where water is scarce is a material advantage and improvement. The diagonal tail end of the table, as shown, is sufficient to accomplish the proper separation of the minerals from the refuse, and a larger triangular smooth surface or square-ended table is useless and simply increases the power necessary to operate the machine. The object of the tail-end flange is to prevent the wash-water, which is turned on the table nearly over and in line with this flange, from slopping over or falling off and effects a large saving of water.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. In an ore-concentrator, the table having its head and tail ends beveled and each provided with upstanding flanges, a feed-trough at the rear side of the table, and longitudinal parallel riffles extending from the head-flange toward the tail-flange, said riffles gradually increasing in length from the box toward the front edge of the table, substantially as described.

2. In an ore-concentrator, the combination of the table having its head and tail ends beveled and each provided with upstanding flanges, a laterally-projecting feed-box on the rear side of the table, and longitudinal parallel riffles extending from the head-flange toward the tail-flange and gradually increasing in length from the box toward the front edge of the table; with means for vibrating said table, substantially as described.

3. In an ore-concentrator, a table having parallel front and rear sides, its head cut on an obtuse angle to its sides, and its tail cut on an acute angle thereto, upstanding flanges on its rear side and head and tail ends, and parallel longitudinally-disposed riffles extending from its head toward its tail end.

4. In an ore-concentrator, the combination of a table having parallel front and rear sides, and beveled head and tail ends, the tail-end angle being more acute than the head angle, each end being provided with upstanding flanges, and a feed-box at the side of the table, and parallel longitudinally-disposed riffles on said table; with the removable amalgamating-plate in said feed-box, and means for vibrating said table longitudinally, and the ore and water feed and supply pipes.

5. In an ore-concentrator, the combination of a table having parallel front and rear sides, an obtuse-angled head end, an acute-angled tail end, said ends being provided with upstanding flanges, and a feed-box at the rear side of the table, and parallel longitudinally-disposed riffles on said table extending from the head toward the tail end of the table, of successively greater length as they approach the front side of the table, and terminating some distance from the tail end so as to leave a smooth surface between their extremities and the tail-end flange; with means for vibrating said table longitudinally, and the ore and water feed and supply pipes, all substantially as described.

6. In an ore-concentrator, the combination of a table having its head end cut on an obtuse angle, and its tail end cut on an acute angle and provided with upstanding flanges, a series of parallel longitudinally-disposed riffles extending from the head toward the tail end of the table and of successively greater length as they approach the front side of the table, said riffles terminating some distance from the tail end so as to leave a smooth surface between their extremities and the tail-end flange; in combination with the ore and water feed and supply pipes, means for vibrating said table, and means for returning partially-treated ores back to the feed-box.

7. In an ore-concentrator, the combination of a table having parallel front and rear sides, an obtuse-angled head end, an acute-angled tail end both ends being provided with upstanding flanges, a feed-box at the rear side of the table, and parallel longitudinally-disposed riffles on said table, extending from the head toward the tail end of the table and

being of successively greater length as they approach the discharge edge of the table; with the ore and water supply pipes leading to the feed-box, the wash-water-supply pipe along the tail end of the table, means for vibrating said table, and the pipe and pump for returning partially-treated ores back to the feed-box.

8. In an ore-concentrator, the combination of the concentrating-tables arranged one above the other and rigidly connected together, the adjustable laterally-tilting frame supporting said tables, means for imparting longitudinally-reciprocatory motion to said tables, the ore and water supply pipes for each table, a pump, a pipe for collecting tailings for each table and returning the same to the pump, and the branch outlets from the pump for returning the tailings to the respective tables, for the purpose and substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JACOB LAMPERT.

Witnesses:
E. H. FANSMITH,
ORLIN H. LAMPERT.