

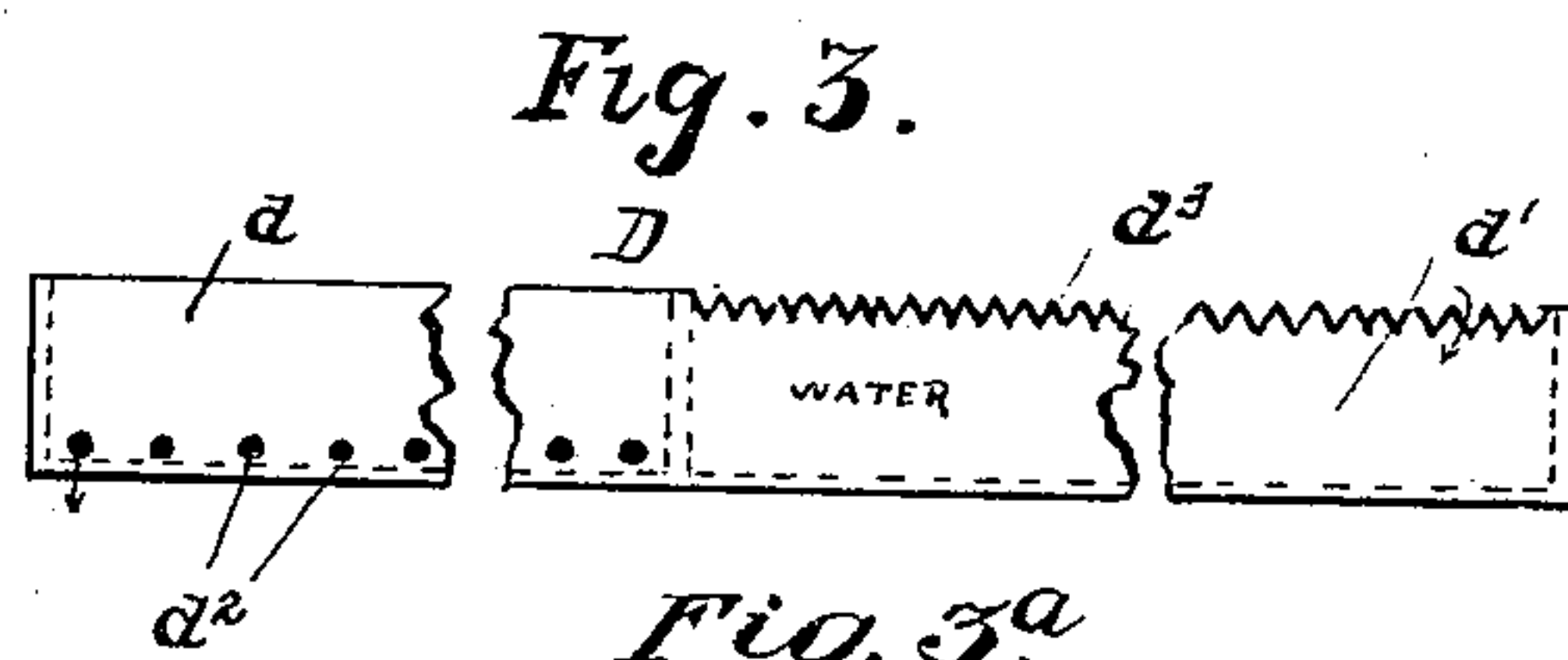
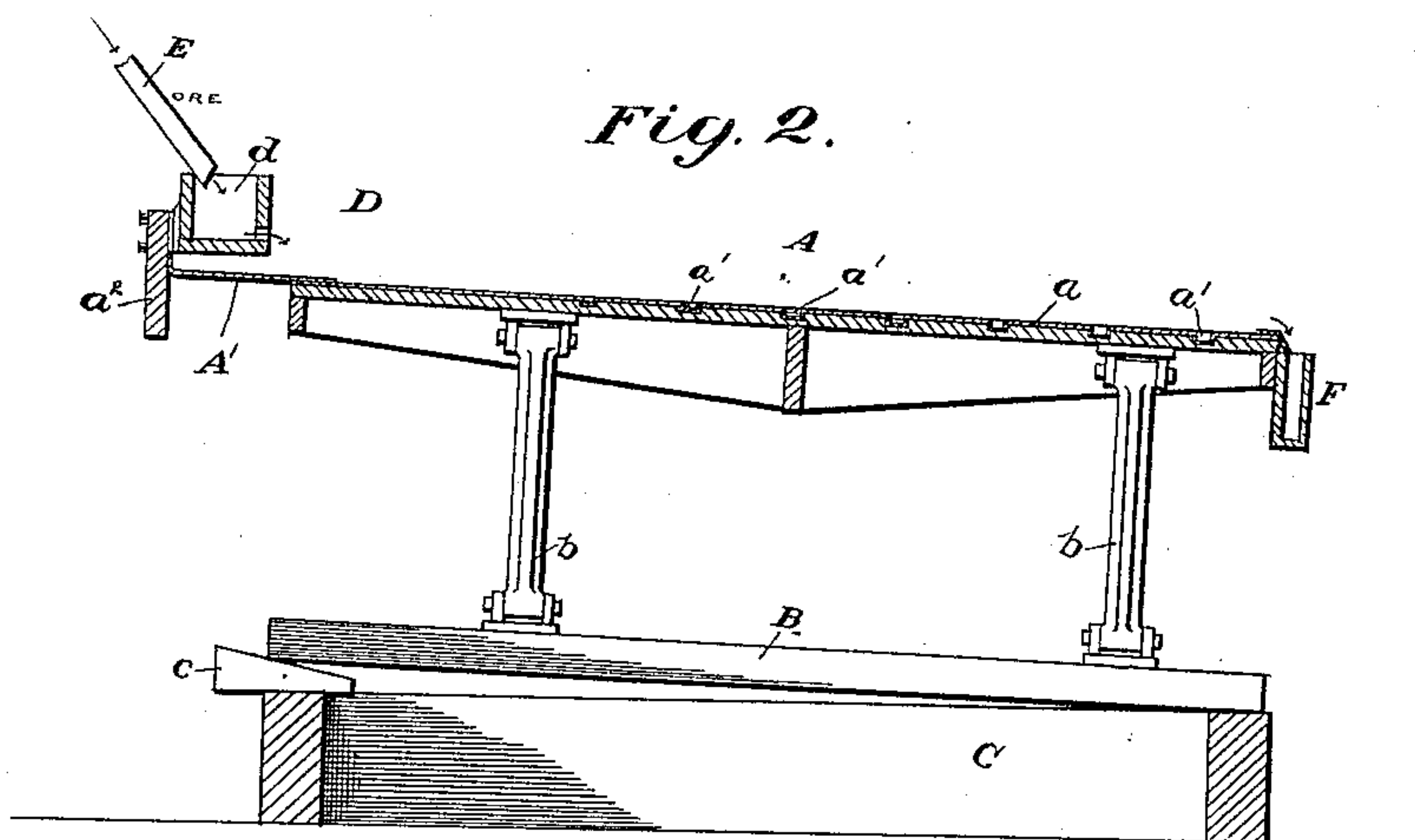
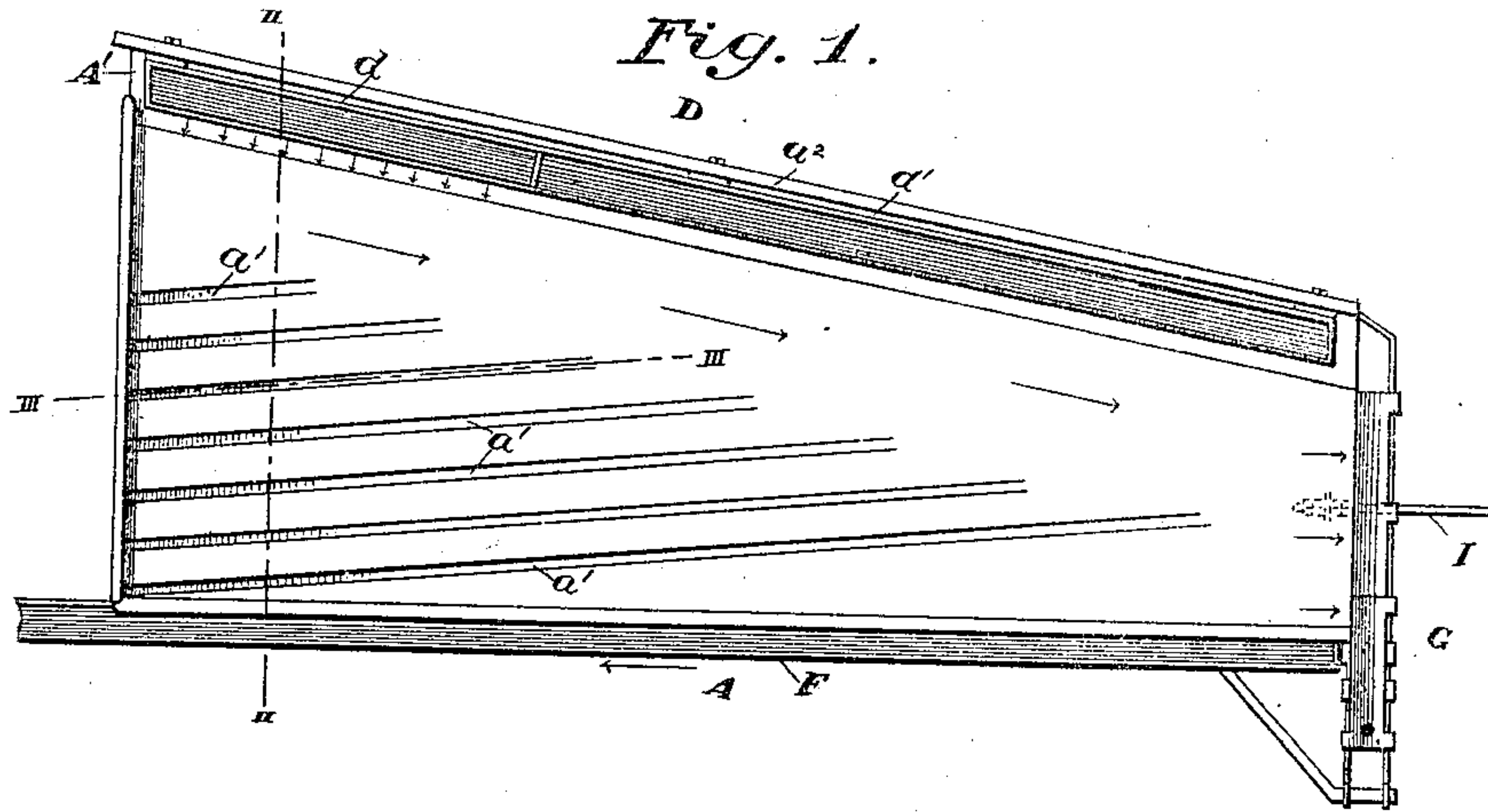
No. 614,322.

Patented Nov. 15, 1898.

S. I. HALLETT.  
ORE CONCENTRATOR.

(Application filed Jan. 29, 1898.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

SAMUEL IRVING HALLETT, OF ASPEN, COLORADO, ASSIGNOR OF ONE-HALF  
TO DAVID M. HYMAN, OF CINCINNATI, OHIO.

## ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 614,322, dated November 15, 1898.

Original application filed September 16, 1897, Serial No. 651,877. Divided and this application filed January 29, 1898. Serial No. 668,419. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL IRVING HALLETT, a citizen of the United States, residing at Aspen, in the county of Pitkin and State of Colorado, 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 the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to ore-concentrators, or that class of machines or apparatus employed for concentrating or separating and grading mineral substances of different specific gravities, and more particularly to apparatus operating to carry out the wet process of concentrating ores, whereby ores of various kinds may be washed and concentrated and the valuable minerals separated and graded with economy of time and labor.

The invention is especially designed for use in connection with ore-concentrators of that class in which the crushed ore is distributed upon and caused to move or flow along a plane surface or table to which is imparted a combination of shaking and rocking motions, whereby the concentrates or particles of mineral settling on the surface of the table are carried along and discharged in different classes or grades at one end or side of the table, while the gangue and refuse matter are carried off at the side or end of the table opposite the distributing-laundry.

The primary objects of my invention are to provide simple, inexpensive, and efficient means for separating the ore and for collecting the same in different grades or classes, so that in treating ores containing minerals of different specific gravities the different minerals may be separated and collected in their respective classes or grades, and to provide a table which shall efficiently separate and collect the finer or lighter and unsized mineral substances or float-mineral which in the operation of concentrators as generally heretofore constructed is either carried off with the gangue or collected in the form of "middlings" and returned to the feed-trough for retreatment with the fresh material being

fed into the feed-trough, with consequent loss of energy and waste of valuable metallic substances.

The invention will first be hereinafter more particularly described, with reference to the accompanying drawings, which form a part of this specification, and then pointed out in the claims at the end of the description.

Referring to the drawings, Figure 1 represents a top or plan view of an ore-concentrating table and its attachments embodying my invention. Fig. 2 is a cross-sectional view taken on the line II II of Fig. 1. Fig. 3 is a detail front view of the distributing-laundry. Fig. 3<sup>a</sup> is a longitudinal sectional view taken on line III III of Fig. 1.

In the drawings, in which similar letters of reference are used to denote corresponding parts in different views, A denotes the table, which is suitably supported to adapt it to have imparted thereto by any suitable mechanism in common use a combination of shaking and rocking motions or any desired movement for accomplishing the desired results. As shown, it is mounted on posts or legs *b b*, the upper ends of which are pivotally connected to the under side of the table, while the lower ends thereof are pivotally connected with and rest upon suitable frame pieces or bars B, which latter may rest upon a suitable support or frame C, as shown, or in any proper manner, suitable devices, as screws or adjustable wedges *c*, being interposed between the bars B and frame C for varying the inclination of the table.

The table is provided with a riffled or grooved surface and with an unriffled or smooth surface, as shown, said riffles or grooves extending along the surface of the table transversely or obliquely to the direction or line of movement of said table and tapering or diminishing in depth toward the unriffled portion. In the form shown in the drawings the riffled and unriffled surfaces are obtained by providing the table with a metallic sheet or facing *a*, in which is formed a series of longitudinal grooves, channels, or recesses *a'*, which preferably extend from the rear end of the table toward the front or discharge end thereof, with a slight rearward in-



clination, and terminate a sufficient distance from the receiving or discharge end or side of the table to leave a clear unobstructed smooth surface extending the length of the table on the side thereof adjacent to the distributing-launder, as shown more clearly in Fig. 1.

The metallic surface or covering of the table preferably consists of a metal having an affinity for the particular metal contained in the ore under treatment and which is the more valuable and desirable to be separated—as, for instance, lead in treating lead ore or a silver sheet or coating in treating gold ore.

The grooves  $a'$  taper from end to end—that is to say, they gradually decrease in depth from the front or receiving end thereof to their opposite terminals, where they merge into the smooth unobstructed surface of the table-top.

At or near the receiving end or side of the table and on that portion thereof on which the crushed ore or pulp is delivered from the distributing-launder I provide a removable wearing-plate  $A'$ , which may consist of a sheet-metal or other suitable plate having one edge or angle thereof secured to the frame piece or bar  $a^2$ , while the other portion or edge thereof overlaps and rests upon the surface of the table, as shown more clearly in Fig. 2. By this means when that portion of the table which is most subject to wear becomes worn and in need of repairs the wearing-plate may be removed and a new one substituted in its stead without necessitating the renewal of the entire metallic surface of the table or the substitution of a new table-top, as is usual in using ore-concentrators as heretofore constructed.

The distributing-launder D may be formed with two or more compartments  $d$   $d'$ , the compartment  $d$  being adapted to receive the pulp or crushed ore from a suitable conduit or pipe E, as indicated in Fig. 2, while the compartment  $d'$  is adapted to receive the water for washing the ore from a suitable conduit or pipe. The ore-compartment  $d$  of the launder D is provided on the discharge side thereof with a series of holes or perforations  $d^2$ , through which the pulp or ore mixed with water is permitted to escape onto the surface of the table. The upper edge of that side of the compartment  $d'$  nearest the table is preferably notched or serrated, as at  $d^3$ , in order that the water used for washing the ore as it passes downward toward the front or lower end of the table may be more evenly and smoothly distributed without splashing or spurting onto the table in greater volume or with greater force at any one point than at other points along the table, thus insuring an even distribution and smooth flow of the water across the table for the purpose of washing the ore and drawing off the lighter material and gangue into a water box or trough F, extending along underneath the edge of the table at that side thereof opposite the dis-

tributing-launder. At the front or discharge end of the table is placed a sectional trough or launder G to receive the heavier particles of mineral or valuable metal separated from the ore.

In the operation of the table the ore is fed into the compartment  $d$  of receiving launder or trough D, while the wash-water, which is located farther down the length of the table and which is used to wash the ore as it passes downward toward the discharge end, is fed into the compartment  $d'$  and flows over the top or serrated edge  $d^3$  of said compartment, so as to secure an even distribution and gentle flow thereof without spurting. At the same time a reciprocating movement differential in its action, with the strength of the longest throw or bump toward the discharge end of the table, is imparted to the table by any suitable mechanism connecting with the pitman I, which may be applied at either end of the table, so as to cause the ore to move along or over the surface of the table toward the discharge end thereof, whereby as the ore is moved along it is washed all the way at right angles by the water issuing from the compartment  $d'$  of the launder, thus washing the lighter material and gangue toward the opposite side of the table and into the trough or box F, from which the gangue and waste may flow off into any suitable receptacle or conduit provided therefor. The heavier ore or valuable material to be recovered remains scattered along the smooth surface of the table, above the terminals of the inclined grooves or channels  $a'$ , and is discharged at the end of the table into the receiving-launder G, while the float-lead or lighter particles of mineral that are not sized, as is the heavier lead or particles, are caught in the grooves  $a'$  and caused to gradually work backward and toward the discharge end of the table, so as to be brought back into the plane of the body of ore or valuable metal, which takes a position forward of an imaginary line running the length of the table outside of the terminals of the aforesaid grooves or slots, whereby the very fine float-lead or other float-mineral is separated and recovered with the larger particles of like kind and specific gravity instead of being carried over and discharged into a middlings receiver or receptacle, as heretofore, and conveyed back to the distributing-launder to be again run over the table, with consequent loss resulting from the fact that the material which is so finely pulverized as to be once discharged and again returned to the table will seek the same place as before and be run again and again into the middlings-receptacle and returned until worn by attrition so fine that it will pass off with the dirty water into the waste. The inclined sloping riffles or grooves, which run against the slant of the table, cause the float-mineral to be carried back to the place it should not have left, while allowing the waste to pass over it and off into the



trough or receptacle to receive the same, thus saving the valuable float material with the heavier ore that lies along the upper line or surface of the table beyond the terminals of the grooves. I thus avoid all intricate sav-  
 5 ings and returnings and accomplish what has hitherto been attempted to be accomplished by returning the same ore to be run over two or more times. The mineral of less specific  
 10 gravity and of a different class from that which is discharged into the first compartment or section of the sectional launder will be carried farther across the table and will be discharged into the second section or com-  
 15 partment, while the material of the next or third class will be discharged into the third section or compartment, thus separating and collecting the different grades or classes of material into two or more classes, the first of  
 20 which, for instance, may be lead, the second iron, and the third zinc, according to the ore under treatment, the same rule applying to any minerals having different specific gravi-  
 ties.

25 By constructing the surface of the table of metal having an affinity for the particular metal it is desired to recover from the ore under treatment the separation and collec-  
 30 tion thereof is greatly facilitated and a more complete separation is effected than is possible under the usual conditions.

The desired differential movement or bump-  
 ing action may be imparted to the table by  
 any suitable mechanism such as has hereto-  
 35 fore been employed in devices of a similar character and which it is unnecessary to illus-  
 40 trate or describe herein, inasmuch as my invention resides in the construction of the table and its attachments and not in the mech-  
 anism for imparting the desired vibratory or reciprocating movements thereto. I may men-  
 45 tion, however, as a desirable movement that which has heretofore been employed with what is known as the "Rittinger" table, made  
 in Germany many years ago and which has been in use in this country for many years, in which there is a side movement or bump-  
 ing action combined with the transverse wash-  
 ing of the ore.

50 It will be understood, of course, that the form and construction of the parts hereinbe-  
 fore described may be modified in a number of ways without departing from the spirit of my invention, and hence I do not desire to  
 55 be limited to the exact construction shown and described.

This application is a division of an origi-  
 nal application filed by me September 16,  
 1897, and in which the sectional receiving-  
 60 launder hereinbefore briefly referred to is made the subject of claims.

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

65 1. In a concentrator, a table provided with tapered riffles which merge into the table-sur-  
 face along a line oblique to said table.

2. An ore-concentrating table adapted to the "wet" process of separating ores, having a smooth upper surface extending along the  
 70 side thereof on which the ore and water are re-  
 ceived, and a series of spaced grooves or chan-  
 nels extending over the surface thereof at one  
 side of said smooth portion toward its dis-  
 75 charging end; the said grooves gradually  
 diminishing in depth from their receiving  
 to their delivery ends and inclined toward  
 and merging in said smooth surface, substan-  
 tially as described.

3. In an ore-concentrator, the combination  
 80 of an endwise-reciprocatory transversely-in-  
 clined table having a series of grooves or  
 channels in its surface extending toward the  
 discharging end of the table and gradually  
 85 diminishing in depth or tapering in a vertical  
 plane from their receiving ends and merging  
 into a smooth unobstructed surface of the ta-  
 ble which extends along the higher side of  
 the latter and across its discharging end; and  
 90 means for distributing ore and water over the  
 table from along its higher side.

4. In an ore-concentrator, the combination  
 of an endwise-reciprocatory transversely-in-  
 clined table having a series of diagonally-ex-  
 95 tending grooves or channels in its surface di-  
 minishing in depth or tapering in a vertical  
 plane from their receiving ends toward the  
 discharge end of the table and merging into  
 a smooth unobstructed surface of the latter  
 which extends along its higher side and across  
 100 its discharging end; and means for distrib-  
 uting ore and water over the table at its higher  
 side.

5. In a concentrator, a table provided with tapered riffles which extend along the table-  
 105 surface transversely or obliquely across the  
 line of movement of the table and terminate  
 along a line oblique to said table.

6. In a concentrator, a table provided with a riffled and an unriffled surface; said riffles  
 110 tapering toward the unriffled portion and ex-  
 tending in a direction oblique to the direction  
 or line of movement of the table.

7. In a concentrator, a table provided with a riffled and an unriffled surface; the riffles  
 115 extending transversely or obliquely across the  
 line of movement of the table, and tapering  
 or diminishing in depth toward the unriffled  
 portion.

8. A table for ore-concentrators having its  
 120 surface provided with a series of longitudinal  
 grooves or riffles diminishing in height from  
 the head toward the tail and extending ob-  
 liquely across the surface of the table and  
 terminating on a line oblique to the table. 125

9. A table for ore-concentrators having its  
 surface provided with tapered grooves or rif-  
 130 fles diminishing in height from the head to  
 the tail; said riffles diminishing in length  
 from the rear to the front or feed end of said  
 table, substantially as described.

10. In combination, a table for ore-concen-  
 trators grooved or riffled longitudinally from  
 head to tail; said grooves being tapered and



diminishing in height from the head toward the tail end of the table, and the feed near the head end of the bed arranged to discharge the pulp transversely across the deeper parts of the grooves, substantially as described.

11. In combination, a bed or table for concentrators grooved or corrugated longitudinally from head to tail; said corrugations being deeper at the head and diminishing in height toward the tail end of the bed, and the

feed near the head end of the bed arranged to discharge the pulp transversely across the deeper parts of the corrugations, substantially as described.

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

SAMUEL IRVING HALLETT.

Witnesses:

ELIAS COHN,

ROBERT WOODBRIDGE.