No. 618,006. Patented Jan. 17, 1899.

W. W. HABERSHAM.

APPARATUS FOR CONCENTRATING AND AMALGAMATING PRECIOUS METALS.

(Application filed Sept. 21, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1

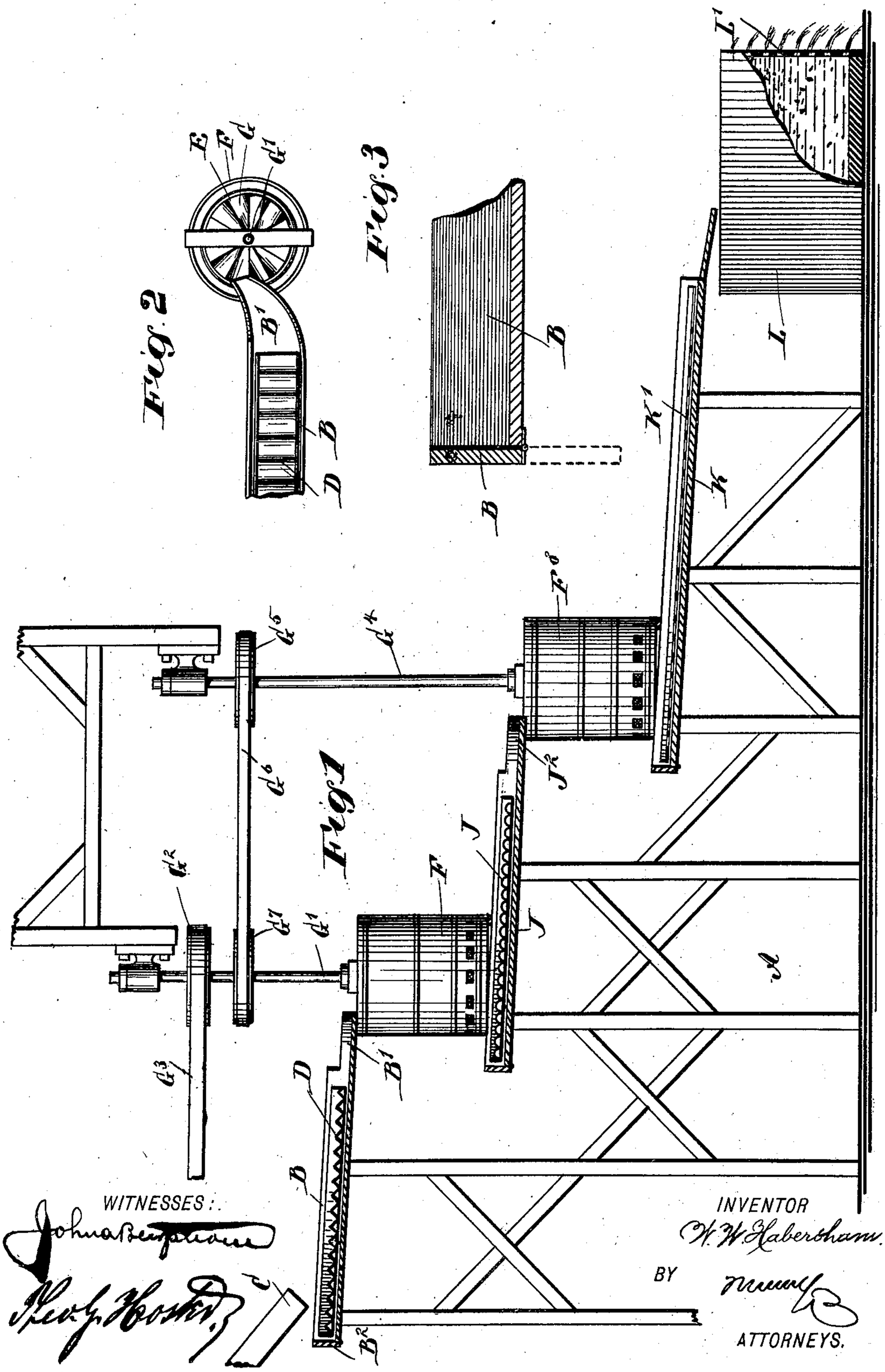

Fig. 2

Fig. 3

WITNESSES:

INVENTOR
W. W. Habersham.
BY
ATTORNEYS.

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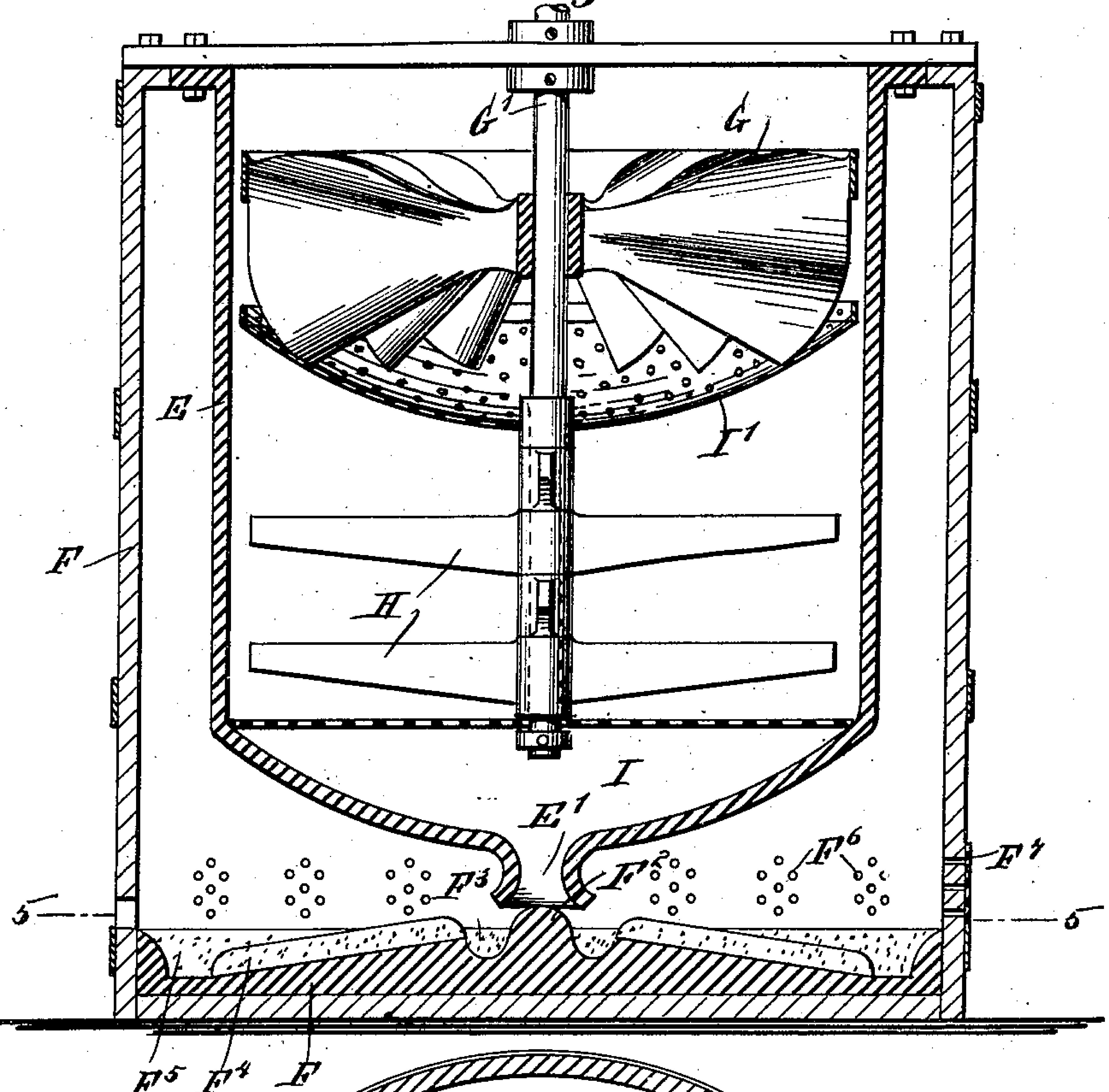
Fig. 4



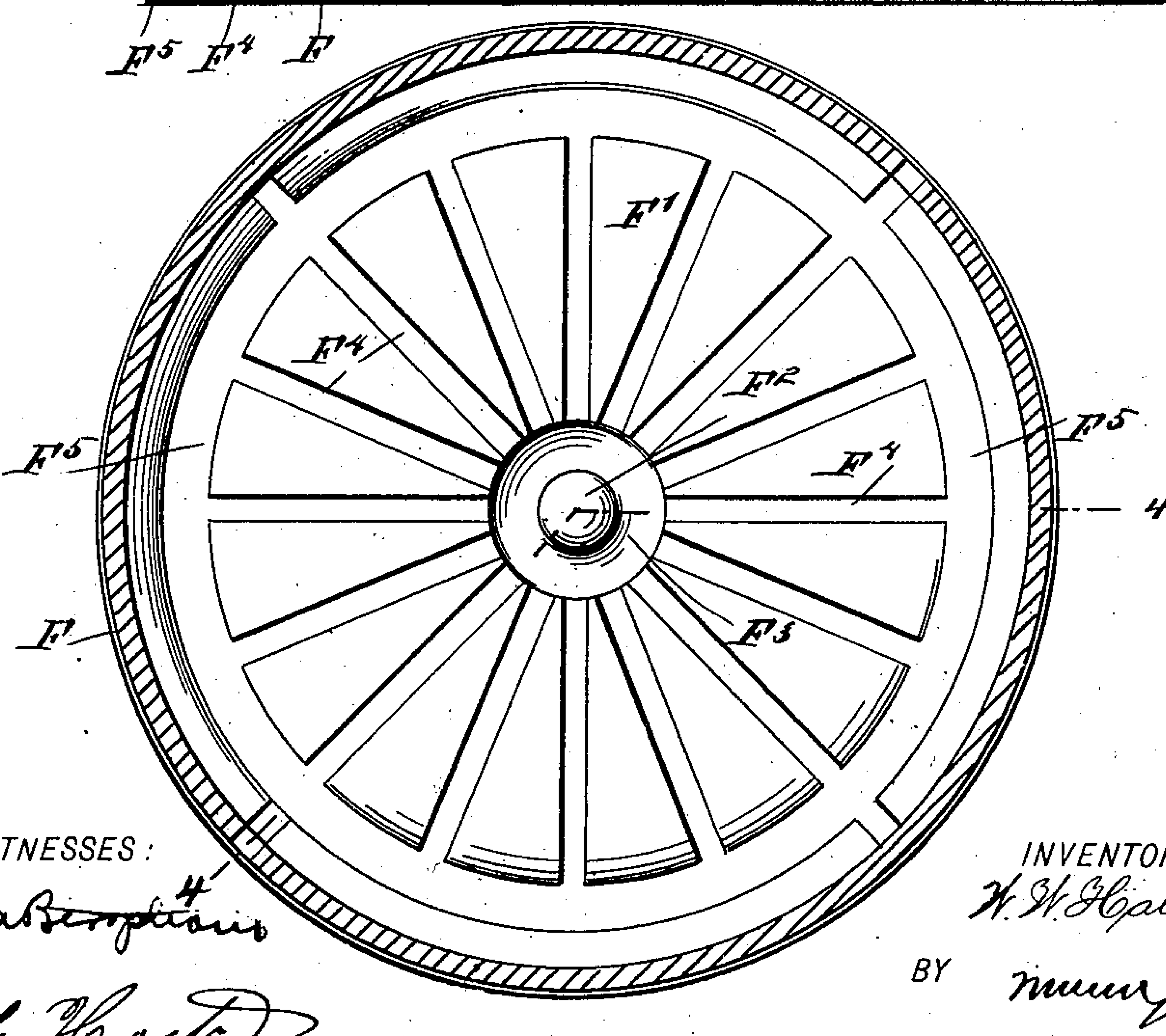


Fig. 5

WITNESSES:

John A. Bergstrom

Fred G. Hoster

INVENTOR

W. W. Habersham.

BY Munn & Co.

ATTORNEYS.

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W. W. HABERSHAM.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 6

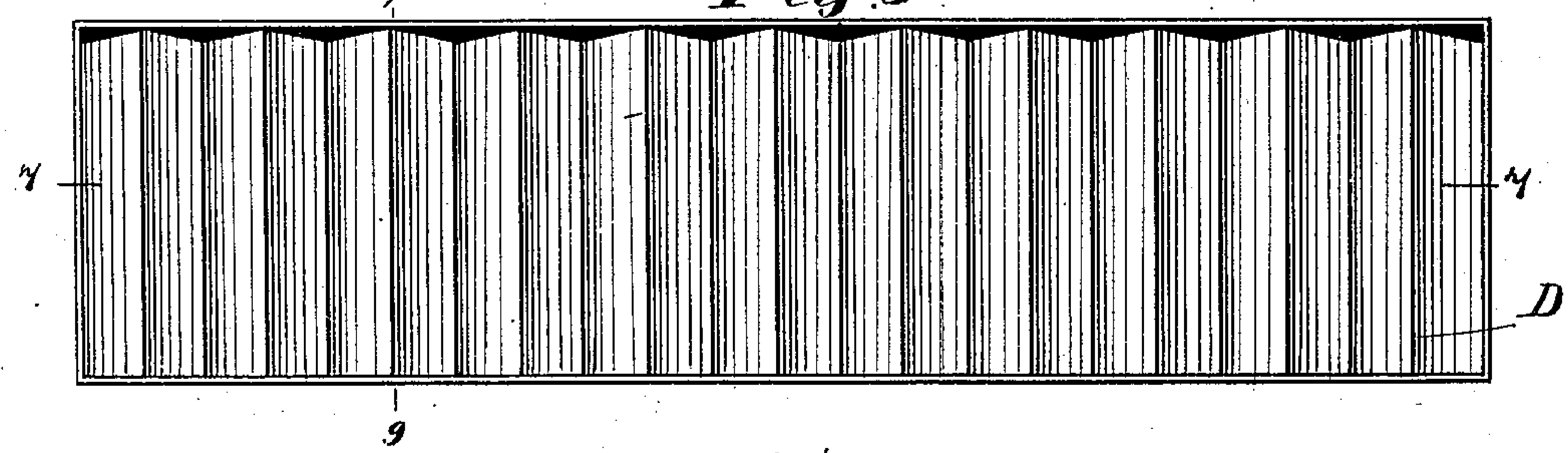


Fig. 7

Fig. 8

Fig. 9

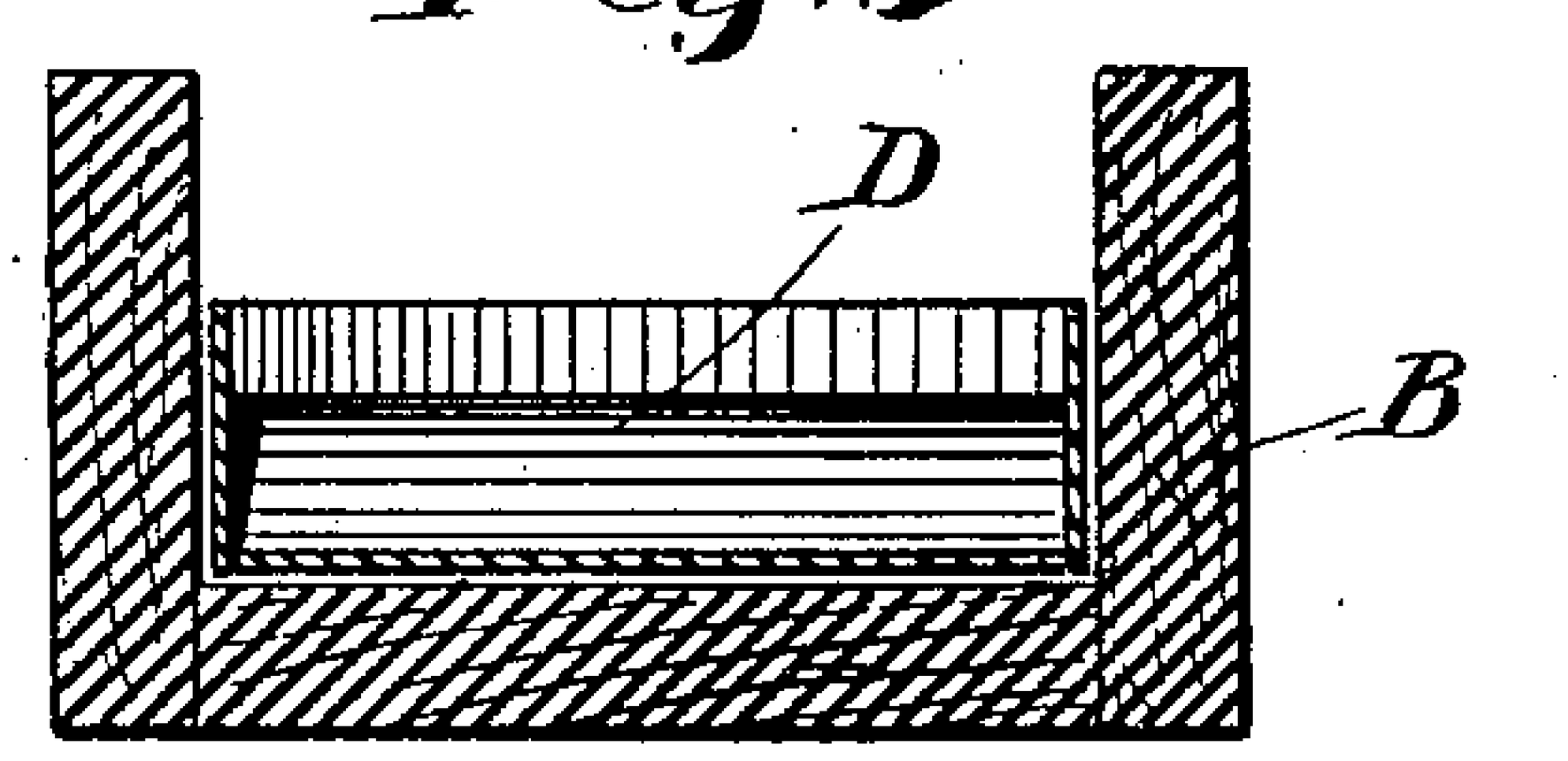


Fig. 12

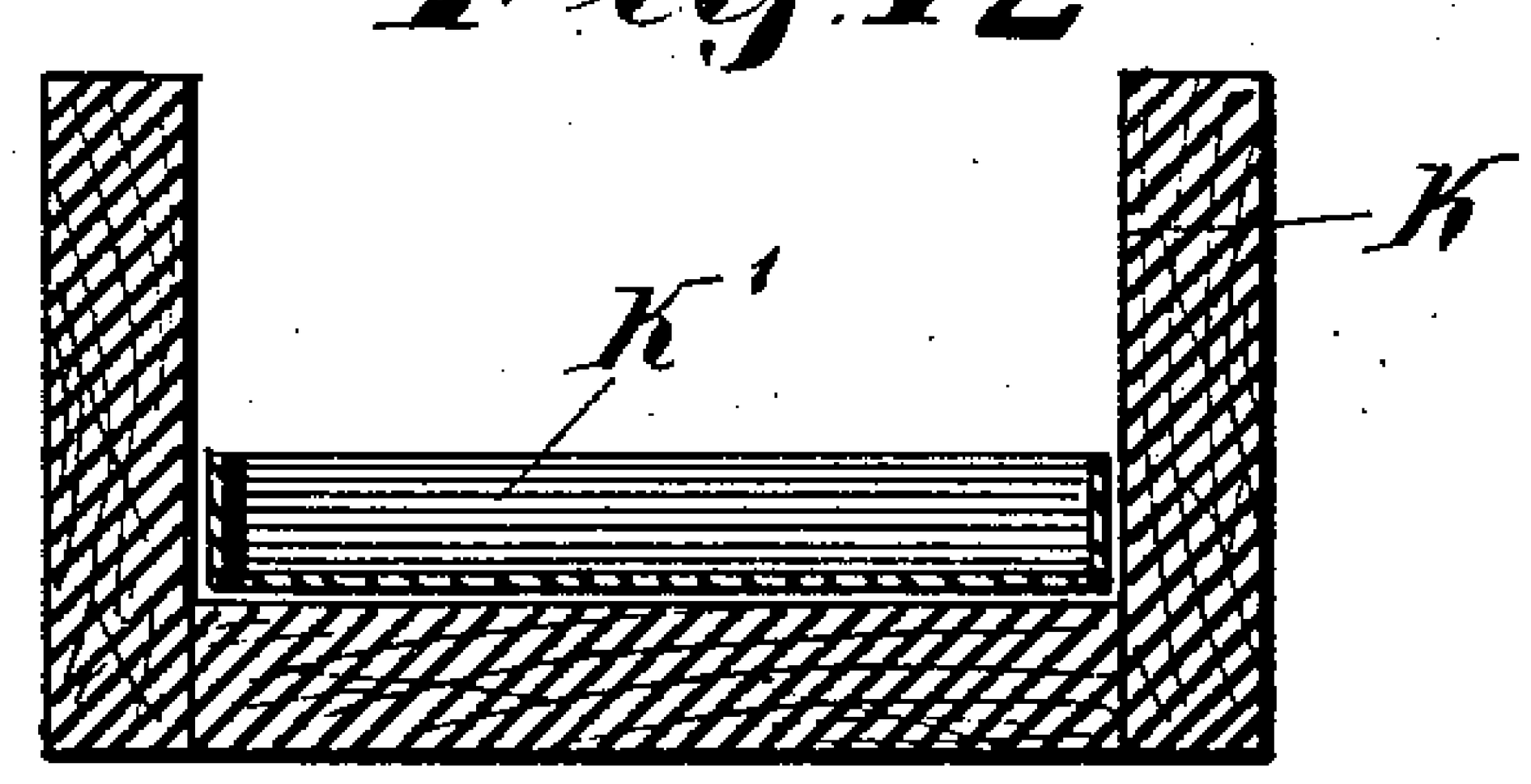


Fig. 10

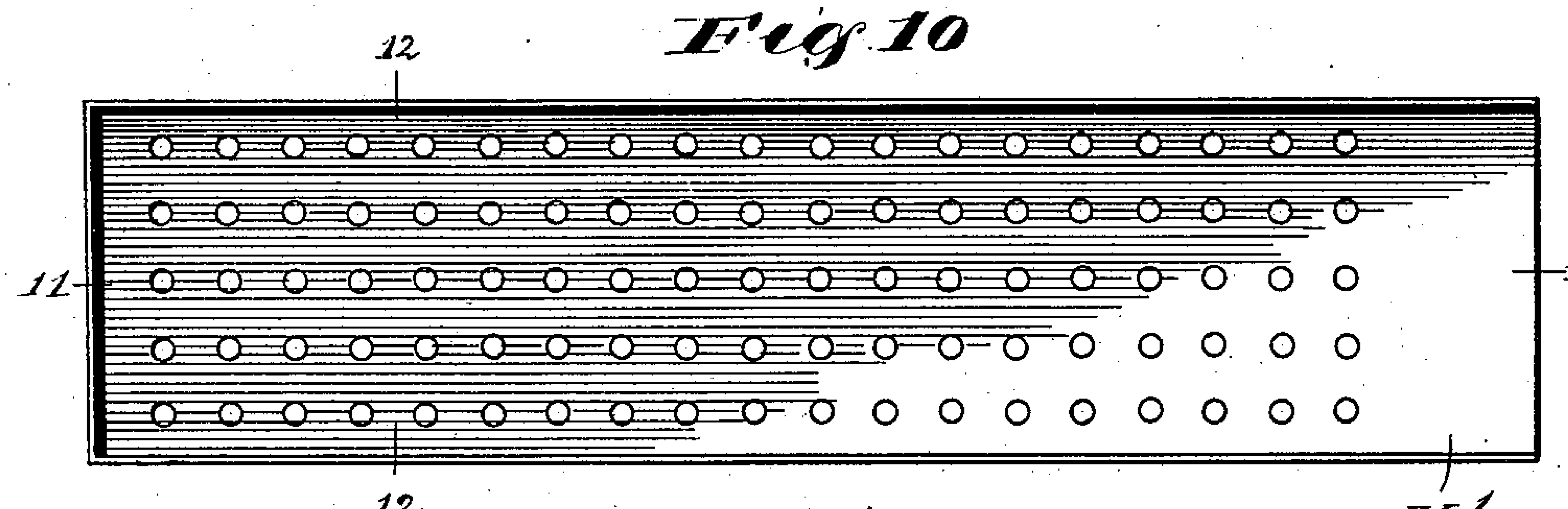
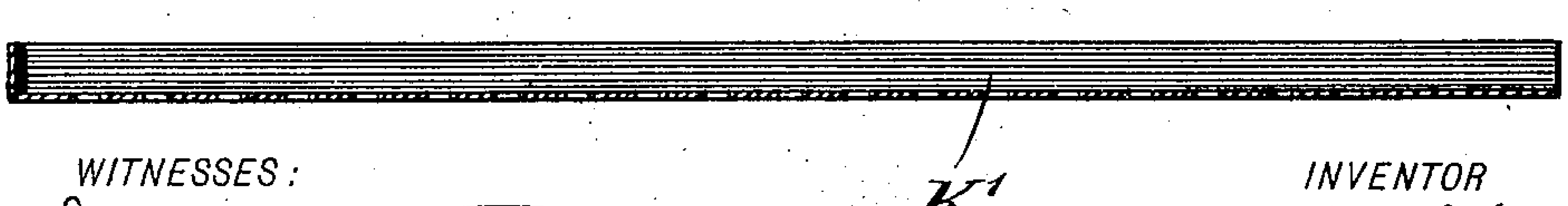


Fig. 11



WITNESSES:

John A. Bergstrom

INVENTOR

W. W. Habersham

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM WARING HABERSHAM, OF GAINESVILLE, GEORGIA.

APPARATUS FOR CONCENTRATING AND AMALGAMATING PRECIOUS METALS.

SPECIFICATION forming part of Letters Patent No. 618,006, dated January 17, 1899.

Application filed September 21, 1897. Serial No. 652,451. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WARING HABERSHAM, of Gainesville, in the county of Hall and State of Georgia, have invented a new and Improved Apparatus for Concentrating and Amalgamating Precious Metals, of which the following is a full, clear, and exact description.

The invention relates to mills; and its object is to provide a new and improved apparatus for saving fine or flour and oxidized gold in mining operations with the aid of an eddy and the precipitation of the metal in a sodium amalgam.

The apparatus consists of various parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement with parts in section. Fig. 2 is a plan view of the tub, vessel, and sluiceway. Fig. 3 is an enlarged sectional view of one of the riffles. Fig. 4 is an enlarged sectional side elevation of one of the cups and vessels, the section being taken on the line 4 4 of Fig. 5. Fig. 5 is a sectional plan view of the same on the line 5 5 of Fig. 4, and Fig. 6 is a plan view of the uppermost riffle. Fig. 7 is a sectional view on the line 7 7 of Fig. 6. Fig. 8 is a longitudinal section of the intermediate riffle. Fig. 9 is a section on the line 9 9 of Fig. 6 and showing the sluiceway as well as the riffle. Fig. 10 is a plan view of the lowermost riffle. Fig. 11 is a section on the line 11 11 of Fig. 10. Fig. 12 is a section on the line 12 12 of Fig. 10 and showing the sluiceway as well as the riffle.

The principles adopted in my method for saving gold in mining operations are twofold—first, that embraced in the construction of sluice-boxes and riffles in combination with tubs, vessels, and wheels whereby the method is fully carried out, the principle embraced in the action of water in rivers and streams in which eddies are formed and the sediment which is carried off by the natural current is stayed and deposited in them; second, that embraced in the attraction of metals or precipitation and in producing a plan of thorough concentration and amalgamation.

In ordinary sluicing operations the heavier particles of gold are precipitated into sluice-boxes and either united with the quicksilver in the riffles or raised on the bottom of the boxes, whereas the fine or flour gold, the weight or specific gravity of which is not sufficient to resist the action of the body of water used in sluicing, is washed away and lost. To obviate this difficulty, I have constructed an apparatus to be used either as an attachment to quartz or other mills used in mining or separately in sluicing, which with the aid of a sodium amalgam will enable the miner to save the greatest portion if not all the gold now lost in mining.

On a suitable frame A is mounted an inclined sluice-box B, into the upper end of which is discharged the material to be treated by means of a spout C, connected with a quartz mill or crusher or any device used in pulverizing and working the ores or gravel and sand. In the sluice-box B are arranged transversely-extending and V-shaped riffles D, as is plainly indicated in Figs. 1, 6, 7, and 9, for causing the heavy particles of the precious metals to settle in the riffles, while the lighter or flour gold, oxidized gold, and the like moves with the rest of the material and water down the sluice-box B over the lateral-curve sluiceway B′ to be finally discharged into a vessel E, suspended in a tub F, as is shown in detail in Figs. 4 and 5. The sluiceway B′ curves sidewise from the end of the sluice-box and discharges the material against the inner wall of the vessel. (See Fig. 2.) By this arrangement the material is first diverted from its course in the sluice-box and finally discharged against the inner wall of the vessel to form an eddy for the separation of the precious metals from the pulp.

The sluice-box B is made in the usual manner of seasoned planks in suitable lengths, as may be required, and closed at the upper ends by lids on hinges B^2, as shown in Figs. 1 and 3, while the milling and sluicing operation is going on, and opened to permit of being cleaned by removing the riffles and contents from the box. Figs. 6 and 7 show the riffle D removed, and Fig. 9 shows the riffle

in place. The riffles may be made of galvanized iron or any other suitable material. They are so constructed as to receive and retain all the gold and other metal which falls into them and prevent the loss of quicksilver and fine or flour gold caused by the leakage of the wooden boxes.

The material flowing into the vessel E drives a propeller-wheel G, secured on a shaft G′, carrying agitating-arms H in the lower portion of the vessel, the said arms serving to separate the gold from the pulp as much as possible, and the lower end of the shaft G′ is set or journaled in a sieve I, extending in the vessel above the bottom of the same, as shown in Fig. 4. A curved sieve I′ extends under the lower portion of the wings or boxes of the propeller-wheel G to suspend the pulp within the reach of the wheel G, so that the same may have effective action thereon. If the device is used on a quartz or other mill, the shaft G′ is provided at its upper end with a pulley G^2, connected by a belt G^3 with a pulley on the mill to rotate the shaft G′ and its arms H to form an eddy in the vessel E for separating purposes, as above described. In this case the hydraulic power of the material entering the vessel over the sluiceway is not relied upon as a driving power.

In the bottom of the vessel E is formed a mouth or funnel E′, which discharges the agitated material in a whirl upon a central projection F^2 for the tub F, containing the vessel E, as above described. The false bottom of the tub is in the form of a bed of Mexican arastra and is made of stone, concrete, or other material and formed with an annular groove F^3 around the central projection F^2. This groove contains sodium amalgam and is connected by downwardly-inclined radial grooves or channels F^4 with a lower annular groove F^5 at the outer edge of the false bottom F′. This groove F^5 contains quicksilver, and the amalgam from the groove F^3 when stirred up by the action of the material as it passes from the vessel E is forced into and unites with the quicksilver contained in the groove F^5, so that the quicksilver is properly acted upon by the sodium amalgam.

All around the bottom of the tub F at intervals of a few inches are holes F^6, arranged in rows and covered with wire-gauze F^7, through which the water and pulp, after passing through the perforated sieve I and being forced and impinged against the amalgam in the center groove F^3 of the false bottom F′, pass through the apertures F^6 into a sluice-box J, on which the tub F rests. The sluice-box J is arranged to receive all the material passing from the tub F into the sluice-box and to return into the sluices. The sluice-box J contains riffles J′, preferably semicircular in form, as indicated in Fig. 8, instead of V-shaped, as the riffles G, shown in Figs. 6, 7, and 9. The sluice-box J connects by a sluiceway J^2 with a vessel of like construction to the one contained in the tub F. The second vessel is suspended within a second tub F^8, similar to the tub F and supported on another sluice-box K, similar to the sluice-boxes J and B. The sluice K may be with or without riffles, as desired. Fig. 1 shows a riffle K′ in place. This riffle is also shown in Figs. 10, 11, and 12 and consists in a perforated plate with side flanges, as shown. The sluice K empties into a tailing-box L. The latter is provided with holes L′ to admit of the free passage of the tailings from the box.

The wheel contained in the second tub F^8 is mounted on a shaft G^4, carrying a pulley G^5, connected by a belt G^6 with a pulley G^7 on the shaft G′, so that when the latter is rotated from the mill, as previously mentioned, then a like rotary motion is given to the shaft G^4, so that both wheels G in the vessels E, contained in the tubs F F^8, are rotated simultaneously. The wheel in the vessel in the tub F^8 can also be driven by the incoming material passing over the sluiceway J^2 into the vessel E to form an eddy, as above described in reference to the said vessel and tub F′. The tub F^8 is similar in construction to the tub F—that is, it is provided with a bottom having the annular and inclined grooves and the central projection, on which latter discharges the spout E′ of the vessel E.

The operation is as follows: The separated and heavier gold and other metals contained in the milled material or pulp as the latter passes down the sluice-box B is retained by the riffles D in the said box, and the material in finally reaching and passing over the sluiceway B′ is turned from its natural channel and in passing into the vessel E is made to subserve the purpose of forming an eddy in the vessel. It is well known that when an eddy is formed the sediment which is carried off by a natural current is stayed and deposited in the surrounding bed of the eddy, and hence a like process takes place in the vessel E, in which an eddy is produced to separate the gold and other metals from the pulp. The separated metals pass with the rest of the material through the spout E′ into the sodium amalgam in the upper groove F^3, so that the metal is readily taken up by the amalgam as the latter is agitated or stirred by the water passing through the material from the mouth of the vessel over the projection F^2 into the amalgam. The agitated and separated amalgam flows down the grooves F^4 to the quicksilver in the groove F^5, which is acted on by the sodium amalgam. The discharged pulp passes from the tub F over the sluice-box J and sluiceway J^2 into the vessel contained in the tub F^8, in which the above-described operation is repeated, and the pulp discharged from this tub F^8 passes over the sluice-box K to the tailing-box L. If it is found that the material in the bottom of the tailing-box L contains gold or other metal, it will be positive proof that all the metal contained in the pulp is not caught in the sluice-boxes or tubs. The amount of metal left in the sluice-boxes

or tubs can be readily determined by comparing the assays of the ore before being milled with that found in the tailing-box.

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

1. In an ore-concentrator, the combination of a tub provided with perforations at its lower portion, through which material may escape from the tub, a vessel mounted in the tub and having an open upper end and having at its lower end a mouth or funnel discharging upon the bottom of the tub, a shaft mounted to turn in the vessel and located centrally therein, a sieve held at the lower portion of the shaft and extending across the lower portion of the vessel, arms mounted on the shaft and located in the vessel to form an eddy therein, a propeller-wheel attached to the upper portion of the shaft and engaged by the pulp as it flows into the vessel whereby to drive the shaft, and a curved sieve supported in the upper portion of the vessel and located directly beneath the propeller-wheel.

2. In an ore-concentrator, the combination of a tub having perforations in its lower portion, a false bottom situated within the tub and having an upwardly-extending central projection surrounded by an annular groove, the false bottom also having radial channels leading to a second annular groove in the outer portion of the false bottom, whereby to connect the two grooves with each other, a vessel mounted in the tub and having an open upper end and having a mouth or funnel at the center of its lower portion, the mouth or funnel discharging upon the projection of the false bottom of the tub, a shaft mounted to turn within the vessel, a sieve held stationary within the vessel, agitating-arms attached to and driven by the shaft, and a propeller-wheel attached to the shaft and located at the upper portion of the vessel.

WILLIAM WARING HABERSHAM.

Witnesses:
A. R. SMITH,
A. RUDOLPH.