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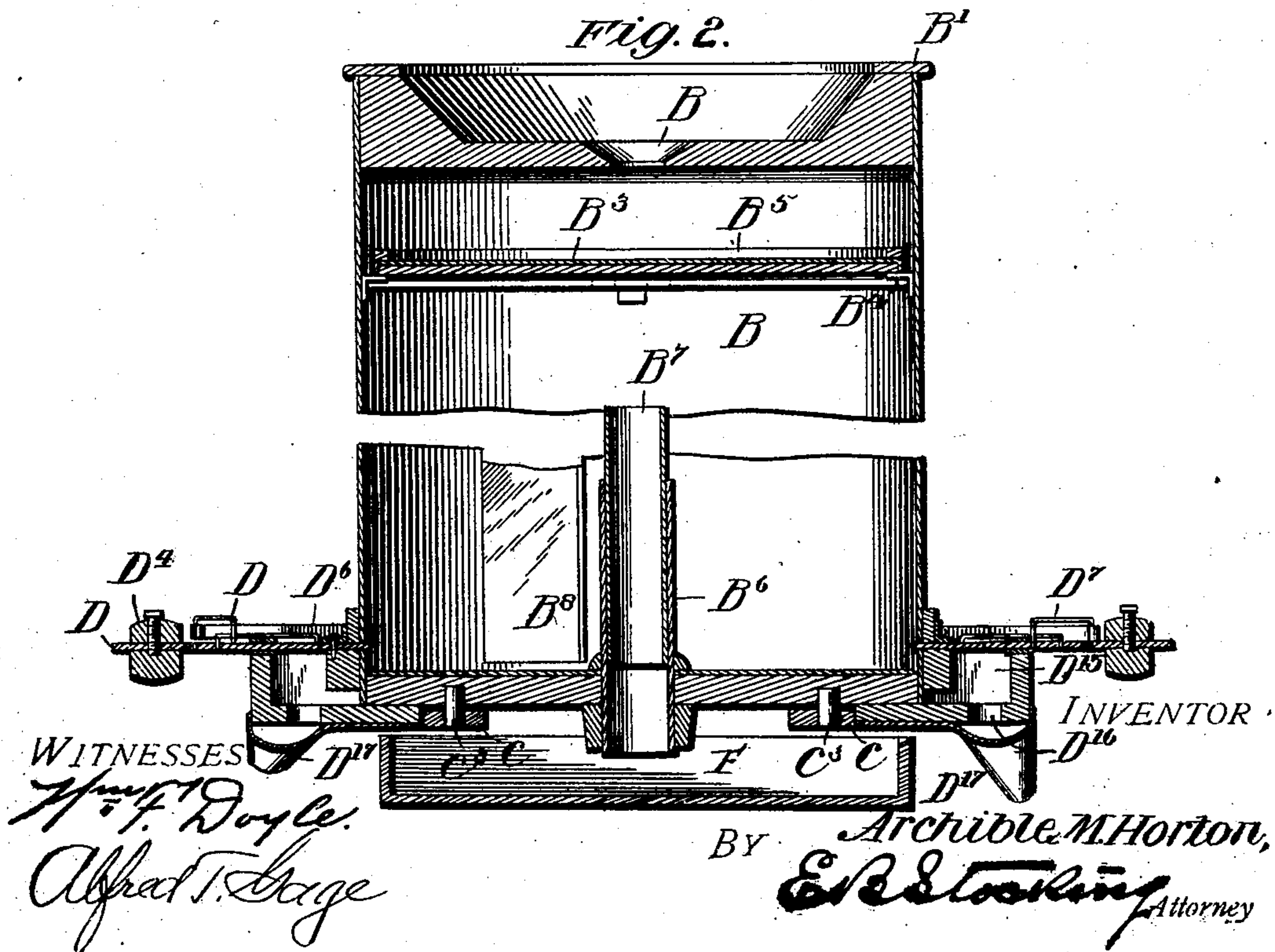
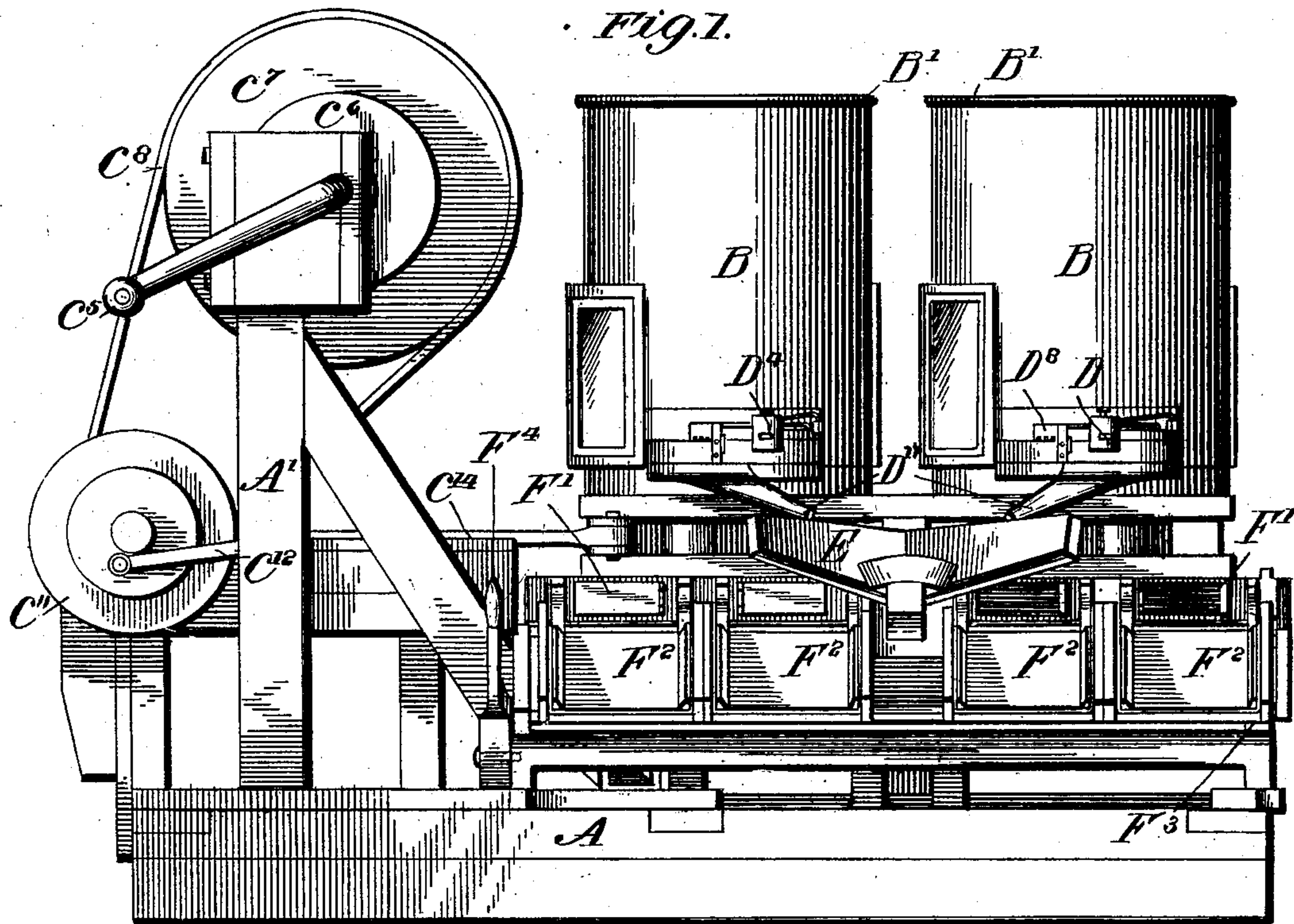
Patented Dec. 24, 1901.

A. M. HORTON.
CONCENTRATING AMALGAMATOR.

(Application filed Feb. 9, 1901.)

(No Model.)

3 Sheets—Sheet 1.



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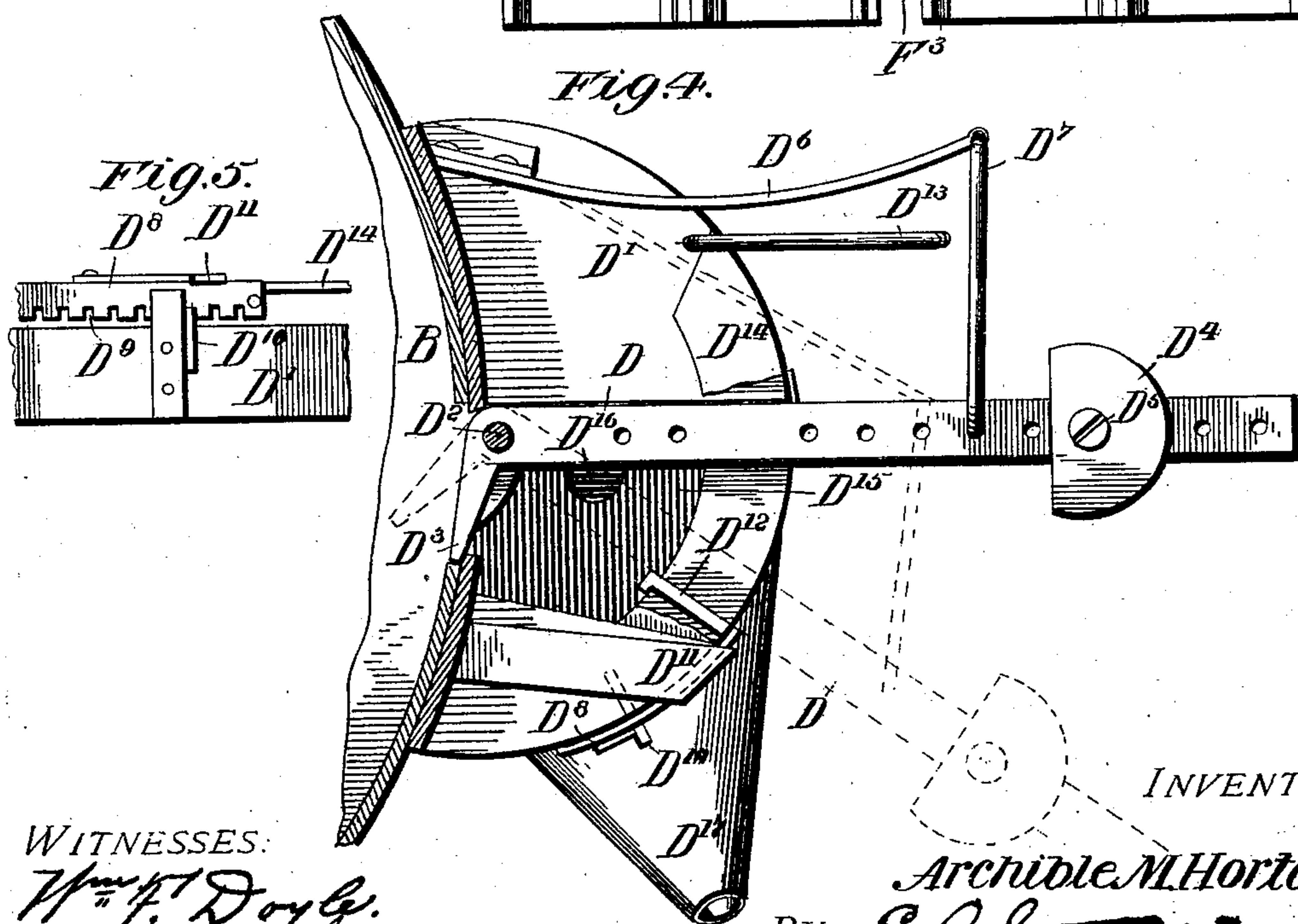
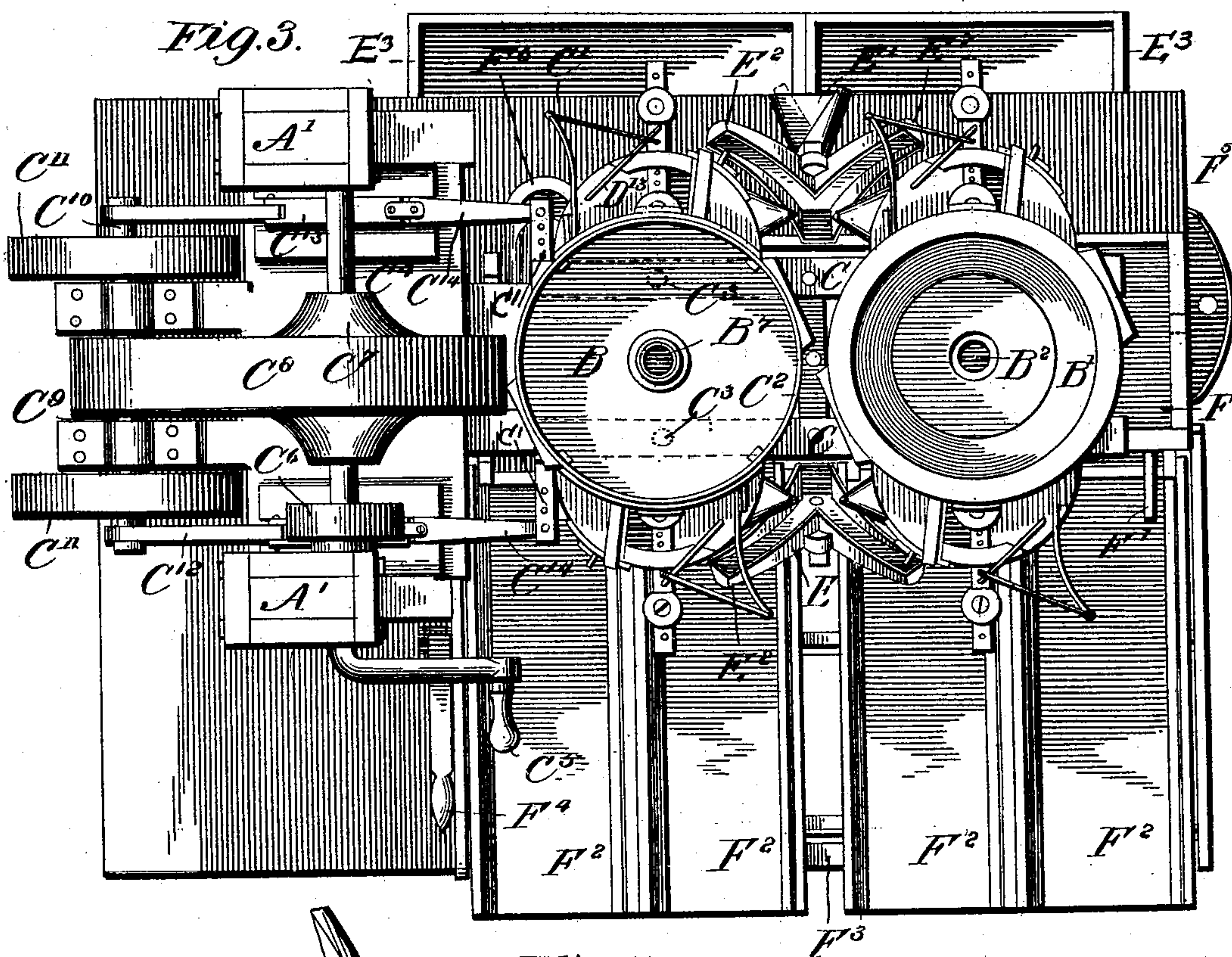
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3 Sheets—Sheet 2.



WITNESSES:

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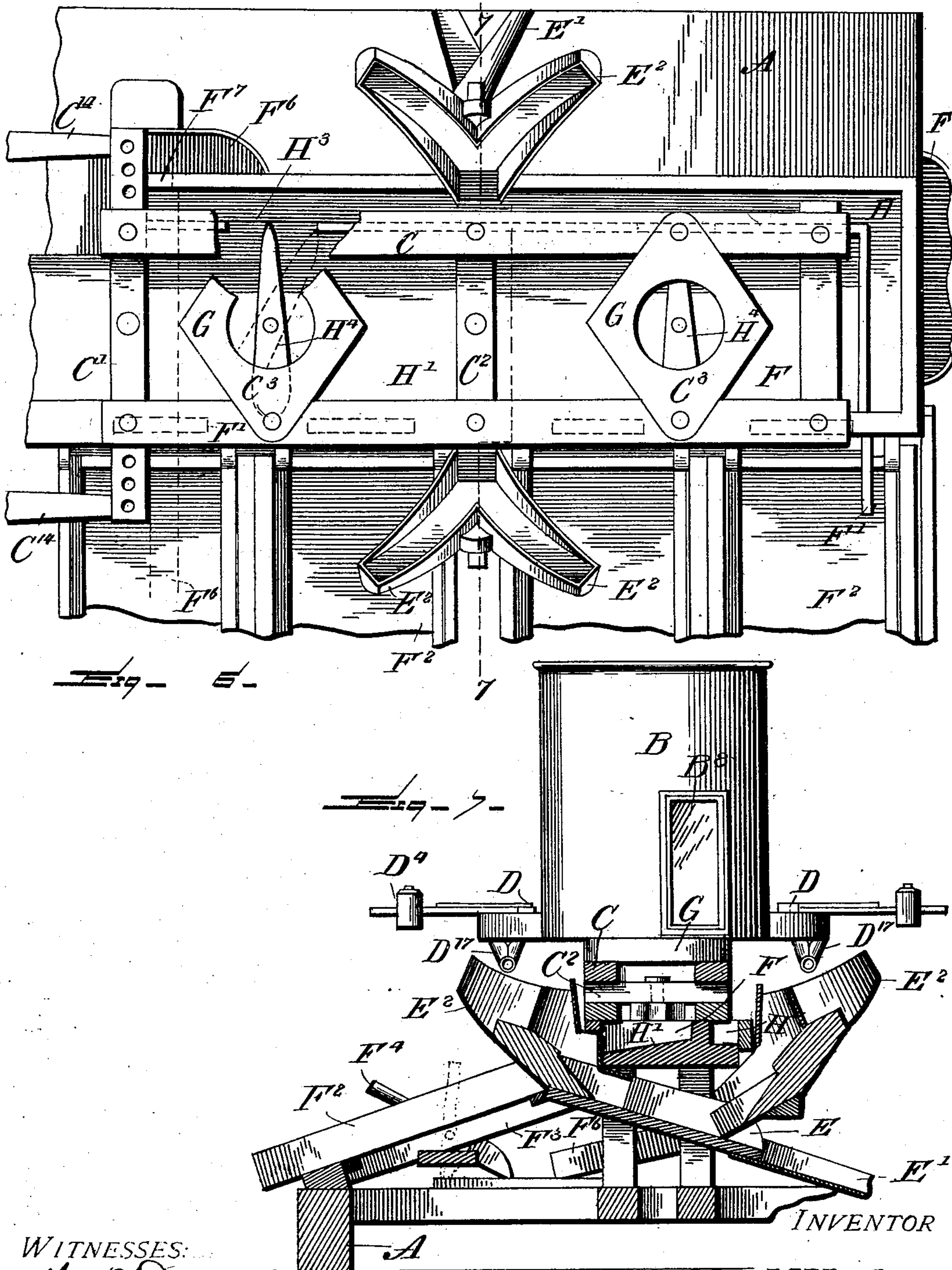
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3 Sheets—Sheet 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ARCHIBLE M. HORTON, OF SARATOGA, WYOMING, ASSIGNOR OF ONE-THIRD TO JOHN HENRY ROSE AND ROBERT BROWN, OF SARATOGA, WYOMING.

CONCENTRATING-AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 689,805, dated December 24, 1901.

Application filed February 9, 1901. Serial No. 46,686. (No model.)

To all whom it may concern:

Be it known that I, ARCHIBLE M. HORTON, a citizen of the United States, residing at Saratoga, in the county of Carbon, State of Wyoming, have invented certain new and useful Improvements in Concentrating-Amalgamators, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to concentrating-amalgamators, and particularly to a machine in which the concentration is produced by centrifugal force in the oscillatory movement of a receptacle.

15 The invention has for an object to improve the construction of the concentrating-cylinder, whereby the amount of sediment collected in the bottom thereof may be accurately regulated and the discharge of this metal-bearing sediment controlled and determined relative to the character of ore operated upon.

20 A further object of the invention is to provide an improved construction of valve adapted to be operated by centrifugal force, together with means for limiting the movement of this valve or holding the same against movement.

25 A further object of the invention is to provide amalgamating means adapted to receive the waste material from the concentrating and amalgamating cylinder in order to determine the character of work performed by the cylinder and to recover any valuable metal which may be present in said waste material.

30 Other and further objects and advantages of the invention will be presented in the following description and the novel features thereof pointed out in the appended claims.

35 In the drawings, Figure 1 is a front elevation of the machine. Fig. 2 is a vertical section through one of the concentrating and amalgamating cylinders. Fig. 3 is a plan of the machine. Fig. 4 is a detail plan of the discharge-valve with parts in section broken away, and Fig. 5 is a detail elevation of the adjustable stop for the discharge-valve. Fig. 6 is a detail plan with the cylinder removed, and Fig. 7 is a vertical section on the line 7-7 of Fig. 6 with cylinders in position.

Like letters of reference refer to like parts in the several figures of the drawings.

The letter A represents a base-frame of any suitable construction adapted to support the parts of the machine in position for relative operation. Upon this frame the concentrating and amalgamating cylinder B is supported and suitably mounted for motion to produce centrifugal force, such as a complete or partial rotation. In the present illustration the cylinder is oscillated through a partial rotation, and one means for accomplishing this motion is shown by the parallel bars C, which are secured to a connector C', connected with the operating mechanism and to a cross-bar c², pivoted to the base upon which the machine rests and to each of the bars C. The base-plate G for the cylinder is suitably pivoted to the parallel bars C, as shown by dotted lines at C³ in Fig. 3 and also shown in Fig. 6. The mounting of one cylinder has been described; but it is obvious that a plurality of cylinders may be used, as shown in the drawings, and each similarly mounted.

As showing one form of driving mechanism adapted for the operation of the parts I have disclosed a driving-shaft c⁴, suitably journaled in standards A' and supplied at one end with a crank C⁵ for use when it is desired to drive the machine by hand, while a driving-pulley C⁶ is supplied for the application of other suitable motive power. Upon the shaft C⁴ a band-pulley C⁷ is secured, from which a driving-belt C⁸ extends to a pulley C⁹ upon a counter-shaft C¹⁰. At each end of this shaft crank-wheels C¹¹ are secured, and from the same pitmen C¹² extend and are pivotally connected to slide-bars C¹³, which in turn are connected by the links C¹⁴, pivoted to the opposite connectors or bars C' C' to produce an alternate oscillation thereof. This movement reciprocates the parallel bars C in opposite directions and oscillates the cylinder pivoted thereto to produce the desired centrifugal movement of the contents within the cylinder.

The cylinder B is provided at its top with a hopper-disk B', having a central feed-opening B², adapted to feed into the cylinder ore-pulp delivered thereto from a battery of stamps or any other desired source. This

opening B² discharges the pulp at the center of an amalgamating-tray B³, which is of less diameter than the cylinder and supported within the same by brackets B⁴, so as to leave
 5 an annular space between the tray and the cylinder through which the ore which has not been amalgamated upon the tray will fall to the lower portion of the cylinder. The tray is provided with the usual amalgamating
 10 metal, which is retained upon the tray by means of a rim B⁵. The lower portion of the cylinder is also provided with suitable amalgamating substances and with a discharge-pipe B⁶, centrally disposed therein and extend-
 15 ing through the bottom of the cylinder. This pipe is provided with an adjustably-telescoping section B⁷, through which the lighter material and waste which are driven to the center of the cylinder by the centrifugal motion may
 20 be discharged. A sight-glass B⁸ is also provided, through which the amount of metal collected in the bottom of the cylinder may be observed.

The discharge of the heavier matter within
 25 the cylinder, which comprises the valuable metal, is effected by means of a needle-valve D, which is automatically operated by centrifugal force, secured in the oscillation of the cylinder B. This valve is shown in detail in Fig.
 30 4 and is pivoted to a discharge-casing D', as shown at D². The valve D³ completely fills and closes the discharge-opening from the cylinder. This valve D³ is disposed at an angle to the lever D, upon the outer end of which an
 35 adjustable weight D⁴ may be secured by means of a pin D⁵, passing through the same and an aperture in the end of the lever. When an oscillatory movement is given the cylinder, the lever D will be thrown to the position
 40 shown by dotted lines in Fig. 4 and the restoring-spring D⁶, which is connected to the valve-lever by means of a link D⁷, placed under tension. The reaction of this spring restores the valve to its closed position, while
 45 the movement of the valve-lever may be regulated in extent by means of the stop-plate D⁸, having a series of recesses D⁹ therein adapted to engage a fixed member D¹⁰, carried upon the discharge-casing D'. This plate is nor-
 50 mally held in contact with the fixed member by means of the spring D¹¹, secured to the casing, but may be raised and adjusted by placing this spring under tension. The plate D⁸ is provided with a contact-face D¹², ex-
 55 tending into the path of travel of the lever D, so as to limit the extent of movement of said lever dependent upon the adjusted position of the plate. If in operating the cylinder it be desired to prevent a discharge at any
 60 time, the valve and lever may be held in a closed position by means of the lock-hook D¹³, pivoted upon the casing D', so that it may be swung over and engaged with an aperture in the lever D to secure the latter against move-
 65 ment, as shown in Fig. 3. The valve-lever is protected by a suitable guard-plate D¹⁴, while

the dimensions and proportions of the several parts are suitably determined to effect the opening of the valve to an extent relative to the speed of oscillation of the cylinder. The
 70 metal passing through this valve is discharged into the chamber D¹⁵ and thence through an aperture D¹⁶, passing into the spout D¹⁷. This spout discharges into a channel or conduit E, suitably supported beneath the same and ex-
 75 tending to the opposite side of the machine, where a delivery-spout E' is provided. These conduits may be lined with amalgamating-plates, and if two cylinders be located side by side the receiving end of the conduit may
 80 be extended, as at E², to receive from both discharge-spouts. The material passing from the spout E' flows into any suitable form of settling-tank—for instance, as indicated at E³—from which the water may escape and the
 85 heavier material settle to the bottom. The spout E' is mounted so as to permit a lateral shifting to discharge into either settling-tank.

The waste material which is discharged from the cylinder through the pipe B⁷ is re-
 90 ceived by the tank F beneath the cylinder, which is provided with a series of discharge doors or valves F', opening onto a series of tables F², mounted in a frame F³, which is pivoted at its upper end and adapted to be
 95 adjusted in inclination by means of a lever F⁴, pivotally mounted on the frame and adapted at its lower end to bear against the base A, upon which the machine is mounted. It will be seen that the adjustment of this lever will
 100 raise or lower the free end of the frame carrying these tables, and thus determine the rapidity of the flow of the material over the same. The tables F² may be provided with any desired form of amalgamating or ore-col-
 105 lecting surface in order to test the waste from the cylinder and determine whether any valuable metal has escaped the amalgamating and concentrating processes therein. In order to facilitate the passage of the waste over
 110 the table, additional water may be introduced into the tank F by any desired means—for instance, from a reservoir F⁵ at one end of the tank. If it is not desired to use the ta-
 115 bles, the doors or valves F' may be closed and the waste material discharged from a suitable opening F⁷ at one end of the tank F and conveyed away by a chute F⁶. The primary purpose of the testing-tables F² is to determine
 120 the character of work done by the cylinders upon different characters of ores, and it will be evident that if a small amount of the waste be tested upon the table and found free from valuable metal the remainder may be per-
 125 mitted to escape through the discharge-chute. The needle-valve D has been shown as applied to opposite sides of each cylinder B; but the number and location of these valves may be varied relative to the capacity of the
 130 cylinder, while the extent to which the valve is opened depends upon the amount of valu-
 able metal collected at the bottom of the cyl-

inder, and is thus governed largely by the character and richness of the ore operated upon.

From the foregoing description it is believed that the operation of the invention will be clearly understood. The pulp from the stamps first falls upon the tray B³ and a large percentage of the free metal therein is amalgamated upon this surface. The remainder is forced over the edge of the tray by the centrifugal motion of the cylinder and passes to the bottom thereof, where this same motion causes the lighter material or waste to move toward the central discharge-pipe, while the heavier metallic particles cling to the wall of the cylinder and are freely discharged through the needle-valve. The adjustable central discharge-tube permits the collection of sufficient material in the bottom of the cylinder to permit the settlement of the heavier or more valuable metals to the lower portion, where they may be discharged. As hereinbefore stated, the waste from the cylinder may be conducted away or passed over the supplemental amalgamating-tables for testing or the recovery of other valuable material, if found to be contained in the waste.

The tank F beneath the cylinders B is provided with a water-channel H, extending around the edge thereof from the reservoir F⁵ to a discharge F⁶. The front portion of this tank is provided with an inclined bottom H', Fig. 7, which leads to the doors F', opening onto the tables F². Opposite the discharge for each of the cylinders an opening H³ permits the water from the channel H to flow upon the table, and this flow may be directed toward one or more discharge-doors by means of a pivoted switch-valve H⁴, the point of one end of which is adapted to lie against either side of the opening H³, as shown by dotted lines in Fig. 6, or centrally of said opening, as shown by full lines. It will be seen that if the valve be shifted to one side the entire body of water will be permitted to pass out of one door, carrying therewith the waste material discharged from the cylinder, while if the valve be centrally disposed the flow and amount of water is divided between the doors upon adjacent sides of the valve and cylinder. In this manner the desired amount of water may be used upon the table F² and either one or both of said tables used. If it be desired to discharge the waste through the chute F⁶, the doors F' may be closed, and the waste material will pass through the openings H³ into the water-channel and thence through the discharge-port F⁷ into the chute F⁶.

Attention is particularly called to the reciprocatory motion by which the centrifugal force produced in the motion of the cylinders is alternated, so that the heavier material within the cylinder shall not acquire the centrifugal motion, and thereby lie perfectly still against the rim of the drum, as would be the case if the motion were produced by a complete rotation. The partial rotation or oscil-

lation distributes or tumbles the material in such manner as to secure a thorough separation and lead the lighter particles toward the discharge-pipe at the center of the cylinder. An important feature of this pipe is the adjustable section at its upper end, by means of which the sedimentary capacity of the cylinder may be varied to retain any desired amount of material below the point of discharge as may be found necessary in operating upon different classes of ore.

It may also be stated that the invention is not confined to the use of amalgamating-plates or material upon the tables F², as the ore may be retained by any collecting means—for instance, a covering of canton-flannel or similar material—which retains the heavier particles of the waste passing through the tables.

It is obvious that changes may be made in the details of construction and configuration of the several parts without departing from the spirit of the invention as defined by the appended claims, as the form of apparatus now illustrated is but one of numerous constructions and arrangements of parts contemplated by this invention.

Having described my invention and set forth its merits, what I desire to show, and secure by Letters Patent, is—

1. In a concentrating apparatus, an oscillating cylinder having a discharge for waste material at its lower portion, an adjustable discharge-pipe extending upward from said discharge, and an ore-discharge valve adapted to be automatically controlled by centrifugal force in the movement of the cylinder; substantially as specified.

2. In a concentrating apparatus, an oscillating cylinder having a discharge for waste material at its lower portion, a discharge-pipe extending upward from said waste-discharge, a telescoping section within said pipe, a tray above said discharge separated from the walls of the cylinder, and a weighted valve controlled by centrifugal force to provide an automatic ore-discharge from said cylinder; substantially as specified.

3. In a concentrating apparatus, the combination with a cylinder, of means for producing a centrifugal movement within the same, a discharge-opening for waste material from said cylinder, and a discharge-valve at the periphery of said cylinder adapted to be automatically operated by centrifugal force in the movement thereof; substantially as specified.

4. In a concentrating apparatus, the combination with a cylinder, of means for producing a centrifugal movement within the same, a discharge-opening for waste material centrally disposed within said cylinder, and a pivoted discharge-valve at the periphery of said cylinder adapted to be automatically operated by centrifugal force in an oscillatory movement of the cylinder; substantially as specified.

5. In a concentrating apparatus, the combination with a cylinder, of means for producing a centrifugal movement within the same, a discharge-opening for waste material centrally disposed within said cylinder, a valve at the periphery of said cylinder having a pivoted weighted lever-arm, and a spring for restoring said arm to its initial position; substantially as specified.
- 10 6. In a concentrating apparatus, the combination with a cylinder, of means for producing a centrifugal movement within the same, a discharge-opening for waste material centrally disposed within said cylinder, a valve at the periphery of said cylinder having a pivoted weighted lever-arm, a spring for restoring said arm to its initial position, and an adjustable stop to limit the opening movement of said valve; substantially as specified.
- 15 7. In a concentrating apparatus, the combination with a cylinder, of means for producing a centrifugal movement within the same, a discharge-opening for waste material centrally disposed within said cylinder, a valve at the periphery of said cylinder having a pivoted weighted lever-arm, a spring for restoring said arm to its initial position, an adjustable stop to limit the opening movement of said valve, and a locking-hook adapted to engage and hold said lever; substantially as specified.
- 20 8. In a concentrating apparatus, the combination with a cylinder, of a means for oscillating the same, a valve-opening in the periphery of said cylinder, a pivoted lever extending from said valve, an adjustable weight upon said lever, a restoring-spring connected to said lever, and a stop-plate to limit the movement of said lever in one direction; substantially as specified.
- 25 9. In a concentrating apparatus, the combination with a cylinder, of a means for oscillating the same, a valve-opening in the periphery of said cylinder, a pivoted lever extending from said valve, an adjustable weight upon said lever, a restoring-spring connected to said lever, a stop-plate to limit the movement of said lever in one direction, and a toothed adjusting-plate carried by said stop-plate and adapted to engage a fixed projection; substantially as specified.
- 30 10. In a concentrating apparatus, the combination with a cylinder, of means for oscillating the same, a valved opening in the periphery of said cylinder, a pivoted lever extending from said valve, an adjustable weight upon said lever, a restoring-spring connected to said lever, a stop-plate to limit the movement of said lever in one direction, a toothed adjusting-plate carried by said stop-plate and adapted to engage a fixed projection, a spring bearing upon the upper surface of said adjusting-plate, and a locking-hook adapted to engage and hold said lever against operation; substantially as specified.
- 35 11. In a concentrating apparatus, the combination with a cylinder having a waste-discharge from its bottom, a tank beneath said cylinder, an inclined testing-table communicating with said tank, means to close the communicating aperture between the tank and table, and an independent discharge from said tank; substantially as specified.
- 40 12. In a concentrating apparatus, the combination with a cylinder having a waste-discharge from its bottom, a tank beneath said cylinder, an inclined testing-table communicating with said tank, means to close the communicating aperture between the tank and table, an independent discharge from said tank, and means for varying the inclination of said table; substantially as specified.
- 45 13. In a concentrating apparatus, the combination with a cylinder having a waste-discharge from its bottom, a waste-tank beneath said cylinder, an inclined testing-table communicating with said tank, means to close the communicating aperture between the tank and table, an independent discharge from said tank, means for varying the inclination of said table, an ore-discharge from said cylinder, a settling-tank, and a conduit for conveying the ore from the discharge to said tank; substantially as specified.
- 50 14. In a concentrating apparatus, the combination with a cylinder having a waste-discharge from its bottom, a tank beneath said cylinder, an inclined testing-table communicating with said tank, doors to close the communicating aperture between the tank and table, an independent waste-discharge from said tank, a pivoted lever for varying the inclination of said table, an ore-discharge from said cylinders, a settling-tank, a conduit for conveying the ore from the discharge to said settling-tank, and a delivery-spout at the discharge end of said conduit; substantially as specified.
- 55 15. In a concentrating apparatus, the combination of a fixed base, a cross-bar pivoted thereto, parallel bars mounted to travel in opposite directions to each other and pivoted to each of said parallel bars, a driven shaft having crank-pins at opposite ends, and independent slide-bars connecting said crank-pins by means of pivoted links with the parallel bars; substantially as specified.
- 60 16. In a concentrating apparatus, the combination with a movable cylinder, an amalgamating-tray supported above the bottom thereof and discharging over its edges, a discharge-pipe extending upward above the bottom of the cylinder and below said tray, an ore-discharge valve disposed at the periphery of the cylinder below the end of said discharge-pipe and operated by the movement of the cylinder, and means for producing centrifugal movement of the contents of the cylinder; substantially as specified.
- 65 17. In a concentrating apparatus, the combination with a cylinder, an amalgamating-tray supported above the bottom thereof, a discharge-pipe extending upward above the

bottom of the cylinder, an ore-discharge valve disposed at the periphery of the cylinder below the end of said discharge-pipe, means for producing centrifugal movement of the contents of the cylinder, a hopper supported at the top of the cylinder to feed material upon the center of said tray, and means controlled by the movement of the cylinder for operating the ore-discharge valve; substantially as specified.

18. In a concentrating apparatus, the combination with a cylinder having a discharge-pipe, a tank beneath said discharge-pipe having a water-channel, a testing-table, a series of doors for discharging the contents of said tank upon said table, a valve pivoted between adjacent doors to direct the flow of water thereto from said channel, and a discharge-chute through which the material from the tank may pass; substantially as specified.

19. In a concentrating apparatus, the combination with a cylinder, a discharge therefrom, a tank beneath said discharge-pipe having a water-channel and inclined bottom, means for discharging the contents of said tank upon a testing-table, a discharge-chute through which the material from the tank may pass, and a directing-valve for controlling the direction of the flow of water over the inclined bottom of the tank; substantially as specified.

20. In a concentrating apparatus, the combination with a cylinder, a discharge therefrom, a tank beneath said discharge, an amalgamating-table, means for discharging the contents of said tank upon said table, a discharge-chute through which the material from the tank may pass, an ore-conduit connected with said cylinder and adapted to discharge into a settling-tank, a reservoir to supply water to a channel within the tank beneath the cylinder, and a lever pivoted to said table for varying the inclination thereof; substantially as specified.

21. In a concentrating apparatus, the combination with a base of parallel bars supported thereon for reciprocation, a cross-bar pivoted to said base and at opposite ends to said parallel bars, a driving-shaft having cranks at both ends connected to said parallel bars to move the same in alternation, and a cylinder-support pivotally mounted at opposite sides upon each of said parallel bars and having a central aperture for a discharge-pipe; substantially as specified.

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

ARCHIBLE M. HORTON.

Witnesses:

J. H. ROSE,
ROBT. BROWN.