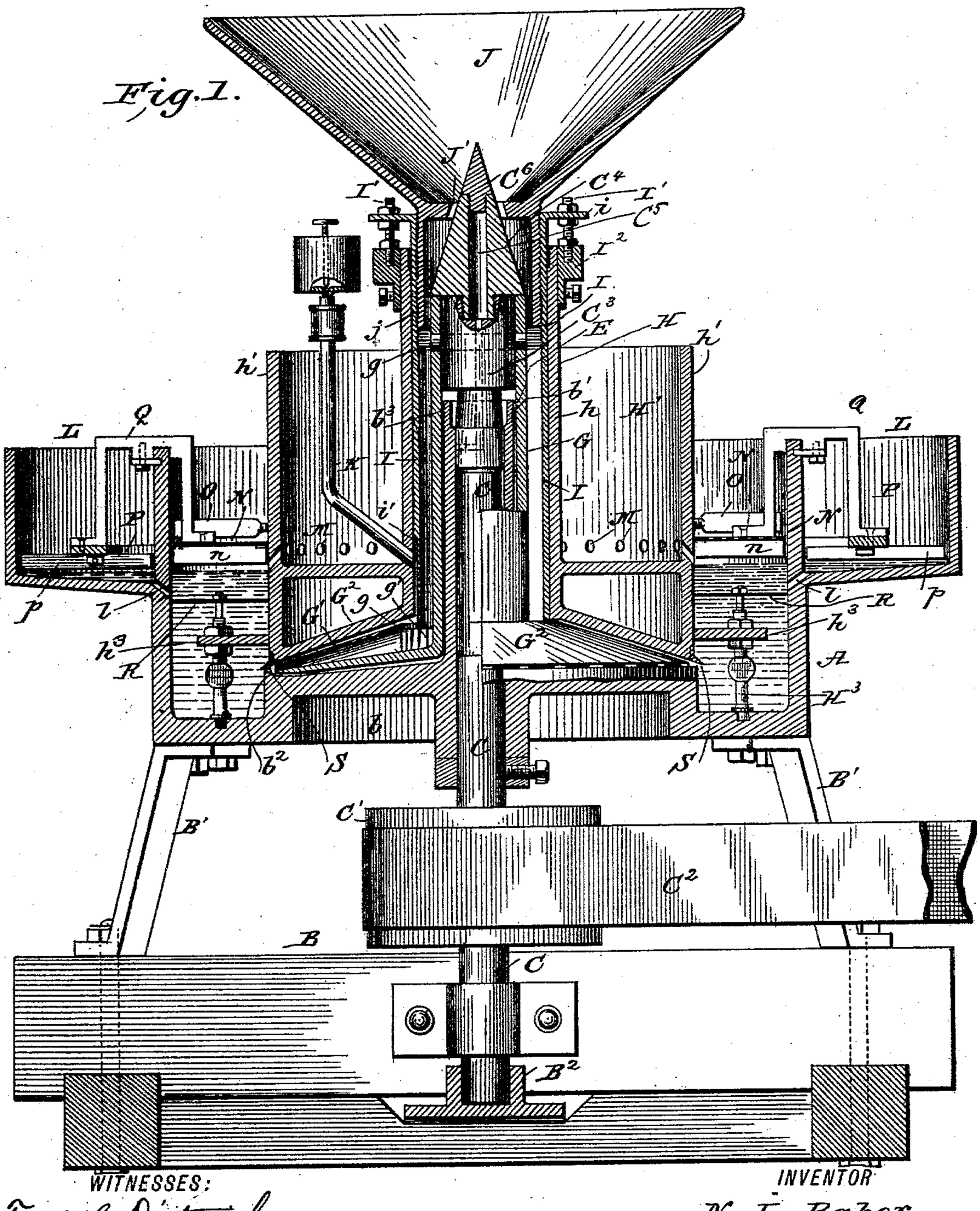
(No Model.) 4 Sheets—Sheet 1.

N. L. RABER.

AMALGAMATOR.

No. 414,581. Patented Nov. 5, 1889.

Fig. 1.



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(No Model.)

4 Sheets—Sheet 2.

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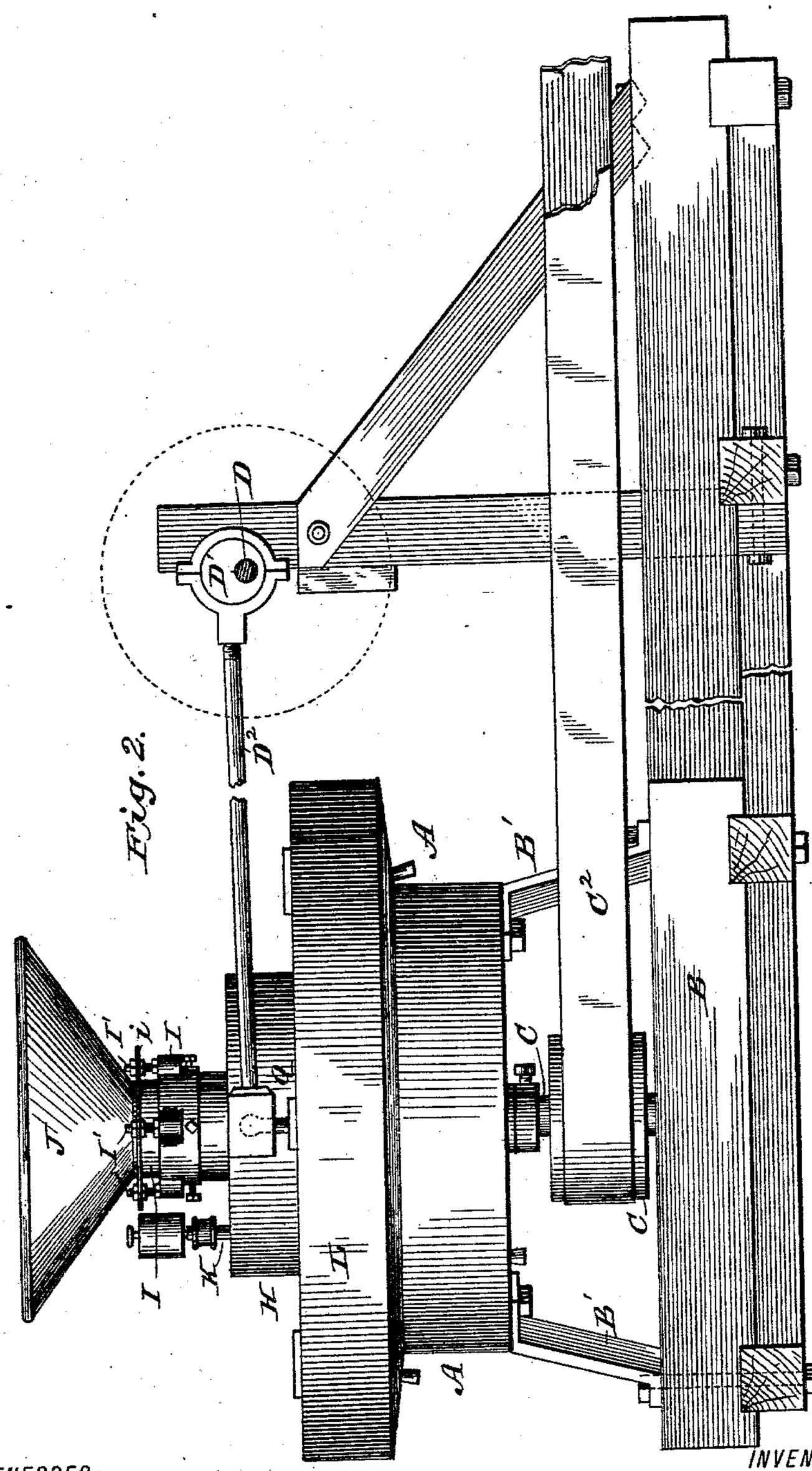
AMALGAMATOR.

No. 414,581.

Patented Nov. 5, 1889.



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4 Sheets—Sheet 3.

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AMALGAMATOR.

No. 414,581. Patented Nov. 5, 1889.

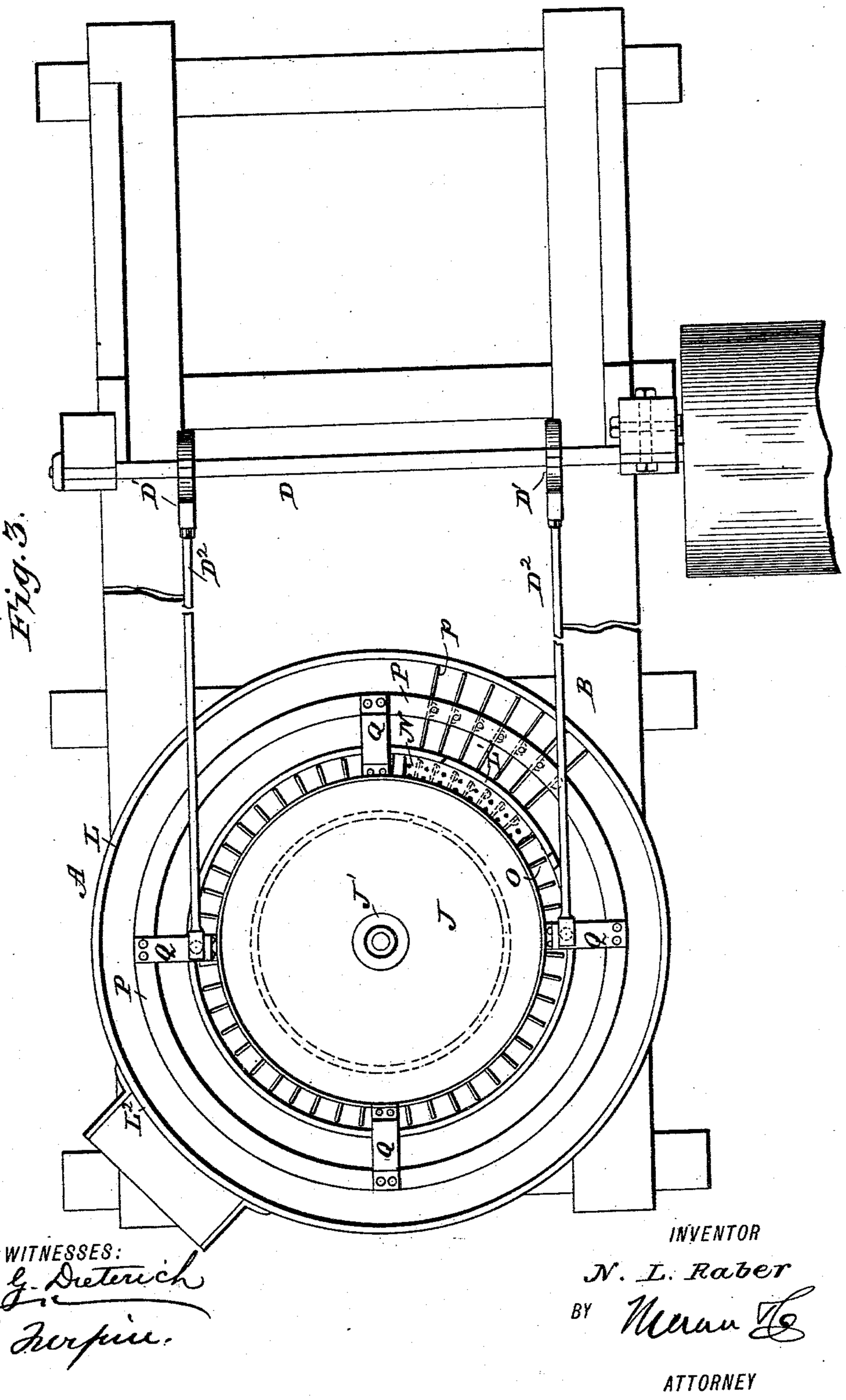

Fig. 3.

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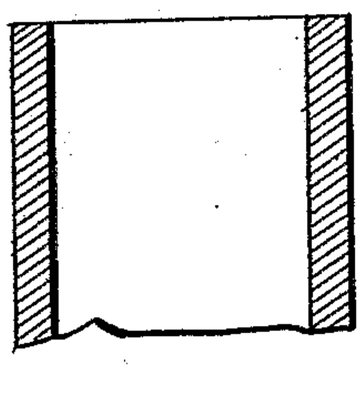


Fig. 4

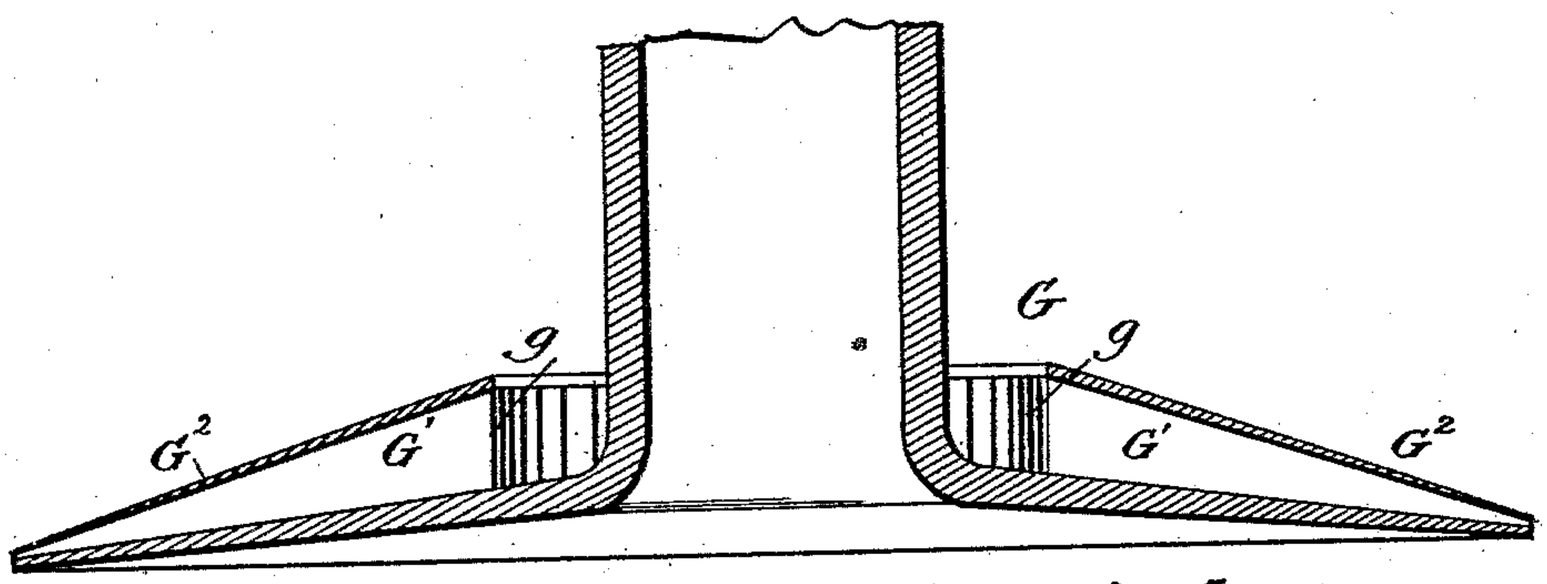
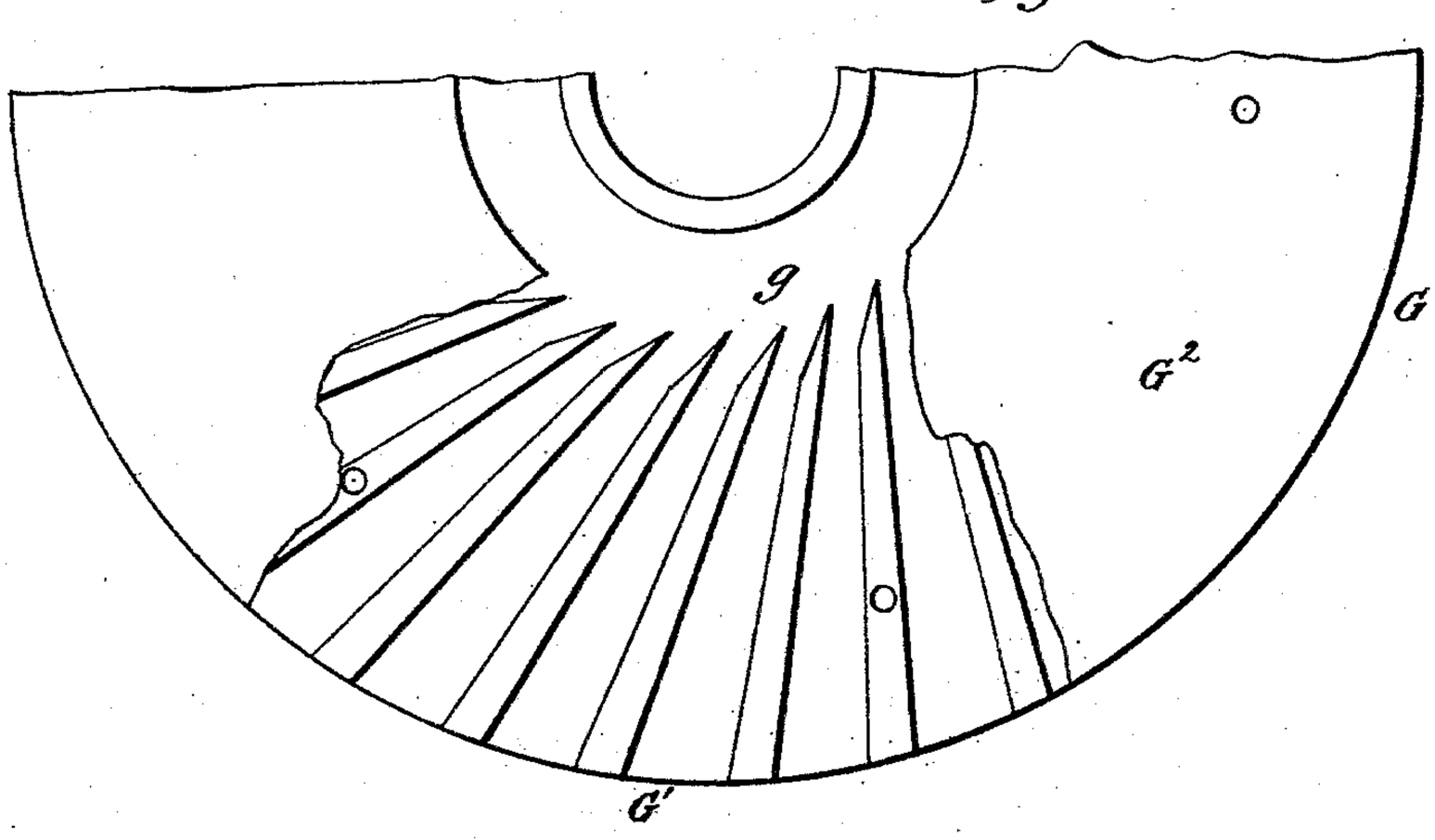


Fig. 5.



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UNITED STATES PATENT OFFICE.

NATHAN L. RABER, OF CORVALLIS, OREGON.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 414,581, dated November 5, 1889.

Application filed June 8, 1889. Serial No. 313,623. (No model.)

To all whom it may concern:

Be it known that I, NATHAN L. RABER, of Corvallis, in the county of Benton and State of Oregon, have invented a new and useful Improvement in Amalgamators, of which the following is a specification.

My invention is an improvement in amalgamators for use in saving gold and other precious minerals, and particularly in that class of such machines employing mercury.

The invention consists in certain novel constructions and combinations of parts, as will be hereinafter described and claimed.

In the drawings, Figure 1 is a vertical section of my improved amalgamator, one half of the feed-wheel being shown in side view and the other half in section. Fig. 2 is a side elevation of same, parts of the framing being broken away. Fig. 3 is a top plan view of the machine, a sufficient number of the outer agitator-plates being shown to illustrate their relations, &c. Fig. 4 is a sectional view of the disintegrating feed-wheel; and Fig. 5 is a plan view of a portion of such wheel, partly broken away.

In the construction shown the drum A is mounted on legs B′, which support it above a suitable frame B, in which is provided the step-box B^2 for the vertical shaft C, such shaft C being provided with the band-pulley C′, on which pulley runs the belt C^2, connecting it with a suitable drive-shaft.

I wish it distinctly understood that I do not confine myself to the mechanism shown for driving the said shaft C, as such shaft may be driven in various other ways, or, if desired, in a small machine, by hand, without involving a departure from some of the broad features of my invention. The framing B also supports bearings for a counter-shaft D, having eccentrics D′ D′, connected with rods D^2, such eccentrics being projected in diametrically-opposite directions, so they will operate their rods D^2 reciprocally, for the purposes hereinafter explained.

Centrally within the drum I provide a pedestal E, such pedestal being preferably cast integral with the body of the drum, as shown. This pedestal is formed with a lower or base portion *b* and an upwardly-extended tubular portion *b*′. On its upper side the portion *b* is inclined downward and outward to a point near its outer edge, whence it inclines up slightly at b^2. The upwardly-extended portion *b*′ is bored axially for the shaft C, the said bore being of greater diameter at its upper end, as shown at b^3, the purpose of such enlargement being to prevent the oil supplied, as will be described, to lubricate the shaft C from passing over the edge of the pedestal and coming in contact with the mercury. The shaft C turns in the tubular portion of the pedestal, and is enlarged at its upper end at C^3 to a diameter slightly larger than that of the upper end of part *b*′, and fitting snugly in the upper end of the disintegrating feed-wheel G, which fits over the upper end of the shaft, and is secured thereto by pin *g*, so the shaft C will operate to turn the feed-wheel, the enlarged portion C^3 being made sufficiently long to insure the rigidity of the feed-wheel. Immediately under the enlarged portion C^3 the shaft C is beveled for the same reason that the upper end of the bore of the pedestal is beveled or enlarged, as before described.

In the upper end of the portion C^3 of the shaft I form a socket, into which the conical regulating-head C^4 is threaded, an oil hole or channel leading downward from such socket, and the head being formed with an opening C^5, forming an oil-reservoir, and with a removable cap C^6, so oil can be supplied to such reservoir.

The feed-wheel has the tubular portion or hub encircling the pedestal and a base portion, which rests on the body part of the pedestal, extends out to or nearly to the upwardly-inclined part thereof, and is inclined downward toward its upper edge on its upper side. While this feed-wheel runs over and conforms closely to the pedestal, it will be seen that clearance is provided between such wheel and pedestal and that the entire weight of the wheel is borne by the shaft which turns it, so that there will be no undue friction between the feed-wheel and pedestal. This feed-wheel is formed on its upper side with upwardly-projected ribs or flutes G′, which flutes are square in cross-section and stand vertically to the disk portion of the wheel, being of a suitable height at their inner ends *g*, or ends

next the center, and decreasing in height toward their outer ends. At their said inner ends the ribs or flutes are brought to a fine or cutting edge, and the general direction of such flutes approaches a tangent to the walls of the cylindrical or hub portion of the wheel. It will be seen that the flutes do not extend at their inner ends to the hub portion of the wheel, but terminate at a point short of such hub portion, forming a recess or receptacle g' in front of the inner ends of the flutes, as shown. Over the said flutes I provide a ring-like cover-plate G^2, which cover-plate in the construction shown is made separate from the wheel proper and is suitably secured on the same by bolts or rivets. It is obvious that such construction may, on account of convenience in casting the parts, be preferred; but I do not desire to be limited to such construction, as obviously the wheel-body and cover complete might be formed in a single piece. It is also obvious that the size, direction, and proportions of those closed passage-ways may be varied without departing from the broad principles of this feature of my invention.

The cover-tube H consists of an inner cylindrical wall h and an outer cylindrical wall h', which form between them the annular water-reservoir H', the outer wall h' also serving as the inner wall of the mercury-space, the inner wall h encircling the feed-wheel and separated therefrom, forming an annular space down through which the sand, pulp, &c., are fed from the hopper down to the disintegrating feed-wheel. By preference the cover-tube and water-reservoir are formed integral, as shown, and are supported with a capacity of vertical adjustment by means of studs H^3, mounted in the base of the machine and extending through lugs h^3, projected laterally and secured by nuts above and below. The cover-tube has a base-like portion which fits snugly over the body of the feed-wheel. Within the cover-tube I support a lining-tube I, which projects at its lower end into the recess g' of the feed-wheel, serving as a means by which to prevent the sand, pulp, &c., from getting above the inner ends of the flutes or ribs and insuring the direction of such material through the covered spaces or ways of the feed-wheel. This lining-tube I is adjustably supported by providing at its upper end lateral lugs i, perforated for the reception of stud-bolts I', on which the lugs are secured by nuts above and below. Such studs I' are mounted on a sleeve or ring I^2, which encircles the cover-tube and is secured by screws, so the ring can be set up or down, as desired, thus providing for a double vertical adjustment with respect to the lining-tube. At its upper end tube I is threaded internally to receive the threaded tube j at the lower end of feed-hopper J, which feed-hopper is thus secured adjustably in the lining-tube and may be conveniently placed and removed. At its lower end the hopper has a discharge-opening J', the walls of which are beveled or inclined to correspond with the conical head C^4, supported to move with the feed-wheel, so that the feed of material is controlled at the top of the passage in the cover-tube, and so that no clogging will take place in such tube to impede the motion of the machine or produce any undue friction.

At the lower end of the lining-tube, and between the same and the cover-tube, I provide a recess at i', forming a way for the chemical compound for quickening the mercury, hereinafter described. This chemical is fed down through a pipe K, passed down through the water-reservoir and extending up above the said reservoir, and is provided at its upper end with a holder or cup for the compound, which cup may be an ordinary oil-cup, as will be understood from the drawings. By this construction the chemical may be fed in a fine stream or in any desired quantity down into the disintegrating feed-wheel for the purposes more fully described hereinafter.

Outside the drum A, at its upper end, I provide the annular trough L, having an inlet L' where the drum discharges at its top therein and provided with an outlet L^2, such inlet L' and outlet L^2 being diametrically opposite, as shown, so that the material discharged from the drum to the trough will have to travel the semi-circumference of the latter before it is discharged. At its lower end the trough communicates with the mercury-space of the drum through openings l formed through the well of the drum below the mercury surface or line in the drum, and the bottom of the trough inclines downward from its outer edge, so that the tendency of heavy minerals deposited in the trough will be to pass by gravity down its inclined bottom and through the openings l into the main mercury-space of the drum.

Outlet-openings at M are provided from the water-reservoir into the mercury-space, preferably at a point just above the mercury, so that water can be flowed onto the mercury and mingle with the sand, &c., passed up through the mercury.

In the mercury-space I provide a perforated ring N, supporting on its under side blades or agitators n, which operate in the water, &c., just above the mercury-line—that is to say, sufficiently above the mercury to prevent any flowing or other injury thereto from their movement. Immediately above the ring N, I provide fixed blades O, which are screwed at their inner ends into the outer wall of the water-reservoir. In the trough I also provide a ring P, supporting on its under side blades or agitators p, which operate close above the mercury in the said troughs, such rings N and P being connected by yoke-like hangers Q, sliding on the drum, so that the movement of both sets of blades n and p can be accomplished by properly connecting the rods D^2

with the yokes Q. It will be understood that the blades *n*, *o*, and *p* are arranged in sets a proper distance apart and extend entirely around the annular spaces in which they are supported. The purpose of these blades is to produce an agitation of the sand, pulp, &c., close to the surface of the mercury and as the particles of material escape therefrom, the purpose being to free at such time any metal which may remain in the material and to effect a deposit of same in the mercury. I wish it understood that these blades are not concentrators in any sense, but simply agitators for the purpose of keeping the sand in a finely-divided condition and with sufficient water to keep it from becoming massed or baked.

Within the mercury-space, and below the surface of the mercury, I support a perforated plate R, the purpose of which is to break up any currents or commotions imparted to the mercury by the material forced thereinto by the revolving feed-wheel. Such plate R is preferably supported on the same studs which support the water-reservoir.

A rubber check-valve S is supported on the combined reservoir and cover-tube, and serves as a check or guard to the space out through which the disintegrated material is forced by the feed-wheel. This valve is formed to rest when clear of pressure from one-sixteenth to one-eighth of an inch above the pedestal, as the pressure of mercury on it will be sufficient to close it down tightly against such pedestal.

By means of the tube or pipe extending down through the water-reservoir I feed directly to the feed-wheel the usual chemicals for quickening the mercury. By the motion of the feed-wheel an instantaneous and perfect distribution of said chemicals throughout the mercury-space is effected. The pipe for feeding the said chemicals, arranged as described, enables me also to keep the flutes or ribs of the feed-wheel in a state of perpetual amalgamation, for by building the feed-wheel of iron, steel, or any other metal or combination of metals that may be kept amalgamated by sodium amalgam or mercury made active by any other chemical or combination of chemicals for the purpose of amalgamating the wheel and enlivening the mercury in the mercury-space.

By feeding a small but constant stream of mercury which falls on the surface of the wheel near its center, whence it is thrown violently against and along the flutes and under and against the steel rim or cover, I secure a constant regeneration of the amalgamated surface of said wheel. In this way I secure an amalgamation of a certain portion of the particles of gold, silver, &c., in their passage along the amalgamated flutes or ribs, such amalgam being ultimately thrown out into the mercury-space, together with the sand, pulp, &c.

In operation the sand, pulp, &c., are fed into the hopper in such quantities as to keep the hopper constantly full. In this way it will be seen that by means of the regulator-valve the pulp, &c., alone is fed into the machine, the air being excluded, such exclusion of air being necessary to prevent the oxidation of the mercury. The regulating devices control the admission of the material to the tube, and after passing such devices it passes downward to the feed-wheel and is thoroughly disintegrated on the sharp inner edges of the ribs or flutes. Then in finely-divided portions it is thrown outward into the mercury, up through which it passes, being freed of most, if not all, of its metal in its passage upward through the mercury, at the top of which the sand, pulp, &c., mingle with the water and are agitated to produce a fine division or separation of its particles and prevent any massing or lumping, thus freeing the metals, so they will be subject to the mercury in the mercury-space and in the discharge-trough.

On comparison of the present machine as shown and described with my former patent, No. 400,114, granted March 26, 1889, they will be found to possess many features in common; but it will be seen that the present machine possesses many features of novelty.

Among the novel features in the present machine is the construction of the feed-wheel with the covered passage-ways having the ribs or flutes formed at their inner ends with cutting-edges, the construction by which the feed is regulated at the upper end of the cover-tube, the combination and arrangement of the mercury-space and the discharge-trough surrounding the same, the uniting of the cover-tube and water-reservoir, the construction, combination, and arrangement of the agitating-plates, and the construction for feeding the chemical to the disintegrating feed-wheel. These features of novelty, as well as others, will be more particularly set out in the appended claims.

Having thus described my invention, what I claim as new is—

1. In an amalgamator, a disintegrating feed-wheel provided with upwardly-projected ribs or flutes which decrease in height toward their outer ends, and having a cover-plate over said ribs or flutes, forming a passage-way between the same, such cover-plate being extended to the inner ends of said ribs or flutes, substantially as set forth.

2. In an amalgamator, a disintegrating feed-wheel provided with upwardly-projected ribs or flutes, having the inner ends of such ribs or flutes formed with inwardly-facing cutting-edges, and provided with a ring-like cover-plate secured to and revolving with the said wheel, substantially as set forth.

3. In an amalgamator, the disintegrating feed-wheel herein-described, formed with the upwardly-projected ribs or flutes, whose inner edges are brought to a cutting-edge and which decrease in height from their inner to

their outer ends, and provided with the cover-plate fitted over the said flutes or ribs, substantially as and for the purposes set forth.

4. An amalgamator, substantially as described, having a drum or casing providing a mercury-space, a tube or way by which the mercury-quickening chemical can be supplied to the feeder, and the feeder having a revolving portion arranged between the discharge of said tube or way and the mercury-space, whereby the said feeder may effect a distribution of the chemical throughout the mercury-space, substantially as set forth.

5. In an amalgamator, substantially as described, the combination of the cover-tube, the feed-wheel having ribs or flutes and provided with a recess, as g', and the lining-tube fitted in the cover-tube and extending at its lower end into the recess g' and in front of the inner ends of the ribs or flutes, substantially as set forth.

6. In an amalgamator, the combination of the cover-tube, the hopper, the operating-shaft and the feed-wheel operating in such cover-tube, and the tapered regulating-head supported to revolve with the shaft and wheel and formed to coincide with the discharge-opening in the hopper, whereby the feed may be regulated at the top of the cover-tube, substantially as set forth.

7. In an amalgamator, the combination of the hopper having a discharge-opening, the pedestal, the shaft fitted in and extended above said pedestal, the feed-wheel having a tubular portion encircling the pedestal and secured at its upper end to the shaft above the pedestal, and the conical regulating-head secured to the upper end of the shaft above the pedestal and feed-wheel and below and coinciding with the discharge-opening of the hopper, substantially as set forth.

8. In an amalgamator, the combination of the feed-wheel having ribs or flutes, the cover-tube fitted over said feed-wheel, the drum or casing providing a mercury-space, and a tube or pipe by which the mercury-quickening chemical may be fed to the feed-wheel at the inner ends of its ribs or flutes, substantially as set forth.

9. In an amalgamator, the combination of the cover-tube, the feed-wheel, the lining-tube I, a recess at i' being formed bewteen said cover-tube and lining-tube at the lower end of the latter, and the pipe K, opening at its inner lower end into such recess, substantially as set forth.

10. In an amalgamator, the combination of the feed-wheel, the cover-tube, the ring I, fitted thereover, adjustable vertically, and provided with studs I′, the lining-tube fitted in the cover-tube, threaded internally at its upper end, and provided at such end with lugs fitting on the studs I′, and secured by nuts thereon, and the hoppper having a tubular portion screwed in the upper end of the lining-tube, substantially as set forth.

11. In an amalgamator, the combination, with the drum or casing and the feed-wheel, of the cover-tube and water-reservoir connected, substantially as described, and supported in the drum or casing over the feed-wheel, as and for the purposes set forth.

12. In an amalgamator, substantially as described, the combination of the drum or casing provided with the mercury-space, the feeder whereby the sand, pulp, &c., are fed into such mercury-space, and the trough communicating at its lower end with the mercury-space in the drum, substantially above the bottom of such space, and in practice about in line with the surface of the mercury, and arranged to receive the sand, pulp, &c., from the upper end of the drum, substantially as set forth.

13. In an amalgamator, the combination of the drum or casing having a mercury-space, the feeder, and the trough encircling the upper end of such drum, such trough having an inlet from the said drum arranged at a point above the bottom of the mercury-space and a discharge, substantially as set forth.

14. In an amalgamator, the combination of the drum having a mercury-space, the feeder, the water-reservoir fitted in said drum or casing, and the agitating-plates movably supported in the drum or casing at a point above the mercury, substantially as set forth.

15. In an amalgamator, the combination of the drum or casing having an annular mercury-space, the perforated plate N, fitted in said space above the surface of the mercury, and the agitator-plates n, secured to and depending from the said perforated plate, substantially as set forth.

16. In an amalgamator, the combination of the drum or casing having a mercury-space, the plates O, fixed within said drum, and the plates n, movably supported in said drum below the fixed plates O and above the surface of the mercury, substantially as set forth.

17. In an amalgamator, the combination of the drum or casing, the trough L, encircling the said drum and having an opening or openings through which the mercury may circulate from the drum or casing, and agitator-plates p, movably supported in said trough at a point above the mercury therein, substantially as set forth.

18. In an amalgamator, substantially as described, the combination of the drum, the trough L, encircling such drum, the plate arranged in the drum and supporting the agitators n, the plate P, arranged in the trough and supporting the agitators p, and the yoke-like hangers connected with and supporting both such agitator-supporting plates, such hangers being movably supported, substantially as set forth.

19. In an amalgamator, the combination of the drum or casing and the trough encircling the same, such trough having its bottom formed on a descending incline toward the drum, and openings being formed leading from such trough to the drum or casing, such

openings being arranged at a point above the bottom of the casing, substantially as set forth.

20. In an amalgamator, a disintegrating feed-wheel formed of a base or body portion and a tubular upwardly-extending portion provided on the upper side of the body portion with ribs or flutes, the inner edges of such flutes being brought to a cutting-edge and having the said inner ends arranged to terminate short of the tubular portion, whereby to provide a recess between said ends and such portion, substantially as set forth.

21. In an amalgamator, the combination of the drive-shaft, the feed-wheel secured to such shaft, an oil-opening being provided to open out of such shaft, and the pedestal having an opening for the shaft, and having such opening enlarged at b^3, whereby to prevent the oil from passing over the pedestal, substantially as set forth.

The above specification of my invention signed by me in the presence of two subscribing witnesses.

NATHAN L. RABER.

Witnesses:
P. B. TURPIN,
SOLON C. KEMON.