(No Model.)

S. W. VALE.

AMALGAMATING MACHINE.

No. 507,465. Patented Oct. 24, 1893.

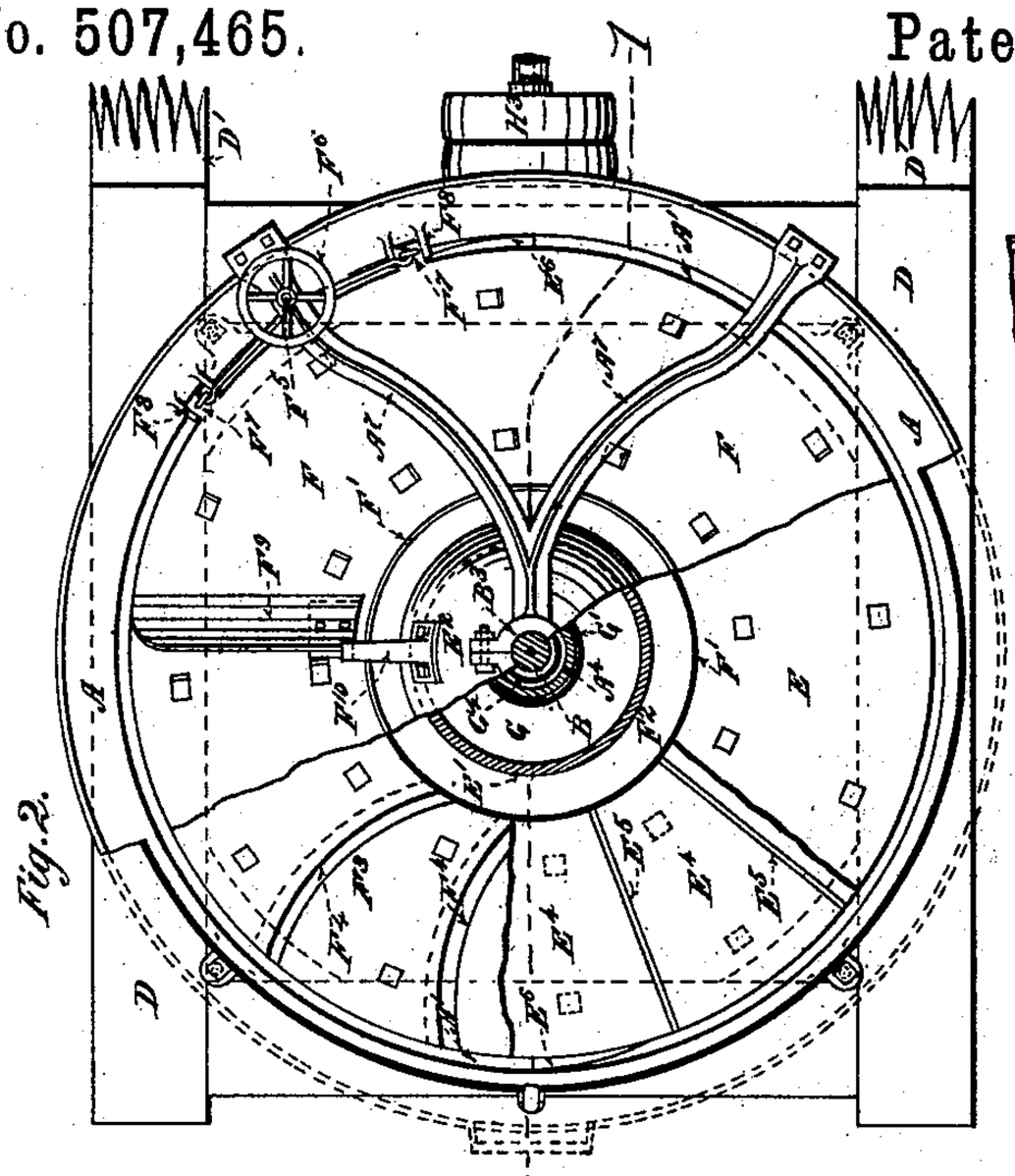

Fig. 2.

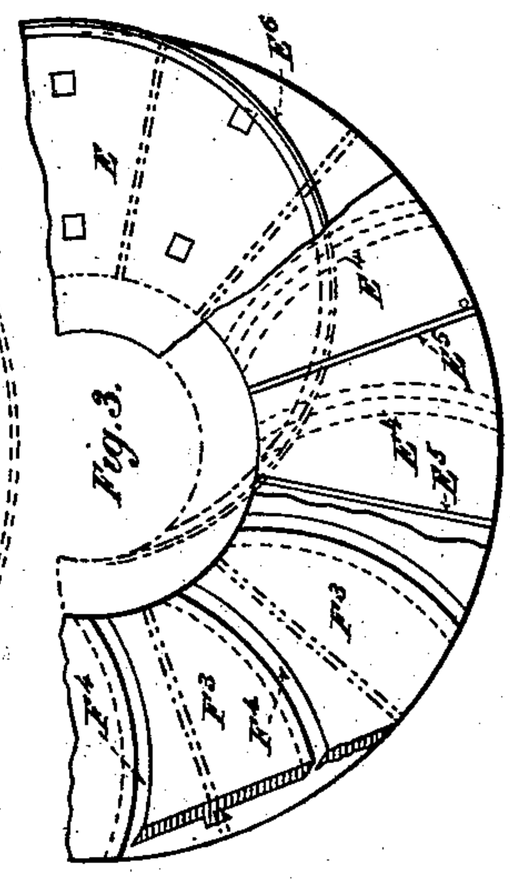

Fig. 3.

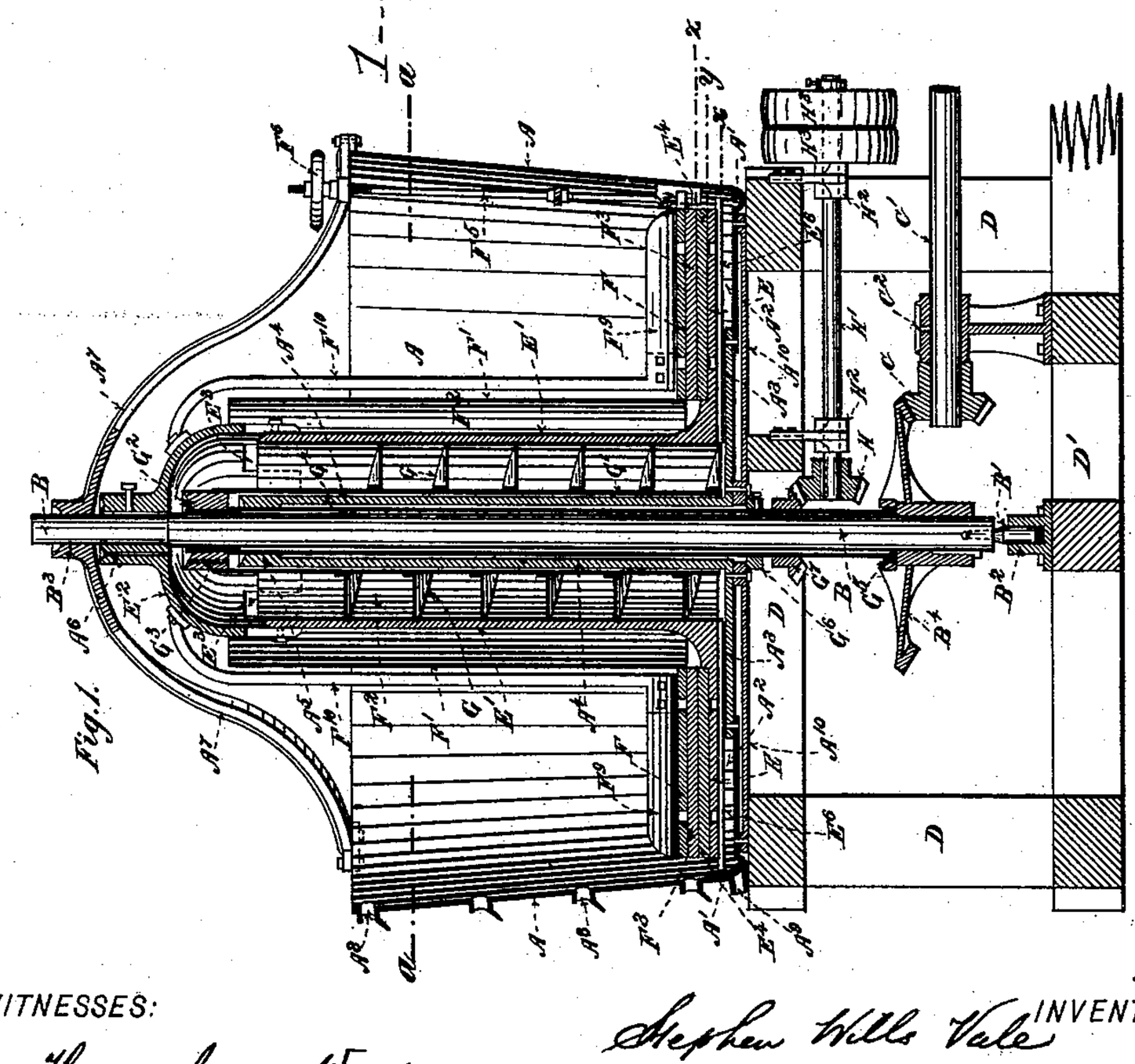

Fig. 1.

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AMALGAMATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 507,465, dated October 24, 1893.

Application filed December 29, 1892. Serial No. 456,726. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN WILLS VALE, mining engineer, a subject of the Queen of Great Britain, residing at Forest Lodge, near Sydney, in the British Colony of New South Wales, have invented new and useful Improvements in Amalgamating-Machines, of which the following is a specification.

This invention relates to certain improvements in amalgamating machines which have rotary mullers and stationary pans and it has been specially devised in order to produce a comparatively cheaply constructed and economically operated amalgamating pan which will effectively treat all classes of discrete metalliferous material for the amalgamation of the precious metals therein.

In order that this invention may be clearly understood reference will now be made to the drawings herewith in which—

Figure 1 is a central vertical section of an amalgamating machine constructed according to these present improvements the section being taken on line 1—1 of Fig. 2 and Fig. 2 is a plan partly in sectional plan of the same. Fig. 3 is a partial plan in reverse on the planes *x*, *y*, *z* in Fig. 1.

The stationary pan has a circular periphery A, an outer mercury well A′ deeper than the annular mercury space A^2 formed by stop or step to surface or bottom A^3 (preferably an amalgamating surface) from which rises the sleeve or trunk A^4 around the central vertical spindle B and a sleeve or hollow spindle thereon hereinafter described and having a bearing A^5 on said sleeve or spindle. This central spindle B is supported at the bottom on a center pin B′ in step bearing B^2 and at the top has a bearing B^3 in a crosshead or frame A^7 reaching from the upper peripheral edges A of the pan. At its lower end it has affixed to it a bevel toothed wheel B^4 in gear with a bevel toothed pinion C of a countershaft C′. The pan is set upon and affixed to a suitable foundation preferably in the form of a frame D on a base frame or sole D′ which also carries the bearing C^2 and may be the outer bearing of the shaft C. The rotary muller has an annular plate or disk E and a central through trunk E′ to the top of which connecting it to the spindle B is a cap or hood E^2 having orifices or openings E^3. The disk E carries on its upper face sector shaped hard metal shoes E^4 forming recesses at their junctions for radial wooden battens or slats E^5 and it carries on its under face curved agitators or scrapers E^6. The stationary grinder has an annular disk F and a central trunk or cylinder F′ forming the annular space or passage F^2. This grinder also has hard metal shoes F^3 but these are on its bottom face and instead of having radial sides they are curved and do not quite join so that grooves or spaces F^4 are left in the grinding surfaces curving from the inner to the outer periphery thereof. This grinder is supported by hangers or rods F^5 from cross-head or frame A^7 and these rods have screwed ends so that by turning hand wheels F^6 the weight of the grinder may be lifted from off the muller so as to obtain an easy start for the machine. This grinder is held to the stationary pan by means of hooks F^7 in eyes F^8 said hooks being connected to the rods F^5. On the top of the grinder are scrapers F^9 connected by arms F^{10} to the hood or cap E^2 of the muller trunk E′. In the trunk E′ is a conveyer formed of a spiral blade G attached to pipe or sleeve G′ which is joined by means of collar and bearing G^2 to another sleeve or hollow spindle G^4 which passes inside of the sleeve or trunk A^4 to a footstep bearing G^5 on the back of toothed wheel B^4 and carries upon itself a collar G^6 by which it is prevented from lifting and a bevel toothed wheel G^7 in gear with bevel toothed wheel H on counter-shaft H′ in bearings H^2 on frame D and carrying fast and loose pulleys H^3. In order that the bearings G^2 and A^5 may be easily lubricated they have a race or well on their upper edges and leading from thence the ports A^6 and G^3 as shown.

The counter-shafts C′ and H′ are revolved by any well known or appropriate mechanism say by means of endless belts from a motive power machine over fast and loose pulleys and the material to be amalgamated is treated preferably in charges although it might be treated in continuous supply and discharge being supplied with water to the

pan as a fine pulp up to say the level marked *a a*. The bottom of the pan is supplied with mercury to say just above the level of the well A^2 so as to have an unbroken surface of mercury to the stop or step of inner surface A^3. Now in operation there is a continual supply of the material fed through the passage F^2 to between the triturating surfaces of the shoes F^3 of the stationary grinder F and the shoes E^4 of the revolving muller E where it is finely ground and thence finds its way by centrifugal action and gravity to the bottom of the pan where it comes in contact with the mercury in wells A′ and A^2 and while passing over said mercury and the surface A^3 is agitated and rolled into the mercury by agitators or scrapers E^6. All this time the spiral G elevates the pulp by drawing it over the mercury (the step or stop formed by surface A^3 preventing said mercury moving toward the center) and discharges it through orifices E^3 into space or passage F^2 whence it finds its way between the triturating surfaces E^4 and F^3. At the same time the scrapers F^9 agitate the pulp above the grinder F and insure that the centrifugal action will cause the material to seek the bottom of the pan. There is by this means a constant and positive flow of material or pulp from the amalgamating material or mercury to the triturating surfaces and back to the amalgamating surface or mercury and while this latter retains the heavier and valuable particles the others are being almost continually under the grinding operation while no grinding at all of the mercury takes place. When the charge is sufficiently treated the pulpy tailings are run out of the pan to waste or otherwise through openings A^8 in its side and when the amalgam is sufficiently rich it is drawn off through plug hole A^9. A false bottom A^{10} is attached to the pan bottom so as to form a space to which steam might be introduced for the purpose of heating the pulp.

In addition to the mercury wells there might be amalgamating surface at the bottom of the pan and further amalgamating surface if it be desired may be used by utilizing the outer surface of the trunk G′ and E′ and the inner and outer surfaces of the trunk F′ and the inner surface of the pan A or any one of such surfaces.

To preserve the mercury active in its amalgamating influence it may be electrolyzed in any well known manner. In the machine hereinbefore described a porous vessel containing an electrolyte such as sulphate of soda would be placed in the pan with the anode immersed therein while the mercury itself would act as the cathode. On the decomposition of the electrolyte hydrogen being liberated on the surface of the mercury would preserve it as desired.

Having now particularly described and explained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an amalgamating machine of the class set forth the combination with a pan having mercury wells and amalgamating surfaces and means for triturating the material under treatment of a rotary conveyer adapted to cause a constant and positive flow or movement of the material from said amalgamating surfaces and mercury to the triturating surfaces and back to the amalgamating surface and so on substantially as herein described.

2. In amalgamating machines of the class set forth the combination with a pan having mercury wells in its bottom of a muller having a central trunk and a grinder also having a central trunk and means for raising the material from the pan bottom through said trunk and discharging it so as to lead to and between said muller and grinder substantially as herein described.

3. In amalgamating machines of the class set forth the combination with a pan A having bottom with wells A′ and A^2 and surface A^3 and a stationary grinder therein of a revolving muller E having a central trunk E′ with orifices E^3 and connection E^2 to a vertical spindle B and means adapted to elevate or move the material under treatment through said trunk E′ and said orifices E^3 substantially as herein described.

4. In amalgamating machines of the class set forth the combination with a pan A having bottom with amalgamating wells and surface and with a revolving muller E having a central trunk of a stationary grinder F having a trunk or cylindrical guard F′ to form annular space or passage F^2 and a conveyer substantially as herein described.

5. In amalgamating machines of the class set forth the combination with a pan A a revolving muller E with trunk E′ and a stationary grinder F with a trunk or guard such as F′ of a vertical spindle B with actuating mechanism and hollow spindle or sleeve G^4 (also with actuating mechanism) bearing and collar G^2, sleeve G′ a conveyer adapted to cause an upward current in the trunk E′ substantially as herein described.

6. In amalgamating machines of the class set forth the combination with the revolving muller and its central trunk and hood and with the stationary grinder of scrapers F^9 above the stationary grinder and the supports and drivers F^{10} extending from said scrapers to the revolving hood of the muller trunk substantially as herein described.

7. In amalgamating machines of the class set forth the combination with the pan having mercury wells A′ and A^2 and surface A^3 the grinder in said pan and with the revolving muller and its central trunk of agitators or scrapers E^6 on said muller bottom substantially as herein described.

8. In combination the pan, the grinder and revolving muller therein, the said muller having a central trunk, the spindle B for revolving the muller with its trunk, the gear wheel

B[4] on the spindle, the conveyer within the muller trunk, and the hollow shaft G[4] surrounding the spindle and connected with the conveyer, said hollow shaft having a bearing supporting the same, substantially as described.

9. In amalgamating machines of the class set forth the combination with the pan the revolving muller and the stationary grinder of a revolving spiral or helical blade G in a trunk E′ and having communication with the pan bottom and by orifices E[3] and surrounding space with the intake of the triturating surfaces substantially as herein described and explained and as illustrated in the drawings.

Dated this 22d day of November, 1892.

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