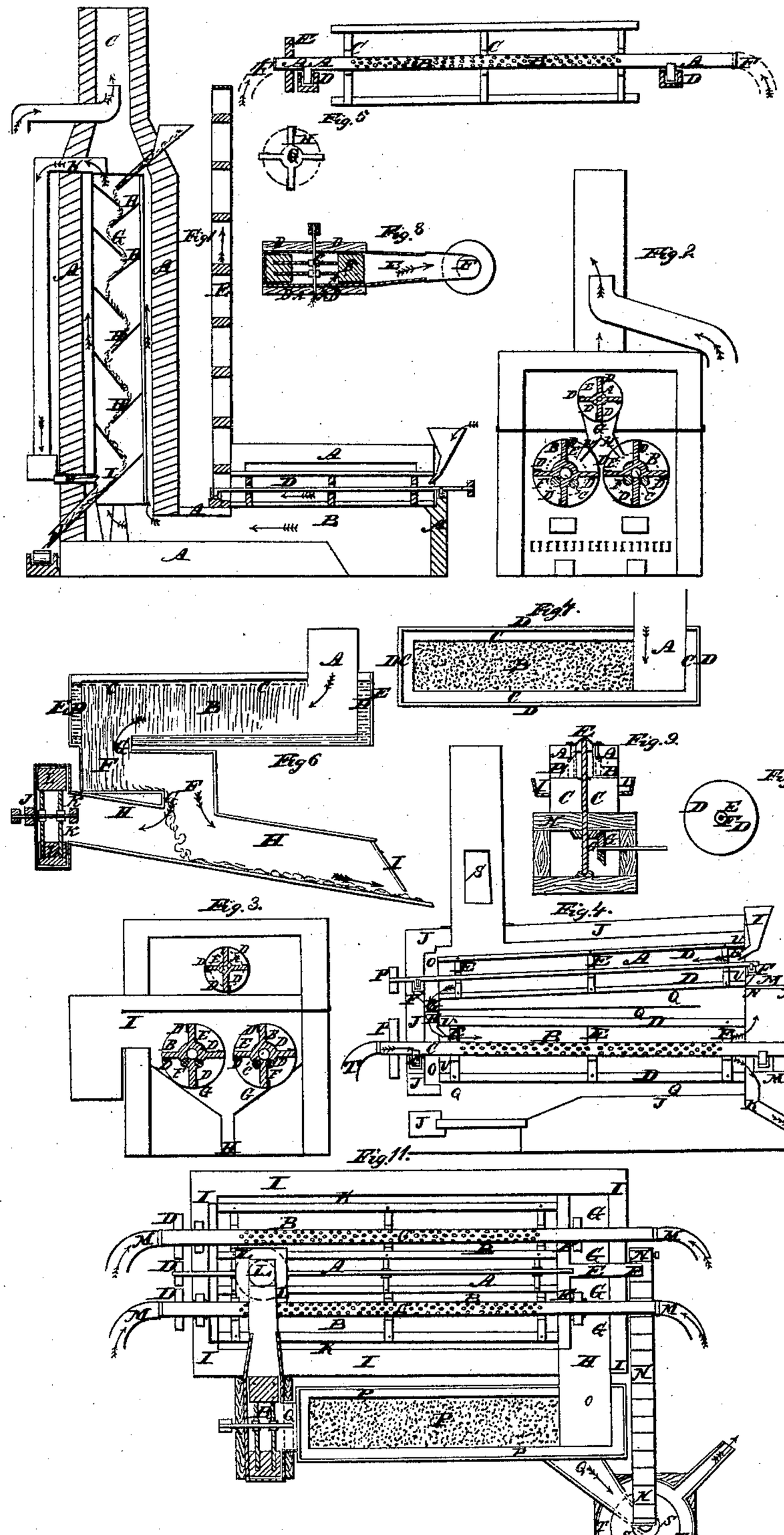
CROSBY & THOMPSON.

Dry Amalgamator.

No. 44,767 Patented Oct. 18, 1864.



UNITED STATES PATENT OFFICE.

AUGUSTINE B. CROSBY AND ROBT. L. THOMPSON, OF GILPIN COUNTY, COLORADO TERRITORY.

IMPROVEMENT IN APPARATUS FOR ROASTING AND TREATING ORES OF GOLD AND SILVER.

Specification forming part of Letters Patent No. **44,767**, dated October 18, 1864.

To all whom it may concern:

Be it known that we, AUGUSTINE B. CROSBY and ROBERT L. THOMPSON, of Gilpin county, Colorado Territory, have invented a new and useful improvement or improvements on the modes and machinery now used for the separation of gold from its associated ores, its separation and condensation from its volatile combinations, and preparing it for amalgamation, called "Crosby and Thompson's Excelsior Gold-Saving Process," of which the following is a full and exact description.

The process consists in the oxidation of the gold-bearing sulphurets or other ores after they are finely pulverized by stamps or other machinery, and wet with a solution of salt, (common,) thereby completely destroying, or nearly so, the chemical combination of the mineralizing agents and the metals involved. The oxidation is effected by means of heat and a plentiful supply of air, in the manner hereinafter described. The effect of this burning is to produce oxides of metals, sulphurous and other acids, sulphates, metallic gold, and gold vapor. All these vaporous products are conveyed from the place of burning through a condenser, in the manner hereinafter described, using the gold-charged water from the stamps or other crushers for the purpose of condensation, and the absorption of sulphurous or other acid to aid amalgamation. The solids are allowed to fall from the place of burning onto an inclined sole, in the manner and for the purpose hereinafter described; also, that they may cool in thin layers in contact with air, so as to absorb their full amount of oxygen in cooling, and become peroxides. The products of condensation and the burned solids are conveyed to a grinding apparatus, in a manner hereinafter described, for the purpose of reducing the solids to a very fine pulp, and to remove by attrition any coating on the gold that might prevent amalgamation. When copper ores are treated, the burned solids must be leached by the condenser-water, and the copper precipitated before amalgamation. The burning is effected by means of one or more vertical cylinders (hollow) surrounded by fire in a furnace of suitable shape, the cylinders to have inclined planes or benches attached to their inside surfaces for the pulverized ore to fall upon and glide off again, so as to retard the progress of the ore through them sufficiently to secure its complete combustion, the supply of air to be taken in at the bottom of the cylinders and passed through them by means of a blower connected with a condenser, and conveyed to the grinders substantially in the same manner as when revolving cylinders are used. The ore is fed in at the top through an adjustable trap, after having been elevated from a drying-cylinder. At the bottom of the cylinders there is an incline plane, with a trap to receive and discharge the solid products of burning, substantially in the same manner as when revolving cylinders are used. When the burning is effected in revolving cylinders, one or more, the air is supplied through hollow axles or shafts perforated in such manner as to supply the air to all parts of the cylinders, to make the area of the perforations a little more than twice the hollow of the shaft, and not to materially weaken the shaft. The cylinders are from two to three feet in diameter and from ten to twenty feet in length, or of any suitable dimension, with four (more or less) lifts from one to four inches wide, so placed on their internal circumference that their rotation shall elevate and drop the pulverized ore through the air, and flanged in such manner at their receiving or feed ends as to prevent the escape of ore, their discharge ends hooded, sleeved, or arranged in any way to secure the ore from waste. The cylinders are placed in furnaces of suitable form and capacity, the fire passing around them. At their discharge end is placed a hood or chamber, at the bottom of which is an inclined plane for the burned solids to fall upon, and be discharged through a trap onto an endless belt or table that carries them to the grinders. At the top or side of the chamber an opening is made to connect with the condenser, through which all the metallic vapors must pass and be cooled to a condensing-point. The condenser is made of iron, copper, or any good conductor of heat, oblong or square in its cross-section, surrounded on all sides but the top by a tank filled with water constantly flowing through it. The top is perforated, so as to admit water from the stamps or other crushers for the purpose of condensation and forming a dilute acid. It connects and discharges itself into the supply-pipe of the blower in a manner substantially

as hereinafter described. The supply-pipe of the blower is placed at an inclination, so that the water with the precipitated metal or ore (condensed) may be discharged by its specific gravity through a trap into a spout or trough extending to the top or feed-spout of the grinders or to the trough surrounding them. It is connected with the blower at and covering the center of one side. The blower receives its supply from the supply-pipe, is closed at all other points save the discharge-spout, it is of usual form, and the discharge-spout extends to the smoke-stack of the furnace and terminates at its center in a nozzle or spout pointing directly up. It is arranged in this manner to make an internal draft of air through the perforated shaft to supply the cylinder to carry the vapors and gases through the condenser and to make a draft to the furnace. The grinders are of the ordinary form of millstones, geared in a similar manner, and made of some soft wood, the lower one made with a smooth surface for ginding, the runner or upper one slotted from the center outward sufficiently to feed the capacity of the grinding-surfaces, and a trough round the lower one to convey the ground material to the amalgamator.

Figure No. 1 of the drawings exhibits by a vertical section the construction of the vertical burner above described; A, wall of furnace; B, fire-room; C, chimney or stack; D, drying-cylinder; E, elevator; F, trap through which the ore passes to G, the cylinder; H, inclined planes to impede the passage of the ore; I, inclined plane; J, trap to discharge the burned ores; K, flue to convey gases and vapors from the cylinder to the condenser.

Fig. No. 2 exhibits by a front view the construction of the burner when three cylinders (revolving) are used; A, the drying-cylinder and discharge end; B B, the two burning-cylinders and receiving ends; C C, the hollow and perforated axles; D D, the lifts; E E, the spider-centers connecting the axles with the cylinders; F F, friction-bearings; G, an adjustable partition to divide the ore falling from the drying-cylinder equally between the burning-cylinders; H H, inclined spouts to convey the ore from the drying to each burning cylinder.

Fig. No. 3 exhibits an end view at the discharge ends of the burners; A, feed end of the drying-cylinder; B B, the discharge ends of the burning-cylinders; C C, the hollow and perforated axles; D D, the lifts; E E, the spider-centers connecting the axles with the cylinders; F F, friction-bearings; G G, inclined planes or soles to receive the burned solids; H, trap through which the burned ore passes to an endless belt or carrier; I, opening for the gases to escape to the condenser, also the metallic vapors.

Fig. No. 4 exhibits a vertical section through the drying-cylinder and one of the burning-cylinders; A, drying-cylinder; B, burning-cylinder; C, the axle extending through the gas-chamber; D D, the lifts; E E, the spider-centers; F F, friction-bearings; G, the adjustable partition; H, the spout from the drying to the burning cylinder; I, the feed-spout to the drying-cylinder; J J J, &c., the walls of the furnace; K, the inclined plane or sole; L, trap at foot of the sole; M M, wall of gas-chamber at the end of the burning-cylinders; N N, top of gas-chambers; O O, hood to the front end of the cylinders; P P, pulleys to drive the cylinders; Q Q, fire-room and passages to the smoke-stack; R, the smoke-stack; S, the discharge-nozzle of the blower; T T, the supply-pipes of an auxiliary blower; U U, the flanges of the receiving ends of the cylinders; arrows, (⟶,) the direction of the ores and gases.

Fig. No. 5 exhibits a longitudinal section of the perforated hollow axle with its connected parts, and a cross-section of the same; A, the axle; B B, the perforations; C C, spider-centers; D D, bearings; E, pulley; F, pipe to the auxiliary blower, cross-section; G, axle; H, spider-center; dotted line, outline of the pulley.

Fig. No. 6 exhibits a vertical section of the condenser, the supply-pipe of the blower, and their connection, and a cross-section of the blower; A, flue connecting the gas-chamber with the condenser; B, the condenser; C, perforated top surrounded by low sides to receive water from the stamps or elsewhere; D D, water surrounding the condenser; E E, tank; F, opening from the condenser to the supply-pipe of the blower; G G, cascades and openings to the supply-pipe of the blower; H H, the inclined supply-pipe to the blower; I, trap through which the condensed matter and water passes to the grinders; J, cross-section of the blower; K, opening to the supply to the supply-pipe; L L, fans.

Fig. No. 7 exhibits a top view of the condenser; A, opening connecting with the gas-chamber flue; B, the perforated top of the condenser; C C, water around the condenser; D D, the tank.

Fig. No. 8 exhibits a longitudinal section of the blower with its connection with the smoke-stack; A, the opening from the supply; B B, fans; C, axles; D, the shell; E, discharge-flue leading to the smoke-stack; F, the nozzle or end of the discharge-flue terminating in the stack.

Fig. No. 9 exhibits a vertical section of the grinders; A, upper grinder or runner; B B, feed-slots; C, lower grinder; D, packing of spindle; E E, driver and bail of any usual device; F, spindle; G G, any usual driving-gear; H H, frame of any suitable form; I, trough running round the lower grinder and leading to an amalgamator.

Fig. No. 10 exhibits a view of the grinding-surfaces of both upper and lower grinders: A, smooth grinding-surface of the runner; B B, feed slots or channels; C, center hole for feeding; D D, the smooth grinding-surface of the lower grinder; E, spindle-hole; F, stuffing-box for the spindle.

Fig. No. 11 exhibits a top view of a horizontal section of all the parts combined when using a combination of three cylinders for burning; A, the drying-cylinder; B B, burning-cylinders with their several connections or parts; C C, the perforated hollow axles and their connections; D D D, pulleys; E E, inclined planes or soles; F, trap at the foot of the soles; G G, the gas-chamber; H, opening from the gas-chamber to the condenser; I I I, walls of the furnace; K K, fire-passages; L, cross-section of the smoke-stack and nozzle of the blower; M, the auxiliary blower; N, the endless belt or table for carrying the burned solids to the grinders; O, flue from the gas-chamber to the condenser; P P P, condenser and tank around it; Q, supply-pipe of the blower with the trap for the discharge of the water and condensed matter; R, the main blower with its connection with the smoke-stack; S, the grinders; T, trough around the lower grinder.

We do not claim the burning of ores in cylinders stationary or vertical, the use of lifts to scatter the ore, the use of chloride of sodium as an assistant to oxidation, nor the use of air as the source of oxygen to be of our invention, as we are aware of their previous use.

We do not claim the use of spray or water tanks for condensing purposes, the use of a blower for creating a draft, nor the grinding of burned ores to prepare them for amalgamation to be of our invention, as we are aware of their previous use.

We claim to be of our invention—

1. The application of the perforated hollow axle, substantially as above described, for the purpose of furnishing a sufficient supply of air at all points in the length of the burning-cylinder.

2. The application of the gas-chamber with the inclined plane or sole and trap, substantially as above described, for the purpose of separating the burned solids from the gaseous and vaporous products without admitting external air, so as to vitiate the draft.

3. The application of a condenser, substantially in the manner and of the form above described, for the purpose of condensing the metallic vapors and obtaining a hot dilute solution of acid to aid amalgamation.

4. The combination of a blower, substantially as above described, for the purpose of making an inward draft, with the cylinder, gas-chamber, and condenser, so that no metallic vapors may escape before condensation.

5. The application of grinders made of some soft wood or any kind of wood, or of any soft material suitable, substantially as above described, for the purpose of grinding burned ores and removing any coatings that may be on the gold particles.

6. The application of the general combination of the foregoing claims with the previously-known arrangements involved, substantially as above described, for the purpose of making a compact, practical, continuous, economical, and thorough mode and means of working gold ores.

In witness whereof we have hereunto subscribed our names the 2d day of August, 1864.

AUGUSTINE B. CROSBY. [L. S.]
ROBERT L. THOMPSON. [L. S.]

In presence of—

S. V. THOMPSON,
B. S. HEDRICK.