

the other portions of the process from the construction of the apparatus, it might seem to need some explanation as applied to the comminuting-cylinder; but when it is considered that there is a continuous pressure at the receiving end of the cylinder, caused by the inflow of the crushed ore, and that this ore from the time it is received within the cylinder is ground and pulverised in a progressive way until the particles are separated one from another to almost the last degree, it will be seen that the pulverised dust or flour thereby produced, being in continual agitation, caused by the revolution of the cylinder and the motion of the pebbles therein, will be approximately analogous to a fluid, and subject to the law of equal pressure in all directions at the same level. This holds true whether the ore be ground wet or dry. Now, the inflow being at one end, and the only possible outflow at the opposite end, and the inflow arising from gravity alone, it follows that the outflow necessarily arises from gravity. It is of importance to note that pounded or hammered gold will resist the action of mercury for a long time, and that the so-called "rusty" gold is merely gold enveloped in a coating of some substance—a gas, a film of grease, a deposit of iron rust, or the like—and thereby protected from the action of mercury. Now, before gold that has been hammered will amalgamate readily with mercury it must be annealed, and before rusty gold can be amalgamated the coating surrounding the gold must be pierced or removed.

Further, the resistance of hammered gold to amalgamation with mercury is irrespective of mass—or, in other words, equal surfaces of gold hammered to equal degrees resist amalgamation equally, and the size and shape of the hammered particles are relatively unimportant, their total surface areas being the real things for comparison. Likewise, gold which is rusty, whether in a large mass or in a small particle, is protected from mercury as long as its envelope remains entire. Stamp-mills, ore-crushers, and the like have a hammering or consolidating effect upon gold subjected to their action, and while much of their flour or powdered gold is probably lost through waste from the great force of water used in connection with them, another large percentage of the total waste is undoubtedly due to the fact that such gold as is not lost in the first instance is lost in the latter processes by reason of its hammered condition and its consequent slowness to amalgamate with mercury. Now, the difference between the product obtained by my process and the products resulting from the processes formerly in use consists not only in the greater fineness in the reduction practised by me, but principally in the fact that this comminuted product is unhammered, uncondensed, unhardened, and also in the fact that the rusty gold is not only deprived of its coating, but that this is done without compressive grinding, and in such a way as to leave the gold in its natural and soft condition.

The pulverisation effected by my process is not only an extreme comminution of the total mass of the ore body, but it is such a comminution obtained without the tremendous pounding or compressive grinding actions used in other processes. While it is true that the crushed ore delivered into the pulverising-cylinder will have been subjected to some little grinding, pounding, or compressing in the rock-breaker or ore-crusher necessarily used for breaking it, it will be seen that this compression will be effective upon a very small portion of the mass, and that within the cylinder the pulverisation is accomplished more by attrition, wearing, gentle grinding, and the like than it is by a pounding action, a compressive action, or a hammering process. In other words, comminution is effected without condensation, hammering, or compression of the gold, and the powdered product is delivered into the amalgamating-pan not only in the finest possible condition—i.e., in the condition presenting the greatest surface-area for a given quantity of gold—but the surfaces of the particles making up this greatest area are worn and scratched in such manner as to present the metal most effectively to the action of the mercury and the gold itself in its natural and soft condition. It may be noted in this connection that some degree of heat is produced in the pulverising-cylinder, though this rarely rises above 150° Fahr., and, while this would not be sufficient under ordinary circumstances to cure hammered gold, it may have some effect in preparing the infinitesimal particles produced by my process for amalgamation, especially by driving out of the pores of the gold gases, greases, and the like.

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

1. In an apparatus for separating gold from its ores, the combination with a pulverising-cylinder, revolving on hollow trunnions both flared in the same direction, of a hopper having an inclined chute fitting within the inner periphery of the outer end of one trunnion, and a covered amalgamating-pan having an inclined chute embracing the outer periphery of the outer flaring end of the other trunnion, substantially as and for the purpose set forth.

2. The process of separating gold from its ores which consists essentially in reducing, without compressive grinding, hammering, pounding, or the like, the entire mass of ore equally to an impalpable powder by gentle attrition of the mass in a gradually-fed revolving cylinder, whence only the thoroughly pulverised materials are permitted to escape by overflow as an impalpable powder, delivering said powder to mercury in an amalgamating-pan to which water is admitted only in quantity sufficient to form a paste, and not enough to produce a flow of the pulp; and finally, when the amalgamating action upon the ore has been completed, washing the pulp into a settler where the amalgam settles from the diluted mass while the impurities are drawn off.

3. The process of separating gold from its ores which consists essentially in reducing the ores to an impalpable powder by gentle attrition in a revolving cylinder, from which only the thoroughly pulverised materials are permitted to escape by overflow into an amalgamating-pan, amalgamating the pulverised materials within the said pan with a quantity of water neither increased nor diminished during the process of amalgamation; and, finally, when the amalgamating action upon the ore has been completed, washing and diluting the pulp into a settler where the amalgam and impurities are separated.

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