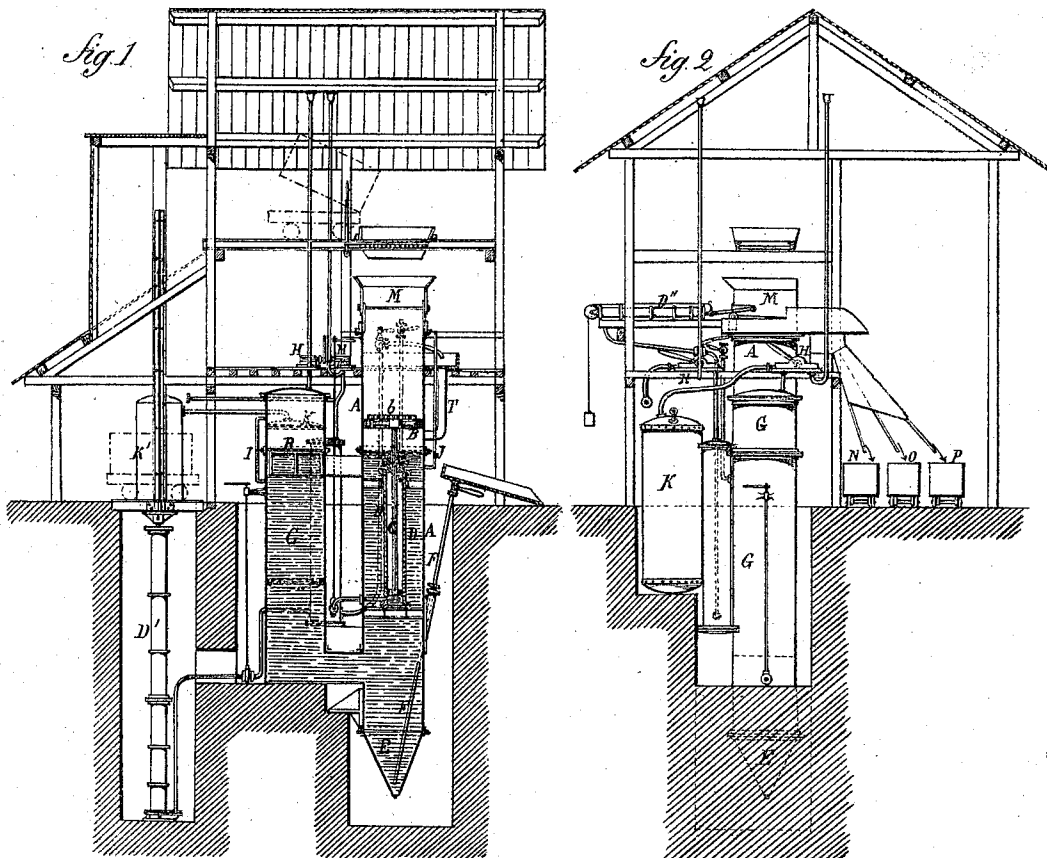


M. EVRARD.

Apparatus for Washing Coal, Ores, &c.

No. 142,221.

Patented August 26, 1873.



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IMPROVEMENT IN APPARATUS FOR WASHING COAL, ORE, &c.

Specification forming part of Letters Patent No. 142,221, dated August 26, 1873; application filed March 21, 1873.

To all whom it may concern:

Be it known that I, MAXIMILIEN EVRARD, of St. Etienne, (Loire,) in the Republic of France, have invented a new Improvement in Apparatus for Washing Coal and Minerals; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a side view; Fig. 2, a rear view; Fig. 3, a horizontal section.

My invention consists in charging the washing-table with a very thick layer of the coal, and in acting first on this layer by an ascensional stream of water, in order to drive the fine particles into the upper layers, then in effecting the classification by order of density by a reciprocating movement given to the water and progressively varying its effects by means of the direct action of steam or compressed air upon the surface of the water. By means of this invention I effect perfect cleansing and classification of the coal or mineral.

A is a cylindrical or other vessel, which receives the charge of coal on a washing-table, B. The table is hermetically packed. It can remain motionless or rise and descend the whole height of the vessel. It carries for this purpose a rod, C, which is terminated by a lower piston, *c*. This latter works in a cylinder, D, fed with water pressed by steam. A sump, E, collects the mud and stones which pass through the screen *b*. F is a cleansing-pipe, which dips into the bottom of the sump E. The receiver G is surrounded with wood to prevent the loss of heat. It contains steam at its upper part and cold water below arising from the condensation of steam. A float, R, composed of several stages retains the boiling water at the surface during the oscillations or fluctuations of the whole column of water. A slide-box, H, distributes the steam to regulate the movement of the column of water at each of the pulsations. A pipe, T, furnished with a cock introduces air into the vacuum or space produced under the table when the filtration of the water is interrupted. Tubes I and J indicate the water-level in the vessel and the

receiver. A reservoir, K, is in communication with a steam-generator, K', to feed the cylinders D D' D'' with the same water, allowing the volume of steam to escape after each operation. The cocks of these cylinders have always three ways and allow of several courses being furnished without making the steam escape from the reservoir K. It is, therefore, only necessary after each operation to replace the water lost in this reservoir. A scraper, M, sliding in guides and worked by a winch or by steam-power or hydraulic power, removes the materials. Each quality of coal is discharged into a corresponding chute, N O P.

The working of the apparatus, which will vary according to the quality or description of material under treatment, is substantially as follows: First, I empty into the vessel through a grating, in order to disaggregate the lumps, all the desired charge, taking care to maintain the water-level above the washing-table about eighteen inches, so that the fine particles do not pass through. Second, the charge having been made, I raise the water-level (by an admission of steam into the receiver G) in order to bring the dust and dirt to the top of the charge. Then I allow the steam to escape from the receiver. If the dust and dirt form an impermeable layer, as is often the case, the water cannot return into the receiver G because it is retained by the vacuum. I therefore open the cock of the pipe T, and the air then occupies under the washing-table all the space left free by the displacement of this volume of water, which is now above the charge. By a fresh admission of steam into the receiver G the air is forcibly driven through the charge and produces a dabbling or working up, which is often necessary in order to mix water with the materials. The water which immediately succeeds the air through the washing-table therefore rises in the vessel, and I can obtain, by its varied effects, (either by an intermittent ascensional current or by oscillations or fluctuations of different amplitudes,) all the desired results. After a few of these liftings or workings up by the air and varied fluctuations of the water produced by the admission and escape of the particles of stone (grains depierre) contained in the slimy portion (moures) descend into the lower layers

below the latter, and the removal of the slimy portion should then be effected in order that the cleansing of other portions may be continued more easily. Consequently, the washing-table is lifted until the first portion is level with the orifice of the tube or vessel in order that it may be discharged therefrom. From this time the classification of the mass continues without inconvenience (since the impermeable layer is removed) by the varied action of the water on each of the portions or charges by means of the admission and escape of the steam into the receiver G in such manner as to bring the densest grains or particles into the lower layers. In proportion to the progress of the classification the table is raised again and the charges or portions are removed in order to avoid the pressure on the others. The quality immediately superposed on the stones, (pierres,) and the stones themselves, can only be removed after several operations. This is necessary in treating charges of very different sizes in order to establish best the line of demarkation between the layers of large pieces which occupy the lower parts. The supply of water to the vessel takes place when the water-level is at its lowest by a channel opening into a reservoir at a higher level. This reservoir also receives the water which is emptied from the tube after its clarification in the settling-basins. The division in water of the slimy coal and muddy mineral being one of the essential conditions of the washing I effect this division by dabbling or working up with steam in a receiver (with or without agitators) or in the washing-vessel itself by employing then boil-

ing water in order to facilitate the disaggregation of lumps. Injections of steam will then replace compressed air in order to produce the dabbling or working up and to obtain a first classing of the heaviest pieces.

To extract the coal from the preparatory washing-vessels or from the washing-vessel A, when they are classified without lifting the table, I employ, as required, an extracting apparatus, composed of a sheet-metal vessel, the bottom of which is formed of narrow flat bars sufficiently separated to give passage to the pieces of coal in its downward movement, but sufficiently close to hold the charge when left to itself. This extractor can effect the removal of each of the charges of layers as they are cleansed even of the stones, (pierres,) but I prefer to effect it by the lifting of the table.

I claim as my invention—

1. The apparatus herein described for washing coal, minerals, &c., consisting of the receiving-vessel A and table B operated from a cylinder, D, the receiver G, float R, and a steam-generator, all connecting and operating substantially as set forth.

2. The combination of the washing-table B and hydraulic lifter, substantially as and for the purpose specified.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

MAXN. EVRARD.

Witnesses:

H. SOUTINE,

FR. MARQUETTE.