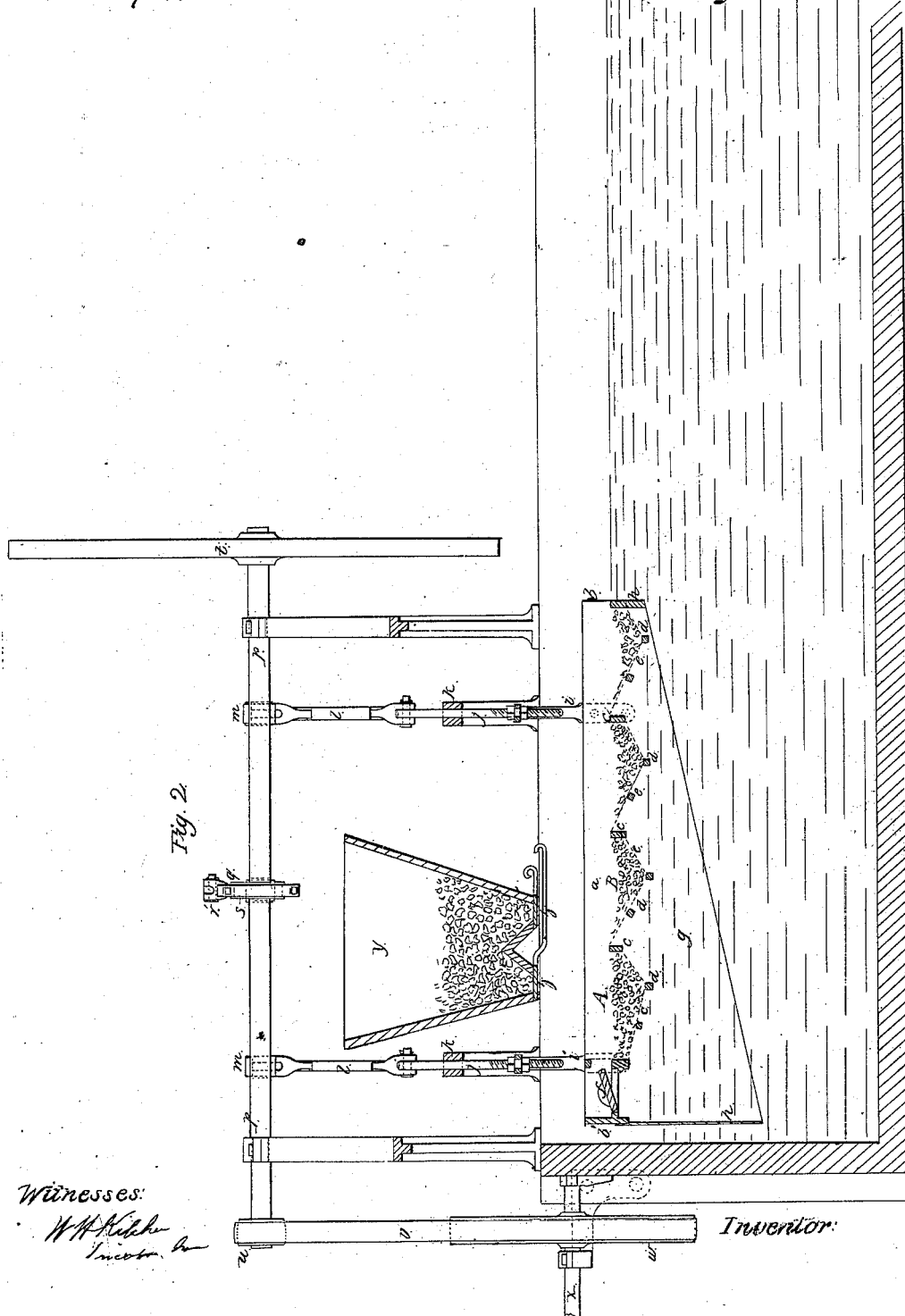


N. Troughton,

Ore Sigger,

No 3.674,

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UNITED STATES PATENT OFFICE.

NICHOLAS TROUGHTON, OF SWANSEA, ENGLAND.

PROCESS AND APPARATUS FOR SEPARATING OR DRESSING ORES REQUIRING WASHING.

Specification of Letters Patent No. 3,674, dated July 22, 1844.

To all whom it may concern:

Be it known that I, NICHOLAS TROUGHTON, a subject of the Queen of Great Britain, and residing at Swansea, in the county of Glamorgan, England, gentleman, have invented or discovered a new and useful Improvement in Dressing Ores Requiring Washing; and I, the said NICHOLAS TROUGHTON, do hereby declare that the nature of my said invention and the manner in which the same is to be performed are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed and to the figures and letters marked thereon—that is to say, the invention relates to a peculiar process of separating ores from the refuse matters contained therein, the said process consisting in subjecting the ore to the action of vertical and horizontal currents of water or other proper fluid in combination, as will be hereinafter described; also to certain means or mechanism adopted in the above process for operating upon the ore, &c., and producing the currents to which it is subjected, and it is important that the principles on which the invention depends should be well understood, and for that purpose I will shortly explain the effects of washing ore as at present practised in order that the nature of my invention may be more readily understood.

It is well known that when a quantity of ore which has been broken fine is put into a sieve and the same worked in water that the heavier matters fall to the lowest position of the mass in the sieve and the lighter or refuse matter may be to some extent removed and separated by hand—other means of separating the earthy or refuse matters from ores consisted in causing the sieves used to remain stationary while water was forced to flow through the same from below upward and then to pass over the sides of the sieves there being intervals of rest the water being stopped from flowing through the sieves during which times of rest the heavier matters were allowed by their greater specific gravity to fall to the lower part of the mass or ore in the sieves. And it has also been proposed to cause the pulverized ore to be first sifted so as to divide the particles of the same sizes from particles of other sizes and then the ore (the particles of which are as nearly the same size as possible) is permitted to fall in water advancing

tage being taken of the greater speed with which the heavier particles will descend through water so that when the matters have been falling for a regulated time the further descent of the particles toward the upper part of the water is prevented, thus separating the heavier from the lighter particles contained in the ore. And I mention these methods of washing ores in order to state the fact, that the heavier particles of ore fall by their greater gravity faster than the lighter or earthy or refuse matters when the same are in water is well known and therefore such is not claimed by me as a novel discovery in washing ores. At the same time my invention relates to means of taking advantage of that property in matter in order to separate the heavier from the lighter particles of matter when washing ores.

It will be readily understood that when a quantity of pulverized ore is placed in a sieve and the sieve is quickly immersed in water that the rising up of the water through the sieve and among the ore will cause this effect, viz., that the lighter particles will be suspended in the water at a greater distance from the surface of the sieve than the heavier particles and when the sieve is again raised the heavier particles not only from their greater gravity but also from their being nearest the sieve will arrive quickest on the surface of the sieve and such is the process which takes place when washing ores with sieves whether the sieve be raised up and down or the water be permitted at intervals to flow up through the sieves but in these cases the earthy and refuse matters for the most part fall back and lie upon the ores and the same can be separated only to a limited degree with practical utility. But by my invention the ores while suspended in water receive a motion in a horizontal direction so that in falling the lighter particles will be carried farther in a horizontal direction than the heavier ones and thus the lighter particles will be separated from the heavier ones the earthy and lighter matters being carried farther and farther from the heavier particles of the matters under process as the same are successively caused to be suspended in the water and thus it will be seen that although the property of the greater gravitation of the heavier particles is taken advantage of by me in carrying

out my invention it is by combining that action with another action which carries away the lighter particles of matter contained in the ore in a horizontal direction farther and farther from the heavier particles of matter contained in the ore as herein described. And in order that the invention may be fully understood and readily carried into effect I will proceed to explain the drawings annexed in the various figures of which the same letters are used to indicate the same parts wherever they occur the said drawings making part of my specification.

Description of the drawings—Figure 1 is a transverse section of a sieve and machinery for working the same arranged according to my invention. Fig. 2 is a longitudinal section of the same. Fig. 3 is a longitudinal section of sieves separately. Fig. 4 is a plan of the sieves.

The combined sieves shown are divided into eight compartments or separated sieves yet all combined on the same frame and each sieve or compartment is similar to all the others as will readily be understood on examining the drawing.

I would remark that although I have shown the combined sieve to consist of eight compartments that number may be varied the object being that the ore shall be separated from the lighter earthy or refuse matters by being successively operated on in a series of sieves as the currents of water rushing up through and over the sieves carry the lighter refuse matters forward from sieve to sieve.

The frame of sieves shown consists of a quadrangular frame of wood or other suitable material, *a, a*, being the sides and *b, b*, the ends thereof.

c, c, are bars which divide the sieves from each other and, *d, d*, are bars for having affixed thereto the wire cloth *e, e*, as is shown in the drawing, each compartment being composed of two inclined planes of wire cloth (which wire cloth is of the same description as that which has been heretofore used in sieves for washing ores) as is indicated by dotted lines and this arrangement is important in the well working of a series of sieves.

f, f are two flap valves which open as the sieves descend in the water and the water flows up through them and flows over from end to end of the sieves carrying forward from sieve to sieve the lighter particles of matter put in motion by the water rising up through the meshes of the sieves as the sieves descend in the water.

The under part of the frame of sieves is inclosed on all sides by plates *g, g* and *h, h* as is shown. The upper part of the frame is inclosed on three sides as is shown at *a, a*, and *b'*.

The frame of sieves thus constructed and arranged is to have a quick up and down motion communicated to it by any suitable means the sieves working in a tank or vessel of water. The frame of sieves has two straps *i, i* affixed across it to which the rods *j, j* are affixed by suitable screws and nuts or other convenient means such rods sliding through guiding holes in the framings *k, k* affixed across the tank or water vessel as is shown.

l, l are two connecting rods attached to the rods *j* by pin joints and by other pin joints to the arms *m* affixed to the axis *n* which axis moves in bearings, one of which is seen at *o* Fig. 1. The axis *n* receives motion from the axis *p* by means of the rod *q* attached by a pin joint to the arm *r* affixed to the axis *n* the other end of the rod *q* embracing an eccentric *s* affixed on the axis *p*. On the axis *p* is affixed a fly wheel *t*. The axis *p* receives motion from the band *v* acting on the drum or pulley *u* and motion is communicated to the band *v* by the drum *w* affixed on the axis *x* such axis receiving rotatory motion from a steam engine or any suitable power.

y is a hopper placed over the frame of sieves so that the ore in the ordinary broken state may fall through the openings below when the slides *z* are opened. The ore falling into the compartment of the sieves *A A* and *B B* will by the quick up and down motion of the sieves in the water and by the water rising up through the sieves be for the time being suspended in the water and during that time the flow of water issuing from the valves will carry forward the lighter particles leaving the heavier particles in the compartments nearest the valves so that as the process goes on the heavier parts of the ore will be left in the lower part of the sieves the lighter parts or refuse being carried onward and ultimately falling over the end of the sieves.

I would here remark that although I believe the arrangements of sieves shown in the drawing and above described to be the best for carrying out my invention I do not confine myself to the details of construction as long as the peculiar character of action be retained whereby the lighter particles of matter are carried on by a current of water flowing in a horizontal direction or nearly so farther and farther from the heavier particles as herein described and I do not confine myself to the mode of obtaining currents of water to flow by valves as other means may be resorted to for obtaining currents and causing the lighter particles to be carried away in a horizontal direction and separated from the heavier particles of matter in the ores under process though I believe the arrangement of sieves and mode of working the same I have described to be the

best for the purpose. The refuse matter passing off from the sieves and the finer particles passing through the sieves are to be re-dressed, when they contain sufficient metallic matter to pay for the cost using finer sieves for the finer particles. When the ore has been washed the sieves are to be raised by withdrawing the pin r' and then by a bar r^2 introduced into the socket r^3 raising the sieves and keeping them raised by lashing the bar r^2 to the hook w' the ore is then to be shoveled out.

There may be various other modes of applying the above described principle or process of washing or dressing ores, such for instance as causing the set or series of sieves to have a vibrating rocking motion transversely instead of being moved in a body vertically as set forth; also substituting an upward or vertical current of water which may be caused to pass through the sieves instead of moving the sieves up and down through the water and at the same time causing a current of water to flow over the stationary sieves instead of producing the current by the flow of water through the valves as before described. All these I consider as mere modifications of the mode or process of operation or of some of the details thereof.

Having thus described my invention I would wish it to be understood that what I claim consists in—

1. Separating the ore from the refuse matter, &c., by subjecting the whole to the action of vertical (or nearly vertical) and horizontal (or nearly horizontal) currents of water in combination whether these currents or either of them be produced in the manner herein described or by any other suitable for the purpose.

2. I also claim the combining with the series of sieves a casing (extending around or partially around the series as set forth) and a valve or valves $f f$ (arranged with respect to the sieves as described or in any other manner so as to produce their intended effect) so that when the whole is placed in a tank of water the upward and onward currents required for the process of separation above described may be obtained by simply causing the series of sieves to move up and down or in other respects as specified.

NICHOLS. TROUGHTON.

Witnesses:

W. H. RITCHIE,
JOSEPH MARQUETTI.