No. 671,317. Patented Apr. 2, 1901.

T. A. EDISON.

METHOD OF SCREENING OR RESCREENING FINE MATERIALS.

(Application filed Mar. 31, 1900.)

(No Model.) 2 Sheets—Sheet 1.

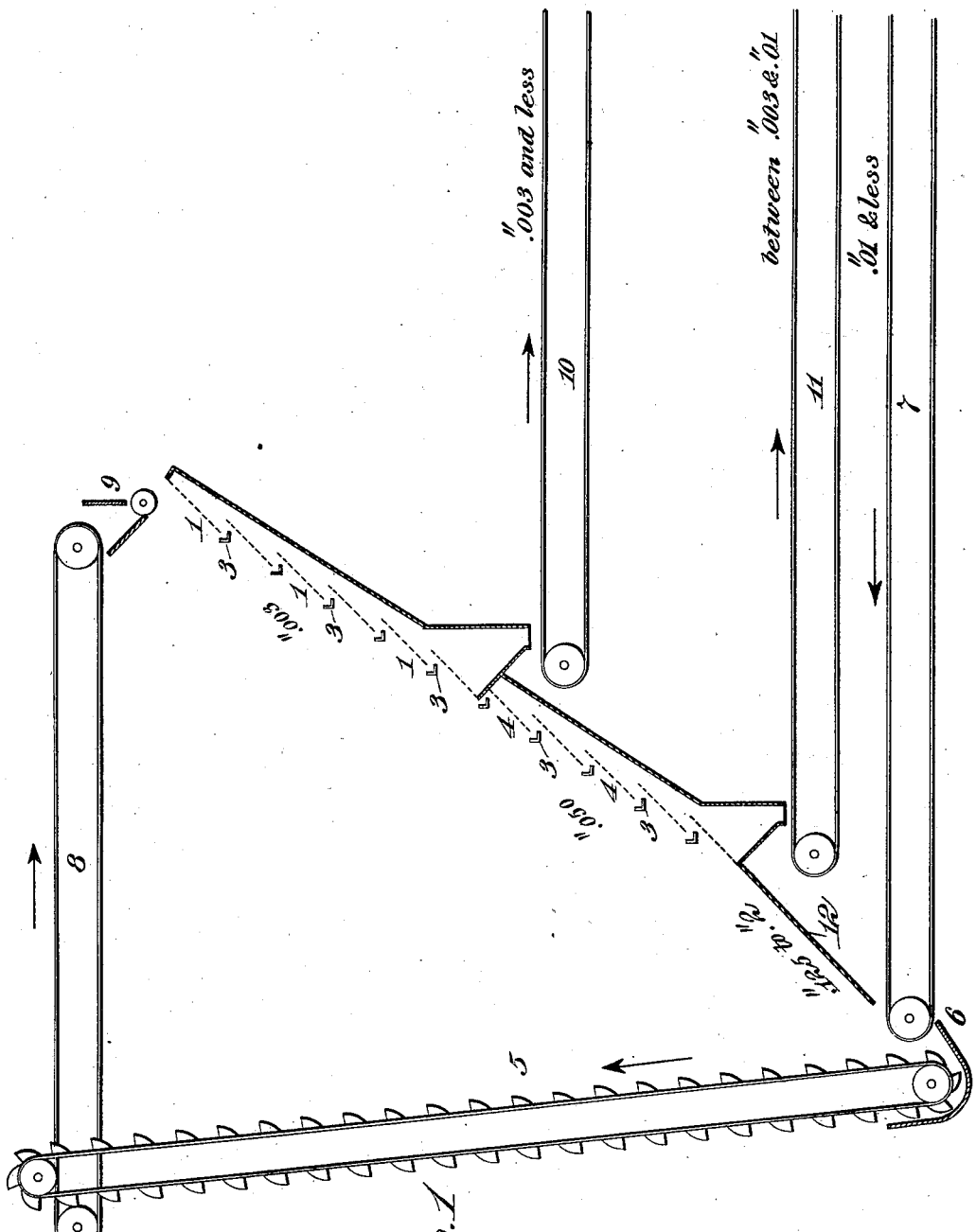

Fig. 1.

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Fig. 2

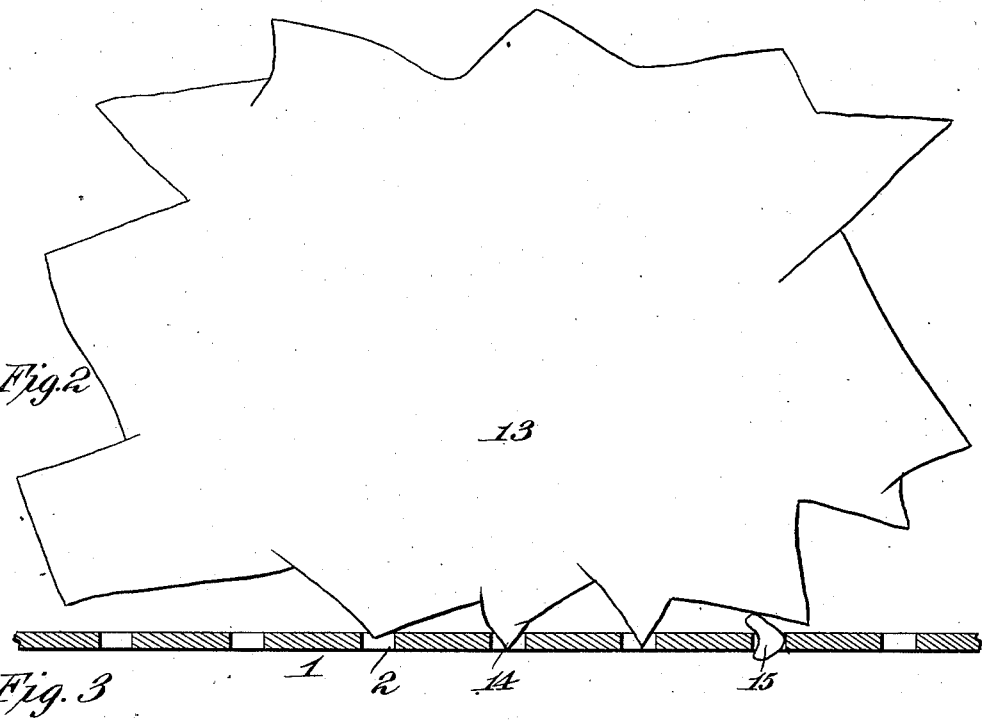


Fig. 3

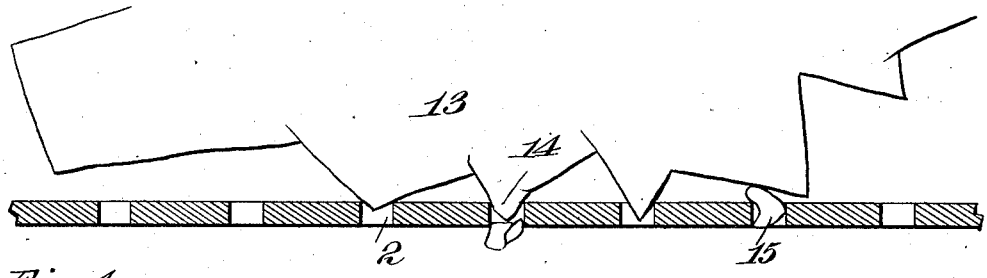
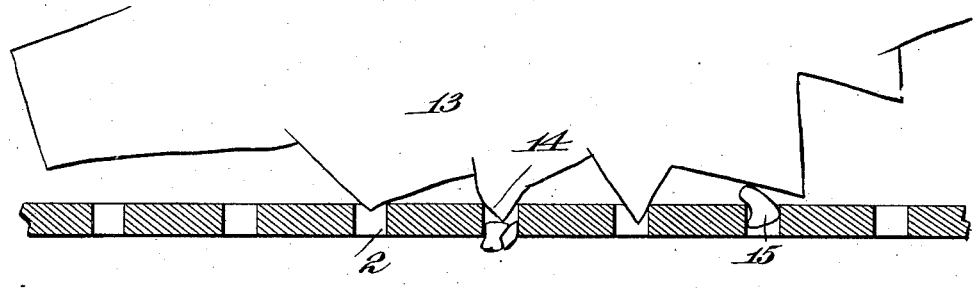


Fig. 4



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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

METHOD OF SCREENING OR RESCREENING FINE MATERIALS.

SPECIFICATION forming part of Letters Patent No. 671,317, dated April 2, 1901.

Application filed March 31, 1900. Serial No. 10,929. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Methods of Screening or Rescreening Fine Materials, (Case No. 1,030,) of which the following is a specification.

My invention relates to an improved method of screening fine materials in the first instance or of rescreening fine materials after they have already been subjected to a preliminary screening operation; and my object is to provide a method for this purpose by which the capacity of the screening devices will be very largely increased and clogging of the screen-openings prevented.

The principal difficulty encountered in practice in screening or rescreening very fine materials has been due to the clogging or choking of the interstices of the screen-plates or other screening devices and in a less degree to the fact that the fine materials tend to clot or aggregate together, so that the individual particles are not properly presented to the screen-surface. By adding to the fine particles which are to be screened or rescreened a larger bulk of much coarser particles, either of the same or of different material, and by passing the mixture of fine and coarse particles through a screening apparatus the screening operation will be very materially facilitated, because the presence of the coarser particles prevents the finer particles from clotting or aggregating, and thereby allows the individual particles to be effectively acted upon by the screening devices, and also for the more important reason that the numerous fine points or projections of the coarser particles engage within the slots or other screen-openings, whereby the onward movement of the coarser and consequently heavier particles will remove from the screen-openings any of the smaller particles which may have become wedged or crowded into such openings to otherwise choke them.

In carrying my improved method into effect I employ screening-plates having slots or other screening-openings and which are made as thin as possible consistent with proper strength and durability, and preferably my improved method is carried on in connection with a screening apparatus employing thin surface-hardened-steel screening-plates of the type described in my application for patent filed June 29, 1899, Serial No. 722,229, whereby the plates may be made of less thickness than the width of the screening-slots, even when the latter are of very great fineness. By employing screening-plates, the fine slots of which are actually wider than the thickness of the plates, the cleaning effect due to the engagement of the fine points or projections on the coarse particles within the screening-slots will be increased, because there will be a larger proportion of such points or projections which can project entirely through the screening-slots than would be the case if the thickness of the screening-plates were increased, while at the same time the use of very thin screen-plates is further advantageous, because the proportion of the fine particles which can become wedged or crowded within the openings thereof will be less than would be the case if the thickness of the screen-plates were increased.

Broadly stated, my improved method of screening or rescreening fine materials consists in maintaining in circulation an approximately constant load of the desired coarser particles, in adding to the circulating coarser particles the desired (preferably less) quantity of particles to be screened or rescreened, in passing the coarse and fine particles through or over a screening device of the desired mesh, whereby the sufficiently small fine particles will be withdrawn from the circulation, and in separating from the coarse particles the fine particles not removed by the screening device. Preferably the improved method effects the separation of the coarse particles and the fine particles not separated by the screening apparatus by the passage of the particles in question over or through a screening device of coarser mesh than any of the fine particles added to the coarse particles, but of finer mesh than any of the coarse particles.

My improved process is particularly designed for the rescreening of material which has already been subjected to the effect of a screening apparatus of greater mesh than that which is ultimately desired. When it

is necessary, as in the manufacture of high-grade Portland cement, for instance, to obtain a uniform run of extremely fine material—say with particles .003 of an inch in diameter or less—it is preferable to carry on the screening or grading of the material by at least two screening operations of different mesh. Thus if it is desired to secure extremely fine particles of, say, .003 of an inch or under in diameter it is preferable to first subject the crushed material in bulk to a screening apparatus of greater mesh—say .010 of an inch—and to subject the screenings of the coarser screens to the effect of screens of ultimate fineness. Thus the very fine screens, wherein the screening must be effected slowly and with care, will be subjected to only a part of the bulk of material and the proportion of particles which will be permitted to pass through such screens will be relatively high. If, on the other hand, the entire bulk of the crushed material were passed over the extremely fine screens of ultimate mesh, an equally effective screening operation would only be obtained by extending the screening-surfaces to a very much greater proportional extent. In other words, a better, cheaper, and more expeditious screening operation can be effected by first passing the crushed material over a screen of, say, .010 of an inch mesh and by then passing the screenings thereof over a screen of .003 of an inch mesh than would be obtained if the original crushed material were passed over two screens of .003 of an inch mesh.

In order that my improved process may be better understood, I show in the accompanying drawings a convenient apparatus for its carrying out, wherein—

Figure 1 is a diagrammatic view of an apparatus designed for the screening or rescreening of very fine material like Portland cement; and Figs. 2, 3, and 4, sectional views through screens of different thicknesses, illustrating the advantages of employing very thin screens for securing the best results, the parts being very much enlarged.

In all of the above views corresponding parts are represented by the same numerals of reference.

For convenience of illustration it will be assumed that the apparatus is employed in the screening of Portland cement and that it is desirable to reduce it to particles of .003 of an inch in diameter and under.

1 1 1 represent the very fine screens, which are preferably extremely thin steel plates having screening-slots 2 therein, as shown in Fig. 2. These plates are relatively short, and checking-shelves 3 are illustrated between the plates to bring the material to rest before passing over each of the plates. In the assumed case the mesh of the screens 1 is .003 of an inch.

4 4 represent coarser screens placed below the fine screens and of the same character. The mesh of the screens 4 is intermediate of the larger of the fine particles and the smallest of the coarse particles, a constant load of which is to be maintained through the apparatus, as will be explained. It will be assumed that the fine particles which are fed to the screening apparatus from the crushing plant are .010 of an inch in size and less and that the coarse particles vary in size from .125 to .200 of an inch. A convenient mesh for the screens 4 will be .050 of an inch, or five times as large as the largest of the fine particles, which hence pass readily through the same, and less than half as small as the smallest of the coarse particles, which therefore cannot be influenced by such screens.

5 is an elevator, the boot 6 of which may be supplied with the fine material by a conveyer 7.

8 is a conveyer which conveys material from the top of the elevator 5 to a hopper 9, having a roller-feed placed above the upper fine screen.

10 is a conveyer which carries off the fine particles separated by the fine screens 1, and 11 is a conveyer which carries off the remainder of the fine particles separated by the coarser screens 4.

12 is an apron or chute which directs coarse material from the bottom of the coarse screens to the elevator 5, as shown.

Assuming the apparatus to be used in the screening of high-grade Portland cement, that crushed cement material having particles .010 of an inch and less in diameter is fed to the conveyer 7, that the screens 1 are of .003 of an inch mesh and the screens 4 of .050 of an inch mesh, the operation will be as follows: The elevator 5 and conveyer 8 are first started, and a bulk of coarse material having particles, say, from .125 to .200 of an inch in diameter is introduced into the boot 6 of the elevator and passes continuously through the apparatus. These particles will not be affected by either the screens 1 or 4. The coarse particles may be cement material or a separate refractory material, such as quartz-sand, preferably the former. The fine cement material having particles .010 of an inch or less in diameter is now fed to the conveyer 7 in quantity preferably not more than one-third that of the bulk of coarse material in transit through the apparatus. The fine particles will be mixed with the coarse particles and be carried by the elevator 5 and conveyer 8 to the hopper 9, by which the mixture of coarse and fine particles will be fed to the uppermost screen 1, and by the roller-feed will be distributed in a thin wide stream on said screen. The particles will pass down the screen 1 and the sufficiently fine particles thereof, having a diameter of .003 of an inch or less, will be carried off by the conveyer 10. The rest of the fine particles having a diameter between .003 and .010 of an inch, will pass through the screens 4 and be carried off by the conveyer 11, to be returned to any suitable crushing, grinding, or other reducing

plant. The coarse particles will pass down the chute 12 and be again mixed with fine particles and carried up and through the apparatus, as explained. The presence of the coarse particles intermixed with the fine particles, and preferably in larger bulk, serves not only to prevent the fine particles from clotting or aggregating and to keep the fine particles in agitation, so as to be effectively acted upon by the screens, but also the numerous fine points or projections carried by the coarser particles will engage in the screen-openings to remove therefrom any of the fine particles which may become wedged in such openings to otherwise clog the same. It will be seen from reference to Figs. 2, 3, and 4 that when the screen-plates are made very thin this cleaning effect will be much more perfect than if the plates are thicker. Thus, referring to Fig. 2, 13 may represent a coarse particle having a diameter of, say, .200 of an inch and provided with a projection 14, which may engage one of the openings 2 of the fine screen to effectively clean any obstructing substances therefrom. If, however, as shown in Figs. 3 and 4, the screen-plates were made half again or twice as thick as that shown in Fig. 2, the projection 14 could not pass to the depth of the screen-opening, and hence would not clean an obstruction therefrom, and manifestly the proportion of projections which could pass to the entire depth of such openings would be extremely small. A further advantage of using very thin plates, and preferably those having a thickness less than the width of the screen-openings, is that there is less likelihood of particles becoming wedged therein than is the case with thicker plates, as appears from consideration of the figures, wherein 15 represents a particle which can readily pass through a perforation of a certain width in a thin plate, as shown in Fig. 2, but which would become wedged in a perforation of the same width in a thicker plate, as shown in Figs. 3 and 4.

I do not claim herein the apparatus described as being adapted for use in the carrying out of my improved method, since such apparatus forms the subject of my application for Letters Patent filed March 7, 1900, Serial No. 7,623.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

A method of screening or rescreening fine materials, which consists in maintaining in circulation an approximately constant load of coarse particles, in adding to the circulating coarse particles a smaller bulk of fine material to be screened or rescreened, in subjecting the fine and coarse particles to a screening operation, whereby the sufficiently small fine particles will be withdrawn from the circulation, and in subjecting the coarse particles and the fine particles not withdrawn from the circulation to a second screening operation, whereby such remaining fine particles will be separated from the coarse particles, substantially as set forth.

This specification signed and witnessed this 28th day of March, 1900.

THOMAS A. EDISON.

Witnesses:
J. F. RANDOLPH,
J. A. BOEHME.