May 3, 1932. G. E. SWINEHART 1,856,273

SINTERING MACHINE

Filed March 19, 1930 3 Sheets-Sheet 1

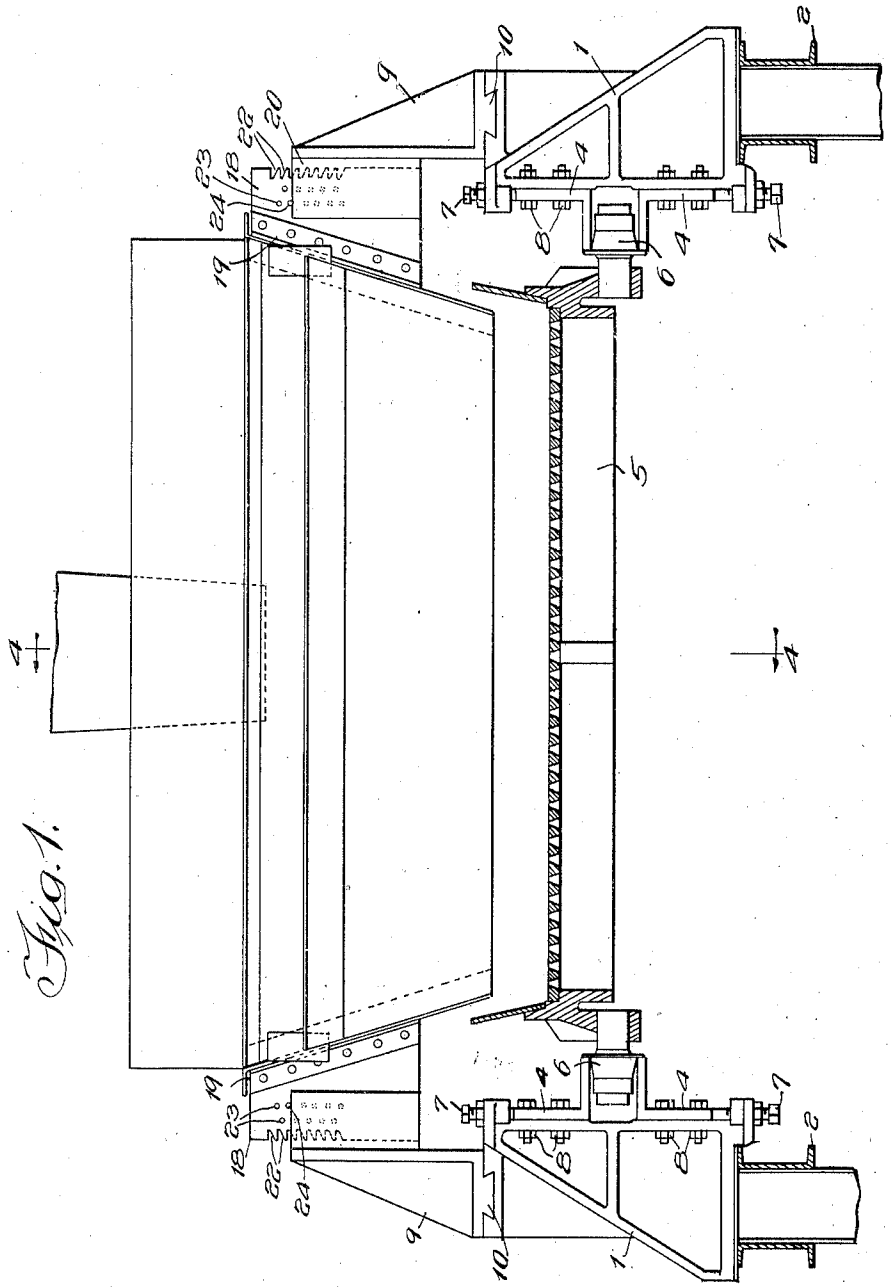


Fig. 1.

Witness:
William P. Kilroy

Inventor:
George E. Swinehart

By Brown, Jackson, Boettcher & Dienner, Attys

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SINTERING MACHINE

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Fig. 2.

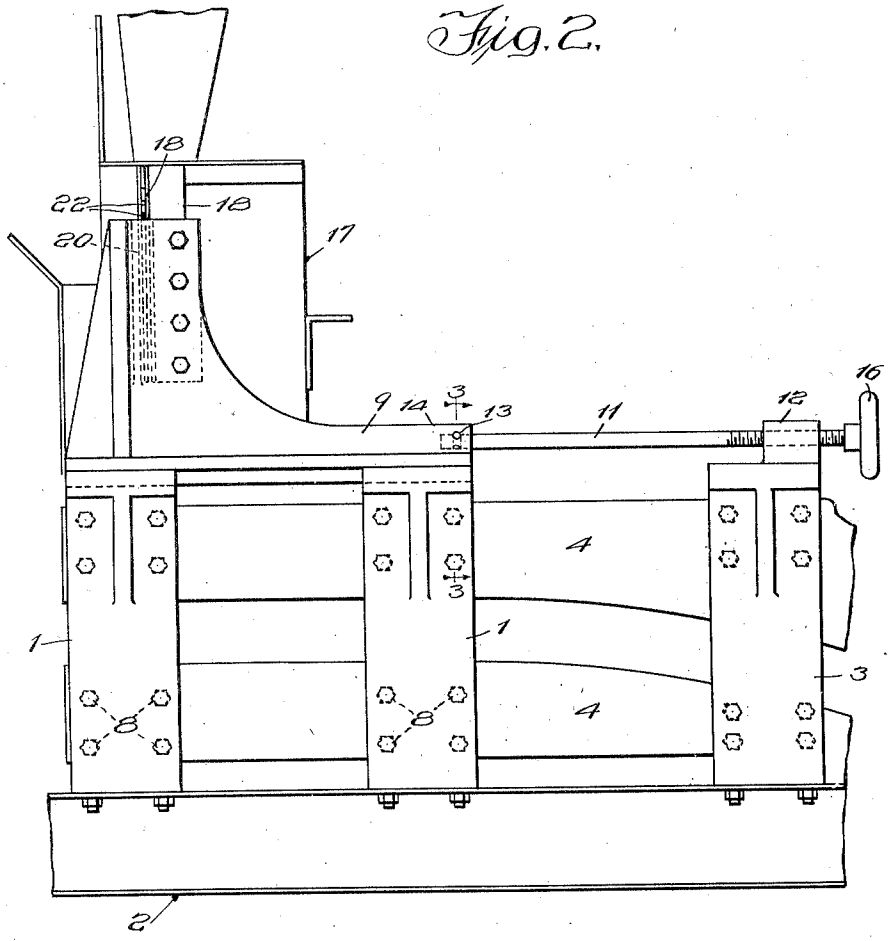
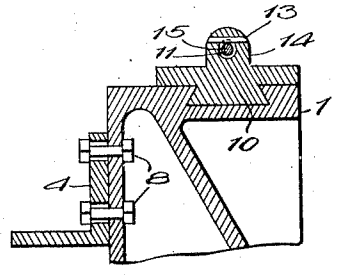


Fig. 3.



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Fig. 4.

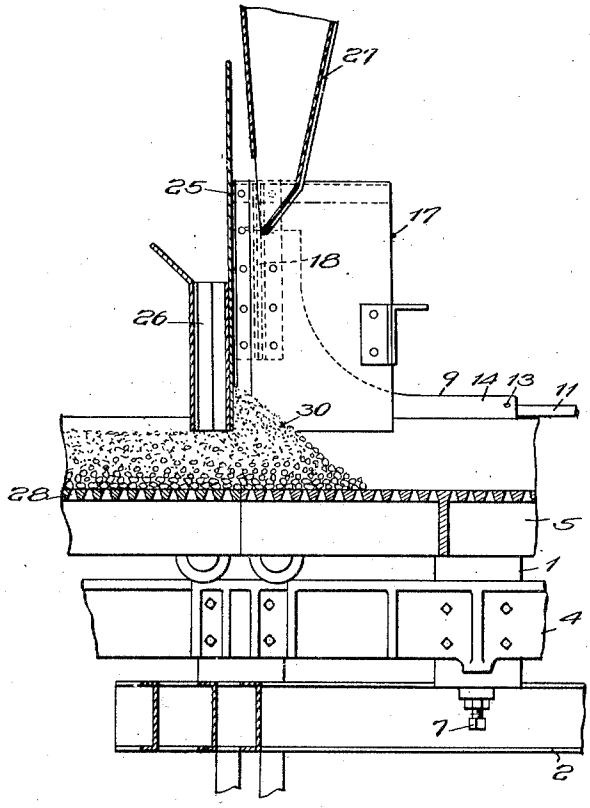


Fig. 5.

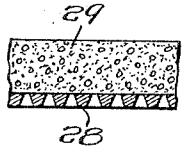
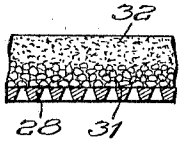


Fig. 6.



Witness:
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Patented May 3, 1932 1,856,273

UNITED STATES PATENT OFFICE

GEORGE E. SWINEHART, OF BUFFALO, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AMERICAN ORE RECLAMATION COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW YORK

SINTERING MACHINE

Application filed March 19, 1930. Serial No. 436,925.

This invention relates to sintering machines for sintering ores, soot, and other material having combustible ingredients.

My invention is particularly adapted for use with sintering machines known in the art as the Dwight and Lloyd machines. In these machines the sintering operation is carried on continuously, the material to be sintered being delivered by a hopper to the grates of pallets which travel beneath the hopper. Materials to be sintered commonly contain a considerable proportion of relatively fine material, known as fines, and an appreciable proportion of relatively large or coarse material known as aggregates. It is the present practice to deliver the material to be sintered to the grates of the pallets with the fines and aggregates mixed indiscriminately. This is objectionable as a considerable portion of the fines is deposited directly upon the grates of the pallets and, during the sintering operation, tends to stop or clog the openings of the grates during passage thereof over the wind boxes, thus materially reducing the passage of air and products of combustion through the grates, and, consequently, reducing the speed of operation and the output of the machine. I have found that this objection can be avoided by separating the material into fines and aggregates, and depositing the aggregates upon the grates to form a lower, loose and porous layer, the fines being then deposited upon the aggregates to form an upper layer. This effectively prevents clogging of the openings of the grates and results in increased speed of operation with a resulting increase in output of the machine.

One of the main objects of my invention is to provide simple and efficient means for separating the material to be sintered into fines and aggregates and for disposing the fines, in an upper layer, upon the aggregates, which form a lower layer directly upon the surfaces of the grates. A further object is to provide means of the character stated which can readily be applied to a sintering machine without necessitating material changes therein. Further objects and advantages of my invention will appear from the detailed description.

In the drawings:—

Figure 1 is a front view of a feed hopper and associated parts of a sintering machine in accordance with my invention, the main frame being shown fragmentarily and in section;

Figure 2 is a side view of the feed hopper and associated parts;

Figure 3 is a section taken substantially on line 3—3 of Figure 2;

Figure 4 is a section taken substantially on line 4—4 of Figure 1;

Figure 5 is a section through a layer of material to be sintered, upon a grate, illustrating the present practice;

Figure 6 is a view similar to Figure 5 illustrating the practice in accordance with my invention.

I have illustrated my invention as applied to a sintering machine of known type, the machine itself being shown fragmentarily. In machines of this type, pallets travel along an endless track extending lengthwise of the main frame of the machine, the pallets being raised from the lower run of the track to the upper run thereof, and propelled along the upper run, by sprocket wheels, the pallets on the upper run being in endwise contact and the sprocket wheels serving to propel the pallets along the upper run to the delivery or discharge end of the machine. The pallets on the upper run of the track first pass beneath a feed hopper from which they receive a charge of the material to be sintered, and then pass beneath an ignition device or furnace which serves to ignite the material at the upper face thereof, after which the pallets during continued travel along the upper run of the track pass over a series of wind boxes which are connected to suitable means for creating a partial vacuum therein so as to cause a down draft through the ignited material for causing combustion downwardly through the mass. The construction and operation of machines of this type are well known in the art, and it is not necessary to illustrate or describe the same here in detail, and only so much of the machine as is

necessary to illustrate my invention is shown.

Supporting brackets 1 are suitably secured to main frame 2 of the machine and extend upwardly therefrom. These brackets cooperate with substantially similar brackets 3 for supporting angle track sections 4 which form a portion of the track upon which pallets 5 travel, these pallets being mounted upon rollers 6 which operate between the track sections 4. The track sections 4 may be adjusted relative to each other by set screws 7 carried by brackets 1, the track sections 4 being secured to the brackets by bolts 8 passing through suitable slots in the track section. The mounting of the track sections and the manner of adjusting the same are not essential features of the present invention, it being sufficient to note that track sections are suitably mounted upon the brackets and provide means for supporting the pallets during travel thereof.

Hopper brackets 9 are mounted upon the upper ends of brackets 1 and are connected thereto by dove-tail connections 10 so as to be slidable lengthwise of the frame 2 of the machine. Adjusting rods 11 thread through bosses 12 projecting upwardly from brackets 3, the forward end of each rod 11 being connected to the associated hopper bracket 9 in a suitable manner, as by means of a pin 13 (Fig. 3) secured through a rib 14 of the bracket and passing through a circumferential groove 15 formed in the rod. A hand wheel 16 is secured upon the rearward end of rod 11 for rotating the same. By turning the rods 11 in proper direction, the hopper supporting brackets 9 can be adjusted with facility lengthwise of the main frame 2 and in either direction.

A feed hopper 17 of suitable construction is disposed between the hopper brackets 14. Supporting plates 18 are secured to the side walls of the hopper in a suitable manner, as by means of angle strips 19 disposed at opposite sides of plate 18 and riveted thereto and to the hopper walls. Plate 18 extends between a flange 20 extending inwardly from bracket 9 and a plate 21 bolted or otherwise suitably secured to the bracket. Supporting plate 18 is provided, in its outer edge, with a series of notches 22, and is further provided with two series of openings 23, the openings of one series being disposed in staggered relation to the opening of the other series. These openings are adapted for reception of a pin 24 which rests upon the upper edges of flange 20 and plate 21 for supporting the hopper in vertical adjustment. By inserting a suitable tool into one of the notches 22, the plate 18 can be raised or lowered for adjusting the same relative to bracket 9. This provides means for effecting vertical adjustment of the hopper to suit conditions. Any other suitable or preferred means for adjusting the hopper may be provided.

Hopper 17 is provided with a vertically extending front wall 25. A shield 26, of suitable type, is mounted in front of wall 25 to protect the same from the heat of the ignition furnace and the heat incident to combustion of the material passing beneath such furnace.

The material to be sintered is delivered to the hopper by a spout 27 disposed and adapted to direct the material against the inner face of front wall 25 of the hopper. This spout preferably swings transversely of the hopper so as to distribute the material the full width thereof. The manner of mounting this spout and imparting swinging movement thereto is well known in the art and need not be illustrated nor described in detail.

According to present practice, the hopper remains stationary and the distance between the front wall of the hopper and the delivery spout remains fixed. The pallets 5, carrying the grate sections 28, travel beneath the hopper and receive therefrom the material to be sintered. This material collects in a pile or ridge at the lower portion of front wall 25 of the hopper, and it is the present practice to deliver the material with the fines and the aggregates thereof mixed indiscriminately so that an appreciable portion of the fines is deposited directly upon the surface of grate 28. The present practice is illustrated in Figure 5 in which the layer of material is designated at 29. The depositing of the material upon the grates in this manner is objectionable because the fines stop and clog the grate openings seriously interfering with combustion and curtailing production of the machine, as above pointed out.

The angle of repose of the material to be sintered varies in accordance with the nature of such material and the moisture content thereof. I have found that by controlling the angle of the rearward surface of the ridge or pile of material deposited upon the grate surfaces at the inner face of wall 25 of the hopper, it is possible to separate the fines and the aggregates of the material by gravity, and to dispose the aggregates upon the grates in advance of the fines. This will be understood more clearly from Fiure 4, in which the ridge of material at the inner face of wall 25 is designated 30. The inclination of the rearward face of ridge 30 can be controlled by the adjustment of wall 25 relative to the delivery spout 27. For any given material, the relation between this wall and the spout is such that the rearward face of ridge 30 will be inclined at such an angle as to cause the aggregates, which are the heavier particles of material, to roll downwardly onto the grates at the bottom of the ridge or pile. In this manner, I separate the fines and the aggregates by gravity and deliver the aggregates to the grates in advance of

the fines so as to form upon the grates a lower, loose and porous layer of aggregate, this layer being designated 31, and an upper layer 32 composed mostly of fines but including a small portion of the smaller aggregates, this upper layer being superposed upon the lower layer. By adjusting the hopper in proper direction, the proper relation between wall 25 and spout 27 to produce the desired results for a given material can be obtained with facility. This separation of the material into fines and aggregates occurs as a continuous operation and is incident to the delivery of the material to the hopper. This is advantageous as permitting operation of the machine at relatively high speed, this high speed operation being rendered possible due to the increased rate of combustion resulting from the ready flow through the material upon the grates of air and products of combustion. As the pallets pass beyond the front wall 25 of the hopper the material upon the grates 28 is leveled off by the lower edge of this wall, or in any other manner, after which the pallets pass beneath the ignition device where the material is ignited and, during continued travel of the pallets, rapid combustion of the mass occurs downwardly through the same as the pallets pass above the wind boxes.

By my invention I provide simple and highly efficient means for separating the material to be sintered into fines and aggregates and for depositing the aggregates upon the grates in a loose and porous layer and then depositing the fines upon this lower layer, this separation and depositing of the material upon the grates occurring as a continuous operation and during travel of the pallets. I thus avoid the objections to the present practice of depositing the material upon the pallet grates with the fines and the aggregates mixed indiscriminately, as above pointed out, and by avoiding clogging of the grates and thus rendering it possible to operate the machine at higher speed than is possible under present practice, I greatly increase the production of the machine.

What I claim is:—

1. In a sintering machine, a hopper comprising a front wall, pallets traveling beneath the hopper and provided with grates for reception of material to be sintered, the front wall of the hopper being substantially perpendicular to the material receiving surface of the grates, means for delivering material to be sintered against the inner face of said front wall, and means for effecting relative adjustment between the front wall of the hopper and the delivering means toward and away from each other and thereby vary the inclination of the rearward portion of the material delivered onto the pallet grates.

2. In a sintering machine, a hopper comprising a front wall, pallets traveling beneath the hopper and provided with grates for reception of material to be sintered, the front wall of the hopper being substantially perpendicular to the material receiving surface of the grates, means for delivering material to be sintered against the inner face of said front wall, and means for adjusting the front wall of the hopper toward and away from the delivering means.

3. In a sintering machine, a frame, a hopper extending transversely of the frame and slidably mounted for adjustment lengthwise of the frame, pallets traveling lengthwise of the frame beneath the hopper and provided with grate sections for receiving from the hopper material to be sintered, the hopper including a front wall, a spout disposed to discharge material to be sintered against the inner face of said wall, and means for adjusting the hopper toward and away from said spout.

4. In a sintering machine, a frame, brackets secured to and extending upwardly from the frame at the sides thereof, a hopper slidably mounted upon the brackets for adjustment lengthwise of the frame and provided with a front wall, pallets traveling beneath the hopper and provided with grate sections for receiving from the hopper material to be sintered, means for delivering material to be sintered against the inner face of said front wall, and means for adjusting the hopper toward and away from said delivering means.

5. In a sintering machine, a frame, brackets secured to and extending upwardly from the frame at the sides thereof, a hopper slidably mounted upon the brackets for adjustment lengthwise of the frame and provided with a front wall, track sections carried by the brackets and constituting a portion of a track, pallets traveling on said track portion and beneath the hopper, said pallets being provided with grate sections for receiving from the hopper material to be sintered, means for delivering material to be sintered against the inner face of said front wall, and means for adjusting the hopper toward and away from said delivering means.

6. In a sintering machine, a frame, brackets secured to and extending upwardly from the frame at the sides thereof, a hopper slidably mounted upon the brackets for adjustment lengthwise of the frame and provided with grate sections for receiving from the hopper material to be sintered, means for delivering material to be sintered against the inner face of said front wall, pallets traveling beneath the hopper for receiving the material therefrom, and adjusting screws having screw connection to the frame and operatively connected to the hopper for moving it toward and away from the delivering means.

7. In a sintering machine, a frame, supporting brackets secured to and extending upwardly from the frame at the sides thereof, hopper brackets having dovetail connection with the supporting brackets for sliding movement thereon lengthwise of the frame, screw brackets secured to the frame beyond said supporting brackets, adjusting screws threading through said screw brackets and having operating connection to the hopper brackets, a hopper mounted upon the hopper brackets for movement therewith and provided with a front wall, means for delivering material to be sintered against the inner face of said wall, and pallets traveling beneath the hopper and having grates for reception from the hopper of the material to be sintered.

8. In a sintering machine, a traveling grate structure, a hopper above the grate structure and provided with a front plate disposed substantially perpendicular to the upper face of said grate structure, and means for delivering material to be sintered against the rearward face of the plate remote from the lower edge thereof and in a freely flowing stream, the plate acting to direct the material onto the grate and to cause the material to collect upon the grate at the rear of the plate and in a pile the rearward surface of which is inclined downwardly and rearwardly at a predetermined angle such that the heavier particles of the material will be delivered upon the grate by gravity prior to delivery of the lighter particles of material whereby the material is caused to be deposited upon the grate in a bed comprising a lower layer of coarse particles and an upper layer of fine particles.

9. In a sintering machine, a traveling grate structure, a hopper above the grate structure and provided with a front plate disposed substantially perpendicular to the upper face of said grate structure, and means for delivering material to be sintered against the rearward face of the plate remote from the lower edge thereof and in a freely flowing stream, the plate acting to direct the material onto the grate and to cause the material to collect upon the grate at the rear of the plate and in a pile the rearward surface of which is inclined downwardly and rearwardly at a predetermined angle such that the heavier particles of the material will be delivered upon the grate by gravity prior to delivery of the lighter particles of material whereby the material is caused to be deposited upon the grate in a bed comprising a lower layer of coarse particles and an upper layer of fine particles, the plate and the delivering means having relative adjustment toward and away from each other for adjusting the angle of inclination of the rearward surface of the pile of material upon the grate in accordance with the material being sintered and the condition thereof.

10. In a sintering machine, a traveling grate structure, a plate above the grate structure, and means for delivering material against the rearward face of the plate in a freely flowing stream, said delivering means and the plate being so related as to cause the material to collect upon the grate structure at the rear of the plate and in a pile the rearward surface of which is inclined downward and rearwardly at a predetermined angle such that the heavier particles of the material will be delivered upon the grate by gravity prior to delivery of the lighter particles of material whereby the material is caused to be deposited upon the grate in a bed comprising a lower layer of coarse particles and an upper layer of fine particles.

11. In a sintering machine, a traveling grate structure, a plate above the grate structure, and means for delivering material against the rearward face of the plate in a freely flowing stream, said delivering means and the plate being so related as to cause the material to collect upon the grate structure at the rear of the plate and in a pile the rearward surface of which is inclined downward and rearwardly at a predetermined angle such that the heavier particles of the material will be delivered upon the grate by gravity prior to delivery of the lighter particles of material whereby the material is caused to be deposited upon the grate in a bed comprising a lower layer of coarse particles and an upper layer of fine particles, the plate and the delivering means having relative adjustment for adjusting the angle of inclination of the rearward surface of the pile of material upon the grate in accordance with the material being sintered and the condition thereof.

In witness whereof, I hereunto subscribe my name this 14th day of March, 1930.

GEO. E. SWINEHART.