W. M. DAVISON AND G. C. RIDDELL.

SINTERING MACHINE.

APPLICATION FILED AUG. 3, 1917. RENEWED JULY 12, 1919.

1,315,910.

Patented Sept. 9, 1919.

3 SHEETS—SHEET 1.

FIG. 1.

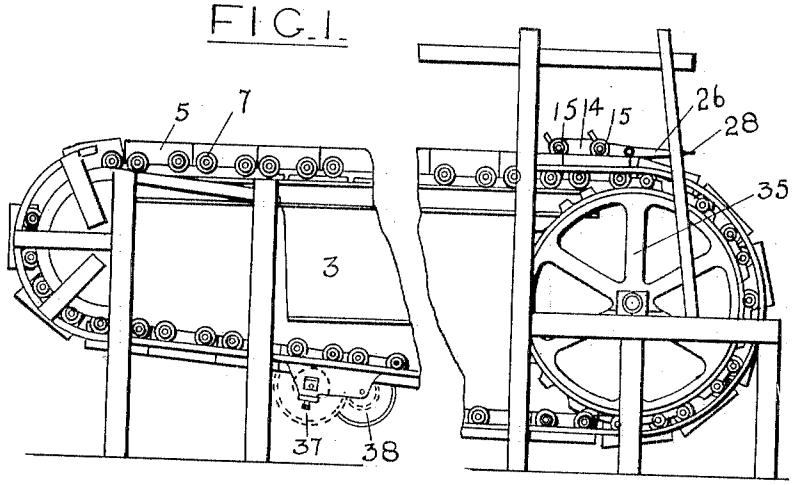


FIG. 2.

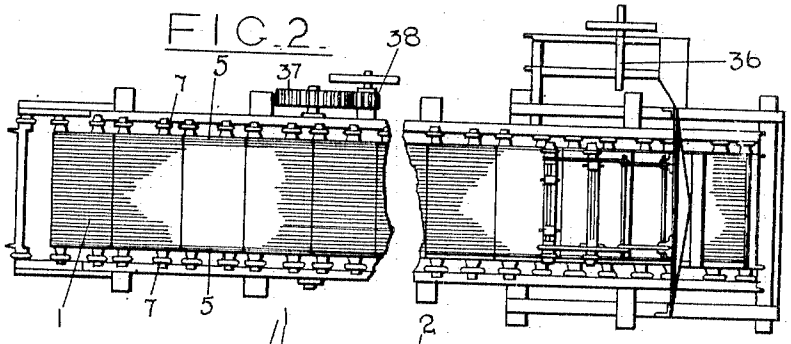


FIG. 3.

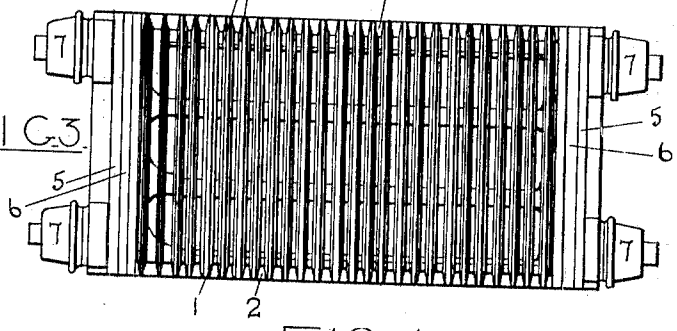
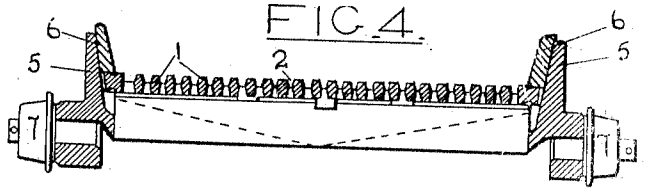


FIG. 4.



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3 SHEETS—SHEET 2.

FIG. 5.

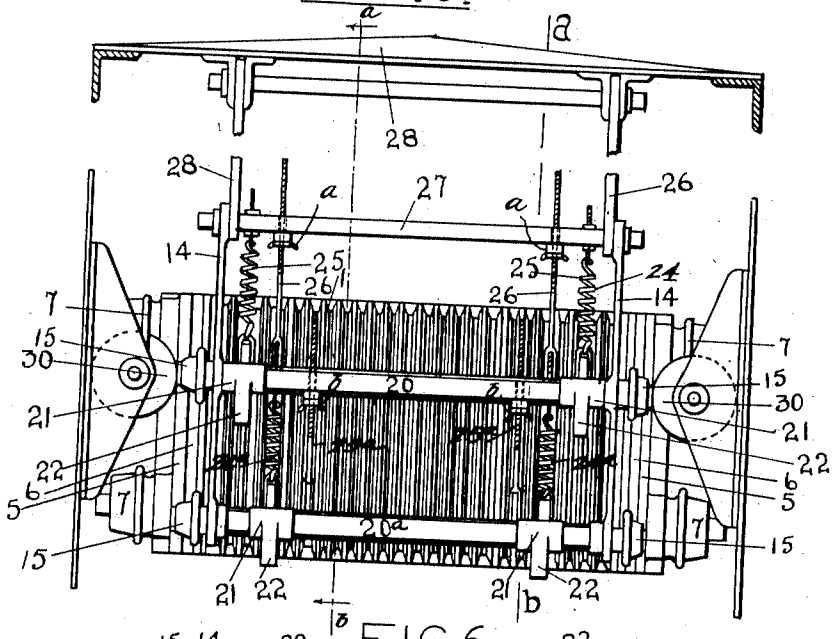


FIG. 6.

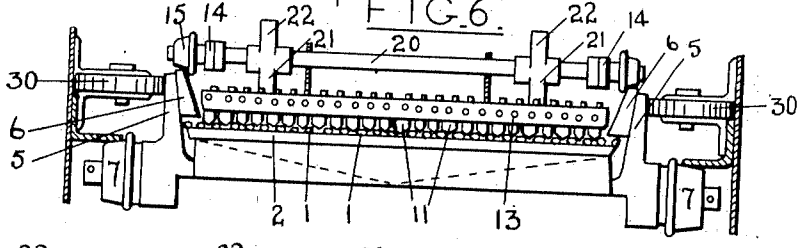


FIG. 7.

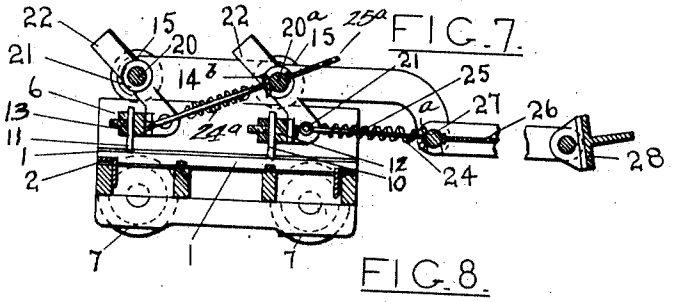
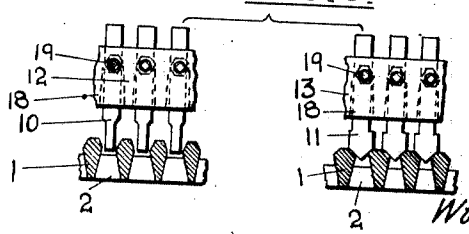


FIG. 8.



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3 SHEETS—SHEET 3.

FIG. 9.

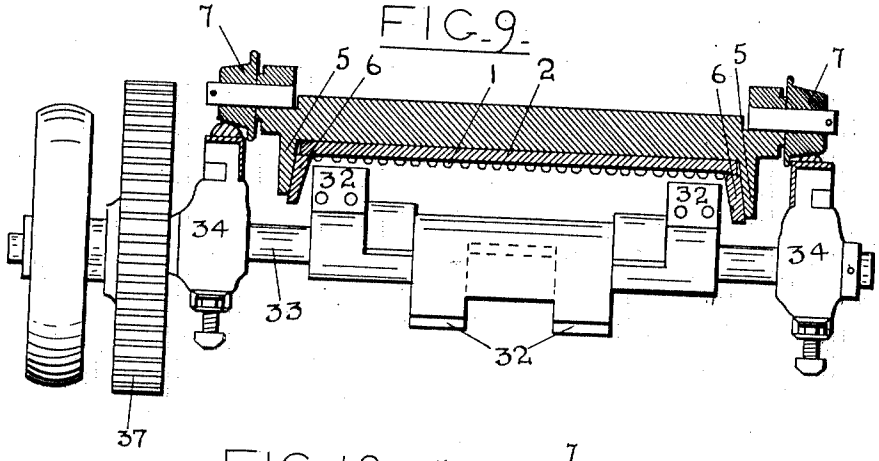


FIG. 10.

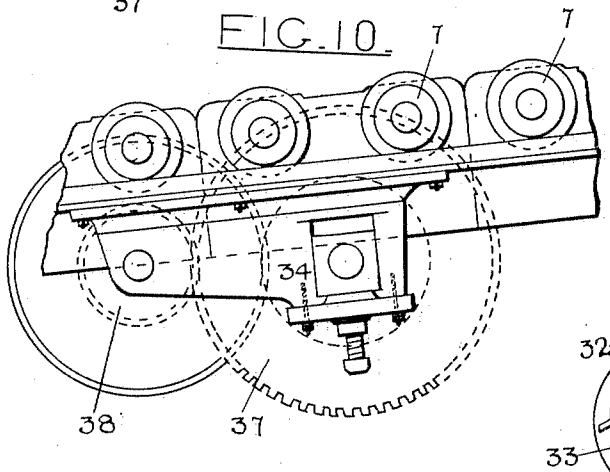


FIG. 11.

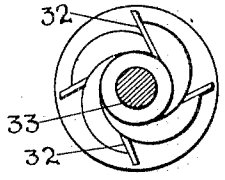
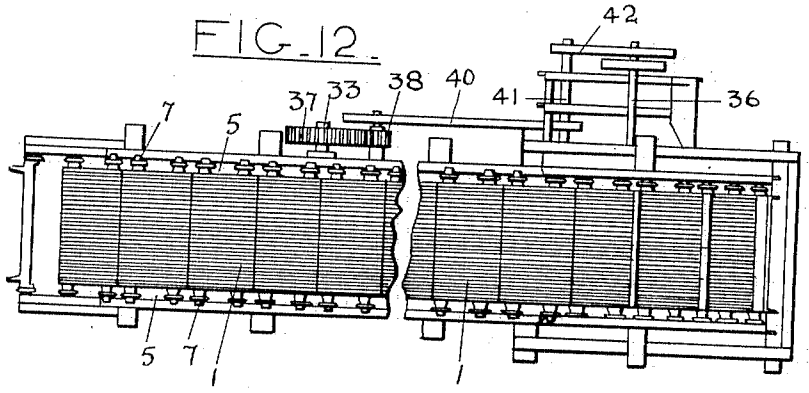


FIG. 12.



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UNITED STATES PATENT OFFICE.

WILLIAM MILLER DAVISON AND GUY CROSBY RIDDELL, OF PORT PIRIE, SOUTH AUSTRALIA, AUSTRALIA.

SINTERING-MACHINE.

1,315,910. Specification of Letters Patent. Patented Sept. 9, 1919.

Application filed August 3, 1917, Serial No. 184,349. Renewed July 12, 1919. Serial No. 310,499.

To all whom it may concern:

Be it known that we, WILLIAM MILLER DAVISON, a subject of the King of Great Britain and Ireland, and GUY CROSBY RIDDELL, a citizen of the United States of America, and residents of Port Pirie, State of South Australia, Commonwealth of Australia, have invented certain new and useful Improvements in and Relating to Sintering-Machines, of which the following is a specification.

This invention relates primarily to certain improvements in grates for use with roasting and sintering machines of those types which employ traveling grates which are liable to become clogged in the air spaces by the sintered material, and in particular for use with the well known "Dwight and Lloyd's sintering machine" in which sections of the grate mounted upon a series of wheeled pallets are caused to travel along a continuous track over a suction wind box and beneath an oil burner or other source of heat; and also to certain improved devices for use in conjunction therewith for the purposes of cleaning from the grate any of the sintered material which may cling thereto and so clog the grate and particularly the spaces between the bars.

In order that our invention may be clearly understood we will describe the same with reference to the accompanying drawings in which:—

Figures 1 and 2 are side and plan views respectively showing portions of a "Dwight and Lloyd" system sintering machine with our invention applied thereto. These figures do not show details.

Figs. 3 and 4 are plan view and transverse section respectively showing our improved grate in position upon a pallet.

Figs. 5 and 6 are plan view and rear view respectively showing the arrangement of the carriage carrying our plowing and scraping tools relatively to the grate and pallet.

Fig. 7 is a central section on line *a b* of Fig. 5.

Fig. 8 is a detail view from the rear showing the method of securing the plowing and scraping tools in the tool boxes.

Figs. 9 and 10 are front and side views respectively of the revolving cutters for chopping away adhering sintered material from the grate.

Fig. 11 is a cross section of the revolving shaft and cutters showing the boss which holds the cutters.

Fig. 12 is a diagrammatic plan view showing the means for driving the revolving cutters.

Figs. 3 to 7 and 9 to 11 are drawn to a much larger scale (4 times) than Figs. 1, 2 and 12, and Fig. 8 is drawn to a much larger scale (3 times) than Figs. 3 to 7 and 9 to 11.

Our improved grate may be constructed in 1, 2 or 3 sections for each pallet of the machine, such grate section or sections being attached to the pallet. Preferably the grate to cover each pallet is made in the one section only. These grates are constructed to suit the existing pallets.

Each grate section comprises a number of grate bars 1 running from front to rear connected together by a frame 2 forming one piece, such section being fastened or held in place upon the pallet by side plates 6 bolted to the side walls 5 of the pallet as heretofore.

There will be various modifications of the means for holding the grates in place upon the pallets, it being evident that the fastenings must be adapted to the form of pallet to which our grate is applied.

With the object of accomplishing a better cleaning of the grate the grate bars 1 are beveled off upon each side to facilitate the cleaning of the same by the scraping tools, while the ends of the bars are tapered off to insure that the plowing tools hereafter described shall readily find their way into the spaces between the bars.

The tops of the four cross ribs of the frame 2 of the grate and which connect the grate bars 1 together are dropped sufficiently below the tops of the grate bars for a distinct elevation of the ore charge above the cross ribs, resulting in better distribution of air through and above the material on the grate directly over these ribs and to allow the plowing tools ample clearance in their travel. This is shown clearly in Figs. 4 and 8. The ribs must be depressed quite a good deal below the narrowest part of the slot to prevent the ore from fusing, flowing, packing and sticking to said ribs and thereby resisting the discharge of the ore from the grate.

Each traveling pallet is supported by four flanged rollers 7 engaging the machine framework, the pallets and the machine

framework being constructed as heretofore and forming no part of our invention.

In conjunction with our improved construction of grate proper we provide means for cleaning the bars and the spaces between the bars upon each revolution or passage of the grate around the machine. This consists of a set of plowing tools 10 and a set of scraping tools 11 arranged across the machine and held in two tool boxes 12 and 13 respectively attached to a carriage 14 or frame carried on flanged rollers 15 which run upon the beforementioned side plates 6 bolted to the side walls 5 of the pallets or upon the side walls themselves, and which keep the carriage at a uniform height above the grate bars as the same pass beneath them thereby allowing the tools to be set as hereafter described to the depth required.

The plowing tools 10, a tool for each space, are held in a tool box 12 toward the leading end of the carriage and are set at such a depth as to project below the narrowest part of the spaces. The scraping tools 11, a tool for each space, are held in a tool box 13 toward the trailing end of the carriage and are set at such a depth as to keep the beveled faces of the bars clean and prevent incrustations thereon.

The plowing and scraping tools are carried in sockets 18 in their respective tool boxes with set screws 19 and lock nuts whereby they may be adjusted and secured at the desired height relatively to the grate bars and frame. The sockets 18 are made somewhat tapered to permit the tools to adjust themselves slightly sidewise to respond to the expansion and contraction of the grates. The screws 19 permit the tools to be removed and sharpened when necessary.

The tool boxes 12 and 13 are suspended from the axles 20 and 20^a, respectively, by means of two carriers 21, one toward each end, which are capable of a rotary movement about the axle permitting the tools to swing backward and upward clear of the grate should an immovable obstruction strike one or more of them. The carriers 21 are preferably fitted with counterweights 22 as shown. Springs 24 are secured to the carriers of the tool box 12 and to the bar 27 of the carriage at the leading end thereof, and to the tool box are hinged screw rods 25, which pass loosely through openings in the bar 27 of the carriage and are provided with nuts *a*. Springs 24^a are secured to the carriers of the tool box 13 and to the shaft 20, and to the tool box are hinged screw rods 25^a, which pass loosely through openings in the shaft 20 and are provided with nuts *b*. The springs 24 and 24^a hold the tools yielding to their work, and the screw rods and nuts limit this forward movement of the tool, and consequently limit the distance the tools 10 project between the grate bars and the pressure the tools 11 bear upon the said grate bars.

The cleaner is held stationary in position over the traveling grates by means of two rods 26, each of which has at the one end an eye which fits upon the cross bar 27 of the carriage and at the other end an eye or other device whereby it is fastened to a beam 28 fastened to the backstays of the machine framework. There are also two side rollers 30 carried by the machine framework and impinging against the outside of the side walls 5 of the pallets to keep them in alinement.

We further provide a preliminary cleaning device where it happens that the material is more than usually refractory, is more leady or sticky in character. In such case there is a possibility that the mass of sintered material will not fall from the grate at the delivery end of the machine. To deal with this we provide a revolving cutter 32 or series of cutters secured upon a shaft 33 supported in bearings 34 attached to the angle iron frame of the machine beneath and a little behind the delivery end of same. The cutters 32 are arranged in sections and are caused to revolve in the same direction as the pallets are traveling and to chop away the material from the grate leaving only a thin layer on the bars 1 preparatory to entering the main cleaner previously described. The bearings 34 of the revolving shaft 33 are adjustable so that the shaft can be raised or lowered slightly to adjust the cutters 32 toward or from the surface of the grate bars. At the same time they assist in causing the pallets to slide toward the main sprocket 35 of the machine.

The shaft and cutters are caused to rotate by suitable connection to the main drive shaft 36 of the machine. The means shown in the drawings comprises a spur wheel 37 secured upon the end of the shaft and a small pinion 38 gearing therewith and a belt pulley mounted upon a pin adjacent thereto, such belt pulley being connected by a belt 40 to a pulley upon a counter shaft 41 which carries a sprocket wheel connected by a chain 42 with a sprocket secured upon the end of the main drive shaft 36.

By means of our invention we provide a grate that keeps approximately clean automatically; that insures a free, full, and much increased flow of air through the grate at all times; that insures better sintering of the material under treatment; that is not liable to breakage through cleaning; that does not require any stoppage or delay for cleaning purposes; and that insures a larger output. The grate is practically self-cleaning in that the mass of sintered material slides away freely as the pallet turns over at the delivery end of the machine, enabling the fall of the pallet to be considerably re-

duced, thereby favorably affecting the life of the pallets.

Where the material being treated is of a more leady and sticky nature it is more liable to cling to the grate, and the revolving cutters should be employed to chop away the bulk of the adhering material preparatory to the final cleaning by the plowing and scraping tools of any hard clogging of the air spaces of the grate.

Having now fully described and ascertained our said invention and the manner in which it is to be performed, we declare that what we claim is:—

1. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction wind box and beneath an oil burner or other source of heat; a grate having its bars running from front to rear with their top edges beveled off upon each side, and having the cross ribs or frame whereby the bars are connected together dropped some distance below the top of the bars, substantially as described.

2. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction wind box and beneath an oil burner or other source of heat; a grate having its bars running from front to rear with their top edges beveled off upon each side and with their ends tapered off, and having the cross ribs or frame whereby the bars are connected together dropped some distance below the top of the bars, substantially as described.

3. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction windbox and beneath an oil burner or other source of heat; a grate formed of one or more sections, each such section having a number of grate bars running from front to rear and connected together by cross ribs forming a frame for same, the tops of the bars having their edges beveled off on each side to allow the coarser material of the charge to lodge between the bars and to permit the freer flow of air through the charge into the wind box, and the ends of the bars being tapered off to insure that plowing tools shall readily find their way into the spaces between the bars, and the cross ribs or frame being dropped some distance below the narrowest part of the spaces between the grate bars to allow ample clearance for said plowing tools in their travel, substantially as described.

4. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction wind box and beneath an oil burner or other source of heat, each of such grates having bars running from front to rear and connected together by cross ribs or frame dropped some distance below the top of the grate bars; means for cleaning the bars and the spaces between the bars comprising a set or sets of tools arranged across the machine and supported from a stationary carriage which in turn is supported by the side walls or other part of the pallets which carry the grates beneath it, substantially as described.

5. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction wind box and beneath an oil burner or other source of heat, each of such grates having bars running from front to rear and connected together by cross ribs or frame dropped some distance below the top of the grate bars; a set of plowing tools, one for each air space, and a set of scraping tools, one for each air space, arranged across the machine and held in two tool boxes suspended from the axles of a carriage carried on flanged rollers which run upon the side walls or other part of the pallets which carry the grates, with means for normally holding the tool boxes with the plowing and scraping tools in operative position, and with means for holding the carriage stationary relatively to the onward movement of the grates, substantially as described.

6. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction wind box and beneath an oil burner or other source of heat, each of such grates having bars running from front to rear and connected together by cross ribs or frame dropped some distance below the top of the grate bars; a set of plowing tools, one for each air space, held by means of setscrews in tapered sockets in a tool box suspended from the axle of a carriage carried on flanged rollers which are supported by some part of the traveling pallets which carry the grates, the tool box and tools being normally maintained in operative position by means of springs and adjusting rods which however permit them to swing clear of the grate backward and upward about the axle when necessary, substantially as described.

7. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction wind box and beneath an oil burner or other source of heat, each of such grates having bars running from front to rear and connected together by cross ribs or frame dropped some distance below the top of the grate bars and such bars having beveled upper edges; a set of scraping tools, one for each air space, held by means of setscrews in tapered sockets in a tool box suspended from the axle of a carriage carried on flanged rollers which are supported by some part of the traveling pallets which carry the grates, the tool box and tools being normally maintained in operative position by means of springs and adjusting rods which however permit them to swing

clear of the grate backward and upward about the axle when necessary, substantially as described.

8. In a roasting and sintering machine wherein traveling grates are caused to travel over a suction wind box and beneath an oil burner or other source of heat; a cutter or cutters secured upon a shaft supported in bearings attached to the angle iron frame of the machine beneath and a little behind the delivery end of the same, with operative connections between such shaft and the main drive shaft of the machine whereby such shaft with the cutter or cutters is caused to revolve in the same direction as the pallets and grates are traveling and therefore to chop away any masses of material adhering thereto, substantially as described.

9. A grate for sintering machines having grate bars and ribs binding the bars having their upper edges depressed below the upper edges of the grate bars, substantially as and for the purpose set forth.

10. A grate for sintering machines having top beveled grate bars forming downwardly tapering slots, and ribs binding the grate bars and having their upper edges depressed below the narrowest part of the slot, substantially as and for the purpose set forth.

11. A grate for sintering machines having grate bars beveled through their length at their upper edges to form downwardly-tapering slots, and ribs binding the grate bars and having their upper edges depressed below the narrowest part of the slots formed by the grate bars, said grate bars tapering at the ends thereof to the level of the ribs.

In testimony that we claim the foregoing as our invention we have signed our names in the presence of two subscribing witnesses.

Signed by the said WILLIAM MILLER DAVISON this sixth day of June, 1917, in the presence of two witnesses.

WILLIAM MILLER DAVISON.

Witnesses:

ARTHUR GORE COLLISON,

KATHLEEN MARY COLLISON.

Signed by the said GUY CROSBY RIDDELL this eighth day of June, 1917, in the presence of two witnesses.

GUY CROSBY RIDDELL.

Witnesses:

P. HAGUE,

DORIS OSBORNE.