Oct. 16, 1956 G. A. HOGGATT ET AL 2,767,065

METHOD AND APPARATUS FOR PRODUCING PLASTER

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Fig. 1

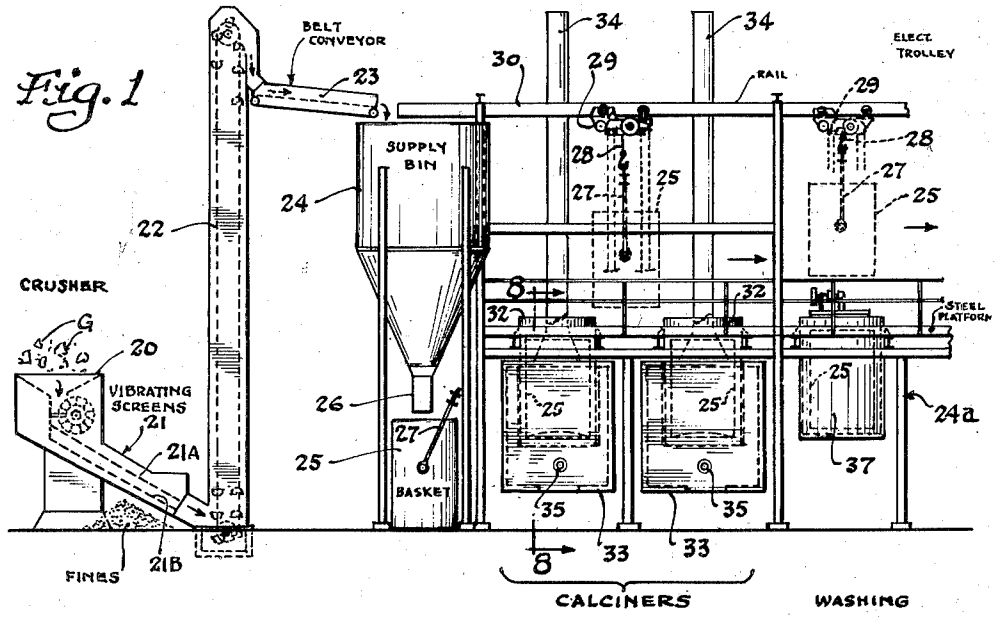

Fig. 4

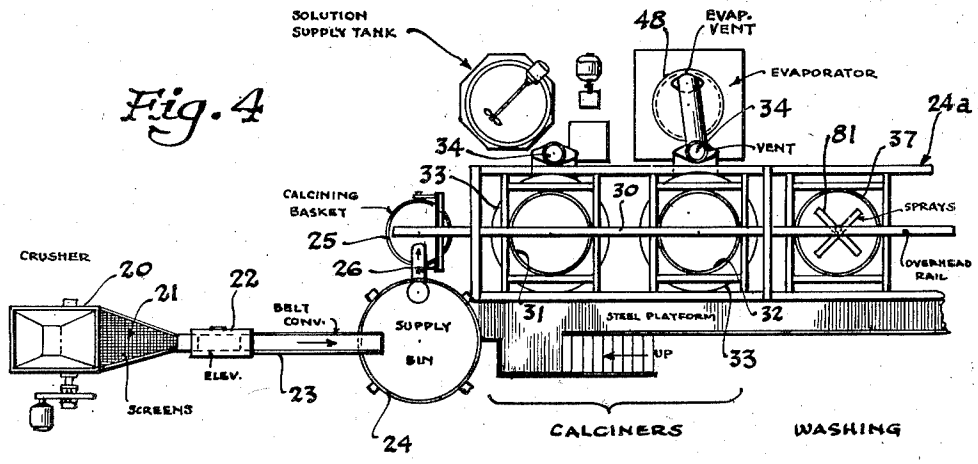

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Fig. 2

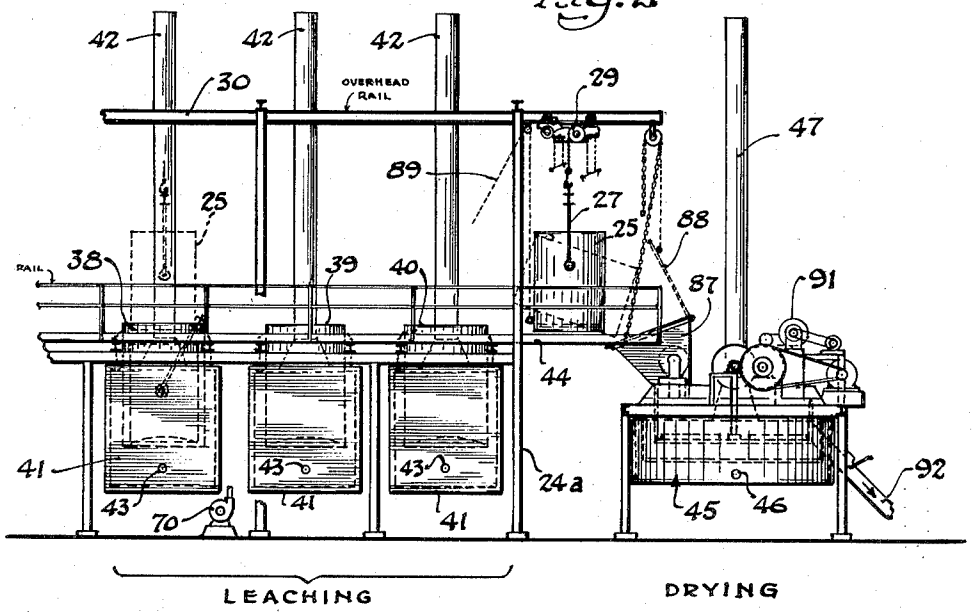
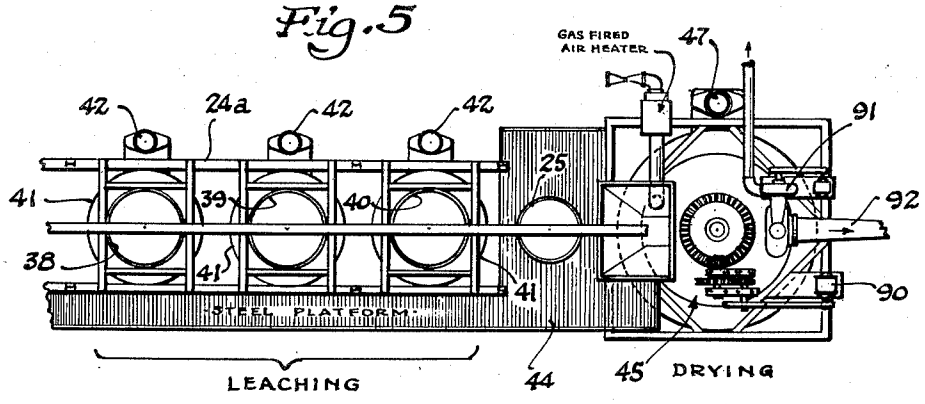


Fig. 5



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METHOD AND APPARATUS FOR PRODUCING PLASTER

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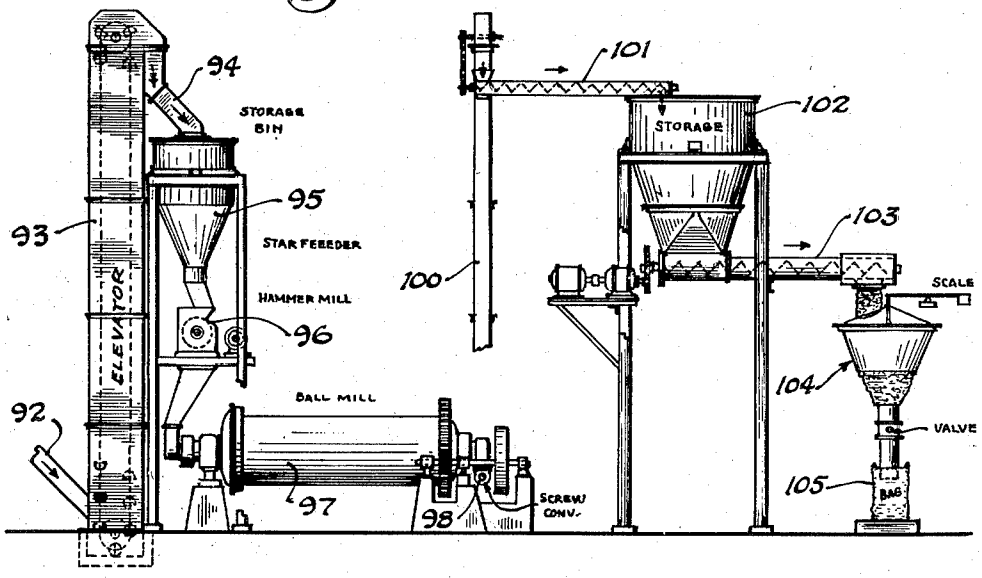
Fig. 3



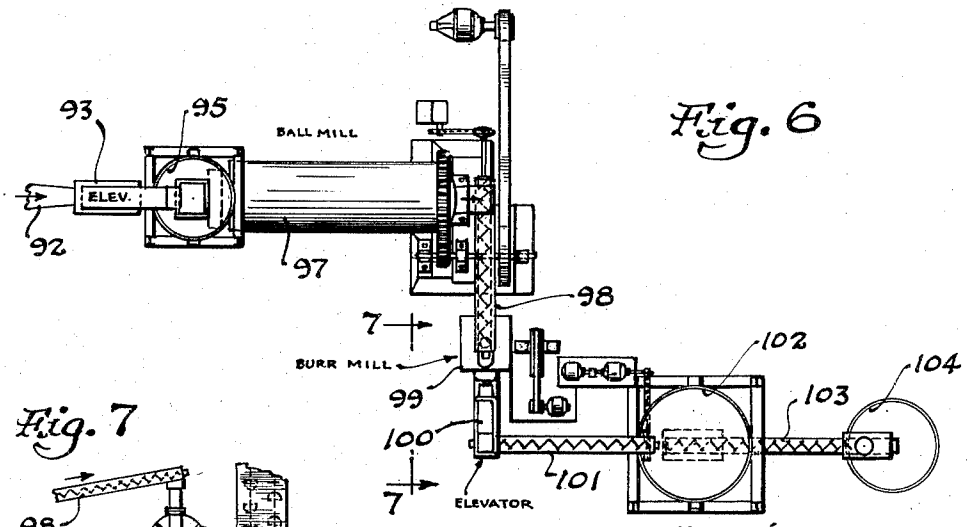
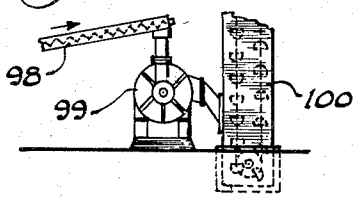


Fig. 6

Fig. 7



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METHOD AND APPARATUS FOR PRODUCING PLASTER

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Fig. 9

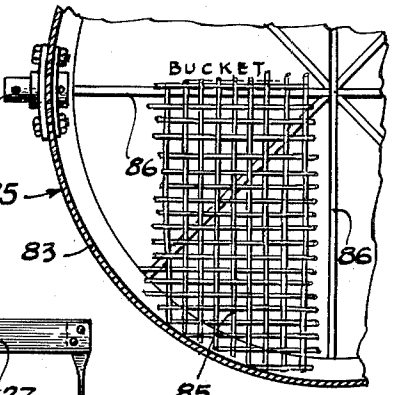

Fig. 8

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Fig. 10

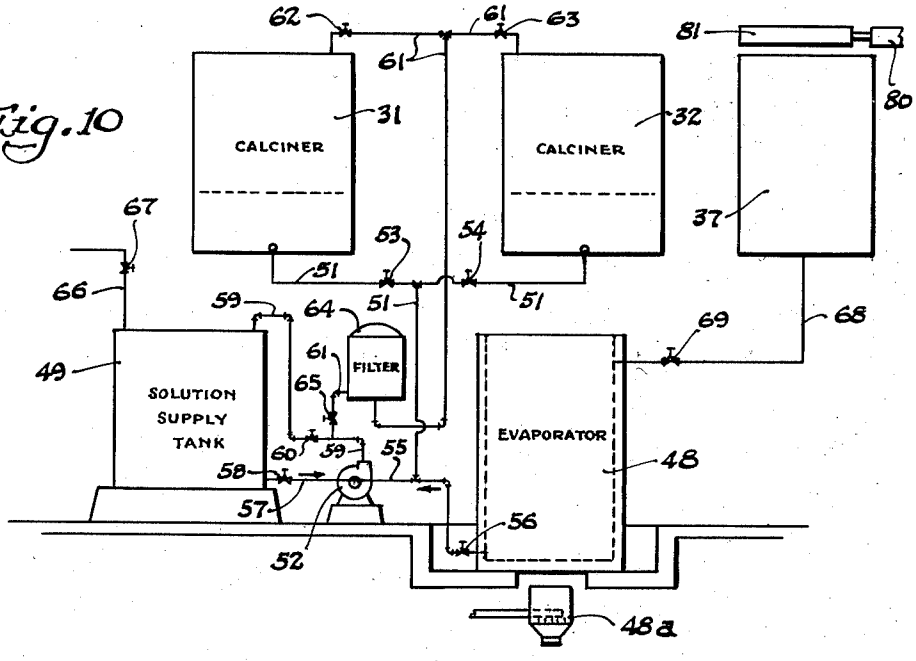
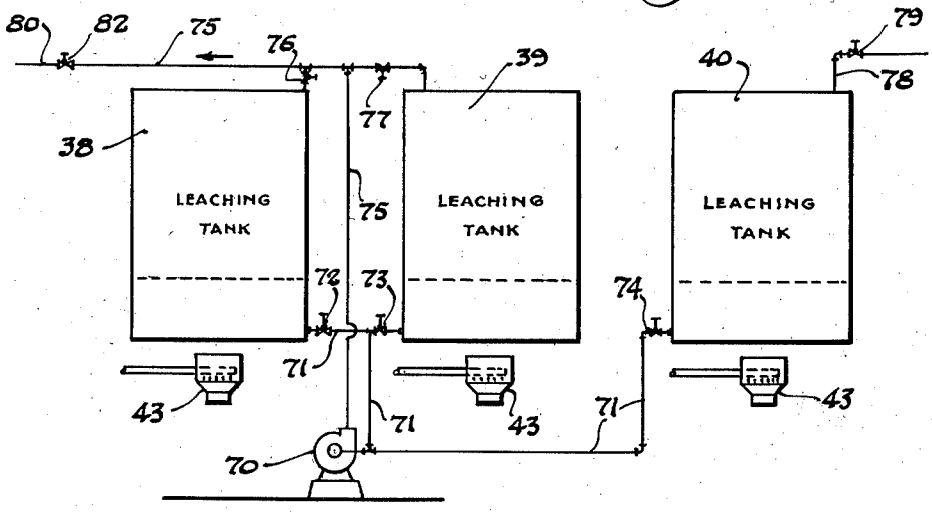


Fig. 11



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United States Patent Office 2,767,065
Patented Oct. 16, 1956

2,767,065

METHOD AND APPARATUS FOR PRODUCING PLASTER

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Application March 19, 1951, Serial No. 216,294

13 Claims. (Cl. 23—260)

This invention relates to an improved method of and apparatus for producing high grade, low water-carrying-capacity calcined gypsum by breaking raw gypsum rock into pieces of the desired size and heating the rock in a salt solution and otherwise treating such gypsum rock under the process that is broadly disclosed by the copending application, Serial No. 216,434, filed March 19, 1951, by Gilbert A. Hoggatt who is one of the present applicants which has matured into U. S. Patent Serial No. 2,616,789. The apparatus as shown is designed preferably for carrying out the calcination step of the process on a batch by batch basis, though some of the steps of the complete process of producing the plaster may be carried out by a continuing process. The type of the salt solution in which the gypsum rock is submerged for the calcining step, the concentration of such solution, the temperatures at which the rock is treated, and the periods of time during which the various steps of the operation are carried out are preferably to be controlled in accordance with the teachings of said Hoggatt application.

It is the object of our invention to provide an improved form of apparatus by which the process of said Hoggatt application may be carried out to advantage and by the use of which refinements in the process may be practiced as hereinafter described. Specifically, it is one of the objects of the invention to provide for the smooth, easy and economical movement of the gypsum through the apparatus, from the initial step of introducing the gypsum rock into the crushing and sizing apparatus to the final step of placing the gypsum plaster in bags.

It is another of our objects to provide an improved form of means by which the salt solution is separated from the calcined rock after the completion of the calcination process, whereby effective results may be attained by the use of a minimum amount of rinsing water which may be handled in batches and shifted from one point of use to another for use to the best advantage both with respect to removal of the salt from the rock and with respect to the reclamation of the salt from the solution in condition for use in a subsequent calcination operation.

It is one of the objects of our invention to provide an improved form of calcining kettles and the baskets and other parts cooperating therewith for handling the rock submerged in the salt solution for carrying out the desired calcination operation.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principles thereof and what we now consider to be the best mode in which we have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Figs. 1, 2 and 3 together show an elevational view of our improved apparatus, Fig. 2 being a continuation of Fig. 1 toward the right and Fig. 3 being a continuation of Fig. 2.

Figs. 4 and 5 and 6 are respectively top plan views of the apparatus shown in Figs. 1, 2 and 3;

Fig. 7 is a vertical sectional view taken substantially at the line 7—7 in Fig. 6;

Fig. 8 is a vertical sectional view taken substantially at the line 8—8 in Fig. 1;

Fig. 9 is a horizontal sectional view taken substantially at the line 9—9 in Fig. 8;

Fig. 10 is a schematic view showing connections between the calcining kettles and certain associated parts; and

Fig. 11 is a schematic view showing the connections between the several tanks.

Referring now to the several figures of the drawings, in which corresponding parts are indicated by the same reference characters, and in which many of the parts are shown diagrammatically, 20 indicates a rock crusher of any approved type to which the raw gypsum rock is fed for being crushed into relatively small pieces ranging from about ⅛ of an inch to ¾ of an inch across, from which crusher the rock is passed along a pair of vibrating screens 21A and 21B so that the screen 21A removes the oversize particles while the lower and smaller mesh screen 21B retains the properly sized particles and passes the fine particles. The crushed and screened rock from the screen 21B is delivered to an elevator 22 by which it is moved upwardly and discharged into position on a conveyor 23 of any suitable type for delivery of the rock into a supply bin 24 supported in raised position of a frame work 24A. From this bin 24, the crushed rock pieces are fed downwardly under manual control into baskets 25 placed successively into position below a discharge spout 26 leading from the bin 24. The crusher 20 and the elevator 22 are operated by power from any suitable source at suitable intervals as may be required for keeping a supply of the crushed rock in the bin 24 ready for use.

Each of the baskets 25 is provided with a bail 27 pivotally connected therewith for releasable engagement with a lifting cable 28 depending from a travelling hoist 29 movably mounted on a track or rail 30, the arrangement being such as to enable the loaded baskets to be moved upwardly and downwardly one at a time by the cable 28 by power applied to the cable by the hoist, and to enable the baskets to be moved forwardly and backwardly along the track 30 as required.

For the calcination of the gypsum rock, we have provided two calcining kettles 31 and 32 each of a size and shape to receive conveniently one of the baskets 25 into position therein, as is clearly shown in Fig. 8, such kettles 31 and 32 being arranged directly underneath the rail 30 for making it easy to move the baskets into and out of position by the hoist 29. As illustrated in said Fig. 8, each of the kettles 31 and 32 is surrounded at its lower end portion by an insulated housing 33 providing a firebox, the upper end portion of which opens into a stack 34 for affording combustion, supporting draft at a gas jet 35 into appropriate position above the bottom opening 36 in the wall of the housing.

Adjacent to the calcining kettle 32, in line with the kettles 31 and 32 toward the right in Fig. 1, and positioned underneath the rail 30, a washing tank 37 is provided, positioned with its open upper end at the same level with the open upper ends of said kettles 31 and 32; and farther toward the right in Figs. 1 and 2, a series of three leaching tanks 38, 39 and 40 are provided, positioned in line underneath the rail 30 so as to enable the baskets 25

to be lowered successively into said tanks through the medium of the hoist 29. Each of the leaching tanks is surrounded at its lower end portion by an insulated housing 41 communicating at its upper end with a stack 42 for creating the necessary draft for rendering gas heating means 43 effective for heating the tank and its contents.

At a short distance to the right of the leaching tank 40 in Fig. 2, we have provided a platform 44 at about the same height as that of the upper ends of the leaching tanks, upon which platform each of the baskets 25 is adapted to be positioned in turn as shown at the right in Fig. 2 preparatory for delivering of the contents of the basket to a dryer mechanism 45 of any approved type. The dryer mechanism as shown in Figs. 2 and 5 is adapted to be heated through the medium of gas heating means 46, a suitable draft for expediting the heating and drying operation being provided by the use of a stack 47 communicating with the dryer.

Adjacent to the calcining kettles 31 and 32 at one side thereof, Fig. 4, and at a lower level, we have provided an evaporator tank 48 and a supply tank 49 adapted to hold a suitable supply of the salt solution employed for submerging the gypsum rock for the calcination process. The evaporator 48 may be of the submerged heater type, as is well understood in the art, but which may be of any other approved form by which heat is applied for removing the greater portion of the water from the salt solution coming to the evaporator from the leaching tanks. In the arrangement shown, the evaporator 48 is provided with a stack 50, Fig. 4, for providing the desired draft for the heating mechanism employed in connection with said evaporator and indicated diagrammatically in Fig. 10 by a reference character 48A.

As is clearly shown diagrammatically in Fig. 10, the calcining kettles 31 and 32 are connected by pipes 51 with the inlet of a pump 52 which is adapted to be driven by power from any suitable source, shut-off valves 53 and 54 being interposed in the pipes 51 for controlling the effective connection with said kettles. The inlet of said pump 52 is also connected with the lower end portion of the evaporator 48 by means of a pipe 55 having a shut-off valve 58 therein, and is connected with the lower end portion of the supply tank 49 by means of a pipe 57 having a shut-off valve 58 therein.

The outlet side of the pump 52 is connected by a pipe 59 with the solution supply tank 49, with a shut-off valve 60 therein, and is connected from said pipe 59 to the calcining kettles 31 and 32 by a pipe 61 having shut-off valves 62 and 63 therein. As is clearly shown in Fig. 10, the pipe 61 leading to the kettles 31 and 32 is also provided with a filter 64 of any approved type interposed therein, a shut-off valve 65 being provided in the line of pipe adjacent to the filter.

A supply pipe 66 provided with a shut-off valve 67 also opens into the supply tank for having salt solution of the desired type from any suitable source to said supply tank. A pipe 68 also connects the lower end portion of the washing tank 37 with the evaporator tank 48, having a shut-off valve 69 connected therein for controlling the flow of liquid by gravity from the washing tank 37 to the evaporator.

As is shown in Fig. 11, the inlet side of a pump 70 is connected by piping 71 with the leaching tanks 38, 39 and 40, shut-off valves 72, 73 and 74 being provided for controlling the flow of liquid from the several leaching tanks. The pump 70 is adapted to be driven by power from any suitable source. The outlet side of said pump 70 is connected by a line of pipe 75 with the upper end portions of the leaching tanks 38 and 39, with shut-off valves 76 and 77 interposed in said piping for controlling the delivery of liquid to said tanks. Hot water is fed to the leaching tank 40 from any suitable source through a pipe 78 having a shut-off valve 79 interposed therein. One branch of the piping 75 is extended toward the left in Figs. 10 and 11 by means of a rubber hose 80 which in turn is connected with a spray head 81 of any suitable type arranged to be moved manually into and out of position over or on the upper end of a basket 25 positioned in the washing tank 37. A shut-off valve 82 is provided in the piping 75 for controlling the delivery of liquid to said spray head 81.

In the arrangement as shown in the drawings, each of the baskets 25 comprises a metal cylinder 83 having trunnions 84 on its side faces pivotally connected with the bail 27. The lower end of the cylinder is provided with a foraminated supporting member 85 of any suitable construction such as a piece of heavy wire netting, being reinforced by brace bars 86 so as to support the load of crushed stone in the basket so as to provide ready access of the liquid in the calcining kettle 31 with the particles of rock in the basket.

In the preferred form of our apparatus, the cylinder 83 forming the body of the basket 25 is of such form, see Fig. 8, as to permit it to rest against the bottom wall of the kettles 31 and 32. When the basket is lowered into such position and the salt solution is brought to a vigorous boil about and underneath the basket inside of the kettle, the solution is forced upwardly through the rock fragments by a percolator action so as to assure good circulation of the solution through the mass of the rock and so as to bring about rapid heat transfer from the solution to the rock. This rapid movement of the solution upwardly through the mass of the rock serves to carry away the water released from the gypsum during the calcination operation, and serves to insure uniform calcination of the rock at different parts of the basket.

In a calcination operation by the use of our improved structure, with a supply of suitable gypsum rock broken into pieces of the predetermined sizes in position in the bin 24, a basket 25 is filled with the rock and hoisted into position above one of the calcining kettles 31 or 32 which is supplied with a suitable quantity of a water solution of the salt selected for use, such as calcium chloride, or other suitable salt. This solution is preferably of the selected degree of concentration so as to be adapted to boil at a predetermined temperature under atmospheric pressure conditions, so that by observing the boiling temperature of the solution, the concentration of the solution may be determined and corrected. A basket 25 with its load of gypsum rock therein is lowered into position in the kettle 31 or 32 so that the rock is completely submerged in the solution, and after the solution has returned to a boiling temperature, such rock is kept in position in the boiling solution for a period of from 3½ to 5 hours, as taught in the aforesaid Hoggatt application, until the gypsum rock in its calcium sulphate dihydrate form is changed to calcined gypsum in calcium sulphate hemihydrate form. When tests show that the rock has been properly calcined, the basket is withdrawn from the kettle and placed in position in the washing tank 37, after which the spray head 81 is placed in position on top of the basket for a preliminary washing operation which removes the greater portion of the salt solution from the calcined rock, the rinsing water for this operation being taken from the leaching tank 38 by the pump 70 for delivery under pressure to said spray head 81. The rinsing water that is thus employed contains a fairly high salt content that has been leached from the preceding batches of the calcined rock, as will hereinafter become apparent.

Under and in accordance with the present invention, the leaching operations are performed successively in the leaching tanks 38, 39 and 40, and the water utilized in such leaching operations is utilized successively in the tanks 40, 39 and 38 as will be described in some detail hereinafter, and after use in the leaching tank 38, such water is utilized in the rinsing operation that is performed in the tank 37 as hereinabove described. Thus the water that is used in the leaching tank 40 is substantially free of salt, and it performs its leaching action on calcined

rock that has previously been subjected to a washing operation in the tank 37, a first leaching operation in the tank 38 and a second leaching operation in the tank 39. Hence, when the rock is placed in the final or third leaching tank 40 it contains a relatively small proportion of the residue of the salt, and the leaching of this rock in the final or third leaching tank 40 is performed with clear water so that such final leaching operation is highly effective.

With respect to the leaching operation that is performed in the tank 39, it should be observed that the leaching water is taken from the tank 40 so that it contains a small percentage of salt at the time when the leaching operation in the tank is started. The rock that is being leached in the tank 39 has, of course, been subjected to the preliminary washing operation in the tank 37 and to the first leaching operation in the tank 38 so that the amount of salt carried on the rock in the tank 39 is relatively higher with respect to the salt concentration of the leaching water that is used. The leaching operation in the tank 39 is, therefore, performed in a highly efficient manner.

The leaching operation in the tank 38 is performed with the water that has previously been used in the tank 39, and while the solution that is thus used in the tank 38 has a fairly high salt concentration, the rock that is being leached in the tank 38 carries salt in quantities or percentages that are quite high in a comparative sense so that the leaching operation is also performed efficiently in the tank 38. As hereinabove pointed out, the water that is thus used in the leaching tank 38 is thereafter utilized in the washing operation that is performed in the tank 37, and after such use, the water is drained to the evaporator so that the salt in this water is recovered as hereinabove explained. The leaching water in the several tanks 38, 39 and 40 is kept at a temperature of from about 190° F. to boiling, and preferably at about 200° F., or higher, so as to expedite the leaching effect for removing the salt solution from the calcined rock and for preventing the freshly calcined gypsum from changing back to its dihydrate form. In the leaching operation, the convection currents in the tanks assure flow of the leaching solution through the baskets and their contents. We have found that very good results are attained in accordance with our system by treating the rock for from about 20 minutes to 40 minutes in each of the leaching tanks, the rock when coming out of the leaching tank 40 being substantially free of any quantity of the salt of the solution. In our improved process, the water in each of the leaching tanks is kept preferably at such temperature as to cause it to circulate gently through the baskets. When the supply of rinsing water is transferred from one of the kettles or tanks to another, the heating means is regulated as may be necessary for temporarily cutting down the amount of the heat supplied as the water is withdrawn from the tank, so as thus to prevent damage to the tank.

Upon withdrawal of the calcined rock from the leaching tank 40, and following a reasonable draining period thereafter, the basket is placed in position adjacent to and over the hopper 87 and the contents are dumped into the hopper 87 of the dryer 45, after which the movable lid 88 on the hopper is lowered into an effective closed position for assisting in maintaining the elevated temperature of the calcined gypsum for a suitable drying operation. The operation of dumping the contents from the hot basket 25 is facilitated by the use of a cable 89 arranged for connection with the lower end portion of the basket, as will be appreciated from the showing in Fig. 2.

The dryer 45 may be of any approved type by which the drying may be effected, the device as shown comprising a motor 90 and cooperating means for tumbling the calcined gypsum during the drying period, and comprising a blower 91 for introducing and circulating hot air through the mass of the calcined gypsum. We have obtained satisfactory results by the use of the dryer as illustrated which is capable of completing the drying operation in about 2 to 2½ hours, with the temperature within the mass of calcined gypsum being maintained at substantially boiling during most of the operation, and with this temperature gradually rising near the end of the operation to about 310°, at which time the dried calcined gypsum is discharged from the dryer.

After the drying operation, the calcined gypsum is fed out through a chute 92 to an elevator 93 of any approved type which drives the calcined gysum through a chute 94 to a storage bin 95 from which the calcined gypsum is fed out as desired for the grinding operation. In the arrangement shown, we have employed a hammer mill 96 for the initial pulverizing operation, from which the calcined gypsum is fed first to a ball mill 97 and thence by a screw conveyor 98 to a burr stone mill 99, from which in turn the comminuted plaster is fed by an elevator 100 and a screw conveyor 101 to a storage bin 102. From the bin 102, the plaster is fed by a screw conveyor 103 to a suitable weighing and bagging mechanism 104 by which the plaster is prepared in bags for shipment or other handling.

In the operation of bringing the plaster to the desired degree of fineness, the hammer mill provides a very great part of the grinding while the ball mill further reduces the size of the particles somewhat and gives the plaster the desired plasticity.

We have found in practice that by the use of our improved process the calcium chloride content or salt residue of the finished plaster is reduced to a very small fragmental part of 1% of the product—say from 1/100 to 6/100 of 1% of the plaster.

In the use of the apparatus as above described, the manner of handling the rinsing and leaching water is of very substantial importance. During the operation of the apparatus for the production of a substantial amount of calcined gypsum plaster, the two calcining kettles 31 and 32 may be kept filled with supplies of the salt solution to such a depth as to insure that the gypsum rock particles making up a load in one of the baskets 25 shall be completely submerged in the solution when the basket carrying such rock is loaded into position in the kettle.

The leaching tanks 38, 39 and 40 are also preferably filled with washing or rinsing water in each operation to such a depth in each of said tanks as to cause the rock to be completely covered by the water in any one of said tanks when a basket 25 carrying the load of the calcined gypsum is lowered into the tank. In preparation for operative use of our apparatus, a suitable supply of clear hot rinsing water is fed into the leaching tank 40, and after use in a leaching operation in the tank 40, said water is fed into the leaching tank 39; after the leaching operation in the tank 39, such water is fed into the leaching tank 38; and after the leaching operation in the tank 38, the water is fed to the spray head 81 at the washing tank 37.

For accomplishing this procedure, hot water is fed first from any suitable source into the leaching tank 40 with the valve 79 open and the valve 74 closed, for carrying out the final leaching operation when the calcined gypsum rock by the use of the fresh clean water. After the completion of the leaching operation in said tank 40 involving the treatment of a single batch of the calcined gypsum, the water is delivered by the pump 70 from the tank 40 to the tank 39, with the valves 74 and 77 open, and the remaining valves closed for such transfer of the water. In due time, after the completion of the leaching operation in the tank 39 on a single batch of the calcined gypsum, the water is delivered by said pump 70 from the tank 39 to the tank 38, with the valves 73 and 76 opened for the operation of transferring the water. In due time again, after the completion of the leaching operation in the tank 38, the water is delivered by the pump 70 from said tank 38 to the spray head 81, Figs. 4 and 10, with the

valves 72, 82 and 69 open for causing the effective rinsing operation in said tank 37 on the freshly calcined gypsum promptly following the movement of a load of said freshly calcined gypsum downwardly into said tank 37 from one of the calcining kettles 31 or 32.

With the valve 69 open, this water which has been used for three successive leaching operations and then for a rinsing operation immediately following the withdrawal of the calcined gypsum from submersion in the salt solution in one of the calcining kettles, is adapted to return by gravity to the evaporator 48 for removal of a substantial amount of the water by evaporation for making such water suitable for use as a make-up for increasing the concentration of the salt solution in one of the calcining kettles 31 or 32.

We have found that this water, after being used for three successive leaching operations on successive batches of the calcined gypsum, as described, and used then for a rinsing operation on the rock freshly removed from the calcining kettle, constitutes a relatively highly concentrated solution of the salt so that it may very readily be further concentrated by evaporation in the evaporator 48 so as to be suitable for use as a make-up component for the salt solution in the calcining kettles 31 and 32, the greater portion of the salt being thus preserved for use with one batch of the rock after another. The cost of the salt used is thus minimized.

For the movement of the solution to and from the calcining kettles 31 and 32 as required for the effective use of the solution and for its preparation for use, the pump 52 is employed, with its operation and effect controlled by manipulation of the various shut-off valves. For forcing a suitable supply of the solution into the calcining kettle 31, the shut-off valves 58, 65 and 62 are opened, while the remaining valves are kept closed, serving to cause the pump to force the solution into said kettle 31 from the supply tank 49, such solution being forced through the filter 64 for preventing the delivery of any solid matter into the kettle with the solution. In like manner, solution is forced from the supply tank 49 into the calcining kettle 32 by the operation of the pump 52, with the valves 58, 65 and 63 open while the remaining valves are in closed condition. When the solution is to be moved by the pump 52 from either of the calcining kettles 31 or 32, the corresponding shut-off valve 53 or 54 is opened for permitting the solution to have access to the inlet side of the pump and the shut-off valve 60 is opened for permitting the movement of the solution through the pipe 59 to the supply tank 49. When solution is to be carried from the evaporator tank 48 to the supply tank 49, the shut-off valves 56 and 60 are openend, with the remaining valves closed, this being effected when the strength of the solution has been built up to the required value by evaporation in the tank 48, as is indicated by the temperature at which the boiling of the solution takes place, or by any other suitable tests as may be desired. The strength of concentration of the solution in the supply tank 49 can of course be increased as desired either by extending the evaporation operation in the evaporator 48 or by adding highly concentrated salt solution through the pipe 66 and valve 67.

In the operation as above described, a fresh supply of hot water is provided in the leaching tank 40 after each successive batch of the calcined gypsum being treated has been subjected to the spraying operation as above described in the washing tank 37. The operations of transferring the water from the tank 40 to the tank 39, and then to the tank 38, and then feeding such rinsing water to the spray head 81 at the tank 37, may be carried out by the use of the pump 70 at any suitable temperature at the convenience of the operator, except that the delivery of the water to the spray head 81 must be timed to conform to the movement of the calcined gypsum into the washing tank 37 from one of the calcining kettles. The delivery of the operating salt solution to the calcining kettles 31 and 32 may be effected by the use of the pump 52 in time preferably for calcining operations alternately in the two calcining kettles 31 and 32. After the completion of the calcining step in connection with a batch of rock by the use of either of the kettles 31 or 32, a calcining operation may be started immediately in connection with the other of said two calcining kettles without waiting for the leaching and drying operations on the already calcined rock, with the apparatus thus employed for the treatment of two separate batches of the rock at the same time. It will of course be understood that only one of the calcining kettles might be used if desired independently of the other kettle; indeed, the apparatus would be effective and highly useful even if one of the calcining kettles should be omitted or removed from the apparatus.

In the normal use of our improved apparatus, the calcining operation by which the gypsum rock is treated in one of the calcining kettles 31 or 32, requires ordinarily about 3½ to 5 hours, depending on the initial size of the rock particles, depending somewhat on the strength of the salt solution, and depending to a great extent on the temperature at which the operation is carried out. The temperature of the salt solutions in the kettles 31 and 32 and the temperature at which the leaching water is kept is controlled by the regulation of the heaters in connection with the several kettles and tanks.

The leaching operation in each of the leaching tanks 38, 39 and 40 requires ordinarily about 20 to 40 minutes for satisfactory results by which the amount of the salt on the calcined rock patricles may be reduced to the desired minimum by the time the rock reaches the dryer 45.

We have found that satisfactory drying may be effected in the dryer 45 in a period of about 2 to 2½ hours so as to bring the calcined rock to the desired degree of stability for preventing any unusual tendency for the hemihydrate to change back to its dihydrate form. In order to minimize this tendency for the freshly calcined gypsum rock to recombine with the free water, the transfer of the basket 25 and its load of rock from one to another of the several kettles and tanks employed is effected as quickly and as rapidly as possible prior to the completion of the drying of the calcined gypsum. We have found that by making these transfers quickly so as to prevent the temperature of the freshly calcined rock from falling substantially lower than the temperature of the water, highly satisfactory results are attained so as to produce plaster having an extremely low water-carrying capacity whereby casts may be made from the plaster having exceedingly high strength and toughness.

After the calcined gypsum rock has been dried sufficiently, it can be stored for grinding later, but we prefer to have the grinding operation carried out promptly following the drying, if possible. With the desired amounts of retarders, or other additives, incorporated with the plaster by the use of any suitable mechanism in connection with the movement of the plaster from the bin 102 to the weighing and bagging mechanism 104, or at any other suitable point, the plaster may be placed in paper bags 105 and sealed ready for transportation to the point of use.

While we prefer to employ the form of apparatus as shown in the drawings and as above described, and to employ substantially the processes as above described, the invention is not to be limited to such apparatus and processes except so far as the same may be specifically claimed hereinafter, it being understood that changes might well be made in such apparatus and processes without departing from the spirit of the invention.

We claim:

1. A gypsum calcining apparatus comprising in combination a basket, means for delivering a load of raw gypsum rock particles into said basket, a calcining kettle adapted to hold an aqueous calcining solution therein,

means for carrying said basket into said kettle so as to submerge the raw gypsum rock therein, means for heating said kettle thereby causing the calcining solution in said kettle to circulate through the rock particles in said basket, a rinsing tank adapted to collect a fluid therein, means for removing said loaded basket from said kettle and depositing said basket in said rinsing tank, means associated with said rinsing tank for feeding a rinsing fluid over the contents of said basket, said rinsing fluid being collected in said rinsing tank, a leaching tank adapted to hold water, means for heating a supply of water in said leaching tank, means for removing said loaded basket from said rinsing tank and depositing said basket in said leaching tank, means connecting said rinsing tank with said calcining kettle for replenishing the calcining solution in said kettle from the fluid in said rinsing tank, a dryer means for removing said basket from said leaching tank and depositing the contents of said basket in said dryer, means for applying heat to said dryer, and means connecting said leaching tank and said means for feeding the rinsing fluid over said basket whereby the rinsing fluid is supplied to said rinsing means from said leaching tank.

2. A gypsum calcining apparatus as specified in claim 1, in which a second calcining kettle is provided alongside of said first claimed calcining kettle, said means for replenishing the calcining solution from the fluid in said rinsing tank being connected to said first and said second calcining kettles, said first and said second calcining kettles being adapted for use alternately with the cooperating apparatus in like manner for thus increasing the output of the apparatus.

3. A gypsum calcining apparatus as specified in claim 1, said means associated with said rinsing tank for feeding a rinsing fluid over the contents of said basket comprising a spray head movable into and out of position above said loaded basket in said rinsing tank.

4. A gypsum calcining apparatus as specified in claim 1, said means connecting said rinsing tank with said calcining kettle comprising a storage tank and an evaporator said evaporator being connected at on end to said rinsing tank and at its opposite end to said storage tank, said storage tank being connected to said calcining kettle, and means for heating said evaporator to concentrate said rinsing fluid before delivery thereof to said storage tank and said calcining kettle.

5. A gypsum calcining apparatus as specified in claim 1, said basket comprising a body portion in the form of a cylinder having imperforate sides adapted to rest at its lower end against the bottom of said calcining kettle, and a foraminous support within said imperforate sides spaced upwardly from the lower portion of said basket.

6. A gypsum calcining apparatus as specified in claim 2, said means connecting said rinsing tank with said calcining kettles for replenishing the calcined solution in said kettles from the fluid in said rinsing tank comprising a storage tank and an evaporator, said storage tank being connected at one end to each of said first and second calcining kettles and its opposite end to one end of said evaporator, said evaporator being connected at its other end to said rinsing tank, means for heating the contents of said evaporator to concentrate said rinsing fluid, said connection between said first and second calcining kettles and said storage tank being provided with means for selectively transferring the concentrated fluid contained in said storage tank to either of said two calcining kettles.

7. A gypsum calcining apparatus comprising in combination a basket, means for delivering a load of raw gypsum rock particles into said basket, a calcining kettle adapted to hold a calcining solution therein, means for carrying said basket into said kettle so as to submerge the raw gypsum rock therein, means for heating said kettle thereby causing the calcining solution in said kettle to circulate through the rock particles in said basket, a rinsing tank adapted to collect a fluid therein, means for removing said loaded basket from said kettle and depositing said basket in said rinsing tank, means associated with said rinsing tank for feeding a rinsing fluid over the contents of said basket, said rinsing fluid being collected in said rinsing tank, a series of inter-connected leaching tanks adapted to hold water, means associated with each of said leaching tanks for heating a supply of water therein, means for removing said loaded basket from said rinsing tank and lowering said basket into the first of said series of leaching tanks and for removing said basket from said first leaching tank and into and out of each of the succeeding leaching tanks of said series, means connecting said rinsing tank with said calcining kettle for replenishing the calcining solution in said kettle from the fluid in said rinsing tank, means for supplying clean hot water to the last of said series of leaching tanks, said inter-connection between said leaching tanks comprising means for transferring said hot water from said last mentioned leaching tank to the preceding leaching tank of said series and successively to each of said leaching tanks of said series in a direction relative to said leaching tanks reversed to the successive lowering therein of said basket, a dryer, means for removing said basket from said leaching tank and depositing the contents of said basket in said dryer, means for applying heat to said dryer, and means connecting the leaching tank into which said loaded basket is first lowered with said means for feeding a rinsing fluid over the contents of said basket, whereby the rinsing fluid is supplied to said rinsing means from said leaching tank.

8. A gypsum calcining apparatus as specified in claim 7, said plurality of inter-connected leaching tanks comprising three leaching tanks adapted to hold water, means for heaating the supply of water in each of said leaching tanks, means for carrying said loaded basket from said rinsing tank and lowering it successively into each of said leaching tanks, means for providing a supply of clean water to the leaching tank into which the loaded basket is last lowered, means for transferring said water from said last mentioned leaching tank into the intermediate of said three leaching tanks, means for transferring said water from said intermediate leaching tank to the leaching tank into which said loaded basket is first lowered and means for transferring said hot water from said last mentioned leaching tank to said means for feeding a rinsing fluid over the contents of said basket.

9. A gypsum calcining apparatus as specified in claim 7, said means for feeding a rinsing fluid over the contents of said basket comprising a spray head movably mounted in position so as to be moveable into and out of position above said basket when positioned in said rinsing tank, said means for delivering said rinsing fluid from said last mentioned leaching tank into which said loaded basket is first lowered being connected to said spray head.

10. A gypsum calcining apparatus as specified in claim 7, said means connecting said rinsing tank with said calcining kettle for replenishing the calcined solution in said kettle from the fluid in said rinsing tank comprising a storage tank and an evaporator, said storage tank being connected at one end to said calcining kettle and its opposite end to one end of said evaporator, said evaporator being connected at its other end to said rinsing tank, means for heating the contents of said evaporator for concentrating said rinsing fluid before delivery thereof to said storage tank and said calcining kettle.

11. A gypsum calcining apparatus, comprising in combination a basket, means for delivering a load of raw gypsum rock particles into said basket, a calcining kettle adapted to hold an aqueous calcining solution therein, means for carrying said basket into said kettle so as to submerge the raw gypsum rock therein, means for heating said kettle thereby causing the calcining solution in said kettle to circulate through the rock particles in said basket, a rinsing tank adapted to collect a fluid therein,

means for removing said loaded basket from said kettle and depositing said basket in said rinsing tank, means associated with said rinsing tank for feeding a supply of water over said loaded basket in said rinsing tank, a leaching tank, means for removing said loaded basket from said rinsing tank and depositing said basket in said leaching tank, means connecting said rinsing tank with said calcining kettle for replenishing the calcining solution in said kettle from the fluid in said rinsing tank, a dryer, means for removing said basket from said leaching tank and depositing the contents of said basket in said dryer, means for applying heat to said dryer, means connecting said leaching tank and said means for feeding the rinsing fluid over said basket whereby the rinsing fluid is supplied to said rinsing means from said leaching tank, means for removing said particles from said dryer and pulverizing means for reducing the size of said particles to a preselected size.

12. A gypsum calcining apparatus as specified in claim 11, in which said pulverizing means comprises a first grinding means for partially reducing the size of said particles, and a second grinding means for further grinding said partially reduced particles to the preselected size.

13. A gypsum calcining apparatus as specified in claim 12, in which said first grinding means comprises a hammer mill and said second grinding means comprises a ball mill and a burr stone, and means for transferring said partially reduced particles from said hammer mill to said ball mill and from said ball mill to said burr stone mill.

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