

No. 781,747.

PATENTED FEB. 7, 1905.

F. A. SIMONDS.

METHOD OF AND APPARATUS FOR CALCINING PLASTER.

APPLICATION FILED MAY 16, 1904.

2 SHEETS—SHEET 1.

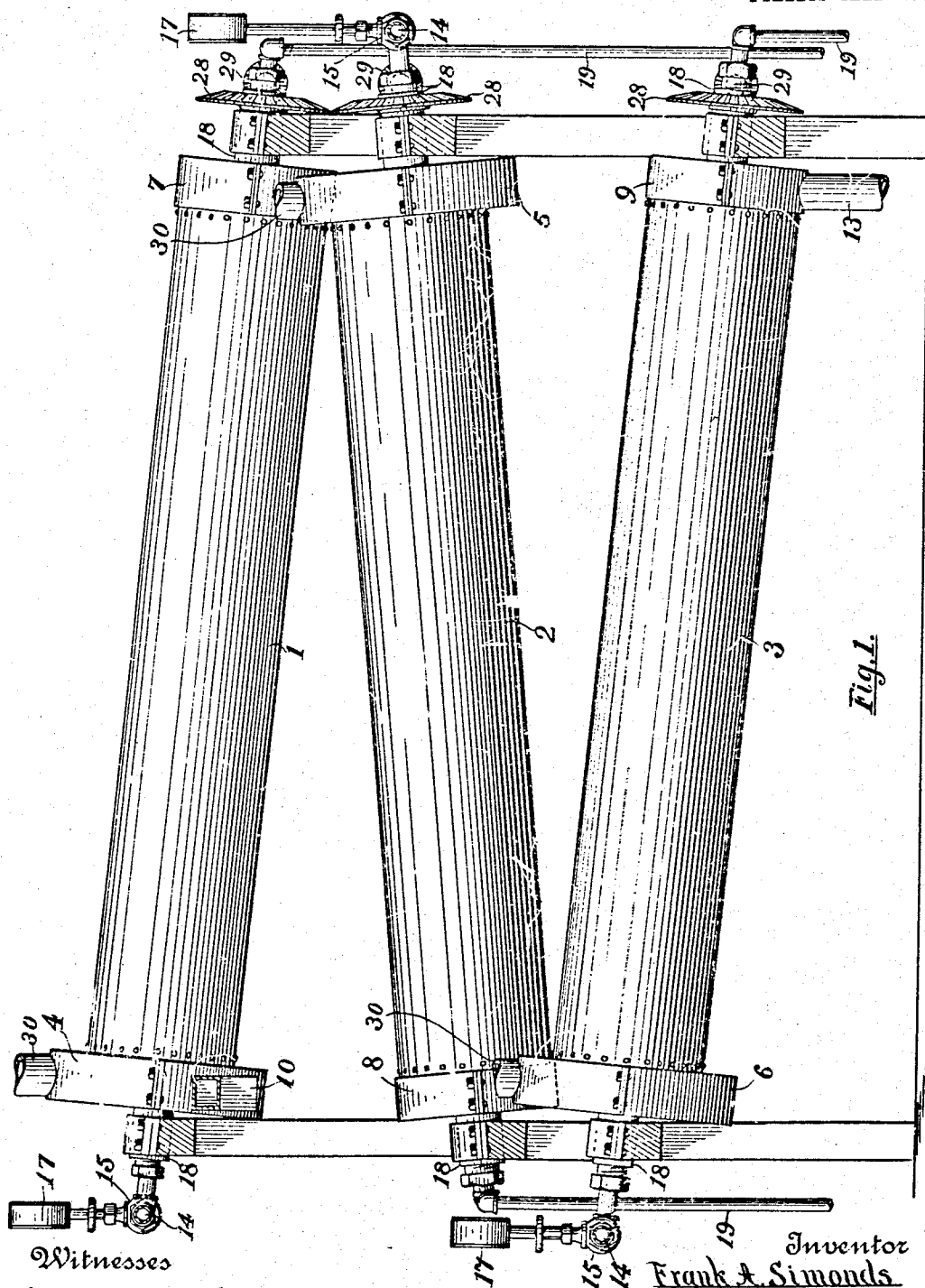


Fig. 1.

Witnesses

Georgiana Chase
Edward R. Moore.

Inventor
Frank A. Simonds

By *Luther V. Moulton*
Attorney

No. 781,747.

PATENTED FEB. 7, 1905.

F. A. SIMONDS.

METHOD OF AND APPARATUS FOR CALCINING PLASTER.

APPLICATION FILED MAY 16, 1904.

2 SHEETS-SHEET 2.

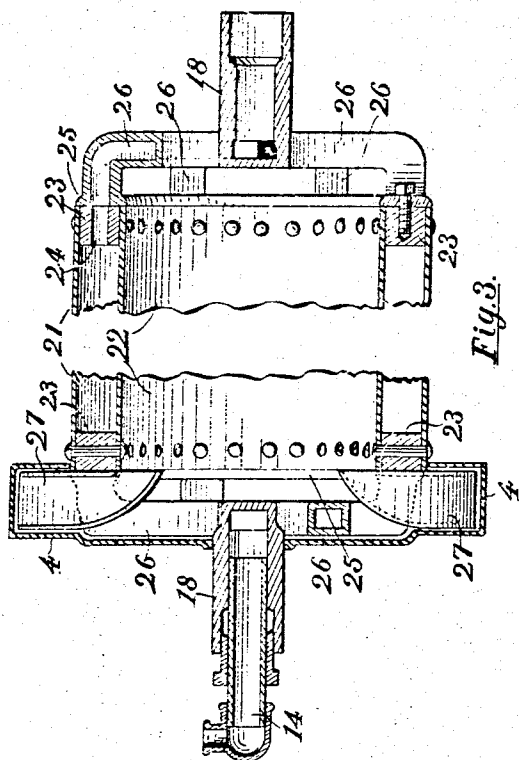


Fig. 3.

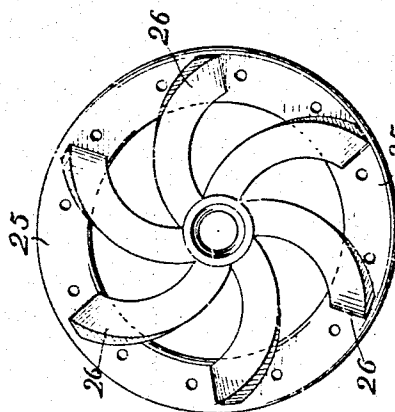


Fig. 4.

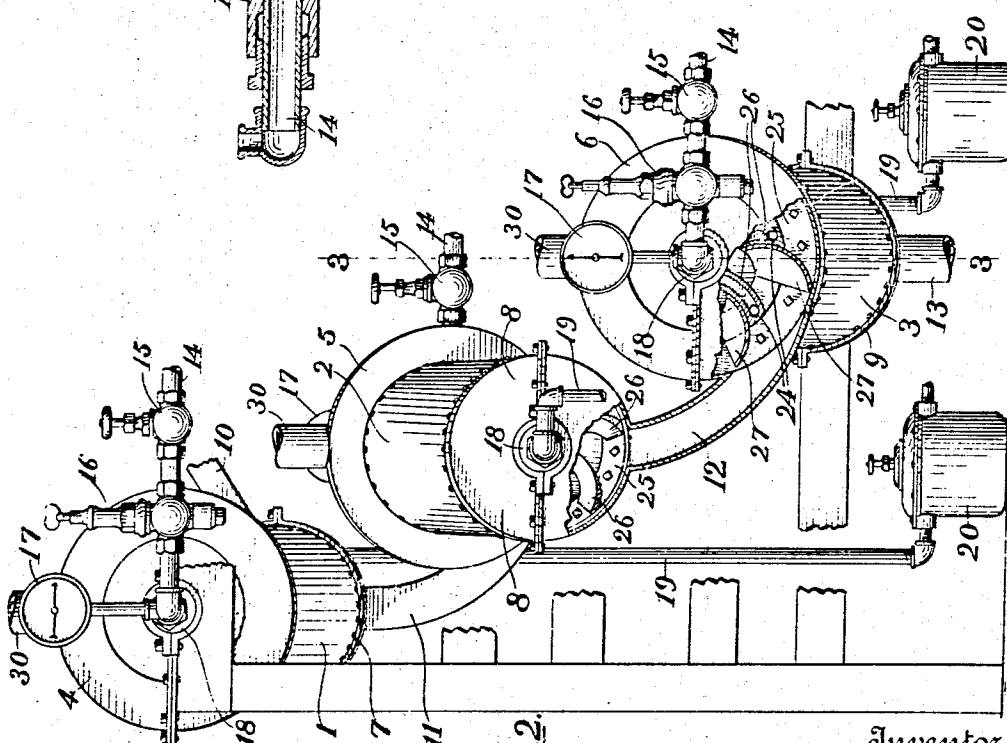


Fig. 2.

Witnesses

Georgiana Chase
Edward R. Mowbray

Inventor

Frank A. Simonds

By *Luther V. Moulton*
Attorney

UNITED STATES PATENT OFFICE.

FRANK A. SIMONDS, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR OF ONE-HALF TO ADOLPH LEITELT IRON WORKS, OF GRAND RAPIDS, MICHIGAN, A CORPORATION OF MICHIGAN.

METHOD OF AND APPARATUS FOR CALCINING PLASTER.

SPECIFICATION forming part of Letters Patent No. 781,747, dated February 7, 1905.

Application filed May 18, 1904. Serial No. 208,166.

To all whom it may concern:

Be it known that I, FRANK A. SIMONDS, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Methods of and Apparatus for Calcining Plaster; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improved method of calcining plaster and apparatus for the same; and its object is to provide means for operating continuously upon a constantly-flowing stream of plaster.

Heretofore it has been found difficult to calcine plaster by any continuous process, the result being that the plaster would either be heated too much or not enough, and no adequate means of regulating the temperature to properly do the work has been devised. Before calcining, plaster contains water in two different states, the free moisture and the water of crystallization. The former is rapidly driven off at a temperature of about 212° Fahrenheit, after which it requires a considerably higher temperature to break up the crystallization and drive the water out of the same—namely, about 300° Fahrenheit—and if such heat is applied beyond the necessary extent the plaster becomes overdone and is injured thereby, producing what is commonly known as "burnt" plaster.

My improved process consists, essentially, in applying steam heat to a continuously-flowing stream of plaster and regulating the heat applied to the different portions of the stream by means of regulating the pressure of the steam and in adjusting the heat applied to the plaster during the latter part of the operation to only a slight degree above the calcining temperature, and thus avoiding any excess of heating after the water of crystallization is driven off.

Referring to the accompanying drawings, which represent a form of apparatus adapted to perform my improved process, Figure 1

represents a side elevation of the device; Fig. 2, an end elevation of the same with parts broken away; Fig. 3, an enlarged detail in vertical section on the line 3 3 of Fig. 2, and Fig. 4 an elevation of one head of a cylinder.

Like numerals refer to like parts in all of the figures.

1, 2, and 3 represent a series of heating-cylinders, through which plaster passes in the process of calcining. These cylinders are rotative and inclined, whereby the plaster is stirred and brought in contact with the interior of the cylinder and passes slowly from end to end through the same. The upper end of each cylinder is provided with a receiving-case (shown at 4, 5, and 6) to receive the plaster at the bottom and to collect and discharge the vapor therefrom at the top, each case being provided with a suitable discharge-pipe 30 to convey away this vapor. The lower end of each cylinder is provided with a discharge-case. (Shown at 7, 8, and 9.) The plaster to be calcined is supplied to the case 4 through any suitable spout 10, and the discharge-case 7 of the first cylinder is connected to the bottom of the receiving-case 5 of the second cylinder by a suitable curved spout 11, and in like manner the discharge-case 8 of the second cylinder is connected to the bottom of the receiving-case 6 of the third cylinder, and the discharge-case 9 of this last cylinder is provided with a suitable spout 13 to discharge the finished product. Each cylinder is constructed of two concentric tubes 21 and 22 of unequal diameter and spaced apart to provide a steam-receiving space therebetween. This space is closed at each end by suitable rings 23, securely riveted in place between the tubes and provided with suitable openings 24 to receive steam and discharge water.

The cylinder-heads consist of suitable rings 25, closely fitted to the rings 23 and secured thereto, and curved hollow arms 26, extending from opposite the openings 24 to tubular hubs 18, forming the journals on which the cylinders rotate. These hubs are provided with suitable stuffing-boxes in which are inserted pipes to convey steam to the cylinders

and to convey condensed water therefrom through the hubs, arms, and openings in the rings. Each cylinder is provided at its upper end with a steam-pipe 14, inserted in the hub 5 18, and interposed in each pipe is a throttle-valve 15, a pressure-regulating valve 16, and a pressure-gage 17, whereby the operator can accurately determine the pressure of steam in each respective cylinder. In the hub at the 10 lower end of each cylinder is inserted a pipe 19 to convey away the water of condensation to suitable steam-traps 20, which remove the water and retain the pressure of steam in each respective cylinder. Each cylinder is also 15 provided with means for rotating the same, which in this instance are shown as bevel-gears 28, attached to one of the journals of each cylinder, and suitable pinions 29, engaging the same, which pinions may be operated 20 in any convenient manner. Each receiving-head is provided with buckets 27 attached thereto, which buckets are adapted to rotate within the respective receiving-case and take up the plaster in the bottom of the same and 25 discharge it into the interior of the respective cylinder. These buckets have inwardly-curved inner ends to laterally discharge the material into the cylinder, as shown in Fig. 3, and the arms 26 in the lower heads are so curved that 30 they will scoop up the water and convey the same to the hub.

The operation of this device in performing my improved process is as follows: The plaster to be calcined is regulated in its flow through 35 the spout 10 in any convenient manner and passing through the cylinders is thoroughly stirred and brought into intimate contact with the heated inner walls of the same. Escaping at the lower end of the first cylinder, it 40 passes through the spout 11 into the receiving-case 5 and passing through the second cylinder is discharged through the spout 12 and finally passes through the third cylinder and is discharged at the spout 13. During 45 its progress through these various cylinders it may be exposed to different temperatures in each, according to the pressure of the steam admitted to the respective cylinders. By spouting the plaster into the bottom of the 50 receiving-cases and taking it up in the curved buckets and discharging it into the lower side of the cylinder there is but little tendency to its escape in the form of dust through the pipes 30. It is immaterial what the tempera- 55 ture may be until the free moisture is driven off; but it is essential that the temperature shall be regulated so that while the plaster is sufficiently heated to drive off the water of crystallization it shall not be overheated, and 60 for this purpose the temperature in the lower cylinder or cylinders, where the finishing is done, is maintained at substantially the same as or at only slightly above the calcining temperature. The result is that however long 65 the treatment may be continued after the wa-

ter of crystallization has been driven off the plaster will not be overdone and injured by excessive heat, and by the use of steam at regulated pressure the heat may be accurately adjusted. 70

I have shown a series of three cylinders; but the number is obviously immaterial.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is— 75

1. The improved method of calcining plaster, consisting of applying steam heat to a continuously-moving stream of plaster, and regulating the temperature of the steam to substantially the calcining temperature of the 80 plaster by regulating the pressure of the steam.

2. The improved method of calcining plaster consisting of passing a continuous stream of plaster through a series of steam-heated 85 vessels, regulating the temperature of the heating-steam by regulating the pressure thereof and adjusting the temperature of the last vessel in the series to near the calcining temperature of the plaster. 90

3. The improved method of calcining plaster consisting of passing a continuous stream of plaster through a series of steam-jacketed and inclined rotating cylinders, supplying steam to said cylinders to heat the same, regulat- 95 ing the pressure of the steam to determine the temperature thereof, and adjusting the temperature of the last vessel in the series to near the calcining temperature of the plaster. 100

4. An apparatus for calcining plaster comprising a series of steam-heated vessels, means for passing a continuous stream of plaster successively through the said vessels, means for separately supplying steam to the same and removing the water of condensation there- 105 from, and means for separately adjusting the pressure of the steam to adjust the temperature of each vessel.

5. The combination of a series of inclined rotative cylinders having double walls spaced 110 apart, means for supplying steam to the spaces between said walls, means for removing the water condensed therein, a separate steam-pipe for each cylinder, a throttle-valve, a pressure-regulating valve and a steam-gage 115 in each pipe, a separate drain-pipe to each cylinder, and a steam-trap to each drain-pipe.

6. In a calcining apparatus, a cylinder having double walls spaced apart, rings closing the ends of said spaces and having perfora- 120 tions therethrough, heads attached to the rings and comprising hollow arms opposite said openings and tubular hubs, a steam-pipe inserted in one of the hubs, a drain-pipe inserted in the other hub, a steam-trap connected 125 to the drain-pipe, a pressure-gage, a pressure-regulating valve, and a throttle-valve in the steam-pipe, and means for passing plaster through the interior of the cylinder.

7. In a calcining apparatus, a steam-jacketed 130

rotative cylinder, means for regulating the pressure of steam in the same, a receiving-case inclosing one end of the cylinder, buckets attached to the cylinder and rotative in the case, a discharge-case inclosing the other end of the cylinder, means for conveying plaster to the receiving-case, and means for conveying plaster away from the discharge-case.

8. In a calcining apparatus, the combination of a cylinder having double walls spaced apart, rings closing the ends of said spaces and having perforations, heads comprising hollow arms opposite said perforations, and hollow hubs connected to said arms, means of supplying steam to one hub, means for conveying water away from the other hub, a receiving-case surrounding one head, curved buckets attached to said head and having inwardly-curved ends and rotative in the case, a discharge-case surrounding the other head, a spout connected to the discharge-case, and means for regulating the pressure of the steam-supply.

9. In a calcining apparatus, the combination of a series of inclined rotative and steam-jacketed cylinders, means for supplying steam to the same, means for severally regulating the pressure of steam in said cylinders, a re-

ceiving-case inclosing the end of each cylinder, buckets attached to each cylinder and rotative in the case, a discharge-case to each cylinder, a spout connecting the discharge-case of each cylinder with the receiving-case of the next cylinder in the series, and vent-pipes at the top of each receiving-case.

10. In a calcining apparatus, a rotative and inclined cylinder having double walls spaced apart, rings closing the ends of said spaces and having perforations, a head attached to the lower end of said cylinder and comprising curved hollow arms opposite said openings, and a hollow hub connected to said arms, a head connected to the upper end of said cylinder and having hollow arms opposite the openings in the ring, and a hollow hub connected to said arms, a drain-pipe connected to the lower hub, a steam-pipe connected to the upper hub, and means for regulating the pressure of steam admitted to the cylinder.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK A. SIMONDS.

Witnesses:

LUTHER V. MOULTON,
WARREN W. ANNOBLE.