July 7, 1931. V. SAHMEL 1,813,086

GRINDING MILL

Filed Nov. 14, 1929 2 Sheets-Sheet 1

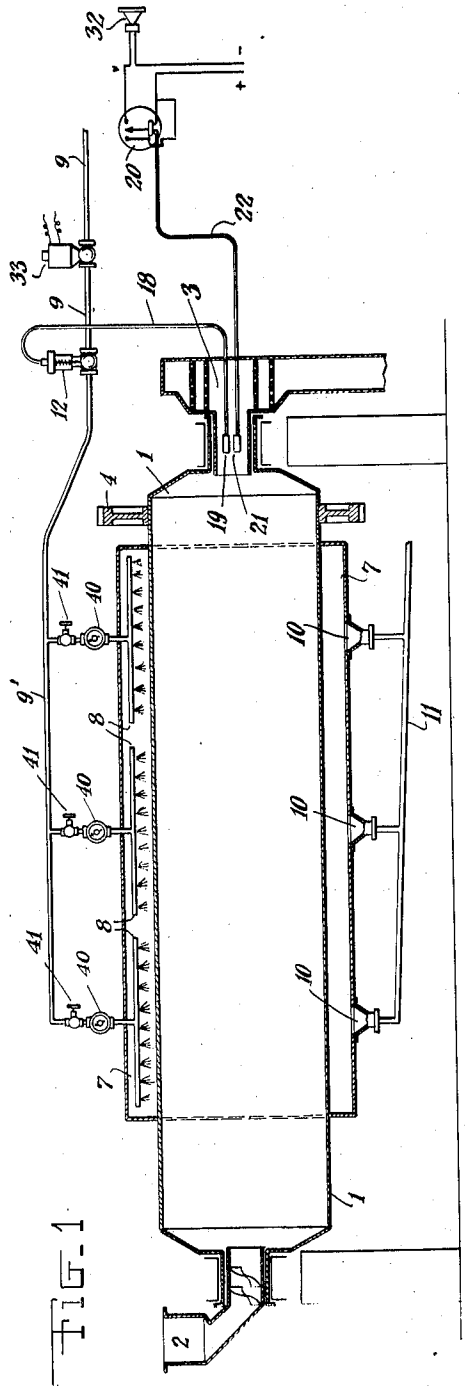

FIG. 1

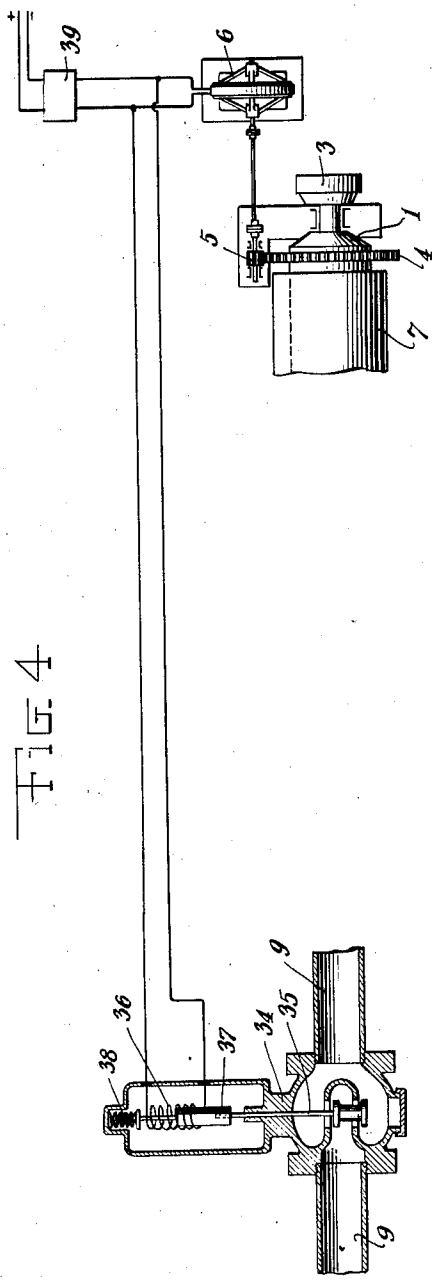

FIG. 4

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Filed Nov. 14, 1929 2 Sheets-Sheet 2

Fig. 3.

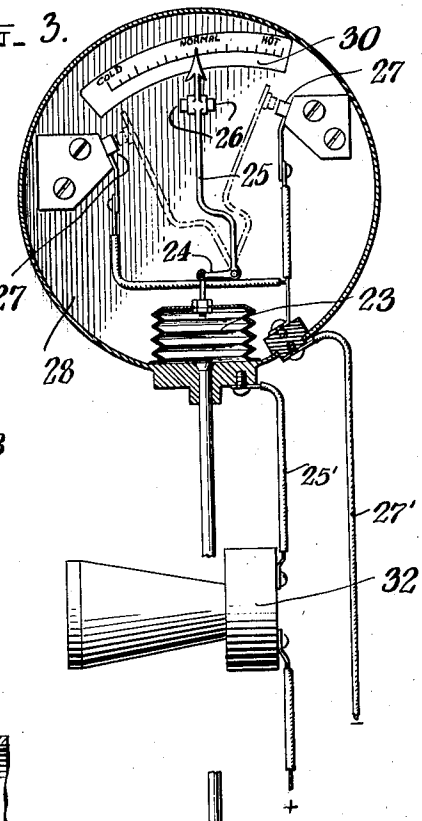

Fig. 2

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UNITED STATES PATENT OFFICE

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GRINDING MILL

Application filed November 14, 1929. Serial No. 407,063.

In the manufacture of Portland cement the importance of preventing, during the grinding of the cement materials, such a rise of temperature within the grinding mill as would bring about a change of the gypsum content to plaster of Paris, with consequent undesirable effect upon the quality of the cement, has come to be generally recognized. Various efforts have been made to prevent the heating of the mill and the material therein incident to the grinding, as by the introduction of an evaporable substance or by the circulation of a cooling medium, such as water, through a jacket without the mill, or by the provision of heat transferring devices within the mill. All of such devices, however, have been dependent upon observation and manual regulation, not only requiring constant watchfulness on the part of an attendant, but introducing the uncertain element of human control and inevitably lacking in that degree of exactness of regulation which is essential to satisfactory and economic operation, which requires the temperature within the mill to be near the critical temperature which would effect a change of gypsum to plaster of Paris without exceeding it. It has been the object of the present invention to provide means whereby the desired temperature within a grinding mill may be maintained automatically. In the present embodiment of the invention, chosen for illustration and explanation of its nature, a cooling medium, such as water, is supplied to the jacket or chamber about the mill and devices are provided whereby the circulation of the cooling medium is controlled automatically. The invention will be more fully explained hereinafter with reference to the accompanying drawings in which it is illustrated, and in which:

Figure 1 is a view in longitudinal, sectional elevation, partly in outline, of a grinding mill equipped with devices for controlling automatically the circulation of the cooling medium in the chamber about the mill.

Figure 2 is a detail view, in sectional elevation, of a thermostatically controlled valve for controlling the flow of the cooling medium.

Figure 3 is a detail view, in sectional elevation, of a dial-type thermometer interconnected with an alarm.

Figure 4 is a detail view, in sectional elevation, of a magnetically operated valve interconnected with a motor for driving the mill, the mill and the motor with their associated parts being indicated in outline and on a smaller scale than that on which the valve is shown.

The mill which may be and is represented as of conventional type, has at one end an inlet 2 for the material to be ground and at 3 an outlet for the ground material. The mill is shown more particularly in Figure 4 as having a driving gear 4 engaged by a pinion 5 of a motor 6. In the construction shown the shell of the rotating mill 1 is encircled by a casing 7 which is stationary and is supported independently of the mill by means unnecessary to be shown. Within the casing 7, at the top, is a series of spray pipes 8 which may be supplied with water or other cooling medium through pipes 9 and 9^1, flow indicators 40 and valves 41 being preferably provided in the connections between the pipe 9^1 and the spray pipes 8. in its lower part the casing 7 is provided with outlets 10 connected to a common drain pipe 11. The cooling medium may be supplied through the pipes 9 from any convenient source and may be conducted away from the casing to the pipe 11 to be cooled and used over again if so desired.

The flow of water through the supply pipe 9 is controlled, in the construction shown, by a thermostatically controlled valve 12. It may be constructed in any suitable manner, such as illustrated in Figure 2, in which the valve body 13 is fitted with a balanced valve 14, the members 15, 15^1 of which cooperate with their respective ports in the usual manner. The stem 14^1 of the valve 14, is extended upward within a chamber 16 and is connected to a sylphon 17, or pressure-sensitive bellows, which is connected through a pipe 18 with a thermostatic bulb 19 located, as shown in Figure 1,

at the outlet end of the mill. The bulb 19, the pipe 18 and the sylphon 17 may be filled or partially filled with a fluid readily expansible under the influence of heat so that when the temperature at the outlet of the mill rises above the predetermined degree the sylphon will be expanded and the valve 14 be moved to permit a freer flow of cooling medium through the supply pipe. On the other hand, if the temperature at the outlet of the mill falls below the predetermined degree the sylphon will contract and the flow of cooling medium through the pipe will be reduced until such time as the temperature in the mill is restored to the predetermined degree.

By observation of the flow indicators 40 the mill attendant will be informed as to the circulation of the cooling medium and the proper distribution of the cooling medium in different parts of the casing 7 can be assured by manipulation of the valves 41.

In the event of failure of the valve 12 to function properly there is provided an independent means by which an undesirable condition in the mill will be signalled and the attention of the operator or attendant called to that fact. As shown, such means may comprise a thermostatically controlled dial-type thermometer, the relation of which is indicated at 20 in Figure 1, while the details of construction are shown more particularly in Figure 3. A bulb 21, located at the outlet of the mill, as shown in Figure 1, is connected by a tube 22 with a sylphon 23, shown in Figure 3. The movable member of the sylphon is operatively connected with a lever 24 to which is connected a pointer or indicator 25 which moves over a scale 30. The indicator is electrically connected through the sylphon 23 and housing 28 with one leg 25^1 of an electric circuit and carries, on opposite sides, contacts 26 which are adapted to make contact, as the indicator reaches the limit of its motion in either direction, with one or the other of insulated contacts 27 which are connected to the other leg 27^1 of the circuit. Included in one branch of the electric circuit, as in the branch 25^1, is a horn or signal 32, so that when the temperature in the mill varies materially from the desired temperature, in either direction, that fact will be indicated by the signal and the attention of the operator attracted so that the difficulty may be remedied.

It is also desirable to provide means whereby the flow of cooling medium shall be started automatically when the mill motor is started and shall be stopped automatically when the mill motor is stopped, either through failure or intentionally. There is therefore provided a magnetically controlled shut-off valve connected into the supply pipe line, as shown in Figures 1 and 4, and constructed and operatively connected with the motor 6, as more particularly shown in Figure 4. The valve is shown as comprising the valve-body 34 and a balanced valve 35 which is connected through its stem with an armature or magnetic core 37 within an electro-magnetic coil 36 which is connected into the circuit of the motor between the motor and the starting box 39. A coiled spring 38 reacts against the electro-magnetic coil 36. When the motor 6 is started by the closing of the circuit in the starter box 39, the coil 36 causes the core 37 to move in such a direction as to move the valve 35 from its seat in the box 34 against the pressure of the spring 38 and thereby permit the cooling medium to flow through the pipe line. If the supply of current to the motor ceases, either through failure or through the opening of the circuit in the starter box 39, the coil 36 is at the same time deprived of current and, by the action of the spring 38, the valve 35 is moved to shut off the flow of cooling medium through the pipe line.

While certain specific constructions of the devices for controlling the flow of the cooling medium and for signalling any material variation of temperature in the mill have been shown and described herein, it will be seen that the construction and arrangement of such devices may be changed to suit different conditions of use and that, except as pointed out in the accompanying claims, the invention is not restricted to the particular construction shown and described herein, either with regard to the controlling devices or to the particular application of the cooling medium.

I claim as my invention:

1. The combination with a grinding mill and means to supply a cooling medium for the purpose of preventing an undesirable increase of temperature in the mill, of means to control the flow of the cooling medium, and thermostatically controlled devices to regulate the operation of said means and subject to the temperature of the material acted upon.

2. The combination with a grinding mill and means to supply a cooling medium for the purpose of preventing an undesirable increase of temperature in the mill, of a valve to control the flow of the cooling medium, and thermostatically controlled devices to regulate the operation of said valve and subject to the temperature of the material acted upon.

3. The combination with a grinding mill and means to supply a cooling medium for the purpose of preventing an undesirable increase of temperature in the mill, of means to control the flow of the cooling medium, a sylphon operatively connected to said means, and a thermostatic bulb located in the mill and subject to the temperature of the mate-

rial acted upon and operatively connected to the sylphon.

4. The combination with a grinding mill, a motor therefor, and means to supply a cooling medium for the purpose of preventing an undesirable increase of temperature in the mill, of means to control the flow of the cooling medium, devices to actuate said means, and electric connections between the motor and said means whereby the operation of said means is dependent upon the operation of the motor.

5. The combination with a grinding mill, a motor therefor, and means to supply a cooling medium for the purpose of preventing an undesirable increase of temperature in the mill, of a valve to control the flow of the cooling medium, electro-magnetic devices to actuate said valve, and electrical connections between the motor and said devices whereby the operation of said devices is dependent upon the operation of the motor.

6. The combination with a grinding mill, a motor therefor, and means to supply a cooling medium for the purpose of preventing an undesirable increase of temperature in the mill, of a valve to control the flow of the cooling medium, an armature connected to said valve, an electro-magnetic coil for cooperation with the armature, electrical connections between the motor and said coil, and a spring opposing the action of the coil on the armature and the valve.

This specification signed this 13th day of November, A. D. 1929.

VIGGO SAHMEL.