No. 773,029. PATENTED OCT. 25, 1904.

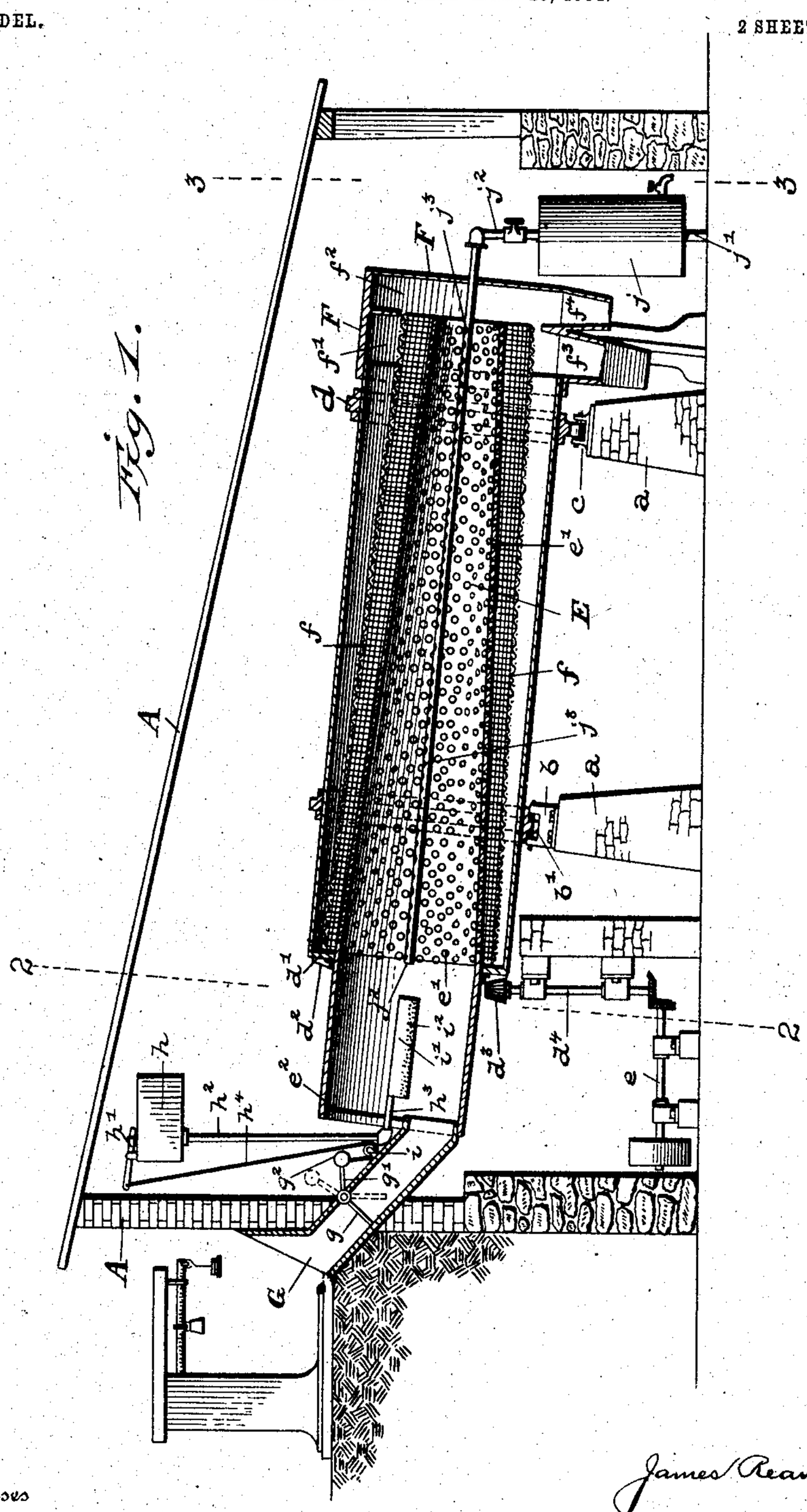
J. REANEY, JR.

MACHINE FOR HYDRATING LIME.

APPLICATION FILED MAR. 16, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
Edwin L. Yewell
G. Ferdinand Vogt.

Inventor
James Reaney Jr.

By Munn & Co.
Attorneys

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

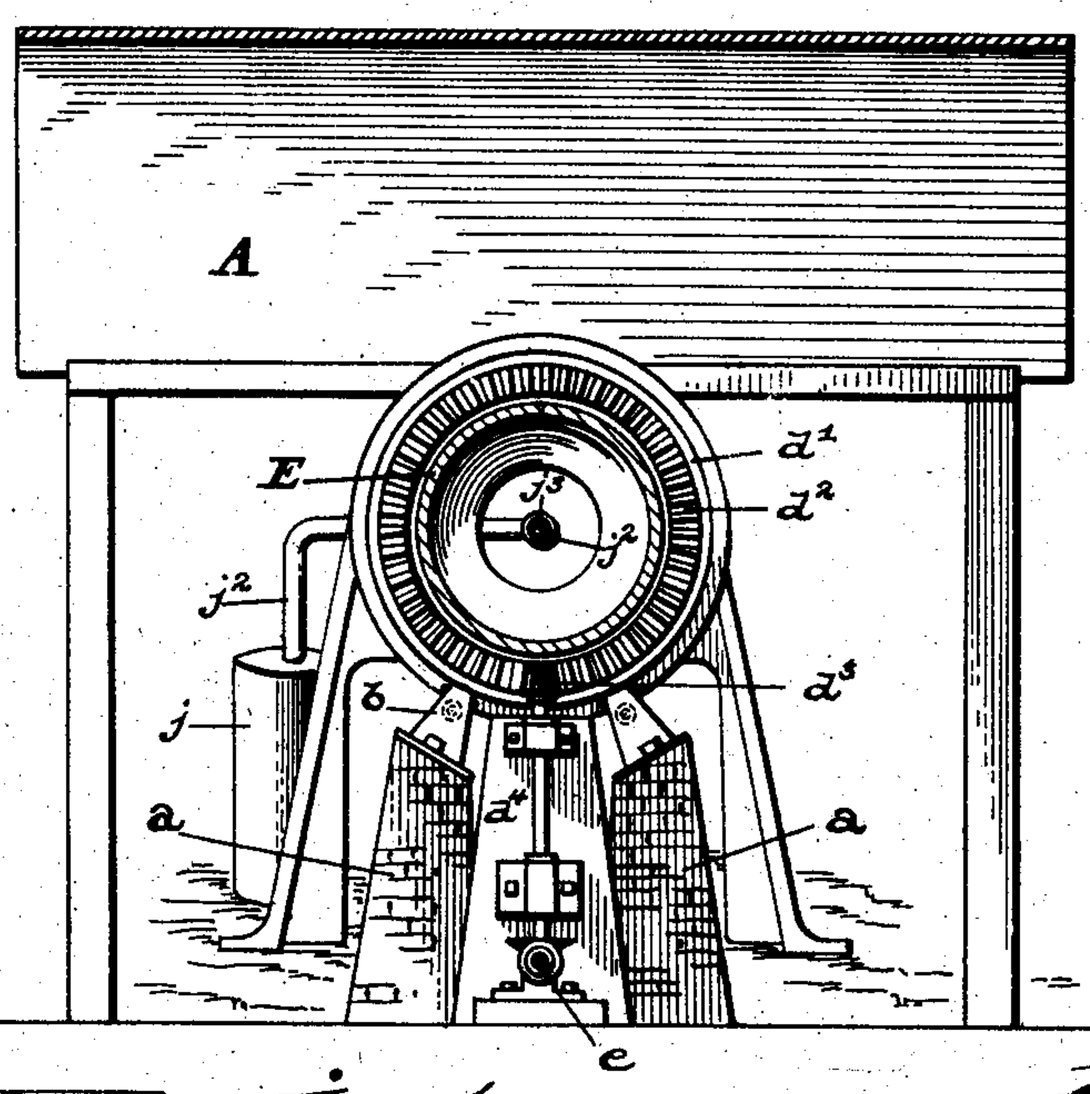


Fig. 4.

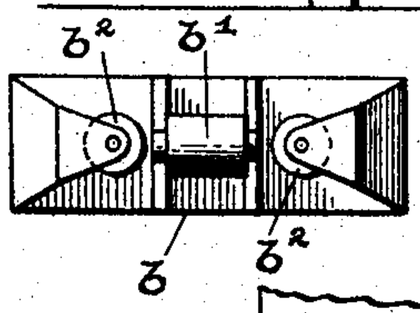
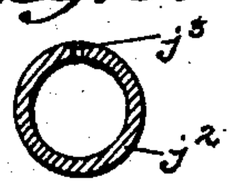
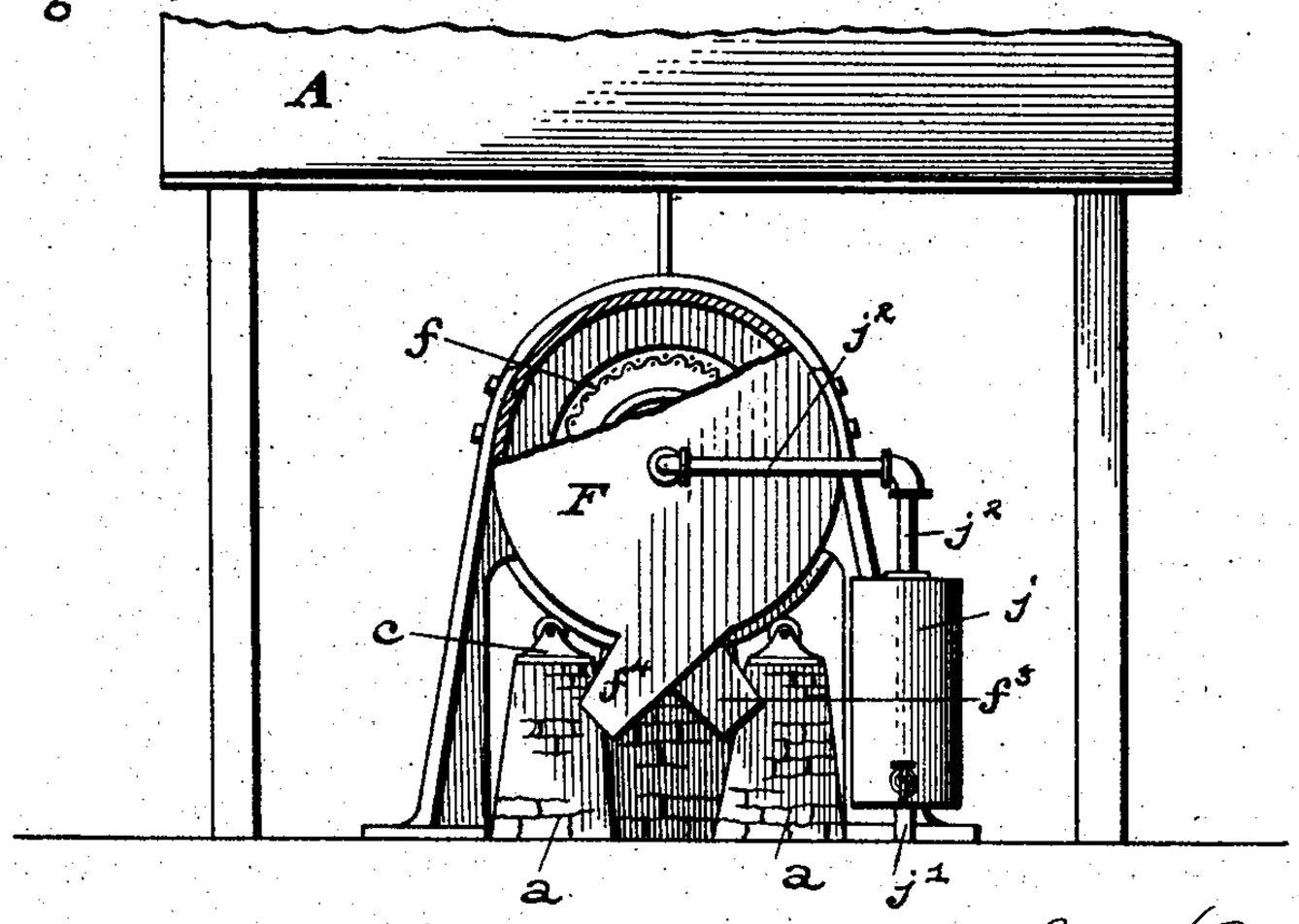


Fig. 3.

Fig. 5.





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UNITED STATES PATENT OFFICE.

JAMES REANEY, JR., OF SHERWOOD, MARYLAND.

MACHINE FOR HYDRATING LIME.

SPECIFICATION forming part of Letters Patent No. 773,029, dated October 25, 1904.

Application filed March 16, 1904. Serial No. 198,382. (No model.)

To all whom it may concern:

Be it known that I, JAMES REANEY, Jr., a citizen of the United States, residing at Sherwood, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Machines for Hydrating Lime, of which the following is a specification.

This invention relates to an apparatus for hydrating lime, and has for one of its objects to provide an apparatus by means of which the ordinary quicklime may be converted into a powdered hydrated lime in a simple and expeditious manner and at little cost.

Another object of the invention is to provide a construction whereby the impurities—unburned or overburned particles in the quicklime—may be separated in the method or operation of producing the hydrated lime.

Another object of the invention is to provide an improved apparatus which may be operated continuously and automatically.

The accompanying drawings illustrate one form of apparatus for carrying the invention into practical effect, in which—

Figure 1 illustrates a vertical longitudinal section through the apparatus, which is inclosed within a suitable housing. Fig. 2 illustrates a sectional elevation at the front end of the apparatus on the line 2 2 of Fig. 1, and Fig. 3 illustrates a rear end elevation on the line 3 3 of Fig. 1. Fig. 4 is a detail plan view of one of the roller-bearings, and Fig. 5 a sectional view of the steam-pipe.

In the drawings, A designates a shed or housing for protecting the apparatus from the weather and which may be constructed in any desired manner so as to practically exclude air.

In the present instance the letter *a* designates a plurality of pillow-blocks or foundation-supports, which vary in height so as to sustain the cylinder in an inclined position. A roller-bearing *b* is mounted on the higher foundation *a* and is provided with a roller *b'*, which revolves in a vertical plane, and two rollers b^2, which revolve in a horizontal plane. The lower foundation is also provided with a roller-bearing *c*. A cylinder D in the present instance is of uniform diameter and is provided with a plurality of encircling track-bands *d*, which bear on the said rollers *b'* and *c* on the foundation-supports. The rollers b^2 serve to prevent endwise movement of the said cylinder D. It will thus be seen by reason of the different heights of the foundation-supports the cylinder is sustained in an inclined position, the front end being higher than the other. At the higher end the cylinder D is closed by an annular end plate *d'*, and said plate is provided on its outer surface with a circular rack d^2. A pinion d^3 on a vertical shaft d^4 meshes with the said rack, and said shaft d^4 is revolved by means of a driving-shaft *e*, and by this means the cylinder D is revolved.

A tapered screen E, preferably of sheet metal, has position within and extends through the cylinder D, and the circular wall of the tapered screen is provided with numerous perforations *e'*. The tapered screen E fits in the annular plate *d'* and is supported in the outer cylinder D, and the two are revolved together. This perforated screen is longer than the cylinder D, and its extremities extend beyond both ends of the latter. The higher end of said screen E, however, which extends beyond the annular plate *d'*, is straight instead of tapered and is free of perforations, and this projecting straight end surrounds a stationary charging-head e^2, which latter closes the end of said perforated screen. The smaller and lower end of the perforated screen E projects beyond the lower end of the outer cylinder D and terminates in a stationary discharging-head F. By reference to Fig. 1 it will be seen that the inner tapered screen E also has an inclination of less degree than that of the outer cylinder D. This difference of inclination between the cylinder and screen is advantageous in that the less degree of inclination retards or causes the lime material deposited within said inner screen E to move slowly toward the smaller or discharge end, whereas the greater degree of inclination of the outer cylinder D causes the fine hydrated lime which has sifted from said inner screen to the outer cylinder to be discharged more rapidly, as will hereinafter be more fully described. A tapered screen *f* also has position within the outer cylinder D and is interposed

between said outer cylinder and the inner screen E. This screen *f* is preferably formed of wire mesh in order that its wavy surface may act on the particles or lumps which have sifted through the perforations of the inner screen E and aid in breaking and pulverizing said particles, so that the latter may pass through the wire mesh and be deposited on the interior wall of the imperforate outer cylinder D. It will be noted that both of the screens E and *f* are tapered and that the smaller ends are the discharge ends. It will also be seen that the taper of the outer screen E is less than the taper of the inner screen *f*. By this arrangement and the placing of the screens within the inclined outer cylinder the pitch of the walls of the outer screen is greater than that of the inner screen, so that the hydrated particles sifting through the inner screen will be moved toward the discharge end faster than those in the inner screen. This is important, because it is desirable to immediately remove the hydrated particles as soon as they become hydrated.

An inclined charging-chute G extends downwardly through the wall of the housing A and opens into the stationary head e^2 and is in communication with the interior of the straight portion of the tapered screen E. This charging-chute is provided with a door or gate *g*, which is pivoted so as to swing inward, and said gate has an arm *g'*, carrying a counterbalance-weight g^2, which serves to keep the gate normally closed. A water-tank *h* has position within the housing and elevated above the chute and is provided with an automatic valve device *h'* and a flush-pipe h^2, which extends downwardly from the tank and passes through the charging-head e^2 and enters the straight end of the inner screen E. The inner projecting portion h^3 of this pipe is provided with a sprinkling-head *i'*, having a plurality of bottom perforations i^2. A cord, chain, or rope h^4 is attached at one end to the valve-lever of the tank and near its other end passes around a pulley *i* and is then attached to the weighted arm *g'* of the charging-gate. It will thus be seen that when the gate *g* swings inward the arm *g'* will raise and pull on the cord or rope h^4, and thereby operate the valve *h'* in the tank *h* and permit the water to pass through the pipe h^2 and discharge onto the lime in the inner screen through the sprinkling-head *i'*.

The stationary discharging-head F at the lower end of the cylinder and screens is provided with two annular compartments *f'* and f^2, and each of said compartments is provided with a discharge-chute f^3 and f^4. The outer cylinder D discharges into the compartment *f'*, and the inner screen E discharges into the compartment f^2.

A drum J of any suitable construction is provided with a steam-inlet pipe *j'* and a steam-outlet pipe j^2, which latter projects through the head F and in an upwardly-inclined direction through the inner screen E. This pipe j^2 is provided with a series of perforations j^3 in its top surface, through which the steam escapes into the said inner screen. The perforations j^3 in the inclined pipe j^2 are along the top surface of said pipe in order that the water of condensation may drain off or flow back into said drum *j*, from which it may be drawn off by means of a cock or valve.

A scale L is provided at the entrance to the chute G, on which the lime to be hydrated is weighed.

In the operation of the apparatus the quicklime as it comes from the kiln is sorted over and the unburned stone removed as far as possible, after which it is preferably loaded onto wheelbarrows and conveyed to the charging-chute G, where it is first weighed, and the prescribed quantity is then dumped into the chute. As the lime passes down through the chute its weight causes the gate *g* to swing inward. This inward movement of the gate operates the valve device *h'* of the tank *h*, and the predetermined quantity of water in the tank then flows down through the pipe h^2 and sprinkling-head *i'* and is distributed over the quicklime beneath it. The valve *h'* of the tank is adjusted so that a given quantity of water will be discharged upon a given weighed quantity of quicklime. This water discharge may be regulated to suit the chemical analysis of the particular lime that is being treated, but should be less than sufficient to convert the given quantity of lime into a perfect hydrate. The lime passes from the charging-chute into the higher end of the slowly-revolving screen E, where it is sprinkled with water, as just described.

During the revolution of the screen the larger particles and heaviest lumps of lime will remain at the lowest part of the screen, and the water-spray from the sprinkler *i'* is directed onto the said larger particles of the lime, which require more water than the finer particles, and the latter cling closer to the screen and are carried partly around and beyond the reach of the spray as the screen revolves. Shortly after the spray ceases, the given quantity of water having been discharged, the entire mass commingles, begins to heat, breaks up and passes through the perforations *e'* in the tapered part of the screen, and deposit on the finer screen *f*, and from this screen the fine-powdered particles pass onto the wall of the outer cylinder. Some of the larger lumps of lime will require additional moisture to complete the hydration, and in order to provide for this the heat and steam generated by the slaking mass is utilized, and in addition thereto steam is supplied to the inner screen through the perforations j^3 of the pipe j^2. These perforations are formed along the upper surface of said pipe, so that the water of condensation may flow back down the inclined pipe into the drum *j*, and thereby

prevent the said water of condensation from dripping into the screen E and possibly adding too much moisture. The mass or particles advance toward the discharge end as the cylinder and screens revolve, generating considerable heat and steam, which aids in the operation by driving off any surplus moisture from any lime particles that may be overmoist, whereas other particles needing moisture eagerly absorb the steam, and the remaining moisture needed for the perfect conversion of the mass being supplied by the stationary perforated steam-pipe. The lump lime rapidly breaks and pulverizes and passes from one screen E to the screen *f* and then to the outer encircling cylinder, from which latter it discharges as finely-pulverized lime into the compartment *f'* in the head F.

It is important that when the lime reaches the finely-pulverized hydrated state it should be removed from the action of the steam as quickly as possible in order to avoid absorbing moisture therefrom, which would tend to make it cake when packed. This quick removal is accomplished by the difference in the pitch of the wall of the cylinder and screens, which retards the coarser lumps in their passage and advances the finer particles more rapidly toward the lower end of the outer cylinder, and the hydrated lime as soon as it reaches the inclined outer cylinder flows almost like water toward the outlet. All particles failing to pass through the perforations *e'* or through the tapered screen *f* will be discharged into the compartment f^2 of the head F and conveyed or discharged at any desired point.

It is obvious that the machine may be provided with a series of discharge-outlets or one outlet for each screen.

The operation of the apparatus is carried on within the housing, and air is practically excluded.

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

1. In an apparatus of the class described the combination of an outer imperforate cylinder; an inner perforated screen tapering in a direction toward its discharge end; a water-supply pipe at the higher end of said tapering screen, and a steam-pipe also within said tapering screen.

2. In an apparatus of the class described the combination of an outer imperforate cylinder; a perforated screen within said outer cylinder and being smaller at one end than at the other, said screen being longer than said imperforate cylinder and projecting beyond the latter at the higher end; a liquid-supply pipe at said projecting end of said perforated screen and a steam-pipe also within said longer screen.

3. In an apparatus of the class described the combination of an inclined outer imperforate cylinder; an inclined inner perforated screen; a water-supply pipe at the higher end of said perforated screen, and means for discharging water through said pipe in predetermined quantities.

4. In an apparatus of the class described the combination of an outer imperforate cylinder; an inclined perforated screen within said outer cylinder, said screen having an imperforate end which projects beyond said outer cylinder; a water-supply pipe at said imperforate projecting end of the inner screen, and means for discharging water through said pipe into the inner screen in predetermined quantities.

5. In an apparatus of the class described the combination of an inclined outer imperforate cylinder; an inclined perforated inner screen; a screen interposed between said outer cylinder and inner screen, and means for supplying water to the inner screen at the higher end.

6. In a machine of the class described the combination of an outer inclined imperforate cylinder; a tapered screen within said outer cylinder; an inner perforated tapered screen which has a taper of a greater angle than said screen, and means for discharging water into the said inner screen in predetermined quantities.

7. In a machine of the class described the combination of a revoluble inclined imperforate cylinder; an inclined inner perforated screen; a head at the lower end of said cylinder and screen and having a plurality of discharge-chutes, one for each cylinder and screen, and means for supplying water to the inner screen in predetermined quantities.

8. In a machine of the class described the combination of a revoluble outer imperforate cylinder; an inner perforated screen of a greater length than said outer cylinder; a discharging-head at the end of said cylinder and screen and having a plurality of discharge-openings, one of said openings registering with the shorter outer cylinder and the other opening arranged to receive the overflow of the longer inner screen.

9. In a machine of the class described the combination of an outer inclined imperforate cylinder; an inner inclined perforated screen; a charging-chute opening into said inner screen; means for normally keeping said chute closed; a tank to contain liquid; a pipe in said inner screen and communicating with said tank, and means whereby when matter is passed through said chute liquid will be automatically discharged into said pipe.

10. In a machine of the class described the combination of an outer imperforate cylinder; an inner inclined perforated screen; a charging-chute opening into said perforated screen; a gate in said chute and pivoted so as to keep the chute normally closed; a water-supply pipe in said perforated screen, and means coacting between said pivoted gate and said water-pipe to automatically discharge water

into said perforated screen when the gate is opened.

11. In a machine of the class described the combination of an outer imperforate cylinder; a perforated screen within said outer cylinder; a water-tank having a valve; a chute opening into said perforated screen; a gate in said chute; means connecting the gate of said chute with the valve of the water-tank whereby the opening of the gate will operate the valve of the tank to discharge the water.

12. In a machine of the class described the combination of an outer imperforate cylinder; a perforated tapered screen within said outer cylinder; a liquid-supply pipe within said perforated tapered screen, and an inclined steam-pipe also within said perforated screen and having a plurality of perforations along its top surface whereby steam may be discharged into the screen but allow the water of condensation to flow off.

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

JAMES REANEY, JR.

Witnesses:
WM. D. POULTNEY,
JNO. H. DUNCAN.