R. C. PENFIELD.

DRY PAN.

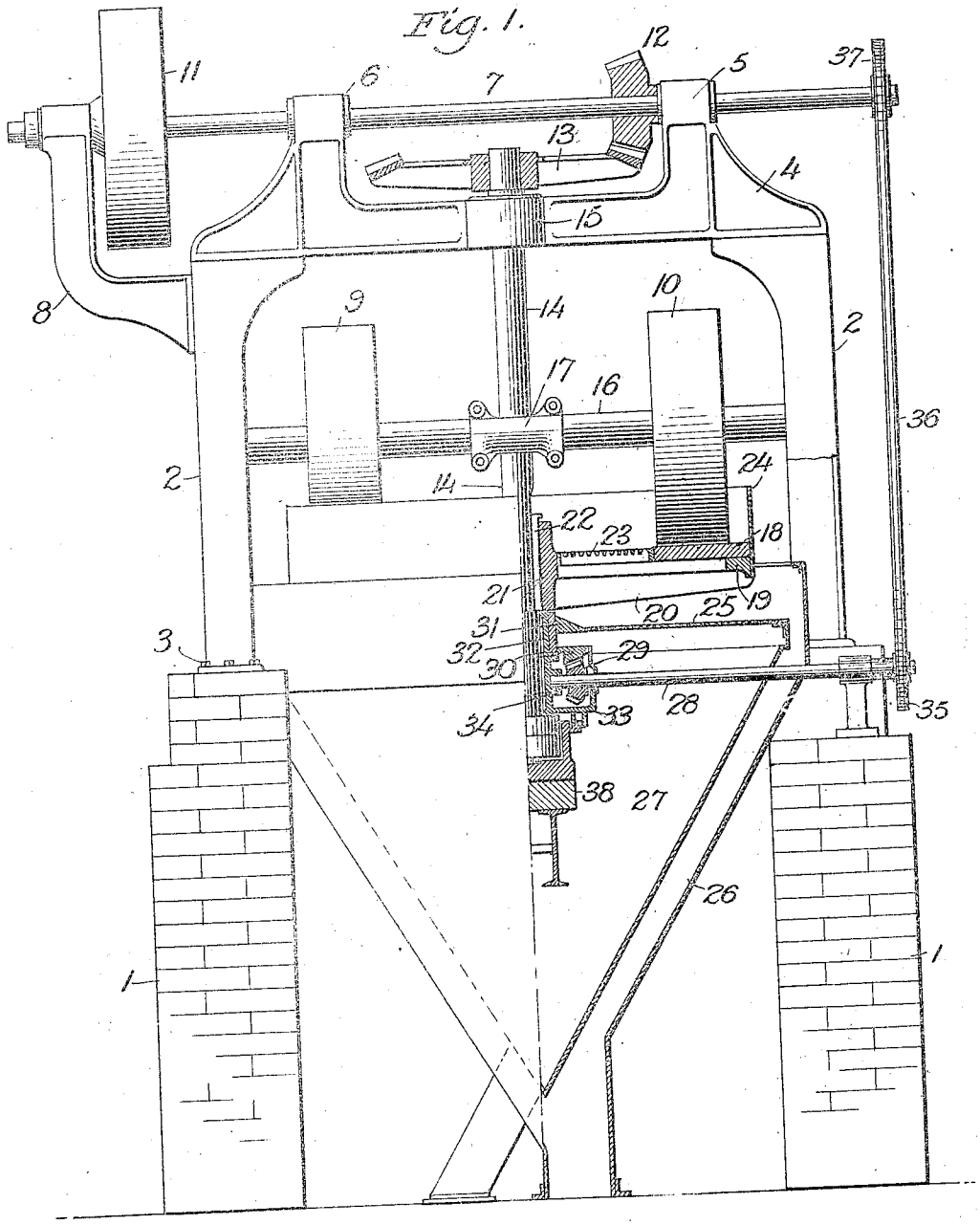
APPLICATION FILED JULY 13, 1909.

974,179.

Patented Nov. 1, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

Julius T. Hunt.

E. B. Schroeder

INVENTOR

Raymond C. Penfield

BY

Fred G. Dieken.

ATTORNEY

R. C. PENFIELD.

DRY PAN.

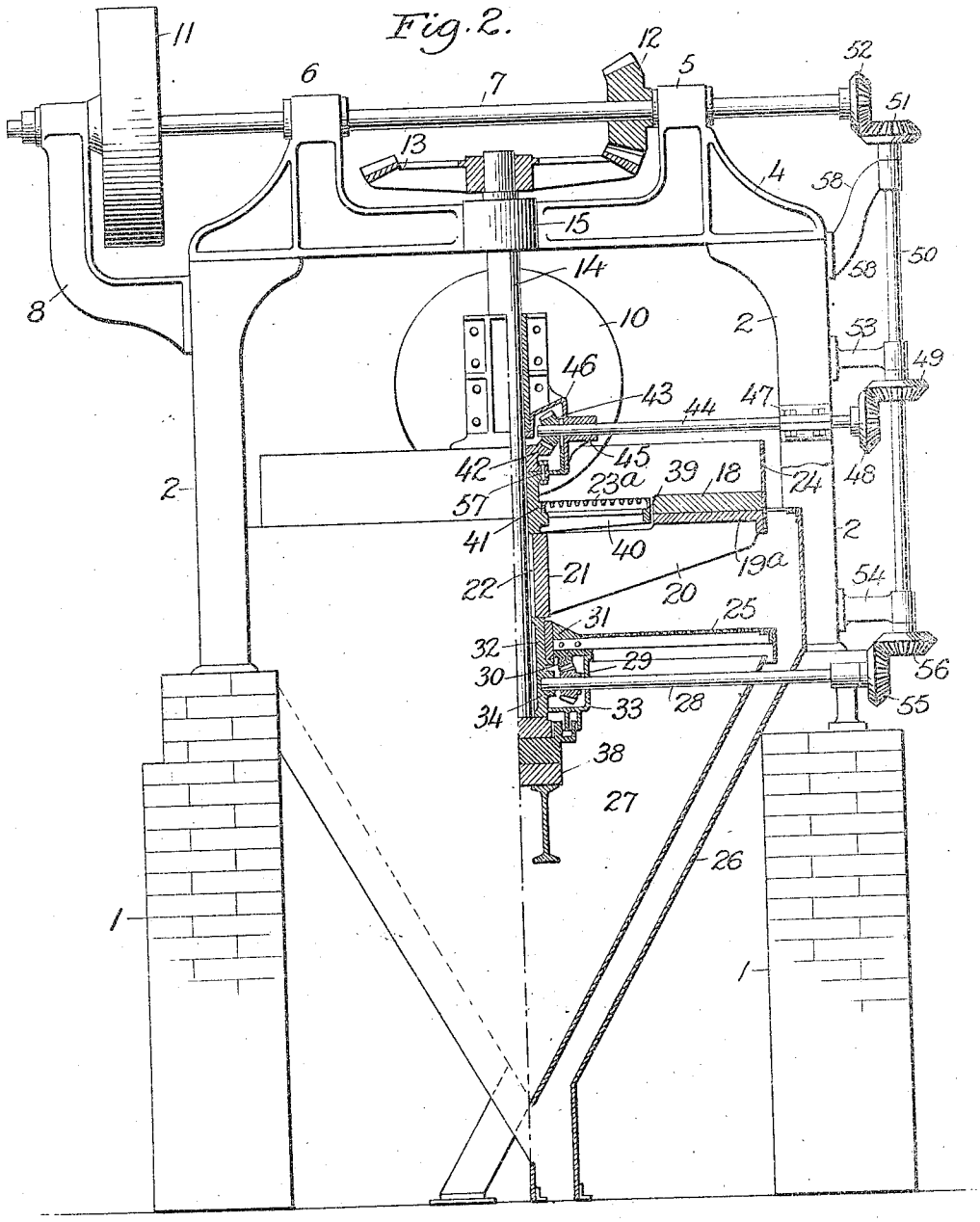
APPLICATION FILED JULY 13, 1909.

974,179.

Patented Nov. 1, 1910.

2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

L. B. Schroeder

INVENTOR

Raymond C. Penfield,

BY

Dodge & Coates

ATTORNEY

UNITED STATES PATENT OFFICE.

RAYMOND C. PENFIELD, OF NEW YORK, N. Y.

DRY-PAN.

974,179. Specification of Letters Patent. Patented Nov. 1, 1910.

Application filed July 13, 1909. Serial No. 507,422.

To all whom it may concern:

Be it known that I, RAYMOND C. PENFIELD, a citizen of the United States of America, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Dry-Pans, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to a rotary dry pan for use in the manufacture of clay products. In other words it may be termed a crushing or grinding mill for grinding and pulverizing clay and similar substances for use in the manufacture of bricks and in kindred arts, the mill being of that general class wherein the material to be crushed or reduced is fed under rollers or mullers located at opposite sides of the axis of revolution of the pan and then screened.

One of the principal difficulties with machines of this class is to obtain a large capacity for the space they occupy, and a reason for not being able to secure a large capacity has been that the speed of the pan causes the material after it passes under the grinding mullers to pass over the screen by centrifugal force too rapidly to permit of a proper and efficient screening.

My present invention therefore consists of means for overcoming this difficulty.

The invention comprises essentially a grinding element running at one speed, and a screening element running at a different speed which will be ordinarily a slower speed, and in combination with these a secondary screening element capable of running at its own independent speed which can be graduated to suit the needs of the machine and the work it is to perform, together with suitable appliances for securing these different relative speeds and varying and regulating the same; and also the invention includes a hopper construction having a number of pouches or receptacles for receiving the clay or other material of varying degrees of coarseness, and of enabling the same to be handled so that the final result for the clay may be as fine as is needed.

The invention furthermore comprises various details and peculiarities in the construction, combination and arrangement of parts substantially as will be hereinafter described and claimed.

In the accompanying drawings illustrating my invention, Figure 1 is a vertical sectional side elevation of my improved dry pan. Fig. 2 is a similar vertical sectional side elevation, illustrating an alternative form of certain parts of the invention.

Similar characters of reference designate corresponding parts throughout the different figures of the drawing.

1 denotes a pier or foundation of brick, concrete, or other suitable material on which the pan is mounted. The main framework of the pan consists of side frames 2 which are securely bolted or otherwise firmly fixed at 3 upon the foundation 1. Upon the frames 2 is supported a horizontal cross frame 4 which is rigidly affixed to said frames 2. This frame 4 provides journal bearings 5 and 6, preferably made as roller bearings, in which is rotatably mounted a horizontal shaft 7 whereon is a driving pulley 11 which may obviously be a plain pulley or a tight and loose pulley, either of which will perform the same function as the friction pulley indicated in the drawing. A bracket 8 secured to one of the side frames 2 serves to provide another bearing for the shaft 7, which bearing is at one of the outer ends of shaft 7. The drive pulley 11 is located on the shaft 7 between the bracket 8 and the bearing 6. Also on the shaft 7, preferably contiguous to the bearing 5, is a bevel driving pinion 12 which meshes with a horizontal master gear wheel 13 that is securely fastened upon the upper end of a vertical main driving shaft 14 which occupies a position centrally in the machine. Shaft 14 is supported at its upper end in a bearing 15 constructed near the central point of the horizontal cross frame 4.

9 and 10 designate mullers or grinding wheels which occupy a vertical position on opposite sides of the shaft 14 and which are rotated by the revolution of the pan beneath them, the material to be crushed being delivered or fed into the pan and brought under the action of the mullers in their rotation and being thereby crushed. These mullers 9 and 10 are supported in any suitable manner upon shafts 16 having bearings in the center boxing 17 and in the side frames 2. Since the shaft or journal arrangements for sustaining the mullers 9 and 10 and enabling them to easily revolve may vary within wide limits, I lay no special claim in

this application to any of the detailed construction of said muller shafts.

The grinding pan proper comprises grinding plates 18 which work in contact with the mullers 9 and 10 by revolving them during the operation of the machine. These grinding plates 18 are supported at the outer periphery of the pan upon a frame 19 carried by a plurality of horizontal arms 20 that are integral with a central hub 21 which is keyed at 22 to the shaft 14 (see Fig. 1). Said frame 19 forms a grinding base. Between the grinding plates 18 and the hub 21 are one or more screen plates 23 that are carried by and revolve with the frame 19 and the muller plates 18. The outer edge of the pan is furthermore provided with a vertical steel rim 24 secured to the frame 19. The material that is crushed upon the muller plates 18 by the action of the mullers 9 and 10 is scraped upon the screen plates 23, and the finer particles pass through the same and are received below upon a secondary horizontal screen 25. The coarser material that will not pass through the mesh of the screen 25 passes over the edge thereof and falls into a hopper 26 which I term a tailings hopper, from which it can be elevated and reground. The finer material, however, which falls through the screen 25 drops into another hopper 27 which I term a screened clay hopper, and can be transferred therefrom by any suitable means to any point where it is needed. The horizontal screen 25 rotates at a comparatively slow speed in a manner which I shall presently point out.

The muller grinding plates 18 and the mullers 9 and 10 travel faster than the screen plates 23, because said muller plates 18 are on the outer periphery of the pan, and hence on a faster moving portion thereof; while the screen plates 23, being nearer the center of the pan, move more slowly. When the ground material falls through the screen 23 and drops upon the screen 25, the best results are obtained because said secondary screen 25 has an independent speed; or, in other words, it operates at a speed which is entirely independent of the speed of the initial screening element 23. Since the muller plates and the mullers are on the outside of the screening plates 23 instead of on the inside, which is the more common and usual construction, it must be understood that the grinding plates and mullers can be run at a much faster speed; while the screen plates 23 run more slowly, thus giving more time for the fine material to pass through.

Supported in suitable journal bearings is a horizontal shaft 28, on which, near its inner end, is a pinion 29 which meshes with a gear wheel 30 forming a part of the frame 31 of the secondary screen 25, which frame revolves loosely around a stationary hub 32. This hub 32 forms a part of a gear casing 33. The end of the shaft 28 is received into a bearing 34 which forms a part of the stationary hub 32. On the other end of the shaft 28 from where the pinion 29 is located is a sprocket wheel 35 around which passes a chain 36 that also passes around and engages a sprocket wheel 37 on the end of the upper shaft 7. In this manner motion is communicated from the top shaft 7 to the shaft 28 which operates the secondary screening device. In lieu of the sprocket wheels 35 and 37 and chain 36, as shown in Fig. 1, I may substitute gear wheels or pulley devices; or any other convenient means for driving the shaft 28 may be employed. Gearing connections for this purpose are indicated in Fig. 2 and will be afterward more fully described.

At 38 I illustrate a step bearing for the lower end of the main driving shaft 14, which bearing may vary widely in its detailed construction. This step bearing serves also to support the stationary hub 32 and the gear casing. The grinding base or the pan proper is provided with an encircling ring 24 of greater or less height.

In the form of the invention illustrated in Fig. 2, the mullers 9 and 10 and the muller plates 18 are supported upon a frame 19^a held by the arms 20 projecting from the central hub 21 which is keyed at 22 to the shaft 14; and screen plates 23^a are located between the muller plates 18 and the central vertical driving shaft 14; but the screen plates 23^a are not carried in this instance by the frame that supports the muller plates, but are supported on an independent screen-supporting frame consisting of an outer rim 39, a plurality of arms 40, and a central hub 41, which hub is mounted loosely upon the vertical shaft 14 and rotates easily thereon. Secured by bolts 57 to the upper end of the hub 41 is a bevel gear wheel 42 with which meshes a pinion 43 mounted on one end of a horizontal shaft 44. Said shaft 44 is supported at one end by a journal bearing 45 which forms a part of a gear casing 46, and at the other end is carried in a bearing 47 in one of the vertical side frames 2.

On the outer end of the shaft 44 is a miter pinion 48 that meshes with another miter pinion 49 on a vertical shaft 50. Shaft 50 is suitably supported in bearings provided by brackets 53, 54 and 58 on the side of one of the frames 2. At the upper end of the shaft 50 is a miter pinion 51 which meshes with a corresponding miter pinion 52 on the end of the upper shaft 7. In this way it will be seen that motion is communicated from said driving shaft 7 to the vertical shaft 50, and from it through the gears 49 and 48 to the primary screen actuating shaft 44. On the lower end of the vertical

shaft 50 is a miter pinion 56 which meshes with and actuates another miter pinion 55 on the outer end of the lower horizontal shaft 28 which is arranged in the same manner as it is in Fig. 1, and has for its function the driving of the secondary screening device 25. Thus it will be seen that the central vertical drive shaft 14 actuates the pan proper or the main grinding base, as it is termed, which carries the grinding plates 18, and drives the same at a certain speed. Also, it is evident that through the miter gears 48 and 49, the shaft 44, the pinions 42 and 43, and the screen supporting frame, the primary screening device 23^a is revolved at a speed whose rate may differ from that of the main grinding device and is generally slower. Also, it is seen that through the miter gears 55 and 56, the shaft 28 and the gears 29 and 30, the secondary screening device which receives the material that falls through the primary screen is driven at a rate of revolution different from either that of the grinding element or the primary screening element. There is thus imparted to the three distinct elements which act upon the material, viz.: the grinder and the two screens, three distinct and independent movements whose degree and rate can be relatively regulated in the manner required. So that in the combination shown in Fig. 2 the material to be ground, crushed, or pulverized obviously passes first into the pan and under the mullers 9 and 10 with the usual result of grinding the material. It is then directed by scrapers on to the primary screening device 23^a, which, as I have said, has a different speed from the grinding plates. The screened material falls from the primary screening device upon the secondary screen 25 which has a still different speed. Such coarser material as will not pass through the screen 25 is thrown off to one side and falls into the tailings hopper 26. The finer material, however, which is of the requisite degree of fineness drops into the screened clay hopper 27, and is carried away therefrom to be used as needed. The coarse material is taken from the tailings hopper back into the pan by any suitable mechanism, so that it may be reground. The details of construction of the hopper devices 26 and 27 may vary greatly. In general, it may be said that they are of conical shape, the tailings hopper 26 being of larger diameter than the screened clay hopper 27. They have suitable outlets at the lower end or on the side, from which their contents are removed with facility. They are supported in any desired manner and are arranged properly beneath the screening mechanism so that the ground substances may pass readily thereinto. Thus, while in Fig. 1 the grinding device and the primary screen have a joint revolution, being both carried by the same revolving support, in Fig. 2, they revolve independently, as also does the secondary screen. In Fig. 1 the revolution of the grinding base is faster than that of the primary screen because it is on the outer periphery of the pan, but the two rotate in unison. In Fig. 2, however, the primary screen may have a decidedly slower rate of revolution, being driven independently of the grinding element. Thus I am enabled to provide for different methods of running the primary and secondary screening devices at different speeds from that at which the grinding plates and the mullers are operated, in order to prevent the ground material from passing over the screen plates too rapidly to be properly screened; and by this improved mechanism I also am enabled to pass the material first through a primary coarser screen, and then through a secondary finer screen running at independent speeds and each independent of the grinding base, in order to increase the capacity of the pan and enable the power to be reduced correspondingly with the capacity.

Many changes in the construction, combination and arrangement of the various parts may obviously be made without exceeding the scope of the appended claims, and I therefore reserve the liberty of making such needful changes in this respect as experience may suggest.

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

1. In a dry pan, the combination of a grinding member, a screening member, the latter being concentric with and inside of the grinding member, means for supporting and jointly rotating the said members, and an independently rotating secondary screening device below the first screen.

2. In a dry pan, the combination of grinding mechanism, mullers arranged to operate in connection therewith, a screening member, means for jointly supporting the grinding member and the screening member, and an independently rotating secondary screening element below the first one and having a finer mesh.

3. In a dry pan, the combination of a grinding base, mullers operating in connection therewith, a primary screen concentric with said base and having a coarse mesh, an independently rotating secondary screen below the first and having a fine mesh, a screened clay hopper for receiving the material from the secondary screen, and a tailings hopper for receiving the unscreened material that does not pass through the secondary screen.

4. In a dry pan, the combination with a grinding base and mullers, of a primary

screen which receives the material from the mullers, an independently rotating secondary screen below the first screen for screening the material more finely than the first screen, and receptacles for receiving screened material of different degrees of fineness.

5. In a dry pan, the combination of grinding plates, mullers working thereon, a screening element concentric with and receiving material from the plates and mullers, an independently rotating secondary screening element below the first screen, a tailings hopper receiving the coarse material thrown off the secondary screen, and a screened clay hopper for receiving the fine material which passes through the secondary screen.

6. In a dry pan, the combination of a grinding base having an encircling rim, mullers working thereon, a screen concentric with and inside of the grinding base and receiving the material therefrom, a secondary screen below the first, means for driving the secondary screen at a different rate of revolution from that of the other rotary elements, conical concentric hoppers beneath the screen devices for receiving material of different degrees of fineness.

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

RAYMOND C. PENFIELD.

Witnesses:
JEANNETTE STORK,
C. B. SCHROEDER.