No. 837,717. PATENTED DEC. 4, 1906.

H. M. PERRY.

PROCESS OF MAKING CEMENT COMPOUNDS.

APPLICATION FILED JAN. 5, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

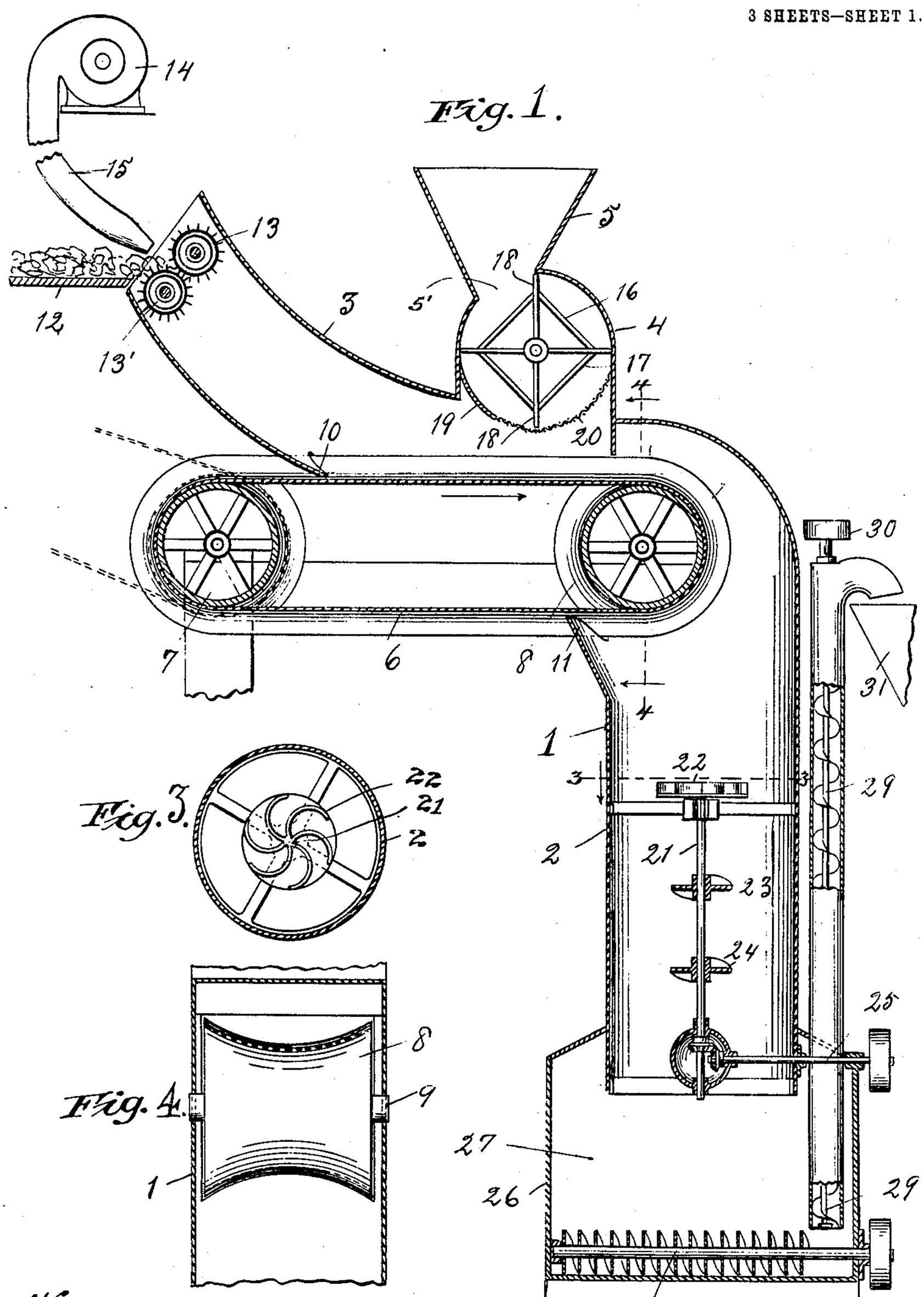

Fig. 3.

Fig. 4.

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3 SHEETS—SHEET 2.

Fig. 5.

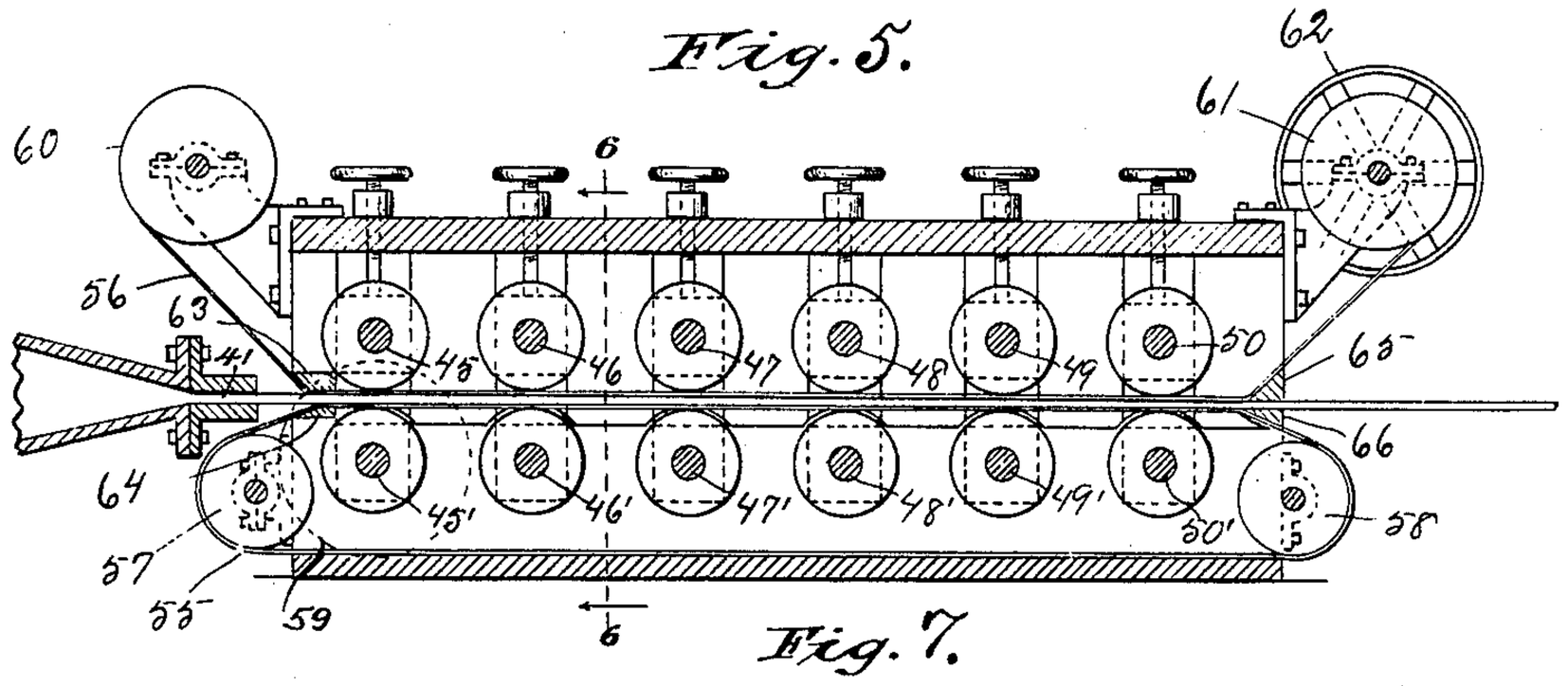


Fig. 7.

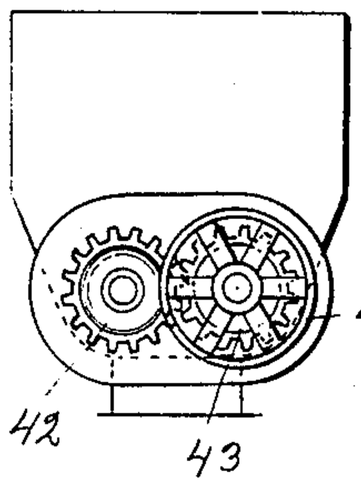


Fig. 8.

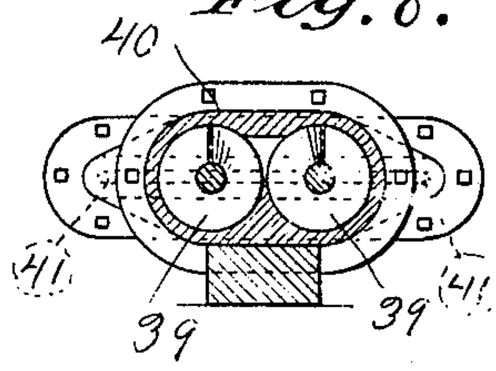


Fig. 2.

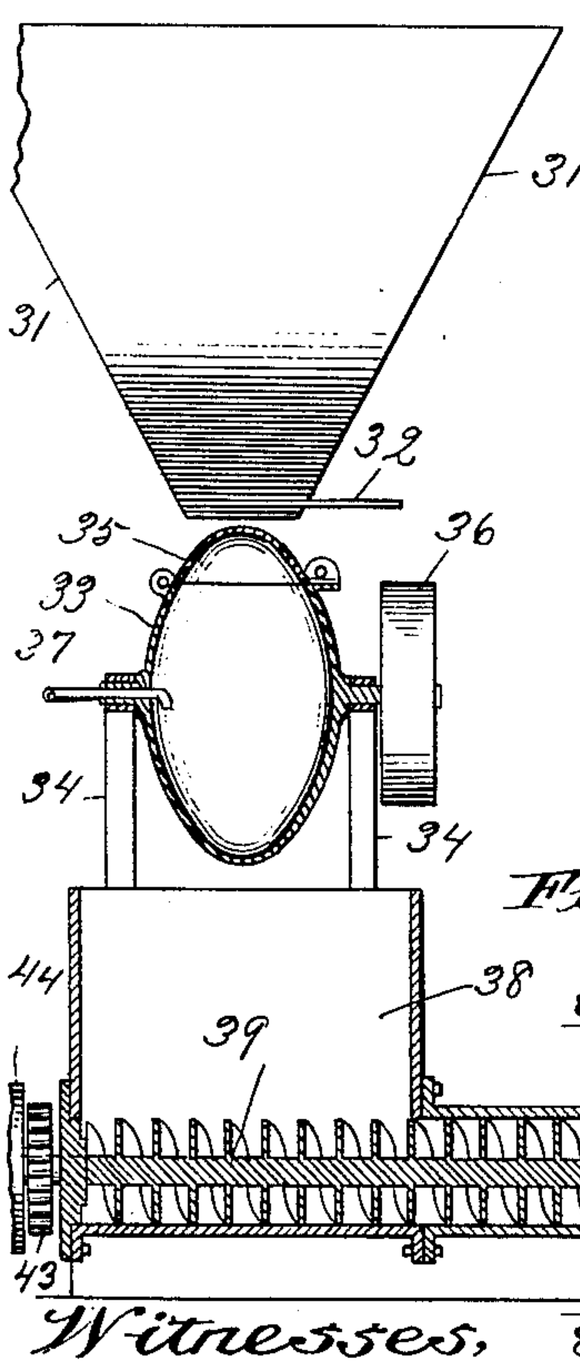
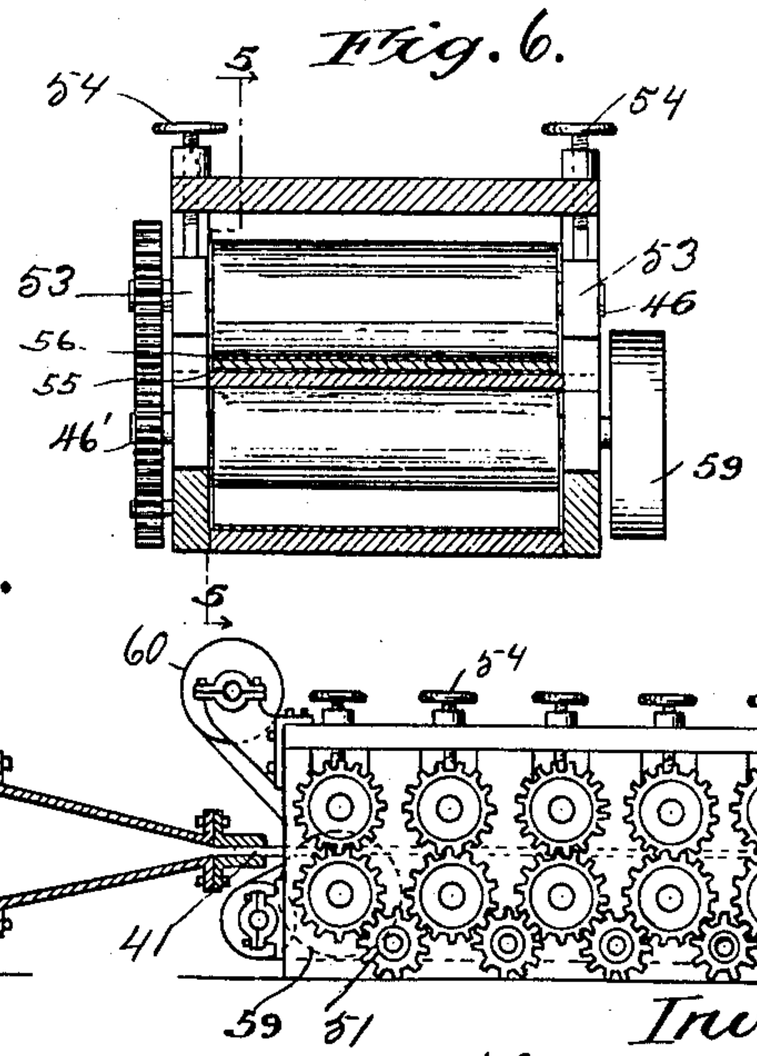


Fig. 6.



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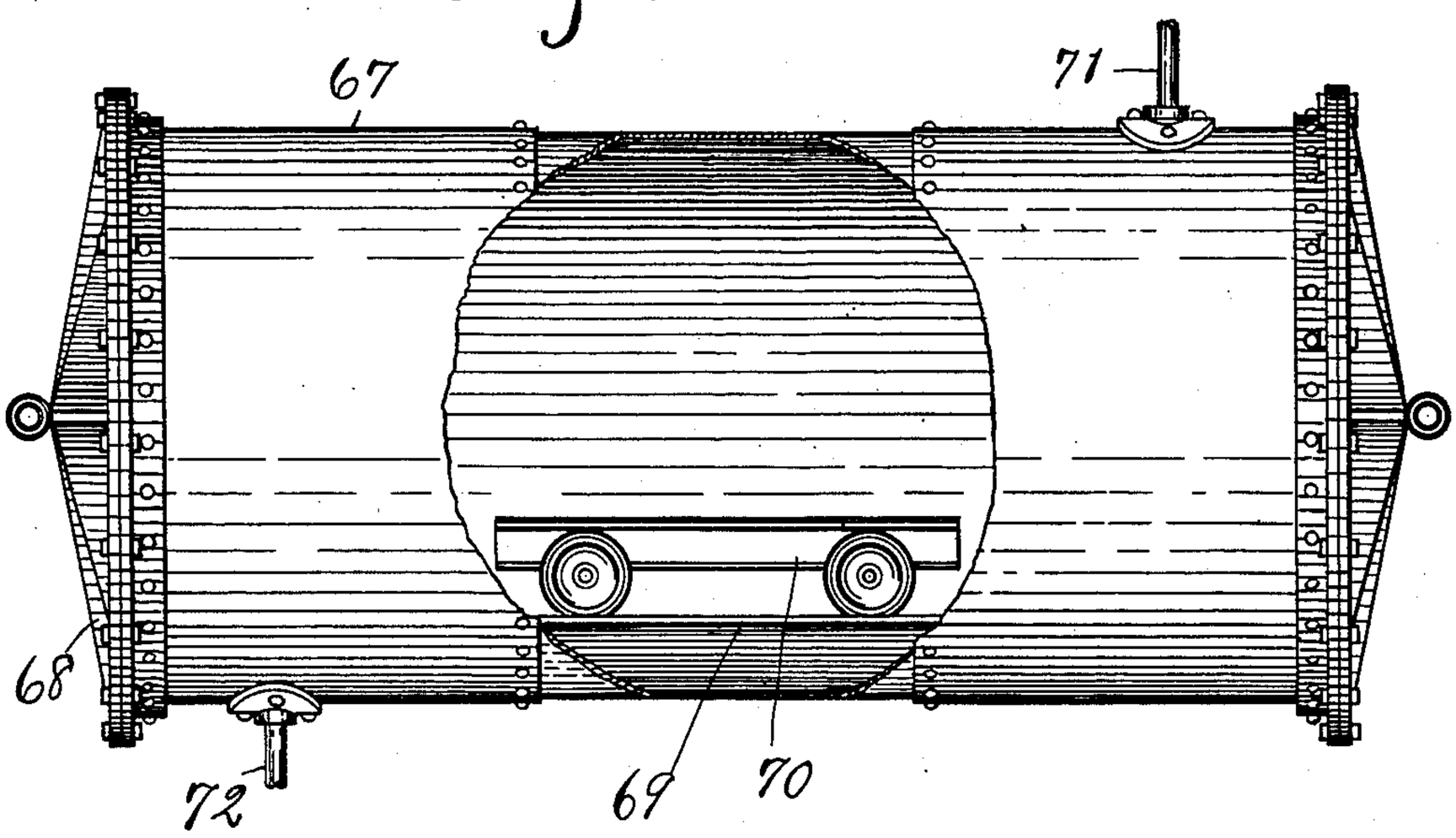
3 SHEETS—SHEET 3.

Fig. 9.



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UNITED STATES PATENT OFFICE.

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PROCESS OF MAKING CEMENT COMPOUNDS.

No. 837,717. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed January 5, 1906. Serial No. 294,724.

25-155

To all whom it may concern:

Be it known that I, HUBERT M. PERRY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Process of Making Cement Compounds, of which the following is a specification.

This invention relates to an improved process of making cement compounds, and more particularly relates to a process for making a compound from hydraulic cement and fiber possessing some of the characteristics of stone and some of the characteristics of wood.

The salient object of the invention is to provide a simple method or process whereby a compound which is fireproof, waterproof, and very tough and hard may be made at a comparatively low cost.

Other objects of the invention are to provide a process which may be carried out continuously; to provide a process the various steps of which are under very perfect control, enabling the proportions of the ingredients to be modified at will and, if desired, without interrupting the process; to provide a process which is equally available for producing the material in the form of slabs, bars, plain or corrugated sheets, and analogous forms, and in general to provide an improved process of the character described.

To the above ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims.

In carrying out the present invention suitable proportions of dry pulverulent hydraulic cement and a suitable fiber, such as asbestos, which has been shredded, are intimately mixed, the mixture thereafter uniformly moistened to a limited extent and only sufficient to insure cohesion of the mass under high pressure, and the mass finally molded into the form desired in a suitable molding apparatus, in which the material is subjected to a succession of compressions.

I have discovered that by bringing the two materials—*i. e.*, the asbestos and the pulverized cement—together by exposing the fibers in thoroughly-separated condition to a cloud or shower of the pulverized cement the fibers become individually coated and charged with the particles of cement, and the mass may thereafter be caused to cohere by moistening and subjecting to pressure, thus producing a material having marked characteristics peculiar to itself.

The process may be carried out by the use of various forms of apparatus and will be readily understood from the following description of the manner in which it is carried out with one particular type of apparatus in which the bringing of the dry materials together is effected by introducing the fiber by means of a blast into the presence of a falling shower of cement.

Referring to the drawings, Figure 1 represents in vertical sectional view, with parts in side elevation, the dry-mixing part of the apparatus. Fig. 2 shows in similar manner the moistening and molding apparatus, the pressing-roll mechanism being shown in side elevation and the parts shown in Fig. 2 being complementary to those shown in Fig. 1. Fig. 3 is a transverse sectional view taken on line 3 3 of Fig. 1 and looking downwardly. Fig. 4 is a view taken on line 4 4 of Fig. 1 and looking in the direction of the arrows. Fig. 5 is a longitudinal vertical sectional view of the pressing-roll mechanism, taken on line 5 5 of Fig. 6 and looking in the direction of the arrows. Fig. 6 is a transverse sectional view taken on line 6 6 of Fig. 5. Fig. 7 is an end elevation of the receptacle into which the material is dumped after being moistened. Fig. 8 is a transverse sectional view taken on line 8 8 of Fig. 2 and looking in the direction of the arrows. Fig. 9 is a side elevation of a retort in which the material is subjected to a hydrating treatment.

Referring to the drawings, 1 designates as a whole a suitable trunk-like casing comprising a vertical portion 2, an obliquely-inclined portion 3, constituting an inlet-spout, a sifter-housing 4, formed as an upper extension of the main casing, and a hopper 5, extending above and communicating with the sifter-housing. Through a suitable opening in the side of the casing is arranged to extend a horizontally-disposed conveyer-belt 6, the upper lap of which extends immediately below the sifter-housing and the delivery end of which is located about in line with the central part of the vertical portion 2 of the casing. The conveyer-belt is mounted upon concave pulleys 7 and 8, respectively, the latter being journaled upon trunnions extending through the sides of the casing and

the former suitably supported outside of the casing and connected with a belt-pulley whereby the belt is driven. The aperture inside of the casing through which the conveyer-belt extends is suitably shaped to follow the external contour of the belt and prevent escape of material, the upper and lower margins of said aperture being curved to follow the concave contour of the belt-laps, as indicated at 10 and 11.

12 designates a suitable support or table arranged contiguous to the receiving end of the spout 3 and over which the fiber is to be fed manually or otherwise to a pair of picker-rolls 13 and 13′, conveniently journaled in the mouth of the spout and provided with prongs which intermesh and serve to thoroughly shred and separate the fiber. These rolls are suitably driven to draw the material into the spout.

14 designates as a whole a blower, which may be of any suitable type, and from this blower leads a blast-pipe 15, which has its delivery end arranged to direct the blast between the picker-rolls 13 13′. The blast of air blown in through the rolls carries the fiber with it downwardly onto the conveyer-belt and beneath the sifter mechanism.

16 designates the sifter, which is so constructed as to form, in conjunction with the casing within which it is mounted, a valve of the turnstile type—that is to say, the rotary member of the sifter comprises a central box-like body 17, journaled to fit closely between the side walls of the housing 4 and provided with a plurality of peripheral vanes 18, which extend from side to side of the casing and at their ends fit closely the cylindric upper side of the casing. A cylindric partition 19 partly closes the lower side of the chamber within which the rotary member it mounted, and from the lower edge of this partition a sieve or screen 20 extends around to the opposite side of the casing, thus completing the cylindric bottom of the chamber. The inlet-opening 5′ of the hopper 5 is of such width and so disposed that the turnstile-valve will at all times keep it sealed against the escape of the blast or plenary pressure within the casing and the sifter-valve will be rotated at a controlled rate of speed, thereby operating as a measuring mechanism which determines the amount of pulverized cement introduced.

The fiber blown in through the spout 3 meets the shower of falling cement, and the two materials are together carried over the conveyer-belt and discharged into the vertical part of the casing, falling in a shower downwardly through the latter. In order to insure that the fibers shall be thoroughly charged with the powdered cement, the vertical part of the trunk-like casing is provided with a vertically-disposed shaft 21, driven at a relatively high rate of speed and carrying a series of fliers, as 22, 23, and 24, which thoroughly agitate the air and material in suspension. The uppermost flier-blades 22 are conveniently in the form of horizontally-disposed spiral blades, while the lower fliers 23 and 24 may desirably be of helical-spiral form, so as to create upwardly-tending currents of air, which maintain the material longer in suspension. The shaft 21 is conveniently driven from the cross-shaft 25, extending in through the side of the casing, the two shafts being suitably geared together and the cross-shaft provided with a belt-pulley outside of the casing. The lower end of the vertical trunk discharges into a larger chamber or hopper 26, having downwardly-converging sides 27 and a conveyer-screw 28, journaled to work in the apex or lowermost part of the hopper and operating to convey the material to one end, at which point it is taken up by an elevating-conveyer 29. The elevating-conveyer is shown as consisting of a vertical screw conveyer, the shaft of which extends at its upper end out through the casing and is provided with a belt-pulley 30, whereby it is actuated.

The upper end of the conveyer 29 delivers into a hopper 31, the discharge-opening of which is controlled by a gate 32. Immediately below the hopper is arranged a revoluble mixer consisting of a hollow receptacle 33, provided with trunnions at each side and journaled to rotate on a horizontal axis in supports 34. A side portion 35 of the receptacle 33 is removably hinged to the main body, so as to form a door through which the charge may be admitted to the receptacle. A belt-pulley 36 is attached to one of its trunnions, and through the other trunnion is arranged to extend axially a supply-pipe 37, through which steam or water is admitted during the rotation of the mixer.

Below the mixer is arranged another hopper 38, in the bottom of which are arranged any desired number of conveyer-screws 39, which are operated to carry the mixture into a spout 40, communicating with one side of the hopper 38. In the present instance two conveyer-screws are provided, and the cross-sectional form of the spout is such as to fit closely around them, as shown clearly in Fig. 8. The spout or nozzle 40 is shown in the present instance as terminating in a narrow slot-like discharge-opening 41, which delivers the material in the form of a flat slab, and the conveyer-screws are geared together, as indicated at 42 and 43, and driven by means of a belt-pulley 44, so as to eject the mixture uniformly.

From the discharge-opening 41 the slab of material passes between a series of pairs of pressing-rolls, as 45 45′ 46 46′, &c. The rolls are all connected by a train of gears, (designated as a whole 51,) so as to be uniformly driven together, one member of the train being driven by means of a belt-pulley 52. Each upper roll is mounted in movable jour-

nal-boxes, as 53, the positions of which are controlled by hand-screws 54, whereby the rolls may be set up or retracted to impart any desired degree of pressure. In practice the rolls are set successively closer to each other from the receiving end toward the delivering end of the mechanism.

In order to support and confine the slab of material during its passage between the pressing-rolls, an endless belt 55 is arranged to travel over the upper sides of the lower set of rolls, and a sheet of fabric 56 is in a somewhat similar manner fed to pass beneath the lower set of rolls and between the latter and the upper side of the slab. The belt 55 is mounted on suitable supporting-rollers, as 57 and 58, mounted at the respective ends of the machine, one of these rolls being actuated by a suitable belt-pulley 59. The web of fabric 56 is drawn from a supply-roll 60, mounted above the receiving end of the rolls and wound upon a receiving-roll 61 at the opposite end of the machine, which is driven by a belt-pulley 62. At the point where the slab enters the roll mechanism guide-bars, as 63 and 64, are mounted to extend across above the web of fabric 56 and below the belt 55, respectively, thus forming an entrance-throat. At the delivery end of the machine a somewhat similar pair of bars 65 and 66 are arranged to act as strippers to strip the fabric and belt, respectively, from the surfaces of the slab.

The material as it is delivered from the pressing-rolls requires to be hydrated—that is to say, owing to the restricted amount of moisture which has been used in mixing and molding the material its affinity for water is not satisfied, and its strength and hardness are increased by subsequent hydration. Owing to the hygroscopic character of the material such hydration will take place if the material is simply exposed to the atmosphere under ordinary temperatures and conditions; but as an improved step of completing this hydration quickly and thoroughly I subject the molded and pressed material to the action of steam under pressure. Accordingly I provide a suitable retort—such, for example, as that shown in Fig. 9 and designated as a whole 67—within which the material may be placed and subjected to the steam treatment. The retort shown consists simply of an ordinary cylindric vessel capable of withstanding comparatively high pressure—say two hundred pounds to the square inch—and provided with a removable closure or head 68. In the bottom of the retort is a suitable longitudinally-extending track 69, upon which is arranged to roll a car 70, upon which the material is loaded. The retort is provided with a steam-inlet pipe 71 and discharge-pipe 72.

In carrying out the process by the use of the foregoing apparatus the dry pulverulent cement is supplied to the hopper of the sifter and the latter operated continuously, while at the same time material is fed to the shredding-rolls and blown into the spout by means of a blower. The amount of cement sifted in is regulated to correspond approximately with the amount of fiber which is fed in, the object being to so proportion the amount of cement that it will be chiefly taken up or lodged upon the fibrous material. In practice I find that the proper proportions of cement and fiber are, by weight, approximately ninety per cent. of cement to ten per cent. of fiber, although these proportions may be considerably varied without defeating the successful carrying out of the process. The mixture delivered to the batch-mixer is there charged with just sufficient moisture to insure proper cohesion of the mass under the pressure to which it is subjected in passing through the nozzle and between the pressing-rolls. This will vary considerably, depending upon the character of the cement used and its condition. After the material passes from the rolls it is transferred to the retort and piled therein in such manner that the steam may have access to all parts and is then subjected to the steam-pressure and heat for a period varying from six to twelve hours. I prefer to employ pressure of about two hundred pounds to the square inch and find that this effects the hydration of the material quickly and thoroughly. After hydration the material is ready for use, although it will usually be allowed to dry under atmospheric conditions.

I claim as my invention—

1. The improved process of making hydraulic-cement compound which consists in first agitating shredded fiber and substantially dry and powdered hydraulic cement in the presence of each other until the individual fibers are sufficiently charged or coated with powder, to form when moistened and compacted, a solid, then uniformly moistening the mass by impregnating it with steam or water, and then converting the same into a solid by molding the mass under pressure.

2. The improved process of making hydraulic-cement compound which consists in first sifting measured quantities of powdered cement over measured quantities of shredded fiber and agitating the two ingredients until the fibers have become thoroughly and sufficiently charged with the dry powder, to form when moistened and compacted, a solid, then moistening the mixture to a limited degree only by the admission of controlled quantities of steam or water and further agitation, then molding the material into a solid of desired form.

3. The improved process of making hydraulic-cement compound which consists in first sifting measured quantities of powdered cement over measured quantities of shredded

fiber and agitating the two ingredients until the fibers have become thoroughly charged with the dry powder, then moistening the mixture to a limited degree only by the admission of controlled quantities of steam or water and further agitation, then subjecting the mixture to a pugging treatment, then forcing the mixture through a forming-nozzle and finally pressing the formed material into a solid between pressing-rollers.

4. The improved process of making hydraulic-cement compound which consists in first precipitating a shower of powdered cement and discharging into said shower continuously and gradually, shredded fiber, maintaining the suspended cement and fiber in agitation until the fiber becomes charged and coated with the powder, then collecting the mixture and subjecting it to a moistening step by admitting steam or water to a limited extent and agitating the mass until evenly moistened, then passing the material through a forming-nozzle under pressure, transferring it from the nozzle to a set of rolls and passing it successively through a plurality of pairs of rolls.

5. The improved process of making hydraulic-cement compound which consists in first precipitating a shower of powdered cement and discharging into said shower continuously and gradually, shredded fiber, maintaining the suspended cement and fiber in agitation until the fiber becomes charged and coated with the powder, then collecting the mixture and subjecting it to a moistening step by admitting steam or water to a limited extent and agitating the mass until evenly moistened, then passing the material through a forming-nozzle under pressure, transferring it from the nozzle to a set of rolls and passing it successively through a plurality of pairs of rolls, and finally hydrating the material by subjecting it to the action of atmosphere charged with moisture.

6. The improved process of making hydraulic-cement compound which consists in first precipitating a shower of powdered cement and discharging into said shower continuously and gradually, shredded fiber, maintaining the suspended cement and fiber in agitation until the fiber becomes charged and coated with the powder, then collecting the mixture and subjecting it to a moistening step by admitting steam or water to a limited extent and agitating the mass until evenly moistened, then passing the material through a forming-nozzle under pressure, transferring it from the nozzle to a set of rolls and passing it successively through a plurality of pairs of rolls, and finally hydrating the material by subjecting it to the action of steam and pressure in a closed chamber.

7. The improved process of making hydraulic-cement compound which consists in first precipitating a shower of powdered cement and discharging into said shower continuously and gradually, shredded fiber, maintaining the suspended cement and fiber in agitation until the fiber becomes charged and coated with the powder, then collecting the mixture and subjecting it to a moistening step by admitting steam or water to a limited extent and agitating the mass until evenly moistened, then passing the material through a forming-nozzle under pressure, transferring it from the nozzle to a set of rolls and passing it successively through a plurality of pairs of such rolls while confining it between flexible webs of material traveling with the molded material.

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