

June 26, 1934.

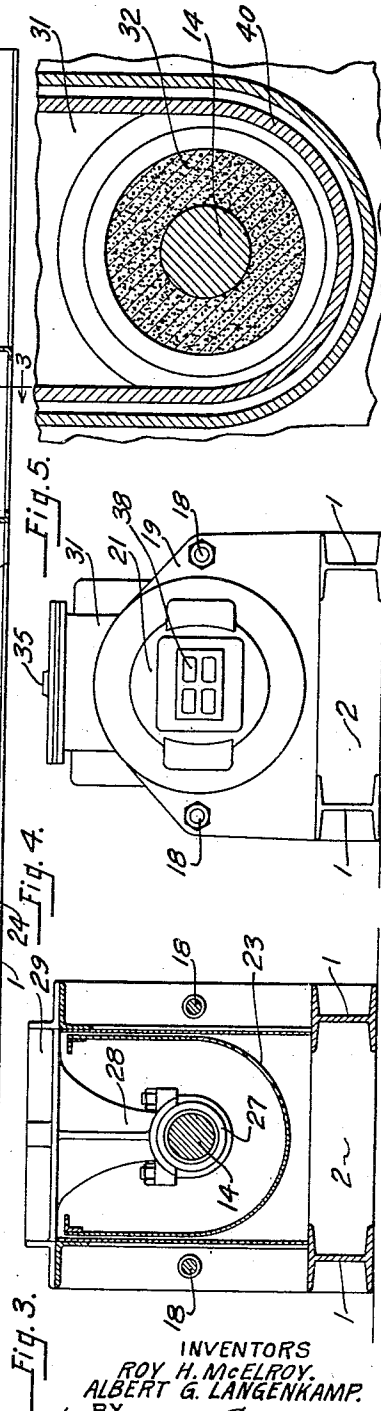
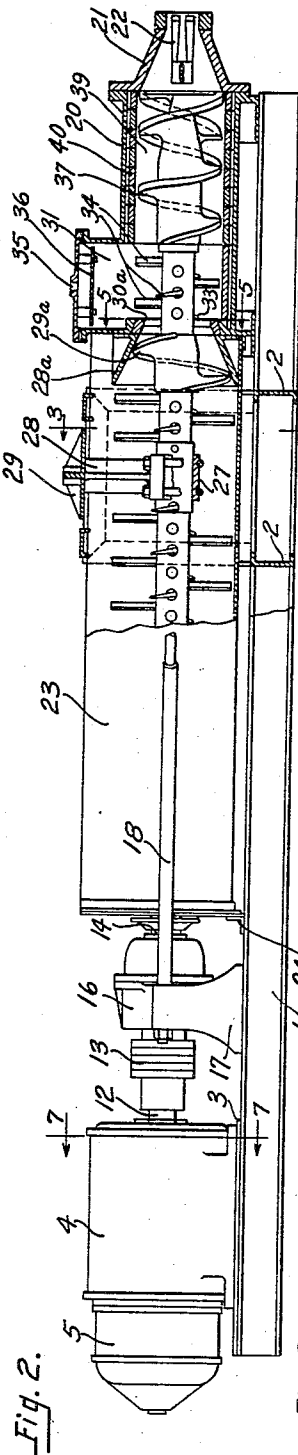
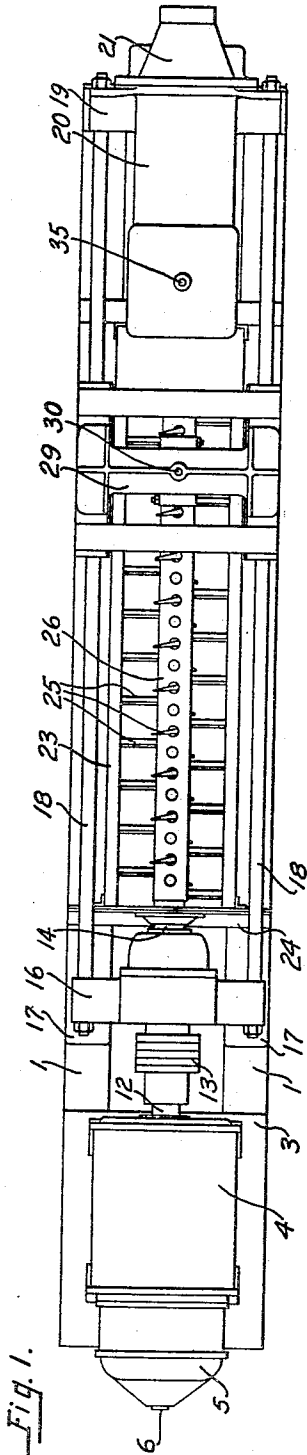
R. H. McELROY ET AL

1,964,266

AUGER MACHINE

Filed Nov. 16, 1932

2 Sheets-Sheet 1



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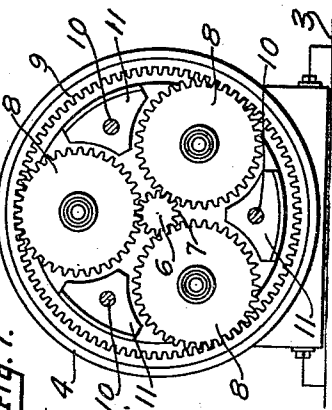
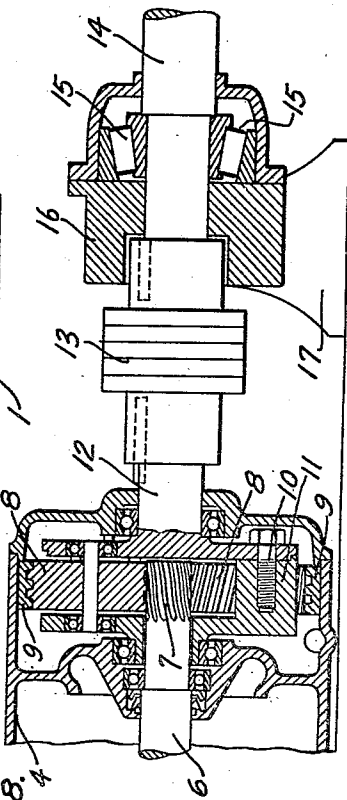
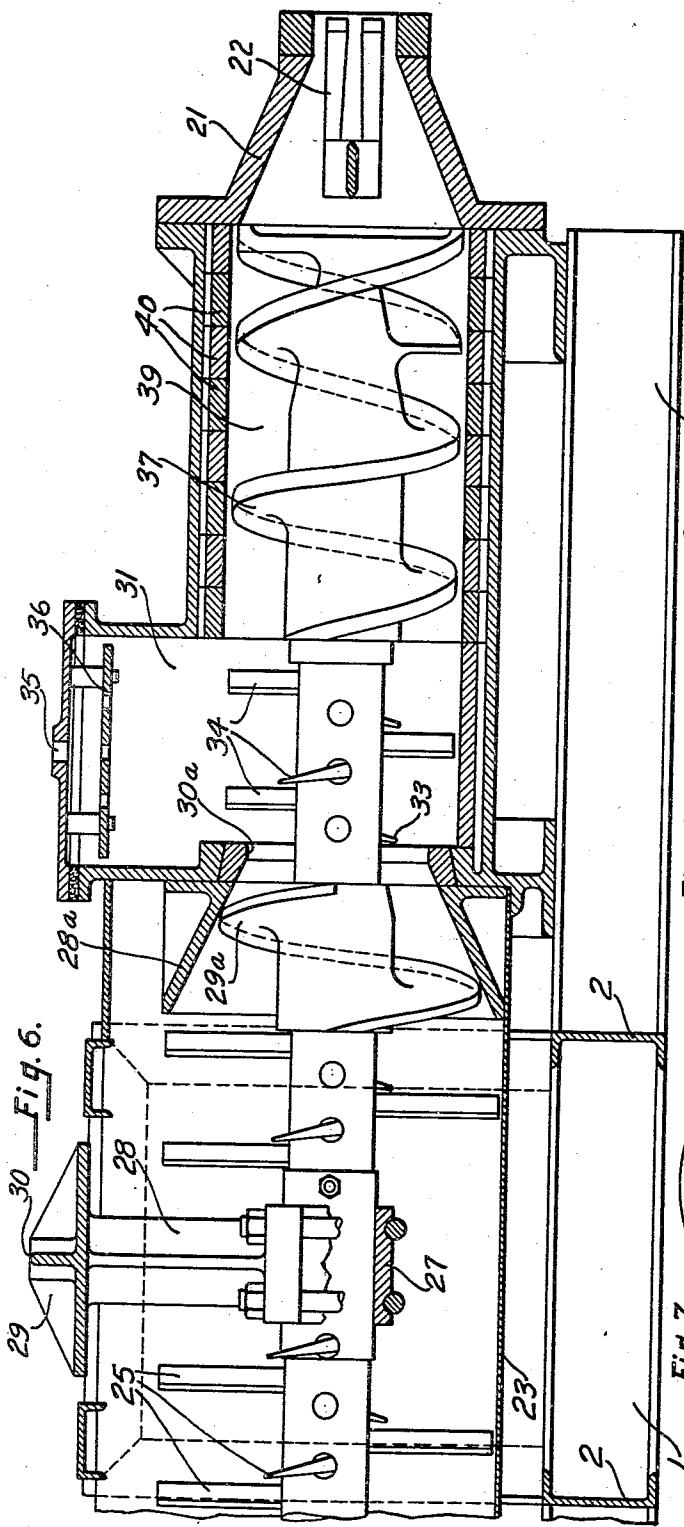
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UNITED STATES PATENT OFFICE

1,964,266

AUGER MACHINE

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Application November 16, 1932, Serial No. 642,894

5 Claims. (Cl. 25—14)

Our invention relates to auger machines for the working of ceramic materials and the like.

It is the object of our invention to provide a method and means of extracting air entrained in the clay so that, when it is extruded by our auger machine, it will be substantially air free and of such homogeneous character as to provide an improved clay product.

It is a further object of our invention to provide in a single continuous process the mixing of the ceramic material, its condensation into a body of homogeneous character with the minimum of air therein, the use of such a product as a seal to prevent the introduction of air into an air extraction chamber, the removal of such product from the seal, the reduction of it into fine pieces to permit the escape of air, the evacuation of the air thus escaping and the final extrusion of the air free product in the form desired.

It is a further object of our invention to provide a single unitary structure in which all of the steps of the process are practiced in a single machine in a straight line; and it is our object to provide a mechanical structure in which there is a single shaft or a plurality of interconnected shafts forming a single shaft so as to have a straight line thrust for performing all of the steps of the process, such shaft being driven by a common motor in order to synchronize the steps of the process as well as reduce the number of bearings.

It is a further object to provide the advantages of a high speed motor with a low speed shaft and to provide for the thrust on a common intermediate bearing remote from the ceramic material where it will not be interfered with by the material.

It is a further object to mount all of the parts comprising the motive power and operating mechanism on a single frame utilizing the parts of the mechanism to interconnect the frame members to secure the maximum rigidity with the minimum weight.

In particular, it is our object to provide stage extrusion with air extraction.

Referring to the drawings:

Figure 1 is a plan view of the mechanism of our invention;

Figure 2 is a side elevation thereof;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is an end elevation of the auger end of the machine;

Figure 5 is a section on the line 5—5 of Figure 2;

Figure 6 is an enlarged vertical section show-

ing the stage extrusion and air extraction mechanism;

Figure 7 is a section on the line 7—7 of Figure 2 showing the power multiplication mechanism;

Figure 8 is a detail side elevation of the power multiplication mechanism.

Referring to the drawings in detail, 1—1 indicate spaced parallel supporting frame members which are interconnected by the transverse frame members 2 and by the superimposed mechanism 65 hereinafter described which bridge the frame members 1 and interconnect them.

For instance, a plate 3 is bolted or welded to the tops of the frame members 1 to interconnect them at the left hand end of the machine. On this plate is mounted a gear reducing unit 4 and motor 5. The motor 5 may be made relatively cheap with the usual high speed, which may be reduced by a proper gearing for driving an auger machine. The motor shaft 6 has on its outer end a pinion 7, which meshes with a plurality of gears 8 supported by means of a frame 11 which is adapted to rotate around the pinion 7 and is integral with one end of the shaft 12. The gears 8 mesh with teeth on an internally geared ring 9, which is mounted in and supported by a casing which forms the outer part of the gear reduction unit 4. The frame 11 is composed of two parts connected by means of bolts 10.

Whenever the shaft 6 rotates it causes the gears 8 to rotate. Since these gears are in engagement with a fixed internally geared ring 9 they must rotate within this ring, and as they rotate they carry with them the frame, to one part of which is attached one end of the shaft 12, thereby rotating the shaft 12. This shaft is connected by the flexible coupler 13 to the main auger shaft 14 that is carried in a thrust bearing 15 in the bridge 16 which connects at its ends 17 with the tops of the side frame members 1. This bridge 16 carries the longitudinally extending bolts 18, the right hand ends of which are mounted in the bridge 19 which carries the forward end of the final extrusion chamber casing 20 on which is mounted a tapered extrusion nose 21 having the block forming knives 22.

A pug mill trough 23 receives the shaft 14 which passes through it. This pug mill trough is supported at its rear end on a transverse angle iron frame 24 which rests on the tops of the side frame members 1. The pug mill is provided with a plurality of knives 25 mounted on the sleeve 26 on the shaft 14. These knives churn the clay and mix it while, at the same time, move it forwardly around the bearing 27 which is suspended on the

bracket 28 carried on the cross frame member or bridge 29. This bearing can be lubricated through the aperture 30. The ceramic material thus thoroughly mixed enters its first stage of extrusion through the tapered collar 28a through which it is forced by the first stage extrusion auger 29a. The inner end of this collar 28a and the ring 30a are both of smaller diameter than the diameter of the screw 29a so that the area where the ceramic material engages the interior of the collar 28a and the ring 30a to the point of its exit into the air extraction chamber 31 is a sealing area against which the ceramic material is forced to prevent the leakage of air. The ceramic material is thus forced into the air extraction chamber in a solid annular body indicated at 32.

There is a relatively long extrusion sealing area thus provided to prevent leakage around the plastic clay.

As this annular body of clay is delivered into the air extraction chamber 31, a shearing knife 33 shears it in rings which are chopped into pieces by the chopping knives 34. Any entrained air in the mixture is thus released and is exhausted by suitable exhaust means through the port 35. A baffle plate spaced from the walls of the chamber 31 is provided in spaced relationship to the port 35, such plate being designated 36. As the ceramic material is chopped in very fine pieces, the air is extracted from it. The knives not only chop it in fine pieces but also serve to move it forwardly towards the right hand so that, when it is picked up by the final extrusion screw 37 in air free condition and delivered through the member 21 over the cutting knives 22 through the openings, it is an air free ceramic product of homogeneous character without air bubbles or entrained air. The passageway 39 surrounding the screw 37 is provided with detachable liners 40.

Process

It will be thus noted that we first pug the material providing a homogeneous mixture of the desired characteristics and, at the same time, progressively move the mixture forwardly as it is pugged. We then condense it and extrude it while, at the same time, use the extruded material as an air seal.

As this air sealing material is being continuously moved forwardly into the chamber being sealed and as the level of the material in the pug mill is substantially the height of the knives on top of the shaft 14, a very effective seal is provided of the plastic ceramic material. Then, according to our process, the material thus extruded is shaved into rings, cut into fine pieces to free the air, has the air extracted from it and is then moved forwardly into a second extrusion mechanism where it is again extruded in air free form, condensed and delivered in final air free blocks, strips or other forms as may be desired.

It will be understood that we desire to comprehend within our invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a method of producing an air free ceramic product, mixing ceramic material, advancing it, subjecting it to extrusion and con-

densation to form it into a body, utilizing the body so formed as it moves as an air seal while introducing it into a sub-atmosphere chamber from which air is being extracted, shearing it into thin sections as so delivered, chopping the thin sections, extracting the air therefrom and while still continuously moving it subjecting it to a second extrusion and condensation step for delivery in a final form, ceramic air free product.

2. In combination, a shaft, a pair of spaced augers mounted on said shaft, extrusion chambers surrounding said augers, and an air exhaust chamber therebetween connected therewith, the extrusion chamber leading into the air exhaust chamber having a cone-shaped wall.

3. In combination, an auger shaft, means of supporting said shaft comprising a thrust bearing, a pug mill for receiving said shaft comprising a trough, cutting and advancing knives mounted on said shaft, a bearing suspended from the walls of said pug mill intermediate the end of the shaft, and an extrusion auger mounted on said shaft at the end of the pug mill, a surrounding tapered throat therefor, an air exhaust chamber located adjacent the exit from said pug mill, cutting and shearing knives on said shaft in said chamber, a second auger on the end of said shaft, a chamber for said auger and an extrusion head mounted on said chamber.

4. In combination, an auger shaft, means of supporting said shaft comprising a thrust bearing, a pug mill for receiving said shaft comprising a trough, cutting and advancing knives mounted on said shaft, a bearing suspended from the walls of said pug mill intermediate the end of the shaft, an extrusion auger mounted on said shaft at the end of the pug mill, a surrounding tapered throat therefor, an air exhaust chamber located adjacent the exit from said pug mill, cutting and shearing knives on said shaft in said chamber, a second auger on the end of said shaft, a chamber for said auger and an extrusion head mounted on said chamber, a common supporting frame for maintaining the foregoing mechanism in alignment, the members of said supporting frame being held together by said mechanism bridging said members.

5. In combination, an auger shaft, means of supporting said shaft comprising a thrust bearing, a pug mill for receiving said shaft comprising a trough, cutting and advancing knives mounted on said shaft, a bearing suspended from the walls of said pug mill intermediate the end of the shaft, an extrusion auger mounted on said shaft at the end of the pug mill, a surrounding tapered throat therefor, an air exhaust chamber located adjacent the exit from said pug mill, cutting and shearing knives on said shaft in said chamber, a second auger on the end of said shaft, a chamber for said auger and an extrusion head mounted on said chamber, a common supporting frame for maintaining the foregoing mechanism in alignment, the members of said supporting frame being held together by said mechanism bridging said members, spaced bridge members supporting said shaft outside of the pug mill, and a bridge member supporting the end of the mechanism adjacent the second auger, and means of connecting said bridge members.

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