June 16, 1925. 1,542,601

O. E. BORNHAUSER ET AL

ART OF PRODUCING GYPSUM BLOCKS

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Fig. 1

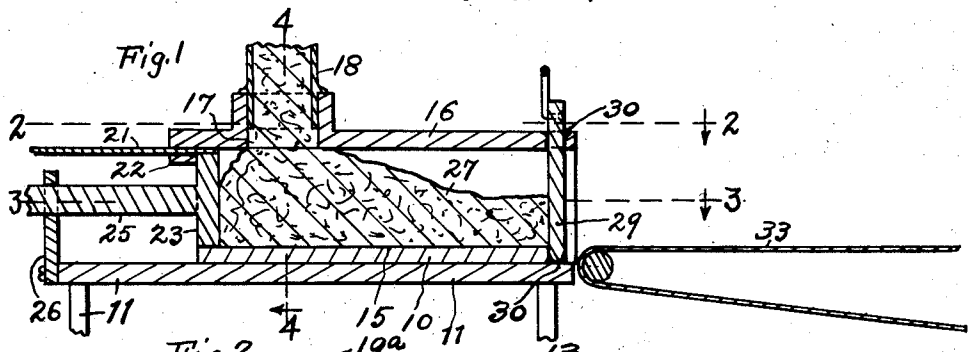


Fig. 2

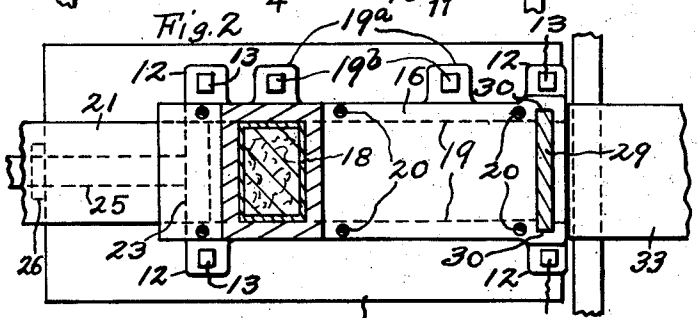


Fig. 4

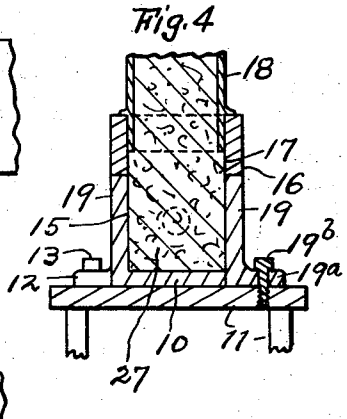


Fig. 3

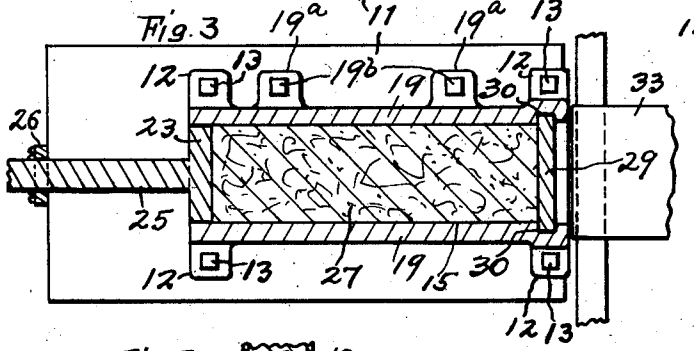
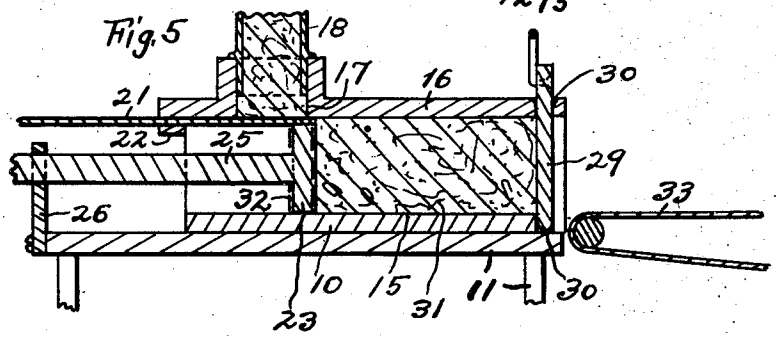


Fig. 5



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Fig. 6

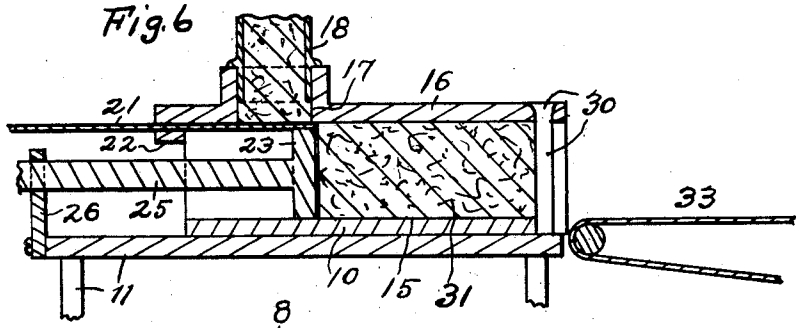


Fig. 7

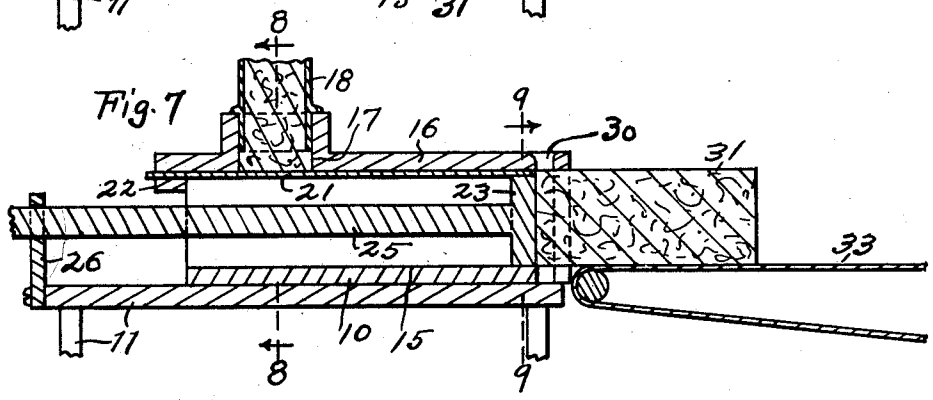


Fig. 8

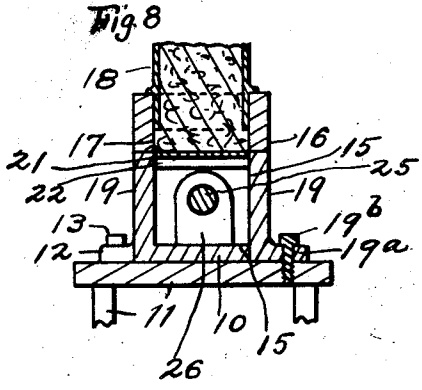
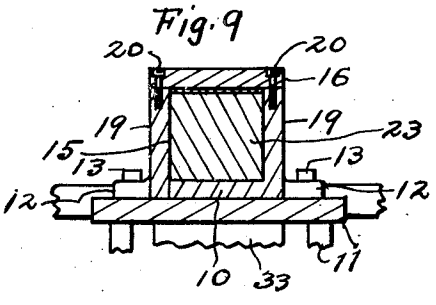


Fig. 9



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UNITED STATES PATENT OFFICE.

OTTO E. BORNHAUSER AND JOHN EDWARD HERMAN, OF SANDUSKY, OHIO.

ART OF PRODUCING GYPSUM BLOCKS.

Application filed June 5, 1924. Serial No. 718,004.

To all whom it may concern:

Be it known that we, OTTO E. BORNHAUSER and JOHN EDWARD HERMAN, citizens of the United States, residing at Sandusky, in the county of Erie and State of Ohio, have invented new and useful Improvements in the Art of Producing Gypsum Blocks, of which the following is a specification.

This invention relates to improvements in the art of producing gypsum blocks, and pertains more especially to the production of an improved gypsum block made from a suitably worked mixture comprising calcined gypsum and water or liquid and preferably also, but not necessarily, binding material.

One object of this invention is to produce gypsum blocks which are stronger and more durable that gypsum blocks heretofore made.

Another object is to facilitate the manufacture of gypsum blocks and to greatly enlarge their production per mold used in making said blocks.

Another object is to produce gypsum blocks having greater ability to hinder the passage of sound therethrough than gypsum products heretofore made.

Another object is to produce gypsum blocks which have adequately set and, without liability of injury to the block, are safely handleable as soon as they have been formed, and do not have to be laid aside for setting and drying preparatory to shipment or transportation.

With these objects in view, and to attain other objects hereinafter appearing, this invention consists in the hereinafter described and claimed improvements in the art of making gypsum blocks.

Apparatus comprising a mold suitable for use in receiving a moldable mass or body to be molded into the improved gypsum block to be produced by our improved process is illustrated in the accompanying drawings in which Figure 1 is a central vertical longitudinal section and shows said mold as charged with said mass or body and as comprising a moveable plunger disposed to form an upright wall of the material-receiving interior chamber of the mold and moveable toward and from the opposite vertically withdrawable upright wall of said chamber. Figs. 2 and 3 are horizontal sections taken along the line 2—2 and line 3—3 respectively in Fig. 1. Fig. 4 is a vertical transverse section taken along the line 4—4 in Fig. 1. Fig. 5 is a vertical section corresponding with Fig. 1, except that in Fig. 5 the hereinbefore mentioned plunger is shown as having been actuated to exert pressure on the hereinbefore mentioned moldable mass or body in the mold, and a block is shown as having been formed, and also a cut-off or valve, controlling the supply of material to the aforesaid chamber, is shown in its closed position in Fig. 5, whereas said valve is shown in its open position in Fig. 1. Fig. 6 is a vertical section substantially corresponding with Fig. 5, except that in Fig. 6 the hereinbefore mentioned vertically withdrawable wall of the mold has been removed to permit the block shown formed in Figs. 5 and 6 to be removed from the mold by the hereinbefore mentioned plunger onto an endless conveyor. Fig. 7 is a vertical section corresponding with Fig. 6, except that in Fig. 7 the plunger is shown as having been moved far enough forwardly to remove the block from the mold onto said conveyor. Figs. 8 and 9 are transverse vertical sections taken along the line 8—8 and line 9—9 respectively in Fig. 7. Portions are broken away in the drawings to reduce their size.

The illustrated mold is shown arranged horizontally and comprises a metal bottom 10 lying on a metal table 11 and provided externally with lugs 12 removably secured by bolts or screws 13 to said table. The mold-bottom 10 is shown as forming the bottom of the material-receiving chamber 15 of the mold, and the mold has a metal top 16 provided over one end portion of the chamber 15 with an opening 17 forming the inlet of said chamber for material to be fed or forced at said inlet into said chamber, and 18 indicates the lower end portion of a hopper which extends and discharges into said inlet. In said hopper the materials or substances supplied thereto are massed and worked and mixed in any approved manner, and the hereinafter described moldable mass or body to be produced in said hopper is made by mixing and kneading or working calcined gypsum, water or liquid, and binding material or solid matter other than gypsum, and material is forced or fed intermittently from said hopper in any approved manner.

The chamber 15 is rectangular in horizontal section, as shown in Fig. 3, and 19 indicates opposite side walls respectively of said chamber, and the mold-top 16 overlaps

and rests on the top edges of said walls and is removably secured to said walls by bolts or screws 20, as shown in Figs. 2 and 9. One of the side walls 19 is preferably formed integral with the mold bottom 10, and the other of said walls preferably consists of a substantially vertical metal plate provided at its outer side with lugs 19^a resting on the table and removably secured by bolts or screws 19^b to said table.

At the lower and discharging end of the inlet 17 (see Figs. 1, 5, 6, 7 and 8) is provided a cut-off 21 for controlling communication through said inlet between the hopper and the mold-chamber 15, and said cut-off consists preferably of a horizontal metal plate extending loosely through a downwardly projecting flange 22 formed on the rear end of a mold-top 16 and arranged to form an abutment for the rear side of the body 23 of a plunger which forms one end wall of said chamber, and the cut-off forming plate 21 overlaps and covers the top edge of and is welded to the plunger-body 23 and forms the top of the plunger. Said plunger extends between the side walls 19 of the mold-chamber 15 and is movable horizontally and endwise of the mold and comprises a stem 25 which extends rearwardly from the rear side of the plunger-body 23 to and loosely through a standard 26 with which the table 11 is provided. The relative arrangement of the parts is such, that the plunger, in its rearward and normal position, shown in Fig. 1, is arranged between the flange 22 of the mold-top 16 and the inlet 17 of the chamber 15 and abuts at the rear side of its body 23 against said flange. We would here remark that in said position of said plunger a predetermined supply of cementitious non-pourable material is forced or fed, in advance of the face of the plunger, from the hopper into said chamber, and 27 indicates a moldable mass or body supplied to said chamber from said hopper and requiring pressure thereon to mold or shape it into the block to be formed in the mold.

Upon supplying the mold-chamber 15 with the moldable gypsum body 27 shown in Figs. 1 and 3, the plunger, forming one end wall of the chamber 15 as hereinbefore indicated, is actuated forwardly toward the upwardly removable opposite end wall 29 of said chamber and to the position shown in solid lines in Fig. 5 in which the face of the plunger is somewhat forward of the inlet 17 of said chamber. Said plunger is adapted, during its movement from the position shown in Figs. 1 and 3 into the position shown in solid lines in Fig. 5, to exert the hereinafter described pressure on the moldable body 27 shown within the mold-chamber 15 in Figs. 1 and 3, and to form the improved gypsum block 31 shown as formed in said chamber in Fig. 5 between the end wall formed by the plunger and the opposite and removable end wall 29 of said chamber.

The last-mentioned or removable end wall 29 of the mold-chamber 15 normally is in its lower position and rests on the table 11, as shown in Figs. 1 and 5, and engages vertical slideways 30 formed in the top 16 and at the inner sides of the side walls 19 of the mold, as shown in Figs. 1, 2 and 3, and extends loosely through and above said top 16.

The plunger, after movement thereof from the position shown in Figs. 1 and 3 into the position shown in solid lines in Fig. 5 to form the block 31, is preferably moved slightly rearwardly into the position shown in Fig. 6 and in broken lines at 32 in Fig. 5, to readily permit withdrawal of the vertically movable wall 29, whereupon said wall is removed upwardly from the mold in any approved manner, and thereupon the plunger is actuated forwardly into the position shown in Fig. 7 to remove the block 31 from the mold. The plunger, during its movement from the position shown in Fig. 6 into the position shown in Fig. 7, removes the block 31 from the mold onto an endless belt or conveyer 33 arranged to receive said block. The application and operation of endless conveyers and the operation of plungers are so well known by mechanical engineers that further description and illustration, in this specification, of the construction and operation of the plunger and conveyer of the hereinbefore described apparatus are not considered necessary. Upon reference to Figs. 7 and 8 it will be observed that the valve-forming plate 21 is large enough in dimensions to close the lower and discharging end of the inlet 17 of the mold-chamber 15 in the extreme forward position of the plunger.

We are aware that heretofore gypsum blocks have been made from material produced by mixing calcined gypsum with enough water to produce a pourable semi-fluid mass and then pouring said mass into molds placed aside to permit the poured material to set and, also, that gypsum blocks have been made by mixing calcined gypsum with enough water to obtain a pouring fluidity and pouring the mass into molds in which the material was allowed to partially set, and the partially set blocks were removed from the molds before the completion of the setting of the blocks.

Our improved process preferably comprises the mixing, within the hereinbefore mentioned hopper, of solid matter consisting largely of calcined gypsum with water or liquid the quantity of which is greater to such an extent than the amount of liquid required for moistening the solid matter other than said calcined gypsum that the amount of liquid in excess of the liquid required for

said moistening is neither over about one and one-half times nor appreciably less than the amount of water of crystallization in the raw gypsum used in producing said calcined gypsum, so as to produce a non-pourable mass highly suitable for making gypsum blocks. Preferably the mixture or mass produced within said hopper consists of calcined gypsum, water or liquid and other suitable solid material such, for instance, as ashes or vegetable fiber, serving as a binder. Sawdust and wood shavings constitute suitable vegetable fibrous material. Ashes and vegetable fibrous material have the ability to absorb or hold liquid. The quantity of water or liquid used for the production of a moldable mass or body comprising calcined gypsum and a liquid-absorbing binding material is to such an extent greater than the amount of liquid required for just satisfying the liquid-absorbing capacity of said binding material that the quantity of liquid in excess of the liquid required for the liquid-absorbing capacity of said binding material shall be not over one and one-half times and not appreciably less than the amount of water of crystallization in the raw gypsum used in producing said calcined gypsum. We would remark that a highly desirably non-pourable mixture of calcined gypsum, binding material or solid matter other than calcined gypsum, and water or liquid, is obtained by having the quantity of water or liquid used in producing said mixture greater to such an extent than the amount of liquid required for the liquid-absorbing capacity or moistening of the solid material other than calcined gypsum that the quantity of liquid in excess of the liquid required for said liquid-absorbing capacity or moistening shall be from about one and one-fourth to about one and one-third times the amount of water of crystallization in the raw gypsum.

The mixture or mass of calcined gypsum, water or liquid and binding material or solid matter other than gypsum, is worked and preferably kneaded in any approved manner within the hereinbefore mentioned hopper to thoroughly mix or intimately associate the constituents of and form a non-pourable mass having such a consistency that pressure on any portion of said mass is required to mold said portion into the form of a building block.

The amount or portion 27 of said mass, shown supplied in advance of the hereinbefore mentioned plunger to the mold-chamber 15 in Fig. 1, is placed, by said plunger during the movement of the plunger from the position shown in Figs. 1 and 3 into the position shown in solid lines in Fig. 5, under the pressure required to cause the moldable body of material supplied to said chamber to fill every portion of said chamber between the plunger and the withdrawable end wall 29 of the mold, and preferably under a pressure of at least twenty-five pounds per square inch of the face of the plunger. Preferably the mold-wall 23 is moved such a distance toward the opposite and removable mold-wall 29 that the distance between said walls is reduced to the extent required to result in the exertion by the plunger, against said moldable body of material in the mold, of a pressure of about one hundred and fifty pounds per square inch of the face of the plunger, and the resulting gypsum block, formed by and within the mold, will be found to be remarkably strong and durable and to have great ability to hinder the passage of sound therethrough, and furthermore said block will be found to have so adequately set during its formation that the block is safely handleable, as soon as it has been formed, without necessitating the laying of the block aside for setting and drying preparatory to shipment or transportation.

We would here remark that preferably during the formation of a block by and within the mold and during the removal of the block from the mold, just enough mixture is prepared in the hereinbefore mentioned hopper for one charge of the mold, and that the mold is again charged as soon as the plunger has been returned into its rearward and normal position shown in Figs. 1 and 3 from the position shown in Fig. 7.

What we claim is:—

1. In the art of making gypsum blocks, a process comprising the mixing of solid matter consisting largely of calcined gypsum with water or liquid the quantity of which is greater to such an extent than the amount of liquid required for moistening the solid matter other than said calcined gypsum that the amount of liquid in excess of the liquid required for said moistening shall be not over about one and one-half times and not appreciably less than the amount of water of crystallization in the raw gypsum used in producing said calcined gypsum and thereby producing a non-pourable mass, then supplying a predetermined amount of the mixture from said mass to the interior chamber of a mold for forming the desired block, and then exerting pressure on the body of material supplied to the mold and thereby completing the formation of said block.

2. In the art of making blocks of the character indicated, a process consisting in mixing calcined gypsum and liquid-absorbing binding material with water or liquid the quantity of which is greater to such an extent than the amount of liquid required for satisfying the liquid-absorbing capacity of said binding material that the amount of

liquid in excess of the liquid required for said liquid-absorbing capacity shall be neither over about one and one-half times nor appreciably less than the amount of water of crystallization in the raw gypsum used in producing said calcined gypsum and thereby producing a non-pourable mass, then supplying a portion of said mass to the interior chamber of a mold for forming the desired block, and then exerting pressure on the body of material supplied to the mold and thereby completing the formation of said block.

3. In the art of making blocks of the character indicated, a process comprising the mixing of solid matter consisting largely of calcined gypsum with water or liquid the quantity of which is greater to such an extent than the amount of liquid required for moistening the solid matter other than said calcined gypsum that the amount of liquid in excess of the liquid required for said moistening shall be not over about one and one-half times but greater than the amount of water of crystallization in the raw gypsum used in producing said calcined gypsum and thereby producing a non-pourable mass, then supplying a portion of said mass to the interior chamber of a mold for forming the desired block, and then exerting pressure on the body of material supplied to the mold and thereby completing the formation of said block.

4. In the art of making blocks of the character indicated, a process consisting in mixing solid matter consisting largely of calcined gypsum with water or liquid the quantity of which is greater to such an extent that the amount of liquid required for moistening the solid matter other than said calcined gypsum that the amount of liquid in excess of the liquid required for said moistening shall be from about one and one-fourth to about one and one-third times the amount of water of crystallization in the raw gypsum used in producing said calcined gypsum and thereby producing a non-pourable mass, then supplying a portion of said mass to the interior chamber of a mold for forming the desired block, and then exerting pressure on the body of material supplied to the mold and thereby completing the formation of said block.

5. In the art of producing gypsum blocks of the character indicated, a process consisting in supplying the interior chamber of the mold with a non-pourable moist mixture which consists largely of calcined gypsum and constitutes a moldable body having a consistency requiring pressure thereon for molding or shaping said body, and then exerting pressure on the body of material supplied to the mold and thereby completing the formation of the desired block.

6. In the art of producing blocks of the character indicated, a process consisting in supplying a non-pourable moist mixture, composed largely of calcined gypsum, in advance of a plunger employed in forming one of two opposite walls of the interior chamber of a mold which is adapted to completely encase the block to be formed, and then actuating said plunger toward the other of said walls and thereby effecting the exertion, on the body of material adapted to compose said block, of a pressure of at least twenty-five pounds per square inch of the face of said plunger.

7. In the art of producing blocks of the character indicated, a process consisting in supplying a non-pourable moist mixture comprising calcined gypsum in advance of a plunger employed in forming one of two opposite walls of the interior chamber of a mold adapted to completely encase the block to be formed by and within the mold, and then actuating said plunger toward the other of said walls and thereby effecting the exertion, on the body of material adapted to compose said block, of a pressure considerably greater than twenty-five pounds per square inch of the face of said plunger.

8. In the art of producing blocks of the character indicated, a process consisting in supplying a non-pourable moist mixture comprising calcined gypsum in advance of a plunger employed in forming one of two opposite walls of the interior chamber of a mold which is adapted to completely encase the block to be formed, and then actuating said plunger toward the other of said walls and thereby effecting the exertion, on the body of material adapted to compose said block, of a pressure of about one hundred and fifty pounds per square inch of the face of said plunger.

In testimony whereof, we sign the foregoing specification.

OTTO E. BORNHAUSER.
JOHN EDWARD HERMAN.