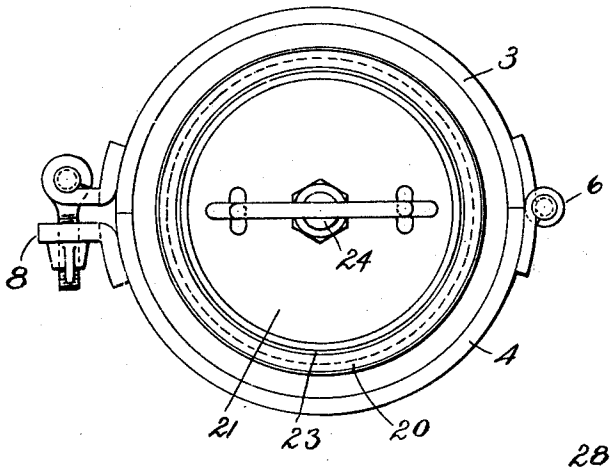
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C. L. NORTON

METHOD AND APPARATUS FOR MAKING BUILDING UNITS

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Fig. 1



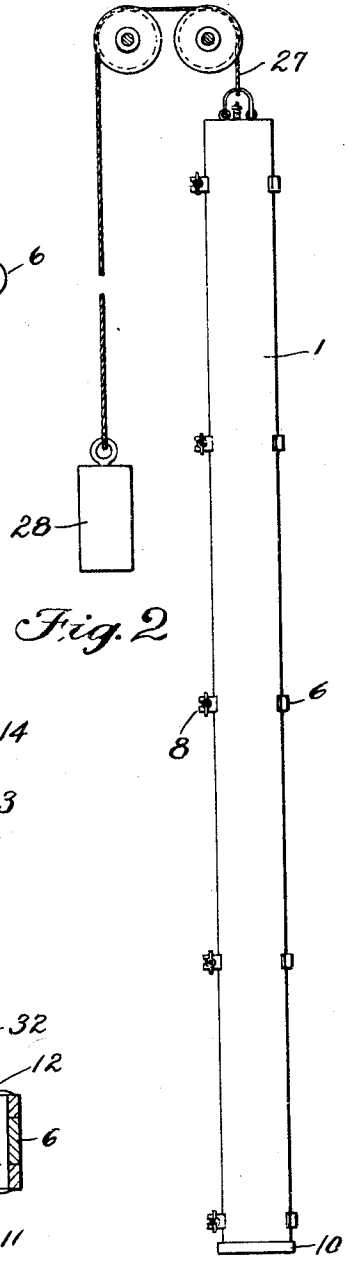
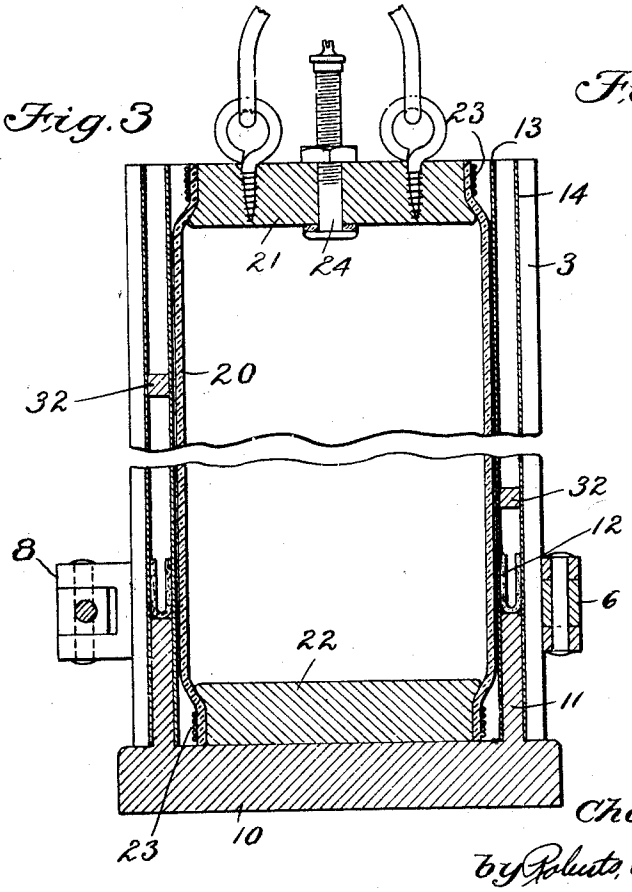


Fig. 2

Fig. 3



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Fig. 4

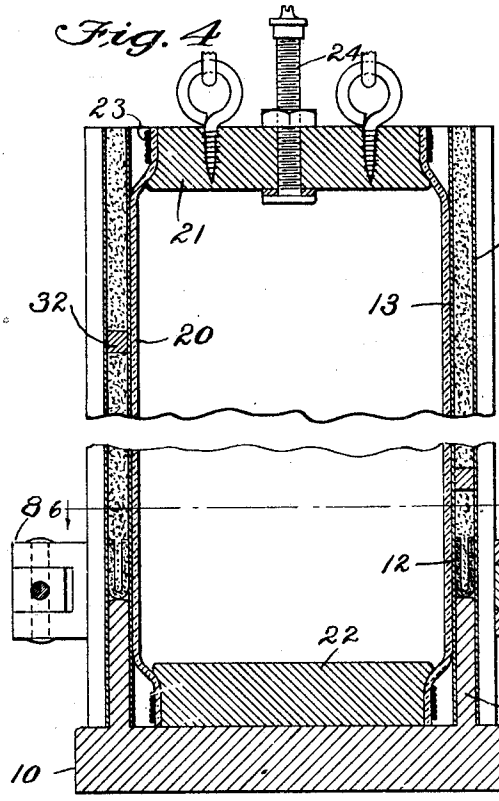


Fig. 5

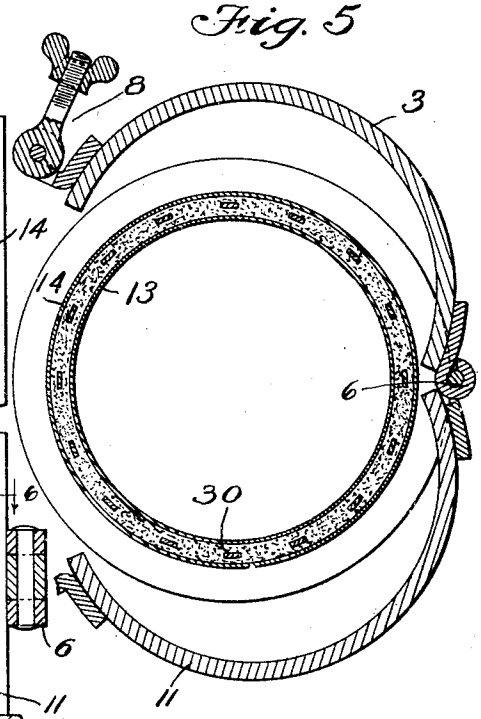


Fig. 7

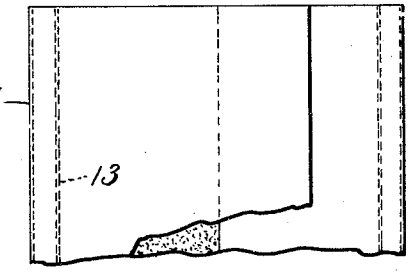
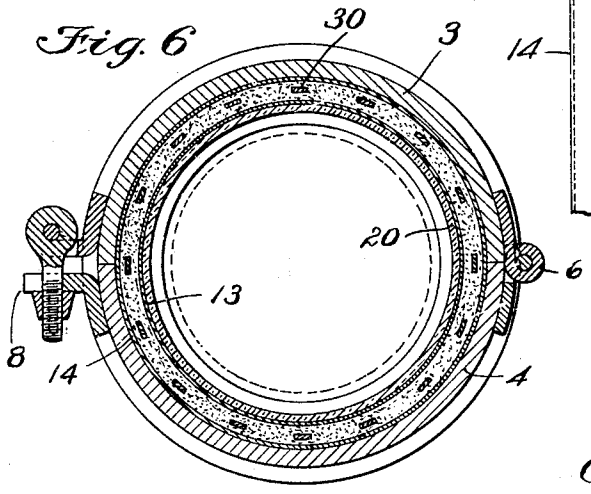


Fig. 6



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Patented Apr. 24, 1928. 1,667,434

UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR MAKING BUILDING UNITS.

Application filed July 15, 1926. Serial No. 122,592.

This invention relates to a method for preparing columnar building units adapted to be used to form the basis for walls, floors and roofs in many different ways as disclosed in copending applications of Albert F. Bemis No. 33,173, filed September 12, 1925, and Nos. 72,673; 72,677; and 72,678, all filed December 2, 1925; a unit of this character being more specifically described in the copending application of Albert F. Bemis, No. 107369 filed on even date herewith.

In order to provide tubular units to form the basis for partitions in buildings, it is desirable to afford means whereby light cementitious material, may be poured between light substantially concentrically arranged cylinders of fibrous sheet material, such as chip board or straw board bound with a variety of cementitious materials, such as plaster or other cementitious materials which may or may not contain fibrous or other aggregate or in some cases by neat cement. Asbestos or other fireproof paper, or cloth preferably stiffened by a suitable compound or fine wire cloth or various combinations of paper, cloth and wire may also be used for the fibrous coverings or tubular shells which form the inner and outer faces of the units. The cementitious filler to be poured between the tubes may be any one of a wide variety of materials, such as gypsum plaster with or without the addition of wood fiber, asbestos or other aggregate, oxychloride of magnesium, magnesium oxide, or a variety of hydraulic cements with or without aggregate. The herein described apparatus has been designed to permit efficient production of units of this type and more especially to provide columnar units of this type which are free from structural defects, which are likely to appear unless special precautions are taken.

The above and further objects of the invention will be apparent to those skilled in the art upon reading the subjoined description and claims in conjunction with the accompanying drawings, in which:

Fig. 1 is a top plan view of part of the improved type of apparatus forming a part of the subject matter of this invention;

Fig. 2 is a side elevation of the improved apparatus;

Fig. 3 is a vertical central section with the intermediate part of the apparatus broken away;

Fig. 4 is a similar view of the apparatus showing cementitious material therein;

Fig. 5 is a horizontal sectional view of the apparatus with the parts thereof swung apart;

Fig. 6 is a section on 6—6 of Fig. 4; and

Fig. 7 is an elevational view of a portion of the completed unit.

In the manufacture of building units of the general type described above, such as for example a tubular member consisting of gypsum poured between two concentric paper tubes, care is needed in pouring the cementitious material between the light paper tubes in order to prevent bursting of the tubes by the hydrostatic pressure of the poured material and to insure intimate contact of the entire paper surface with the cementitious filler.

For this purpose, it is desirable to provide a form or mold temporarily to support the light paper walls while the cementitious material is being poured and is having an opportunity partially to harden. I have found it desirable to use a suitable metal casing 1 with cylindrically formed walls which are split longitudinally to provide the substantially similar halves 3 and 4, indicated in Fig. 1, which may have one pair of adjoining margins connected by hinges 6 and the opposite pair detachably connected by any suitable latch means, such as the screw-threaded clamps 8, whereby the mold may be readily opened and closed. In order to permit ready removal of the building unit and evenly formed surfaces thereon, the inner surface of the mold is comparatively smooth.

It is furthermore desirable to provide the casing 1 with a base 10 of substantial circular form and with a cross-sectional area somewhat greater than the corresponding dimension of the casing. Upon the base 10 may be provided an upstanding ring 11 adapted to have a cross-sectional size substantially equivalent to that of the unit which is to be manufactured and to provide a narrow clearance space between the mold and the ring 11. The ring 11 is adapted to hold suitable hydraulic packing 12 thereon, such as an annular member of U-shaped cross-section.

In the manufacture of the units a suitable tubular shell 13 of paper or the like is next provided, this cylinder preferably being formed of a single roll of paper with overlapped marginal portions forming a seam which extends for the full height of the unit, the overlapping portions of the paper

being fastened to each other by a tacky adhesive such as glue. Preferably the lower end of this paper tube extends into substantially abutting relation with the inner part of ring 11. A similar but larger paper tube 14 is provided adjoining the inner surface of mold 1, preferably being designed to be slightly smaller than the mold when first installed in the unit-making apparatus.

In order to space the cylinders 13 and 14 at a uniform distance from each other, or if desired, eccentrically in any predetermined manner; suitable spacing means such as small blocks 32, bits of plaster or the like may be interposed at convenient points between the tubes, preferably being secured to one of the tubes before assembly with the other tube. If desired, these blocks may be located on the inner tubes before the outer tube is formed thereabout by adhesively connecting the marginal portions of the paper. When tubes 13 and 14 are assembled in the casing their lower ends extend down at either side of ring 11 with the packing 12 therebetween, and preferably there is a slight clearance between the casing and the outer tube. The two halves 3 and 4 of the casing are then swung together and the latches 8 fastened to form a substantially cylindrical mold as illustrated in Figs. 4 and 6.

In order to support the inner cylinder 13 a suitable mandrel or core 20 is provided. This mandrel preferably is expansible and may comprise a pneumatic rubber tube, preferably of the approximate texture used for inner tubes in pneumatic tires for motor cars. It is preferably provided with heads 21 and 22 of wood or the like, which are tightly secured to the rubber by wire windings 23. An automatic valve 24 similar to a conventional tire valve is disposed in the upper end member 21 of the pneumatic mandrel. This valve 24 is adapted to receive air from any conventional air line. In order to permit ready insertion and removal of the mandrel from the tube its upper end may be secured to a cable 27 running over pulleys and provided with a suitable counterweight 28 or fastening means. Thus it may be easily lowered into the inner paper tube or shell 13 or raised therefrom. It is to be understood that after the paper cylinders have been assembled in the manner described, the rubber mandrel is located within the inner cylinder or shell and is subsequently inflated to support that cylinder in the manner illustrated. The pneumatic mandrel is preferably inflated to a pressure at which it supports the paper tube to a sufficient degree substantially to balance the hydrostatic head at the point of greatest pressure, i. e. at the bottom of the tube. Preferably these operations take place while the adhesive substance, such as glue, connecting marginal portions of the outer paper cylinder 14 remains in a somewhat tacky condition. Any suitable cementitious material, such as specified above, is then poured between the two paper tubes. At a lower end of the tubes it is adapted to spread the hydraulic packing in the usual manner, thereby preventing leakage of the liquid cement at this point.

Since the marginal portions of the paper cylinders are not fixedly secured to each other, slight relative movement or slippage therebetween is possible and pouring of the cement will serve slightly to expand the tube 14 until it is in firm abutting relation with the inner wall of the casing 1, while the inflation of the tube 20 will serve to hold the paper tube 13 against the cementitious material. By this means wrinkles are prevented in the paper tubes, and the plaster may be packed accurately to fill the same throughout their length, and the tubes may be accurately located in desired relative position concentrically or otherwise.

Since the excess moisture in the poured cementitious material is at once absorbed by the paper, that substance is temporarily weakened and has a slight tendency to stretch, and therefore accurate and even support by the mandrel and mold is essential. Furthermore, unless such support is accurate and uniform, the cementitious material will not pack evenly between different parts of the paper shells and wrinkles or flaws are likely to appear.

The rapid absorption of the moisture by the paper permits the cementitious material to set rapidly and the unit may be provided with sufficient rigidity to permit its removal from the mold within a short time, as, for example, within six to ten minutes, the mandrel being deflated to facilitate this operation. The unit may then be placed on a drying rack for several hours to permit complete hardening of the filler. Prior or subsequent to this drying operation, the depending portion of plaster and the extending lower ends of the paper tubes 13 and 14 may be removed so that the paper and cement tubes present a substantially flush lower surface.

While I have described the above process with particular reference to units formed by pouring gypsum plaster between paper shells, it is obvious that by this method building units may be made of a wide variety of materials, such as those enumerated above, in order to possess light weight and considerable strength or rigidity. The bond between the fibrous material, such as paper, and the plaster or cementitious material, will be very intimate, in fact an attempt to peel the paper from the plaster will usually result in splitting of the former. Thus the considerable tensile strength of the paper or fibrous material and the compressive strength

of the cementitious filler combine to provide a unit of considerable strength, yet of unusually low cost and weight. It is also obvious that the cross-sectional shape of the unit may be varied as, for example, to make its outer or inner surface elliptical or to arrange the tubes eccentrically so that the material of the unit will be unsymmetrically arranged. Suitable reinforcing means such as symmetrically or unsymmetrically arranged longitudinal strips 30, or combinations of these strips and hoops, or a cylindrical member of wire netting may be inserted between the paper tubes before the filler is provided to provide a reinforcement for the same, if desired. Such elements may conveniently be combined with the spacers 32 in many instances.

I claim:

1. In the manufacture of articles of the class described, the preparation of a paper tube by pressing overlapping marginal portions of a paper sheet into yieldable engagement, the placing of the tube in a casing having a slightly larger cross-sectional area included between the surfaces of its inner walls than that between the adjoining surfaces of the outer walls of the tube, and the pouring of cementitious material into the tube, thus causing the latter to expand to conform to the shape of the inner surface and size defined by the casing.

2. The subject matter of claim 1 further characterized in that an inner tube is positioned within the first-described tube and the cementitious material is subsequently poured between the tubes.

3. In the manufacture of articles of the class described, the preparation of a paper tube by pressing over-lapping marginal portions of a flexible sheet into unstable, adhesive engagement, the location of the tube in a casing of larger diameter than that of the tube, the locating of a yieldable core in the casing, the pouring of cementitious material between the tube and core, whereby the pressure of the poured material may cause relative movement between overlapping portions of the paper tube, permitting the cementitious material and the adhesive to harden within the tube in its expanded form, and subsequently removing the core from the tube.

4. In the manufacture of articles of the class described, the preparation of substantially cylindrical tubes of flexible fibrous material with different diameters, the larger of said tubes being slightly expansible, placing one tube within the other, locating the tubes in a casing slightly larger in inner cross section than the outer tube, placing a yieldable mandrel in the inner tube and pouring cementitious material in the space between the tubes, whereby the outer tube is adapted to be expanded by the pressure of the material to conform to the shape of the casing and whereby the inner tube is adapted to be yieldably held by the mandrel against the pressure of the poured material.

5. The subject matter of claim 4 further characterized by the locating of spacing elements between the tubes when they are assembled in the casing, whereby they may be retained in accurate position in relation to each other.

6. A method of manufacturing columnar building units comprising the cutting of a long piece of yieldable fibrous material, coating one of the longitudinal margins of the same with adhesive, overlapping the longitudinal margins and pressing them into adhesive engagement whereby a tubular shell is formed, preparing another similar tubular shell of a smaller diameter, locating one of the shells within the other and pouring cementitious material in the space between the shells while the adhesive in the outer shell remains in a semi-soft state whereby relative movement between the overlapping marginal portions of the shell may take place and it may expand and conform somewhat to the shape imposed by the pressure of the poured material.

7. A method of manufacturing columnar building units comprising the cutting of a long piece of yieldable fibrous material, coating one of the longitudinal margins of the same with adhesive, overlapping the longitudinal margins and pressing them into adhesive engagement whereby a tubular shell is formed, preparing another similar tubular shell of a smaller diameter, locating one of the shells within the other and placing the shells within a supporting casing having an inner diameter somewhat greater than the outer diameter of the outer shell and pouring cementitious material in the space between the shells while the adhesive in the outer shell remains in a semi-soft state whereby relative movement between the overlapping marginal portions of the shell may take place and it may expand and conform somewhat to the shape imposed by the pressure of the poured material and defined by the internal shape of the casing.

Signed by me at Boston, Massachusetts, this 14 day of July, 1926.

CHARLES L. NORTON.