H. C. TODD & C. MAYR.

SMOKE STACK.

APPLICATION FILED APR. 20, 1908.

1,045,459.

Patented Nov. 26, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

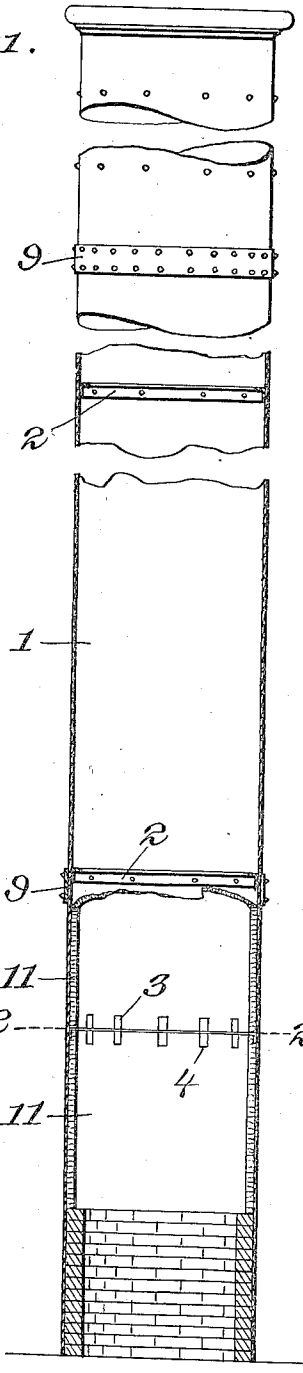


Fig. 3.

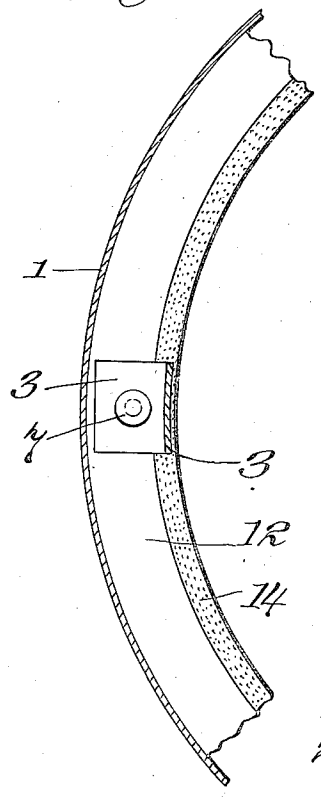
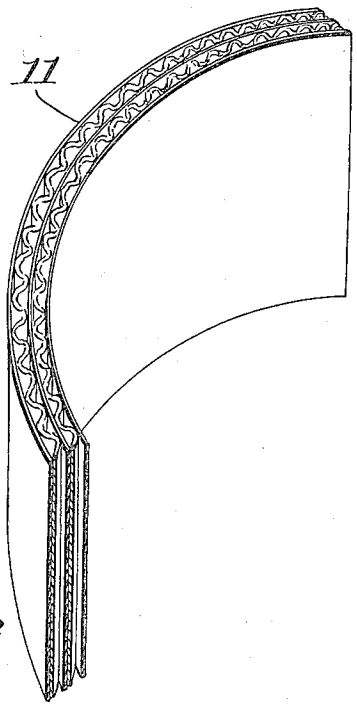


Fig. 4.



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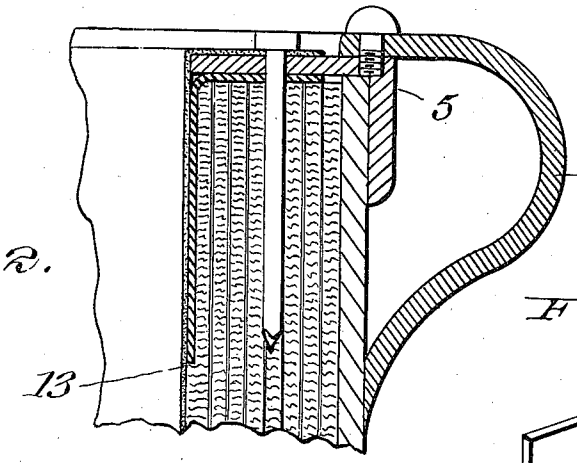
2 SHEETS—SHEET 2.

Fig. 2.



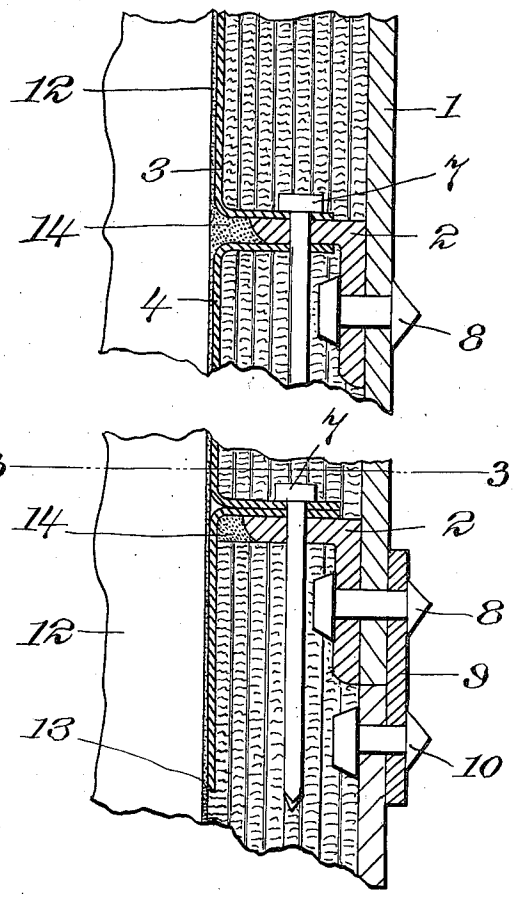
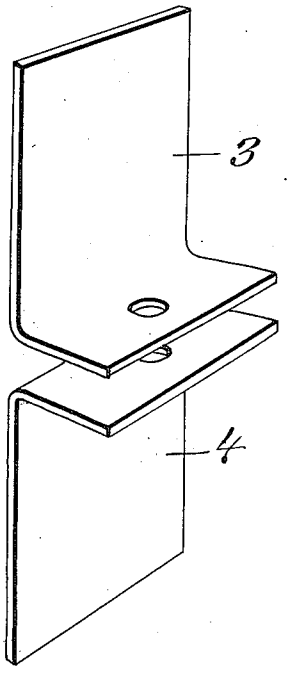


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY C. TODD, OF OAK PARK, AND CHARLES MAYR, OF CHICAGO, ILLINOIS, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO CHICAGO FIREPROOF COVERING CO., A CORPORATION OF ILLINOIS.

SMOKE-STACK.

1,045,459. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed April 20, 1908. Serial No. 428,087.

To all whom it may concern:

Be it known that we, HENRY C. TODD and CHARLES MAYR, citizens of the United States of America, and residents of Oak Park, Cook county, Illinois, and Chicago, Cook county, Illinois, respectively, have invented certain new and useful Improvements in Smoke-Stacks, of which the following is a specification.

Our invention relates to smoke stacks or chimneys and comprises a metal stack lined with a special material and having certain features of construction hereinafter described, and comprises a specific use of the material set out in U. S. Patent No. 796,164 granted to Henry C. Todd and Charles Mayr under date of August 1, 1905.

Steel has many well known advantages as a material for the construction of tall stacks for factories, power plants, large buildings, etc., but has the great disadvantage that it is quickly corroded by the combination of moisture and acid gases to which it is exposed. Actual experience has proven that the steel plates of a stack three-sixteenths of an inch thick have been so disintegrated by these influences after fourteen years' use that a man can push his finger through the crumbling shell. To overcome this difficulty and reduce heat conductivity, such stacks have been lined with brick, but the different rates of expansion under heat of steel shell and the brick lining are liable to collapse the lining and open up cracks through which the gases pass to corrode the metals of the stack as before. Such brick linings are also heavy and require additional strength in stack and foundations, which means an increase in cost.

We have invented a stack lining which overcomes all these difficulties and has peculiar advantages, especially when applied in the manner shown in the accompanying drawings, in which:

Figure 1 is a side elevation of one of our improved stacks with parts broken away and parts in section. Fig. 2 is a vertical section through a portion of one side of a stack showing our preferred method of construction. Fig. 3 is a horizontal section of a portion of the stack on line 3—3 of Fig. 2. Fig. 4 is a detail perspective view of a block of the lining or filling material, and Fig. 5 is a modified detail.

Throughout the drawings, like reference figures indicate like parts.

The steel part of the stack comprises the shell 1, the angle iron steps 2, 2, the angle cleats 3 and 4, the top ring 5, and cornice 6. Preferably, the cleats 3 and 4 are held to the steps 2, 2, by long pins 7, 7, passing through the flanges and cleats, and the step irons are fastened to the shell by rivets 8, 8, which may also pass through the ring 9, which serves as a coupling to the next section of the shell, to which latter section it is fastened by rivets 10.

The filling or lining consists of a series of curved blocks, 11, 11, of light, fireproof, moisture proof and acid proof material, held in place by the cleats 3 and 4, and pins 7, 7, and the inner continuous facing 12 of cement or similar materials. Preferably the blocks 11 are recessed as shown at 13, 13, to allow the cleats to lie flush with the inner face of the block and present a smooth surface to which the cement lining may be applied. The space between the ends of the blocks 11, which project beyond the angle iron steps 2, is filled with a mass of cement 14. This makes the lining continuous, protects the angle iron steps and fills up the ends of the air cells in the blocks 11, 11, so as to prevent circulation of air. This formation of dead air cells composing a large proportion of the bulk of the lining material assists greatly in improving the heat non-conducting character of the lining.

The preferred material for the filling and lining blocks is asbestos treated with a solution of silicate of alumina in a mixture of water and silicate of soda. The silicate of alumina should preferably be hydrated. A silicate of alumina giving good results contains, silica 55 per cent., alumina 26 per cent., iron sesquioxid 3 per cent., water 16 per cent. The treating solution should preferably contain by weight from 50 to 63 per cent. of water, from 11 to 16 per cent. of silicate of soda, and from 20 to 35 per cent. of silicate of alumina, depending on the degree of heat to which the article is to be subjected in baking, the larger amount of water being used when the degree of heat to be used in baking is lower, and the smaller amount of water when a higher degree is to be used in baking. The asbestos is preferably prepared in cellular form composed of

alternate sheets of flat and corrugated asbestos board or paper cemented together in blocks, each about two inches thick, three feet high and six or seven feet wide, curved to the radius of the stack and forming a simple fraction of its circumference. Preferably the cementing material holding the sheets of each block together is composed of the silicate of alumina and soda above described. Each block after drying is dipped in the treating solution above described, and then baked. This baking should continue for a number of days at a certain degree of temperature, or a less number of days at a higher temperature, according to thickness, etc. Approximately the baking may be defined as 600 day-degrees Fahrenheit, that is to say, it may continue one day at a temperature of 600 degrees, or two days at 300 degrees, or one day at 150 degrees, one at 200 and one at 250 degrees, etc. During this baking the silicate of soda forms a hydrated molecular combination with the silicate of alumina, so that cold water has no effect on the baked block and warm water will extract only the traces of surplus carbonate of soda occurring in the commercial silicate of soda used for the treating solution. Of course the blocks might also be formed of loose asbestos fiber alone or mixed with a filler treated with this solution and molded and baked. The product resulting from either process which we call hydrasbestus is peculiarly fitted for stack linings, as it is light in weight, waterproof, fireproof and acid proof. It is especially suited to withstand sulfurous acid gas (SO_2) which merely neutralizes the silicate of soda (SiO_3Na_2) on the exposed surface of the lining and sets free silica which forms a binder for the surface still stronger and more impervious to gases than the original compound.

In operating our invention each section of shell with the step angle-iron 2 and ring 9 are assembled and riveted in the shop. When placed in position on the job the sections are fastened together by rivets 10. The blocks 11 are then put in the lower shell, and the cleats 3 and 4 are added, the cleats 3 overhanging the said blocks 11 of the next lower section. The pins 7, 7, are then passed through the metal parts and into the blocks 11 below. The operation is repeated as each section is added and as the last step the inner lining or facing of cement 12 is added. This cement is formed of the treating solution reduced to a plastic mass.

Besides the advantages resulting from light weight, and resistance to moisture, acid fumes and heat, this lining is a fine non-conductor of heat so that with a temperature of 600 degrees Fahrenheit in the stack, the metal shell will rarely be raised 30 degrees above the temperature of the external air. The result is largely due to the air cell character of the lining, the spaces formed in each block 11, by the corrugations of its component sheets are closed at top and bottom by the angle iron steps 2, and the cement bodies 14. This not only increases the chimney draft by preventing the cooling of the gases of combustion, but it renders the use of the stack particularly advantageous in buildings, as it does not heat the adjacent apartments unpleasantly in hot weather. The extra cost of the hydrasbestus lining over brick is more than compensated for by the saving in cost of foundations, floor supports, expansion rests, and reduced diameter of shell. A two inch hydrasbestus lining takes the place of a six inch brick lining, thus permitting an eight inch reduction in shell diameter for a stack of given capacity. The method of assembling the parts illustrated permits the stack sections to expand lengthwise without pulling the blocks in two, and the material is in fact sufficiently elastic to adapt itself to movements of the stack without rupture of the continuity of the inner lining 12. In case of repairs, any set of cleats can be removed by withdrawing the loose pin 7, 7, and a new block put in without the necessity of cutting rivets or rusted nuts.

Having, therefore, described our invention, we claim:

1. The combination in a smoke stack, of a metal shell, angle iron steps fastened to the interior thereof, upwardly and downwardly extending cleats fastened to said steps and a lining of blocks of non-heat conducting, fireproof material fitted in between said steps and cleats.

2. The combination in a smoke stack, of a metal shell, angle iron steps fastened to the interior thereof, upwardly and downwardly extending cleats fastened to said steps and a lining of blocks of non-heat conducting, fireproof material fitted in between said steps and cleats, together with pins extending through the steps and cleats into the upper ends of each series of blocks.

3. The combination in a smoke stack, of a metal shell, angle iron steps fastened to the interior thereof, upwardly and downwardly extending cleats fastened to said steps and a lining of blocks of non-heat conducting, fireproof material fitted in between said steps and cleats, said blocks being formed of asbestos in cellular form and waterproofed.

4. The combination in a smoke stack, of a metal shell, angle iron steps fastened to the interior thereof, upwardly and downwardly extending cleats fastened to said steps and a lining of blocks of non-heat conducting, fireproof material fitted in between said steps and cleats, together with a continuous lining of cement covering the blocks, cleats and steps.

5. The combination in a smoke stack, of a metal shell, angle iron steps fastened to the interior thereof, upwardly and downwardly extending cleats fastened to said steps and a lining of blocks of non-heat conducting, fireproof material fitted in between said steps and cleats, said blocks being formed of asbestos in cellular form and waterproofed, together with a ring of cement between the ends of the blocks and adjoining the angle iron steps.

Signed at Oak Park, Ill., this 14th day of April, 1908.

HENRY C. TODD.
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Witnesses:
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A. L. HARVEY.