Aug. 4, 1931. J. V. SCHAEFER 1,817,104

STACK

Filed Dec. 17, 1928

Fig. 1.

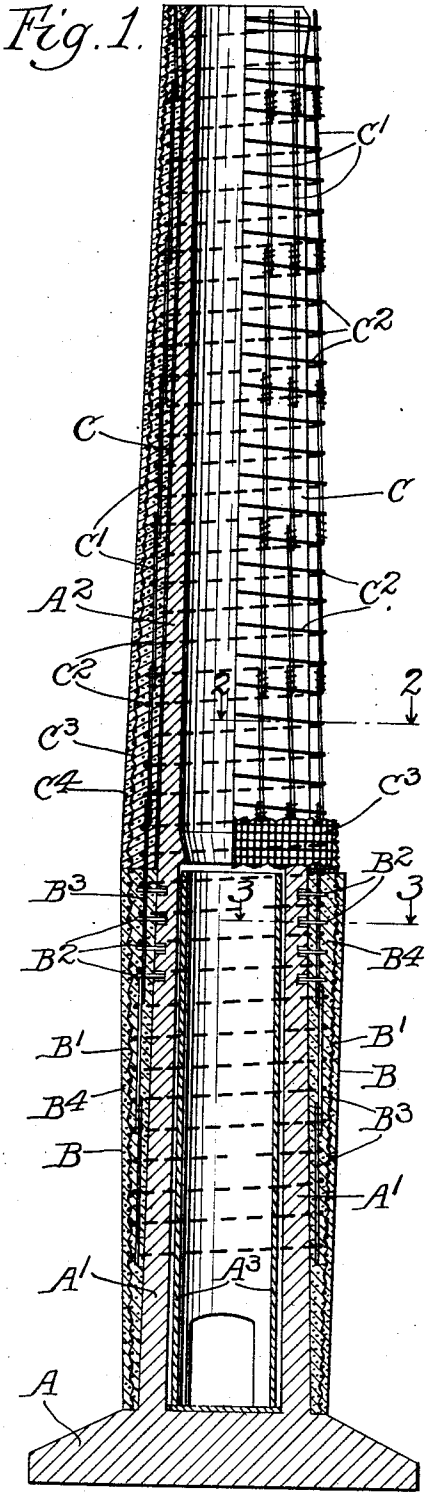


Fig. 2.

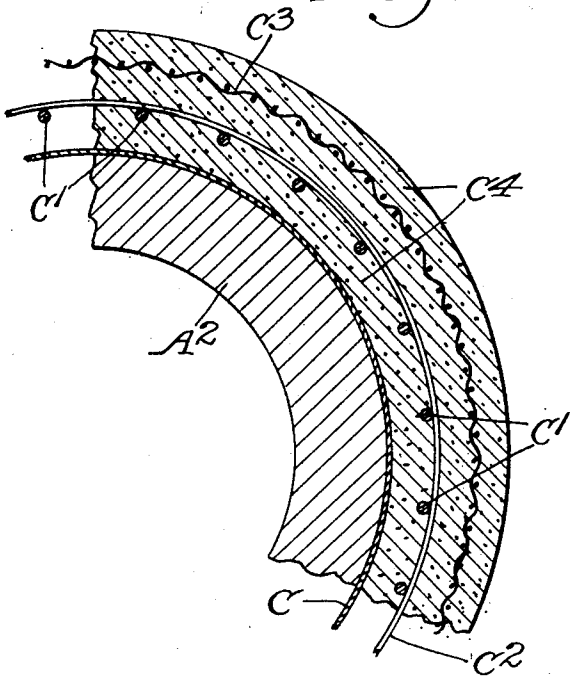
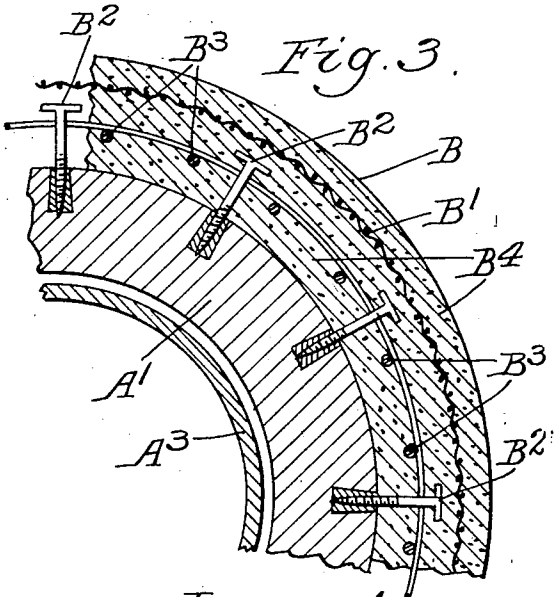


Fig. 3.



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Patented Aug. 4, 1931 1,817,104

UNITED STATES PATENT OFFICE

JOHN V. SCHAEFER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO CEMENT-GUN CONSTRUCTION COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS, AND ONE-HALF TO CEMENT-GUN COMPANY, INC., OF ALLENTOWN, PENNSYLVANIA, A CORPORATION OF NEW YORK

STACK

Application filed December 17, 1928. Serial No. 326,493.

My invention relates to an improvement applicable to chimneys and similar structures, such as silos, grain bins, elevators and the like, and to methods of making or repairing them. One object of my invention is to provide a method of restoring a chimney or similar structure whose effectiveness and stability have been impaired, as by disintegration. Another object is the provision of a method for repairing a chimney or similar structure, the upper part of which has become weakened. Other objects will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings, wherein—

Figure 1 is a vertical section with parts broken away;

Figure 2 is a section on an enlarged scale on the line 2—2, and

Figure 3 is a section on an enlarged scale on the line 3—3 of Figure 1.

Like parts are indicated by like symbols throughout the specification and drawings.

A generally and diagrammatically indicates any suitable base or foundation or support upon which a chimney may be erected. A^1 indicates the lower portion of the original chimney, which may be of any material but it is shown in Figure 1 as of masonry or concrete. A^2 is the upward extension thereof. A^3 indicates an inner firebrick tube or liner for the chimney A, preferably spaced inwardly therefrom.

It often happens that chimneys, whether of metal or masonry or concrete, become defective and broken down and are eaten away by the hot gases which pass upwardly within or by the action of weather from without, or both. I shall therefore describe my invention as applied to a chimney, but wish it to be understood that I do it for purpose of illustration, not limitation. One application of my invention is to provide means for salvaging or repairing a stack or similar structure in which the upper portion is too defective to be patched or repaired. It frequently happens that the upper portion of a structure, for example of a stack, is practically destroyed, while the lower portion is still in more or less sound condition. In chimneys, this may be because the frequently used fire brick inner tube or chimney A^3 protects the lower portion of the chimney. Also, the upper portion of the stack is thinner and in many cases more exposed to weather, as where the lower portion of a stack is inclosed in the building, or protected by surrounding buildings.

In the present disclosure of my invention I employ a method which includes employing the lower section of a structure as a support for a supplemental or substitute or surrounding structure which may surround the upper portion of the structure. Referring in detail to the drawings, the lower stack section A^1, on the foundation A, may be surrounded by an outer sleeve or sheath or layer B, herein shown as of reinforced concrete. B^1 generally indicates any suitable reinforcing means, for example the wire mesh reinforcement shown in section in Figure 3. In order not only to anchor and secure the surrounding portion B to the lower chimney portion A^1, but also to serve as a supporting means for the outer chimney upwardly projecting about the upper inner chimney portion A^2, I supply a substantial reinforcing, for example the bars B^3 and the bars C^1, extending upwardly into the upper portion and downwardly into the lower portion of the outer or surrounding structure or sheath. Note the rods B^3 penetrating the upper outer structure C^4, the reinforcements of the upper and lower structures being preferably continuous, or at least being adapted to extend upwardly and downwardly through both structures. Thus I do not depend alone on the strength of the sheathing at the point of junction between the lower structure B and the upper structure C^4, but by extending the reinforcing rods B^3 downwardly througout nearly the entire extent of the portion B I give for the support of the upper portion the entire strength of the mass B and its adhesion to the original stack A^1. I may even use anchor bolts, as at B^2, to further insure attachment of the outer structure B to the inner chimney A^1, so that the upper portion C^4 may have the full sup-

port both of the original lower structure A^1 and the outer or reinforcing structure B, acting as a unit.

The rods B^3, C^1, as well as the outer ends of the anchors B^2 and the mesh B^1, are all imbedded in the concrete B^4 or C^4, as the case may be, which may be applied in any suitable manner, but which is particularly effectively applied by means of a cement gun or cement projecting means.

Assuming the existence of the strengthening or projecting or reinforcing band or sleeve B about the lower chimney portion A^1, that portion may be considered as consolidated into a larger and stronger base section, amply able to support the weight of a new chimney. The upper chimney portion A^2 is then employed largely as a form for the outer chimney or jacket. Its outer surface may be patched or smoothed, if desired, and preferably there is then applied to it a flexible sheath or layer C, which may be of asbestos or any other suitable material. Exterior of this sheath C may be carried up the reinforcing rods C^1, which if desired may be tied to the rods B^3. Circumferential cross members C^2 may be employed and also the mesh C^3, which may be considered an upward extension of the mesh B^1 of the lower section. The reinforcing system so formed is embedded in the cement or concrete C^4, which may be cast about the chimney but is preferably projected against the chimney A^2 and the flexible sheath C, as by a cement gun or other suitable concrete projecting means.

The result of the carrying out of my method is the production of a lower chimney section which includes both the original lower chimney section and an outer enlarging and strengthening thereof. This lower section, which is anchored together as a unit, serves as the base for the upper outer chimney section which surrounds the upper inner chimney section A^2 but is structurally independent thereof, the two being preferably, but not necessarily, separated by the flexible sheath or asbestos liner. As an illustration, the lower portion of a stack, from which defective spots here and there may be chipped away, is surrounded by the reinforcing structure, including the rods B^3, and concrete may be shot against the old base A^1 to form the new sheathing concrete structure B. The structure B is thoroughly anchored to the portion A^1 not only by its natural bond of concrete to concrete, but by additional anchor bolts B^2. The vertical reinforcing rods B^3 of the lower structure and C^1 of the upper structure form a continuous system extending down nearly the full length of the surrounding stack or sheath, having maximum strength at the dividing point between the upper and lower stack portions, and gradually diminishing in strength, but extending nearly to the bottom of the stack. In that way the strength of the entire bottom portion is available to support the upper sheath C^4. The stresses are gradually distributed and become less and less as you go down the stack.

It will be realized that whereas I have described and shown a practical and operative structure and have illustratively shown a chimney, nevertheless many changes may be made in size, shape, number and disposition of parts, and in location of reinforcing and in details of reinforcing, without departing from the spirit of my invention. Furthermore, it will be realized that the illustration of my invention as embodied in the chimney is to a degree illustrative, and that I do not wish my invention to be understood as being limited to a chimney, it being applicable to other structures in which weathering or deterioration of the upper parts makes necessary the employment of strengthening, reinforcing, or sheathing.

I claim:

1. A chimney which includes a lower chimney portion, an upper chimney portion, a reinforcing structure surrounding said lower portion and forming a structural unit therewith, an outer chimney extending upwardly from said structure about said upper chimney portion, and structurally independent of said upper chimney portion.

2. A chimney which includes a lower chimney portion, an upper chimney portion and forming a structural unit therewith, a reinforcing structure surrounding said lower portion, an outer chimney extending upwardly from said structure about said upper chimney portion, and structurally independent of said upper chimney portion, and separated therefrom by a flexible intermediate layer.

3. A chimney which includes a lower chimney portion, an upper chimney portion, a reinforcing structure surrounding said lower portion and positively secured thereabout and thereto, an outer chimney extending upwardly from said reinforcing structure, about said upper chimney portion, structurally independent of said upper chimney portion and mounted upon and secured to said reinforcing structure.

4. A chimney which includes a lower chimney portion, an upper chimney portion, a reinforcing structure surrounding said lower portion and positively secured thereabout and thereto, an outer chimney extending upwardly from said reinforcing structure, about said upper chimney portion, structurally independent of said upper chimney portion and mounted upon and secured to said reinforcing structure, and an intermediate sheath between said outer chimney and said upper chimney portion.

5. A chimney which includes a lower chimney portion, an upper chimney portion, a strengthening structure, surrounding said

lower portion, and positively secured thereto, an outer chimney extending upwardly from said strengthening structure, about said upper chimney portion, structurally independent of said upper chimney portion and mounted upon and supported by said reinforcing structure and lower chimney portion, the strengthening structure including a chimney surrounding jacket of reinforced concrete, and securing members, imbedded in said concrete, penetrating the lower chimney portion.

6. A chimney which includes a lower chimney portion, an upper chimney portion, a strengthening structure, surrounding said lower portion, and positively secured thereto, an outer chimney extending upwardly from said strengthening structure, about said upper chimney portion, structurally independent of said upper chimney portion and mounted upon and supported by said reinforcing structure and lower chimney portion, the strengthening structure including a chimney surrounding jacket of reinforced concrete, securing members, imbedded in said concrete, penetrating the lower chimney portion, the outer chimney being of reinforced concrete, there being reinforcing elements extending from said outer chimney downwardly into said strengthening structure.

7. A composite structure which includes a lower, inner portion and an upper, inner portion, a reinforcing structure surrounding and forming a structural unit with such lower inner portion, a surrounding and sheathing structure upwardly extending about such upper inner portion and supported upon said reinforcing structure, the reinforcing structure and the lower portion which surrounds it being adapted to unitarily support the upwardly extending sheathing structure.

8. A composite structure which includes a lower, inner portion and an upper, inner portion, a reinforcing structure surrounding such lower inner portion, a surrounding and sheathing structure upwardly extending about such upper inner portion and supported upon said reinforcing structure, the reinforcing structure being provided with generally vertical reinforcing rods, the reinforcing structure being of concrete, said reinforcing rods being adapted to distribute the stresses of the surrounding and sheathing structure throughout the lower reinforcing structure and to the lower inner portion.

Signed at Chicago county of Cook and State of Illinois, this 13th day of December, 1928.

JOHN V. SCHAEFER.