

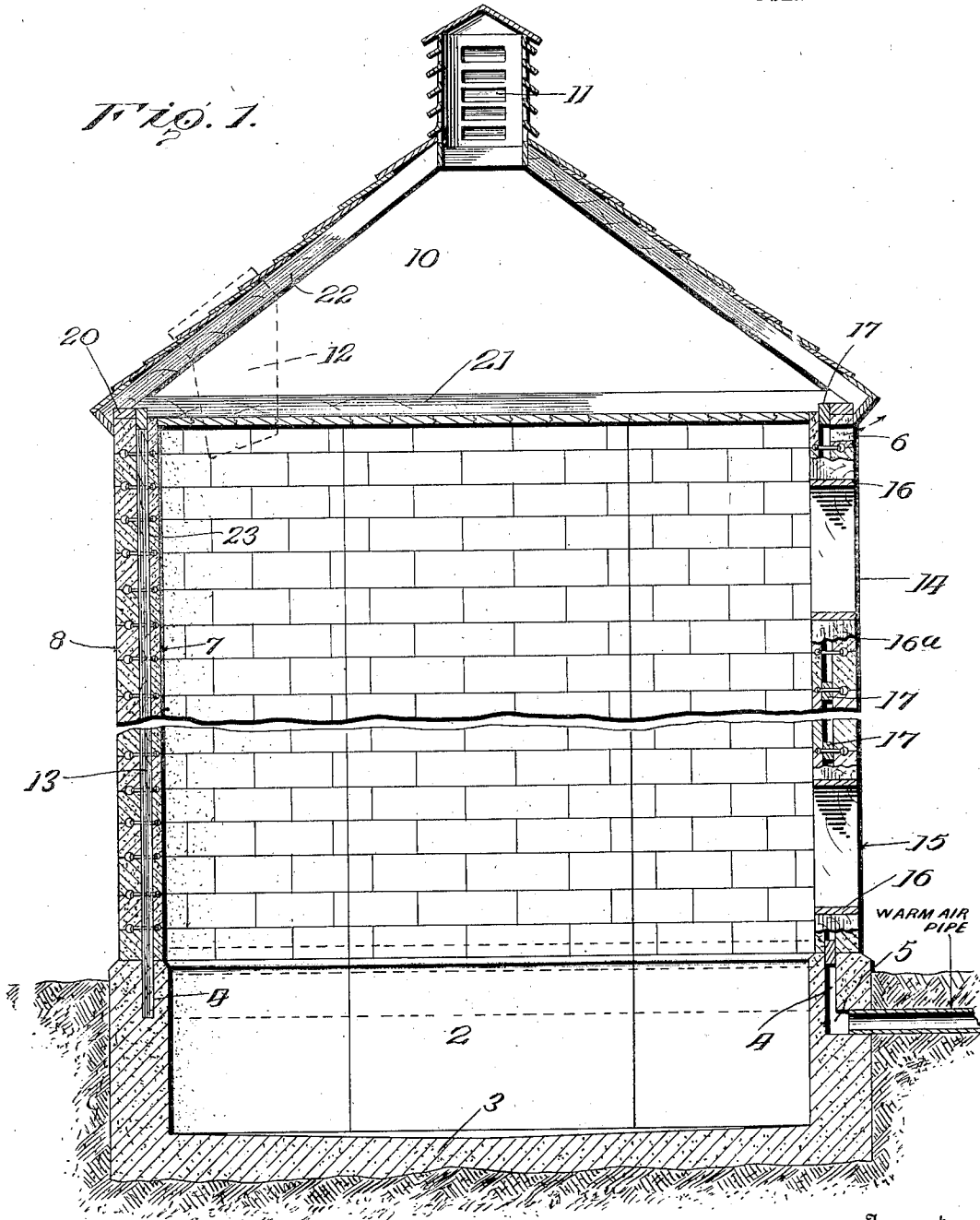
H. DIEBEL.
SILO.

APPLICATION FILED JAN. 20, 1912.

Patented Apr. 15, 1913.

4 SHEETS—SHEET 1.

1,058,949.



Inventor

Henry Diebel

Witnesses
Friedman Espey
Joana H. Tallin

By

A. M. Tracy, Attorney

H. DIEBEL.
SILO.

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4 SHEETS—SHEET 2.

Fig. 2.

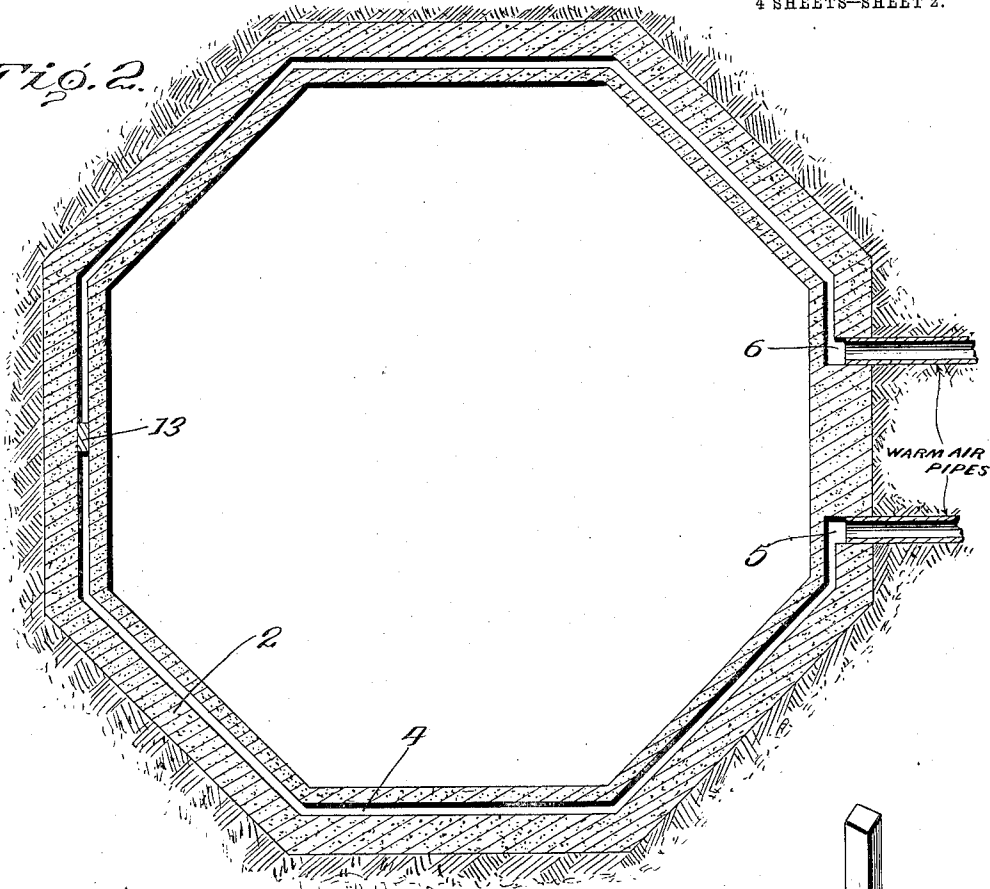


Fig. 5.

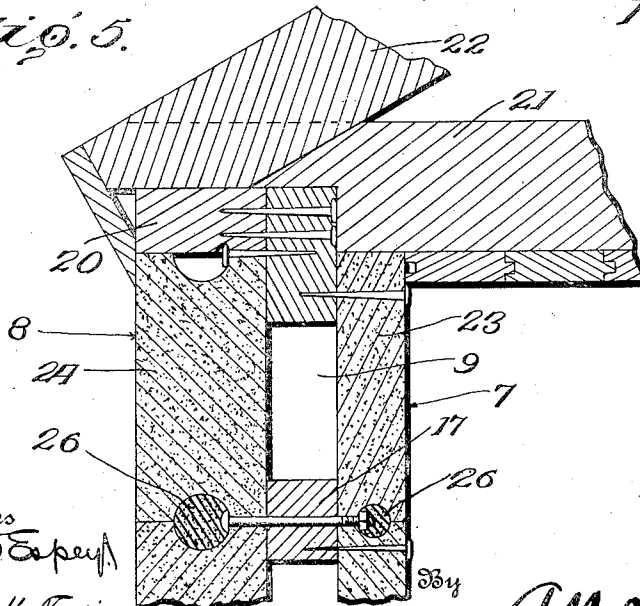


Fig. 9.



Witnesses
Cremat Espey

Jana H. Fallin

Inventor

Henry Diebel

A. M. Macy, Attorney.

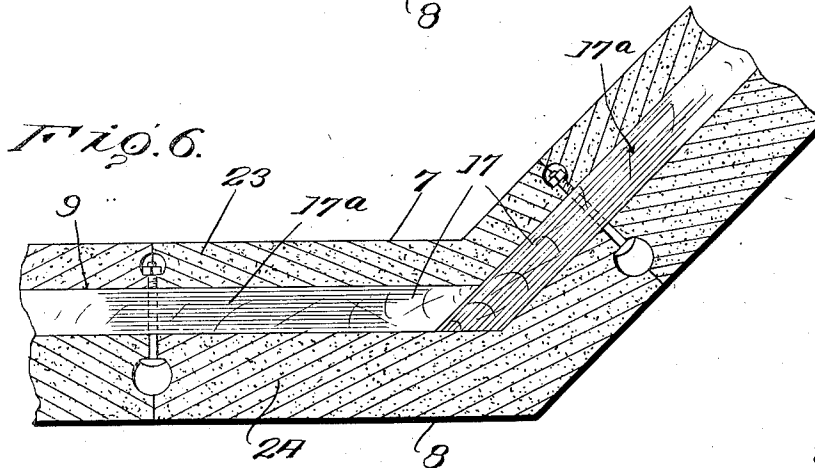
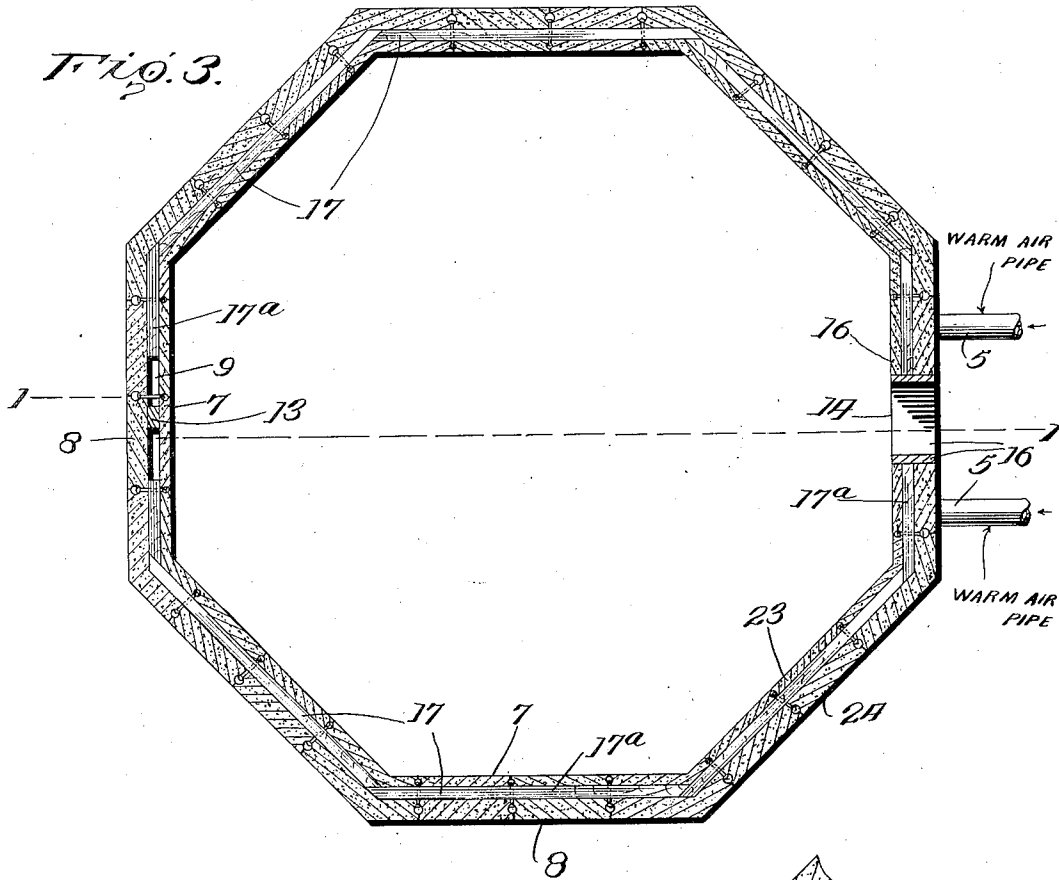
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4 SHEETS—SHEET 3.



Inventor
Henry Diebel

Witnesses
Herman E. Peep
Joana M. Fallon

By

A. M. Tracy, Attorney

H. DIEBEL.

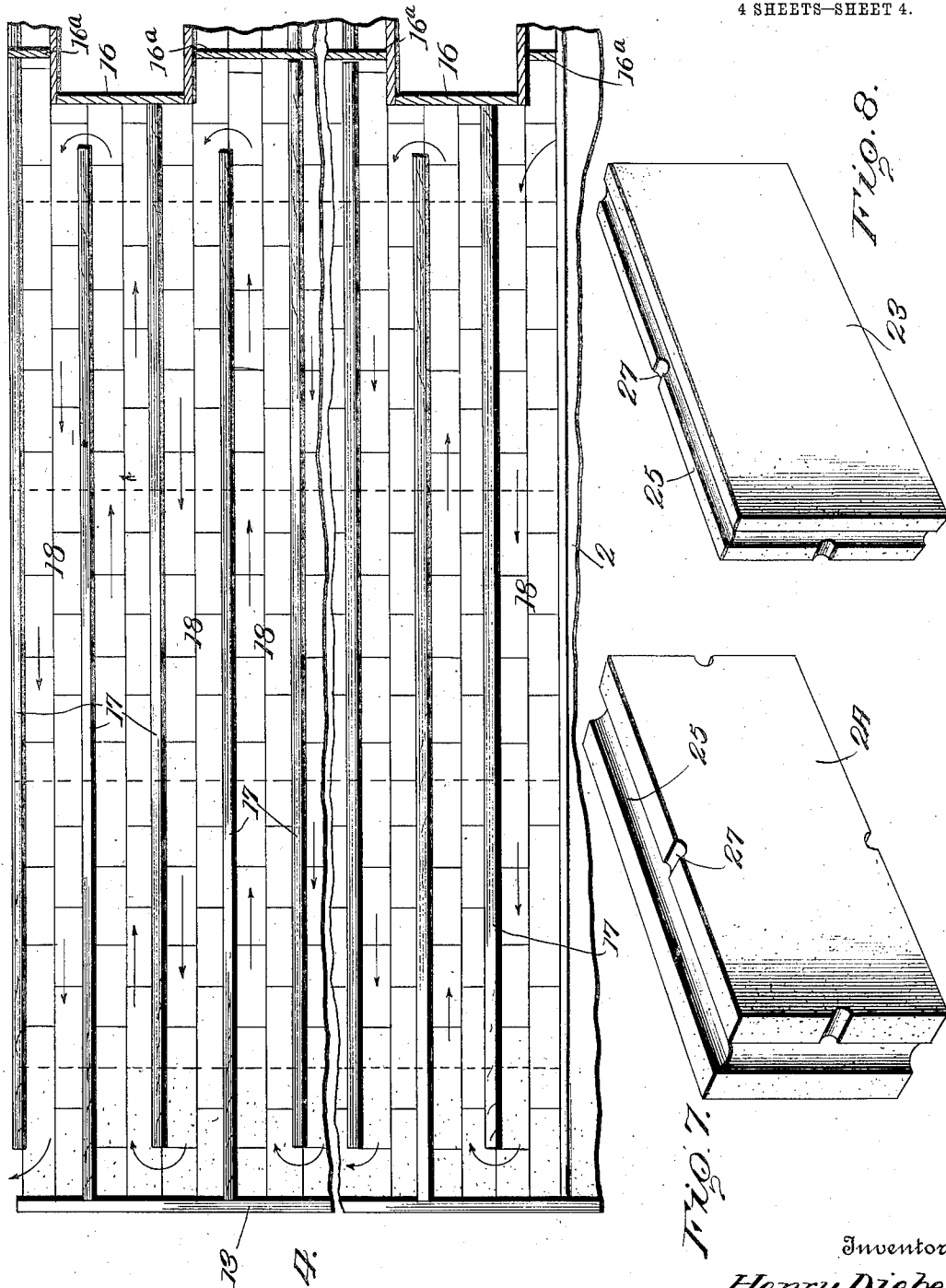
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4 SHEETS—SHEET 4.



Witnesses
Edmund E. Epp
Joana M. Fallon

Fig. 4.

Fig. 7.

Inventor
Henry Diebel

By

A. H. Hacy, Attorney.

UNITED STATES PATENT OFFICE.

HENRY DIEBEL, OF LONG PRAIRIE, MINNESOTA.

SILO.

1,058,949.

Specification of Letters Patent.

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Application filed January 20, 1912. Serial No. 672,413.

To all whom it may concern:

Be it known that I, HENRY DIEBEL, citizen of the United States, residing at Long Prairie, in the county of Todd and State of Minnesota, have invented certain new and useful Improvements in Silos, of which the following is a specification.

This invention relates to building constructions, and particularly to the construction of silos.

The primary object of my invention is the provision of a silo so constructed as to prevent the ensilage from freezing in cold weather.

A further object is the provision in this connection of a double wall silo, the space between the walls providing a warm air space adapted to be connected to some source of warm air.

Another object is the formation of warm air ducts extending within the walls of the silo from inlet openings located in the basement of the structure to outlet openings disposed in the upper portion of the structure and opening to the outer air.

A further object is to improve the general construction of silos by the use of concrete blocks of peculiar form bonded together by tie bolts, these concrete blocks being so arranged that after the tie bolts are in place, and the inner and outer blocks separated by division or spacing members, as will be later fully described, the tie bolts may be tightened to draw the outer and inner walls formed by the blocks into bonded relation to each other.

Other objects will appear in the course of the following description.

In the drawings: Figure 1 is a vertical sectional view of my improved silo upon the line 1—1 of Fig. 3; Fig. 2 is a horizontal view on the line 2—2 of Fig. 1; Fig. 3 is a horizontal section on the line 3—3 of Fig. 1; Fig. 4 is another face view of one half of the outer wall of the silo, the inner wall being removed; Fig. 5 is a vertical detail section of the upper end of the wall and the adjacent roof beams; Fig. 6 is a detail horizontal section through a corner of the silo wall; Figs. 7 and 8 are perspective views of the outer and inner wall blocks, respectively; and Fig. 9 is a perspective view of one of the members of which the horizontal division pieces 17 are composed.

Corresponding and like parts are designated by the same characters of reference throughout the several views.

I have illustrated my improved silo as being octangular in form, but, of course, do not wish to be limited to any particular shape for the silo, as it might be round, square, or of any other desired figure. The base 2 of the silo has, of course, the same form in plan as the walls of the structure. This base is preferably solid and made of concrete, brick, stone or other suitable material. The floor 3 of the base is preferably of concrete. The upper face of the base wall is formed with a duct or passage 4, preferably opening along its entire extent upon the upper face of the wall, which duct extends nearly around the base wall. A warm air inlet opening or passage 5 extends from the exterior of the building into one end of this duct and a like inlet passage or opening 6 also extends from the exterior of the building into the other end of the duct.

The walls of the silo which extend above the ground line are formed of an inner wall 7 and an outer wall 8 separated from each other to provide a space 9 which registers with the space 4 of the base. While I do not wish to be limited, broadly speaking, to any particular material for the outer and inner walls of the silo or any particular construction of these walls, they are preferably formed according to my invention of blocks of artificial stone, as will be later described.

The roof 10 is of any ordinary and usual construction, and formed and provided with the usual ventilating louver 11 and chute 12.

The interspace 4 of the upper face of the base, and the interspace 9 between the outer and inner walls of the superstructure is divided into two main portions by a vertically disposed division wall 13 preferably composed of a joist or scantling located between the outer and inner blocks of which the side walls of the silo are composed, and extending from the bottom of the space 4 to the junction of the walls with the roof. This division wall 13 is located preferably diametrically opposite to a point between the two openings or passages 5 and 6, or, in other words, diametrically opposite to upper and lower door openings 14 and 15, which are framed by the door casing 16. Vertically disposed division members 16^a extend

above and below the door casings so as, in conjunction with a division member 13, to divide the space 9 into two lateral sections.

Extending horizontally within the space 5 between the two walls are a series of division members 17, each member being composed of a plurality of sections or pieces 17^a and each member as a whole being of less length than the distance from one inlet 10 opening 5 or 6 to the vertical division wall 13, as shown in Fig. 4. These division members are set in staggered relation to each other, that is, one of said members 17 at one end abuts against the division wall 13, 15 but is spaced from the vertical division wall 16^a or the casing 16, while the next adjacent members above and below abut against the wall 16^a or the casing 16, but not against the division wall 13. These members, therefore, alternately abut against the division wall 13 and the casing 16 or division wall 16^a. There is thus provided, as shown by the projection, Fig. 6, on each side of the building, and extending half-way around it, 25 a continuous passage or flue 18 which extends in a zig-zag direction from the warm air entrance opening in the base to the roof, where it opens to the outer air, as by an outlet 6. It will thus be seen that there are 30 practically two sets of grooves or warm air passages, each extending substantially half-way around the building, so that the inner wall of the silo as a whole is inclosed by a warm air space. This warm air space 35 may be connected to any source of warm air, but preferably it is connected to ventilating openings extending from a stable or cow house. I have found in practice that by connecting the silo interspace by a 40 flue leading to and ventilating the cow house or stable, that the warm air so conducted to the silo will entirely prevent the ensilage from freezing, and that at the same time a perfect ventilation of the stable or cow 45 house is provided, inasmuch as a continuous flue is formed surrounding the silo and extending upward and discharging at its upper end to the outer air. It is extremely difficult in cold countries to prevent ensilage 50 from freezing within the silo, but by my invention it is possible to secure this object with no expenditure of money except that incident to building the silo.

Because the silo is shown as octagonal or 55 polygonal in plan, the division members can not be formed each in a continuous strip, but must be formed preferably of strips each of which is equal in length to one of the sides of the polygon. As illustrated in 60 Fig. 9, each strip 17^a, which is preferably formed of a small joist or scantling, is beveled at its ends so that when the strips are placed together, as illustrated in Fig. 6, the end of one strip will butt against the 65 end of the next succeeding strip. As illus-

trated, one end of a strip butts against one end of the adjacent strip, while the other end of the first-named strip overlies the abutting end of the next adjacent strip or piece.

In building the silo, the inner wall is first 70 built up to a certain height from the ground and then the first division members 17 are nailed or otherwise attached to the inner wall. The outer wall is then built up to 75 the height of this member 17, and then the inner wall continued upward until the next member 17 is put in place, and so on. The uppermost member 17 is nailed or otherwise attached not only to the inner 80 wall, but to a cap beam 20 which rests upon the outer wall, as shown in Fig. 5, and upon which, in turn, the roof beams 21 and 22 are supported.

As previously stated, the outer and inner 85 walls of that portion of the silo which extends above the ground, are preferably formed of blocks of artificial stone, cement or other suitable material. The block for the inner wall is illustrated in Fig. 8, and 90 one for the outer wall is shown in Fig. 7. The blocks 23 for the inner wall are thinner than the blocks 24 for the outer wall, but both inner and outer wall blocks are formed with marginal grooves or channels, as 25. The 95 grooves or channels may either be left empty or filled with cement or other bonding material 26, thus closing joint between abutting blocks and preventing the passage of moisture or of air through between the 100 abutting blocks. These grooves or channels 25 also form seats for tie bolts 26. Preferably, the edges of the blocks are transversely grooved, as at 27, so as to inclose and fit over these stay or tie bolts. 105

As previously described, the longitudinal dividing members 17 composed of the strip 17^a are put in place as the wall is built up. Hence, each course of blocks 23 and 24 may be tied to each other as the work progresses, 110 without danger of the blocks forming the walls being drawn toward each other, the members acting as spacing members, while the bolts 26 tie the walls to each other and into close contact with the spacing members 115 or division members 17. After the bolts 26 of a course have been put in place within the notches or grooves 27, the grooves 25 may be filled with cement, as before described, and the next course of blocks put in position. It is not, however, absolutely necessary to use cement, as if cement is not used the panels 25 will form a space which will 120 sufficiently insulate the joint between the blocks. Of course, at the corners the blocks 23 and 24 will be angular in form, as illustrated in Fig. 6 these corner blocks being 125 designated 23^a and 24^a. After the wall has been built up with the strips 17^a in place, spikes may be driven from the inside face 130

of the inner wall through the strips 17^a and into or through the outer wall. Preferably, the wall of the silo is relatively thin, and I have found in practice that with the outer blocks four inches in thickness and the inner blocks two inches in thickness, and the outer and inner blocks spaced apart two inches, the wall is amply strong and at the same time thoroughly protective of the ensilage.

It will be seen that my method of constructing silos provides a silo which is thoroughly dry, weather proof, and which will prevent the ensilage from freezing and at the same time provide a duct whereby warm air together with foul odors from the cow house or stable may be conducted away.

My improved silo may be readily built at relatively small cost, and it is obvious that while preferably this silo is built of cement or concrete, brick or other like material may be used on the exterior, and lathes, plaster or other desired finish on the interior, and that I need not, therefore, be limited to the precise construction of the silo described in order to secure the general advantage claimed in my invention.

Having thus described the invention, what is claimed as new is:

1. A building of the character described comprising an outer wall and an inner wall separated to provide a warm air space between the walls, said walls having a series of entrance openings extending vertically in superposed relation, each opening being surrounded by a casing, said casings extending transversely across the walls and the space therebetween and forming a series of vertically disposed division members, a vertically disposed division member located directly opposite said casings and disposed in said space, said last named member and said casings together dividing said space into oppositely disposed lateral halves, each having an inlet and an outlet, and horizontally disposed division members disposed in said space in staggered relation to each other and abutting alternately against one or the other of the vertical division members whereby to provide for each of said air spaces a continuous air passage extending back and forth from the lower portion of the building to the upper.

2. A building of the character described, having an outer wall, an inner wall separated to form a warm air space, a plurality of vertically disposed division members dividing said space into a plurality of sections, each section of the air space being formed at its lower end with a warm air inlet opening and at its upper end with an outlet opening, and horizontally disposed vertically spaced division members disposed in each of said spaces in staggered relation to each other and abutting alternately against one or the other of the vertical division members

whereby to provide for each of said air spaces a continuous passage extending back and forth from the lower portion of the building to the upper, and wall tying means passing through both walls and through said horizontally disposed division members.

3. A building of the character described comprising a base having a vertical wall, the upper face of the vertical wall being formed with a continuous vertically disposed recess, a superstructure resting upon said base and comprising outer and inner walls separated from each other to provide an air space coincident with the recess in the upper face of the base, said base having an inlet passage extending in to the recess and the superstructure having an outlet passage at its upper end extending through its outer wall, the space between the outer and inner walls being divided by vertical division members and horizontally disposed division members located in said space and between the vertical division members and having a staggered relation to each other and alternately abutting against one or the other of the division members, whereby to provide a continuous air passage on each side of the building extending from the inlet opening of the base to the outlet opening of the superstructure.

4. A silo comprising a many sided base having a vertical wall, the upper face of the vertical wall being formed with a continuous vertically disposed recess, a many sided superstructure resting upon said base and comprising outer and inner parallel walls separated from each other to provide an air space coinciding with the recess in the upper face of the base, said base having an inlet passage extending into the recess and the superstructure having an outlet passage at its upper end extending through its outer wall, the space between the outer and inner walls being divided by vertical division members and horizontally disposed division members located in said space and between the vertical division members and having a staggered relation to each other and alternately abutting against one or the other of the division members whereby to provide a continuous air passage on each side of the building extending from the inlet opening of the base to the outlet opening of the superstructure, the horizontally disposed division members consisting of sections, each of the same length as one of the sides of said wall, each of said sections being beveled at its ends, the bevels extending in opposite directions to each other whereby the end of one of said sections overlap the inside face of the next adjacent section.

5. A silo having an outer many sided wall and an inner many sided wall separated to provide a warm air space, each wall being

composed of abutting blocks, each block having a channeled edge, vertically disposed division members dividing the space between the outer and inner walls into oppositely disposed lateral halves, each having an inlet and an outlet, and horizontally disposed vertically spaced division members disposed in said space in staggered relation to each other and abutting alternately against the one or the other of the division members whereby to provide for each of said air spaces a continuous air passage extending back and forth from the lower portion of the building to the upper, the outer wall being formed with an air inlet opening

at the lower end of said passage and an outlet opening at the upper end of the passage, and bonding devices extending between the outer and inner walls and having portions disposed in said channels of the blocks forming the outer and inner walls, said bonding devices binding the walls against the division members.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY DIEBEL. [L. s.]

Witnesses:

ALBERT RHODA,
CHAS. KOONZE.