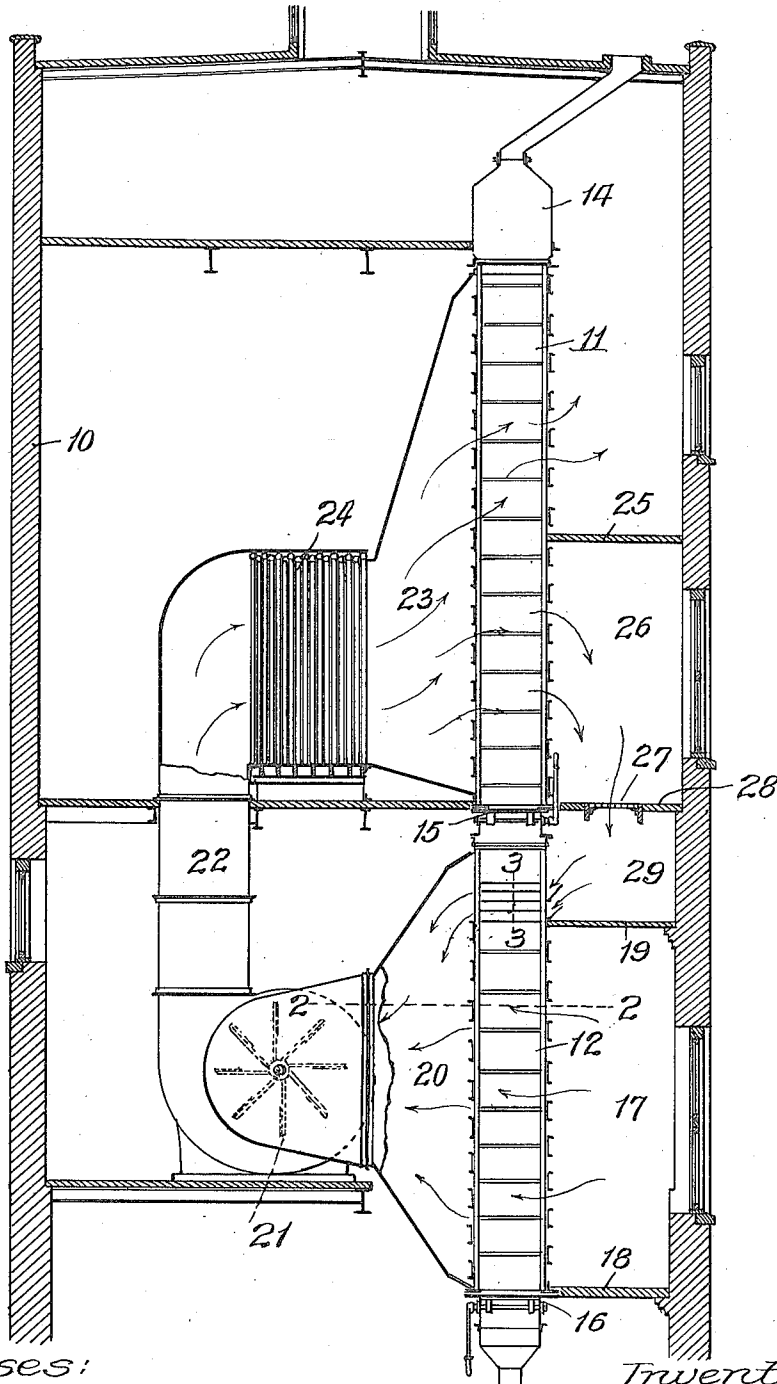


1,127,974.

Patented Feb. 9, 1915.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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Inventor
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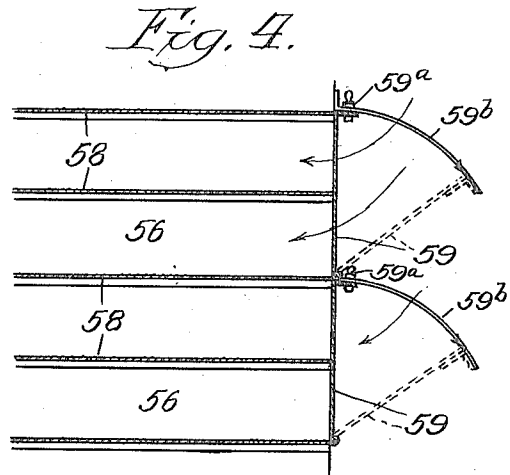
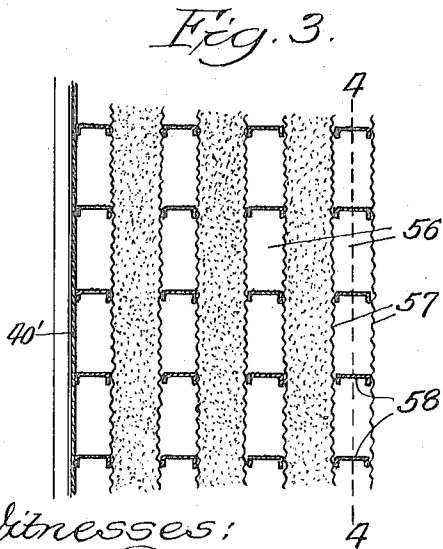
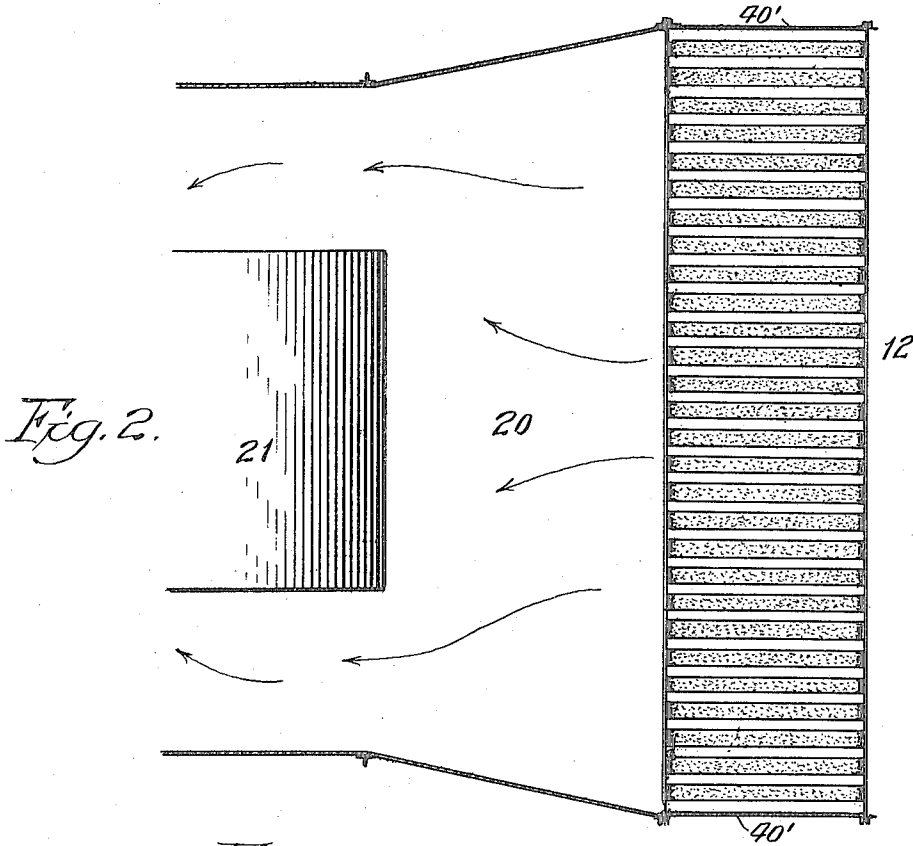
H. C. ELLIS.
GRAIN DRIER.

APPLICATION FILED SEPT. 12, 1914.

1,127,974.

Patented Feb. 9, 1915.

4 SHEETS—SHEET 2.



Witnesses:
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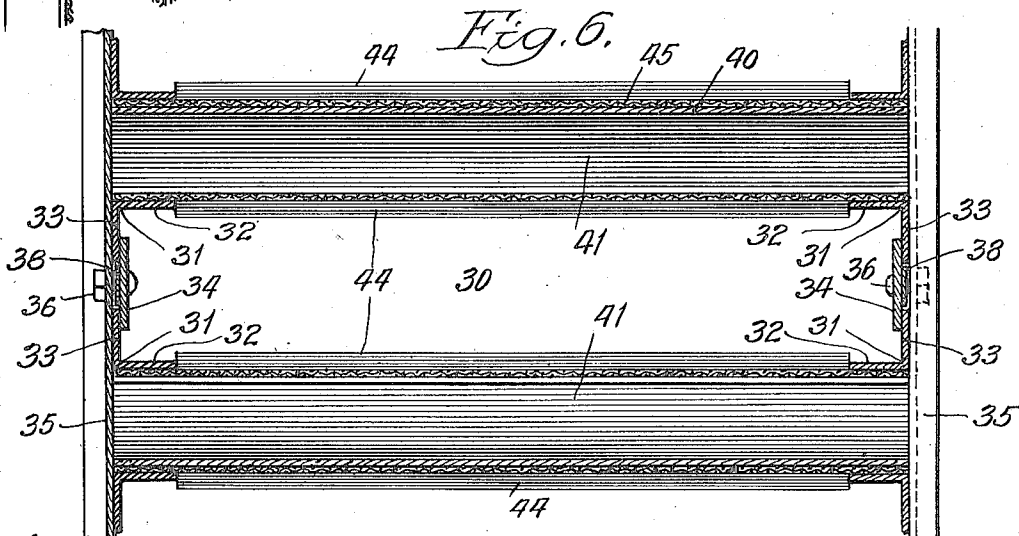
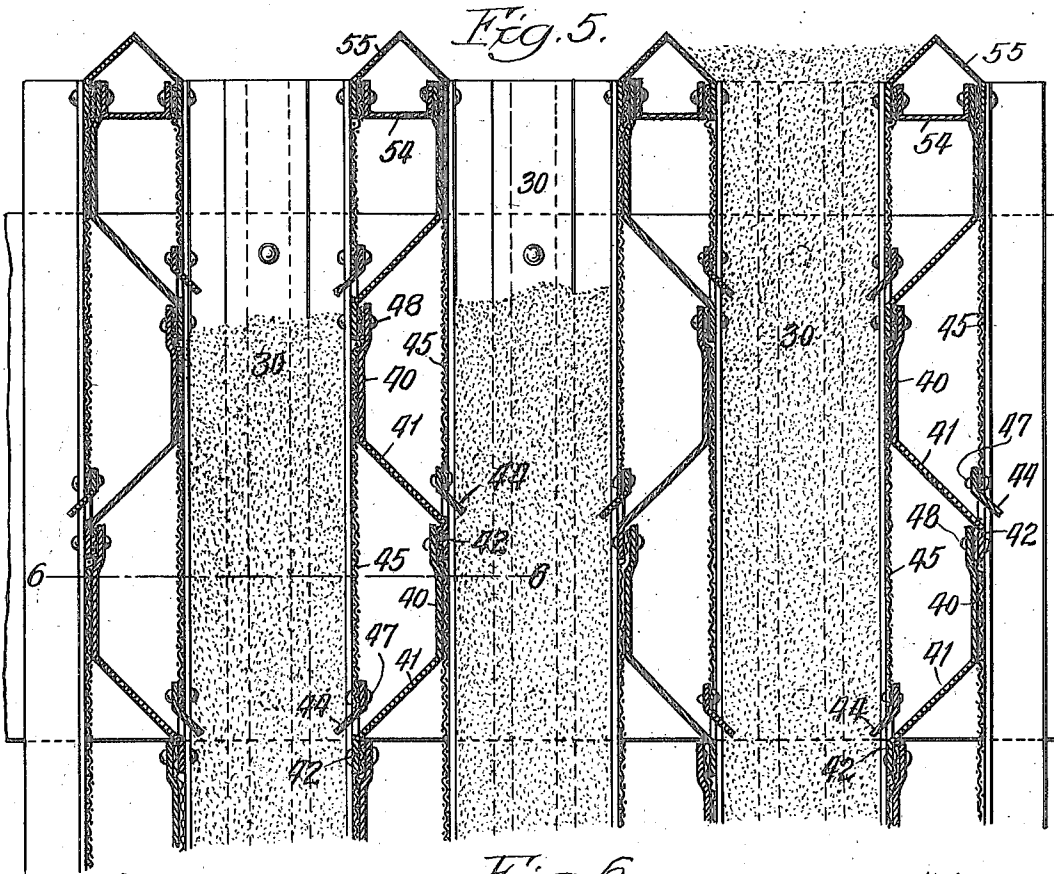
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GRAIN DRIER.
APPLICATION FILED SEPT. 12, 1914.

1,127,974.

Patented Feb. 9, 1915.

4 SHEETS—SHEET 3.



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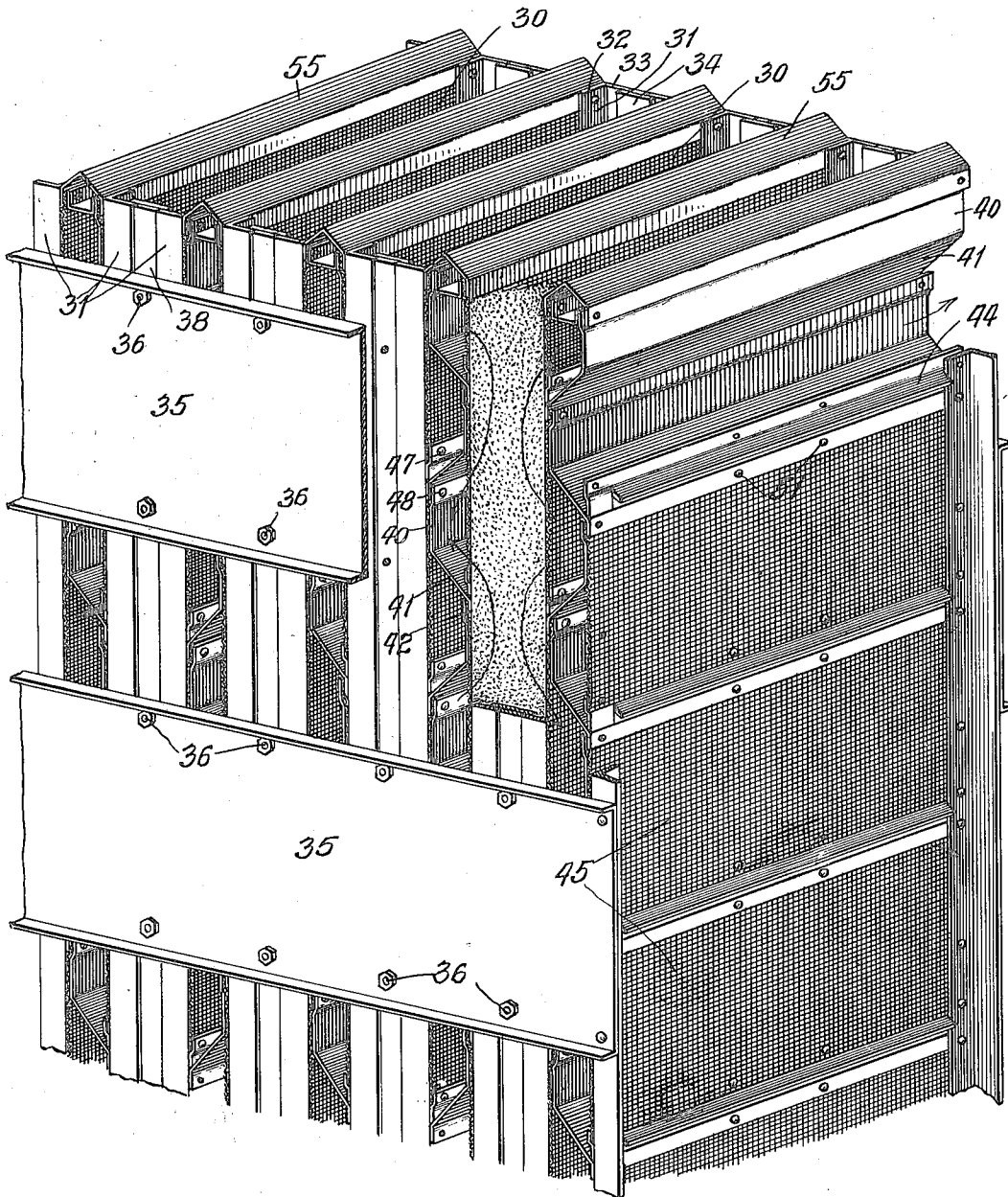
APPLICATION FILED SEPT. 12, 1914.

1,127,974.

Patented Feb. 9, 1915.

4 SHEETS—SHEET 4.

Fig. 7.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

HUBERT C. ELLIS, OF CHICAGO, ILLINOIS, ASSIGNOR TO ELLIS DRIER & ELEVATOR COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF WISCONSIN.

GRAIN-DRIER.

1,127,974.

Specification of Letters Patent.

Patented Feb. 9, 1915.

Application filed September 12, 1914. Serial No. 861,339.

To all whom it may concern:

Be it known that I, HUBERT C. ELLIS, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grain-Driers, of which the following is a full, clear, and exact description.

The invention relates to apparatus for drying and cooling grain.

In Letters Patent No. 921,097, granted May 11, 1909, there is disclosed an apparatus in which the grain is disposed in vertical shafts or columns and in which there are pressure and exhaust flues or ducts through which air under pressure is applied to both sides of the grain columns to cause the air to pass lengthwise of the column and then be discharged from both sides thereof into the exhaust flues. In this construction, the flues are formed of sheet metal shaped to provide vertically extending walls and horizontally extending division walls between the flues, and it was the practice to provide a continuous screen cloth extending the length of the column. In the practice of the invention set forth in said Letters Patent No. 921,097, it has been found that many particles of broken grain would become lodged and accumulate on the horizontal division walls between the flues, so that it was necessary occasionally to blow out the flues and clean them. The dust was usually carried off through the exhaust flues, but the deposits consisted of particles of grain which were usable.

One object of the present invention is to provide an improved drier of the type set forth in said Letters Patent No. 921,097, in which the division walls are formed to prevent these accumulations and which will cause them, if carried into the flues, to fall back into the grain columns, thus saving the particles for consumption.

Another object of the invention is to improve the construction of driers of this type by providing a drier in which the pressure and exhaust flues are formed of separately built-up sections, including sections of screen cloth, and thereby avoid the necessity of providing a continuous screen cloth extending throughout the height or length of the grain columns.

The invention further designs to provide an improved drier formed with flues between the grain columns which have openings com-

municating with the grain shafts for deflecting particles of grain forced through the screen back into the grain column, thus keeping the flues clean and saving the grain particles.

In treating wet grain to eliminate the moisture, it is now common practice to force a blast of air through the grain column under sufficient pressure to force the air through the drier containing the grain. In practice, it frequently occurs that some of the grain becomes cracked or blistered in the drier. This results from the pressure and dryness of the air in those parts of the drier where the blast contacts with the grain initially, and from the uneven heating and drying of the different portions of the kernels, causing uneven and sudden shrinkage of one portion of the kernel before another has been treated. An apparatus for overcoming this deterioration of the grain in the drying process by impregnating the hot air with a small per cent. of moisture sufficient to prevent the cracking and blistering of the grain, without materially interfering with the drying process, is set forth in Letters Patent No. 1,001,259, granted August 22, 1911, to Wynn E. Ellis.

One object of the present invention is to provide an improved apparatus of this type, in which the air, after having passed through the damp grain, is drawn through the upper portion of a subjacent cooler. By passing the moist air through the upper portion of the cooler, more direct air passages can be employed for returning the air to the blower. This result is attained by providing direct passages through the upper portion of the cooler.

A further object of the invention is to provide a grain drier which is formed of sections having pressure and exhaust flues therein, the sections being assembled so that the spaces between the sections or grain shafts may be easily varied according to the width of the grain column desired.

Lastly, the invention designs to provide a grain drier which is simple in construction, has a large capacity and which may be produced at a low cost.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings: Figure 1 is a vertical

section of a grain drier and cooler embodying the invention. Fig. 2 is a section taken on line 2—2 of Fig. 1. Fig. 3 is a section taken on line 3—3 of Fig. 1. Fig. 4 is a vertical section taken on line 4—4 of Fig. 3. Fig. 5 is a section on an enlarged scale through several of the upper ends of the grain shafts and the air flues between them. Fig. 6 is a section taken on line 6—6 of Fig. 5. Fig. 7 is a perspective of the upper portion of the drier, parts being broken away.

The improved apparatus is illustrated as erected in a suitable inclosing structure 10 and comprises a drier 11 in which the grain is subjected to a blast of hot air, and a cooler 12 into which the grain passes from the drier in which the grain is subjected to a blast of cold air. Grain is delivered into the drier from a suitable garner 14, as well understood in the art. A suitable valve 15 is disposed below the drier 11, and controls the discharge of material from the drier into the upper end of the cooler. A similar valve 16 controls the discharge of grain from the cooler. By closing these valves, a charge of grain may be treated as long as desired. Cold air from a compartment 17 formed between horizontal walls 18 and 19 passes through the cooler 12 to a trunk 20 which leads to the intakes of a blower 21. This blower discharges the blast through a pipe 22 into a trunk 23 which supplies air to the supply flues of the drier 11. In the transit to the drier, the air is heated by a suitable heater 24. The air blast, after passing through the drier, is divided by a wall 25, that portion of the air escaping from the drier above said wall passing to the atmosphere and the portion of the air passing into the chamber 26 below wall 25 passing through a grating 27 in the floor 28 into a chamber 29. The air passing into the chamber 29 from the drier is impregnated with moisture, for the purpose of preventing the air-supply to the drier from being sufficiently dry to blister the grain. This air passes through the upper portion of the cooler to a trunk 20, as hereinafter more fully set forth.

The drier 11 comprises a series of vertical grain-shafts 30, each adapted to hold grain in a columnar mass. The sides of these shafts are formed by vertically extending flue structures made up of similar units. Each of these structures comprises four standards 31 disposed at the corners thereof and formed of angle iron, one flange 32 of which extends inwardly along the side of one of the grain shafts and the other flange 33 extends crosswise of the shaft. These standards are secured together in spaced relation so that the sides of the flue structures will form the sides of the grain shafts by strips 34 which overlap the flanges 33 of

two adjacent flue structures, bars or plates 35 extending across the ends of said structures and bolts 36 which clamp the strips 34 against the flanges. The standards 31 are thus clamped between bars 35 and the strips 34. An important advantage of this construction is that the drier may be erected with grain shafts of different widths. It will be manifest that the flue structures may be separated more or less within the limits of the overlap of strips 34 and flanges 35 without varying the construction of the flue-structure or necessitating special construction for each width of shaft desired. In some instances, narrow grain shafts are desired so that the grain will be more effectively and quickly dried, while in other instances wider grain shafts are desired. If desired, reinforcing strips 38, welded to strips 34, may be interposed between the flanges 33 of the standards of adjacent flue structures. Strips 34 and the standards 31 form enclosures for the grain shafts. Obviously, any number of these flue structures may be thus assembled to form a drier of the desired capacity without variation of the flue structures and by providing bars 35 of the necessary length to secure all of the structures together.

Each flue structure comprises a vertical series of sheet metal plates, each having a vertically extending portion or wall 40 forming a closed side of a flue, an inclined wall 41, forming a dividing wall between vertically adjacent flues, and a vertical flange 42 adapted to overlap the upper end of a sub-jacent plate. These plates have their vertical walls alternately disposed on the opposite sides of the structure, to form flues opening alternately into the grain shafts on opposite sides of the structure. An inclined deflector strip 44 extends across the lower portion of the open side of each flue, projects slightly into the adjacent grain shaft and is secured in separated relation to or above the inclined wall 41. A strip of screen cloth 45 forms the open side of each flue, extends from each deflector-strip 44 upwardly to the upper end of the vertical wall 40 of each flue and is secured between the overlap between a flange 42 at the lower end of one of the inclined walls 41 and the upper end of a vertical wall 40 of vertically adjacent plates. Rivets 47 pass through strips 44, the screen-cloth 45 and the flanges 32 of the corner standards at the ends of said strips, and rigidly secure the screen-cloth and strips 44 in any flue structure. Between their ends the screen-cloth and strips 44 are secured together by rivets 50. Rivets 48 passing through the upper ends of walls 40, the upper ends of the screen-cloth 45 and the vertical flanges 42 at the lower ends of inclined walls 41 and through the flanges 32 of the corner standards, secure

the flue-plates and the screen cloth in the flue structure. Between their ends, walls 40, screen-cloth 45 and flanges 42 are secured together by rivets 51. The inclined walls 41 and the screen cloth 45 and vertical walls 40 form transversely extending flues in the flue structure which open alternately into the sides of the grain-shafts on the opposite sides of the structure. Walls 40 serve to reinforce or back the screen-cloth and prevent it from being bulged by the grain in the shafts. An important attribute of this manner of building the flue structure is that comparatively short pieces of screen-cloth may be utilized in lieu of extending a sheet of such cloth from the top to the bottom of the grain shaft to avoid joints between the pieces. Another important attribute of this construction is that the walls 41 are inclined sufficiently to prevent broken grain from accumulating thereon, because any such material carried through the screen-cloth by the air blast and not carried away with the blast will slide down the inclined walls 41 and under deflector-strips 44 back into the grain column. Furthermore, each flue structure being composed essentially of sheet metal strips and comparatively small pieces of screen cloth, can be secured to the corner standards with facility, and the height of the structure may be built up to any height desired. Channel-bars 54 hold the upper ends of corner standards 31 in spaced relation and V-shaped top-strips 55 direct the grain into the shafts between the flue-structures. The outer side of each end flue-structure is closed by an imperforate sheet 40'.

Cross-bars 35 are alternately disposed on the opposite ends of the shaft to close the exhaust flues at that end at which the supply chamber is disposed and to close the pressure flues at that end at which the exhaust chamber is located. These bars 35 are of sufficient height to close two rows of flues having their opposite sides opening into adjacent grain shafts respectively. The pressure flues for each of the grain shafts are oppositely disposed at the sides thereof, and the exhaust flues are correspondingly disposed so that the air blast will pass into the grain column at both sides thereof and will be directed vertically between the walls 40 of the intermediate flues. Resultantly, the air blast passes into the grain column at both sides thereof and thence vertically through the column at the adjacent exhaust flues, as indicated by arrows in Fig. 5. The closed sides of the flues for one shaft serve as division walls for directing the blast vertically in the adjacent grain shaft. As a result of this formation, the vertical series of flues between the shafts open alternately into the shafts respectively, and have closed or imperforate walls at one side which form

the division walls for directing the blast vertically in the adjacent flues, and the pressure and exhaust flues for one shaft are separated or spaced apart by the intermediate flues for the adjacent shafts, thus making it possible to utilize all the space between the grain shafts for flues.

The flue structure set forth is utilized in the drier and the cooler. To provide a direct return for the moist air in chamber 29; the upper portion of the cooler above the wall 19 is provided with direct passages 56 therethrough. Below the wall 19 the flue structures of the cooler are the same as those employed in the drier. The direct passages 56 in the cooler are formed by extending the screen-cloth 57 continuously from the uppermost pressure flue to the top of the cooler. Channel bars 58 are secured between the screen-cloth to support it and direct flues 56 open at both ends extend transversely through the cooler. As a result, the suction blower 21 will draw cold air from the chamber 17 through the pressure and exhaust flues in the cooler and will draw some moist air from chamber 29 directly through the flues 56. This moist air, and air which has passed through the cooler 12, will be mixed in trunk 20 and will pass into the eyes of suction blower 21 which will force that air through the heater 24 and trunk 23 into the pressure flues of the drier 11.

Valves 59 are pivoted to the inlet end of the cooler adjacent the direct flues 56 to regulate the supply of moist air taken from the drier, so that moist air, in the necessary quantity to prevent the hot air being forced to the pressure flues of the drier, will not blister or crack the grain. Valves 59 may be opened more or less and secured in assigned position by bolts 59^a which are adapted to pass through slots in arcuate bars 59^b to vary the amount of moist air supplied to the fan.

In operation, the dust in the grain in the drier will be carried off by the air, but the broken grain and heavier particles, as well as very small grain, which may be forced through the screen-cloth 45, will fall on the inclined bottoms 41 of the flues, from which it will pass back into the grain shafts. In this manner accumulation of these particles and choking of the flues will be avoided, and, if at any time the blast should prevent these particles from passing back into the grain shafts, the flues will discharge the accumulation whenever the blast has stopped and the grain shafts are emptied.

The invention thus exemplifies a flue structure for grain driers or coolers in which the division walls which divide the flue structure into a vertical series of flues are inclined to prevent accumulation of grain, and which are in effect self-cleaning. The invention also exemplifies an improved flue

structure which is made up of plates and short sections of screen-cloth which can be readily assembled. The invention also exemplifies an improved apparatus in which the flue structures may be readily built with vertical grain shafts of different widths. The invention also exemplifies an improved cooler which is provided with direct air passages for the moist air from the drier.

The invention is not to be understood as restricted to the details set forth, but may be varied within the scope of the appended claims without departing from the spirit of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising plates dividing the spaces between said shafts into a vertical series of transversely extending flues and having vertically extending walls formed to close one side of a flue and inclined bottom walls for directing material passing into the flue back into a grain shaft.

2. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts, comprising separate plates dividing the spaces between said shafts into a vertical series of transverse flues and each plate forming a vertically extending wall to form a closed side of a flue and an inclined bottom wall for directing material passing into the flue back into a grain shaft.

3. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts, comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall to form a closed side of a flue and an inclined bottom wall for directing material passing into the flue back into a grain shaft, the ends of the plates being overlapped and secured together.

4. In apparatus of the character described, the combination of a series of grain shafts, flue-structures between said shafts comprising plates dividing the spaces between the grain-shafts into a vertical series of transverse flues and having vertically extending walls to close one side of the flues and an inclined bottom wall for directing material passing into the flue back into a grain-shaft, and means for closing one end of each flue.

5. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising plates, dividing the spaces between the shafts into a vertical series of transverse flues and having vertically extending walls to close one side of a flue and inclined bot-

tom walls for directing material passing into the flue back into a grain shaft, the alternating inclined bottom walls of the flues being disposed to discharge the material into the grain shafts at the opposite sides of the flue structure respectively.

6. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising separate plates dividing the spaces between said shafts into a vertical series of transverse flues, each plate having a vertically extending wall to form a closed side of a flue and an inclined bottom wall for directing material passing into the flue back into a grain shaft, the alternating inclined bottom walls of the flues being disposed to discharge the material into the grain shafts at the opposite sides of the flue-structure respectively.

7. In apparatus of the character described, the combination of a series of grain shafts and flue-structures between said shafts comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall to form a closed side of a flue and an inclined bottom wall for directing material passing into the flue back into a grain shaft, the alternating inclined bottom walls of the flues being disposed to discharge the material into the grain shafts at the opposite sides of the flue structure respectively, the ends of the plates being overlapped and secured together.

8. In apparatus of the character described, the combination of a series of grain shafts, flue structures between said shafts comprising plates dividing the spaces between the grain-shafts into a vertical series of transverse flues and having vertically extending walls to form a closed side of a flue and an inclined bottom wall for directing material passing into the flue back into a grain shaft, the alternating inclined bottom walls of the flues being disposed to discharge the material into the grain shafts at the opposite sides of the flue structure respectively, and means for closing one end of each flue.

9. In apparatus of the character described, the combination of a series of grain shafts, and flue structures between said shafts comprising plates, dividing the spaces between the shafts into vertical series of transverse flues and having vertically extending walls closing one side of the flues and an inclined bottom wall for directing material passing into the flue back into a grain shaft, and foraminous material extending over the other sides of the flues.

10. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising plates dividing the spaces between the shafts into a vertical series of

transverse flues and having vertically extending walls closing one side of the flues and inclined walls for directing material passing into the flue back into a grain shaft, and sections of foraminous material extending over the open sides of the flues and over the vertical walls.

11. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall forming a closed side of a flue and an inclined bottom wall for directing the material passing into the flue back into a grain shaft, and sections of foraminous material extending over the open sides of the flues, the ends of the plates being overlapped, the foraminous material being secured between the overlapped ends of the plates.

12. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising separate plates dividing the spaces between the grain shafts into a vertical series of transverse flues, each plate having a vertically extending wall forming a closed side of a flue and an inclined bottom wall for directing material passing into the flue back into a grain shaft, and sections of foraminous material extending over the open sides of the flues, the ends of the plates being overlapped, the foraminous sections extending over the vertical walls and between the overlapping ends of the plates.

13. In apparatus of the character described, the combination of a series of grain shafts and flue structures between the shafts comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall forming a closed side of a flue and a bottom wall, the ends of the plates being overlapped and secured together.

14. In apparatus of the character described, the combination of a series of grain shafts and flue structures between the shafts comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall forming a closed side of a flue and a bottom wall, the ends of the plates being overlapped, and secured together, the closed sides being alternately disposed at the sides of the grain shaft respectively.

15. In apparatus of the character described, the combination of a series of grain shafts and flue structures between the shafts, comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having

a vertically extending wall forming a closed side of a flue, a bottom wall, the ends of the plates being overlapped and secured together, and sections of foraminous material at the open sides of the flues.

16. In apparatus of the character described, the combination of a series of grain shafts and flue structures between the shafts, comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall forming a closed side of a flue, a bottom wall, the ends of the plates being overlapped and secured together, and sections of foraminous material, each extending over the open side of one flue and having one end secured between the overlapping ends of adjacent plates.

17. In apparatus of the character described, the combination of a series of grain shafts and flue structures between the shafts, comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall forming a closed side of a flue, a bottom wall, the ends of the plates being overlapped and secured together, and sections of foraminous material, each extending over the open side of a flue and over the closed side of another flue and having one end secured between the overlapping ends of adjacent plates.

18. In apparatus of the character described, the combination of a series of grain shafts and flue structures between the shafts, comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall forming a closed side of a flue, a bottom wall, the ends of the plates being overlapped and secured together, and sections of foraminous material, each extending over the open side of a flue and over the closed side of another flue.

19. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising plates dividing the spaces between said shafts into a vertical series of transverse flues and having vertically extending walls closing one side of the flues and bottom walls, sections of foraminous material at the open sides of the flues, and cross strips at the open sides of the flues respectively and above said bottom walls, said foraminous sections terminating at said strips.

20. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising plates dividing the spaces between the grain shafts into a vertical series of transverse flues, each plate having vertically extending walls to form a closed side of a flue and a bottom wall for a flue,

foraminous sections at the open sides of the flues and cross strips at the open sides of the flues respectively and above said bottom walls, said foraminous sections extending
5 over a vertical wall of one flue and over the open side of another.

21. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said
10 shafts comprising plates dividing the spaces between the shafts into a vertical series of transverse flues and having vertically extending walls closing one side of the flues, and inclined bottom walls for directing ma-
15 terial passing into the flue back into a grain shaft, and strips extending across the open sides of the flues and above said bottom walls.

22. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said
20 shafts comprising separate plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall closing one side
25 of a flue and an inclined bottom wall for directing material passing into the flue back into a grain shaft, and strips extending across the open sides of the flues and above said bottom walls, and having inclined, de-
30 flecting portions in the grain shafts.

23. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said
35 shafts comprising plates dividing the spaces between the shafts into a vertical series of transverse flues, each plate having a vertically extending wall closing one side of a flue and bottom wall, cross-strips adjacent
40 the bottom walls at the open sides of the flues, and sections of foraminous material extending over the open sides of the flues, secured to said strips and extending over the vertical walls.

24. In apparatus of the character described, the combination of a series of grain shafts and flue structures between said shafts comprising plates dividing the spaces be-
50 tween the shafts into a vertical series of transverse flues, each plate having a vertically extending wall closing one side of a flue and a bottom wall, cross-strips at the open sides and adjacent the bottom walls, the plates having their ends overlapping,
55 and sections of foraminous material extending over the open sides of the flues, and over the vertical walls and being secured between the ends of overlapping plates and to said strips.

25. In apparatus of the character described, the combination of a series of flue structures each comprising walls for divid-
60 ing the structure into transversely extending flues, vertical angle bars at the corners of said structures and having flanges project-

ing from the sides of the structures and means overlapping said flanges to form closed ends for the spaces between the struc-
70 tures, and means for securing the structures together to form grain shafts between them.

26. In apparatus of the character de-
scribed, the combination of a series of flue structures each comprising walls for divid-
75 ing the structure into a vertical series of transverse flues, vertical angle bars at the corners of said structures having flanges projecting from the sides of the structures, bars overlapping the side-flanges of said angle bars to form closed ends for the spaces be-
80 tween the structures, and means for securing the structures together to form grain shafts between them.

27. In apparatus of the character described, the combination of a series of flue structures each comprising walls for divid-
85 ing the structure into transverse flues, angle bars at the corners of said structures having flanges projecting from the sides of the structures, vertical bars overlapping said flanges of said angle bars to form closed
90 ends for the spaces between the structures, and cross-bars at the ends of the structures, and means for securing the vertical bars to said cross bars to form grain shafts between the structures.

28. In apparatus of the character described, the combination of a drier, a cooler below the drier into which the grain is dis-
100 charged from the drier, means for forcing the air through the drier, flues extending through the cooler, means for conducting a portion of the air which has passed through the drier to said flues in the cooler and means for conducting air from said flues
105 to the forcing means.

29. In apparatus of the character described, the combination of a drier, a cooler below the drier into which the grain is dis-
110 charged from the drier, means for forcing air through the drier, flues extending directly through the cooler so the air will not pass through the grain in the cooler, and means for conducting a portion of the air which has passed through the drier to said
115 flues, and means for conducting air from said flues to the forcing means.

30. In apparatus of the character described, the combination of a drier, a cooler below the drier into which the grain is dis-
120 charged from the drier, the drier and cooler comprising grain shafts and transverse flues, means for forcing the air through the drier, flues extending directly through the cooler through which air will pass without passing
125 through the grain therein, means for conducting air which has passed through the drier to said direct flues, and means for conducting air from said flues to the forcing means.

31. In apparatus of the character de- 130

scribed, the combination of a drier, a cooler
below the drier into which the grain is dis-
charged from the drier, means for forcing
the air through the drier, flues extending di-
rectly through the cooler, means for con-
ducting a portion of the air which has
passed through the drier to said direct
flues, means for conducting air from said
flues to the forcing means, and valves for
regulating the flow of air through said flues.

32. In apparatus of the character de-
scribed, the combination of a drier, a cooler
below the drier into which the grain is dis-

charged from the drier, means for forcing
the air through the drier, flues extending di-
rectly through the cooler, means for con-
ducting a portion of the air which has
passed through the drier to said direct flues,
means for conducting air from said flues to
the forcing means, and valves at one end of
the cooler for regulating the flow of air
through said flues.

HUBERT C. ELLIS.

Witnesses:

MILDRED STUMPF,
KATHARINE GERLACH.