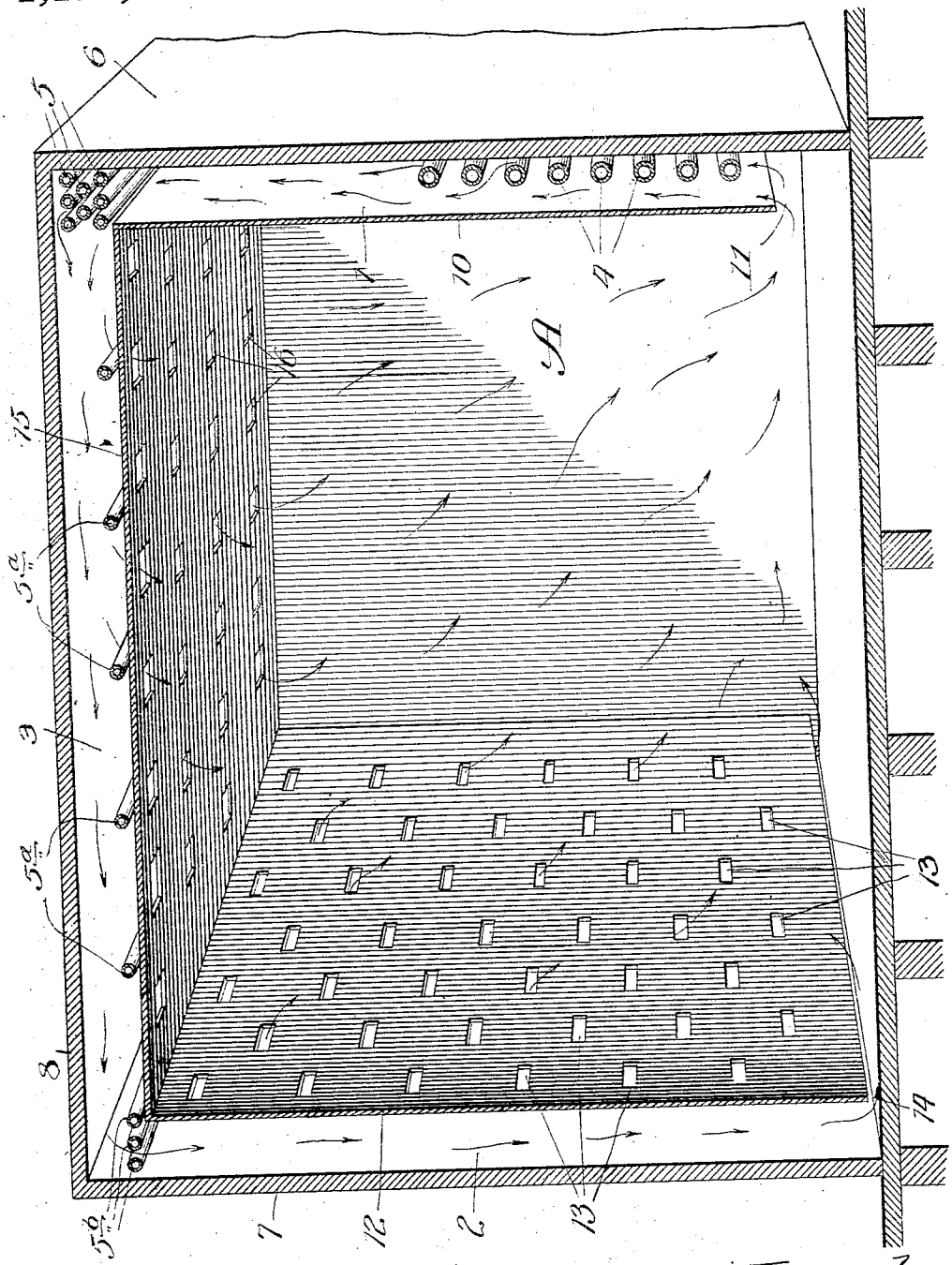
C. HULTGREN.

KILN.

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KILN.

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To all whom it may concern:

Be it known that I, CHARLES HULTGREN, a citizen of the United States, residing at Twenty-second and Union streets, Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Kilns, of which the following is a specification.

This invention relates particularly to kilns adapted to the purpose of drying coatings of oil, varnish, paints, etc.; and the primary object of the invention is to provide an improved kiln, which can be cheaply constructed and economically operated, with improved results to the articles being treated.

The invention is illustrated in its preferred embodiment in the accompanying drawing, which represents a broken perspective view, diagrammatic in its nature, of the improved kiln, with the front wall removed.

In the form shown, the kiln comprises a drying chamber A flanked by an up-draft heating flue 1, and by a down-draft return flue 2, which are in communication at their upper ends through a cross-draft return flue 3, which surmounts the chamber A; heating-coils 4 disposed in the flue 1; and a group of cooling coils 5 located at the junction of the flues 1 and 3. In addition, I have shown a few widely spaced cooling-coils 5^a disposed in the flue 3 and distributed from side to side of the drying chamber and above the same, and a group of cooling-coils 5^b at the upper end of the flue 2. Any one, or more, of the groups of cooling coils may be dispensed with, if desired.

The kiln-walls 6, 7, 8 and 9 may be of any suitable material. Wood serves the purpose admirably. The flue 1 has for its walls the side-wall 6 and a parallel inner wall or partition 10, which preferably is imperforate but cut away at its lower edge to afford a space, or passage, 11, adjacent the floor 9, through which the air may enter the flue 1. The flue 2 has for its walls the side-wall 7 and an inner parallel wall 12 which is perforate or provided with openings 13, and which is preferably cut away slightly at its lower edge to afford a relatively small passage 14 adjacent the floor. The top passage 3 is between the ceiling 8 and an inner ceiling 15, which is foraminous or provided with perforations 16.

The kiln which may be practically air-tight, is, in practice, provided with suitable doors (not shown); and suitable controlling valves (not shown) for the pipes or coils are located exterior to the kiln.

Water may be circulated through the cooling-coils, and exhaust steam may be circulated through the heating-coils 4. The cooling-coils may incline somewhat, if desired so that in the event of any condensation on their surfaces, the water will be conducted away. The air, warmed by the coils 4, passes up through the flue 1, and flows through the top-flue 3, being cooled as it passes the coils 5. Part of the cooled air settles down through the foraminous inner ceiling 15 of the kiln, and part flows through the down-draft flue 2 and through the foraminous inner side-wall 12—all passing back through the chamber A to the bottom of the up-draft flue 1. The articles to be dried are placed in the chamber A, and intimate contact with the air-currents is assured by reason of the fact that currents pass through every portion of the chamber A. Not only so, but the air which is thus brought into contact with the surfaces to be dried is at a moderate temperature, so that the drying action will be moderate and uniform. This is a matter of special importance in the drying of varnished or painted surfaces, where it is highly desirable that any tendency to blister or check the coating shall be obviated. While this purpose is accomplished by the present invention, it is evident that nevertheless a comparatively rapid circulation of the air may be maintained, so that much quicker drying can be effected, in a perfectly safe manner, than has hitherto been possible with the use of known kilns. Moreover, the desired result is attained in a very economical manner and without the use of mechanical air-circulating mechanism.

Where the improved kiln is used only for drying certain kinds of paints, varnishes, etc., there will be found no visible condensation on the cooling pipes, but the cooling pipes nevertheless serve their function in the operation of the kiln. Such oils or materials as are volatilized or oxidized are probably eventually deposited on the kiln-walls or escape with the air during periods of recharging of the kiln, so that they do not interfere with the operation of the kiln.

It is evident from the description of the

operation that the cooling-coils and the co-operating cross-draft and down-draft flues having foraminous inner walls constitute means for tempering (cooling) the air and distributing the return currents throughout the entire space of the drying-chamber, the cooling-coils also coacting with the heating means in effecting circulation of the air.

The foregoing detailed description has been given for clearness of understanding only, and no undue limitation should be understood therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art. While it is most advantageous to locate the flues 1 and 2 at the lateral (longitudinal) sides of the kiln, the principle of the invention may be employed in any suitable arrangement.

What I regard as new, and desire to secure by Letters Patent, is—

1. A kiln of the character described, comprising a drying-chamber flanked by an up-draft flue having an inlet-passage from the bottom of the drying-chamber and flanked also by a return down-draft flue having a foraminous wall, a return top-flue joining the up-draft flue and down-draft flue, means whereby the air in the up-draft flue is heated so that an upward flow is produced in the flue, and a cooling device in the path of the heated air flowing toward the drying chamber, for the purpose set forth.

2. A kiln of the character set forth, comprising a drying-chamber having an up-draft flue at one side, a down-draft flue at another side and a cross-draft flue at the top, the inner walls of said down-draft flue and cross-draft flue having openings therein to admit the air to the drying-chamber and the up-draft flue having communication at its bottom with the drying-chamber, and heating means in the up-draft flue.

3. A kiln of the character set forth, comprising a drying-chamber having an up-draft flue at one side, a down-draft flue at another side and a cross-draft flue at the top, the inner walls of said down-draft flue and cross-draft flue having openings therein to admit the air to the drying-chamber and the up-draft flue having communication at its bottom with the drying-chamber, heating means in the up-draft flue, and cooling means in one of the return flues.

4. A kiln of the character set forth, comprising a drying-chamber having an up-draft flue at one side, a down-draft flue at another side and a cross-draft flue at the top, the inner walls of said down-draft flue and cross-draft flue having openings therein to admit the air to the drying-chamber and the up-draft flue having communication at its bottom with the drying-chamber, heating means in the up-draft flue and cooling means in the space at the junction of the up-draft and cross-draft flues.

5. A kiln comprising a drying-chamber, an up-draft flue at one side of the drying chamber and a cross-draft flue surmounting said chamber, said last-named flue having openings in its inner wall and said first-named flue having an inlet near its bottom, heating means whereby the air in the up-draft flue is heated so that an upward flow is produced in the flue, and a cooling device in the path of the heated air flowing toward said drying chamber, for the purpose set forth.

6. A kiln of the class described comprising a drying-chamber, a flue at one side of said drying-chamber and communicating therewith at the top, means for heating the air in said flue, and means for cooling the air at the top of said drying-chamber and adapted to cause a downward flow of air through said drying-chamber.

7. A kiln of the class described, comprising a drying-chamber, an up-draft flue at one side of said drying-chamber and communicating therewith at the top and bottom, means for heating the air in said flue, and cooling coils adjacent to the top of said drying-chamber for cooling the air and causing it to flow downward therethrough.

8. A kiln of the class described, comprising a drying-chamber, an up-draft flue at one side of said drying-chamber and communicating therewith, means for heating the air in said flue, and cooling means in the path of the heated air and between said heating means and drying-chamber, all being arranged to cause a downward flow of air through said drying-chamber.

9. A kiln of the class described, comprising a drying-chamber, an up-draft flue at one side of said drying-chamber, heating means in said up-draft flue, a cross-draft flue above said drying-chamber having a foraminous inner wall adapted to provide inlet openings distributed across the top of said drying-chamber, and cooling means located in the path of the air between said heating means and drying-chamber.

10. A kiln for the purpose specified and of the class described, comprising a drying-chamber, an up-draft flue adjacent thereto communicating at its upper and lower portions with the corresponding portions of the drying-chamber, means for heating the air which passes through the up-draft flue, and means for cooling the air after it passes the heating means and effecting distribution of the air currents through the drying-chamber in their return course therethrough to the lower portion of the up-draft flue.

11. A kiln of the class described, comprising a drying-chamber, an up-draft flue at one side of the drying-chamber, a cross-draft return flue above said drying-chamber, a down-draft return flue on the side of said drying-chamber opposite said up-

draft flue, heating means for said up-draft flue, said up-draft flue and said down-draft flue each communicating with said drying-chamber at the bottom thereof, the inner wall of one of said return flues having perforations therein to distribute the return air currents through the drying-chamber.

12. A kiln of the character set forth, comprising a drying-chamber, an up-draft flue at one side thereof, a down-draft flue at another side thereof and communicating near its lower portion with the drying-chamber, a cross-draft flue at the top of the drying-chamber having its inner wall provided with openings providing communication with the drying-chamber, and heating means in the up-draft flue.

13. In a kiln of the class described, the combination with an inclosure, means whereby the same is divided to afford a main drying chamber adapted to receive the article to be dried, a space thereabove and an auxiliary chamber communicating with the upper portion of said main chamber through said space, of means adapted to heat the air in said auxiliary chamber, whereby an ascending current of air is created therein, and other means above said main chamber adapted to cool such current of air and thereby cause it to descend into said main chamber independent of any agency in the latter.

14. In a kiln of the class described, the combination with an inclosure divided by an upright partition to afford upon one side of such partition a main drying space and upon the other side an auxiliary chamber, the two being in communication at the top and bottom of the partition, of means adapted to heat the air in said auxiliary chamber, whereby an ascending current of air is created therein: and other means above said drying space adapted to cool said current of air and thereby cause it to descend into said drying space independent of any agency in the latter.

15. A kiln comprising a drying-chamber, an up-draft flue at one side of the drying-chamber and communicating therewith at its upper end, means whereby the air in the up-draft flue is heated so that an upward flow is produced in the flue, means for distributing the heated air throughout the drying chamber, and a cooling device in the path of the heated air flowing toward said drying chamber.

16. A kiln of the class described, comprising a drying-chamber, an up-draft flue at one side of said drying-chamber and communicating at its top and bottom with said drying-chamber, means for heating the air in said flue, and cooling means in the path of circulation and between said heating means and drying-chamber, all being arranged to cause a downward flow of air through said drying-chamber.

17. A kiln comprising a drying-chamber; an up-draft flue at one side of the drying-chamber, the lower end of the flue opening into the chamber; a cross-draft flue surmounting said chamber and communicating with the flue first named; means whereby the air in the up-draft flue is heated so that an upward flow is produced in the flue, the inner wall of the cross-draft flue being provided with openings of such size and so spaced that the flow from said flue is distributed throughout the entire upper portion of the chamber; and a cooling device in the path of the heated air near the upper wall of the chamber.

CHARLES HULTGREN.

In the presence of—
J. G. ANDERSON,
R. A. SCHAEFER.