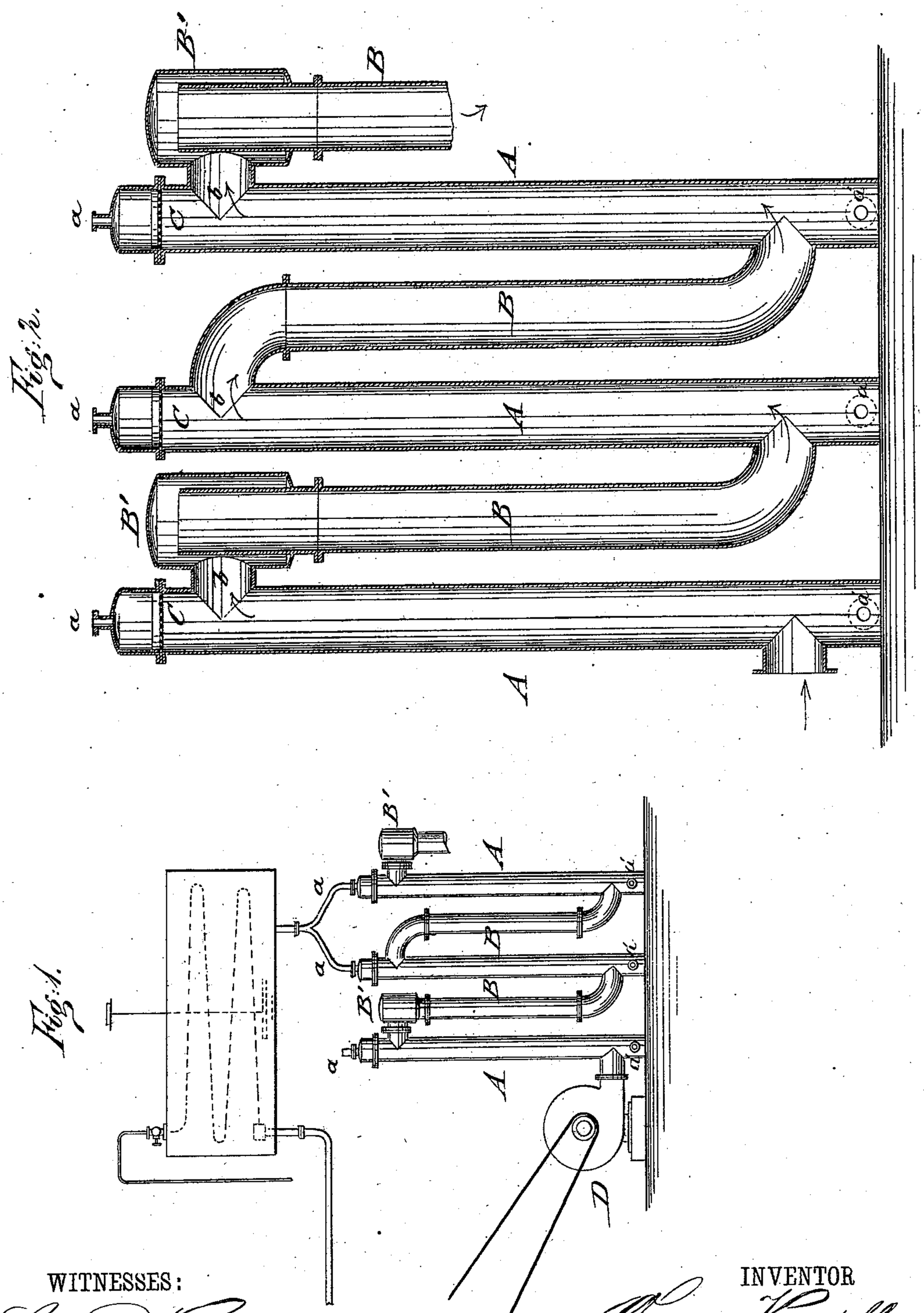
O. KROPFF.

Air-Cooling Apparatus.

No. 227,796. **Patented May 18, 1880.**



WITNESSES:

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AIR-COOLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 227,796, dated May 18, 1880.

Application filed January 30, 1880. Patented in Germany February 5, 1879, and in Austria December 31, 1879.

To all whom it may concern:

Be it known that I, OSCAR KROPFF, of Nordhausen, A. H., in the Empire of Germany, have invented certain new and useful Improvements in Air-Cooling Apparatus, of which the following is a specification.

In the accompanying drawings, Figure 1 represents a side elevation of my improved air-cooling apparatus, shown in connection with an air-forcing apparatus and with the refrigerator of an ice-machine, and Fig. 2 is a vertical longitudinal section of the same on a larger scale.

Similar letters of reference indicate corresponding parts.

The object of this invention is to furnish an improved apparatus for cooling large quantities of air to a temperature of + 1° or + 2° centigrade, and conducting it to the spaces to be cooled, such as cellars, storage-rooms, refrigerating-buildings, &c.

The invention consists of two or more upright cylinders, which are connected by tubes extending from the upper part of the first cylinder to the lower part of the next cylinder. Atmospheric air is forced through the cylinders by an air-forcing apparatus, and cooled by being exposed to finely-divided jets of water of different temperatures, the jets being produced by perforated sieve-like plates at the upper part of the cylinders. The connecting-tubes are inclosed at their upper part by enlarged casings, which form, with the tubes, traps for collecting the water mechanically carried along by the air.

Referring to the drawings, A A are two or more upright cylinders, of suitable dimensions and material, according to the size of the spaces to be cooled. These cylinders are placed either one above the other or (preferably) sidewise of each other, as shown in the drawings. They are connected with each other by communicating tubes B, of the same diameter, which extend from the upper part of one cylinder to the lower part of the cylinder next above or adjoining thereto, according to the relative positions of the cylinders toward each other.

The cylinders are closed at the top and bottom ends, each being connected at the top by a pipe, *a*, with a water-reservoir—the first cylinder with a reservoir containing well or aqueduct water, the second and third with a reservoir containing ice-water, or with the refrigerator of an ice-machine, as shown in Fig. 1.

Each cylinder A is provided, between the water-supply pipe and the opening of the connecting-tube B, with a perforated plate, C, by which the water supplied through the pipes *a a* is divided into a number of small jets.

The lower part of the first cylinder is connected with a fan, blower, or other air-forcing apparatus, D, by which atmospheric air is forced into the first cylinder and then upward through the minute jets of well-water. The air is thereby cooled off to nearly the temperature of the well-water, passing through an opening, *b*, at the upper end of the cylinder into the connecting-tube B, which carries it to the lower part of the next cylinder. In this cylinder the air forces up its way through minutely-divided jets of ice-water, and is cooled thereby to nearly the temperature of the same. It is then conducted to the third cylinder and passed again through jets of ice-water, and so on, being finally discharged at nearly the temperature of the ice-water, and conducted to the cellars or spaces to be cooled.

The upper part of the connecting-tubes B is extended above the openings *b* of the cylinders A and inclosed by a casing, B′, of somewhat larger diameter than the tube B, said casing forming, with the tube, a kind of trap with trough-like receptacle below the opening *b*, for the purpose of collecting any water carried mechanically along by the air. When the trough is full the water is discharged back into the main cylinder A, and conducted with the cooling-water through water-exit pipes *a′* at the bottom thereof.

The air discharged by the cooling apparatus has a temperature of from 1° to 2° centigrade, and is perfectly dry, as the water does not evaporate at such a low temperature and under common atmospheric pressure. On the contrary, if the air be moist all moisture is removed in its passage through the cooling-cylinders. The water-jets also clean the air of all dust and other impurities, so that a perfectly pure and dry air of low temperature is

obtained, which is forced in a continuous current into the cellars or other places to be cooled.

If it be desired to obtain air of a temperature below 0° centigrade, a cold solution of salt is used in place of the ice-water.

By using only one or two cylinders and water of higher temperature, air of correspondingly higher temperature can be obtained. As the air is first cooled by well-water, the consumption of ice is considerably less than if the air were cooled directly by ice-water.

In this manner a simple and comparatively cheap apparatus and method of cooling air in large quantities for breweries, slaughter-houses, and other buildings is obtained.

I am aware that to cool air by bringing it in contact with refrigerated water in the form of a spray is well known. It is also well known to cool air by passing it through a series of ice-receptacles; but in one case, as well as in the other, the refrigerating agent is of the same temperature, while by my method the cooling of the air takes place successively—first by well-water to a medium temperature, then by ice-water to a lower temperature. The result is a saving of ice to the extent of the lowering of the temperature of the air produced by the well-water.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An air-cooling apparatus consisting of two or more cooling-cylinders with water and air inlets and outlets, and with perforated plates in their upper parts, and of a tube or tubes connecting the upper part of one cylinder with the lower part of the next adjoining cylinder, substantially as set forth.

2. The combination of two or more cooling-cylinders having water supply and discharge pipes, and perforated plate below the supply-pipe, with a tube or tubes connecting the upper part of one cylinder with the lower part of the next adjoining cylinder, and with an air-supply tube of the first and an air-discharge tube of the last cylinder, substantially as set forth.

3. In an air-cooling apparatus, the combination, with a cooling-cylinder, A, and tube B, of a water-trap, B′, at the upper end of the connecting-tube, substantially as and for the purpose specified.

4. In an air-cooling apparatus, the combination of a cooling-cylinder A, with an air-conconducting tube, B, and with a casing, B′, inclosing the upper extended end of the tube, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 17th day of October, 1879.

OSCAR KROPFF.

Witnesses:
MORITZ WEEHSUNG,
FRIEDRICH AJSEB.