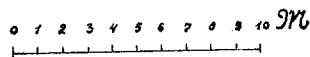
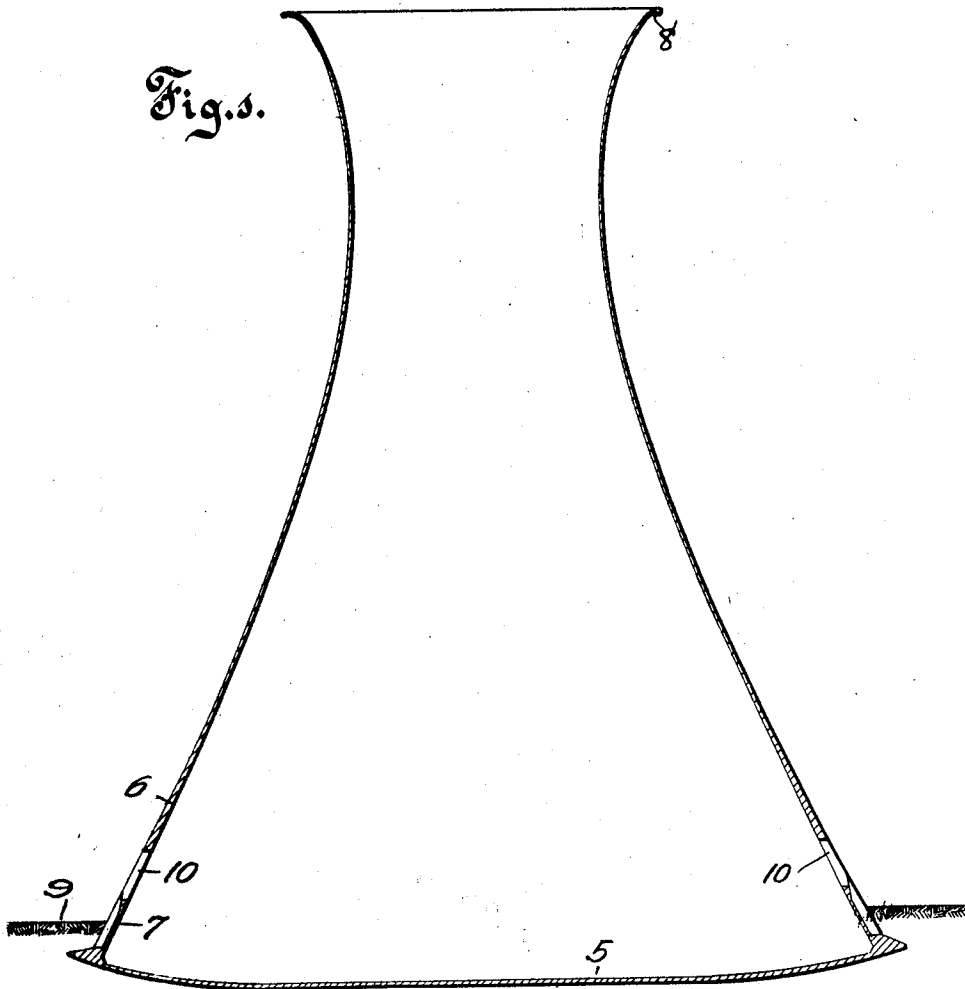


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COOLING TOWER OF REINFORCED CONCRETE.
APPLICATION FILED AUG. 16, 1917.

1,343,832.

Patented June 15, 1920.
2 SHEETS—SHEET 1.



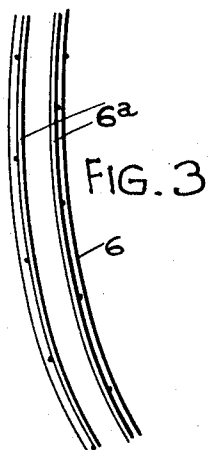
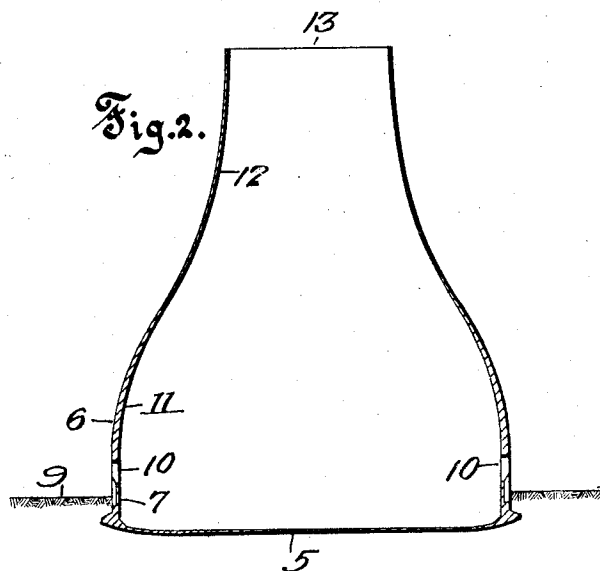
Witnesses
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UNITED STATES PATENT OFFICE.

GERARD KUYPERS, OF ROTTERDAM, NETHERLANDS, ASSIGNOR OF ONE-HALF TO
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COOLING-TOWER OF REINFORCED CONCRETE.

1,343,832.

Specification of Letters Patent. Patented June 15, 1920.

Application filed August 16, 1917. Serial No. 186,621.

To all whom it may concern:

Be it known that I, GERARD KUYPERS, a subject of the Queen of the Netherlands, residing at Rotterdam, Netherlands, have invented certain new and useful Improvements in Cooling-Towers of Reinforced Concrete, of which the following is a specification.

This invention relates to cooling towers having maximum dimensions and formed of reinforced concrete without any interior supports, beams, couplings, reinforcements or sustaining means engaging the inner continuous wall thereof, and whereby the particular form and weight resist destructive pressure of the wind against the outer side of the wall thereof.

The existing cooling towers constructed of wood or steel are not able to resist moisture.

The existing cooling towers of concrete and iron are able to resist moisture, but are very expensive for example because the deadweight and the pressure of wind in case of storm make very costly preventive measures necessary.

The invention makes these measures unnecessary; the wall itself is made able to resist the said forces.

By omitting any structural reinforcements or supporting means within the interior of the wall of the tower, it is necessary, in accordance with the invention, to construct the wall itself in such manner that there will be no internal projections or obstructions, and also to so shape the wall and regularly modify the thickness of the wall as to eliminate, or remove any danger of collapse or fracture at any point which might otherwise result from unequal expansions of the construction caused by hardening, temperature and moisture. In other words, the wall of the improved cooling tower is so constructed as to be sufficiently strong and durable to withstand the ordinary or usual physical agents which are liable to endanger such structures. The invention consists, therefore, in a cooling tower devised without any sustaining means or resisting structure in connection therewith, except that which may be included in the wall itself, as for instance the ordinary reinforcing devices embodied in all concrete structures, and to so form the wall that it will decrease in thickness from the bottom upwardly toward the top of the

tower, the tower also structurally decreasing in cross-sectional area and formed with curved surfaces which avoid any resisting projections which might produce interior vulnerable points in the wall. The tower is provided at its lower portion with a plurality of openings surrounding the same, and the base thereof is depressed below the surface of the ground and is practically integral in its construction with the surrounding side wall which rises above the top of the ground surface.

The invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical section through a cooling tower embodying the features of the invention, and

Fig. 2 is a similar view showing a slight modification in the form of the tower.

Fig. 3 is a detail sectional view of a portion of the wall of the tower showing the reinforcing therein.

Referring to Fig. 1, the numeral 5 designates the base which is depressed below the ground surface to any suitable distance and is intersected adjacent to its perimeter by a side wall 6 having its thickest portion 7 extending from the base or close to the tower and gradually decreasing in thickness upwardly to an intermediate point where the said wall continues in a thinner formation toward an upwardly and outwardly flaring rim 8, as shown. Fig. 3 illustrates a reinforcing means as 6^a within the wall structure to give the latter strength in a manner as will be readily understood. At a suitable distance above the base 5 and the ground surface 9 the wall 6 is formed with a plurality of openings or inlets 10 and permit the circulation of air into and upwardly through the tower, acting against the inner side of the wall as a sustaining means, and serving as a strong reinforce against the pressure of the air against the outer side of the wall. The circulation of the air within the tower and upwardly through the latter will effect the cooling function desired. It will be noted that the inner surface of the wall 6 is entirely devoid of any projections or cross braces or interior bracing means, and as a consequence the air will have unrestricted movement upwardly within the tower, and to facilitate this air circulation or movement, the inner surface of the tower is regularly curved and the tower contracts gradually or is substantially frusto-conical in its

contour, the lines changing toward the upper end to produce an outer concave surface and therefrom the wall extends downwardly toward the base in a practically straight or true conical surface contour. In the form of the tower shown by Fig. 2, the base is similar to that shown by Fig. 1, but the side wall 6 in this instance extends upwardly from the base near the perimeter of the latter, first in a short straight length and then is formed convex, as at 11, the wall gradually merging into a concave portion 12 and at the same time narrowing, the wall terminating at its upper end in a fully open outlet 13 without the rim 8, as shown by Fig. 1. The lower inlet openings 10 are the same in the structure shown by Fig. 2 as in Fig. 1 and the illustration of the device as formed in Fig. 2 is for the purpose of demonstrating the possibility of modifying the shape but at the same time preserving the general contour of the side wall from the base toward the upper end of the tower and also the embodiment of regularly curved surfaces and the gradual decrease of the thickness of the wall from the base upwardly a certain distance so as to give ample rigidity and strength to the side wall of the tower of such character as to resist weight pressure and at the same time render devices of this class strong and durable without resorting to the use of internally disposed reinforcing means such as beams, coupling bars, or other analogous devices.

What I claim is:

1. A low cooling tower having a base and side wall, the side wall decreasing in thickness from the base uppermost toward the upper open end of the tower and also converging toward said upper open end, the side wall at a short distance above the base being provided with a plurality of inlet openings therearound and which are the sole inlets to the interior of the tower from the bottom to the upper open end, the interior of the tower being also fully open and free of all obstructions from the bottom to the top thereof.

2. A low cooling tower having a wall constructed of reinforced concrete material and provided with a side wall which gradually decreases in thickness and as a whole converges from the base of the tower toward an upper fully open outlet at the top of the tower, the interior portion of the tower being free of supporting and reinforcing devices and the inner surface of the side wall being free of projections and angles and smooth, the side wall also having inlet openings therearound at a short distance above the base of the tower.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GERARD KUYPERS.

Witnesses:

WILLEMINA DE JAGER,
JOHAN FLIOHAN.