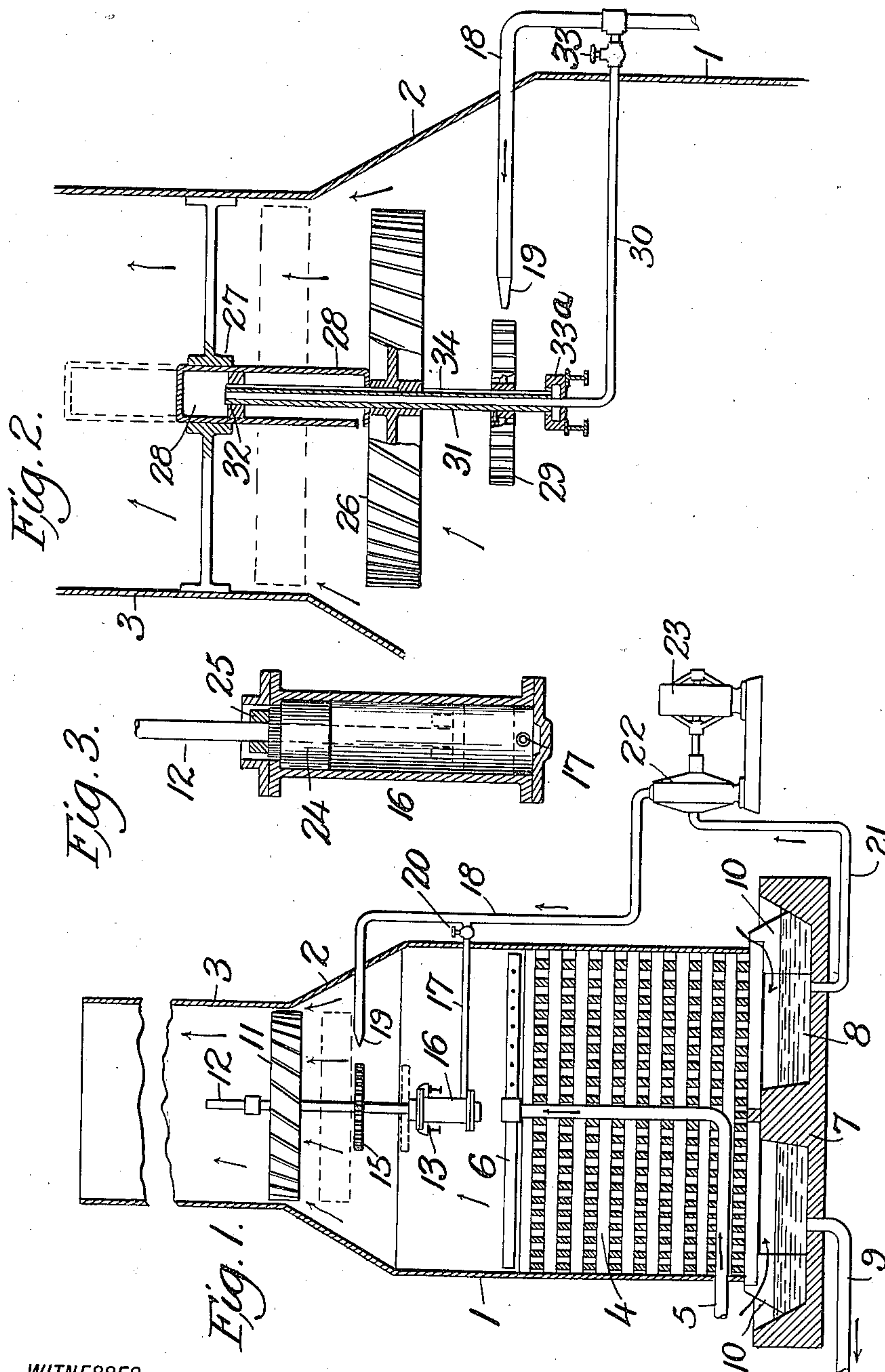


L. R. ALBERGER.
COOLING TOWER.
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Patented Nov. 22, 1910.



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COOLING-TOWER.

976,246.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LOUIS R. ALBERGER, a citizen of the United States of America, residing at Greenwich, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Cooling-Towers, of which the following is a specification, reference being had therein to the accompanying drawing.

10 My present invention relates to an improvement in cooling towers, the function of which is to cool water or watery liquid, or some other similar liquid, by distributing it in such a manner that a large surface will be
15 exposed and acted upon by a current or currents of air. The invention relates more particularly to that special type of cooling towers in which the liquid is spread out or sprinkled over surfaces formed by boards
20 geometrically arranged in a regular manner in the tower or over other surfaces provided by the use of wire-cloth, earthenware, or other materials, and in which the air is drawn through the filling and then discharged to
25 the atmosphere by means of a fan or mechanical ventilator; and the invention further relates to that kind of a cooling tower in which the action of the fan may be discontinued when desired and the flow of air
30 obtained by a natural draft through the action of a stack or chimney, in order that the best results may be obtained with the simplest construction, and so that the same tower
35 may at one time be operated with a mechanical circulation of the air, and at another time by a natural draft, and at another by a combination of the two circulations.

40 In my co-pending application for Letters Patent for cooling towers, filed Oct. 1, 1909, Serial No. 520,579, I have described examples of this type of cooling tower, and in the present invention I am extending and applying the same principle in a different form of mechanism with certain added features of
45 construction and operation.

50 Among many objects which might be mentioned, a leading object of the present invention is to enable the conversion of the tower from a natural draft to an artificial draft tower to take place at practically the same time with the application of the water pressure for driving the fan, and preferably through the same means.

55 The invention, therefore, consists essentially in fluid pressure means for placing the

fan in its operative position in the tower, that is to say, for transferring it from its non-obstructive or idle position to its active position, and also in means for applying pressure to a fan-actuating motor at substantially the same time as the transposition of the fan from its idle to its active position; and it also includes and combines various details and peculiarities in the construction, arrangement and combination of parts substantially as will be hereinafter described and claimed.

In the accompanying drawings, illustrating my invention, Figure 1 is a vertical sectional side elevation of my improved cooling tower having an elevated stack and showing the fan situated in its active position in said stack and representing also the hydraulic arrangement for lifting the fan from its idle position below the stack to its active position therein. Fig. 2 is a similar detail partial view in partial section of an alternative arrangement of means for lifting by hydraulic pressure the fan from its inactive and non-obstructive position below the stack to its live position in the stack. Fig. 3 is an enlarged sectional detail of the hydraulic cylinder shown in Fig. 1, the pressure within which lifts the fan and its shaft.

Similar characters of reference designate corresponding parts throughout the different figures of the drawing.

1 designates the main shell of a cooling tower. It is cylindrical in form and may be of any suitable material. Above the main shell 1 is a conical section 2 which reaches from the diameter of the main shell 1 to the smaller diameter of a superposed stack or draft chimney 3 which may be elevated to any desired height and is employed for producing a natural draft. I present this form of shell and stack, however, only as specimens, and with no idea of being restricted thereto, for obviously the invention is applicable to other forms, including the form in which the entire tower may have the same diameter throughout. Inside of the main shell 1 is a filling 4 occupying the interior of the shell from the bottom up to a suitable point below the conical section 2, and consisting of any desired material such as is customarily employed for this purpose.

5 denotes a pipe which conveys to the tower the heated water which is to be cooled. It enters the lower portion of the tower and

then passes up centrally therein, having at its upper end a distributor 6 consisting of several horizontal perforated arms through which the water has exit and can spread in a sheet or spray over the top of the filling, downwardly through which it passes. At the base of the shell 1 is a foundation 7 having piers on which the shell rests. In this foundation is a well or receptacle 8 that receives the water falling downwardly from above through the filling, said receptacle 8 having a removal pipe 9 through which the water is carried off. In the foundation 7 and around the bottom periphery of the shell 1 are openings or interstices 10 between the piers through which the atmospheric air passes into the bottom of the shell 1 and thence upwardly to the tower. There may be any desired number of the openings 10 devised and applied in any preferred way, provided only the object is gained of admitting air at the base of the tower. From the well 8 leads a pipe 21 which extends to a centrifugal pump 22 operated by a suitable motor 23. Said centrifugal pump, which may be of any desired type or variety, may take its water supply from some other point if desired, but it is found convenient to connect it with the well 8 by the pipe 21. Furthermore, a pipe 18 runs from the centrifugal or turbine pump 22 to a water motor 15 against which water is discharged in a jet from the nozzle 19 at the end of the pipe 18, thus enabling the motor 15 to be actuated. Said motor 15 may be a Pelton water wheel or any other suitable water motor.

11 denotes an example of fan which is mounted on a vertical shaft 12. In the example of the invention, illustrated in Fig. 1, this shaft 12 also carries the Pelton water wheel 15 or other suitable motor. Motor 15 actuates the shaft 12 and thus drives the fan 11. 16 denotes a hydraulic cylinder of any suitable kind which is supported by the framework at 13. Within cylinder 16 is a piston 24 which carries a step-bearing 25 that receives the lower end of the shaft 12, thus permitting shaft 12 to rotate in the step-bearing and upon the piston 24. The movement of the piston up and down obviously carries with it the shaft 12 and the water motor 15 and fan 11, which in the present example are described as securely fastened to said shaft. Fan 11 and motor 15 are shown in Fig. 1 in full lines in their active operative position, and in dotted lines in the position that they occupy when they are idle and inactive. When the fan 11 is in its active position it fills the stack 3, as shown, and when rotated creates an artificial draft. In its inactive position, this fan is sufficiently below the stack 3 to be out of the way so that it will not obstruct the passage of the air flowing through the tower as the result of a natural draft. When the motor

15 is elevated to its active position, it comes directly opposite to the nozzle 19 where the jet of water issuing therefrom can impinge upon the blades of the motor and thus actuate the latter. The introduction of water pressure into the cylinder 16 below the piston 24 results in lifting the shaft 12 and thus raising the fan into the stack 3 and lifting the motor 15 to a point where the water jet will drive the same. This introduction of pressure into the cylinder 16 may be accomplished in a variety of ways, and one means for so doing consists of a pipe 17 entering the cylinder 16 near the lower end thereof and connecting with some suitable source of water supply, as, for instance, the water pipe 18 which runs from the centrifugal pump 22. Cylinder pipe 17 is preferably provided with a valve 20 outside the tower for controlling the water passing through it. By opening the valve 20 and allowing the water pressure to enter the cylinder 16, the piston 24 and shaft 12 will be raised, the fan placed in active position in the stack, and the motor lifted to the point where it will receive its actuating pressure. The operation of the centrifugal pump 22 thus in this arrangement of parts supplies water through the pipe 18 to drive the motor 15, and also supplies the pressure which is taken through the pipe 17 to the hydraulic cylinder to lift the motor and fan to their active position.

It is not necessary, of course, for the motor 15 to be always changed from one position to another, for obviously an arrangement may be made wherein said motor will remain at all times in the same horizontal plane, and, of course, will only become active when the water jet impinges thereon, while the fan will be movable relatively to the motor. In Fig. 2, I have shown an alternative arrangement of my invention wherein such is the case, the motor, as 29, not being lifted up and down with the fan; and the fan shaft, as 31, not being vertically movable; while the fan 26 is susceptible of being changed from an inactive and unobstructive position to an active position in the stack. In Fig. 2 the same form of stack is indicated as is shown in Fig. 1, having the shell 1, the conical part 2, and the superposed natural draft stack 3. The fan 26 is provided with a cylinder 28 securely fastened thereto in some suitable way, which cylinder has a vertical play in a bearing 27 supported in the stack 3.

31 denotes a rotary shaft which is hollow and has a pipe 30 running entirely through its length. The upper end of the shaft 31 has a ring or disk 32 thereon which fits into the interior of the fan-carrying cylinder 28. Thus the shaft 31 passes through the lower end of the cylinder 28, and said cylinder is movable up and down on the shaft and on

the disk 32. Likewise on the shaft 31 is the Pelton water wheel or other motor 29 which is similar to the motor 15 of Fig. 1. Motor 29 is fixed on shaft 31 so as to revolve therewith, and is provided with means for securing it at any desired position in the vertical length of shaft 32, not being adjustable up and down on the shaft except by changing the securing means, so that the motor remains in position to be driven by the water jet issuing from the nozzle 19 on the end of the supply pipe 18 whenever the pump is in operation and pressure is supplied. The fan 26, however, is splined or feathered to the shaft 31, as shown at 34, in order that it may readily move up and down thereon, and at the same time will be so secured thereto as to revolve therewith when the shaft is driven. Shaft 31 has its lower end supported in the step bearing 33^a carried by a part of the framework. The upper end of the pipe 30 which passes through the center of the shaft 31 opens into the interior of the cylinder 28. It will be apparent, therefore, that when the pressure from the pump is passed through the pipe 30 and delivered into the interior of the cylinder 28, the result will be to lift said cylinder up into the position shown in dotted lines in Fig. 2, the cylinder carrying with it the fan 26, so that the latter will be transferred from its idle position to an active position in the stack. In this case, as in the piping in Fig. 1, the pipe 30 which carries water to the cylinder 28 connects with the main water supply pipe 18, and is preferably furnished with a controlling valve 33 outside of the tower. Any suitable centrifugal, turbine, or other pump may be utilized for pumping the water through the pipe 18 in the form of the invention shown in Fig. 2 in like manner as is done in Fig. 1.

Although I have represented two ways in which hydraulic pressure may be conveyed to the operating mechanism for the purpose of transferring the fan from an inactive to an active location, yet it will be manifest that the invention is susceptible of many other modifications. A hydraulic cylinder is only one example of means that can be employed for utilizing the proper actuating pressure whereby the fan can be placed in active position at the same time that the motor is started. Obviously from the foregoing explanation when the pressure is in the hydraulic cylinder 28, not only will the fan be placed in active position, but it will be driven as well at substantially the same time, and when the fan is thus operated a strong draft of air will be drawn through the filling and through the cooling tower. When the pressure is off from either cylinder, the fan will drop from one position to the other and obviously will cease to operate the moment the pressure is withdrawn

from the motor. When the fan drops down into its inactive position, the natural draft will be allowed to pass through the tower.

Many variations in the construction and arrangement of the hydraulic cylinder, as also of the other parts, may be made without departing from the invention so long as the idea is preserved of employing a pump or fluid-pressure means for transferring the fan from its nonobstructive or idle position to its active and operative position, as this forms the essential idea of the invention. Sometimes the fan is driven by the water motor, but it is conceivable that it may be actuated by other means; and I therefore reserve the liberty of driving it in any desired way provided fluid pressure is availed of for the purpose of changing the position of the fan from being idle to being active. The two functions of changing the position of the fan, and also of actuating it, may take place at practically the same time, but they may also occur at different times, and sometimes they may occur through the same pressure system, which latter is susceptible of more or less modification in the accomplishment of the result in view. The hydraulic cylinder shown may be used with air or other fluid pressure, and other means may be employed for using water, air or other kinds of fluid pressure.

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

1. In a cooling tower, the combination with a shell, of a stack for producing a natural draft, a fan for drawing air through the shell, a fan-actuating water motor, and fluid-pressure means for actuating the motor and for placing the fan in operative position.

2. In a cooling tower, the combination with a stack susceptible of producing at times a natural draft, of a fan for drawing the air through the tower, and a hydraulic pump for actuating the fan and for placing it in an operative position.

3. In a cooling tower, the combination with a shell and a filling therein, of a mechanical agency for creating a draft, said agency being transferable from an active position to an idle position, in which latter a natural draft is permitted, a motor for actuating said agency when in its active position, and means for driving said motor and for placing the draft-creating agent in its operative position.

4. In a cooling tower, the combination with a shell and a filling therein, of a natural draft stack, a fan capable of drawing air through the shell, a fan-actuating water motor, and a hydraulic pump for driving the motor and placing the fan in position to create an artificial draft.

5. In a cooling tower, the combination with a shell, of a stack for producing a nat-

ural draft, a fan for drawing air through the shell, a fan-actuating water-motor, and means for placing the motor and fan in active position and removing them therefrom.

5 6. In a cooling tower, the combination with a shell and a filling therein, of a fan located above the filling, a natural draft stack, a fan-actuating water-motor, a shaft carrying the fan and the motor, a cylinder
10 receiving pressure for the purpose of lifting the shaft and placing the fan and motor in active position, and means for supplying water pressure to the motor.

15 7. In a cooling tower, the combination with a stack susceptible of producing at times a natural draft, of a fan for drawing the air through the tower, and fluid-pressure means for placing it in its operative position.

8. In a cooling tower, the combination 20 with a shell and a filling therein, of a mechanical agency for creating a draft, means for actuating it, and fluid-pressure means for transferring it from an idle position to an active position.

25 9. In a cooling tower, the combination with a shell and a filling therein, of a stack for producing a natural draft, a fan for drawing the air through the tower, and a fluid-pressure pump for placing said fan in
30 its operative position.

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

LOUIS R. ALBERGER.

Witnesses:

R. M. HOPKINS,
W. S. DORAN.