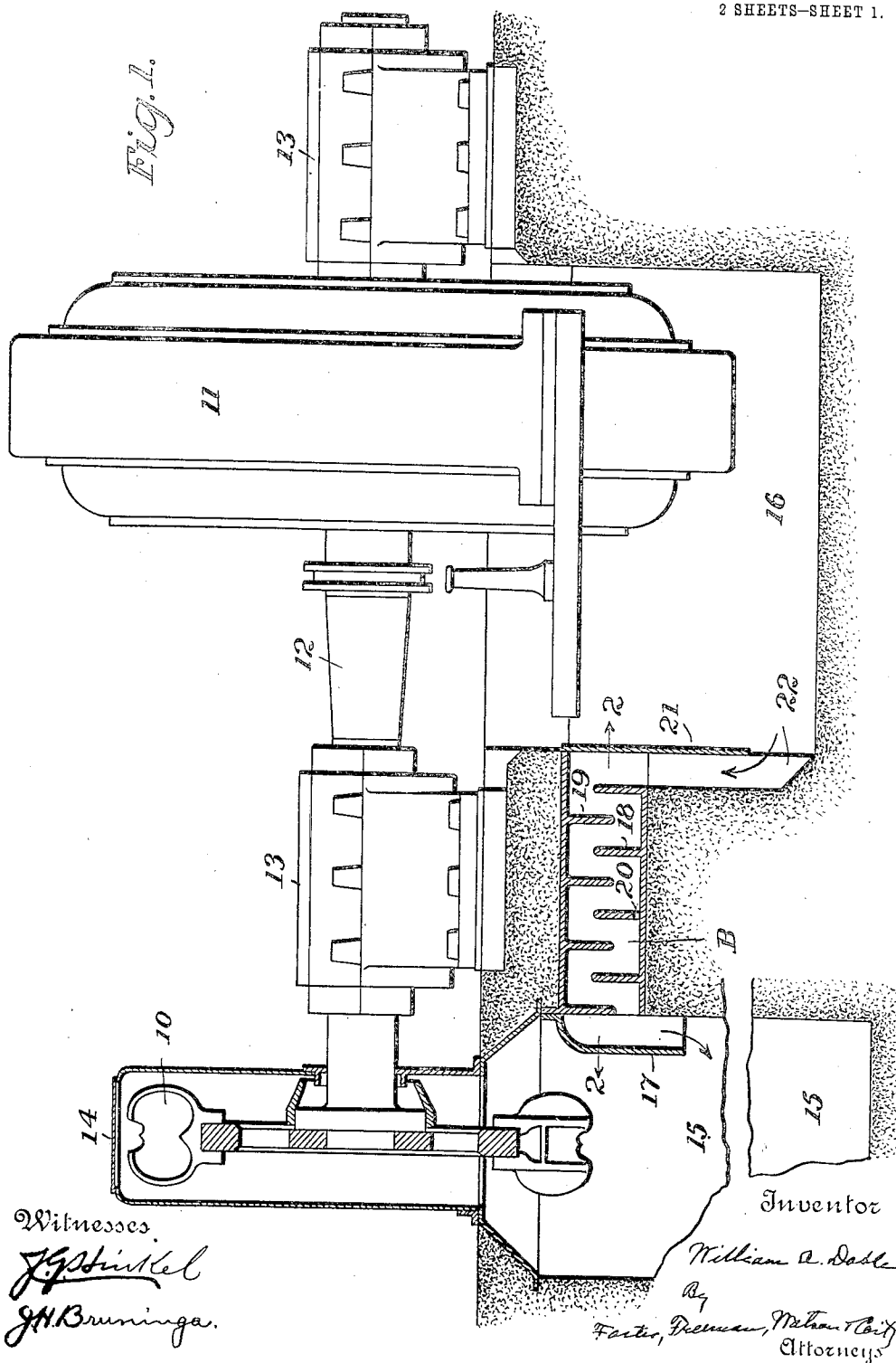


W. A. DOBLE.
HYDRO ELECTRIC UNIT.
APPLICATION FILED JUNE 1, 1910.

1,028,554.

Patented June 4, 1912.

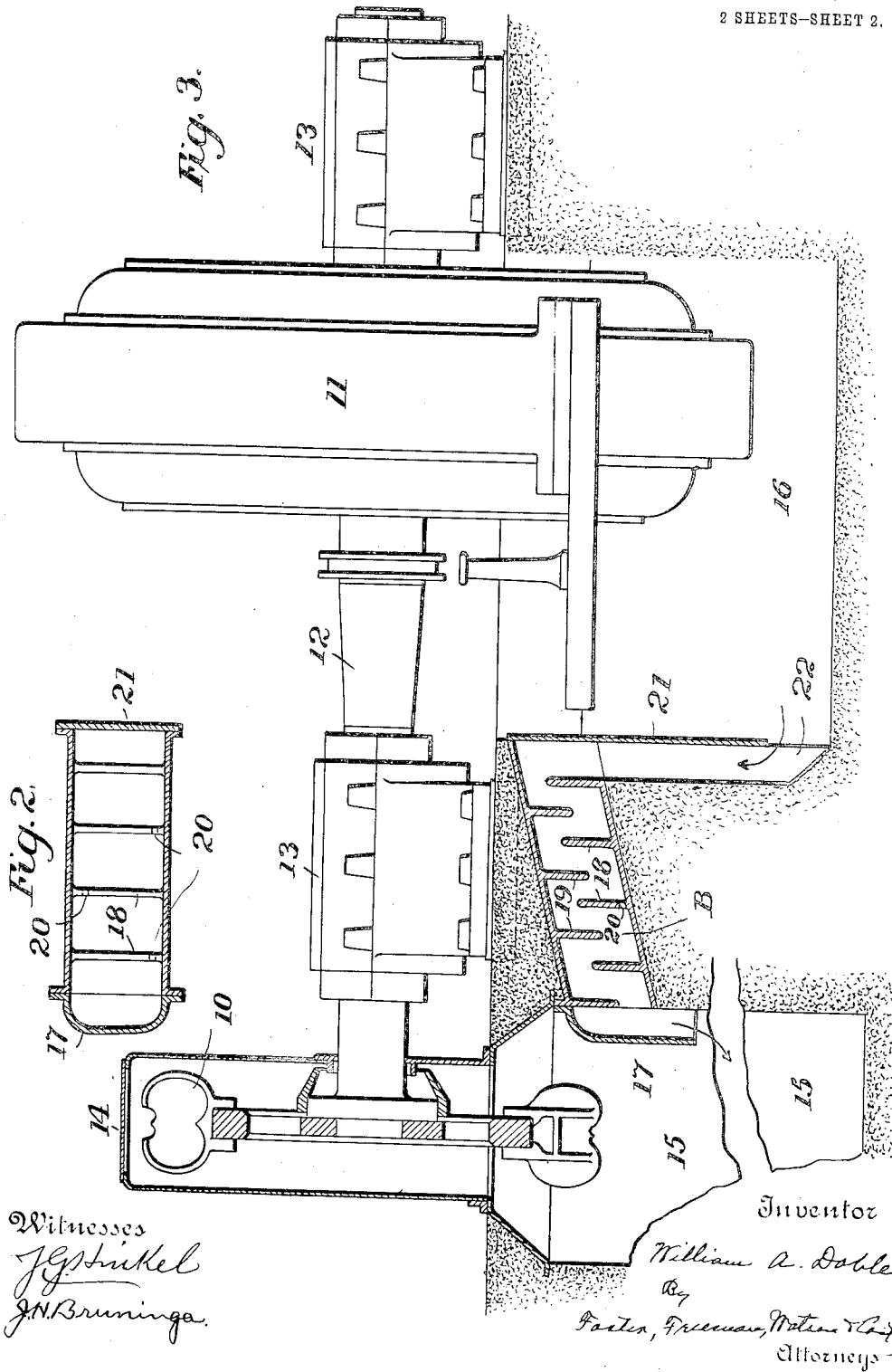
2 SHEETS—SHEET 1.



1,028,554.

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2 SHEETS-SHEET 2.



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UNITED STATES PATENT OFFICE.

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HYDRO-ELECTRIC UNIT.

1,028,554.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM A. DOBLE, a citizen of the United States, and resident of San Francisco, county of San Francisco, State of California, have invented certain new and useful Improvements in Hydro-Electric Units, of which the following is a specification.

This invention relates to hydraulic motors, and particularly to hydro-electric units.

When a water wheel is driven by a stream of water directed by a nozzle against it, it is found that a partial vacuum is created in the housing, wheel pit and the tailrace. This partial vacuum prevents the water from flowing freely out of the tailrace, and in shallow tailraces backs the discharge water up to such an extent that interference of the wheel with the discharge water takes place. In large units, the generator must be mounted so as to extend into a pit. The air in the pit will get hot and foul, rendering the same uncomfortable to the operator. There is also the more serious objection to the generators heating up, due to lack of ventilation in the pit, which not only reduces the efficiency of the generator, owing to the greater resistance of the windings at the higher temperature, but also materially reduces the life of the generator, as the excess heating gradually destroys the insulating value of the materials used for that purpose, and in time causes the generators to break down and burn out, which calls for expensive repairs beside loss of the use of the machine. The same is true of other station apparatus, as transformers, etc., some means must generally be provided for cooling the same especially where they are large.

One of the objects is therefore to provide an air inlet for the motor whereby the vacuum may be done away with.

Another object is to provide means for ventilating the generator or other station apparatus.

Another object is to so combine the means for obtaining the above objects that the generator or other apparatus is ventilated by the motor and in turn supplies heat to the motor.

Further objects will appear from the detailed description.

The invention will be described in connection with the accompanying drawings, in which—

Figure 1 is a section through the wheel pit, tailrace and generator pit, parts of the machine being shown in elevation; Fig. 2 is a section on the line 2—2 of Fig. 1; and Fig. 3 is a view similar to Fig. 1, but showing another form of this invention.

Referring to Figs. 1 and 2, 10 designates a water wheel and 11 an electric generator, the movable element of which is connected to the water wheel by means of a shaft 12, mounted in bearings 13. The hydraulic motor is inclosed by the usual housing 14 and the wheel of the motor extends into the nozzle and wheel pit 15, from which the water is discharged into the tailrace. Generator 11 is mounted on its foundation, and partially extends into a generator pit 16. The division wall between the wheel pit and tailrace, and the generator pit is provided with a passage B which connects the generator pit with the wheel pit and the tailrace. This passage is preferably provided with a suitable lining, and the motor terminal has extending over it a hood or protector 17, which prevents the water from being splashed into the passage. The passage walls are also provided with upwardly and downwardly extending ribs or plates 18 and 19, which form baffle plates, and thus prevent the water from being splashed into the generator pit. The lower ribs are provided with staggered drain holes 20, which allow the water which does enter the passage to drain back into the tailrace. The generator pit terminal of the passage is provided with a plate or hood 21, so that the passage opens into the lower part of the pit.

In Fig. 3, the air passage is shown as inclined downwardly toward the wheel pit and tailrace so that drainage will be facilitated. It is to be understood that the ribs are provided with drain holes 20 similar to that shown in Figs. 1 and 2. The construction is otherwise similar to that shown in Fig. 1, and further detailed description will therefore be unnecessary.

The direction of the air currents is shown by the arrows. The air will be drawn from the generator pit, by the vacuum created in the motor housing, wheel pit, and tailrace, and thus the generator pit will be thoroughly ventilated. This air passage also re-

duces the vacuum in the motor casing and the tailrace. It will be noted that the air passage extends to the bottom of the generator pit, thus insuring a free circulation of air therein as the air will enter the pit above and will be discharged from below. The protecting hood and the ribs or baffles prevent the water from being splashed into the pit.

In addition to the advantages of ventilating and cooling the generator by drawing off the hot air, there is a further and very great advantage in this combination. In high altitudes, and in those countries where they have cold winters, there is a great deal of annoyance caused by the freezing of the spray water discharged from the water-wheel. When the water is broken up into a spray by its action on the wheel, it freezes rapidly in low temperatures, but the discharge of the warm air from the generator into the nozzle and wheel pit of the water-wheel would entirely prevent this freezing. In some cases, to operate the wheels in the winter time, it is necessary to put steam jackets around the water-wheel nozzles. By the use of the above described combination, the warm air discharged into the wheel and nozzle pit is ample to make steam jackets entirely unnecessary, and eliminates any possible danger of freezing, and the cost of a steam boiler and fuel to furnish steam in the jacket is also done away with. At the same time the generator or other station apparatus is ventilated and cooled.

In the specific embodiment shown, the hydraulic motor is of the impact type. This invention is, however, not necessarily limited to this specific type of hydraulic motor, since it may be applied to other types. It may in certain cases then be necessary to provide a blower to draw the heat away from the generator or other station apparatus, and discharge it around the motor, its entrance pipe and draft tube. The heat from the station apparatus may be utilized to heat any part of the motor so as to prevent the freezing, for instance, it may be used to heat the stand pipe which is connected to the pressure pipe line.

In the specific embodiment shown, the air is drawn from the pit of the generator. Where, however, the generator is small and does not extend into a pit, then the air may be drawn through the base plate upon which the generator is mounted or a housing for the generator. The base plate may in such cases be hollow, so as to facilitate cooling.

A hydro-electric station is generally provided with different kinds of energy transforming apparatus, for instance, generators, transformers, rotary converters, etc. In some cases, where the flow of the stream varies, it is also the practice to provide auxiliary apparatus for taking the peak

load when the flow of the stream is low. Such auxiliary apparatus may be steam driven units or may consist of internal combustion engines. The latter type of engines must necessarily be cooled, and this cooling may in certain cases be accomplished by air. All of this station apparatus especially where the apparatus is of large size must necessarily be provided with some means for cooling the same. In accordance with this invention, the station apparatus may be cooled and the heat may be utilized to heat the motor so as to facilitate proper operation. It will therefore be seen that the above combination accomplishes simultaneously two important results, namely, the cooling of the station apparatus, and the utilization of the heat in the motor.

It is obvious that various changes may be made in the details of construction without departing from this invention, and it is therefore, to be understood that this invention is not to be limited to the specific construction shown and described.

Having thus described the invention, what is claimed is:

1. The combination with a hydraulic motor, of a generator driven thereby, a pit for said generator, a housing for said motor, and an air passage connecting said pit with said housing.

2. The combination with a hydraulic motor, of a generator driven thereby, a pit for said generator, a discharge conduit for said motor, and an air passage connecting said pit with said conduit.

3. The combination with a hydraulic motor, of a generator driven thereby, a pit for said generator, a discharge conduit for said motor, an air passage connecting said pit with said conduit, and a hood over the motor terminal of said passage.

4. The combination with a hydraulic motor, of a generator driven thereby, a pit for said generator, a discharge conduit for said motor, and an air passage connecting the bottom of said pit with said conduit.

5. The combination with a hydraulic motor, of a generator driven thereby, a pit for said generator, a discharge conduit for said motor, an air passage connecting said pit with said conduit, and an extension for said passage extending to the bottom of said pit.

6. The combination with a hydraulic motor, of a generator driven thereby, a pit for said generator, a discharge conduit for said motor, an air passage connecting said pit with said conduit, and baffles in said passage.

7. The combination with a hydraulic motor, of a generator driven thereby, a pit for said generator, a discharge conduit for said motor, an air passage connecting said pit with said conduit and having an extension

sion to the bottom of said pit, and a hood over the opening for said passage into said conduit.

8. The combination with a hydraulic motor and a discharge conduit therefor, of an air inlet for said conduit, said inlet inclining downwardly toward said conduit, and ribs extending from the lower wall of said inlet, said ribs being provided with drain holes.

9. In a hydroelectric station, the combination with a hydraulic motor and other station apparatus, of a casing for said motor, and a conduit leading from said casing to said apparatus for conveying air from said apparatus to the interior of the casing.

10. In a hydroelectric station, the combination with a hydraulic motor and other apparatus, of a casing inclosing said motor, means inclosing said apparatus, and a con-

duit connecting said casing and said inclosing means whereby air may be conducted from the inclosing means to the interior of the casing, for the purpose described.

11. In a hydroelectric station, the combination with a hydraulic motor and other energy transforming apparatus, of a casing for said motor, means inclosing said apparatus, and means connecting the interior of said inclosing means with the interior of said casing whereby the vacuum in said casing will induce air to flow from said inclosing means to said casing, as and for the purpose described.

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

WILLIAM A. DOBLE.

Witnesses:

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LEOPOLD M. KARNASCH.