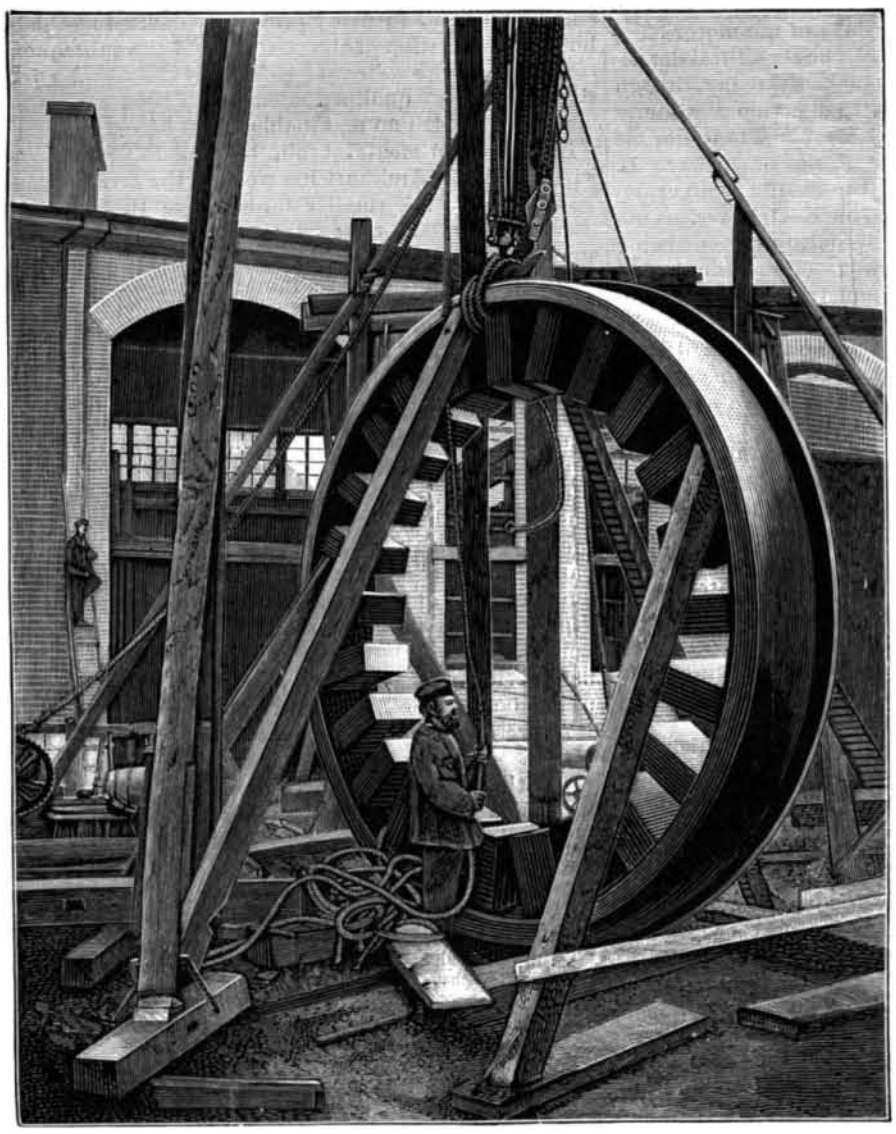
ALUMINUM WORKS IN SWITZERLAND.

The Aluminum Industry Company, limited, is the title of a company formed not long ago at Zurich, Switzerland, with a capital of $2,000,000, for the manufacture of the alloys and pure metal aluminum by the electric method. Cryolite is exposed to the electric current. Some idea of the extensive nature of the enterprise will be gained when we state that 4,000 horse power is available, to obtain which the company employs turbine wheels, taking water from the River Rhine, at a point just above the Rhine Falls, near Schaffhausen, actually Venhausen.

The dynamo machines were constructed by the Machine Works Company at Oerlikon. Up to the present time an altogether erroneous opinion has prevailed to the effect that colossal machines would be quickly ruined by continuous working. The regularity of the work at Venhausen, however, and the fact that machines there have been in use day and night already for over a year, without the least interruption occuring, demonstrate, says *Engineering*, the groundlessness of the fear. Machines constructed for only 6,000 amperes have been worked at Venhausen with 15,000 amperes without being in the least degree damaged. The new or additional plant of the Aluminum Industry Company comprises for the present three machines. Two large machines of 600 horse power each, which serve for the production of aluminum, and a smaller machine of 300 horse power for exciting the field magnets of the former, and other machines which may become necessary hereafter, as well as for lighting purposes and for driving sundry motors.

The field magnets of the large machines resemble an inwardly toothed wheel and consist of 24 poles. The whole magnet frame consists of a single piece, cast at the Oerlikon foundry, and weighs, without taking into consideration the copper wrapping, no less than 12,000 kilos. (12 tons), the outer diameter is 3·6 meters (11 feet 9 inches), the inner diameter which contains the armature is of 2·43 meters.

The armature is constructed of the so-called drum type, Mr. C. L. Brown's patent, and possesses the peculiarity that the wires do not rest outside on the armature iron, but are placed in openings close to the periphery of the latter. These wires are connected with the commutator by means of U-shaped strips of copper. On the back or upper part similar strips are used, but instead of being connected to the commutator they are fastened together in a very simple way.



FIELD MAGNET OF THE GREAT DYNAMO OF THE ALUMINUM INDUSTRY CO.

The arrangement described above allows any of the wires to be taken off easily in case of repairs without unfastening any metal joints, as each wire is kept separate from the others by the iron of the armature. The armature has 240 wires, which are in connection with a commutator, consisting of 120 segments. The diameter of the commutator is as much as 1·800 meters, a dimension necessitated by the enormous strength of the current, which much surpasses the power developed by the largest machines known up to the present time. The current is transferred through 24 points to sets of 5 brushes of 50 millimeters in width, of which 12 are alternately in connection with a massive copper ring, from which the current is supplied direct to the furnaces.

These rings were cast in Venhausen, two of them being required for each machine; they contain over 3,000 kilos. of copper. It was only possible to cast these rings perfectly solid by means of adding a little aluminum to the copper. An ingenious contrivance renders it possible not only to turn the double brush-holding rings round their axes, so as to place the brushes properly, but also to remove them as may be required; in addition to this each brush is provided with a simple apparatus for adjusting it as may be rendered necessary by wear.

Contrary to the general rule, the axes of these machines are not horizontal, but vertical, the armature being set over, and coupled directly with the turbines. A special advantage of this arrangement is, in the first place, the great facility for handling the commutators with 120 brushes for each machine. Another advantage is that the copper dust from the commutator and brushes falls directly underneath, and not into the magnet frame and armature, which would be the case with a horizontal position. Furthermore, the space required for the machine is very small in comparison with its power, and last, but not least, there is also a considerable saving of power, owing to the fact that, being directly coupled to the turbines, no transmission mechanism is necessary, the friction being reduced to a minimum by the relieving valves.

The two larger machines are constructed to develop 14,000 amperes at 30 volts, or 420,000 watts, with uninterrupted working day and night, but this estimate is rather low, as the power may be increased on special occasions to 500,000 watts.

The number of revolutions is 260 a minute, but 150 are sufficient to give the full current specified. These machines are the largest direct current dynamos in the world.

Visitors to the works generally show a certain amount of uneasiness when approaching these very powerful currents, but there is no ground for such uneasiness, for low tension currents do not involve any danger whatever.

Progress of Gunnery.

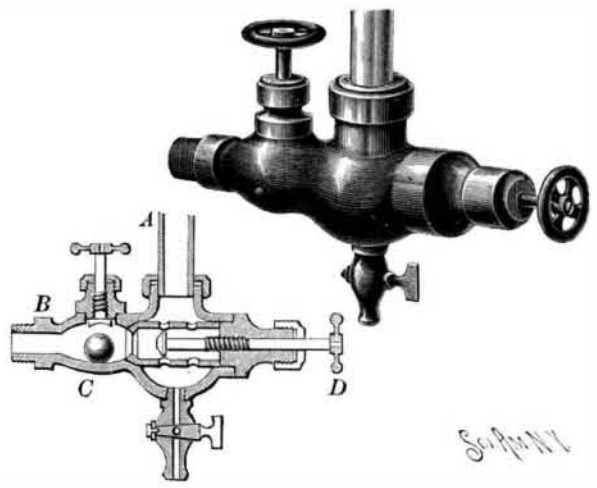
In former days our most powerful weapons were the 68 pounder or 8 inch 95 cwt. smooth bore gun, used with a charge of 18 lb. of powder, which threw a spherical cast iron shell of about 48 lb. weight, containing 2 lb. 9 oz. of powder; and the 13 inch cast iron sea service mortar, used for bombardment, for which the spherical shell weighed 207 lb., and the projecting charge was 20 lb. of powder. The positions which these pieces then held are now occupied by the 8 inch rifled howitzer, throwing a conoidal wrought iron or steel shell, charged with a much more powerful explosive than powder; the 12 inch breech-loading gun of 45 tons weight, with a charge of 295 lb. of powder, throwing a projectile of 682½ lb. weight; the 80 ton 16 inch muzzle-loading gun, with a charge of 450 lb. and a projectile weighing 1,640 lb.; and the 110 ton breech-loading gun of 16¼ inches caliber, which throws steel projectiles weighing 1,800 lb. with a powder charge of 960 lb. The cost of production of the smooth bore cast iron guns in those days ranged from $125 to $150 per ton; now, our rifled steel breech-loading guns cost from $850 to $1,000 per ton.

A Train Delayed by Caterpillars.

A dispatch from Mankato, Minn., May 23, says: "All the trains on the Milwaukee road this morning were delayed at a point seven miles out of this city by millions of caterpillars which had crawled upon the rails to sun themselves. Sand boxes were soon exhausted and two engines were hardly sufficient to move the train. The morning freight was an hour and ten minutes in going two miles. The caterpillars were ground into masses of grease over which the wheels slipped. The caterpillars have been a pest in that locality for two weeks."

AN IMPROVED WATER GAUGE.

A gauge designed to prevent the overflow of steam and water in case the glass breaks, while permitting of readily blowing off the gauge whenever desired, is shown in section and perspective by the engraving.



McFARLANE & BARRETT'S WATER GAUGE.

It has been patented by Mr. William A. McFarlane and Simeon A. Barrett, of San Bernardino, Cal. The two cocks of the gauge, of which only one is shown, are provided with the usual connecting glass, A, each cock having a casing, a hollow extension of which, B, screws into the boiler, establishing connection between the interior of the boiler, the casing, and the glass. In the hollow extension connecting with the boiler is an enlarged portion, C, in which is a ball adapted to be seated on the end of a valve plug screwing into the casing opposite the hollow extension. This valve plug extends across the casing, and has in its walls a series of openings and a second seat, adapted to be engaged by a valve held on a valve stem with a handle, D, this valve stem passing centrally through the plug. In the bottom of the casing is a pet cock, which, when opened, serves to blow off the gauge. To lock the ball in place in the enlarged portion, C, when it is desired to blow off the gauge, a curved clamping plate, adapted to fit on one side of the ball, is held on the lower end of a valve stem screwing in a suitable cap, and provided with a handle. With this gauge, in case the glass breaks, the water from the boiler forces the ball to the valve seat at the end of the valve plug, so that the water cannot escape into the casing and out through the broken glass. The operator can then turn the handle, D, to move the valve on the stem connected therewith to its seat, preventing the escape of water until a new glass has been placed in position. When it is desired to blow off the gauge, the clamping plate is moved by its valve stem to lock the ball in place in the enlargement, C, and, the valve of the pet cock being opened, the water freely passes through the casing and out of the cock. The several parts are so arranged that the ball and the valve plug may be readily taken out, in order to clean the gauge, without disturbing the position of the two parts and the glass.

New Torpedo Protections.

The Nile battle ship lately proceeded to the back of the Isle of Wight, for the trial of a new system of torpedo defenses, the invention of Captain Wilson, of the Vernon. The Nile is the first vessel in which hollow steel booms have been substituted for the ordinary cumbrous wooden spars. The new booms are of the usual length, between 30 feet and 40 feet, which is understood to be the limit of safety, and arranged diagonally at equal distances along the sides. The topping lifts are also disposed obliquely, but in the opposite direction to the set of the booms, so that when they are let go the booms, in falling into position at right angles with the ship, carry the ring nets into the water, and when raised they pull up the nets and the way of the ship is not impeded. Another feature of the system is that the usual hook attachments are dispensed with, the heel of the boom being stepped against the skin of the vessel, where it is held by a chain and fore and aft guys, and kept from slipping by a shallow socket resembling in form the letter L reversed. The trial, which was watched by the assistant controller of the navy, the members of the torpedo committee, and the officers passing through the torpedo class, was considered satisfactory, the whole ship being dressed in her crinoline defense in a couple of minutes. This alertness in preparing for torpedo attack is the special merit of the new system, since it is of comparative unimportance how long it takes to stow the defense. It is, however, doubtful whether, considering their slender connection with the side, the booms would retain their position in a heavy seaway, or be able to resist the shock of a torpedo hung up in the nets.—*London Times.*