THE CENTENNIAL EXPOSITION.

We give on the opposite page a fine engraving of a portion of the interior of the Main Building at the Centennial. The artist has also represented the procession which, headed by President Grant and the Emperor of Brazil, passed through the different edifices immediately after the opening ceremonies. The distinguished party was received by the various foreign commissioners, who, with their respective committees, had posted themselves in front of their departments and along the principal aisle. The three gateways, shown in the illustration, belong to Spain, Egypt, and Denmark, and are the most elaborate temporary decorations which have been erected. Egypt surrounds her entire section with a low wall of wood and canvas, painted to imitate stone. There is a noticeable absence of display of this kind in the departments of England and France. England, especially, avoids even ornamented show cases, and presents her exhibits in plain but handsomely made cases, which do not distract the eye from the articles themselves.

THE JUDGES.

The most important event of the past week has been the organization of the board of judges. The formal ceremony took place on May 24, in the Judges' Hall, into which first marched the Centennial Commission, headed by General Hawley, and followed by the American judges. As the foreign judges entered all rose, and patriotic airs were performed by the band. General Hawley then extended a welcome to the foreign members, and Mr. Goshorn delivered a brief speech relative to the duties of the Board.

THE UNITED STATES EXHIBIT—SIGNAL BUREAU.

In our review last week of the general condition of affairs at the Exposition, lack of space compelled us to omit mention of the United States Building, the arrangements in which are nearer completion than in any other part of the Exhibition. On each side of the main portal is arranged a formidable collection of cutlery. There is a mammoth 20-inch Rodman gun, and several Dahlgren smooth bores and Parrott rifles of smaller proportions. These are mounted on their carriages and provided with all fittings and appurtenances. Inside the building one of the most interesting displays is that of the Signal Service Bureau. It is intended to show a signal station with all its appliances. The principal instruments exhibited are as follows: Lieutenant Gibbon's barograph, or self-registering barometer is the usual siphon-shaped mercurial barometer, in the short leg of which an iron float rests upon the column of mercury. The slightest change in the level of the column makes this float rise or fall, and its motion is communicated by a cord running over a pulley to the circuit breaker of an electromagnet. The armature of the magnet communicates its motion to a pen which dots the surface of a cylinder moved slowly by clockwork, thus registering the slightest change and the exact moment of its occurrence. The paper with which the surface of the cylinder is covered is ruled to cover a space of fourteen days; and as each paper is removed, it is filed away as a permanent record of that period of time. Foreman's barograph is in its leading characteristics like the one above described, and has also an attachment which automatically prints in figures each change of one thousandth of an inch.

Hough's thermograph is a self-registering thermometer. It consists of a siphon tube, the short leg of which is expanded into a larger tube with a closed end. In this short leg is placed alcohol, which is confined there by a column of mercury in the longer leg, which is open at the top. The thermometer operates by a contraction and expansion of the spirit by cold or heat, raising the column of mercury as the spirit expands, and letting it sink as it contracts. Upon the surface of the mercury is a float, which rises and falls with the column, and, by a very delicate apparatus, operates a circuit breaker of an electromagnetic circuit. This again, as in the case of the barograph, is made to record the changes of a revolving cylinder.

A marine barograph is constructed much like the one first described, except that the tube containing the mercury is made of iron instead of glass. It has an attachment to hang it up by, which keeps it always in a perpendicular position.

Eccard's evapograph is an instrument for determining the amount of moisture in the atmosphere, and registering the result. This is determined by the rapidity with which water, exposed to the atmosphere, will evaporate. The instrument is an open cylindrical vessel filled with water, resting upon a delicate scale; as the water evaporates, the vessel is lightened and rises, the slightest change being sufficient to operate the circuit breaker of an electromagnet, which, as in other instruments, records the changes on the cylinder moved by clockwork. The motion, of course, is always upward, as evaporation continually goes on with greater or less rapidity.

Gibbon's electrical rain and snow gage records in like manner the depth of the rain or melted snow which falls in any given time. A receiver is situated on the roof of the building, the area of the upper section of which is a certain number of times as great as the base of the cylinder of the instrument, with which it is connected by a tube. Upon the water in the lower cylinder is a float, which, as it rises, communicates its motion by an electromagnet to the recording apparatus as before described.

Eccard's rain gage dispenses with the electro-magnet, the float communicating its motion by a counterpoise to the clockwork. This is a very simple and effective instrument.

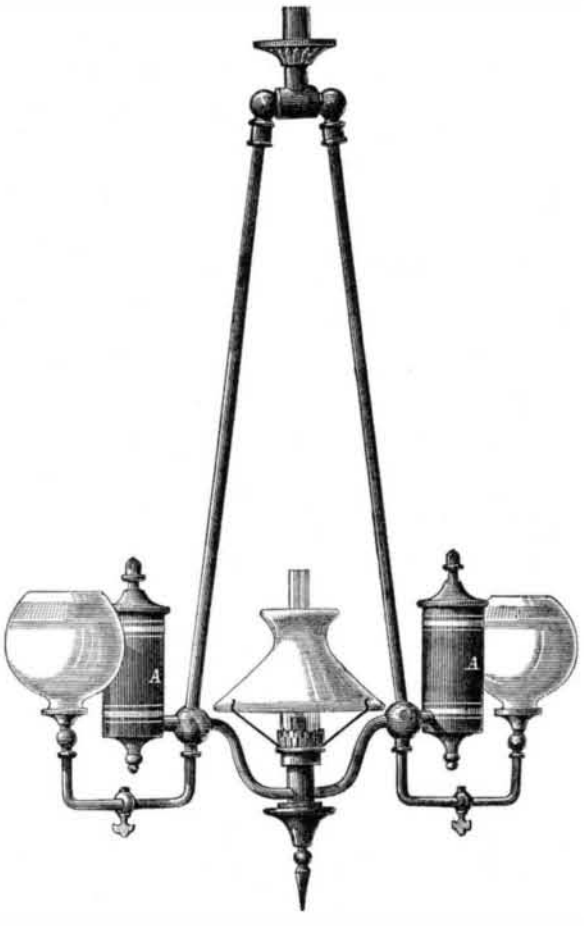
Gibbon's anemograph measures and records the velocity and direction of the wind. Upon the roof of the observing station, four hemispherical cups, placed vertically on horizontal arms, catch the slightest movement of the air and cause the arms to revolve a certain number of revolutions, equaling, in the distance traveled, the distance traveled by the wind; then an electric circuit closes, and an electromagnet records the same on a revolving cylinder. This cylinder, moving by clockwork, should there be no movement of the magnet, will cause the pencil to make a long, straight line; with a high wind the record is frequently made, and the line is broken up into longer or shorter sections, corresponding with the velocity of the wind. The direction is indicated on another cylinder. There are four magnetic circuits, connected with the four points of the weather vane, corresponding with the four points of the compass. Once in four minutes the clockwork makes a record, and that record is made by the pen of whichever circuit the weather vane has at the time closed. Eccard's anemograph dispenses with the electric circuit, and makes its record on the cylinder by entirely mechanical means. The weather vane, in turning, revolves the rod to which it is attached, which communicates its motion directly, or by gearing, to the pen, without the intervention of an electromagnet.

An ingenious apparatus has been constructed to provide the weather necessary to work these different instruments. It includes a shower bath to produce an artificial rainstorm, and a fan blast, which generates gales of any force, from ten to sixty miles per hour. The manner of printing the weather maps, which are sent to all parts of country, is fully illustrated in this department.

CLARK'S COMBINED GAS AND OIL CHANDELIER.

The exorbitant price charged for gas in some large cities has resulted in a greatly increased use of oil, which is much the cheaper mode of illumination Various devices have been introduced to combine oil lamps with gas fixtures, so that the latter, being already in most city houses, may still be utilized and the expense of separate lamp holders saved. To this class belongs the present invention, which ingeniously arranges a lamp in connection with a gas fixture, so that either gas or oil, or both, may be burned, as desired.

The construction consists simply in carrying a separate gas pipe to each arm of the fixture. To each pipe is attached an oil tank, A; and these tanks communicate, by tubes supported in bulbs, to, but do not intersect, the gas pipes, with the argand burner in the middle. The gas is lit at the extremities of the arms; and the light is increased at a small cost by the oil illumination, or the gas may be unused, and only the lamp lit.



One advantage of this arrangement is that it does not compel the cutting-off of the gas, as is the case when a lamp is fitted directly over the burners; so that, while lamplight may be ordinarily employed on special occasions, when greater illumination is desired the gas burners may be ignited. The invention will doubtless be quite popular not only with consumers but also with gas companies, since it tends to prevent the return of meters and total abandonment of the gas facilities, as might otherwise follow a substitution of oil.

Patented May 9, 1876, through the Scientific American Patent Agency. For further particulars regarding sale of patent, rights, etc., address the inventor, Mr. George P. Clark, P. O. Box 327, Newton, Mass.

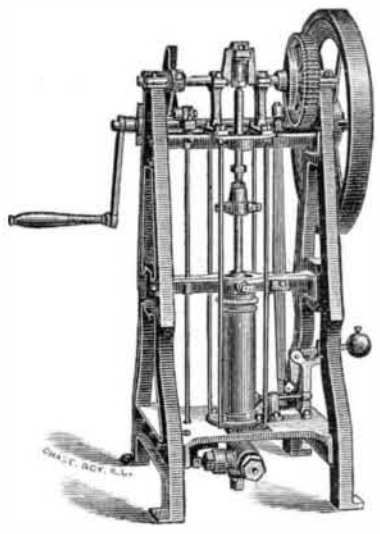
A Metal More Fusible than Tallow.

M. Lecoq de Boisbaudran, whose recent discovery of the new element gallium, and whose subsequent researches thereon we have from time to time noted, has recently, for the first time, succeeded in obtaining a grain and a half of the metal in a pure state. This has enabled him to determine the remarkable fact that gallium melts at 85·1° Fah., so that it liquefies when held in the hand. When solid, the metal is hard and resistant, even to a few degrees below the melting point. It can be cut, and possesses a slight malleability. When fused, it adheres easily to glass, on which it forms a beautiful mirror, whiter than that produced by mercury. It oxidizes but very superficially when heated to red ness in the air, and does not become volatile. The density at 59° Fah. is 4·7, that of water at 39·2° Fah. being 1.

Excepting mercury, which only becomes solid at —37·9° Fah., there is no other element which liquefies at so low a temperature as gallium. Fusible alloy, of 1 part lead, 1 part tin, and 1 part bismuth, melts at 201°, and phosphorus at 111·5°. Wax and tallow have melting points respectively at 142° and 92° Fah.

MOLL & ALTHEIDE'S IMPROVED AIR PUMP.

The accompanying illustration represents an improved air pump, which, the inventors claim, produces an absolute vacuum. The valves are operated by means of cams and levers, insuring a positive motion and a greater efficiency than it is



possible to secure where atmospheric pressure alone is relied on to open and close the valves. We have never seen the apparatus: but it is stated by the inventor that the perfection of this machine is such that it may be used by manufacturers of thermometers, barometers, sympiesometers, Geissler tubes, and other physical apparatus, to advantage. It is also said that manufacturing chemists and sugar refiners can by its use ob- tain superior productions in less time and with less expense than by excessive heat.

The apparatus consists of a cylinder placed on a platform, which is secured to two vertical standards, at the top of which a crank shaft is supported in suitable bearings. A spur wheel is keyed on one end of this shaft, which takes its motion from a pinion on the shaft, which is shown at the back of the ma chine. There is a balance wheel and also a hand crank for operating the machine on this last mentioned shaft. A crosshead on the end of the piston rod is connected to the crank shaft by means of a connecting rod.

A cam is fixed on the end of the crank shaft (at the left hand in the engraving) which operates the induction valve by means of the rod shown near the side of the machine, which carries a roller which engage s with the cam. The lower snd of the rod just mentioned is connected with a lever which operates the induction valve, and is weighted so that, when the cam is not in contact with the roller, at the upper end of the rod, the weight will hold the valve closed.

On the other side of the machine, a cam is attached to the side of the spur wheel, which operates the eduction valve through a lever carrying a roller at its upper end, and having a fulcrum at the cross bar, which connects the vertical standard just above the upper end of the cylinder, and is connected at the lower end with the valve. Near this le ver, a standard is fixed to the platform, which supports a right-angled lever carrying a weight at its outer end, and a flanged roller at its inner and lower end, which bears upon the lower end of the valve-operating lever.

Atmospheric pressure is depended on to operate the valves, as they are opened by the cams, and closed by the weighted levers. By this arrangement, it is claimed that the instant of opening and closing the valves can be regulated to better advantage than when they are arranged to operate automatically. This pump is provided with valves of new and peculiar construction, and also an improved packing for the piston, which add to the efficiency of the machine.

Patented October 19, 1875. For further information, address the inventors, C. F. Moll and J. H. Altheide, Quincy, Ill.

Production of Silver in the Whole World.

According to recent statistics, the production of silver in the whole world in 1800 was $35,000,000, which rose in 1850 to $42,500,000, in 1854 to $47,500,000, and in 1865 to about $62,500,000. The production of this precious metal during the year 1873 is subdivided as follows: England and its colonies, $10,000,000; Norway, Sweden, and Denmark, $250,000; Russia, $500,000; Austria, $1,620,000; Germany, $3,000,000; France, $2,000,000; Spain, $2,000,000; Sardinia, $500,000; Mexico, $20,000,000; Central and South America, $8,000,000; Canada, $900,000; the United States, $36,500,000, which gives a total of $85,250,000. Including the year 1873, it is estimated that the total production of silver, since the discovery of the New World by Christopher Columbus, has been $715,000,000, the largest source of accession, during late years, being due to the Nevada mines.