withdrew and abandoned the same, becoming convinced of the serious disadvantage of having to employ machinery calculated to withstand pressures of 700 or more lbs. to the square inch, which this liquefied gas exerts at the common temperature of 65° Fah. Professor Lowe, of balloon fame, in attempting to use the pressure of carbonic acid gas (when liquefied by powerful pumping machinery, under a pressure of 600 lbs. to the square inch) as a source of power for flying machines, was struck by the evolution of great cold during the evaporation of this liquefied gas; and he obtained patents for its use for making ice, and for refrigeration in general. Notwithstanding that he spent many thousands of dollars to put this scheme in practical operation, and kept to its pursuit for several years, it finally utterly failed; and all attempts in this line were given up, the stumbling block being the same as was found in using liquefied nitrous acid, namely, the difficulty of keeping the joints tight under the enormous pressure required; for even the solid metals themselves showed, under the extreme pressure, such porosity that the gases passed through as through a sieve.

The process of Professor Paersh, of New Orleans, using carbon bisulphide, was abandoned for a contrary reason. Its boiling point being 112° Fah., more than 22° above that of ether, it was even less successful than the common ether, the process for which has never been quite satisfactory, as fully proved by the results of the labors of Siebe, in England, Twining, in New Haven, and others afterward.

Liquefied sulphurous acid boils at 14° Fah., and at the increased temperature exerts a pressure of 60 lbs. per square inch, or 4 atmospheres; and thus it appears well adapted for the purpose, and some years ago it was proposed to use it, and, if I am not mistaken, its employment was patented by Professor Seely, of New York city; but its corrosive effect on the metals of which the machine was made forbade its practical application.

The methylic ether machine of Tellier, in France, was at first said to be a great success; and about 10 years ago one of the apparatus was imported from France and exhibited in operation at the Morgan Iron Works in this city. There appears, however, to have been great difficulty in procuring the pure methylic ether required, notwithstanding that its preparation had been minutely described in Tellier's patent. The ignorant persons who had charge of the machine became possessed of the idea of cutting short all trouble, by using ammonia, which was easily procured; and, as any well informed person could have warned them, within 24 hours the whole beautiful machine, a credit to the Parisian workshops whence it came, was utterly ruined, the ammonia having destroyed all the brass parts. Machines using ammonia are therefore always built entirely of iron.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

NUMBER XLV.

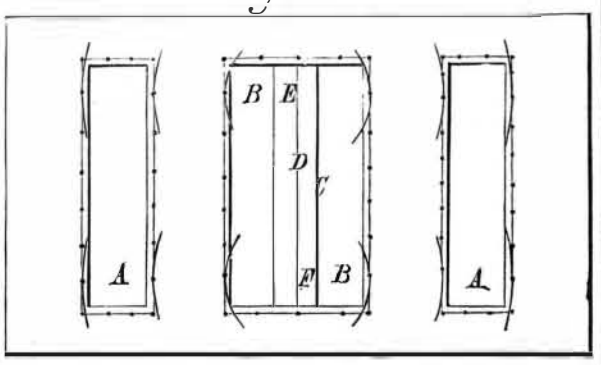
MARKING OFF SLIDE VALVES AND CYLINDER PORTS.

If, in marking off a set of cylinder ports and a slide valve for the same, we are provided with a detail drawing, we have no option, of course, as to their proportions; but if, on the other hand, we have liberty to proportion the same, we have to consider the following: If we make the slide valve to cover the ports without having any steam lap, the exhaust will not be sufficiently free, and there will be a back pressure upon the engine. The amount of steam lap necessary to prevent back pressure will be an amount equal to one quarter of the width of the steam port in a slowly running engine, and equal to about three quarters of the width of the steam port in a fast running engine. If it is incumbent that the valve have no steam lap, or an amount of such lap equal to or less than one quarter of the width of the steam port, we may make the cylinder exhaust port about one and three quarters as wide as the steam port, which will be sufficient to maintain, at all parts of the stroke, an exhaust opening in the cylinder exhaust port equal to that obtaining in the steam port acting (at the same point of the stroke) as an exhaust port: the object of narrowing the cylinder exhaust port in this case being to keep the valve narrow, so that its friction upon its seat may be kept as small as possible, in consequence of its reduced area for the steam to act on, pressing it to its seat. The best results are obtained from a slide valve by giving it sufficient steam lap to cut off the steam supply when the piston has traveled about three quarters of the length of the stroke; if more than such an amount of steam lap be given to the valve, its action becomes distorted, that is, unequal at and during one stroke as compared to the ther

The area of the steam ports should be proportioned by the following rule, which is given by Mr. John Bourne in his "Catechism of the Steam Engine:" "Multiply the area of the cylinder in square inches by the speed of the piston in feet per minute, and divide the product by 4,000. The quotient will be the area of each cylinder port in square inches." This rule is a much better one than any which gives a definite and fixed proportion between the area of the cylinder and of the steam port, because it takes into consideration the quantity of steam required to pass through the port in a given time, and increases the area of the port in proportion as the speed of the engine is increased.

Having determined the dimensions and proportions of our ports and valve, we proceed as follows: Beginning with the cylinder, we place in the exhaust port a center piece, as shown in Fig. 231, in which A represents the steam port, B B the cylinder exhaust port, and C the center piece wedged or fastened therein. In the center of the position intended for the ports, we mark upon the center piece the center line, D, and from the points, E, F, we mark with the compasses the segments of circles from which the width of the steam ports, exhaust port, and bridges are marked, the lines being drawn by the aid of a straight edge. We mark the ends of the ports by the aid of a straight edge and square. To mark off the valve, we may either plane up two of the edges and

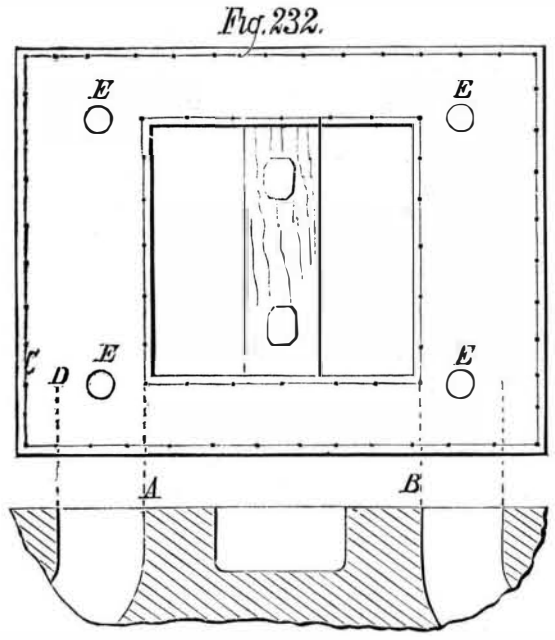
Fig. 231.



mark the lines by the aid of a square, allowing an equal amount to be taken off each side of the exhaust port, or we may place a centerpiece in the exhaust port of the valve, and perform all the marking-off before any of the planing is done, the operation being shown in Fig. 232. From A to B is the width of the exhaust port of the valve, and from C to D on each side is the lap of the valve.

It is found that valve seats (the cylinder faces on which the valves slide) will have when they become worn, a groove cut across the bridges between the ports and extending along the face beyond on each side, running close to the edge of

Fig. 232.



the ports, and at right angles to the lengths of the ports. To prevent the formation of this groove, it is found necessary to drill in the face of the valve the four small holes (say of ¼ inch diameter) shown in Fig. 232, at E, E, E, E, their depth being about half the thickness of the valve.

To mark off the back of the valve where the slide spindle frame fits, we must stand it on the marking table, with the face standing perpendicularly and at a right angle to the face of the table, and draw a center line on the back of the valve, from which line we may mark off the back of the valve to the necessary conformation.

PROGRESS OF THE CENTENNIAL EXHIBITION.

The exhibition buildings and grounds are fast approaching completion.

THE MAIN BUILDING

is completed internally, the painting and gas pipe connections having just been finished. Show cases are rapidly appearing, that of Devlin, the clothier, being especially notable, both for its style and size. The floor is strewn with packages, prominent among which, on account of their size, are those sent by J. D. Burchall and Co., woolen manufacturers, of Leeds, England, containing woolen goods, and cases of terra cotta from Messrs. Doulton, of England, who are erecting four elegant show cases in which to exhibit pottery and porcelain. Among the exhibits forwarded by the Secretary of State for India, London, England, is a fine muslin, into which threads of gold are interwoven. This material is made exclusively for the rajahs in India, and is so fine in its texture that 50 yards of it can be doubled up and passed through a lady's finger ring.

INDIAN COURT.

The exhibits for the Indian court are nearly all in the building, having been transported from the Indian Museum, London, England.

The Egyptian, Norwegian, Chilian, Spanish, and other courts are all graceful and nationally characteristic edifices, and are fast approaching completion. They promise to be among the most attractive parts of the exhibition. The Norwegian goods are mostly on the ground.

MACHINERY HALL.

In the Machinery Hall, the workmen are busy erecting the shafting and laying steam pipes for the Corliss engine, all the parts of which are on the spot, and most of them erected.

Messrs. Mirrelees, Tait, & Watson, of Glasgow, Scotland, are erecting an engine and sugar mill, the total weight of which is 180 English tuns. It is a compound beam engine, of the parallel motion order, with Corliss valves. the high pressure cylinder being of 24 inches bore and 56 inches stroke. The top roller of the mill weighs 24,780 lbs. The entries of the above firm also include 26 and 36 inch centrifugals and two smaller engines, one driving a small mill and one driving a centrifugal. One of these engines is a valveless engine, which takes steam through the head of the piston, which is a very long one, having in it ports arranged to operate with ports in the bore of the cylinder, and not at the ends thereof.

Messrs. Wm. Sellers & Co.. of Philadelphia, have their slotting, planing, vertical, and horizontal boring, drilling, and punching and shearing machines, as well as several large and small engine lathes, in position. J. Mitchell, of Philadelphia, is erecting a column composed of English, French, German, American, and Austrian grindstones, of various grades. J. P. Morris, of Port Richmond Iron Works is erecting a vertical column compound engine of the following description: High pressure cylinder, 50 inches in diameter, of 84 inches stroke; the low pressure cylinder is in line with it, so that both piston heads are fast upon one rod. The valves are constructed under Wanock's patent, and are balanced. The (two) fly wheels are each 24 feet in diameter, and of 21 tons weight, the whole engine weighing 110 tuns. This engine will drive a blower (for blast furnaces) of the following description: The cylinder is like an ordinary steam cylinder, and is provided with a similar piston, save that the piston rings are composed of maple wood, and are cut in segments to accommodate their being set out. The blower valves are of the griddle order. The size of the blower cylinder is 90 inches in diameter by 7 feet in stroke.

The floor spaces are all marked off, and many foundations for the various entries are being laid. Some few of the exhibitors who have their entries all ready are delaying the placing of them in position in the hopes of being able to obtain space in more prominent locations, provided the owners of such latter space shall be dilatory enough to warrant the commissioners in disposing of the space now allowed to them. The fears of the latter are, however, having the effect of hastening the forwarding of entries; hence it is improbable that any reallotment of space will take place, save in the case of those who are very much behindhand.

THE GROUNDS.

Swarms of workmen are busy leveling roadways, removing *débris*, and laying out the grounds and planting additional shrubs, evergreens, etc., notwithstanding the unpropitious weather. The railroad men, both steam and horse car, are at work in full force, giving promise that their preparations will be completed in ample time.

AGRICULTURAL HALL.

The above hall is the most backward of all the buildings but the rate of progress is proportionally rapid, every day making a noticeable difference in its appearance. The working force is here exceptionally strong; and there is evidence that it will soon be ready for the reception of entries

THE FOREIGN EXHIBITORS.

As a rule, the foreign exhibitors have more goods upon the ground than is the case with the American entries, a fact to which their representatives point with a feeling of pride. There is no doubt, however, that the arrival of American goods will, during the coming week, be very large. Representatives of foreign governments who were present at the Paris and Vienna Expositions give it as their opinion that the vista of the main building at Philadelphia excels, in general design, lightness, and airiness, that of any previous international exhibition.

A Metric Treaty.

The President has recently sent to the Senate for ratification a treaty, the object of which is to establish an international uniformity and precision in the standard of weights and measures. The treaty is between the United States and the governments of Austria, Argentine Republic, Belgium, Brazil, Denmark, Spain, France, Italy, Peru, Portugal, Russia, Sweden and Norway, Switzerland, Turkey, and Venezuela. It contains an agreement between all the parties to maintain in Paris, at the common expense, a permanent bureau of weights and measures, to be under the control of an international committee. The bureau is to be charged with the following duties:

1. All comparisons and verifications of the new prototype of the meter and kilogramme. 2. The custody of the international prototypes. 3. The periodical comparison of the international standard with the international prototypes and of test copies, as well as comparison of the standard thermometers. 4. The comparison of the prototypes with the fundamental standards of non-metrical weights and measures used in different countries for scientific purposes. 5. The standarding and comparison of geodesic measuring bars. 6. The comparison of standards and scales of precision, the verification of which may be requested by governments, scientific societies, or even by constructors or men of science.

WE are indebted to Mr. R. O. Morris, Secretary of the Rod and Gun Club, Springfield, Mass., for a very attractive pamphlet containing a list of premiums and rules to govern the dog show which takes place on April 26, under the auspices of the abovenamed club. Many very handsome premiums are offered, and it is expected that the exhibition of pointers and setters from all parts of the country will be especially large and fine.