product multiplied by the number of cubic feet of water to be converted into steam, will give the total amount of fuel required in this case.

Making the proper allowance for the pine wood in lighting the fires, the weight of oil consumed in the experiment was 60 lbs.; the contents of the boiler was 200 cubic feet, at a temperature of 60°, which was heated by this weight of oil to the boiling point =212°; thus the weight of oil which heated 200 cubic feet one degree was $\frac{60\text{ lbs}}{152}$=0·39 lbs; and the weight of oil which was requisite to heat *one* cubic foot of water *one* degree was $\frac{.39}{200}$=.0019 lbs. This multiplied by 1,119°=2·126, and this by the 200 cubic feet of water in the boiler, gives 425 lbs. as *the weight of the oil which would convert the contents of the boiler into steam at the atmospheric pressure* —or $\frac{200 \times 62{\cdot}34}{425}$=29·34 lbs., as the *weight* of water at a temperature of 60°, which will be converted into steam by *one pound of oil.* From Isherwood's valuable experiments, on marine boilers—we find this same type of boiler in use on board the U. S. Steamers—and from the mean of the experiments conducted on these boilers, we find the quantity of water evaporated, from a temperature of 100° with steam at the pressure of the atmosphere, by one pound of anthracite coal, to be 8·5 pounds. To compare this with the evaporation made from a lower temperature of water by means of the oil, this weight must be reduced in the following ratio, established by Isherwood: $\frac{966°+112°}{966°+153°}=\frac{1078}{1118}$=0·964, which multiplied by 8·5, gives 8·16 as the weight of water at 60°, converted into steam of atmospheric pressure by one pound of anthracite coal.

Comparing this result with that above shown for the product of the combustion of oil, we find the evaporating power of the two fuels to be in favor of the oil, in the ratio of 29·33 to 8·16, or 3·6, weight for weight; the coal and the oil occupying about the same space for a given weight. That is to say, a cubic foot of coal as stored aboard ship, will weigh about the same, or a little less, than a cubic foot of oil, the first weighing from 43 to 52 pounds, and the latter about 54 lbs. to the cubic foot.

Further experiment, with improved apparatus, will be necessary in order to determine the precise economic value of this fuel in comparison with coal, but the advantages of the oil as a fuel for marine engines may be briefly summed up as follows:—

Rapidity with which steam may be raised—reduced dimensions of boiler and furnace below that required for coal—the continuous firing effected by feeding the fuel through a pipe into the furnace, thereby preventing the great loss of heat in the furnace every time a fresh supply of coal is thrown on, and the rush of cold air upon the opening of the furnace doors —the freedom from smoke, cinder, ash, or refuse of any kind, which in coal reaches from seven to over sixteen per cent of the whole amount. In the ability to command a forced fire almost instantly, without a forced draught, which, under some circumstances at sea, is of vital importance. In dispensing with the numerous class of coal heavers, stokers, etc., and all the inconvenience of raising clinkers and ash from the furnace rooms; and finally the diminished space occupied in the storage of the fuel.

Respectfully submitted,

JULIUS W. ADAMS, Engineer.

The above experiments were made in presence of Capt. Bythesea, R. N., Sec'y. of Her Brit. Maj. Legation at Washington; Cyrus W. Field, Esq., Hon. James Wadsworth, Hon. Horace Greeley, Hon. David Dudley Field, John E. Williams, Esq., President Metropolitan Bank; William A. Thompson, Esq., Vice-President Erie and Niagara Railway; Geo. W. Quintard, Esq., Morgan Iron Works; Mr. James Farron, Superintendent Morgan Iron Works, and officers of the Company.

AS ONE of the workmen employed at Whitewell's Blast Furnace, South Stockton, was recently taking a slag ball from the furnace, a tipper named Henry Badley, was about to tip it when it burst, and the molten slag flew over him, setting his clothes on fire, burning him severely on various parts of the body, and melting his watch.

THERE will be but one eclipse this year that will be visible to us—a total eclipse of the moon, March, 30th.

THE FOOT LATHE.

Number 8.

[Continued from Page 66.]

An indispensable article on a foot lathe, where any fancy work is to be done, is the centers—of which we have before spoken—shown in Fig. 40. These consist of a common set of heads, with spindles fitted to them. One spindle has an index plate and spring, and the other has a common center. These heads set on a slide that is moved back and forth over a rest, screwed to the lathe bed as usual. It is easy to see that with this we can do some very fine cabinet work. Suppose we have a round vase turned up handsomely, and we wish to flute the base or make it a series of curves all round; to do this we have only to put it in the centers, set the index so as to come out even, as before explained, and go ahead.

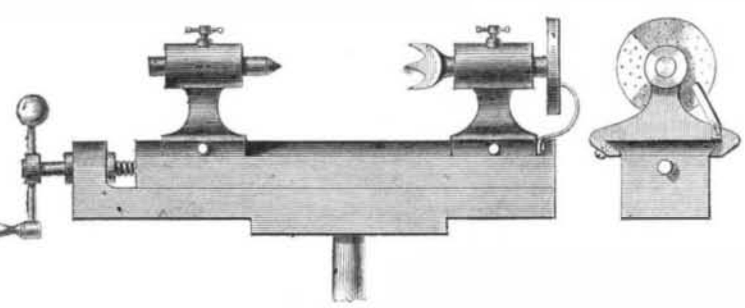

Fig. 40.

The kind of cutter to be used is a sort of gouge set in a cast-iron head, something as a plane iron is set in its stock. That is, fitted tight to a groove and held by a set screw. Two of these cutters should be used at equal distances apart, and the cutter head should be keyed on a short shaft set between the main centers of the lathe. The whole should be accurately balanced, or else the work will be full of chatters or ridges. Since centrifugal force increases as the square of the velocity, any thing that runs a little out of truth will be very much exaggerated as the speed increases. By using cutters of different shapes, beautiful effects can be produced; as, for instance, suppose we take a common round-nose cutter, set the index so as to divide the circle of the job we are to work on in twenty-four parts, and execute that part of the design, then take a tool forming an ogee and work out the spaces intervening, we shall find that the article, when completed, will have a beautiful appearance, and that instead of being round the bottom will be octagonal, which will present a pleasing contrast to the rest.

The centers can be set at any angle with the cutter shaft, and a pineapple pattern can be made on straight surfaces by executing one part at one angle, then reversing the rest that carries the centers, and finish the remainder, one part of the pattern crossing the other.

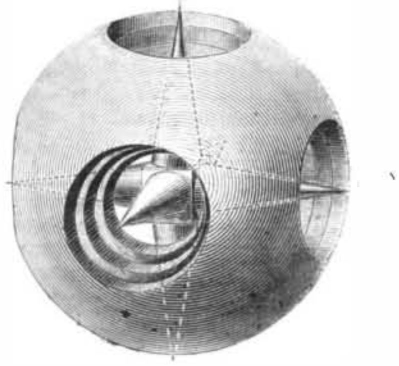

Fig. 41.

We present herewith views of a novel ornament which exhibits great mechanical ingenuity and manual dexterity, but is otherwise of no value. It consists, in one form, of a globe with a series of rings or globes inside, and a six-armed spur projecting through holes—all cut out of one solid piece.

This figure shows how the points are turned. After the internal rings are cut out with a quadrant tool like Fig. 43, and the spur also severed, by cutting in the ends of the holes (not boring them out solid), the globe is put in a shell chuck with three set

Fig. 42.

screws in it, as shown. The set screws go through the holes in the globe, and the cross pieces in between the spurs serve to steady the job. Any number of points may be turned in the globe. Fig. 44 shows a polygon with many spurs turned inside. At first sight it would appear that the tool severing the rings would cut off the points also, but it will be seen that this is not the case, for the holes being bored so as to leave a core standing (which afterward serves to

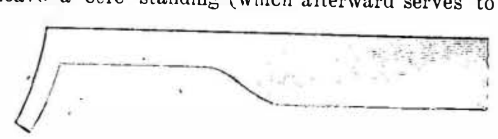

Fig. 43.

make the points of the spur), the severing tool falls into the holes and goes no further, and each division serves as a guide for the tool in the next hole, so that the globe is made the same size, without jags. The quadrant tool, shown before, must be followed round

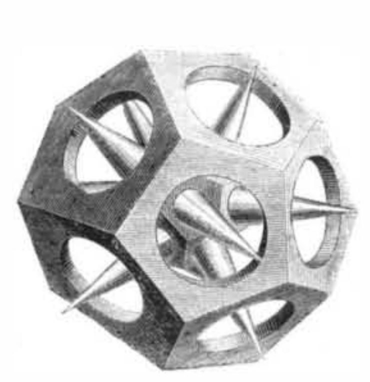

Fig. 44.

the shell in the act of cutting it out, so that it will make the same round, and the globe must be shifted in the chuck to reach all the holes. It is no easy task to make this little affair, for all it looks so simple.

ARRANGEMENTS have been made with Mr. G. W. Beardslee for the purchase by the Government of the torpedo implements used by him in destroying vessels of war, harbor obstructions, forts, and batteries, etc., by means of submarine explosions. Mr. Beardslee has recently been occupied at Chatham in making the preliminary arrangements for some futher additional experiments on a much more extended scale than any previously undertaken, with the object of further demonstrating the importance of the new agency for the destruction of forts and vessels of war.

MR. G. W. CUSHING, master mechanic of the Chicago and North-western Railway, has sent us a spirited colored photograph of locomotive designed by him for the company, for which we return thanks.

THE application from the artisans employed in the different dockyards for an increase of wages, has been refused by the English Admiralty.