for this firm the gold medal at the Paris Exhibition. The engine has during the past week been thoroughly tested in every way, its performance, simplicity, and ease of management eliciting much satisfaction and applause. The official trial was made in the Place des Terreaux, in front of the Hôtel de Ville. Steam was raised from cold water, and the engine started in 11 minutes, and pumping through 160 feet of hose, water was projected continuously in a solid steam bare 1 inch in diameter to the top of the dome, a height of 160 feet; larger streams, and two, and even four at a time, were delivered far above the mural crown on the top of the facade of the building, 112 feet high. The engine was then taken under steam to the Quai de la Charité on the Rhone, and a hose 600 feet attached, leading to the Place Belle-cour, to see if its power should be in any way diminished; it was, however, found to play as well as with a short hose, although there was a suction lift of 15 feet, and two streams were being delivered; the pressure in the pump being 8, and that in the boiler 7 atmospheres. By this experiment the authorities plainly saw that the whole of Lyons lying between the rivers Rhone and Saone was under command in case of fire. Several other trials, some during the night, were made, chiefly to instruct the fire-brigade, with whom the new engine is quite a favourite.—*Mechanics' Magazine.*

Tortoise Shell.

A correspondent inquires as to the production and manufacture of tortoise shell. It is the product of a marine tortoise or turtle generally known as the "hawk's bill." The shell, so called, is in reality only the outer covering of the shell proper, and is found simply as scales or plates. These are removed by the application of fire. The turtle is caught and secured to the ground, when a light fire is built on his back, which loosens the plates so they can be removed by a knife. The animal is then left free and the separate plates are in time replaced by a plate or shield. The shell is rarely removed from animals weighing less than 160 or 170 pounds, as it is too thin for use in the arts.

The shell is manufactured into various articles by being softened in hot water, which renders it pliable and almost plastic. It is largely manufactured in Providence, R. I.—*Scientific American.*

The largest pair of Propeller Engines in the World.

The direct acting engines for the English iron clad *Hercules* built by John Penn & Sons, at Greenwich, near London, are the largest pair of screw engines ever constructed.

They are of the double trunk variety, a style built almost exclusively by the Messrs. Penn. There are two cylinders, each 127 inches in diameter by 4 feet 6 inches length of stroke of one piston; the diameter of the trunks is 47 inches, whose area being deducted, gives the pistons an effective diameter of 118 inches.

These engines are intended to run 60 revolutions per minute, consequently the two pistons, pass through a volume of 84,600 cubic feet per minute; they are to be supplied with steam by the ordinary horizontal tubular boilers, containing in the aggregate about 1,000 square feet of grate surface; they will be fitted with superheaters. It would seem therefore that these engines are intended to be worked highly expansively, and notwithstanding the comparatively small boiler capacity, the eminent engineer who constructed these monsters promises for them no less than 7,200 indicated horse power. Judging from the performance of many engines of similar style built by this firm we have no doubt that this enormous power will be realized. A comparison between the engines of the *Hercules* and those of the U. S. S. *Wampanoag* cannot fail to show that the planner of the machinery of one of these ships has made a big mistake.

The *Wampanoag* engines are geared and are expected to make 30 turns per minute, the cylinders are two in number and are 100 inches in diameter by 4 feet stroke of piston. Hence the piston will speed through a volume of 26,784 cubic feet per minute. So while the *Hercules* has a capacity of cylinder represented by 84,600 cubic feet, the *Wampanaog* has a cylinder capacity represented by only 26,000 cubic feet. In other words, although the eminently successful builder of these big direct acting engines employs over three times more cylinder capacity than Mr. Isherwood does in his "cog wheel" engines, he uses considerably less boiler than that blundering engineer. As a consequence, while the engines of Mr. Isherwood will only work up to some 4,000 indicated horse, those of Penn will work up to 7,200 indicated horse power. Again the 7,200 horse power engines take up about 8 feet 6 inches, in the length of the ship, less than the 4,000 horse power engines, and their boilers occupy some 20 feet less in the same direction. Thus if the *Hercules* engines were placed in the *Wampanaog*, she would be urged by more than double her power, and at the same time much less room would be occupied in the vessel by machinery, and, *ceteris paribus*, she would be driven over 18 knots per hour.

It would seem that Penn and other successful builders go ahead just as if the U. S. Navy Steam Blue Books with their "seven-tenths cut-off" and non-superheating theories had never been published.—*Scientific American.*

Telescope for Objects under Water.

A new Telescope for examining objects situated under water, was recently tested on one of the French canals. Reports affirm that pencil marks could be clearly distinguished at a depth of more than five feet. Its practical application will be the examination of the hulls of vessels without its being necessary to dock them.

The Lucimeter.

The various ways of measuring the quantity or intensity of light have always been a matter of paramount interest to philosophers. The earliest contrivance, and certainly an excellent one, due to Count Rumford, consisted in intercepting the light received from a given source, by means of a certain number of plates of dulled glass; the smaller the number required to make the light disappear, the smaller, of course, was its intensity. This was called a photometer. Others have since been constructed on various principles, but they are no