atus intended to be placed in an obscure corner, or those parts of machines which are not seen, require no outward adornment: but in other cases, where perhaps hundreds of persons daily use the apparatus, and the whole world, so to speak, criticises and comments upon its appearance, a tasteful and appropriate exterior adds, not only to the beauty of the machine, but to its value; and is at once a mark of enterprise and an evidence of the maker's cultivation.

COST OF MODERN NAVIES.

The French naval architect, M. Xavier Raymond, in his book on "Les Marines de la France et de'l Angleterre," describes the enormous cost of modern navies, as compared with those of other times, when sailing vessels alone were employed. In the days of Nelson, it was calculated that the number of guns carried was a criterion of the cost of a vessel, and that the cost of each gun was £1,000 (about $5,000.) For steam wooden frigates, the cost per gun is now rated at from £5,000 to £6,000, and for iron-plated frigates it exceeds £10,000. Again, the expense of maintaining a modern steam frigate is almost fabulous compared with the old sailing craft. The *Edinburgh Review* states that the *Warrior* frigate, ready for sea, represents £400,000 ($2,000,000) of the public money; while the *Minotaur* now building, and to be covered with 5½-inch plates will represent $2,500,000. As this thickness of plates has been shattered by guns already in existence, it is now proposed to build other vessels with 8 and 10 inch plating, in which case a single ship will cost about $5,000,000! The *Review* says, "The Americans are confident that they can carry and work at sea 15-inch guns, throwing 450 lb shot, with charges of powder sufficient to pierce and destroy a ship's side composed of 36 inches solid oak and 1 inch of iron lining, protected with 5½ inch plates. They have destroyed such a target at 100 yards distance, and they have done this with cast-iron guns and cast-iron shot. It will not do to shut our eyes to such eventualities. In designing these additional iron-clads, which it is too evident England will be compelled to build, the increasing difficulties of the question must be fairly considered and the magnitude of the cost boldly confronted." In our opinion such huge iron-clad war ships, now proposed for the British navy, might be very efficient at sea against inferior vessels; but in most cases they would be useless in America, for attacks on harbor fortifications or batteries, owing to their great draft of water—ranging from 28 to 30 feet. They would not be able to come within a range of ten miles from New York city.

REVELATIONS OF THE MICROSCOPE.

Brush a little of the fuzz from the wing of a dead butterfly, and let it fall upon a piece of glass. It will be seen on the glass as a fine golden dust. Slide the glass under the microscope, and each particle of the dust will reveal itself as a perfect symmetrical feather.

Give your arm a slight prick, so as to draw a small drop of blood; mix the blood with a drop of vinegar and water, and place it upon the glass slide under the microscope. You will discover that the red matter of the blood is formed of innumerable globules or disks, which, though so small as to be separately invisible to the naked eye, appear under the microscope each larger than a letter, o, of this print.

Take a drop of water from a stagnant pool, or ditch, or sluggish brook; dipping it from among the green vegetable matter on the surface. On holding the water to the light it will look a little milky; but on placing the smallest drop under the microscope, you will find it swarming with hundreds of strange animals that are swimming about in it with the greatest vivacity. These animalcules exist in such multitudes that any effort to conceive of their numbers bewilders the imagination.

This invisible universe of created beings is the most wonderful of all the revelations of the microscope. During the whole of man's existence on the earth, while he has been fighting, taming and studying the lower animals which were visible to his sight, he has been surrounded by these other multitudes of the earth's inhabitants without any suspicion of their existence! In endless variety of form and structure, they are bustling through their active lives—pursuing their prey—defending their persons—waging their wars—prosecuting their amours—multiplying their species—and ending their careers: countless hosts at each tick of the clock passing out of existence, and making way for new hosts that are following in endless succession. What other fields of creation may yet, by some inconceivable methods, be revealed to our knowledge?

THE SUN'S PATH AMONG THE STARS.

The sky, including the sun, moon and stars, rolls around us every day, from east to west. But the sun moves each day among the stars about one degree in the opposite direction; completing the circle of 360 degrees in 365 days. As the sun illuminates that half of the heavens in which it is situated at the time, it carries the day with it; slipping the illuminated half of the heavens slowly round from west to east. Hence the several stars rise about four minutes earlier each day than they did the day before; and, in the course of the year, they are each in turn brought up to our view during the night; excepting those that are so near the south pole of the heavens that they never rise.

The sun's path among the stars is not round the celestial equator or equinoctial, half way between the poles, but it crosses the equinoctial at an angle of 23° 28′; so that in midsummer the sun is among those stars which are 23° 28′ north of the equinoctial, and in midwinter he is among those stars which are 23° 28′ south of the equinoctial. An inspection of the simple apparatus described on page 402, Vol. VIII (new series) of the Scientific American will show how this change in the altitude of the sun varies the length of the days.

This motion of the sun was observed and the ecliptic was named long before the true cause of the phenomenon was suspected. It is now known to be produced by the annual revolution of the earth, in its orbit around the sun. The place of the ecliptic among the stars is always the same, while the places of the equinoctial and the poles are constantly but slowly changing.

POWER TO DRIVE CIRCULAR SAWS.

Differences of opinion prevail among millwrights respecting the amount of power employed to drive circular saws. Undoubtedly the power employed will just be in proportion to the work—the speed of the saw and the character of the lumber cut. The higher the speed and the harder the timber, the greater will be the amount of power required; but how much this is for saws of different sizes, according to their speed and the timber to be cut, is not very well known. Practice, and minute information furnished on these points, by those engaged in sawmills, would be very interesting to a large number of the readers of the Scientific American. On page 128, Vol. 14 (old series) of the Scientific American, it is stated that 12-horse power is required for a circular saw 52 inches in diameter, cutting yellow Southern pine, and running at the rate of 4,600 feet per minute, at the periphery.

A correspondent writing to us from Tioga, Pa., lately, states that 40-horse power is employed in that lumber region, for a 4-foot circular saw, and that this amount of power is for common, not extra work. We had entertained the idea, derived from persons engaged in sawing timber, that about 14-horse power was usually required to drive a 4-foot circular saw, in cutting such timber as white pine, spruce and soft maple; but this amount of power it seems would only be about one-third of that used in Tioga county, Pa.

A GOOD MACHINE OIL.

The difficulty of obtaining a good machine oil—apart from sperm which is too costly for general use—has been felt by manufacturers, and the evil deplored. Aside from the enormous friction entailed by bad lubricants, the absorption of power is a question of immediate loss, and one that soon makes itself apparent in the yearly bills for repairs. Mr. F. S. Pease, of Buffalo, N. Y., has experimented a long time on the production of a desirable machine oil, which could be afforded at a comparatively low rate; and has so far succeeded that, at the recent Exhibition of the World's Fair, held in London, he was awarded two medals upon its merits. The most eminent English engineers—one of them Mr. D. K. Clarke, professionally well known in this country—have testified to its excellent qualities; and Muspratt, the English chemist, thus states his opinion of it:—

"A qualitative examination of your engine and signal oil proves it to be of a compound nature. In my experiments it burned freely and gave a good light without clogging the wick. It is free from acidity and does not resinify when exposed in a thin stratum to the air. The preceding qualities indicate that the 'Engine and Signal Oil' is well suited to the use for which you have intended it."

Other certificates have been shown us—among them the endorsement of the United States Commissioner at the Industrial Exhibition: but we deem the above sufficient to establish the estimation in which the article is held abroad. Mr. Pease informs us that he has filled large orders for some English railways, and is now supplying the principal lines in this country. We have no hesitation in recommending the oil to manufacturers as a most desirable article.

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week. The claims may be found in the official list:—

Envelope Machine.—This invention relates to a movable slide placed under the lifters, in such a manner that a fresh supply of blanks can be introduced under the lifters at any moment whenever they begin to rise, without stopping the machine; also to a peculiar arrangement of the lifter and table which supports the gum box and under which the blanks are conveyed to the creasing box, in such a manner that the table itself pulls off the blanks from the lifters and retains them in a correct position for the plunger to act upon; and further, to certain improvements in the mechanism employed to impart the desired motion to the gum box in relation to the lifters, to counterbalance the conveyor, to crease, fold, and press the envelopes, and to discharge them from the machine when finished. George H. Reay, of New York city, is the inventor of this machine. The patent has been assigned in full to L. Negbaur, No. 5 Spruce street, New York.

Ring Spinning Frame.—In most if not all ring spinning frames heretofore constructed, the rings have been fitted snugly into openings provided for them in the ring rail, without any provision for adjusting them in the said rail. This rail is held in place by lifting rods which work up and down in stationary guides provided for them in the frame, and as these rods and guides wear, the rings become eccentric to the spindles, and cause great irregularity in the draft of the yarns in every revolution of the travelers and spindles, and make imperfect work. The object of this invention is to provide for the adjustment of the several rings in the rail separately, to set them concentric with their respective spindles; and to this end it consists in making the openings provided in the ring rail for the reception of the rings larger than the exteriors of the portions of the rings which are received within them, and in the employment of adjusting screws screwing into the rail from the inner and outer sides thereof, and into the said holes to adjust and hold the said rings therein. Welcome Jenckes, of Manchester, N. H., is the inventor of this improvement.

Leather-splitting Machine.—This invention consists, first, in the employment for adjusting the gage roller at the proper distance from the plane of the edge of the splitting knife according to the thickness to which the skin is to be reduced, of a pair of eccentrics or cams attached to the same shaft, and arranged to act one upon each of the journal boxes of the said roller, whereby the uniform adjustment of both ends of the said roller is insured, and the difficulty of adjusting the said roller correctly by separate adjustments, such as the screws commonly employed, at each end, is overcome. It also consists in making the standards or housings which contain the journal boxes of the gage roller adjustable, to bring the said roller more or less on the edge of the splitting knife, whereby the knife is enabled to be better secured against springing or accidental displacement, by obviating the necessity of adjusting it. Horace Wing,