3110 deg, or 1728 cubic inches 1·8 deg.; 273 times that amount will double the volume of the air, while it will take 1184 times the same absolute amount of heat to change the water into steam, giving the proportion of 4·34 in favor of air. The difference from the proportion 4·45 is made by using 91 deg. in place of 479, which I think is more correct. It also requires more than 50 per cent. of heat to raise one cubic foot of steam at 212 deg., a given number of degrees, more than it does to raise one cubic foot of air the same number of degrees; that is, the relative heat is, by the books as 1 53 to 1, being as 3 to 2 in favor of applying heat to air rather than steam, and about as 3 to 1 in favor of applying heat to steam rather than to water, to change it into steam. Why, then, has air not been used? I suppose one reason is, that it takes half or more of the power to do the necessary pumping. Mr. Ericsson uses two-thirds nearly, the remaining difference is balanced by the power gained by condensation of steam and the application of the expansion principle applied to high pressure steam, leaving them, perhaps, not far from equal. But when Mr. Ericsson saves five-sixths of the heat, and consequently the same proportion of fuel, that is a different matter, and it becomes evident that if necessary, human ingenuity and power will be taxed to their utmost capacity to insure the success of his experiment. I think you will have to give it up at last.

Akron, Ohio, 1853. S. H. Bass.

[For editorial remarks on the above two letters, see page 189.]

Machinery and Tools as they are.—Saws and Saw Mills.

(Continued from page 179.)

No tool is used in a greater variety of industrial occupations than the saw, and when made in a circular form it is even more useful than when rectilineal, finding alike a place among the minute tools of the optician and among the rough but rapid working instruments of the backwoods. In employing the circular saw to cut lumber, the primary subject of inquiry is concerning its diameter,—as a rule it is generally advisable to employ a saw of as small a diameter as circumstances will permit, for the resistance, the surface friction, and likewise the waste from the thickness of the plate, rapidly increase according to the size. But if the saw is so small as to be nearly buried in the work, the metal becomes heated, the escape of the dust is prevented, and the rapidity of the sawing is consequently diminished. As a general rule it appears best to use that part of the saw which is nearest to the centre, and to allow its diameter to be about four times the average depth of the log. Circular saws are usually fixed on mandrels, which revolve in bearings securely united to the stationary frame-work of the saw bench, the end play of the spindle being prevented by collars, as it is highly important to check any lateral motion. The saw is placed between two plates or flanges, which are firmly pressed against the former by a nut, so that they compel it to accompany their revolutions as the mandrel revolves, and to further ensure the saw's rotation, steady pins are passed both through the saw and the fixed flange. When the diameter of the saw is considerable, compared with that of the flanges, the blade is very flexible and liable to be diverted from the true plane. In order to prevent this, there are many different contrivances; when a wooden bench is employed, the saw works in a narrow groove, which it cuts for itself in the bench, or a metal plate with a suitable slot is sometimes used, but a preferable method is to inlay a piece of hard wood and allow the saw to form the groove. Other methods, namely, to guide the periphery of the saw by rollers, or to employ two small saws in lieu of a larger one, are devices familiar to our readers. Sawing apparatus of both these and of nearly every other description, will be found illustrated and explained in the back and current volumes of the "Scientific American." When it is designed to use this tool for cutting wood at any angle, it is customary to make the platform adjustable, and that to an extent commensurate with the exigency of the case; a more simple way is to use supplementary wooden beds placed to the angles required. A plan for cutting weather-boards out of a sound log, has been proposed, when the timber is placed between centres over the revolving saw, which makes a vertical and radial incision, the tool is then released and the wood shifted on its axis for a new cut, so that the entire tree is sawn into feather-edged boards. In this instance the saw is novel in design, on account of its being buried so deeply in the wood, a circular plate is fitted with four pieces of steel, each having two teeth, while a great velocity atones for the paucity of these latter.

The cutting of veneers is undoubtedly the most remarkable instance of the precision that can be attained in the operation of sawing; for this description of work the saw is generally large, and here advantage is taken of the pliancy' of the veneer, which allows the saw to be thick towards the centre, whilst it is thinned away towards the edges. In the large application of the principle, the saw is composed of many segments, and is often 18 feet in diameter. For sawing ivory in thin leaves, the saw is a single plate from 6 to 36 inches diameter, when frequently a block only one inch thick yields thirty leaves. But when a large log of timber is to be cut into veneers, and the saw exceeds four feet in diameter, it is formed of segments firmly secured to an iron plate, whilst the timber has two motions, the one longitudinal and the other lateral, to advance it sideways between each cut. This latter object is effected by adjusting screws and worm wheels moved by a handle, which makes 50 or 60 turns to advance the log one inch, the veneer, as it is cut, being guided off from the saw. There is a mode of superseding the saw in veneer cutting, which has several times been proposed, and probably originated in Russia, where a machine is employed capable of cutting an entire tree into one spiral veneer with a knife, as if the veneer were uncoiled like a piece of silk from a roller. In France, the plan has been applied to iron and sheets obtained measuring 150 by 30 inches. This plan, however, is not adapted for brittle woods, and does not expose the most ornamental section to view, which is the desideratum in veneers, on account of the purposes for which they are always employed, namely, fine cabinet work, and to give a superior appearance to the exterior of furniture. Circular saws have likewise been applied to cut off the ends of railway bars whilst red-hot, the saw making 1000 revolutions per minute, and having the lower ends immersed in water.

Marble has, for several years, been extensively sawn by machinery driven by steam power, although the processes are closely analogous to those pursued by hand. The ordinary arrangement is to form a frame by fixing vertically four strong posts well connected together, within this the block of marble is placed, and over the marble is suspended the saw-frame, which reciprocates horizontally, and rolls on pulleys which slide in vertical guides, and are suspended by chains connected to a counterpoise weight, so adjusted as to allow the saw frame to descend when left to itself, and which supplies sufficient pressure for causing the penetration of the saws. The distances between the saws and their parallelism are adjusted by iron blocks, and every blade is separately strained by its wedge until sufficiently tense. The blades, it must be observed, are merely slips of soft iron without teeth, so that the blade itself does not cut but simply serves as the vehicle for the application of the sand, which acts as the teeth of the saw, and performs the cutting process, the action of the saw being assisted by a small stream of water supplied from above. The introduction of the sand and water at the proper time is the chief difficulty in stone-sawing, to allow the cutting material ready access beneath the edges of the saw blades, the frame is slightly lifted during each stroke, and by the usual system the end of the stroke is the period chosen, but a recent patent points at the central position as most eligible. The traverse of the frame is, perhaps, preferably given by a jointed connecting rod attached by an adjustable loop to a long vibrating pendulum put in motion by steam power. The circular saw is also employed for cutting slabs of marble into narrow pieces, but although termed a saw, in work of this kind it is, in reality only a disc of iron without teeth, several of these being fixed on a revolving mandrel, whilst the marble is placed on a reciprocating bed which travels with a slow traversing movement.

(To be Continued.)

[For the Scientific American.]

Burning Fluid and the Newell Lamp.

As I am willing to avow myself the writer of the article in the "Haverhill (Mass) Gazette," respecting burning fluid, and the Newell Lamp, an extract from which, with some comments thereon, you publish on page 160 of your useful journal, I trust you will suffer me to say a word in vindication of its justness and entire correctness. since it has been called in question by the statements of Dr. C. T. Jackson, Newell, and others.

I wish to be brief, and therefore I will say at once that every statement contained in that article is strictly and entirely correct, and I challenge the parties denying them to prove them otherwise. I am ready to show by proof, which will not be questioned a single moment, that hundreds of gallons of "turmeric colored" burning fluid is sold every week in Boston. I will produce a highly respectable manufacturer of burning fluid, who will testify that he has been provided with a glass measure, and been directed to add it full of tinct of tumeric to each barrel of burning fluid, by a dealer in "Safe Patent Oil." Who will connive at and deny the existence of such outrages? Is this gentleman, who is a "distinguished chemist," willing to meet me on this subject? This gentleman uses a "hydro-carbon fluid, with diluted alcohol, containing 20 per cent. of water, which makes it less dangerous," &c. No chemist would ever make a statement like this. I profess to be somewhat intimately acquainted with the exact chemical nature of all volatile hydro-carbon mixtures used for purposes of household illumination, and do not believe in such a mixture as that, containing 20 per cent. of water. Will he give me the formula for the mixture he uses, I wish to examine it?

I stated in the article in the "Gazette," "that if Newell was to be believed these holes in the cap of his lamp were ordered by Jackson." Gentlemen of the highest respectability in Boston have signified their willingness to testify, under oath, that Newell has stated to them, repeatedly, that Jackson would not give his certificate until the holes were made. It is generally understood that Dr. Jackson proposed them. The holes still continue to be made in the cap, and it is a mild term you use, Messrs. Editors, when you call them a "scientific blunder." You state that you have been unable to find a record of Jennings' old patent for wire-gauze tubes, like Newell's, taken out in 1836. You will not find it in the books; it was, I think, destroyed at the time the Patent Office was burned. A record of the patent is on file at the Department. Any one who has any doubt respecting the granting of this patent can receive positive information by writing to the Commissioner. I have, in my hand, at this time, one of Jennings' gauze tubes probably a dozen years old. There are many of them in existence in Boston at the present time. In respect to burning fluid, I wish to say that I have not, and never have had, any interest whatever in the manufacture or sale of the article.

Jas. R. Nichols.

Haverhill, Mass.

[See some remarks on this letter on page 189.—Ed]

The Tunnelling Machine.

Messrs. Editors—I perceive in your paper of the 5th inst. a paragraph, that, from a similarity of phraseology, seems to have been copied from a paper in this city. It announces with much plausibility that "the Hoosic Tunnelling Machine has proved a failure." To enable you to see how much truth there is in that assertion, I wish to quote the very language used by one of the most distinguished engineers of Western New York, in a conversation between himself and one of our city lawyers of high distinction; in answering the question, "what is your opinion of the machine?" he said, "I have seen the machine operate and have examined it well: it is my deliberate opinion it will cut out more rock in a day than can be removed by any means known to me." If that can be called a failure, what must it be capable of doing to entitle it to the appellation of a successful machine? As I am a constant reader of the "Scientific American," such an expression of opinion on its page must, of course be somewhat annoying to me, as I claim to be the inventor of said machine, and have ever entertained the highest respect for the candor as well as the scientific character of your paper. I take the liberty of sending you an article on the doings of the machine by an eye-witness, who has honestly given the dark as well as the bright side of the matter. If you have not seen this before, it may afford some additional light on the subject, and I cannot yet believe you are one of those who prefer darkness to light.

Chas. Wilson.

Boston, Feb. 9, 1853.

[The article referred to by Mr. Wilson appeared in the "Boston Transcript" of the 7th inst., which confirms the opinion expressed by the engineer mentioned above. We entertain something of a dread to notice anything that appears in some papers, as news, about inventors, for the very reason that nine times out of ten it is incorrect—either wilfully or by mistake.

Basket Willows.

I have lately seen in several papers, articles on the basket willow, and in your last paper you give the amount paid for the foreign article. There is perhaps not a place in the country where the willow could be cultivated to as good advantage as on our alluvial meadows along the Connecticut river. It grows here spontaneous of all sizes and sorts from the fine seedling to the coarse, which is just fit for hampers. There is no attention paid to it here, except to clear it out of the land, which is a work of much labor. I have seen the finest work made from it, of all kinds, from the most beautiful fancy baskets, to the largest and best willow cradles. There is a celebrated basket maker here, who makes all his work from those willows; he has been all over Europe, and he has repeatedly told me that there is no place where he has ever been, where willows grow so fine and good as here. His prepared willows have often been exhibited at our fairs, and as far as I could judge, were of very superior quality. Any quantity can be gathered in our meadows.

Yours, W. Bigelow.

Hartford, Conn., Feb. 14th 1853.

Labor Law in Rhode Island.

The Senate of Rhode Island have passed a bill regulating the employment of minors in factories. The act provides that children under twelve years shall not be employed in any manufacturing establishment in that State, and children between twelve and fifteen shall not be employed more than eleven hours in any one day, nor more than nine months in any one year, and these children must attend school at least three months in the year. The bill provides that ten hours shall constitute a day's work.

Sperm Oil.

The New Bedford, Mass., "Standard" has the following:—"We understand that $1,30 per gallon has been refused for sperm oil during the past week. The last sales that have come to our knowledge were made at $1,28. The quantity in the market is extremely small. The vessels which are to arrive here within the next few weeks will make profitable voyages for the owners."

United States Survey.

The United States Survey in California is rapidly progressing, the base line being already completed seventy miles. It will probably touch the sea coast some four miles north of Los Angeles. Mr. Gray is following Col. Washington, and is surveying a range of townships.

The French Navy.

No less than twenty ships of the line are now building in the French dock-yards, and for the greater number of them screws have been ordered. In addition to these there are eighteen frigates and fifteen other vessels of different classes building, which are to be all propelled with screws.