## sCientific and practical information.

## TUNGSTEN IN THE ARTS.

In the last few years the consumption of tungsten and its compounds has vastly increased. It is now used for improving the quality of puddled iron and steel as well as cas steel, and is one of the constituents of Mushet's special steel. Its addition to German silver renders it tougher, and it is employed in many other alloys with gold, silver, lead, etc One alloy called minargent contains 100 parts copper, 70 nickel, 5 tungsten, and 1 aluminum. Bartels in Hanove makes a large number of tungsten preparations for use in dyeing and printing; the tungstate of soda serves as substi tute for tin salt, for fireproofing fabrics, and for the manu facture of bronze powder and blue carmine. In cosmetics tungsten is taking the place of white lead and zinc. Tung sten in steel gives it the property of retaining magnetism for a longer time and makes it useful for magnetic needles.

## CONVERSION OF STARCH INTO SUGAR

The conversion of starch, cellulose, and the like into glu cose or grape sugar has usually been accomplished by the use of dilute acids in open vessels. Soine Parisian chem ists, Gibon, Dusart, and Bardy, now propose to conduct this operation in closed cylinders under a pressure of 3 to 4 at mospheres. The proportions taken are $35 \cdot 3$ cubic feet wa ter and $4 \cdot 4$ pounds sulphuric acid to 4,400 pounds dried starch, and the operation lasts two hours. If a thicker sirup is desired, it is only necessary to diminish the amount of water taken. Some other acid may be used than sulphuric. The advantage of the process consists in obtain ing the desired product by a single operation, since neither concentration by evaporation nor filtration is necessary.
determining the quantity of alcohol in fusel oil
When fusel oil is imported into England, it is admitted free of duty, provided that it does not contain over 15 per cent of alcohol of 0.92 specific gravity. The method employed in the London custom house for determining the amount of alcohol depends upon the insolubility of fuse oil in water. A certain quantity of the liquor to be tested is shaken with an equal volume of water and left standing for 12 hours. At the end of that time two layers are formed the upper one of fusel oil, the lower of alcohol and water. The specific gravity of the latter is taken, and from it the percentage of proof spirits is calculated

This method, according to Dr. G. L. Ulex, gives too high a percentage of alcohol, for crude fusel oil contains not only amylic alcohol, but also ethylic, propylic, and bitylic alcohols, which are more soluble in water. Ethylic alcohol is soluble in every proportion, propylic alcohol is very soluble, butylic alcohol dissolves in 10 parts of water, amylic alco hol is as good as insoluble.
From some experiments by theauthor, he found that fusel oil from beets consists of 2 parts of soluble alcohols and 1 part insoluble alcohol, and that only a small part of the former is wine alcohol. Although this liquor contains only 3 to 4 per cent of proof spirit, according to the custom house rules it would seem to contain 40 per cent of proof spirit and be taxed accordingly. This leads to very great injus tice in English import duties, and although this law is not in force here, we give the following more accurate method of making the determination

The boiling point of absolute (ethylic) alcohol is $173.12^{\circ}$ Fah. ; that of propylic alcohol, $206.6^{\circ}$ Fah.; butylic alcohol, $228 \cdot 2^{\circ}$ Fah. ; amylic alcohol, $269 \cdot 6^{\circ}$ Fah., so that this difference can be employed in separating them. If wine alcohol is present in considerab'e quantities, it alone will be found in the first portion of the distillate. Three and two fifths ounces of the fusel oil to be tested is placed in a retort and 1.35 drams distilled off. This distillate is mixed with an equaĩ quantity of a saturated solution of common salt, and, after shaking, left to settle. If the quantity of fusel oil then found floating on the top is 40 minims or more, it is certain thet less than 15 per cent of proof spirits is present, and hence it is free of duty. If the quantity of fusel oil is less than that, the liquor is tested by mixing it with an equal quantity of salt solution, shaking, and allowing to rest

The salt solution is then separated and distilled by itself and the quantity of proof spirit determined in the distillate by taking its specific gravity

## the velocity of lioht.

Olaf Roemer, an eminent Danish astronomer, whiie ob serving the eclipses of Jupiter's satellites, in 1676, found that light occupied about 16 minutes and 26 seconds in pass. ing through the diameter of the earth's orbit, and assuming the distance of the earth from the sun to be nearly 95,000 , 000 miles, he determined the velocity of light to be 192,500 miles in a second.
In 1723, Bradley, an English astronomer, discovered the aberration of light, and determined its velocity to be 191,515 miles per second.
In 1849 , M. Fizeau invented an apparatus for measuring the velocity of light between terrestrial stations, and determined it to be 194,677 miles a second.
M. Foucault, with substantially the same apparatus, determined the velocity to be 185,177 miles per second, and showed that this result was correct to within $\frac{1}{500}$
Quite recently M. Fizeau has published the particulars of stations about 6 miles apart, using the rays from a oxyhydrugen light; and he gives, as the mean of 650 good observations, a velocity of
186,363 miles per second. The result obtained by Roemer is usually given in test books, and in fact is commonly quoted as the correct velocity of light. But the close agreement of the more recent researches of MM. Foucault and Fizeau, and
the elegant methods used by these philosophers in their researches, render it nearly certain that the velocity of light

## sUlphite of soda as an antichlor

The term antichlor, which applied originally to any sub stance employed to destroy the free chlorine remaining in fabrics bleached with it, is now almost entirely limited to hyposulphite of soda, $\mathrm{Na}_{2} \mathrm{~S}_{2} \mathrm{O}_{3}$. During the reaction of this alt upon chlorine, free suiphur is deposited upon the fab ics, much to their detriment. The probable reason, that thi has never before been observed, is because its injurious ef fects have been attributed to overbleaching. This finely di ided sulphur, when deposited in the fiber of paper, gradual y oxidizes to sulphurous and sulphuric acid, which renders the paper brittle, and, if wriiten upon withiron ink, bleaches or fades it. This effect upon paper has sometimes been at ributed to its containing too much wood fiber.
A larger quantity of active sulphurous acid can be ob tained from a given weight of sulphite of soda, $\mathrm{Na}_{2} \mathrm{SO}_{3}$ than from an equal weight of the hyposulphite, and from this no sulphur is deposited, so that it ought most certainly to be preferred for use as antichlor on a large scale. W are informed by large manufacturers of chemicals that sul phite of soda can be made at a price not higher, in propor tion to its efficiency, than the hyposulphite.

## Jet-mHow and Where it is obtained

A writer in the Practical Mayazine gives the following interesting particulars regarding jet, a material much used for the manufacture of mourning jewelry. In this country, we may remark, the substanceis largely imitated by vulcanized rubber, which, when new, closely resembles the genuine arti cle. Real jet jewelry mounted in gold is worth from five and six to as high as seventy dollars per set, the price, how ver, depending principally upon the quantity of preciou metal used. It is very serviceable, and, unlike rubber, it re tains its brilliancy
Jet is of two distinct species-hard jet and soft jet-but the latter is of very minor importance and will be referred to ereafter.
The hard jet is found in the strata known as the jet rock, which appears to be a deposit of sea anemones, and some years ago a patent was taken out to distil petroleum from

The jet rock occurs in the lias formation, some thirty yards bove the main band of Cleveland ironstone, and is discov ered in compressed masses in layers of very different sizes being generally from half an inch to two and a halfinches in thickness, from four to thirty inches wide, and four or five feet in length. It invariably tapers away, running, as the miners say, to a "feather edge "
These jet layers are always protected by a skin, the color making another division; for that found in the cliffs by the sea has always a blue skin, while that discovered in the inland hills has a yellow coating. The jet found in the same mine varies very much in quality; its worst specimens, those which are quite brown aud will not take a polish, are termed dazed jet.'
The soft jet is confined to the lower oolite-in the sandstone and shale-some 160 yards higher than the hard jet, and is undoubtedly of a pure ligneous origin, the fiber and the branches of trees being more or less distinctly marked.

The most valuable finds of jet have been washed down by the sea's action, where the jet rock crops out in the cliffs, and on the cliffs, where the seams are exposed. The dealera of the town of Whitby, in Yorkshire, England, where the principal deposits of the material exist, rent these jet cliffs and inland seams from the owners, generally for a fixed lump sum paid in advance-not for a royalty-for the right to work a certain number of yards. Nearly all the jet now obtained is found inland, but in former days tales are told of men being swung by ropes over steep cliffs like the eiderdown hunters of Norway. At present, cliff jet is worked with the same mining operations as that lying under the inland hills.
The process is very simple, and, to those acquainted with the intricacjes of iron and coal mining, of no very great interest. A mine is commenced by drifting into the face of a rock a passage of seven feet by five. A tramwa is then laid down, and the shale is tilted from the mou of the mine, the drift continued for about forty yards, at the rate of from two to fcur feet per diem; then cross drifts are started in a variety of directions. As soon as the rock
becomes too hard, the miners retire, pulling in the roofs becomes too hard, the miners retire, pulling in the roofs
as they recede, for the bulk of the jet is found generally in the falling top rock.
There are at present twenty-three jet mines in full work, only one of these being of soft Jet. The average number of men employed in each mine is six, and there are now some hundred and fifty miners engaged in this industry The men are generally paid by the week, and only earn fom the high wages of the iron miners.
Hard jet varies in prices from 75 cents to $\$ 3.50$ per lb. soft jet from $\$ 1.37$ to $\$ 7.50$ per stone, according to size and quality, and sometimes also according to the fluctuations of the market. For instance, when the Prince of Wales life was in danger, Whitby was thronged with buyers for both the raw and manufactured article at any price, and some speculators were severely bitten by his happy re
It is stated that the turn-over in rough English hard je mounts to $\$ 200,000$ annually.
The material is manufactured as follows: The jet is first peeled and stripped of its skin, be it blue or yellow; by meăns
of a manual chipping process with a heavy iron-handled chisel It is then sawn up into the exact sizes for the object for which it is intended, the saw being guided by an ingenious arrangement of little wooden directors. Much care is taken in this process of " sawing up," for great economy can, by rigid supervision, be effected, one manufacturer stating that by very simple arrangement he was able to make his raw ma erial go a fifth further than any of his rivals. The littl ragments are then del:vered to workmen, who, with th id of small grindstones driven by a foot treádle, take off the anguiar portions and reduce them more nearly to the re quired dimensions. They then pass into the hands of the carvers who, with knives, small chisels, and gouges, soon it be rough work only, cut them into the desire ${ }^{3}$ pattern If the work, however, be really artistic, the carving is of course a much more artistic process; and it is curious to see lads and men, who one migbt fairly think had not the slight est knowledge in the world of art principles, cut deftiy and rapidly cameos that in their beauty of profile resemble the old masterpieces; flower scrolls and groups of fruit hat have a marvellous fidelity to Nature herself; and cru ifixes and pendants that rival all the ingenuity and patienc f the "heathen Chinee." Sometimes you notice them with pattern placed before them, or with a rough design scratched by a knife's point upon the material itself-often est, however, it would seem as though the work were alto gether original.
After being carved, the goods are removed to the polishing room, where the first process, in the case of rough goods, rotta takes place, upo treadle grindstone fed with oil an rottenstone." Then the finish and the polish are given by gainst quickly revolving wheels, covered with chamoi leather for the larger portions and with strips of list for the indented parts of the pattern, the beautiful polish being civen by means of a composition of a red pigment and oil They are then set (the settings all coming from Birming ham) and taken to the warehouse, where they are carded, o strung if necėssary, and priced and packed by young women being then stored for the inspectiou of the buyers.

## NEW BOOKS AND PUBLICATIONS.

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a most valuable feature, and it enables every holder of a book to mark off the changes, weekly.
The Unity of Natural Phenomena, a Popular Introduc tion to the Study of the Forces of Nature. From the French of Emile Saigey, with an Introduction and Note Natural Science in Urbana University. Price $\$ 1.50$ Natural Science in Urbana University. Price $\$$.
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sciences, have been already promulgated by higher authorities than ou present author, there is much food for reflection and pleasant reading in his work, which aspires rather to popularize facts already ascertwined than startle the world by its originality.
reech loaders. By "Gloan," Price $\$ 2$. New York
G. E. Woodward; Orange Judd \& Co., 245 Broadway. The author of this readable ittle book has given, in addition to a pract cal description of the construction, mechanism, and treatment of a breec loading shot gun, a very curious historical account which will suiprise man resders, as it demonstrates the orgin of the breech loading system the style
least four centuries old. The book is written in a chatty, pleasant style least four centuries old. The book is written in a chatty, pleasant
and will be acceptable to the numerous votares of outdoor sports.
Report of the Minister of Poblic Instruction for the
Province of Quebec, for the year 1871. Montreal: I. Minerve Press
This pamphlet gives the reader a favorable impression of the state of education among our Canadian neighbors, and explains the system, of mparting instruction in all branches of knowledge, nuw used in the Britie

Yeast, Protorlasm, an
Thomas H. Huxley F R
he Relations between Matter and Force. By John H. Tice, St. Louis, Mo

Price 25 cents. Boston: Estes and Lauriat, 143 Washington
Street. Street.
The first of the papers In this pamphlet is most weloome, as it gives us one
of the most strikiag of modern theories on the mystery of the origin of ufe of the most strikisg of modern theories on the mystery of the origin of life
as explained by one of the creators of contemporarysotenoe, in a popular and accesssible form. The second essay is full of thought and sound argument and will be widely read as a new contribution to our knowledge of the question of all questionis in the world of pnysics.
Table of Change Wheels for the Screw Cutting Lathe. Camden, S. C.
This heading is all the information we possess as to the origin of one of answered quertes on the proportions of gcrew catting gear, and here we have, neatly printed, the whole subject reduced to tabular form and giving the figures to tbree places of decimals. We regret we cannot give the author and publisher due oredit for this practically useful publication.
Digestion and Drspepsia ; a Complete Explanation of the Plyyiology of the Digestive Processes. By R. T. Trall,
M.D., Author of "The Hydropathic Encyclopædia," The Hygienic Handbook," etc. New York: S. R. W'ells, 389 Broadway.
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ject. The book is coplously fllustrated.

