

left in the holder after each knot and drops out as the holder rotates. There are several types of knotters. The one described is the form in most general use.

While a large number of parts are used to operate the essential parts described, it will be seen that the principle of the self-binding harvester, like that of most machines, is comparatively simple.

A New German Harbor.

A harbor affording increased conveniences for deep sea fisheries has just been completed at Geestemunde, near Bremerhaven. The Prussian State spent about one and one-half millions of dollars on this work. The harbor is 3,940 feet long, 263 feet wide, and 14.5 feet deep at low water. Coal yards and storage houses are provided, and the present arrangements permit of the simultaneous unloading from fifteen ships. A special electric light plant and special water works have been constructed for this harbor. The government expects that these improvements will greatly assist German fishermen, says Uhland's Wochenschrift, in their struggle with foreign competitors.

THE PULPIT OF THE CATHEDRAL OF TREVES.

Of all the countless thousands of tourists who rush up and down the Rhine on the steamers, probably not one per cent ever visit the old city of Trèves, or Trier, as it is called in Germany, though it is one of the most interesting places in the empire. Trèves is situated on the right bank of the Moselle, and can be reached from Coblenz by rail or by the river Moselle. A tribe of Belgic Gauls who occupied the territory were conquered by Cæsar, in B. C. 56. In the reign of Diocletian, Trèves became the capital of Belgica Prima, and during the fourth century it was frequently the residence of the Roman emperors. After the introduction of Christianity, the old Roman city became the residence of bishops, archbishops, and electors, until Clemens Wenceslaus, the last elector, transferred his residence to Coblenz, in 1786, and in 1815 it was ceded to Prussia.

The city is picturesquely situated in a rich plain surrounded by vineclad hills and wooded heights. Several of the Roman structures still remain in very fair preservation. The principal monuments are the Porta Nigra (a fortified city gate), the brick basilica, the Roman palace, the amphitheater, Roman baths, and the Igel monument, one of the most interesting Roman relics north of the Alps. Even the cathedral itself derives from the Romans. It is one of the oldest churches in Germany, the nucleus consisting of a quadrangular basilica erected by the Emperor Valentinian I (364-375) for commercial purposes and the administration of justice. The church, which was made out of the basilica was partially destroyed by the Franks, but was restored in the original style some time about 550. It was again devastated by the Normans and was restored and increased in size about 1025. The vaulting of the nave and aisles dates from the thirteenth century. The interior contains several monuments worthy of note, and in the high altar is the "Holy Coat" without

seam, which is exhibited at rare intervals. This is one of the most famous, if not the most famous of relics.

One of the best bits of detail in the building is the pulpit shown in our engraving, dating from 1572. It was the work of Hans Ruprecht Hoffman. The pulpit

hundred miles in twenty-four hours, or about four and a half miles an hour. This would have been a notable advance, for the carriers were then taking nearly thirty hours between Philadelphia and New York. The roads were bad and there were many slow ferries.

. . . In 1776 there were only twenty-eight post offices in the Colonies; in 1795 there were four hundred and fifty-three, and in 1895 there were 70,064. The rates of postage when the department was organized under the Constitution were high; for thirty miles, six cents for one letter sheet; for sixty miles, eight cents; for one hundred miles, ten cents, and so increasing with the increased distance to the maximum, twenty-

five cents for distances over four hundred and fifty miles. Stamps were not in use in those days, nor was the sender of a letter required to pay the postage in advance. The postage, six cents or twenty-five cents, as the case might be, was written by the postmaster on the letter, and if the sender paid the postage the word 'paid' was added; if he did not, the postage was collected of the person to whom the letter was addressed. These rates soon yielded a surplus over the cost of the service, spite of the franking privilege which the law gave to congressmen and the heads of departments. . . . The demand of the newspapers and periodicals of every class for cheap postage, seconded by their subscribers, has led to a reduction of rates greatly below the actual cost to the government. In his report for 1892 the Postmaster-General, after stating that the present letter rates pay twice the cost of the letter mail, says

that the book and newspaper mail is carried at a loss of six cents a pound. In recent years the Post Office Department has been characterized by a very progressive spirit, and it is now rendering, not a perfect service, but a high class service. No other department has more nearly kept pace with the marvelous development of our country."—Ex-President Harrison, "This Country of Ours," in Ladies' Home Journal.

Arrest of Assimilation.

Mr. A. J. Ewart has carried out a series of experiments on the power of arresting assimilation in green plants exercised by certain agencies: Dry and moist heat, cold, desiccation, partial asphyxiation, etherization; treatment with acids, alkalies and antipyrine; accumulation of the carbohydrate products of assimilation; immersion in very strong plasmolytic solutions, prolonged insolation, etc. He finds, says the Journal Linnean Society, that if the cell remains living the induced inability to assimilate is only temporary; the cell continuing to respire during the whole time of arrest.

In the great majority of cases no visible change in the chlorophyll is associated with an arrest of assimilation. Cells in which the green color of the chlorophyll is quite masked by the presence of a brown or reddish brown pigment may exhibit a distinct power of assimilation. In certain cases isolated chlorophyll bodies may continue to assimilate for a short time after removal from the cell to which they belong.

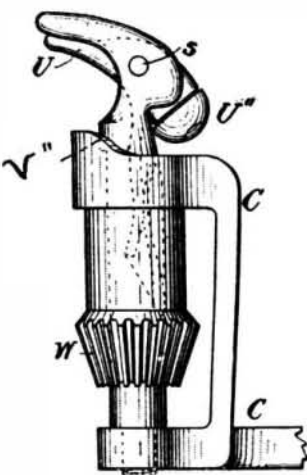


Fig. 9.

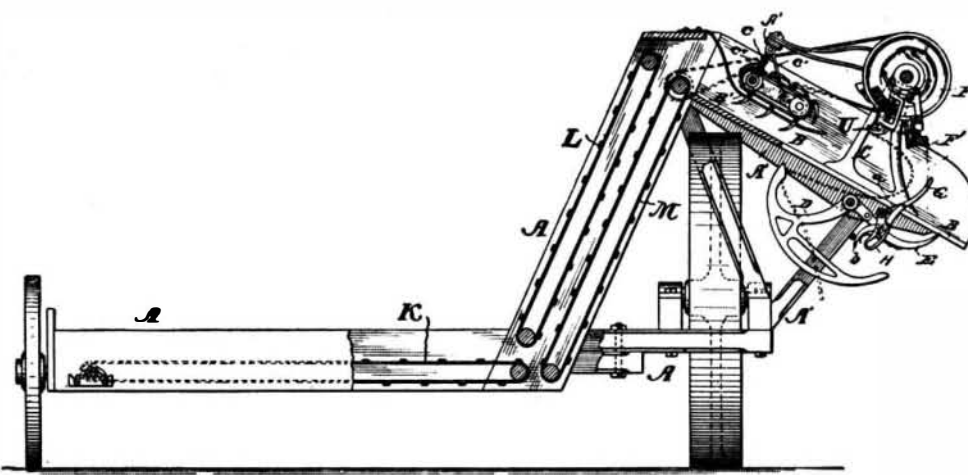


Fig. 1.

is approached by an imposing staircase whose entrance is masked by a doorway. This doorway is heavily overlaid with ornament, though, fortunately, of a good period. The armorial bearings are effectively introduced. The pulpit proper rests on an octagonal column, the facets of the column having small engaged statues. The reliefs on the pulpit are quite high and are well up to the best German work of the period, though they are hardly as pure as the Italian work of the period which had preceded it. A carved canopy completes what is perhaps one of the finest pulpits north of the Alps. For our engraving we are indebted to the Blätter für Architektur und Kunsthandwerk.

Our Mails in the Early Days.

"In Washington's first term an effort was made to speed the mails—to move them at the rate of one



PULPIT OF THE CATHEDRAL OF TREVES.

Science Notes.

Sir Benjamin Ward Richardson, M.D., F.R.S., died on November 21, aged sixty-eight years. An extended biographical notice, with portrait, will be found in the SUPPLEMENT, 1092. He had made important investigations on the effects of anæsthetics, having discovered the use of ether spray for the abolition of pain in local surgical operations. He was the author of many articles and books treating especially of the subjects of public health and social reform. Many of these articles were printed in the SUPPLEMENT.

Some idea of the enormous trade in musical instruments may be gained when it is stated that a single firm, Messrs. Lyon & Healy, has just completed their one hundred thousandth guitar. The time was when nearly all of our musical instruments were imported, but now, thanks to improved methods of manufacture, artists do not have to go abroad for their instruments, and, in fact, American musical instruments are beginning to be known as the standard the world over. They are more durable and more highly finished than foreign goods—the result largely of special American machinery.

The Influence of Mountain Air.

It is a matter of no small interest to that large number of poitrinaires who annually betake themselves to the mountains for the winter months to ascertain how the benefit is brought about which they undoubtedly receive. By many the mechanism of the Alpine cure has been a mere matter of physics, says the London Hospital. Recognizing that phthisis is chiefly prone to occur among those who from their mode of life do not thoroughly expand their lungs, and that in the rarer atmosphere of high altitudes a much more complete expansion of the lungs is necessary, to obtain the same quantity of oxygen, than would be required in the denser air of the plains, the benefit of residence in the mountains has been attributed to a constant unconscious effort to expand the lung more fully, and to the consequent greater interchange of air in its recesses. Certainly the marked enlargement of the capacity of the chest which is often found after a few months' residence in the high Alps, and the tendency to the development of compensatory emphysema around the diseased and contracting portions of the lungs, tend to show that this theory is correct so far as it goes. But all who go into the Alps feel that there is something more than this in mountain air, and it has recently been shown that not only do the chest muscles adapt themselves to the new conditions, but that the blood itself becomes altered in response to the lessened amount of the more rarefied oxygen which each blood corpuscle can carry.

The effect of this process of adaptation is that the red corpuscles multiply considerably while, according to some, the hemoglobin is also increased. In any case, the oxygen carrying capacity of the blood is increased. This accords fully with the well known effect of mountain air in the treatment of anemia, and also with the feeling of well being felt by visitors to high altitudes. It does not do, however, to dissect a climate too much, or to attribute to one or two factors what really is due to the concurrence of many influences, and it seems probable that mountain air depends for its efficacy on many conditions besides its lessened density, such, for example, as its purity, its dryness, and its comparatively low temperature, combined with the intense solar radiation common at high altitudes. That these are the really important conditions, and that lowered barometric pressure is not everything, is shown by the fact that to get the full benefit of the mountains people must get out of doors, whereas the lessened density of the air should affect those indoors just as much as those outside. Nevertheless we are quite prepared to believe that the compensatory blood changes produced by residence in the mountains are important elements in the "mountain cure."

New Docks at Gibraltar.

Under date of August 31, 1896, Consul Sprague, in his annual report, refers as follows to the building of new naval docks in Gibraltar:

The continued increase of the British navy in battleships and cruisers of formidable dimensions is urging upon the government the necessity of establishing, without further delay, increased docking facilities for their new specimens of naval warfare, not only at home, but in the colonies. Gibraltar has been one of the coaling stations which has already received the earnest attention of the Admiralty, owing to its deficiency in dock and other accommodations for the refitting of war ships, besides securing protection from outward attack for the large stock of coal that has to be kept on hand. The construction of these formidable works has already commenced, with the employment of about 4,000 workmen of all classes, who are daily kept hard at work, under the special charge of superintendents sent out from England by the Admiralty authorities, who control everything connected with this important undertaking, which is likely to consume at least five years for its completion and an outlay of several millions of pounds sterling.

ABSOLUTELY PURE ALCOHOL FROM ACETYLENE GAS.

Acetylene, already so much spoken and written of as an illuminant, threatens to introduce itself in the confection of liquors. This use of it may, at first, appear but little appetizing, when its disagreeable odor is considered, but we hasten to say that care is taken to transform it into alcohol, for it is a gas which contains the principal elements of that precious liquid; there remains but to add what is lacking—oxygen.

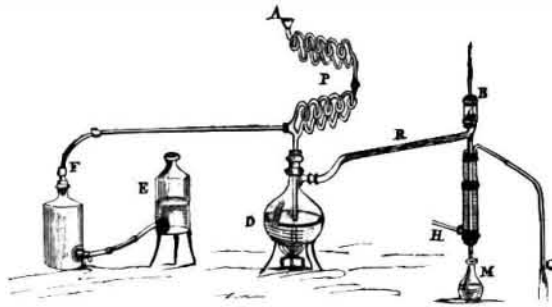
Alcohol is, in effect, a compound of carbon, hydrogen and oxygen; acetylene possesses already the first two elements. We will now give it the third and increase to completion the dose of hydrogen, which was a trifle too small in quantity to bring acetylene quite up to the alcohol stage.

Here is the arrangement, which, although but a laboratory experimental apparatus, is easily made industrial, should a plant based upon this process be established.

In a flask, F (Fig. 1), calcium carbide and metallic zinc are placed: knowing that zinc, when attacked by water acidulated with sulphuric acid, gives hydrogen gas in the presence of water, we see here that the calcium carbide freely evolves acetylene gas. In the flask, E, put, then, water and a little sulphuric acid and connect this flask with the first by a flexible tube, so that, when E is elevated or lowered, we may introduce or withdraw, at will, liquid in the flask, F, according to the need of the production.

The acetylene and the hydrogen, developing at the same time, do not fail to seize the opportunity for combining. In the nascent state bodies always have a greater affinity for each other than at a later stage.

It is of this marriage, then, that the ethylene is born, which, being now disengaged, goes over into the glass worm, P, where it comes in contact with concentrated sulphuric acid heated to 80° (Centigrade), which is slowly poured into a funnel, A; it is here that it gets its oxygen. It now forms a new body, which is ethylsulphuric acid. This is collected in the flask, D, and is brought to ebullition. Here it is decomposed into sul-



APPARATUS FOR MAKING ALCOHOL BY MEANS OF ACETYLENE GAS.

F. Flask containing calcium carbide and scrap zinc. E. Water acidulated with sulphuric acid. A P. Glass worm in which hot sulphuric acid circulates. D. Flask to collect and distill ethylsulphuric acid. R B. Worm for condensing vapors of alcohol. M. Flask for the pure alcohol, condensed. H C. Liebig condenser.

phuric acid, which remains, and may be used again, and into alcohol, which evaporates but is collected and condensed by means of tube, R, connecting with worm, B, surrounded by a current of cold water circulating from H to C.

In M is collected an alcohol absolutely pure,* which industrially produced would not cost more than 20 centimes (4 cents) per liter. It contains none of those essences which are always present in the vegetable alcohol, and which render them dangerous for consumption.

It is not a little curious that alcohol furnished in large quantity by the vegetable kingdom is now going to be given us by the mineral world, and at a ridiculously low price. It would seem that in combating alcoholism we are going against the laws of nature. After all, we had best conclude that if Dame Nature thus places alcohol in profusion within our reach, it is not to take the place of water as a beverage.—From *Le Monde Moderne*. Translated by J. Colton Lynes, Ph.D., ex-president Georgia Agricultural College, etc.

Changes in the Pupil in the Insane.

At the recent meeting of German alienists at Heidelberg, Dr. Soemerling contributed an important paper on this subject. He attaches little importance to a difference in the size of the pupils of the eye, as they are

* The chemistry of the process is not given in the original; it is, however, very simple. In flask F we have
 $Zn + H_2SO_4 = ZnSO_4 + H_2$
 Zinc + sulphuric acid = zinc sulphate + hydrogen.
 $CaC_2 + 2H_2O = Ca(OH)_2 + C_2H_2$
 Calcium carbide + water = slaked lime + acetylene
 At the instant of the above reaction this is formed
 $C_2H_2 + H_2 = C_2H_4$
 Acetylene + hydrogen = ethylene.
 And in tube and worm, A P, we have
 $C_2H_4 + H_2SO_4 (hot) = C_2H_5SO_4$
 Ethylene + sulphuric acid = ethylsulphuric acid.
 Which, being boiled in D, decomposes thus:
 $C_2H_5SO_4 + H_2O + heat = C_2H_5OH + H_2SO_4$
 Ethylsulphuric acid + water + heat = alcohol + sulphuric acid.

not uncommonly unequal in those who are in perfect health. The loss of reaction to light, on the other hand, he regards as of the utmost importance and significance, and of all conditions of the pupil in the insane it is the most frequent and the most important. In 3,010 cases of progressive paralysis it was found to be present in 68 per cent, and it forms an early symptom in this disease, and may exist as an isolated one for so long as ten years without having other symptoms added to it. It is nearly always bilateral, although the two pupils are not always equally affected and the shape of the pupil may be round, oval, or irregular. The sudden and quick dilatation of the pupils is sometimes present in general paralysis, but this occurs also in the healthy, and is probably without much significance. Hippus is rare in paralysis. Except in general paralysis, the loss of light reflex in the pupil is uncommon. Among 9,160 insane this symptom was present in 1,639 cases, and of these 1,524, or 92 per cent, were cases of general paralysis. In syphilis, also, this condition of the pupil is sometimes found without evidence of any other morbid condition. Its occurrence after injuries to the head alone is very doubtful, and it probably does not occur in simple and uncomplicated hysteria. In short, he regards the loss of light reflex as a symptom of weighty import and grave significance. If it is not a precursor of tabes dorsalis or general paralysis, it at least indicates a profound disturbance of the nervous system, and it may be present long before any other morbid phenomenon manifests itself. A few other unimportant variations in the pupil in connection with epileptic and other attacks are referred to, and, in conclusion, the question is raised as to the position of the central mechanism on which the pupillary reaction to light depends. No definite group of cells can as yet be indicated as the center for this reflex.—*Lancet*.

Artificial and Natural Petroleum.

M. Francis Laur, in a communication to the *Echo des Mines*, says the *American Gas Light Journal*, calls attention to the unexpected discovery of the artificial production of petroleum, which, he says, starts a new question of great interest to scientists, as to whether petroleum is an ancient deposit in the earth's surface or is being reproduced to-day in the lower series of measures. Those who consider that the production of petroleum is contemporaneous are, says M. Laur, unable to account for the method of its formation, and have to be content with the mere hypothesis of certain obscure reactions which took place in the bowels of the earth. Now, however, it is only needful to invoke the presence of the metallic carbides which exist in the central nucleus and which can be reached by the water which is sucked in through the earth's crust, so that it is rational to suppose that firedamp, acetylene, petroleum, tar, and inflammable gases of all kinds may be produced and infinitely modified by the difference of pressure and temperature. Arguing from this point, M. Laur suggests that Lake Baku must, if this is the case, be the outward and visible sign of a natural production of hydrocarbons, while the Caspian Sea, whose issue has not so far been determined, but whose boundary does not grow less, may be regarded as a natural means of feeding the important internal laboratory where the petroleum is produced.

Skilled Workmen Choose the Scientific American.

One of the largest and most influential manufacturing concerns in the Western States, the W. F. & John Barnes Co., of Rockford, Ill., has been in the habit for several years of making a Christmas present of a year's subscription for the *SCIENTIFIC AMERICAN* to those of its workmen who wished to take the paper. This year twenty-one copies were thus subscribed for. In order to ascertain the comparative popularity of our journal among its employes, we wrote the firm as follows: "We would like to know whether the *SCIENTIFIC AMERICAN* is the only publication to which you subscribe for your most progressive workmen, and whether you give the men their choice of publications. We make this inquiry as we are a little curious to know as to the popularity of the *SCIENTIFIC AMERICAN* among your workmen."

To this we received the following reply: "In answer to your inquiry we beg to say that the *SCIENTIFIC AMERICAN* is the only publication for which we send subscriptions for our men. We would, of course, be perfectly willing to send subscriptions for other papers or magazines if they desired, but they do not seem to make any inquiry for anything but the *SCIENTIFIC AMERICAN*."

Emil Du Bois-Reymond.

Prof. Emil Du Bois-Reymond, the distinguished physiologist, died in Berlin on Saturday, December 26. He was born in Berlin in 1818. He began studying theology, but abandoned this for natural science. After a sojourn at Bonn he returned to Berlin, and studied anatomy and physiology under Jean Muller, and on his advice undertook his researches in animal electricity, on which subject he published several works. In 1868 he replaced his master as professor of physiology at the University of Berlin, and was named, in 1867, perpetual secretary of the Berlin Academy of Sciences.