United States Timber Test Work.

Although all the leading railroad engineers, architects, professors of engineering, and others interested in the timber tests had flooded with hundreds of letters their Representatives and Senators and the Committee on Manufacturing, in whose hands the special appropriation for the work was pigeon-holed, neither the committee nor the House paid any attention to this expression of public interest. The Senate, however, realized that there was value in the work and sincerity in its indorsers, and increased the appropriations for the Forestry Division by $8,000, that is, 20 per cent of the amount asked and considered by those in charge as necessary to continue the work on a proper business basis.

Under the circumstances, the testing will be discontinued until after July, when the new appropriations become available, and then proceed at the slow pace which Congress has set.

Although the result of the efforts of those who took active interest in securing appropriations for the work were not crowned with that success which they deserved, this is the only proper method of influencing legislation, and those interested in the investigation should not fail to move again when the new Congress assembles.

The first compilation of test results is now in the hands of the printer, and will probably be issued within six or eight weeks, as Bulletin 8, Timber Physics, part 2. It will contain the results obtained on longleaf pine, and will especially discuss in detail the results of tests and examinations of bled and unbled timber, results which in themselves justify the expenditure by the government of money on such work.

The Forestry Division will exhibit the methods pursued in this work at the World's Fair, which will be of interest, since nowhere in the world has such comprehensive and systematic investigation of timbers been ever devised. The working plans for a similar undertaking by the Prussian government have only just been perfected.

Another exhibit of interest to railroad engineers and those interested in reducing forest waste will be a collection of the most approved types of metal railroad ties.

ANOTHER EARLY FRENCH PATENT FOR A BARBED WIRE FENCE.

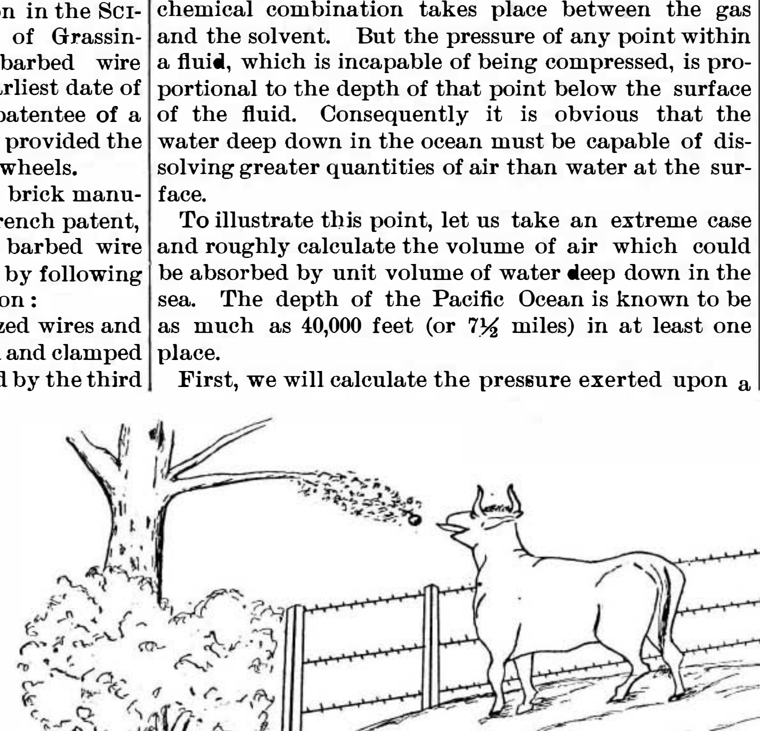
BY A. M. TANNER.

The writer has already called attention in the SCIENTIFIC AMERICAN to French patents of Grassin-Baledans, 1861, and Jannin, 1865, for barbed wire fences, which are both anterior to the earliest date of invention set up by the first American patentee of a barbed wire fence, who, as is well known, provided the wires of a wire fence with a series of spur wheels.

Almost about the same time a Breton brick manufacturer, Gilbert Gavillard, received a French patent, dated August 27, 1867, No. 77,570, for a barbed wire fence, which may be described as follows, by following as nearly as possible the French description:

This fence is composed of three galvanized wires and of spines, also galvanized, placed between and clamped by two strands, while the heads are covered by the third strand. These strands of galvanized wire are twisted together, so as to present iron thorns on all their faces. In order to form a fence, it suffices to plant posts in the ground and attach thereto, by means of iron wire hooks, three of these artificial thorny branches, which are placed at a sufficient distance apart to prevent animals from going over this thorny obstacle.

A drawing annexed to the patent is herewith reproduced.



AN EARLY FRENCH PATENT ON BARBED WIRE.

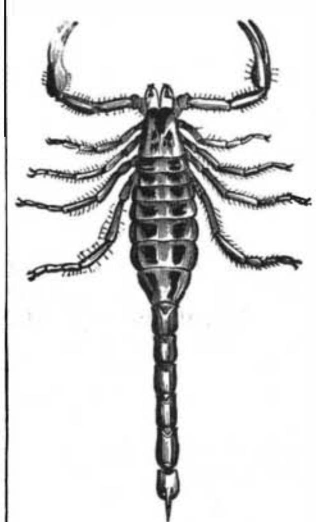
It will be seen that it presents, in a very striking way, how an ox is prevented from reaching an apple on the other side of the barbed fence. Although the drawing does not show the form of the barbs, it is evident that they are ⊥-shaped, and that the third wire or strand prevents the barbs from dropping out by locking them in place between the two other strands. The Gavillard patent may be considered as resembling the Michael Kelly patent, of February 11, 1868, No. 74,379.

Utilization of Coal Dust.

The London *Times* gives an account of a process by which anthracite coal bricks are now being manufactured by the Coal Brick Syndicate, of London. The bricks are made of grains of anthracite dust, which are forced to cohere by means of a special cementing compound and by great pressure. The coal dust is mixed with the binding material in the proportion of 96 per cent of the former to 4 per cent of the latter. The compound is fed into a mixer, where it meets a jet of steam, a stiff paste being formed, which is delivered successively into a series of moulds under a pressure of 25 cwt. As the mould plate revolves, the charge in each mould is brought between two rams, which exert a pressure of two tons per square inch on each side of the charge, forming a very dense and homogeneous coal brick. The brick, still in the mould, passes on to the delivery ram, by which it is pushed out on to a table, and is removed for the market. These coal bricks are said to make an excellent fuel and to possess a very high efficiency for steam-raising purposes. The *Times* thinks that with such a fuel at the disposal of the public there is room to hope for a reduction in the pollution of the atmosphere of towns, as well as a reduction in the coal bills of steamship companies and of steam users generally.

THE DEADLY SCORPION.

The scorpions have become so numerous in the city of Durango, Mexico, that the municipal authorities have offered a valuable prize, to be given the person capturing the largest number this month. Two thousand of the deadly pests were killed at the hospital there recently in one day. For these scorpions the city pays 60 cents a hundred, and three times a week those collected are counted and killed at the hospital, and 80,000 were thus destroyed last year. Persons who get permits to hunt the pests have the right to enter and search private houses for them.



We give a cut of the little *Buthus carolinianus*, or, as it is now called by systematists, *Centrurus vittatus*. This is the commonest scorpion of the United States, and is found as far north as Tennessee and North Carolina. Of the larger species of the Southwest we have no figure. This, however, will do fairly well for a representative of the family.

The Submarine Atmosphere.

BY A. E. RICHARDSON, B.A., F.C.S., A.M.I.E.E.

It is a well known fact that the amount of gas capable of being held in solution by a given liquid is directly proportional to the pressure exerted, unless chemical combination takes place between the gas and the solvent. But the pressure of any point within a fluid, which is incapable of being compressed, is proportional to the depth of that point below the surface of the fluid. Consequently it is obvious that the water deep down in the ocean must be capable of dissolving greater quantities of air than water at the surface.

To illustrate this point, let us take an extreme case and roughly calculate the volume of air which could be absorbed by unit volume of water deep down in the sea. The depth of the Pacific Ocean is known to be as much as 40,000 feet (or 7½ miles) in at least one place.

First, we will calculate the pressure exerted upon a cubic foot of water at that depth. Assuming that the specific gravity of sea water is roughly 1·026, a cubic foot of sea water will weigh 1,026 oz. (a cubic foot of distilled water is generally taken as weighing 1,000 oz.) Then the pressure exerted per square foot at a depth of 40,000 feet will be

$$40{,}000 \times 1{,}026 \text{ oz.} = 40{,}000 \times \frac{1{\cdot}026}{16} \text{ lb.}$$

Hence the pressure per square inch will amount to

$$\frac{40{,}000}{144} \times \frac{1026}{16} = 17{,}812\tfrac{1}{2} \text{ lb.}$$

The pressure due to one atmosphere may be roughly taken as 15 lb. per square inch. Thus the pressure at a depth of 40,000 feet is equivalent to that of 1,187 atmospheres. This, with the pressure due to the air above, amounts to 1,188 atmospheres.

It must be borne in mind that this is only an approximate calculation. For instance, the density of sea water is taken at a rather low figure, and no allowance is made for the compressibility of sea water under great pressures.

Accepting, however, 1,188 atmospheres as the approximate pressure at the stated depth, let us calculate the volume of air which a unit volume of the water would be capable of dissolving under this pressure.

I have no data at hand for the absorption coefficients of sea water for oxygen and nitrogen or for air; so I will take the coefficients for pure water. Here again an error will arise, for sea water cannot absorb so much air as ordinary water; for it has been found that in solutions of different substances the solubility of gases is in most cases diminished.

One volume of water at normal temperature and pressure absorbs about 0·0245 volume of air. With the temperature remaining constant the volume of gas absorbed remains the same under all pressures. But this volume of air, under a pressure of 1,188 atmospheres, would occupy a volume of 0·0245 × 1,188 under normal pressure. This quantity amounts to 29·106 volumes. Hence a cubic foot of water at a depth of 40,000 feet is capable of absorbing 29 cubic feet of air measured at normal pressure.

Since a c. c. of air weighs 0·00129 grm., 29 c. c. will weigh 0·037 grm. That is to say, the water in question would be capable of dissolving about 1-27 of its own weight of air. Nor does there seem any reason to suppose that this amount of air is not absorbed, for the atmospheric gases must permeate the whole of the ocean's depth in order that deep sea fishes may obtain the oxygen necessary for the preservation of their existence. At a depth of 1,380 feet water absorbs its own volume of air (measured at atmospheric pressure). Thus in all water below this depth there is dissolved more than its own volume of air. We have then a second but submerged atmosphere.

In this most marvelous submarine atmosphere are vast quantities of air stored away—how vast it is difficult to estimate. Remembering that three-fourths of the face of the earth is covered by water, one is apt to conclude that there is almost as much air hidden away in the ocean's depth as is found above its surface. What effect such great pressures have upon the solvent powers of the water for solid constituents it is doubtful to say. Probably the solvent powers are much modified by the presence of such quantities of dissolved gases. It is possible that such considerations as the foregoing have already appeared in print. As, however, I have never read or heard of such suggestions, I venture to bring the question before your readers.—*Chem. News.*

Aluminum Light.

A remarkable kind of light has been successfully exhibited by Dr. Philip Lenard, of Bonn, and has formed the subject of a paper read before the Royal Prussian Academy of Sciences at Berlin. Hertz has shown that the rays which proceed from the cathode of a Geissler tube, and are capable of exciting phosphorescence, will permeate thin metal. If then it were practicable to find a sheet of metal foil thick enough to be air-tight and opaque, yet thin enough to be permeable by this discharge, it would be possible to allow these rays a passage into the open air by closing an opening in a discharge tube with such a piece of foil. This idea has been realized by Dr. Lenard by means of an ingeniously arranged apparatus and a hammered aluminum plate 0·003 millimeter thick. This plate forms in the apparatus in question a shutter which Dr. Lenard calls the "window," because, while quite impermeable to air and light, it allows the rays from a cathode at a distance of 12 centimeters to penetrate it freely. These rays render the air faintly luminous. A halo of bluish light surrounds the "window," and is moderately bright only on its surface. At the same time a strong odor of ozone is recognizable. Substances capable of phosphorescence, if held near the "window," shine with their peculiar light on the side nearest to it. All the phenomena of phosphorescence cease if a magnet is so applied to the discharge tube as to repel the cathode rays from the inner side of the "window." The atmosphere is a dull medium for the cathode rays to penetrate, coal gas is more permeable, and so is hydrogen, while oxygen and carbonic acid are less permeable than air.

Cost of Columbus' Expedition.

The cost of discovering America by Columbus, says Prof. Ruge, in the "Globus," was 1,140,000 maravedis, or about $7,296 of our money. The money of Queen Isabella, of course, had a higher purchasing power than the dollar of to-day. Of the sum named, Columbus received an annual salary of $320, and the two captains each $192 per year. Each sailor, in addition to his subsistence, received $2.45 per month, or one ducat.