

Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

(Established 1845.)

One copy, one year, for the U.S., Canada or Mexico.....\$3.00
One copy, six months, for the U. S., Canada or Mexico..... 1.50
One copy, one year, to any foreign country, postage prepaid, £1 18s. 6d. 4.00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

The Scientific American Supplement

(Established 1876)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year for the U. S., Canada or Mexico. \$6.00 a year, or £1 4s. 6d., to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country.
Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries, eight dollars and fifty cents a year, or £1 14s. 11d., postage prepaid.

Building Edition of Scientific American.

(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders, and all who contemplate building this work is invaluable.
Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign countries, \$3.00 a year, or £3 12s. 4d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign countries, \$6.50 a year, or £1 6s. 9d. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN, and SUPPLEMENT, \$9.00 a year. To foreign countries, \$11.00 a year, or £2 2s. 2d., postage prepaid.

Export Edition of the Scientific American

(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. \$5.00 a year, or \$9 12s. 4d., postpaid to any part of the world. Single copies, 25 cents.
MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO. Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JULY 2, 1898.

Contents.

(Illustrated articles are marked with an asterisk.)

Books, new..... 12
Canal, Russia's strategic..... 4
Car seal breaker*..... 6
China, commerce in..... 9
Climate, conditions affecting..... 10
Comets, recent..... 8
Cuban invasion..... 8
Descobry..... 8
Electrical exhibition in Como..... 9
Firecrackers, manufacture of..... 9
Forest, the ax the preserver of the..... 4
Ports, Spanish*..... 11
Geographical commemoration..... 8
"Greenham" accident to the..... 9
Gun carriage, disappearing*..... 5
Heavens in July..... 7
Instinct or superstition?..... 9
Inventions recently patented..... 12
"Maine," loss of..... 7
Matches without phosphorus, prizes for..... 6
Negotiable paper for patents..... 4
Notes and queries*..... 12
Paralysis, divers*..... 4
Patent rights, negotiable paper for..... 4
Patents, list of..... 12
Philippines as a trade center..... 10
Range, improved*..... 6
Still, water*..... 6
Submarine torpedo boat, Spanish*..... 7
Supplement, current..... 8
Thirst of soldiers..... 7
Torpedo boat, submarine*..... 7
Uniforms, light weight..... 5
Vasco da Gama..... 8
Vespucci..... 8
Weather stations in the Caribbean Sea..... 6

TABLE OF CONTENTS OF

Scientific American Supplement

No. 1174.

For the Week Ending July 2, 1898.

Price 10 cents. For sale by all newsdealers.

I. AUTOMOBILES.—Competition of Automobile Hackney Carriages.—9 illustrations..... 18783
II. BIOGRAPHY.—Don Carlos.—1 illustration..... 18789
III. BOTANY AND HORTICULTURE.—Bark and Cork..... 18785
IV. CHEMISTRY.—Action of Sea Water on Cast Iron..... 18787
V. CIVIL ENGINEERING.—The New Railroad Station in Dresden. 18786
VI. ELECTRICITY.—Electric Railroads in Seoul..... 18775
Rapid interrupters for Induction Coils.—1 illustration..... 18785
VII. ILLUMINATION.—Apparatus for the Production of Acetylene Gas.—3 illustrations..... 18786
Novel Gas Leak Detector..... 18787
VIII. MARINE ENGINEERING.—Engines of the Ferry Steamer "Chebucto."—1 illustration..... 18792
H. M. S. "Heron," Light Draught River Gunboat, by Yarrow & Company, London.—1 illustration..... 18792
IX. MATERIA MEDICA.—Indian Hemp (Cannabis Indica seu Sativa).—By Dr. G. ARCHIE STOCKWELL..... 18790
X. MECHANICS.—The Work Done in Hammering..... 18783
XI. MEDICINE.—The Causes of the Explosive Effect of Modern Small Caliber Bullets.—By CHARLES E. WOODRUFF.—7 illustrations..... 18795
XII. MISCELLANEOUS.—An Historical Medal.—2 illustrations..... 18789
Engineering Notes..... 18791
Miscellaneous Notes..... 18791
Selected Formulae..... 18791
XIII. ORDNANCE.—The Causes of the Explosive Effect of Modern Small Caliber Bullets.—By CHARLES E. WOODRUFF.—7 illustrations..... 18795
XIV. PATENTS.—Patents.—By JAMES W. SEE..... 18784
XV. PHYSICS.—Liquefied Air for Industrial Purposes.—2 illustrations..... 18787
The Dussaud Telescope.—2 illustrations..... 18793
XVI. TECHNOLOGY.—Concerning Rope..... 18786
XVII. TRICKS.—Magic Squares.—11 illustrations..... 18793

NEGOTIABLE PAPER FOR PATENT RIGHTS.

In our correspondence column will be found a communication regarding an enactment spread upon the statute books of Tennessee, making it a felony to receive any negotiable paper given in purchase of a patent, or interest therein, unless said paper carries upon its face a statement of the purpose for which it was originally uttered. The penalty is imprisonment for from one to three years.

This is, apparently, the last outcome of a form of special legislation, begun in Ohio, in 1886, and which has been in greater or less degree emulated by thirteen Western and Middle States. The original enactment in Ohio has undergone considerable modification, so that it is much less objectionable than the statute in Tennessee. The validity of such acts has been adversely passed upon as unconstitutional by the United States Circuit Courts for Indiana and Southern Ohio, and by the Supreme Courts of four States.

Per contra, these statutes have been respectively upheld in the courts of last resort in five States. Therefore, considering the conflict of legal authorities, it is desirable the questions involved be brought before the Supreme Bench of the United States for final adjudication.

Unfortunately, any hardship arising from this form of legislation is prone to fall upon innocent shoulders, especially in the case of the Tennessee statute, which makes the holding of a note of ordinary form, given for a patent consideration, an absolute felony. Under such enactment, what recourse has the banker or broker who discounts a note couched in the usual verbiage of such documents, especially if the drawer thereof chooses to repudiate it as having been given for a patent right. As regards any protection afforded the holder of the discounted note, none is apparent, since, in case of swindle, the swindler, as he always has done, unloads and escapes.

HOW THE AX MAY BE MADE THE PRESERVER OF THE FOREST.

In a recent address before the Lumber Exchange of Baltimore, Dr. B. E. Fernow, chief of the Forestry Division of the United States Department of Agriculture, presented many important facts. The title of his address, "The Ax the True Preserver of the Forest," does not appear at first sight to be a topic which would naturally suggest itself to a friend of trees, but Dr. Fernow showed that it was in line with the true principle of forestry. The more trees which lumbermen could cut down and turn into good lumber, the more the lumbermen are pleased, for as a class they are not always in sympathy with the point of view of experts in forestry who wish to preserve the trees. In the past it has been the custom of many lumbermen to look upon the scientific forester as their worst enemy, but now they are coming to see that it is an entirely erroneous view of the case, for without these experts and without legislation all of our forests would be cut down in time, and not only would lumbermen be without occupation, but the great industries which make use of lumber would be paralyzed.

Trees must be cut down and ought to be cut down, not only for commercial and industrial uses, but also for the good of other growing trees, and all that the scientific forester asks is that the cutting should be done judiciously. The ignorant lumberman who does not look to the future cuts down all of his forests at once, while the forester cuts the trees so as to make it a permanent investment. The old fable of the man who killed the goose that laid the golden eggs has been wasted on many lumbermen in the past, but it is to be hoped that the establishment of the School of Forestry in Cornell University, the first in the country, is destined to work a great revolution in the ideas of intelligent people.

We have a remarkable object lesson in forestry in Germany, where it has become almost an exact science. In this country about 11,000,000 acres of forest lands are owned by the state and the yearly revenue is not less than \$20,000,000. About 20,000,000 acres of forest lands are owned by private individuals and their profits are almost as great. During the last fifty years at least these revenues have been constantly on the increase, owing to the more intelligent management, irrespective of the market price of material. This is a practical view of the matter which ought to appeal strongly to Americans.

Of course, forestry can only be practiced successfully in a country where forests properly receive adequate protection from fire. In the last few years many farms in New England have been abandoned because the land was no longer regarded as productive, though they would be considered so in other countries where people are less used to an abundant fertility. If, however, they are no longer capable of producing crops, they could be turned to good account by the growing of trees, and many thousands of acres of land that are now useless would thus be made to produce a handsome revenue, while at the same time a large addition would be made to the diminishing timber resources of our country.

DIVER'S PARALYSIS.

Every profession that entails extraordinary conditions and surroundings exacts, ultimately, some penalty, if the warnings of nature are not heeded, and that of divers is by no means exempt. Diver's paralysis has long been recognized, though its occurrence is comparatively infrequent, and divers themselves hold it is directly induced by abrupt change in air and body pressure. A descent to a depth of less than 150 feet is supposed to entail little inconvenience; but every additional yard beyond is regarded with suspicion as a proportionately increasing source of danger. Old men, too, appear to be more prone to these seizures than the young or those in middle life; but the character of the water, per se, and the time of submersion are not considered as vital factors.

Recently, in The Clinical Journal, Frederick Taylor reported a case of this paralysis—the third seizure in the same individual since 1890, the two former, however, being of ephemeral character, exciting no alarm or apprehension. On the last occasion the paralysis came on during operations conducted at a depth of 162 feet. A heavy piece of machinery that was being manipulated slipped and jammed the diver against a beam, at the same time compressing and almost entirely obliterating the lumen of his air pipe; and though he did not become unconscious, the danger was realized and he began to economize the supply of oxygen at his disposal.

After about five minutes, intense pains and noises in the head were experienced, along with evidences of suffocation and a tendency to lose consciousness. In the meantime those on the lighter observed the air tube was not working, and another diver went down, who by following the life line was able to clear the air pipe, and also to relieve his fellow diver, the latter being at once and rapidly drawn to the surface, the ascent occupying less than a minute. The victim of the accident noted nothing unusual or extraordinary, save he was giddy and excessively nauseated, until an attempt was made to stand, when he became aware of a feeling of numbness in his feet and lack of power and sensation in the legs, which latter, in less degree, also obtained to the arms.

Nine weeks later, there having been no improvement in the meantime, he was admitted to hospital, when it was observed there was notable loss of power in both legs and partial anæsthesia of the inner surfaces thereof from a point three inches above the ankle to about the same distance above the knees, the areas being roughly symmetrical. The knee jerks were normal, and the muscles, though soft and flabby, apparently were not at all wasted; neither was there any loss of sensation as regards heat, cold or pain.

The sufferer ascribed his condition solely to being hauled to the surface suddenly—to abrupt change in bodily pressure, aided by lack of proper oxygen, resultant upon fouling of the air tube. The degree of immersion he seemed to regard as of little account, even while admitting that a descent beyond one hundred and fifty feet usually caused a sense of "fullness in the head, buzzing in the ears, flashes of light before the eyes, succeeded, perhaps, on coming to the surface, by bleeding from the mouth, nose and ears, and more rarely a condition known to divers as the 'bends,' which last is generally ascribed to the bands applied around wrists and ankles to render the diving suit watertight. The "bends" is what is known in medical parlance as "wrist" and "foot drop," and in divers usually passes off in twenty-four to forty-eight hours; but this condition is also suggestive that depth and pressure is an integral factor in producing diver's paralysis.

Hitherto, this form of paralysis has attracted little attention, probably because of its generally ephemeral nature; but it appears probable, in the light afforded by the foregoing, that it is cumulative in effects; i. e., each succeeding attack predisposes in progressive ratio to another, until the individual, if he persists in adhering to a diver's calling, especially if he essays unusual or dangerous depths, becomes a permanent and incurable paralytic. Considering also the fact that locomotor ataxia is relatively frequent among divers and now recognized as of primary specific origin, and that disease of this character predisposes to paralytic seizures presenting phenomena that practically parallel those of diver's paralysis, it would seem as if it were an act of folly for those who have ever suffered from specific lues to take up the calling of a diver.

RUSSIA'S STRATEGIC CANAL.

The expenditure for naval work in many countries is far greater than ever before, and the effect of this is shown not only in the laying down of new ships and the building of ordnance, but also in the creation of naval stations at home and naval bases of supply and repair abroad, and the field of activity has even been enlarged so as to admit of the construction of extensive engineering works in the shape of canals for the purpose of the rapid concentration of fleets of war vessels. The most extensive work in this direction is that to be conducted in Russia for connecting the waters of the Baltic and Black Seas. The canal will have a length