Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors. PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN

..... 1 50 One copy, six months, for the U.S., Canada or Mexico.... One copy, one year, to any foreign country belonging to Postal Union. 4 00

Remit by postal or express money order, or by bank draft or check. MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

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, 5500 a year, for the U. S., Canada or Mexico. 56.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page. (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 within Postal Union, what dollars and fifty cents a year.

Building Edition.

Huilding Edition. THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERI-CAN is a large and splendid illustrated periodical, issued monthly, con-taining floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautifni plates, showing desirable dwellings, public buildings and archi-tectural work in great variety. To builders and all who contemplate build-ing this work is invaluable. Has the largest circulation of any architec-tural publication in the world. Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.00 a year. To foreign Postal Union countries, \$5.00 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign Postal Union countries, \$1100 a year. PLEMENT, \$3.00 a year. To foreign Postal Union countries, \$100 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typo-graphy with the SCIENTIFIC AMERICAN. Every number of La America is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circuitates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish posses-sions-wherever the Spanish language is spoken. 35.00 a year, post paid to any part of the world. Singlecopies Scients. See prospectus. MUINN & CO. Publishers pies 20 cenus. Boo pro-MUNN & CO., Publishers, 361 Broadway, New York

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

NEW YORK, SATURDAY, APRIL 1. 1893.

Contents.

| (Illustrated articles are marked with an asterisk.) | | |
|--|--|--|
| Agricultural inventions, recent 203 Armor plates, testing | Girders, bridge, a train load Harrow, Riley & Evans ⁴ Induction coil for altern currents | |
| | | |

d of*.. 193 197 nating 199 ited... 203 t*..... 196 idest* 197 cord. 20 ril.... status new...

SCIENTIFIC AMERICAN SUPPLEMENT

TABLE OF CONTENTS OF

No. 900.

For the Week Ending April 1, 1893.

Price 10 cents. For sale by all newsdealers

PAGE 1. BIOGRAPHY.-Ferdinand de Lesseps.-Scenes in the life of De Lesseps.-3 illustrations. . 14376

- 14388
- III. CHEMISTRY.—The Coloring Principle of Poke Berries.—Chemi-cal investigation of this coloring matter. The Constitution of the Alkaloids.—A valuable paper on this interesting subject. The Farmington, Washington County, Kas., Aerolite.—Analysis of this recently fallen aerolite. 14389 . 14387
- IV. CIVIL ENGINEERING.—Shops Operated by Compressed Air. A shop in which large and small tools are operated by compresse sed A shop in which large alu sinai tools at the second second
- V. ELECTRIC ENGINEERING.—The Pasadena and Mount Wilson Railway.—The steepest railroad in the world.—Its electrical driv-
- ♥I. ELECTRICITY.-Sending Plans and Drawings by Telegraph.-A method of telegraphing designs, with samples of the process.-2 method of telegraphing designs, and and woolen Fabrics -The Electrolytic Bleaching of Cotton and Woolen Fabrics -Experiments in bleaching with electrolyzed water.
- VII. HORTICULTURE.-Carex Japonica Variegata.-A decorative

Scientific American.

THE LEGAL STATUS OF RAILROAD EMPLOYES.

neers on the Toledo, Ann Arbor & North Michigan the destruction by delay of perishable goods because dle cars of non-union and boycotted roads. This as well. amounted to a refusal to handle freight from the Ann Arbor road.

Of course, such action on the part of the sympathizing engineers caused utter derangement of business.

The railroad authorities resolved to invoke the Federal powers. They obtained first an injunction from Judge Taft, restraining members of the Brotherhood of Locomotive Engineers from boycotting Ann Arbor freight. A suit for \$30,000 damages was also filed against Chiefs Arthur and Sargent for ordering the engineers to strike. Next, the Lake Shore road dispatched a special train to Cleveland and brought United States District Judge Ricks to Toledo, and obtained from him an attachment for three of their fire men and four of their engineers, who had refused to from Locomotive No. 85 while passing along the Calehandle the boycotted freight. The men were required to show cause why they should not be prosecuted for contempt of court in face of Judge Taft's previous pany, laid it down that the railway company, having order.

Locomotive engineers and railroad employes generally occupy quasi-public positions. The public is dependent on them for the carrying out of its business. Under the common law the conspiring to raise the price of labor or of other commodity is held to be unlawful. In England the quasi-public status of certain employments is definitely recognized. As a fully public employment, the soldier's or policeman's position may be cited. In joining the ranks of either of these bodies, a man surrenders a measure of his personal freedom. He voluntarily and knowingly puts himself under obligations which are more binding and involve severer penalties than those attached to ordinary contracts. Death cannot be the penalty for violation of a civil contract. Desertion from the ranks of the army may incur it.

The action of the United States courts in the railroad cases seems to recognize the status of railroad employes the affairs of the community are committed. A denot the subject of private suit—it is a matter for indictment and government prosecution.

The railroads of the United States form an interstate system. This brings them under Federal jurisdiction. The striking engineers and firemen have been shown very clearly that they will not have State authorities only to deal with. They have to face the more rigorous administration of justice as meted out by the United States courts. They are being placed in the position of soldiers of the public. To attempt a boycott of freight, or to conspire in effecting a strike, is by these actions of the courts declared a species of desertionlike the desertion of his colors by a soldier in face of mentioned, while the necessity was not clearly estabthe enemy. The great army of peace, which railroad lished. The Lord Chancellor also admitted that negliemployes really constitute, is always in face of its gence or carelessness on the part of the engine driver enemy-the overcoming of time and space in the interests of the public.

The court's action cuts in two ways. The representatives of labor are inclined to see in it an interference with their personal rights. Many protest strongly against it. If their privileges of sympathetic striking and boycotting are interfered with by the courts, the new state is pronounced slavery by the more rabid labor advocates. This view is of course totally false. The soldier held down to the severest penalties, subject even to corporal indignities, and in some armies to flogging, is not held to be disgraced by enlistment. When a man chooses the railroad as the scene of his life's work, he virtually enlists, and should feel himself

her view of the action of Judges Taff tached to a car hauled by twenty-four horses, which ecognition by the state of railroads was started from the power house at Seventh Avenue ulation of their affairs. One school and Fifty-first Street, proceeding thence north to es the interference by the courts as Fifty-ninth Street, back to Thirty-sixth Street, and ationalizing the railroad service. from there to the power house again, where workmen clamored for. The interstate com-¹ commenced splicing the two ends. At the north and t step. The new injunction mo- south ends of the space covered, where the cable ther movement in the same direc- changes its direction, it runs around wheels twelve feet private letter expresses have been in diameter.

railroad do not relish the idea of the engine crew de-A very novel and important action, important, at serting their engine miles from any settlement and least, as bringing a much discussed question into the perhaps in weather which may involve sickness and area of judicial action, was taken on Saturday, March death from exposure to the passengers. The shipper 18, in the United States court at Toledo. The engi-10f freight must resent the loss of a market or perhaps Railroad had struck. Their places were filled as far of the blocking of a railroad by organized action on as possible with outside men. The Brotherhood of the part of its striking employes. Such action in the Locomotive Engineers, by their chief, P. M. Arthur, army or at sea would be mutiny. The events we are had ordered Brotherhood engineers to refuse to han- discussing may make it virtually mutiny on railroads

British Law as to Locomotive Sparks and Fire Raising.

The House of Lords, sitting as an Appeal Court recently, defined the law as to the liability of railway companies for fires caused by sparks from their locomotives. The case was raised, says *Engineering*, by a Port Glasgow Sailcloth Company against the Caledonian Railway Company, the Court of Session having decided in favor of the railway company. The issue was really between fire insurace corporations and railway companies. It was agreed that the fire which consumed the Sailcloth Company's flax store, and involved £12,000 damages, was caused by a spark emitted donian line contiguous to the stores; but the Lord Chancellor, in giving judgment for the railway comstatutory power to run along the line with locomotive engines, which in the course of their running are apt to discharge sparks, it was necessary to prove that the power given was not reasonably and properly exercised, and this the Sailcloth Company had failed to do. The mere fact that the destruction by fire was caused by the spark did not involve liability; the point really was whether the railway company had, as was their bounden duty, used the best practicable means, according to the then state of knowledge, to avoid the emission of sparks. The Sailcloth Company failed to prove to the contrary. The offending locomotive, No. 85, belongs to a type adopted in 1888. Prior to 1882 the engines of the Caledonian Company were fitted with a spark arrester-a grid in the uptake or funnel to prevent embers escaping with the exhaust steam. The new type, on the other hand, has the vortex blast and not a spark arrester. It was contended in evidence in support of the greater efficiency of the new as assimilated to that of soldiers. To such operatives arrangement, that in the old arrangement the lower tubes got blocked up and required a greater draught tention of cars does not mean injury to one person, or in the upper tubes to maintain the steam-raising power to a corporation, but it means injury to an indeter- of the boiler. Consequently the spark arrester was ⁸ 194 minate number of the public. Injury to the public is required, owing to the enormous increase of draught. With the vortex blast arrangement, on the other hand, the draught is more equally diffused. The consequence is that, as the lower tubes do not get blocked, combustion is more complete, and it is alleged fewer embers are likely to leave the fire box. It was, therefore, held by their lordships that the modern engine, even without the spark arrester, was more efficient than the earlier type with the spark arrester. As to the contention that an extra precaution might have been taken by adding the spark arrester, even in the vortex blast engine, there was conflict of testimony as to whether this would not militate against the other advantages would involve the liability of the railway company; but the fact that sparks issued from the funnel did not indicate negligence or carelessness. On the other hand, the engine driver was proved to be an experienced man, and there was no suggestion why he should have departed on this occasion from the ordinary mode of working the engine. The five lords sitting on appeal all agreed in the decision in favor of the railway company, with costs.

Placing a Big Street Car Cable in its Trench. Over two miles of 1½ inch steel cable of the Broadway Railroad Company was recently placed in the trench beneath the street pavement, where it is to be subject to peculiar responsibilities and penalties. used in hauling the cars. The end of the cable was at-

| herbaceous plant.—1 illustration | 14388 | The other view of |
|---|---|---|
| ♥III. MATHEMATICS.—Points of Contrary Flexure-Graphic De- termination.—By Prof. C. W. MACCORD, Sc.D.—A further contri- bution to praphic mathematics4 illustrations | 14384 | Ricks involves the re and the Federal regu |
| IX. NAVAL ENGINEERING.—The Zimer Boat.—A recently pat- ented boat, driven like a bicycle.—1 illustration | 14378 | of socialists welcome the first step in na |
| X. ORDNANCE—Cordite.—The English smokeless powder.—Its powers and uses. The Gun Trials of the Twin-Screw Armorciad Ram Libertad.— Full details of trial of the guns of an Argentine ship | 14385 14376 | This has long been cl merce act is the first |
| XI. PHYSICSAutomatic Mercurial Air PumpsA pump for con- tinuous workingThe results of its operation1 illustration | 14383 | tions appear as a fur tion. The old time p |
| XII. PHYSIOLOGYRespiration in SingersStudy of muscular breathingmotionsThe apparatus employed2illustrations SaccharineOfficial note on this new industryManufacture and uses of saccbarine | 14386 | supplanted by the po the railroads of the c |
| XIII. TECHNOLOGY - Agate Grinding in GermanyHow agates are ground and polishedThe scenery in the locality4 illustrations | 14379 14388 14381 14378 14386 14382 14382 | The court proceedi ject the purging of co defense of the Brot technical point is available defense. This unfor- ation of the constitut this must sooner or la of the case are, from least, on the side of t |

oost office. The parallel course for country is advocated by many.

An Underground Stream.

A dispatch from Augusta, Ill., says that four miles lings have for their immediate obcontempt of the employes and the northwest of that place, a few days ago, William Allen therhood's officers. Hence every bored a well on his farm, going to a depth of 77 feet, valled of by the attorneys for the At that depth suddenly the entire bottom fell $o\mu t$, rtunately prevents a full determin- carrying all but about 5 feet of the walls with it. At tionality of the injunction. But the bottom of the deep hole thus formed could be seen later be adjudicated. The equities a swift rushing stream. All efforts to fill up this hole the point of view of the public at have proved futile, the rushing current carrying away the railroad. The passengers on a everything thrown into it.