Scientific American.

Scientific American.

ESTABLISHED 1845.

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

No. 361 BROADWAY, NEW YORK.

A. E. BEACH.

O. D. MUNN.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, six months, for the U.S. or Canada..... 1 50 One copy, one year, toany foreign country belonging to Postal Union, 4 00 Remit by postalor expressmoney order.

Australia and New Zealand .- Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit #1 in current Colonial hank notes. Address

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, \$5.09a year, for U. S. and Canada. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies, l0 cents. Sold by all newsdealers throughout the country.

Combined Rates .- The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of seven dollars.

The safest way to remit is by draft, postal order, express money order, o registered letter.

Australia and New Zealand,-The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, JUNE 29, 1889.

Contents.

(Illustrated articles are marked with an asterisk.)					
Acid. oxalomolybdic 404	House for switch stands. McCar-				
Am. Ass. for Ad. of Sci 404	thy's				
A nimals, device for Catching *403	Improvements, Mississippi River				
Appliances, railway 409					
Back, spring, James' *403	Inventions, agricultural				
Bicycles 402	Inventions, electrical				
Boats, torpedo	Inventions, index of				
Business and personal 409	Inventions, mechanical				
Chisel, carpenters', Palmer's *404	Inventions, miscellaneous				
Cleaner, flue, Oldfield's, *403	Jack, flooring, Townsend &				
Colors, beautiful, sources 404	Winslow's				
Colors, complementary 408	Keeping at it				
Coupling, car, Nusly,s *404	Leaves, forms of				
Coupling, car, Swenson's*403	Locomotive exhibit, French				
Disaster. Johnstown*406	Mark, trade, advantages				
Dynamo and compass 400	Planets, position in July				
Elevators, Otis, at Eiffel tower 402	Population of U.S				
Eggineers, Am., European trip 404	Signal, drawbridge, Long's				
Exhibition, Paris 401	Silo presses and ensilage				
Frame, crystallizing, Beller's*403	Spindles, support for, Duffy's				
Fund, Elizabeth Thompson 408	Sunshade for vehicles				
Gas, nat., in mnf. of steel 408	Supply, Water, New York				
Girders, Diggest 405	Telea polyphemus, notes op				
Alternite Alter	Tologoogo Tiob				

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT

No. 704.

For the Week Ending June 29, 1889.

Price 10 cents. For sale by all newsdealers.

PAGE I. ARCHÆOLOGY.-The Origin and Manufacture of Playing Cards. -By GEORGE CLULOW .- A most interesting lecture recently delivered before the Society of Arts, in London, giving the history of playing cards and the different methods of manufacturing them used at different epochs, down to and including the present time.. 1124

- II. CHEMISTRY.-Lecture Experiments.-By PETER T. AUSTEN Experiments showing the reactions of different oxides of nitro-.... 11249 BOURNE, LL.D.-The production of pure nitrogen from ammonium and sodium nitrite, with formula and full details of ... 11250 manipulation..
- III. CIVIL ENGINEERING .- Bridge over the Indus at Sukkur.- A Mechanical Quarrying and Stone Cutting.-An interesting reiew of the machinery in the Traigneux Quarry, in the province of Namur, Belgium, illustrating the application of the continuous wire as well as of other machinery for cutting stone.-24 illustra 1124
- IV. ELECTRICITY .- A Model Electrical Manufactory .- By L. W. SERRELL, Jr.-A new factory of the C. & C. Electric Motor Co. in this city described, with a diagram of the current delivery at all periods of the day.-1 illustration..... ... 1124
- V. MECHANICAL ENGINEERING.-A Three Hundred Horse Power er Jonval Turbine.- A large turbine recently constructed in England for use in the Transvaal Gold Fields, adapted for transportation to the South African deserts.--1 illustration...... 11245 Pumping Machinery, Ancient and Modern.-Firstinstallment of

illustrative diagrams of the arrangement of the warp and weft

THE WATER SUPPLY OF NEW YORK.

A record of draught is of interest to show what has taken place and of importance to show what is going to take place. When represented graphically, the record would take the form of a plane curve, that is to say, if at given intervals of time an enumeration of the people was made and the volume of water required by them was ascertained, the succeeding changes in draught would be clearly indicated by a line drawn through the points of intersection of the variable and the variant. It is practicable to calculate the data as to population which would form the values of the variable quantity, and the record of consumption would form the values of the variant; but the failure of the supply has imposed a condition in the equation, and hence the utility of the prolonged curve for determining the deficiency of supply at any time and in showing the wayward course of the true curve, which changes with abruptness as the storage is occasionally replenished, but which fails ever to assume its proper position.

In 1875 the per capita demand was ninety-five gallons and the draught by the city had reached the maximum delivery of the aqueduct. Since this time, therefore, the antecedent condition of the variable has alone been maintained, that is, the population has continued to increase, while the extent of this increase as exhibited by a greater draught has been relegated to the mercies of a prolonged curve.

In 1880 the indicated requirement was ninety-seven gallons per capita, equivalent to a daily delivery of 115 million gallons; but the actual delivery was only 99 million gallons, and hence the allotment was only eighty-two gallons, showing a deficiency of fifteen gallons to each person, or a total of 16 million gallons in the delivery.

In 1888 the indicated requirement was one hundred gallons, equivalent to a daily delivery of 161 million gallons. Prior to this date an additional supply of 10 million gallons had been received from the Bronx River, so that the actual delivery was 110 million gallons per day, making the allotment seventy gallons per capita, showing a deficiency of thirty gallons to each person, or a total of more than 50 million gallons in the delivery.

When the new aqueduct is completed, the deficiency will be partially made up, inasmuch as during the winter months the customary flow-off from the Croton induced currents from the charged wires or from the basin can be utilized. Until such time, however, as the storage is increased by the completion of the Sodom dam, there will be no addition to the delivery during the summer months above what it is at present. and hence a calculation for the dry season of 1889 must be based on the prolonged curve. The indicated requirement for this and the following year is one hundred and one gallons, but the allotment will only be sixty-six and sixty-two gallons respectively.

Now the question is suggested, will the theoretical maximum daily delivery be attained when the Sodom dam is built? Assuming that the new reservoir thus formed will be in use in 1893, and allowing that the storage is thereby increased 5,000 million gallons, then the total storage of the Croton basin will be 14,700 million gallons. In this year the population will be two million and the daily theoretical consumption 200 million non-magnetic chronometer. gallons.

But in order to provide for this volume daily, the estimated storage is 30,857 million gallons, showing a deficiency of storage provided of 16,157 million gallons. In other words, the capacity of the Croton watershed in the summer of 1893 will be approximately 135 million gallons per day, so that the demand will still exceed the supply, and the allotment, instead of being more than one hundred gallons, will be sixty-six gallons.

There are no projects on foot to restore the supply to its former volume, and it may be said that no part of the work contemplated in the Croton basin can be finished in time to modify this "say so" of the prolonged curve for 1893.

We might go still farther and say that although all the projected dams be built, including the Quaker of compasses in series, binnacle, bow, and tops, the Bridge dam, which is claimed to be "the largest work mean local error is easily computed. Now come elecof its kind in the world," still the delivery could not be tric fittings, lights, and steering gear for passenger

comparison with that of other cities is immaterial-it is plainly not due to domestic use, but to features of an industrial and commercial character and therefore intimately connected with the prosperity of the city. To limit the consumption to one hundred gallons per day could not be taken exception to, provided there was any occasion for such limitation; but to allow the supply to be reduced to seventy gallons and less is to curtail enterprise, if not to defeat manifold industries that are already established.

To recite here the lines of manufacture and shipping that are dependent on a free and abundant use of water would be substituting a pleading from the people for emphatic criticism and give an entirely false aspect to the question. There is no benefit in dealing with hypotheses as to what business advantages this diminishing of the supply has deprived the city of, or in speculating on the dangers of a scant delivery in mid-summer, when it can be shown in an incontrovertible manner that the means adopted for procuring the additional water are not going to accomplish the end. What the people want next is evidence of abundance of water coming from somewhere—the testimony as to the need of such abundance was taken many years ago. The citizen gets no comfort in learning from the prolonged curve that his quota of water is to-day 30 per cent short of what he is entitled to. Has he not a right to be astonished that after the construction of the aqueduct and the Sodom dam, his allotment will be 35 per cent less than he is bargaining for? The choice of the Croton basin, with its "dry seasons," low cycle years, and untimely flow-off, has so occupied the authorities in its defense that the city has obtained a lead by growth which, according to the prolonged curve, it is going to maintain.

DYNAMO AND COMPASS.

The recent studies of Sir William Thomson of the effects of electricity upon the compass, as described in his recent paper, though not discovering a means of wholly protecting the needle from electrical influence, serves to point out at least one of the principal causes of it, and to indicate, with hopeful distinctness, the direction in which others may perhaps not unprofitably be sought for. War ships and passenger steamers -the only ones having electrical fittings-have not heretofore been able to protect their compasses from magnetism of the dynamos.

At times the one or the other appears to exert an influence almost directly opposed to that of the mysterious something in the polar north to which the needles owes its allegiance. Sir William Thomson says that he has discovered, beyond peradventure, that, when single wires are employed—the ship's iron hull being used for the return conductor to the dynamo-there is the greatest disturbance, the widest deflection of the needle, and that the alternating system, where carefully installed, does not, save under unusual conditions, affect the true pointing of the needle. As to the effect of constant and vagrant currents upon the ship's chronometer, we do not propose to discuss that at this time, because in most, if not all, cases of complaint, the master has not been provided with a

Only those used to the sea and familiar with navigation can fully appreciate the value of the investigations now being conducted by Sir William Thomson and other equally skillful electricians. When skies are clouded, when storms are come, the compass is the mariner's mainstay, for, by "dead reckoning," he may, with something like certainty, mark his way and hit his port; getting his course by compass, time by chronometer, and speed by log. When iron ships were first floated, the card compasses in use at the time were found wholly unfit to guide them by. It would have mattered little what the deflection was if only it had been constant, but it deviated. Ritchie came to the rescue with his liquid compass, immersing the needle in a bath of spirits of wine or alcohol, and by means

a Sibley College lecture.—ByMr. J. F. HOLLOWAYGiving an ex-	brought up to o	ne hundred gallons	per capita, for the	steamers and search lights, motors, firing apparatus,
haustive review of the direct-acting steam pump 11245	reason that the	population is increas	sing at such a high	and other ingenious mechanisms for battery and pilot-
The PulsometerBy Prof. DE VOLSON WOODThe Pulsome-	rate that it will	reach the point wh	ere the demand is	house of men-of-war: admirable contrivances all. vet.
ter described and illustrated, with a mathematical analysis of its	equal to the ma	ximum capacity of	the drainage area	if no way were found for encountering the mal-influ-
Water Softening.—By GEORGE E. DAVIS.—A discussion of the	in 1897 while to	complete all the nec	essary impounding	ance of those currents and their cenerator it is hard
proper treatment of water for use in boilers, with a view to the	Recorvoire hefor	this data is a physic	al impossibility	to see how their presence could have been televeted
prevention of scale and corrosion by producing a soft deposit 11247		e this date is a physic	cal impossionity.	to see now their presence could have been tolerated
VI. MEDICAL-Hypodermic Injections of Quining in Malaria An		ug table is given the	calculated require-	anoat. The careful mariner "swings" his ship before
excellent suggestion for malaria treatment, involving the subcu-	ment of each in	habitant, based on t	he records of past	quitting port, to adjust his compasses, and while afloat
taneous application of quinine, with formula	years, together	with the allotment t	that has been fur-	is able to mark the deviation of their needles from true
VIL MISCELLANEOUS -The Catastrophe at Samos - A note of	nished and wil	l be furnished du	ring the summer	north by means of tables marked on his ocean chart.
the disaster to the German ships, with illustrations of their wreck	months of the y	ears noted.		But, let such interferences as the dynamo and its cur-
in the recent hurricane2 illustrations 11239	Date. Per c	spita demand, gallons.	Allotment, gallons.	rents interpose, and ship and crew are in imminent
VITI NAVAL UNCINUTBINGThe Structured Strength of See.	1840	20	20	danger of destruction. The nautical as well as the
going Torpedo Boat No. 1By Lieut. F. J. DRAKE, U. S. Navy.	1875	95	95	scientific world has then cause for congratulation at
-Commencement of a most elaborate review, with exhaustive	1880	98	82	the discoveries made by Thomson and others
calculations of the constants of the new sea-going torpedo boat.	1869	100	62	
-5 illustrations 11242	1995	101	665 E-2	
IX. TECHNOLOGYA New Flexible ClothAn improved method				UARRIAGE manufacturers are predicting that in the
 of making twills, diagonals, and other double-backed cloths, with	j we nave seen	that the per capita	demand has risen	not distant juture wooden wheels will be done away

e away from troenty gallons in 1840 to one hundred at the pre- with, and steel wheels substituted on account of the