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Contents.

(Illustrated articles are marked with an asterisk.)

Bacteria in the air.....	217	Measure, a standard.....	216
Balloon, experiment with.....	214	Mowers and reapers, cutting apparatus for.....	211
Beetle, stag, tropical.....	217	New Orleans.....	212, 213
Books and publications.....	218	Notes and queries.....	219
Business and personal.....	218	Padlock, improved, Richard's.....	210
Car coupling, Walton's.....	210	Paint, heat indicating.....	210
Car starter, improved.....	211	Paper, transparent.....	214
Cotton press, New Orleans.....	213	Patents, decisions relating to.....	216
Cotton wharf, New Orleans.....	213	Pendulum hoist, Sattles.....	211
Combustion, heat of.....	209	Photographic notes.....	216
Combustion, slow.....	213	Photos for photo-engraving.....	211
Cream and milk radiator, Jamieson's.....	211	Quinine, artificial manufacture of.....	210
Demagnetization of watches.....	217	Rubber, protection of ships with.....	212
Drowned, resuscitation of the.....	215	"Salt pattering" in stone.....	216
Dyspeptic, prescription for, Dr. Abernethy's.....	216	Saw, drag, Griswold's.....	210
Eaves trough hanger.....	210	Screw driver, spiral, Allard's.....	211
Electric tramway, Hamburg.....	215	Ships, war, protection of, with rubber.....	212
Exhibition, International, in Spain.....	209	Sky, night, September and October.....	209
Experiments in pneumatics with a steam vacuum.....	214	Steamboat, Mississippi river.....	212
Foods found to be liable to adulteration.....	208	Steamer Etruria, Cunard.....	214
Hummingbird, ruby throated, the.....	209	Telephone, Cushman, the.....	208
Inventions, agricultural.....	218	Telephony, long distance.....	208
Inventions, engineering.....	218	Traffic combination, Mandeville's.....	211
Inventions, index of.....	219	Trade mark de isions.....	216
Inventions, miscellaneous.....	218	Tramcar, electric.....	215
Machinery, benefits of.....	213	Watches, demagnetizing, apparatus for.....	207
		Welding by electricity.....	208
		Woolen fabrics, to clean.....	209

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 561.

For the Week Ending October 2, 1886.

Price 10 cents. For sale by all newsdealers.

	PAGE
I. BOTANY.—A Century Plant in Bloom.—Interesting account of the recent blossoming of an <i>Agave Americana</i> at Auburn, N. Y.....	8965
Alpine Flowers in the Pyrenees.—1 illustration.....	8965
II. CHEMISTRY.—Probable Isolation of Fluorine.—Decomposition of hydrofluoric acid, by H. MORSE and A. F. LINN. Full description of a new and important volumetric determination.—1 illustration.....	8963
Production of a new body, possibly fluorine, or perfluoride of hydrogen. The Determination of Nitric Acid by the Absorption of Nitric Oxide in a Standard Solution of Permanganate of Potash.—By H. MORSE and A. F. LINN. Full description of a new and important volumetric determination.—1 illustration.....	8964
Water of Crystallization.—By W. W. COLEMAN. 1 illustration. Discussion of the state of water of crystallization in a salt in solution.....	8964
III. ENGINEERING.—Combustion, Fire Boxes, and Steam Boilers.—By JOHN A. COLEMAN. Address before the June Convention of the Master Mechanics' Association.....	8963
Compound Hydraulic Presses.—Different forms of presses designed for pressing bales for shipment.—Very fully illustrated by 8 figures.....	8961
Examination Papers in General Construction.—Eighty-six questions in engineering propounded by the civil service examiners of New York City.....	8966
IV. MEDICINE AND PHYSIOLOGY.—A New Apparatus for the Study of Cardiac Drugs.—By WILLIAM GILMAN THOMPSON, M.D. Ingenious application of instantaneous photography to the study of heart movements.—Apparatus and views produced.—3 illustrations.....	8966
Cresote a Specific for Erysipelas.—A new cure for this complaint.....	8966
V. METALLURGY.—Primitive Iron Manufacture.—Iron furnace and blowing apparatus in use in Bengal.—2 illustrations.....	8962
VI. MINING ENGINEERING.—The Catastrophe at Chancelade.—Application of photography to investigating mine disasters.—4 illustrations.....	8967
VII. MISCELLANEOUS.—Celebration of the 500th Anniversary of the University of Heidelberg, August, 1886.....	8967
Useful Bags and How to Make Them.—Interesting paper on the trunk makers' art.—4 illustrations.....	8960
VIII. NAVAL ENGINEERING.—Atlantic Steamers.—By W. JOHN.—Exhaustive comparison of representative Atlantic liners and war ships.—3 illustrations.....	8954
Jet Propellers.—Hydraulic propulsion of vessels.—Mathematical examination of this subject.....	8961
IX. ORDNANCE.—The New Army Gun.—Description of the 8-inch steel gun as manufactured at the West Point, N. Y., Foundry.—1 illustration.....	8962
X. PHYSICS.—A New Thermo-Regulator.—1 illustration.....	8969
Cohesion and Cohesion Figures.—By WILLIAM ACKROYD, F.R.S. Laws of vortex rings examined, and relation of solubility to cohesion.....	8963
Pipette for taking the Density of Liquids.—Apparatus and calculations for use.—1 illustration.....	8969
XI. TECHNOLOGY.—Impurities in Photographic Chemicals, and Tests for Same.—Table referred to in a paper read before the Birmingham Photographic Society by G. M. Jones, M.P.S.....	8967
Molasses, how made.....	8961
Work on Plantably Described.—Optical errors and human mistakes.—By ERNST GUNDLACH.—On the examination of optical glasses.—A paper read before the Buffalo meeting of the A. A. S.....	8963
Soap.—By HENRY LEFFMANN, Ph.D.....	8962
Somzee's New Gas Burners.—Interesting description of regenerative burners.—3 figures.....	8968
The Diamond Gas Burner.—Of value as a supplement to the above named article, describing an incandescent burner.—1 illustration.....	8969
Wood Oil.—A new industry worked on the large scale in Sweden.....	8962

LONG DISTANCE TELEPHONY.

There is a popular belief that the long distance telephone is crowding the telegraph to the wall, and only awaits the expiration of certain contracts to usurp its place altogether; in other words, that the obstacles in the way at present are legal rather than scientific. This seems, however, to be an error, and we turn to a report of the National Telephone Association, recently sitting in St. Louis, to prove the correctness of the assertion. By this we find that while much is being accomplished in long distance telephony at various parts of the country, it has not yet reached a point as to efficiency which may be regarded as wholly satisfactory, nor has it yet proved itself formidable in competition with the telegraph. Long distance telephony may be compared, perhaps not inaptly, with fast time on the railway. It is possible on the railway to make a mile a minute, and still better time is sometimes made both here and abroad, but it has been found undesirable, on economic grounds, to run faster than forty miles the hour. So in telephony 100 miles or thereabout seem to be the paying limit at present, notwithstanding the fact that a line has been successfully operated between New York and Chicago, a distance of nearly 1,000 miles, and several others have been experimented with, each giving more or less satisfaction, according as the conditions under which it was operated were favorable or unfavorable.

The Wisconsin Telephone Company has a line in regular and successful operation 199 miles in length, the Ohio Valley Co. one of 156 miles, the Michigan Bell Co. one of 145 miles, the Great Southern one of 142 miles, and the Central D. & P. Co. of Pittsburg one of 135 miles. But, on the other hand, 12 out of the 19 principal companies do not possess a single line in successful operation which has a continuous length of 100 miles.

What is possible is not always practicable; and though at the present time lines many times longer than those now in use may be operated, the service is so uncertain as to make their construction and maintenance a hazardous venture when regarded from a commercial standpoint. One of the principal speakers before the recent telephone convention, Mr. A. S. Hibbard, of Milwaukee, said:

"In our exchange service we guarantee to each subscriber the means of quick, certain, and successful communication with any other. In our toll line service we would like to guarantee to patrons at each town an equally perfect means of communication with any other town. At present we are obliged to qualify our offers, and can give the perfect service only if the line is not busy, or not noisy, or is free from 'cross talk,' or the instruments at both ends are in perfect condition and the station wanted is not too far away. These limitations are most confusing to the would-be patron, and must produce in his mind a series of just so many doubts concerning the efficiency of the service, a condition of things certainly detrimental to its popularity. In some localities better results are obtained than at others, but much is yet to be done to make toll line service perfect and popular with the public."

The fact is, that since the last meeting of this telephone convention, a year ago, nothing has been accomplished in the way of preventing, or even lessening, that terrible obstacle in the way of good telephone service—induction. Nor is this attributable to a lack of zeal on the part of telephone men. On the contrary, the most skillful electricians have worked assiduously upon the problem. When they come to better understand the phenomenon of induction, its causes, and how to prevent its appearance, the operation of long distance telephone lines may become commercially profitable, because then the service they give, unlike the present, will be certain and reliable.

Every one who has used the telephone much, knows how troublesome "cross talk" is at times. Indeed, in lines not more than ten miles in extent, if there be parallel wires, a good, clear service is not to be thought of. In this regard, a curious discovery was recently made by one of the speakers at the recent convention. He says that when it is found impossible to work two parallel wires at the same time, if those using one of them will speak German or any other foreign tongue, while those in the other are speaking English, they will have no trouble in making themselves understood.

The Cushman Telephone.

A suit is pending in the United States Circuit Court at Chicago, in which the Bell Telephone Company is the complainant. The defendant is the American Cushman Telephone Company. This company antedates all previous claimants to telephone patents, claiming that Cushman, the inventor, constructed and publicly operated a telephone at Racine, Wis., in 1851. The Cushman patent is claimed to be identical with that of Prof. Bell. The American Cushman Telephone Company was incorporated a short time ago, and set out to manufacture and sell telephones. Immediately the Bell Company filed a bill in the Circuit Court, praying for an injunction.

The answer denies that Bell had ever transmitted articulate speech by the method or with the apparatus now claimed to be covered by his patent. In 1851, the defendants claim, S. D. Cushman constructed and exhibited in Racine an instrument by which articulate sounds were transmitted in exactly the same manner in which Bell accomplished the same thing years later. For three years Cushman's telephones were in public use in Racine, while the inventor endeavored to invent a transmitter which would so magnify the sounds that conversations could be carried on in noisy places. In 1867 and 1868 Cushman explained in public his method.

In support of these claims, the attorneys for the Cushman Company have more than twenty-five affidavits by people who saw and talked over Cushman's telephone in Racine. There are also affidavits from men of high standing to whom Cushman talked in Ohio, and to whom he exhibited his instrument for transmitting vocal sounds by means of electricity.

Welding by Electricity.

According to the *Electrical World*, Professor Elihu Thomson, of the Thomson-Houston Electric Company, has invented a method by which metal wires can be welded together without the application of external heat, but simply by passing strong currents of electricity between the joint of the two pieces to be welded. The apparatus used is exceedingly simple, and consists of a pair of metallic clamps, by means of which the ends of the wires are gripped and held so as to touch each other. The clamps are made of heavy section, so as to be good conductors, and are electrically joined by a spiral of a few turns of thick copper bar, which forms the secondary coil of a transformer. The core of this transformer consists of a circular ring of iron wires, and the primary coil occupies about a sixth part of the circumference. It is wound in the same way as the coils on a Gramme ring. A machine producing alternating currents, and a suitable rheostat, by which the strength of the current can be varied, complete the apparatus. Since the secondary coil and the heavy metal clamps present hardly any resistance in the secondary circuit, the current therein is very large, and raises to a high temperature the protruding ends of the wires to be welded, so that, practically, the ends fuse together. Professor Thomson states that his invention is not confined to copper wires, but is also applicable to other metals, viz., German silver, steel, iron, and brass. Some borax or other flux may be used, but it is not essential.

The advantage of electrically welding joints on this principle is that the joints are homogeneous, and of the same thickness as the rest of the wire. Where the conductors to be soldered together are large, as in Edison mains and all mains for direct supply, one of the main difficulties has been that the external heat applied to the joint runs back along the conductor and into the protecting tube almost as fast as it is applied, thus making the operation very tedious. With Professor Thomson's apparatus no such difficulty need be expected, even when joining the heaviest bars, as the heat is localized to the fraction of an inch on either side of the joint. The invention should also be very valuable in joining the ends of steel band saws, as the metal need not be heated along any distance on either side of the joint, thus keeping the temper and finish of the saw the same. When the pieces are very large, Professor Thomson suggests the use of outside heat in addition to the heat applied electrically.

Foods Found by the Chemists of the Massachusetts Board of Health to be Especially Liable to Adulteration.

FORM OF ADULTERATION.

Milk.—Addition of water or coloring matter, and abstraction of cream.

Butter.—Substitution of foreign fats, and addition of coloring matter.

Spices.—Addition of starch and other foreign powders. Especially true of pepper and mustard.

Cream of Tartar.—Substitution of starch, gypsum, and other cheaper substances.

Baking Powders.—Alum and other injurious ingredients. Baking powders have no legal standard, other than that of freedom from harmful ingredients.

Lard.—Presence of cheap fats and oils.

Olive Oil.—Substitution of cheaper oils.

Jellies and Preserved Fruits.—Substitution of cheaper fruits, and addition of coloring matter.

Vinegar.—Absence of the required amount of acetic acid, and addition of coloring matter.

Honey.—Substitution of cane sugar, glucose, and other substances.

Molasses.—Addition of glucose, presence of tin or other foreign substances.

Sugar.—Glucose, poisonous coloring matter.

Maple Sugar and Sirup.—Glucose.

Confectionery.—Terra alba, poisonous coloring matter, fusel oil, arsenical wrappers, etc.

Coffee.—Mixture or substitution of various cheaper substances.

Canned Fruits, Vegetables, and Meats.—Metallic poisons.