

is illustrated. The third contribution, "Indiana's First Settlement," by the Hon. E. A. Bryan, president of Vincennes University, is on the beginnings of the State of Indiana, with portraits of George Rogers Clark and François Vigo. Then follows "The Harrisons in History," by Mrs. Ella B. Washington, an account of the President's family; "The Historic Quadrille," by Gen. John Cochrane, pointing out the historic idea which seems to have been so little understood by the public at large; "Reminiscences of Mrs. Bradford," the daughter of Hon. Elias Boudinot, who was one of the ladies of the Washington circle, by J. J. Boudinot; "Slavery in Connecticut," by Charles M. Andrews; and "Louisburg, 1745, Bunker Hill, 1775," by Nathan M. Hawkes.

— The *International Record of Charities and Correction* has been removed to Springfield, Ill., where the publishing details will hereafter be under the charge of the Rev. F. H. Wines, with whom the plan of the *Record* originated, and who has from the outset been its editor. The suspension of the *Record* for the last four months has been caused by the fact that it had not succeeded in securing sufficient support to return the cost of its publication, which has resulted in a considerable deficit, that has now been met by the voluntary contributions of its friends. The plan and the execution of the *Record* have been very warmly commended by the best authorities, and the successive numbers have been cordially welcomed by a certain circle of readers interested in the special subjects to which it was devoted; but the support for it, even on the part of those directly concerned in reformatory work, was much smaller than had been looked for by Mr. Wines and by those who had associated themselves with him in the undertaking. The valuable editorial services of Mr. Wines have been contributed entirely without compensation, and at no little personal sacrifice. Mr. Wines proposes to continue the publication at Springfield, which will enable him to deliver to the subscribers, at an early date, the num-

bers required to complete the current volume; and it is his hope to receive such further encouragement from the public as may warrant him in continuing the publication without further break, and may enable him to secure for the *Record* a permanent place as the recognized organ of the charity-reform interests of the country.

— The April issue of *The Trained Nurse* (consecrated to those who minister to the sick and suffering in hospital and home) contains articles on "The Relation of Hospitals to Medical Education," "Insanity, its Causes and Cure," "Articles for the Mother's Use," "Health in our Homes," "Asepsis for the Nurse," besides considerable other editorial and original matter. The monthly Hospital Supplement contains hospital news from all parts of the world. The Lakeside Publishing Co., Buffalo, N.Y., are the publishers.

— A. D. F. Randolph & Co. have ready an interesting literary contribution to the anniversary celebration, in Mr. Thomas E. V. Smith's volume, "The City of New York in the Year of Washington's Inauguration, 1789."

— Roberts Brothers have just ready "Ethical Religion," a volume of lectures delivered by W. M. Salter before the Society of Ethical Culture of Chicago; and a revised edition of C. E. Pascoe's useful handbook, "London of To-Day," which is now in its fifth year.

— Houghton, Mifflin, & Co. will publish shortly another contribution to the growing Emerson literature. The forthcoming volume is by the son of the sage of Concord, Mr. Edward W. Emerson, who will afford a glimpse into the domestic life of his father. The title of the book will be "Emerson in Concord." Houghton, Mifflin, & Co. have also under way an illustrated edition of Thackeray, which will be, it is promised, more complete than any other existing edition. It will be in twenty-two 12mo volumes printed in large type.

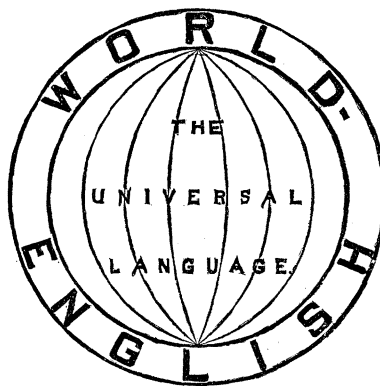
# ONE LANGUAGE FOR THE WHOLE WORLD.

## WORLD-ENGLISH :

THE UNIVERSAL LANGUAGE. 25 CENTS.

EVERY one has heard of the butcher who, after a long search for his knife, at last found it in his mouth: so speakers of English have been seeking for a universal language, when, lo! it is in their mouths. The intelligibility of English words has been obscured by a dense mist of letters. This is now dispersed by A. Melville Bell, who has already won a world-wide reputation through his invention of "Visible Speech," the great boon to deaf-mutes. Professor Bell calls this new discovery of his "World-English," and the result is a language which cannot fail to meet with acceptance, and at once supersede the supposed necessity for "Volapük," or any other artificial language. No language could be invented for international use that would surpass English in grammatical simplicity, and in general fitness to become the tongue of the world. It is already the mother-tongue of increasing millions in both hemispheres, and some knowledge of the language is demanded by all educated populations on the globe. Social and commercial necessities require that the acquisition of this knowledge shall be facilitated, and it is believed that Professor Bell's invention has removed the last impediment to English becoming the universal language, for which vague desires have long been entertained, although hitherto only futile efforts have been made.

Ex-President Andrew D. White, of Cornell University, says: "I believe that the highest interests of Christian civilization and of humanity would be served by its adoption. China and Japan would be made English-speaking peoples within fifty years, and so brought within the range of Christianizing and civilizing ideas, in the largest sense. All existing missionary work is trivial as compared with this. For your system would throw wide open those vast countries, as, indeed, all the countries of the world, to the whole current of English and American thought."



For Diffusion of English throughout the World

AS

THE UNIVERSAL LANGUAGE

This "Hand-Book of World-English" is the Complete, Simple, and Efficient Medium.

FOREIGNERS

Will Acquire, by Means of this Hand-Book, a PERFECT PRONUNCIATION OF ENGLISH. For Primary School Pupils and Illiterate Adults

World-English is a Royal Road to Reading.

To Teachers of English and Modern Languages

This Hand-Book will be of Primary Importance as a Phonetic Directory.

DEFECTS OF SPEECH

Will be Readily Corrected by Means of the Articulative Directions in this Hand-Book.

## HAND-BOOK OF WORLD-ENGLISH,

25 CENTS.

The plan of this little book is altogether new. Letters and sounds are so associated, in all the exercises, that from the mere knowledge of letters a learner cannot fail to pronounce words with certainty. English reading will thus be easily acquired, whether by natives or foreigners, children or adults.

The general resemblance of World-English to Literary English is such that any reader of the latter deciphers the former at sight, or, at most, after a few minutes' study of the new letters. A like result may be anticipated for those who shall learn to read from World-English. They will transfer their power of reading to the literary form of the language, almost without effort. The orthographic aspect of words will, besides, be so fixed in the eye, by contrast, that spelling will be remembered as — what it really is — a pictorial association with words.

No special training is required to qualify teachers for using this book. The subject can even be successfully introduced in the kindergarten and the nursery. This phonetic mode of initiation in reading cannot be too strongly urged on the attention of School Boards on both sides of the Atlantic.

The ordinary orthography of each word is interlined with the World-English version throughout the Exercises and Readings.

So set down, our tongue is the best for the world to unite upon.—*Brooklyn Eagle*.

The idea of Mr. Bell has much to recommend it, and the presentation is charmingly clear.—*American, Phila.*

The result is a language which cannot fail to meet with acceptance.—*Boston Traveller*.

Has the merit of great ingenuity.—*Railway Age*.

His treatise, as a study of English orthoepy, condenses the result of much thought and experience in small compass.—*The Critic*.

World-English deserves the careful consideration of all serious scholars.—*Modern Language Notes*.

World-English is the English language unburdened of its chaotic spelling.—*Popular Science Monthly*.

We commend it to the attention of teachers.—*Ottawa Globe*.

"World-English" and "Hand-Book of World-English" can be had of all booksellers, or will be sent for 50 cents, post free, by the publisher,

**N. D. C. HODGES, 47 Lafayette Place, New York.**

## INDUSTRIAL NOTES.

THE Thomson-Houston Company has been obliged to greatly increase their facilities in order to handle their rapidly increasing business in electric railways. In addition to the large contracts which they closed some time ago, they have lately closed the following: Lynn and Boston Railroad Company, Nahant Line, which has 4,300 feet of track, two turnouts, maximum gradient of four per cent, the line extending from Central Square, Lynn, to Nahant House, Nahant: one car will be put in operation at first, the power for which will be obtained from the station of the Lynn Electric Light Company. Newburyport and Amesbury Horse Railway Company, Newburyport, Mass., which line is about six miles in length, and will operate two cars: it is made up almost entirely of curves and grades, the maximum of which is ten per cent; the cars will be operated by a current from the Newburyport Electric Light Company, Newburyport, Mass., and also from the Amesbury Electric Light Company, Amesbury, Mass. The Newton Circuit Line, Newton, Mass., which will operate ten cars, and is eight miles in length: it will run from Newton to Watertown on the West End track, and on new track from Watertown to West Newton and Newtonville. The Plymouth and Kingston Railway Company, Plymouth, Mass., which line is four miles in length, and will operate three cars, the maximum gradient being six per cent: this line will run from Chiltonville, through Plymouth, to Kingston, and on nearly all of the line the bracket method will be used; the track is about laid. The Quincy Street Railway, Quincy, Mass., which line will operate four cars, and is five miles in length, extending from Quincy, through Wollaston Heights and Atlantic, to the Neponset River; the bracket method of overhead construction will be used. The company has also received orders for new cars from the Wheeling Railway Company, Wheeling, W.Va.; West End Street Railway Company, Boston, Mass.; Topeka Rapid Transit Company, Topeka, Kan.; Omaha and Council Bluffs Railway and Bridge Company, Omaha, Neb.; Lynn and Boston Street Railway Company, Lynn, Mass. The company has also constructed a track of about one mile for the Hillside Coal Company of Scranton, Penn., on which a forty-horse-power locomotive is used. This is used for carrying coal, and is capable of hauling about twenty cars loaded with one ton each.

— The Thomson-Houston Electric Company report the following sales of stationary motors: 7.5 horse-power, Walker & Pratt Manufacturing Company, Boston, Mass.; 1 horse-power, J. R. Kelly, Providence, R.I.; 10 horse-power, Georgia Electric Light Company, Atlanta, Ga.; 10 horse-power, Master-Builders' Association, Boston, Mass.; 1 horse-power, A. Harris, Providence, R.I.; 1.5 horse-power, Bonschur & Holmes, Philadelphia, Penn.; 3 horse-

power, H. W. Ladd, Providence, R.I.; 1.5 horse-power, W. Shedley, Providence, R.I.; 10 horse-power, J. J. Hillman, Boston, Mass.; 15 horse-power, Garfield & Proctor Coal Company, Boston, Mass.; 1 horse-power, Cambridge Shirt Company, Cambridgeport, Mass.; 1.5 horse-power, A. C. Manchester, Providence, R.I.; 1.5 horse-power, New Bedford Gas Company, New Bedford, Mass.; 3 horse-power, C. F. Heptonstall, Providence, R.I.; 1 horse-power, B. F. Haley, Dover, N.H.; 1.5 horse-power, John M. Sweeney, Wheeling, W.Va.; 3 horse-power, B. L. P. Martin, Providence, R.I.; 5 horse-power, T. C. Entwistle, Lowell, Mass.; 15 horse-power, Minot Estate, 30 Court Street, Boston, Mass.; 20 horse-power, Whit-tier Machine Company, Boston, two motors for elevators; 5 horse-power, Thomson-Houston Electric Light and Power Company, Buffalo, N.Y.; 10 horse-power, Wales Manufacturing Company, Syracuse, N.Y.; 5 horse-power, St. Catherines Electric Railway Company, St. Catherines, Ont.

— The Thomson-Houston Electric Company reports the following sales of arc and incandescent lamps; Adams, Mass., 45 arc; Falls City Jean and Woollen Mill, Louisville, Ky., 200 incandescent; Sanford Woollen Mills, Medway, Mass., 100 incandescent; Stearn & Silverman, Wheeling, W.Va., 20 arc; Monroe County Insane Asylum, Rochester, N.Y., 600 incandescent; Moore Building, Syracuse, N.Y., 200 incandescent; Saxon Woollen Mills, Franklin, Mass., 200 incandescent; New Haven, Conn., 45 arc; New England Company, Bath, Me., 300 incandescent; Washington Court-House, O., 50 arc; Buffalo, N.Y., 190 arc; Cambridge, Mass., 1,000 alternating; Lowell, Mass., 1,000 alternating; Hudson River Street Hospital, Poughkeepsie, N.Y., 800 incandescent; Leominster, Mass., 50 arc, 600 alternating; Bedford, Penn., 50 arc, 600 alternating; Leicester, Mass., 600 alternating; Stamford, Conn., 1,500 alternating; Hudson, N.Y., 45 arc; Fernandina, Fla., 50 arc; Portland, Me., 45 arc; New Decatur, Ala., 50 arc; Manchester, N.H., 100 arc; Chester, Penn., 30 arc; Revere, Mass., 600 alternating; H. W. Smith, Bangor, Me., 50 incandescent; Findlay, O., 1,000 alternating; T. J. Stewart, Milo, Me., 50 incandescent; Woonsocket, R.I., 1,000 alternating; Riverside and Oswego Mills, Providence, R.I., 400 incandescent; Pitman, Mass., 500 alternating, 50 arc; Morse Whyte, Cambridge, Mass., 200 incandescent; Rockland, Me., 30 arc; Jewell Milling Company, Brooklyn, N.Y., 200 incandescent; Savannah, Ga., 250 arc; James Walker & Co., Basin Mill, Mo., 50 incandescent; Malden, Mass., 500 alternating; Fort Paine Coal and Iron Company, Fort Paine, Ala., 400 incandescent; Upper Sandusky, O., 60 arc; J. B. Mason, Providence, R.I., 50 incandescent; Columbus, Ga., 1,000 alternating, 100 arc; Thomasville, Ga., 50 arc; Perry Paine Building, Cleveland, O., 1,000 incandescent.

## OUR CENTENNIAL EXHIBIT.

Many of those who regularly read advertisements of our goods in these columns, will be in New York city during Centennial Week. We hope to see them here in the store.

For a few days, immediately preceding and following the great Military and Civic Parades, each department in the house will make a special decorative display of its goods.

Having, beyond question, one of the largest and most varied assortments of High Novelty Dress Fabrics to be found in America, we expect to make this Exhibit memorable, and in every way worthy of the time in which it occurs.

**JAMES McCREERY & CO.**

BROADWAY AND ELEVENTH STREET,  
NEW YORK.

## A TEMPORARY BINDER

for *Science* is now ready, and will be mailed postpaid on receipt of price.



Half Morocco - 75 cents. This binder is strong, durable and elegant, has gilt side-title, and allows the opening of the pages perfectly flat. Any number can be taken out or replaced without disturbing the others, and the papers are not mutilated for subsequent permanent binding. Filled in this binder, *Science* is always convenient for reference.

N. D. C. HODGES,

47 Lafayette Place, N. Y.

ESTABLISHED 1859.

**H. A. DREW,**  
Commercial Printer,  
5 Clinton Place, near Broadway,  
New York.

Wedding Orders, Souvenirs, Invitations, Orders of Dance, etc., etc., done in the latest and most elaborate styles, at reasonable prices.

All Favors promptly attended to.

## Wants.

A YOUNG MAN can have lucrative engagement, not only a fixed salary, but according to his work accomplished in travelling for SCIENCE. A personal interview invited.

N. D. C. HODGES,

47 Lafayette Place, New York.



## PETER COOPER'S GLUE.

Prepared in liquid form by the N.Y. Liquid Glue & Adhesive Co. The long and well-known reputation of this glue for its strong adhesive properties requires no recommendation. It is the glue your furniture is glued with, and never fails to join the hardest of wood if properly applied. Always ready for use. For sale everywhere.

CONTAINS NO ACID.

Unalterable & Fragrant  
**GLUE PASTE**

A strong and harmless preparation of flour and glue for Photographers, Manufacturers, Merchants, Insurance Companies, Banks, and family and office use. Contains no acids. Unlike Mucilage, adheres and dries immediately. N. Y. Liquid Glue and Adhesive Co., Preparers of Peter Cooper's Glue in Liquid Form, 18 N. William St., New York. Used in this office.

# GUARANTY INVESTMENT COMPANY

CAPITAL \$250,000.

Hon. ALBERT H. HORTON (Chief Justice, Kansas Supreme Court), Topeka, Kan., Pres't.

## 7% Guaranteed Farm Mortgages 7%

The Company calls the special attention of Investors to the following points :

I. All loans guaranteed and interest payable semi-annually at the Importers' & Traders' National Bank, New York.

II. Unusual fulness of information, not only about the security itself, but about the general development of the section where the farm is located.

III. An examination each year of the general business of the Company and the Mortgages themselves by a COMMITTEE OF INVESTORS sent for the purpose.

IV. Many hundred Mortgages taken and NOT A SINGLE FORECLOSURE.

V. Exhibitions in New York at frequent intervals, of Kansas and Nebraska Farm Products. The Exhibition at the American Institute in the fall of 1888, received the *HIGHEST AWARD* of superiority.

VI. Monthly Bulletins giving full information about all Mortgages offered for sale.

*Address for Monthly Bulletin and Investors' Committee Report for 1888,*

HENRY A. RILEY, General Eastern Manager, 191 Broadway, N.Y.

### A BOOK FOR THE TIMES !

#### NEW EDITIONS !

Laidlaw's Constitution of the United States and the Declaration of Independence, in English, French, and German, with notes. Sold by all book-sellers, or by the publishers, LAIDLAW BROS. AND CO., 137 W. 41st St., New York.

Second and Revised Edition, in cloth - - - - 50c. postpaid.

Third Edition, in paper - - - - - 25c. postpaid.

Publications received at Editor's Office,  
April 15-27.

ARNOLD, M. Reports on Elementary Schools, 1852-82. Ed. by Sir Francis Sandford. London and New York, Macmillan. 302 p. 12°. \$2.25.

BOYLESTON, P. John Charaxes: A Tale of the Civil War in America. Philadelphia, Lippincott. 289 p. 12°. \$1.25.

CLAUS, C. Elementary Text-Book of Zoölogy. Tr. and ed. by Adam Sedgwick and F. G. Heathcote. 2d ed. Vols. I and II. London and New York, Macmillan. 967 p. 8°. \$8.

CONNOLLY, J. H. A Storm Ashore. Chicago, New York, and San Francisco, Belford, Clarke, & Co. 92 p. 12°.

CONVERS, D. Marriage and Divorce in the United States: As they are and as they ought to be. Philadelphia, Lippincott. 266 p. 16°. \$1.25.

HILDBRETH, C. L. The Masque of Death, and Other Poems. Chicago, New York, and San Francisco, Belford, Clarke, & Co. 168 p. 12°.

JACOBI, M. P. Physiological Notes on Primary Education and the Study of Language. New York and London, Putnam. 120 p. 12°. \$1.

KINKAD, A. The Queen of the Block. Chicago, New York, and San Francisco, Belford, Clarke, & Co. 57 p. 12°.

LOGAN, C. Her Strange Fate. New York, Chicago, and San Francisco, Belford, Clarke, & Co. 268 p. 12°. 50 cents.

MELDOLA, R. The Chemistry of Photography. (Nature Series.) London and New York, Macmillan. 382 p. 12°. \$2.

MONTGOMERY, D. H. The Leading Facts of French History. Boston, Ginn. 321 p. 12°. \$1.25.

NICHOL, J. Francis Bacon, his Life and Philosophy. Part II. Bacon's Philosophy. Philadelphia, Lippincott. 259 p. 16°. \$1.25.

PHIN, J. A Practical Guide to Success in the Use of Recipes, Formulæ, etc., Technological and Commercial. New York, Industrial Publ. Co. 44 p. 16°.

### 16 PAGES. THREE 16 PAGES.

Hundred Thousand new subscribers for *The Family Journal and Ladies' Companion* wanted. It is the most interesting and instructive paper ever issued. Subscribers will receive during the coming twelve

### MONTHS

novels written by American Authors, complete in each three numbers. The story of popular works of fiction will be retold by a novel reader, the most interesting and unique feature ever introduced in any publication, giving the substance of popular and standard books by famous writers in a space easily read by the busiest people. We have engaged

### FOR

this work a widely known and popular writer. Comments on Current Events, Fashions, New and Original Ideas and Designs for Ladies' Fancy Work and Household Decoration, Letters from Correspondents and their Answers. The colleges and seminaries of the United States will be treated one each month in an illustrated article, showing the particular advantage of each, cost of attendance, etc. Invaluable to parents having sons or daughters whom they desire should receive the advantages of a higher education than the ordinary school affords. Articles on Painting and Drawing, giving home instruction by a well-known artist. A trial subscription of this elegant paper will be sent to any address, three months, for

### TEN CENTS.

Liberal pay for literary work adapted to our columns, and for new and original drawings, designs and ideas on any subject which we can use.

Premium List the most complete in the world. We offer inducements to club raisers and agents approached by no other publishing house. The celebrated Gilbert Cut Waist Linings, which we send post paid to any one sending us two yearly subscribers at 50 cents each is alone worth 75 cents.

137 Sent to any address, post paid one year, 50 cents; six months, 25 cents, and a three months trial subscription for only 10 cents.

TRY IT! TRY IT! TRY IT!

and you will become a permanent reader. Address:

John L. Douglass, Publisher,  
322 Broadway, N. Y.

"The Week, one of the ablest papers on the continent."—*Descriptive America*.

ENLARGED AND IMPROVED.

## THE WEEK:

*A Canadian Journal of Politics, Literature, Science and Arts.*

PUBLISHED EVERY FRIDAY.

\$3.00 per Year.

\$1.00 for Four Months.

THE WEEK has entered on its SIXTH year of publication, greatly enlarged and improved in every respect, rendering it still more worthy the cordial support of every one interested in the maintenance of a first-class literary journal.

The independence in politics and criticism which has characterized THE WEEK ever since its first issue will be rigidly maintained; and unceasing efforts will be made to improve its literary character and increase its value and attractiveness as a journal for the cultured home. Many new and able writers are now, or have promised to become, contributors to its columns, and the constant aim of the Publisher will be to make THE WEEK fully equal to the best literary journals in Britain and the United States.

As heretofore, PROF. GOLDWIN SMITH will, from time to time, contribute articles. London, Paris, Washington and Montreal letters from accomplished correspondents will appear at regular intervals. Special Ottawa Letters will appear during the sessions of Parliament.

THE WEEK in its enlarged form will be the same size as "Harpers' Weekly," and the largest paper of its class on the continent.

SEND FOR FREE SAMPLE COPY.

C. BLACKETT ROBINSON, Publisher,  
5 Jordan St., Toronto.

### Readers of Science

*Corresponding with or visiting Advertisers, will confer a great favor by mentioning this paper.*

*Schools.***The Sauveur Summer College**  
OF**LANGUAGES.**(Removed from Amherst, Mass., and Oswego, N.Y.,  
to BURLINGTON, VT.)

The Normal Class will be taught for the French by Dr. Sauveur, for the German by Dr. W. Bernhardt, for the Latin by Prof. J. U. Dillard. Fourteenth Session: July 8 to August 16.

Dr. Sauveur's new work, *LES CHANSON'S DE BERANGER*, with *Historical Commentary and Notes*, will be ready June 1, and taught at the School. For Circulars address

DR. L. SAUVEUR,

Copley Terrace, Roxbury, Boston, Mass.

N.B.—Circulars of Dr. L. SAUVEUR Educational Works will be sent free to applicants.  
[Mention this paper.]

CONNECTICUT, NEW HAVEN,

**MRS. CADY'S SCHOOL FOR YOUNG LADIES.**  
Prepares for Smith and Wellesley, and admits to Vassar by Certificate. Circulars. Early application necessary.

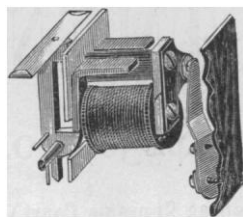
NEW JERSEY, PLAINFIELD.

**THE CHESTNUTS.**—Parents with daughters to educate, or orphan girls with companion, may find a comfortable home, with school instruction by applying to Miss E. E. Kenyon.

**A NEW MAGAZINE—THE SWISS CROSS**

Devoted to spreading a love of nature among the people. Edited by HARLAN H. BALLARD, President of the Agassiz Association, and succeeding *St. Nicholas* as the official magazine of that body. \$1.50 a year. Sample copy 10 cents, or 25 cents for trial subscription for 3 months.

N. D. C. HODGES, PUBLISHER,  
Mention this paper. 47 Lafayette Place, New York.



A  
★  
DROP  
IN THE  
PRICE  
★  
OF

**GRAVITY  
DROP  
ANNUNCIATORS.**

DON'T FORGET THE

**DUST-PROOF BELLS.****HAZAZER & STANLEY,****32 Frankfort Street, N. Y.**

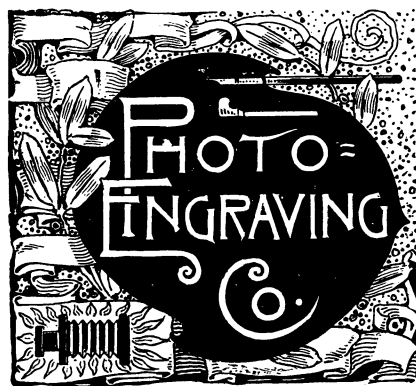
Any one who will have the following blank filled out by a responsible Newsdealer, and mailed to us, will be allowed a three months' subscription to *Science*.

**N. D. C. HODGES,****47 LAFAYETTE PLACE, NEW YORK.**

1889.

To the ..... News Company.

You may add to my regular order five copies of *SCIENCE* each week (returnable).



BRANCH AT 728 CHESTNUT ST.  
PHILADELPHIA, PA.

JOHN HASTINGS = Pres't.  
A. R. HART = Gen. Manager.  
JOS. TRIPP = V. Pres't.

**ENGRAVING FOR  
ALL ILLUSTRATIVE  
AND ADVERTISING  
PURPOSES**

67-71 PARK PLACE  
NEW YORK.

**SCIENCE CLUBBING RATES.****10% DISCOUNT.**

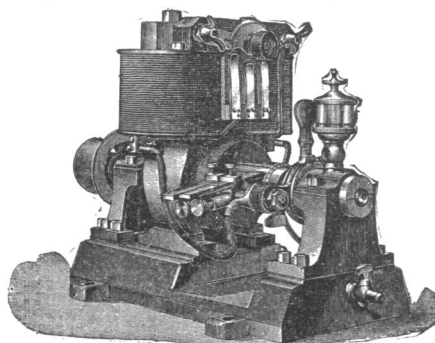
We will allow the above discount to any subscriber to *Science* or *The Swiss Cross* who will send us an order for periodicals exceeding \$10, counting each at its full price.

	Year's Subscription.	With Science.	With The Swiss Cross.
Agricultural Science.....	\$ 2.50	\$ 5.30	\$ 4.50
American Agriculturist.....	1.50	4.30	2.50
American Analyst.....	1.00	4.25	2.25
American Architect and Building News.....			
Imperial edition.....	10.00	12.80	11.00
Gelatine ".....	7.00	9.80	8.00
Regular ".....	6.00	8.80	7.00
American Garden.....	1.00	4.25	2.25
American Journal of Philology.....	3.00	6.25	4.25
American Machinist.....	2.50	5.30	4.50
American Magazine.....	3.00	5.80	4.00
American Naturalist.....	4.00	7.50	5.50
Andover Review.....	4.00	6.80	5.00
Atlantic.....	4.00	6.80	5.00
Babyhood.....	1.50	4.30	2.50
Babyland.....	.50	3.75	1.75
Bradstreet's.....	5.00	7.80	6.00
Brain.....	3.50	6.30	4.50
Building (weekly).....	6.00	8.80	7.00
Carpentry and Building.....	1.00	4.25	2.25
Century Magazine.....	4.00	6.80	5.00
Chautauquan, The.....	1.50	4.30	2.50
Christian Union, The.....	3.00	5.80	4.00
Christian Weekly, Illustrated.....	2.50	5.30	3.50
Cosmopolitan, The.....	2.00	4.80	3.00
Critic.....	3.00	5.80	4.00
Eclectic Magazine.....	5.00	7.80	6.00
Edinburgh Review.....	4.00	6.80	5.00
Electrical World.....	3.00	5.80	4.00
Electrician and Electrical Engineer.....	3.00	5.80	4.00
Electrical Review.....	3.00	5.80	4.00
Engineering and Mining Journal.....	4.00	6.80	5.00
English Illustrated Magazine.....	1.75	4.55	2.75
Forest and Stream.....	4.00	6.80	5.00
Forum, The.....	5.00	7.80	6.00
Godey's Lady's Book.....	2.00	4.80	3.00
Harper's Bazar.....	4.00	6.80	5.00
Harper's Magazine.....	4.00	6.80	5.00
Harper's Weekly.....	4.00	6.80	5.00
Harper's Young People.....	2.00	4.80	3.00
Health and Home.....	1.00	4.25	2.25
Herald of Health.....	1.00	4.25	2.25
Illustrated London News (Amer. reprint).....	4.00	6.80	5.00
Independent, The.....	3.00	5.80	4.00
Inter Ocean, The.....	1.00	4.25	2.25
Iron Age (weekly).....	4.50	7.30	5.50
Journal of Philology (Eng.).....	2.50	5.30	3.50
Journal of Speculative Philosophy (begins with Jan. No.).....	3.00	5.80	4.00
Judge.....	4.00	6.80	5.00
L'Art.....	12.00	14.80	13.00
Life.....	5.00	7.80	6.00
Lippincott's Magazine.....	3.00	5.80	4.00
Littell's Living Age.....	8.00	10.80	9.00
Little Men and Women.....	1.00	4.25	2.25
London Quarterly.....	4.00	6.80	5.00
Macmillan's Magazine.....	3.00	5.80	4.00
Magazine of American History.....	5.00	7.80	6.00
Medical and Surgical Journal.....	5.00	7.80	6.00
Mechanical Engineer.....	2.00	4.80	3.00
Metal Worker.....	1.00	4.25	2.25
Microscope, The.....	1.00	4.25	2.25
Nature.....	6.00	8.80	7.00
New Princeton Review.....	3.00	5.80	4.00
North American Review.....	5.00	7.80	6.00
Outing.....	3.00	5.80	4.00
Overland Monthly.....	4.00	6.80	5.00
Pansy.....	1.00	4.25	2.25
Political Science Quarterly.....	3.00	5.80	4.00
Popular Science Monthly.....	5.00	7.80	6.00
Popular Science News.....	1.00	4.25	2.25
Portfolio, The.....	7.50	10.30	8.50
Practitioner.....	3.50	6.30	4.50
Public Opinion.....	3.00	5.80	4.00
Puck.....	5.00	7.80	6.00
Puck (German).....	5.00	7.80	6.00
Quarterly Review (London).....	4.00	6.80	5.00
Queries.....	1.00	4.25	2.25
Rural New-Yorker.....	2.00	4.80	3.00
St. Nicholas.....	3.00	5.80	4.00
School Journal.....	2.50	5.30	3.50
Scientific American.....	3.00	5.80	4.00
Supplement.....	5.00	7.80	6.00
Architect and Builders' edition.....	2.50	5.30	3.50
Scribner's Magazine.....	3.00	5.80	4.00
Southern Cultivator.....	1.50	4.30	2.50
Springfield Republican (weekly).....	1.00	4.25	2.25
Sunday School Times.....	2.00	4.80	3.00
Teachers' Institute.....	1.25	4.05	2.25
Texas Siftings.....	1.00	6.80	5.00
Trained Nurse.....	1.50	4.30	2.50
Treasure-Trove.....	1.00	4.25	2.25
Truth Seeker, The.....	3.00	5.80	4.00
Wide Awake.....	2.40	5.20	3.40
Young Folks' Journal.....	1.00	4.25	2.25

**N. D. C. HODGES,**  
**47 Lafayette Place,**  
**New York.**

# C. & C. ELECTRIC MOTOR COMPANY.

Electric Motors  
FOR  
Arc and Incandescent Cir-  
cuits, Most Economi-  
cal Motor on the  
Market.  
Regulation Perfect.  
Motors Designed for all  
Power Purposes.



OFFICE and MANUFACTORY:  
402 and 404 Greenwich Street, New  
York City.

New England Office, 19 Pearl St., Boston.

Philadelphia Office, 301 Arch St.

Western Office, 139-141 Adams Street  
Chicago.

Southern Office, 25 Carondelet Street,  
New Orleans.

## THE American Bell Telephone COMPANY. 95 MILK ST., BOSTON, MASS.

This Company owns the Letters  
Patent granted to Alexander Gra-  
ham Bell, March 7th, 1876, No.  
174,465, and January 30, 1877,  
No. 186,787.

The Transmission of Speech by  
all known forms of ELECTRIC  
SPEAKING TELEPHONES in-  
fringes the right secured to this  
Company by the above patents, and  
renders each individual user of tel-  
ephones, not furnished by it or its  
licensees, responsible for such un-  
lawful use, and all the conse-  
quences thereof and liable to suit  
therefor.

## ESTERBROOK'S STEEL PENS.

OF SUPERIOR AND STANDARD QUALITY.

Leading Nos.: 048, 14, 130, 135, 239, 333  
For Sale by all Stationers.

THE ESTERBROOK STEEL PEN CO.,

Works: Camden, N. J. 26 John St., New York.

### Old and Rare Books.

One Million Magazines. Back numbers, vols.  
and sets—old and new, Foreign and American.  
CATALOGUE UPON APPLICATION.

A. S. CLARK,

34 Park Row, New York City.

BACK NUMBERS and complete sets of leading Mag-  
azines. Rates low. AM. MAG. EXCHANGE,  
Schoharie, N.Y.

H. WILLIAMS,

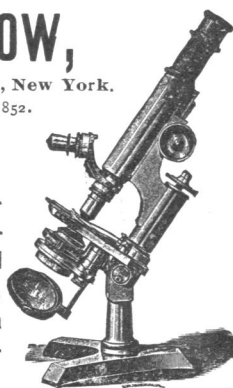
Dealer in Old Magazines, Reviews, &c. Scientific  
periodicals a specialty. 39 Macdougall St., N.Y.

### Scientific Apparatus.

J. GRUNOW,  
621 Sixth Avenue, New York.  
Established 1852.

MAKER OF

Microscope Stands,  
Oil Immersion Object-  
ives and Abbe Con-  
densers for Bacterial  
and Histological work,  
of Objectives, Camera  
Lucida and other ac-  
cessory apparatus.



### IMPROVED OIL LIGHT MAGIC LANTERNS.

Also Lime and Electric Light Apparatus, and  
mechanical, plain, and fine colored views.

J. B. COLT & CO., Manufacturers,  
No. 16 BECKMAN STREET, NEW YORK.

MAGIC Stereopticons and the Best Views  
LANTERNS for Public, Church, Home, and  
Scientific Exhibitions. Best appa-  
ratus, new views. Largest stock. Reduced prices. 24  
Years' Practical Experience. Illus. Catalogue Free.

GEO. H. PIERCE,

136 S. Eleventh St., Philadelphia, Pa.

### ELECTRICAL TESTING BUREAU,

Johns Hopkins University, Baltimore, Md.

Resistance Coils and Boxes Compared.  
Am meters and Volt meters calibrated.  
Condensers standardized.  
Primary and Secondary Batteries Tested.  
Efficiency of Dynamos and Motors Deter-  
mined.  
Insulation of Cables and Wires Tested.  
Etc., Etc.  
Circulars describing Methods Used, Prices,  
Etc., sent on Application.  
Address as above.

MORRIS EARLE & CO.  
SUCCESSORS TO

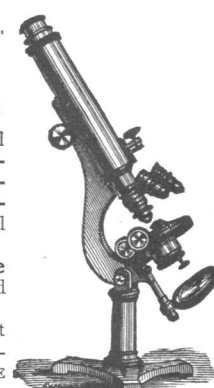
R. & J. BECK,

1016 Chestnut Street Phila

Microscopes and all  
Accessories and Ap-  
paratus. Photograph-  
ic and Photo-Micro-  
graphic Apparatus and  
Outfits.

Spectacles, Eye  
Glasses, Opera and  
Marine Glasses, etc.

Illustrated Price List  
mailed free to any ad-  
dress. Mention SCIENCE  
in corresponding with us.



E. & H. T. ANTHONY & CO.  
591 Broadway, N.Y.

Manufacturers and Importers of  
PHOTOGRAPHIC INSTRUMENTS,  
Apparatus and Supplies of every  
description. Sole proprietors of  
the Patent Detective, Fairy, Nov-  
el, and Bicycle Cameras, and the  
Celebrated Stanley Dry Plates.

Amateur Outfits in great variety, from \$5.00 upward.  
Send for Catalogue or call and examine. More  
than 40 years established in this line of business.



### GOOD NEWS TO LADIES.

Greatest inducements ever of-  
fered. Now's your time to get  
up orders for our celebrated  
Teas and Coffees, and secure  
a beautiful Gold Band or Moss  
Rose China Tea Set, Dinner Set,  
Gold Band Moss Rose Toilet Set, Watch, Brass Lamp,  
or Webster's Dictionary. For full particulars address  
THE GREAT AMERICAN TEA CO.,  
P. O. Box 289. 81 and 83 Vesey St., New York.

## R. ELLIS & CO.

BUSINESS, HOTEL AND PATENT BROKERS,

AUCTIONEERS, ETC.

No. 176 BROADWAY,

Room 46.

New York.

CLIENTS Advised free of charge.



# CALIGRAPH

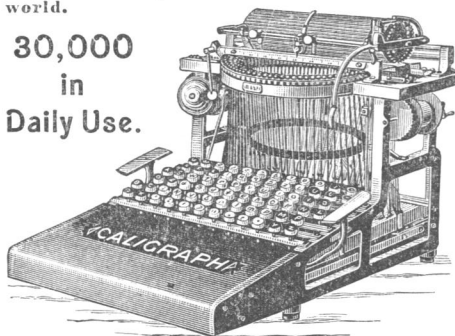
MEDAL AWARDED!

**GREATEST SPEED ON RECORD!!**

126 words per minute, errors excluded.

T. W. Osborne, winner of international contest at Toronto, wrote on the Caligraph Writing Machine 630 words in five minutes, thus gaining for the Caligraph the championship of the world.

30,000  
in  
Daily Use.



For full and correct account of above test, address  
**THE AMERICAN WRITING MACHINE CO.,**  
HARTFORD, CONN.  
New York Branch, 237 Broadway.

## PARIS EXPOSITION.

The Cheque Bank issues Cheques, either singly or put up in Books, for the special use of **VISITORS** to the **PARIS EXPOSITION**, who can cash the same at upwards of **seventy** Banking Houses, situated in different parts of Paris, **without charge**.

Visitors' mail matter can be addressed to them, Care of the Societe Generale, 4 Place de l'Opera, opposite the Grand Hotel, where English is spoken.

Every Cheque that is issued by the Cheque Bank is **EQUAL TO CASH**, as Bank Notes are, for the Bank's Capital, Guarantee Fund and Customers' Balances are **invested in British Government Securities**, or held in Cash in the **Bank of England**, and can be cashed in every town in Europe without charge.

For Handbook containing list of **2,500** Banking Houses who cash the cheques, *free of charge*, apply to

**CHEQUE BANK, Limited,**  
Capital, £100,000. Guarantee Fund, £27,000.  
Trustees, The Right Honorable John Bright, M.P.,  
The Right Honorable Earl Beauchamp.  
**NO. 2 WALL STREET, NEW YORK.**

**Visitors to Europe and Paris Exposition** should carry a book containing Cheque Bank Cheques, which are absolutely safe and cheaper than Letters of Credit, and much more convenient; are payable on presentation *without charge* at 2,500 Banking Houses and 250 of the principal Hotels in Europe.

## FOOD ADULTERATION

And its Detection. With photomicrographic plates and a bibliographical appendix. By J. P. Battershall. 328 pages, 8vo, cloth. Price, \$3.50. Circulars and Catalogues on application. E. & F. N. SPON,

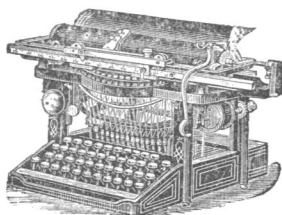
12 Cortlandt St., New York.



**KIMBALL'S  
STRAIGHT CUT  
CIGARETTES.**

Unsurpassed in quality.  
Used by people of refined taste.  
Highest award at Brussels, 1888.  
The finest smoking mixtures are of our manufacture.  
Fifteen First Prize Medals.  
**WM. S. KIMBALL & CO.,**  
Rochester, N.Y.

# REMINGTON STANDARD TYPEWRITER



**WON  
Gold and Silver Medals  
FOR**

**CHAMPIONSHIP OF THE WORLD.**

At Toronto, in open contest, Aug. 13, 1888.

**151 Words per Minute, Without an Error.**

The above is an authentic record made by Mr. Frank E. McGurkin, at Detroit, on Jan. 21, 1889, on a memorized sentence, thus beating all previous records of correct work, by 30 words per minute and placing the "Remington" still further beyond reach of competition. Photographic copies of certified work furnished on application. WYCKOFF, SEAMANS & BENEDICT, 327 Broadway, N.Y.

## The Mutual Life Insurance Company OF NEW YORK.

**RICHARD A. McCURDY, PRESIDENT.**

**ASSETS - - - \$126,082,153 56**

The Largest and best Life Insurance Company in the World.

The New Business of the Mutual Life Insurance Company in 1888

Exceeded \$103,000,000.

Its Business shows the Greatest Comparative Gain made by  
any Company during the past year including

A gain in assets of.....	\$ 7,275,301 68
A gain in income of.....	3,096,010 06
A gain in new premiums of.....	2,333,406 00
A gain in surplus of.....	1,645,622 11
A gain in new business of.....	33,756,792 85
A gain of risks in force.....	54,496,251 85

## The Mutual Life Insurance Company

Has Paid to Policy-holders since Organization \$272,481,839 82.

## KNABE

PIANOFORTES.

UNEQUALLED IN

Tone, Touch, Workmanship and Durability.

**WILLIAM KNABE & CO.**

NEW YORK: No. 112 Fifth Av., above 16th St.  
BALTIMORE: Nos. 22 and 24 E. Baltimore St.  
WASHINGTON: No. 817 Market Space, Penn. Av., near 9th St.

### PATENTS.

During April and May my fees due only on allowance if desired. Write  
**WM. H. BABCOCK,**  
513 Seventh St., Washington, D.C., P. O. Box 220.  
Formerly Examiner in Patent Office.  
THIRTEEN YEARS' PRACTICE.

### A RARE CHANCE FOR A COLLEGE.

For sale—1,300 FINE COINS AND MEDALS, silver, gold, bronze, a history in coins commencing with the fifteenth century, representing over 500 historical persons and 175 countries and cities. Address  
**L. D., P.O. Box 1337, New York.**

## IMPROVING THE MEMORY PICK

and facilitating the acquirement of knowledge by lectures and correspondence. Classes forming. "MEMORY and its Doctors," from Simonides to "Loisette," mailed for 10 cents.  
**DR. PICK, 24 Union Square, N. Y. City.**

### Readers of Science

Corresponding with or visiting Advertisers will confer a great favor by mentioning the paper.

## What Scott's Emulsion Has Done!

Over 25 Pounds Gain in Ten Weeks.  
Experience of a Prominent Citizen.

THE CALIFORNIA SOCIETY FOR THE  
SUPPRESSION OF VICE.  
SAN FRANCISCO, July 7th, 1886.

I took a severe cold upon my chest and lungs and did not give it proper attention; it developed into bronchitis, and in the fall of the same year I was threatened with consumption. Physicians ordered me to a more congenial climate, and I came to San Francisco. Soon after my arrival I commenced taking Scott's Emulsion of Cod Liver Oil with Hypophosphites regularly three times a day. In ten weeks my avoirdupois went from 155 to 180 pounds and over; the cough meantime ceased. **C. R. BENNETT.**

**SOLD BY ALL DRUGGISTS.**