only transport, from the higher country to the sea, a mass of solid matter equal to that borne down" by these two rivers. Such an accession of earth would cover annually 1,650 square miles of surface—or, in one year, one third more than the dry land of Rhode Island; in three years, nearly the area of Connecticut; and in twenty-eight years, nearly that of the State of New York, with a layer of soil one foot in thickness! And this amount is denuded from the water shed of but two rivers! "But," says the unconvinced reader, "how small is the area of New York State when compared with the vast extent of country drained by these mighty streams! The foot in New York State must be reduced to a fraction of an inch over the slopes of the Himalayas, and of Northern India." To which we reply, how short a time is twenty-eight years compared to the age of these rivers! For on this point other evidence steps in, and we learn that the deposits in their delta, even as far as our limited knowledge of them goes, are sufficient to cover our State with seven hundred feet of earth; or, in other words, that material enough to form a mountain range nine hundred miles in length, twenty-five miles in breadth, and sloping from the plain to a hight of twenty-eight hundred feet, has been in the course of time removed from the basins of the Ganges and the Brahmapootra. Should the reader figure this out he will say, "At this rate you give these rivers an antiquity of twenty thousand years." And why not? Or twice as long, if you will? Lyell, with very good grounds for the statement, says of the Mississippi, that it has been transporting its earthy burden to the ocean during a period far exceeding perhaps one hundred thousand years. Perchance, now, you begin to understand why men remained so long in ignorance of the vast operations of Nature? As long as the world was thought to be but six thousand years old, men saw no purpose in her slow movements, and the results she had already achieved were but so many incomprehensible puzzles.

SCIENTIFIC INTELLIGENCE.

COLORED CEMENTS.

Professor Bottger prepares cement of diverse colors and great hardness by mixing various bases with soluble glass.

Soluble soda glass of 33° B. is to be thoroughly stirred and mixed with fine chalk, and the coloring matter well incorporated. In the course of six or eight hours a hard cement will set, which is capable of a great variety of uses. Bottger recommends the following coloring matters:

1. Well sifted sulphide of antimony gives a black mass, which, after solidifying, can be polished with agate, and then possesses a fine metallic luster.
2. Fine iron dust, which gives a grey black cement.
3. Zinc dust. This makes a grey mass, exceedingly hard, which, on polishing, exhibits a brilliant metallic luster of zinc, so that broken or defective zinc castings can be mended and restored by a cement that might be called a cold zinc casting. It adheres firmly to metal, stone, and wood.
4. Carbonate of copper gives a bright green cement.
5. Sesquioxide of chromium gives a dark green cement.
6. Thénard's blue, a blue cement.
7. Litharge, a yellow.
8. Cinnabar, a bright red.
9. Carmine, a violet-red.

The soluble glass with fine chalk alone gives a white cement of great beauty and hardness.

Sulphide of antimony and iron dust, in equal proportions, stirred in with soluble glass, afford an exceedingly firm, black cement; zinc dust and iron in equal proportions yield a hard, dark grey cement.

As soluble glass can be kept on hand in liquid form, and the chalk and coloring matters are permanent and cheap, the colored cements can be readily prepared when wanted, and the material can be kept in stock, ready for use, at little expense. Soluble glass is fast becoming one of our most important articles of chemical production.

USE OF IODINE IN THE MANUFACTURE OF CHLORAL.

The enormous consumption of the hydrate of chloral as an anodyne and the expense of its manufacture, render any modification of the old process of its preparation very acceptable. F. Springmuhl, assistant in the laboratory of Breslau, proposes the employment of iodine as an improvement. To every half pound of alcohol he adds half a grain of iodine. The alcohol, which is colored brown by the iodine, soon becomes clear on passing chlorine gas through the mixture, and the hydrochloric acid produced by the decomposition of the alcohol is passed through water for its absorption; while the residue of the vapor is removed by sulphuric acid and chloride of calcium. The liquid becomes hot at first, and has to be cooled; it is afterwards heated to ebullition. After passing chlorine gas for twelve hours through the half pound of alcohol contained in a tubulated retort, no more hydrochloric acid is observed, and only pure chlorine gas passes over. The liquid in the retort is neutralized with caustic lime, filtered and distilled. At 161° Fah., all the iodide of ethyl goes over; and between 230° and 240° Fah., the chloral, which is separately condensed, is then mixed with concentrated sulphuric acid, once more distilled, and finally purified by sublimation. The hydrate of chloral obtained in this way amounted, in two experiments, to ninety and ninety-six per cent of the theoretical quantity, and was of the best quality and free from iodine.

It is said that the purification of the hydrate of chloral can be best accomplished by the use of chloroform, benzole, oil of turpentine, or bisulphide of carbon, as solvents.

If 1 part of the hydrate of chloral be dissolved in 5 or 6 parts of the oil of turpentine at between 86° and 104° Fah., and the liquid be slowly cooled, beautiful plates and tables separate. The best solvent is the bisulphide of carbon; at 60° Fah., 1 part of the hydrate of chloral is soluble in 45 parts of the bisulphide; but at temperatures below the boiling point of the solvent, 4 or 5 parts of the bisulphide are sufficient to 1 part of the chloral. By allowing the liquid to cool slowly, large prisms, sometimes an inch long, separate, and in the air rapidly lose all traces of the bisulphide. When prepared in this way, the perfectly pure hydrate of chloral fuses between 120° and 127° Fah.

For medicinal purposes only the pure, crystalline product ought to be employed.

ARTIFICIAL ALIZARINE.

One part of anthracen is boiled for a few minutes with 4 to 10 parts of concentrated sulphuric acid diluted with water, and neutralized with carbonate of lime, or with a carbonate of soda or potash; and the sulphates of these bases removed by filtration or crystalization. The resulting liquid is heated to from 356° to 500° Fah., with caustic potash, to which chlorate of potash or saltpeter in an amount equal to the anthracen employed has been added, so long as a violet-ble color is produced. From this product the alizarin is thrown down by acids.

RARE MINERALS.

Professor Rammelsberg, of Berlin, has recently analyzed two rare minerals, called Fergusonite and Tyrite, the former from Sweden, and the latter from Norway, the composition of which discloses substances so little known that it is difficult to see to what uses they could be applied, even if we had them in great abundance. It so often happens, however, that elements of rare occurrence eventually become the very corner stone in some new technical discovery, that it is never well to pass over any of them as of no value. We give below the constituents of the minerals, and doubt if many of our readers are familiar with the earths mentioned:

	Fergusonite.	Tyrite.
Tantalic acid	8·73	45·00
Columbic acid	40·16	.....
Stannic acid, Tungstic acid	0·91	.....
Yttria	30·45	30·00
Ceria	7·80 (Ceria, Lanthana, Didymia)	5·74
Lanthana, Didymia		3·51
Iron	4·09	1·48
Urania	1·98	6·52
Lime	3·40	2·36
Alumina	....	1·05
Water	4·47	4·88
	101·99	100·54

The Insulation of Telegraph Wires in Cities.

Glass, when placed in the shade, becomes completely coated with a thin film of water whenever the moisture contained in the atmosphere amounts to above 40 per cent of saturation. During rain the atmosphere sometimes reaches the point of complete saturation, or 100 per cent. When this is the case, any article of glass, even if exposed to the atmosphere alone, and not to the direct action of the rain, is soon completely covered with moisture, and under these circumstances its surface becomes a conductor of electricity.

The atmosphere of all large cities is heavily charged with soot, smoke, and ammoniacal salts, arising from combustion; and these, being taken up by the particles of falling rain and moisture, increase the conducting power of the latter to an enormous extent. Careful experiments made in Manchester, England, where the atmosphere is very impure, showed that the conducting power of the rain water which fell in that city was more than 300 times that of distilled or absolutely pure water. Speaking of this subject, Latimer Clark says: "Pure water offers a very high resistance, but if it contain any acids or saline matters in solution, the resistance is much smaller; hence it is that clear rain in the country does not greatly injure the working of a line, but in towns, where the atmosphere is less pure, the insulation often becomes very imperfect in wet weather."

The comparative insulation of wires, in the city and country, under otherwise similar conditions, may be seen by the following actual measurements, taken at the New York office of the Western Union Company: No 1 wire east showed a mileage insulation, between 145 Broadway and Harlem river, of 66,000 ohms, while from Harlem river to New Haven, Conn., the same wire gave 282,000 ohms per mile No. 3 east, to Harlem, gave 53,500 per mile; Harlem to Hartford, Conn., 218,000. The insulation in the country exceeded that in the city in the proportion of more than 4 to 1.

The European telegraphic engineers have endeavored to surmount this difficulty by changing the insulators at short intervals, as their surfaces became smoked and dirty. This, however, is but a partial remedy, as the trouble arises as much from the great conductivity of rain water, under the conditions referred to, as it does from dirt upon the surface of the insulators. They have also largely resorted to the expedient of running the wires underground, a method involving great expense, and yet of rather questionable benefit, as far as immunity from interruption is concerned. Considerable embarrassment is also occasioned by inductive action, when underground wires are employed, especially in working automatic or printing instruments.

It is to an American inventor that the credit is due of being the first to discover a practical and effectual means of insulating wires in cities; and equal credit should be accorded to the American telegraphic superintendent who had the boldness to put the plan into practice on a large scale, and with the most successful results—we refer to the magnificent lines built by General Anson Stager, of the Western Union Company, in the principal Western cities, which are considered by competent judges to be, perhaps, the finest examples of telegraphic construction in the world.

The hight of the city poles above the ground is sixty-five feet. They carry fifty No. 9 wires, arranged upon nine cross arms, and insulated with the Brooks insulator. A test of these lines in rain, after two years' exposure, shows the insulation, within eight miles from the office, to be so high as to be beyond the range of measurement of either the Siemens universal galvanometer or the Varley differential—the instrument usually employed for these tests. These lines, as specimens of telegraphic engineering, are equally creditable in a mechanical point of view. The massive spars, ranged with mathematical accuracy for miles along the straight and level streets of Chicago, instead of detracting from the appearance of the thoroughfares, are a positive ornament to them. The ordinary sized poles are twenty-one feet in hight, and fitted with similar insulation. These are used on the Central Pacific Railway line, the Michigan Central, and the Philadelphia and Reading Railroad line. The latter, by the way, is a very good specimen of substantial construction, eight wires being carried upon two cross arms, and not high enough from the ground to strain the poles too much upon the sharp curves which abound upon that road.—*The Telegrapher.*

NEW BOOKS AND PUBLICATIONS.

MINES AND MINING OF THE ROCKY MOUNTAINS, THE INLAND BASIN, AND THE PACIFIC SLOPE. Comprising Treatises on Mining Law, Mineral Deposits, Machinery, and Metallurgical Processes. By R. W. Raymond, Ph. Dr., U. S. Commissioner of Mining Statistics. Illustrated with 140 Engravings. Beveled boards, extra English cloth. New York: J. B. Ford & Co. 1871. Price, $4·50.

This volume contains, in a condensed form, a vast amount of information concerning our American mining industry, its condition, prospects, methods, and appliances. It comprises a description of all the gold and silver mining districts of the West; a careful discussion of the laws affecting their titles; a thorough essay on mineral deposits in general, their occurrences, characters, and classification: twenty-seven chapters, profusely illustrated, on the mechanical appliances of mining and on metallurgical processes; and an appendix, with valuable tables of statistical information. Three alphabetically arranged analytical indexes, one of Mines, one of Mining Districts, and one of Subjects, complete the work. With these the vast body of information contained in these 800 octavo pages is remarkably convenient and accessible for purposes of reference. The style of the book is free from obscure technicalities, and eminently adapted to interest and instruct the non-professional reader; while yet it is clear, terse, and accurate enough to satisfy the demand of experts.

VICKS' CATALOGUE AND FLORAL GUIDE.

One of the handsomest illustrated floral catalogues that come annually to our office is Vick's, of Rochester, N. Y. This year it comes to us more beautiful than ever. It is printed on tinted paper, and contains more than 200 engravings of the choicest varieties of flowers and vegetables, two of which occupy full pages, and are finely colored. Anyone having a taste for horticulture should inclose 25 cents to James Vick, Rochester, N. Y., and have a copy of his catalogue and guide mailed to him.

HIDE AND SEEK. A Novel. By Wilkie Collins, Author of "Woman in White," "Dead Secret," and many other popular Novels.

Messrs. T. B. Peterson & Brothers, 306 Chestnut street, Philadelphia, have just issued an edition of "Hide and Seek." Price, 75 cents.

A TEXT-BOOK OF ELEMENTARY CHEMISTRY, THEORETICAL AND INORGANIC. By George F. Barker, M. D., Professor of Physiological Chemistry in Yale College. New Haven, Conn.: Charles C. Chatfield & Co.

Prof. Barker has brought to the preparation of this work extensive knowledge of his subject, and, what is perhaps even more important, the fruits of an experience only to be obtained in teaching, through the want of which many able men have failed in their attempts to write good text-books for students. We are, after examination, prepared to give the book hearty commendation. Not that it is wholly without fault in plan and execution, but that these are so few, and the merits of the book are so obvious, as to disarm criticism. Accustomed to different methods of thought, the slight defects referred to may, perhaps, be only such to us, and may appear merits to others. The book is admirably calculated to introduce beginners into the science of chemistry. It is printed and bound in beautiful style.

NOTICES OF MINING MACHINERY, AND VARIOUS APPLIANCES IN USE, CHIEFLY IN THE PACIFIC STATES AND TERRITORIES, FOR MINING, RAISING AND WORKING ORES. With Comparative Notices of Foreign Apparatus for Similar Purposes. By William P. Blake. New Haven, Conn.: Charles C. Chatfield & Co.

This work is a reprint of a part of a report made by its author to the U. S. Commissioner of Mining Statistics, and printed as Part. IV. of the Commissioner's Report to Congress for the year 1870. Since the preparation of the report, there have been important advances in the construction of mining machinery, which have suggested certain modifications in this reprint. The work is replete with important and valuable information.

ST. LOUIS, THE FUTURE GREAT CITY OF THE WORLD. Illustrated with a Map, by L. U. Reavis. Second Edition. St. Louis: Published by order of the St. Louis County Court.

This book contains a large mass of facts, historical, geographical, geological, mineralogical, and statistical, in regard to St. Louis, one of the most important commercial and manufacturing centers of the great West. The whole is arranged in a very readable style, and printed in large pamphlet form.

A CHRONOLOGY OF PAPER AND PAPER MAKING. By Joel Munsell. Fourth Edition. Albany: Joel Munsell, 82 State street.

To those who know with what ability Mr. Munsell can compile, and in what a fine style he can print a work of this character, we need not say one word in regard to the value of the one now announced; and readers of this class are not few. For the benefit of those who are not familiar with Mr. Munsell's works, we will say, however, that the volume opens with a history of paper and paper making, which is followed by a chronology of paper, including improvements in its manufacture, and various industrial applications, arranged as the author so well knows how to do, in admirable form for reference. The work should be in every technical library, and is full of interest to the general reader.

SCIENTIFIC ADDRESSES, by Prof. John Tyndall, LL.D., F.R.S., Royal Institution, on the Methods and Tendencies of Physical Investigation; on Haze and Dust; on the Scientific Use of the Imagination. New Haven, Conn.: Charles C. Chatfield & Co.

WE are indebted to Mr. Dewitt C. Cragier for a copy of the Ninth Annual Report of the Board of Public Works of the City of Chicago, a voluminous and well-prepared document. Mr. Cragier will please accept our acknowledgements.

THE ADVERTISING HANDBOOK for 1871 has been issued in very convenient form, by T. C. Evans, 106 Washington st., Boston, Mass. Advertisers will find it a very useful book of reference.

WE are indebted to Mr. John Eaton, Jr., Commissioner of Education, for a copy of his Annual Report for 1870. We have read a great deal of this most admirable public document. It abounds in valuable information and statistics upon the present condition of education in the various States in the Union, together with instructive papers upon several specific subjects.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

11.—CARRIAGE LAMPS, BURNERS, AND BRACKETS.—R. Spaulding Merrill, Boston, Mass. January 3, 1871.

21.—TUCK MARKER FOR SEWING MACHINES.—J. F. Kellogg, North Bridgewater, Mass., and E. A. Cutler, Providence, R. I. January 5, 1871.

29.—STEAM BOILERS.—W. B. Mack, Philadelphia, Pa., residing at Glasgow, January 6, 1871.

32.—REPEATING FIRE-ARMS.—Oliver F. Winchester, New Haven, Conn. January 6, 1871.

33.—PLUMBAGO PRESSES.—Hubert R. Ives, New Haven, Conn. January 6, 1871.

Business and Personal.

Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us: besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

All reference to back numbers must be by volume and page.

GEARING CIRCULAR SAWS.—In answer to E. O. T.'s inquiry in regard to running a saw by gear direct from engine, I would say that there would be no trouble with the gear, but it would be folly to run a large saw in that way, owing to the great liability of the saw to be instantly stopped by the springing of timber, turning of logs, and other causes that practical sawyers know. My opinion is that if E. O. T. try it he will some day find his mill a wreck. I would also state that I have a gear of his description 2-feet diameter, 5-inch face, run by water power, that often makes 800 turns in a minute, used with belt for driving a 48-inch saw.—A. O. B., of Vt.

CEMENT.—F. P. B. can make a cement for fastening leather to iron or glass, as follows: To 1 quart of glue, after it is dissolved in good cider vinegar, add 1 ounce Venice turpentine; let it cook about half a day, when it is fit for use.—O. L. C., of N. H.

TURNING LATHE.—If M. C. R. will take a light cut from the bottom of the tail-stock, his lathe will turn true. The tail stock is evidently a little too high for the cone.—R. A. B., of Pa.

J. M. D.—The object of our query column, and column of answers to correspondents, is to benefit our readers at large, not individual readers. If you will send the recipes of which you speak we will publish them, but do not intend to make our office a medium of intercommunication on private business matters. The action of a steel magnet or any other magnet, will not render the air magnetic. A machine kept in motion by the attractive force of a permanent magnet would be a perpetual motion in the same sense as one kept in constant motion by the action of gravity. A water wheel placed in a never-failing stream is a perpetual motion in this sense. What is sought for is, however, a machine that will move itself independently of static force. Have you got such a machine? If so, we shall be glad to be introduced to it.

B. M. & Co., of Ind.—You are on the right track. By admitting air behind the bridge wall in the manner proposed, you will probably consume your smoke. We believe that heated air, if forced in under pressure, is better than cold air. If, however, it go in only under ordinary pressure, what you gain by increase of temperature will be, in great measure, lost by expansion, less oxygen entering in proportion to volume than when it enters cold.

J. A. H., of Ga.—There is no such substance as that you seek. The experiment you propose indicates that you do not understand the first principles of electrical science. Better get some good treatise, and inform yourself, than waste time and money in trying experiments which can not by any possibility teach you anything.

M. Y., of Ga.—We shall be glad to hear from you on the subject proposed, but cannot, of course, promise publication till we read your manuscript. The proportions for Babbitt metal, and method of making the alloy are as follows: Melt 4 parts of copper, and add by degrees 12 parts of best Banca tin, and 8 parts of regulus of antimony. When the mass is melted add 12 parts more of tin.

B. J. of Pa.—Rosner, a Danish Astronomer, first determined the velocity of light in 1675, by observing the eclipses of Jupiter's moons. It seems to require no time at all to pass over any distance of earth; the flash seems to be instantaneous.

E. M. F., of N. J.—You may use soda ash in your boiler to remove scale without any danger of hurting the boiler. In some cases it will loosen the scale, in others it will not. It will do no harm to try it.

G. F. C., of ——.—Plaster of Paris is prepared for taking casts by simply mixing it with water to the consistence of cream. The mixing must be done rapidly, or it will set before it can be poured into the mold.

O. W. Y. of Conn.—You will find the information you seek in an article on "Artificial Stone," page 263, Vol. XXIII. of the SCIENTIFIC AMERICAN.

L. R., of N. H.—The motive powers of streams, flowing equal volumes of water, will be directly as their falls. If a stream through which a given volume, at a given point, falls ten feet, produce at that point one hundred horse power, the same volume falling at another point twenty feet would yield two hundred horse power. The horse power of any body of falling water, is the weight in pounds which falls per minute, multiplied into the distance in feet through which it falls, and the product divided by 33,000.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—CEMENT FOR LEATHER THAT WILL RESIST WATER AND HEAT.—I wish a cement for leather that will resist the action of water and moderate heat.—J. A. K.

2.—FILTER FOR CISTERNS.—I see some of your correspondents recommend a wall of soft-burnt bricks for cistern filters. Should the wall be laid up with mortar or cement, or simply with the bricks alone?—J. A. K.

3.—How can I render scrap lead (such as accumulates in a plumber's shop) as soft and tough as pure sheet lead or pig lead? I desire to make castings of a peculiar shape, and can do so with pure sheet or pig lead, but the scrap is too hard and brittle. Cheapness is of course an object.—H. W. J.

4.—HARDENING CAST IRON.—How can cast iron be hardened after it is fitted and finished, without injury to the finished surface, and so as to render it more durable under wear?—C. D. S.