venture to think the metallurgists have done their part; we can tell you how to produce all these things with certainty, except, perhaps, the lobster red, and it remains for your artist to employ them.

In conclusion, I would say that many of these alloys may be blended by casting; you may have an alloy with a solidifying point a little lower than the rest, and pour the two alloys in succession, and the one which sets first may be covered by the other one. Here is an example of a bronze god (Fig. 12) clothed in brass, with brass anklets and bracelets. That is done by pouring brass round a copper casting of suitable form. On slicing this figure through, we found that was the fact. You have here the copper covered by the brass, and endless modifications may be produced in this way by pouring alloys one over the other.

While this paper is passing through the press an excellent exhibition of metal work has been opened in the hall of one of the ancient companies of the City of London, the Armourers' and Braziers' Company. The works exhibited showed no lack of inventive power and careful design, notably in the case of the articles sent by the East-end "Guild and School of Handicraft," but the craftsmen limited their efforts to working in brass, copper, iron and the precious metals, and appeared to have no notion that a wide range of beautiful alloys were equally available. Surely an effort should be made to induce British artificers to employ the materials and methods which their Japanese brethren have used for centuries with such remarkable effect.

A CHEAP FUNNEL-JACKET.

By JOHN A. FORRET.

THE appliances in the market for keeping solutions hot while being filtered are a water-jacket of tin or copper, and a funnel let through the ordinary water-bath. With the tin-jacket there is no means of drying it after use, which means rapid corrosion by rust, while the copper article is too expensive. The only objection I have to the water-bath jacket is the large quantity of water to be heated when the bath is used for filtering alone.

Some time ago I devised the hot-funnel shown in section below, and find it to answer the purposes of a

A, tin box, round or square; B, funnel; C, brass tube, with collar soldered into A; D, I. R. tubing, stretched over funnel and fitting accurately into C; E, glass tube fitting tightly into D.

hot-water funnel-jacket. The funnel being in direct contact with the water, its contents are much more rapidly heated than in the case of the ordinary jacket, with its intervening tin or copper. One drawback, however, is its fixity when in use—the funnel cannot be removed without emptying the bath.

The whole thing can be put together in the back shop at the expense of a little time and patience. The one I have in use was made out of an old vaseline-tin, the brass tube being the neck of a disused spirit-lamp. —*Chemist and Druggist.*

WIBORGH'S METHOD FOR THE ANALYSIS OF SULPHUR IN IRON AND STEEL.

By J. B. COHEN, Ph.D.

THIS method, which has recently been published in detail in Professor Ledebur's new volume on iron and steel analysis (*Leitfaden für Eisenhütten-Laboratorien*: Vieweg und Sohn), is described as rapid and accurate. The apparatus is shown in the figure.

It consists of a wide necked flask, *a*, of 250–300 cc.

capacity, to which is fitted a double bored cork. Through one hole passes a tap funnel, *b*, which terminates just below the cork, and through the other a cylindrical glass tube, *c*, about 21 cm. long, open at both ends. The upper end is about 6 cm. in diameter, and the lower end drawn out so as to pass through

the second hole in the cork. The amount of sulphur is determined by the depth of the yellow stain produced by H_2S on the surface of a piece of calico previously soaked in a 5 per cent. cadmium acetate solution and dried, the calico being stretched across the wide open end of the cylindrical tube. The calico may be stretched by means of two stout India rubber rings $\frac{1}{2}$ inch in width, which fit tightly round the upper part of the wide tube. One ring is allowed to project above the tube, so as to form a horizontal edge, and over this the calico is stretched by means of the second ring. Ledebur employs a wooden ring and two clamps, but the above method answers perfectly well.

The flask is first half filled with water and boiled on a sand bath to expel air, the sample of iron or steel, 0.1 to 0.8 gm., according to the amount of sulphur, is quickly introduced, and the water again boiled for a few minutes; dilute sulphuric acid (1 : 5) is introduced from the tap funnel gradually until the iron is dissolved without interrupting the heating.

Sulphureted hydrogen is evolved and the calico is stained. To obtain an even stain it is necessary that the cylindrical tube should have a vertical position.

When the iron is completely dissolved, the boiling is continued for eight to ten minutes. The calico is now removed, well rinsed and dried, and the stain compared with a set of standard colors. The set of standards (six shades are sufficient) is prepared by taking a sample of iron with a known quantity of sulphur and obtaining various shades with different weights of the sample by the method described above. These should be mounted on white cardboard and kept for comparison.

Having made an analysis and fixed upon the standard shade which comes nearest to that of the sample, the weight of sulphur is determined by the following formula:

If w is the weight of the standard sample corresponding to the standard shade containing s of sulphur, and w_1 is the weight of the sample taken, then the weight of sulphur s_1 in the sample is

$$s_1 = \frac{w s}{w_1}$$

The same standard shade can therefore be used for a variety of samples when different weights are employed. —*Jour. Soc. Chem. Industry.*

THE SCIENTIFIC AMERICAN Architects and Builders Edition.

\$2.50 a Year. Single Copies, 25 cts.

This is a Special Edition of the SCIENTIFIC AMERICAN, issued monthly—on the first day of the month. Each number contains about forty large quarto pages, equal to about two hundred ordinary book pages, forming, practically, a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued during the past year, and many others are in process of construction.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the Largest Circulation of any Architectural publication in the world.

A Catalogue of valuable books on Architecture, Building, Carpentry, Masonry, Heating, Warming, Lighting, Ventilation, and all branches of industry pertaining to the art of Building, is supplied free of charge, sent to any address.

MUNN & CO., Publishers,
361 Broadway, New York.

Building Plans and Specifications.

In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Churches, Schools, Stores, Dwellings, Carriage Houses, Barns, etc.

In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address

MUNN & CO., 361 BROADWAY, NEW YORK.

THE

Scientific American Supplement.

PUBLISHED WEEKLY.

Terms of Subscription, \$5 a year.

Sent by mail, postage prepaid, to subscribers in any part of the United States or Canada. Six dollars a year, sent, prepaid, to any foreign country.

All the back numbers of THE SUPPLEMENT, from the commencement, January 1, 1876, can be had. Price, 10 cents each.

All the back volumes of THE SUPPLEMENT can likewise be supplied. Two volumes are issued yearly. Price of each volume, \$2.50 stitched in paper, or \$3.50 bound in stiff covers.

COMBINED RATES.—One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, \$7.00.

A liberal discount to booksellers, news agents, and canvassers.

MUNN & CO., Publishers,

361 Broadway, New York, N. Y.

TABLE OF CONTENTS.

	PAGE
I. ASTRONOMY.—Helio-stat for the Smithsonian Institution, Washington.—By SIR HOWARD GRUBB.—A recent accession to the cabinet of the Smithsonian Institution.	12151
II. CHEMISTRY.—A Cheap Funnel Jacket.—By JOHN A. FORRET.—A simple and easily constructed laboratory appliance for filtering solutions hot.—1 illustration.	12166
Wiborgh's Method for the Analysis of Sulphur in Iron and Steel.—By J. B. COHEN, Ph.D.—A colorimetric method of determining sulphur in iron and steel.—1 illustration.	12166
III. CIVIL ENGINEERING.—Some Engineering Works.—By E. L. CORTELL.—A review of some of the great engineering works of the century, with interesting statistics and data.	12152
IV. CYCLING.—A Water Velocipede.—A water bicycle with concealed motor.—1 illustration.	12155
V. DECORATIVE ART.—The Use of Alloys in Art Metal Work.—By Prof. W. C. ROBERTS-AUSTEN.—An elegant series of examples of Japanese art work in metals of different colors with analyses and full details.—12 illustrations.	12163
VI. ELECTRICITY.—A "Home-made" Electric Motor.—A motor for driving a sewing machine fully described, with full sized illustrations of parts.—12 illustrations.	12160
An Experimental Proof of Ohm's Law, Preceded by a Short Account of the Discovery and Subsequent Verification of the Law.—By ALFRED M. MAYER.—An excellent demonstration for the use of the student of the great electric law.—2 illustrations.	12162
Electric Torch at the Paris Opera House.—Recent application of electricity at the Paris Opera House, in illuminating the torch of Genius.—2 illustrations.	12162
VII. MECHANICAL ENGINEERING.—An All-round Titan.—A lifting crane of very great power and capacity for use in railroads, track yards, and in similar positions.—1 illustration.	12155
Sibley College Lectures.—Car Wheels.—By ROBERT W. HUNT.—A Sibley College lecture, treating of the manufacture of cast iron car wheels and the processes for producing a good wearing surface for the tread.—4 illustrations.	12156
VIII. MISCELLANEOUS.—Heligoland.—Description of the island recently ceded to Germany by England.	12153
IX. NAVAL ENGINEERING.—The Large Sail Vessels of France.—The increase in size of iron sailing vessels, with description of the largest sailing vessel in the world.—Advantages of water ballast.—3 illustrations.	12154
X. TECHNOLOGY.—Improved Flax Scutching Machine.—An advance in the manufacture of linen.—A new Scotch machine for treating the stalks of flax.—2 illustrations.	12158
The Great Salt Deposits of Khewra, in the Punjab.—By E. ROUGER.—The mining and treatment of Indian salt.	12158
Sulphite Pulp in America.—Sulphite pulp from different processes compared, and difference stated.	12159

A New Catalogue of Valuable Papers

Contained in SCIENTIFIC AMERICAN SUPPLEMENT during the past ten years, sent free of charge to any address. MUNN & CO., 361 Broadway, New York.

Useful Engineering Books

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published, for free circulation, at the office of this paper. Subjects classified with names of author. Persons desiring a copy have only to ask for it, and it will be mailed to them. Address,

MUNN & CO., 361 Broadway, New York.

PATENTS.

In connection with the Scientific American, Messrs. MUNN & Co. are solicitors of American and Foreign Patents, have had 42 years' experience, and now have the largest establishment in the world. Patents are obtained on the best terms.

A special notice is made in the Scientific American of all inventions patented through this Agency, with the name and residence of the Patentee. By the immense circulation thus given, public attention is directed to the merits of the new patent, and sales or introduction often easily effected.

Any person who has made a new discovery or invention can ascertain, free of charge, whether a patent can probably be obtained, by writing to MUNN & Co.

We also send free our Hand Book about the Patent Laws, Patents, Caveats, Trade Marks, their costs and how procured. Address

MUNN & CO.,

361 Broadway, New York.

Branch Office, 622 and 624 F St., Washington, D. C.