BOOKS OF EXPERIMENTS FOR THE HOME CHEMIST

1847-1994

William B. Jensen
University of Cincinnati

Oesper Collections
Cincinnati, OH
2017

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DEDICATED TO ALFRED POWELL MORGAN

Whose Modest Books for the Home Chemist were My Boyhood Bibles

Preface

The origins of this booklet are to be found in a talk I was invited to give at a symposium on the popularization of chemistry held at the 247th National ACS Meeting in Dallas, Texas, on 16-20 March 2014, and in my recent discovery of a 2002 booklet in the Oesper Collections of the University of Cincinnati by Helmut Hitz and Georg Schwedt entitled *"Zur Belustigung und Belehrung" Experimentier-bücher aus zwei Jahrhunderten*, which highlights German-language books on home science experiments found in the collections of the Deutsches Museum in Munich (1). It quickly became apparent that the slides for my Dallas talk could be easily reformatted as a booklet similar to that of Hitz and Schwedt, albeit it one dealing exclusively with chemistry experiments for the home amateur rather than with science experiments in general.

As emphasized in the introduction to my Dallas talk, the topic of popularizing chemistry is very broad and can encompass an enormous range of activities, including:

1. Popular public lectures, such as those by Faraday on *The Chemical History of a Candle* (1860) given at the Royal Institution, or those by Cooke on the *New Chemistry* (1872) given at the Lowell Institute of Boston.

2. Popular surveys of chemistry, such as Marcet's well known *Conversations on Chemistry* (1806), or Liebig's *Familiar Letters on Chemistry* (1843), which first appeared as a series of articles in a local German newspaper. Indeed, Marcet's book was originally intended as

a guide for young girls attending popular public lectures on chemistry but was also used as a textbook in the United States, thus illustrating how attempts to classify this literature can be ambiguous at times.

3. Popular books explaining the chemistry of everyday things, such as Johnston's *The Chemistry of Common Life* (1855), or Lassar-Cohn's *Chemistry in Daily Life* (1909).

4. Less familiar to 20th-century audiences is a series of popular books attempting to use chemistry to prove the existence of God and the truth of religion of which there is a continuous 19th-century tradition beginning with Prout's famous Bridgewater Treatise of 1834 and ending with Cooke's massive tome on *Religion and Chemistry* of 1864.

5. Lastly, there is the chemistry set and its accompanying literature, both of which extend back to the late 18th century. Its best and earliest 19th-century examples include the books *Chemical Amusement* (1817) by Frederich Accum and *Chemical Recreations* (1823) by John Griffin, both of which were sold independently, though originally intended to accompany the chemistry sets manufactured by their authors.

This booklet will deal with none of the above approaches to popularization, but rather with a sixth approach closely related to the chemistry set literature, namely independent books of experiments intended for amateur home chemists, but not necessarily intended for use with a chemistry set *per se*. This subject was suggested by a personal memoir I had just completed when I received a call to participate in the Dallas symposium that described my own personal experiences growing up as a boy amateur chemist and in which I had

reviewed the various books that I had used when building up my own home laboratory back in the 1950s and 1960s (2).

Though the Oesper Collections at Cincinnati contain many 19th and 20th-century British, German and French examples of this literature, I have restricted myself to the 45 items belonging to my personal library rather than to the Oesper Collections. In each case I show the front cover of the book in question and its publication information, except when the cover is plain or heavily damaged, in which case I show the title page instead. Following Hitz and Schwedt, I have also included short biographies of selected authors, though this has proved possible only for items appearing before 1950, and have also shown selected pages from the books themselves when I thought them of sufficient interest.

My personal collections do not contain examples published after 1994. This is in part because more recent examples of this literature are increasingly inhibited by issues of safety and fear of law suits. As a result, more and more are targeted at young children rather than adolescents, and use simple, albeit boring, items found in the kitchen rather than in a true chemical laboratory (for example, item 39). On top of this, many are now illustrated with cartoons (see items 40 and 45) rather than proper illustrations. As a committed boy chemist I am certain I would have found all of this both uninteresting and vaguely insulting, as I apparently also do as an adult.

William B. Jensen
Cincinnati, OH
October 2017

References and Notes

1. H. Hilz, G. Schwedt, *"Zur Belustigung und Belehrung." Experimentierbücher aus zwei Jahrhunderten*, Deutsches Museum: München, 2002.

2. W. B. Jensen, *Memoirs of an Amateur Chemist*, Oesper Collections: Cincinnati, OH, 2013. Available on line at http://www.che.uc.edu/jensen/W.%20B.%20Jensen/Books/Memoirs%20of%20an%20Amateur%20Chemist.pdf

BOOKS OF EXPERIMENTS FOR THE HOME CHEMIST

John Joseph Griffin (1802-1877)

John Joseph Griffin was born in London but grew up in Glasgow, where he studied chemistry at the Andersonian Institution. After graduation he began, in partnership with his eldest brother, Richard, a publishing and laboratory supply house. In 1852 the business was divided, with John taking the laboratory supply portion, which he moved to London, and his nephew, George Griffin, retaining the publishing portion in Glasgow. Initially known as J. J. Griffin & Sons, the laboratory supply house would eventually become Griffin & George and, under that guise, would continue in business well into the 20th century.

During his lifetime Griffin would author, edit, or translate at least seven books dealing with various aspects of chemistry, most of which were published by the family firm. Item 1 was his earliest book and first appeared in 1823. It would subsequently go through many editions and expansions, of which version shown represents the 9th edition.

CHEMICAL RECREATIONS:

A

POPULAR COMPENDIUM

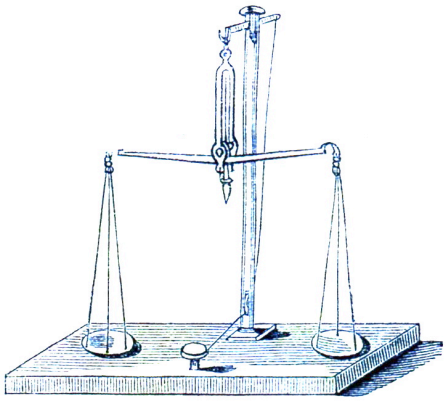
OF

EXPERIMENTAL CHEMISTRY,

FOR THE USE OF BEGINNERS.

BY

JOHN JOSEPH GRIFFIN.

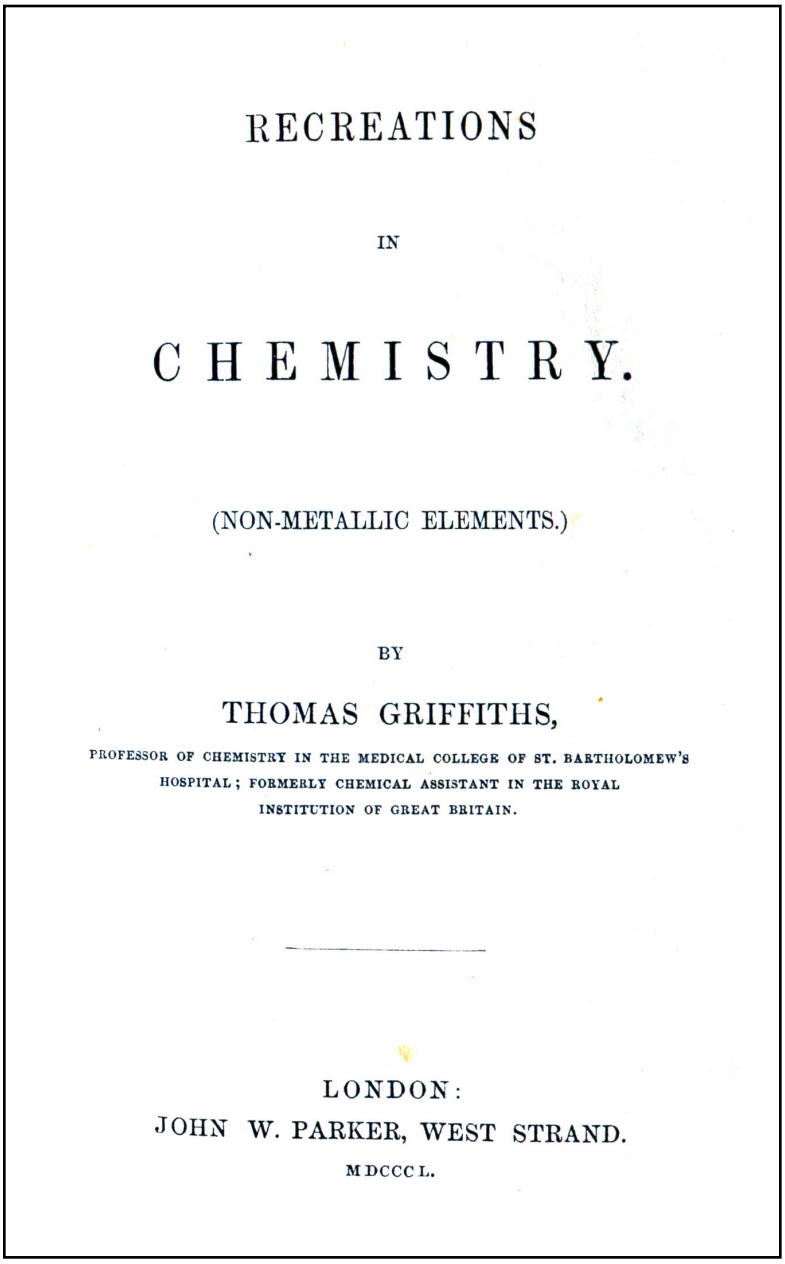


THE NINTH EDITION.

ENTIRELY REWRITTEN AND ILLUSTRATED BY ENGRAVINGS.

GLASGOW:
PUBLISHED BY RICHARD GRIFFIN AND CO.
AND WILLIAM TEGG AND CO. LONDON.
1847.

Number 1
John Joseph Griffin
Chemical Recreations
Glasgow: Richard Griffin & Co.
1847



RECREATIONS

IN

CHEMISTRY.

(NON-METALLIC ELEMENTS.)

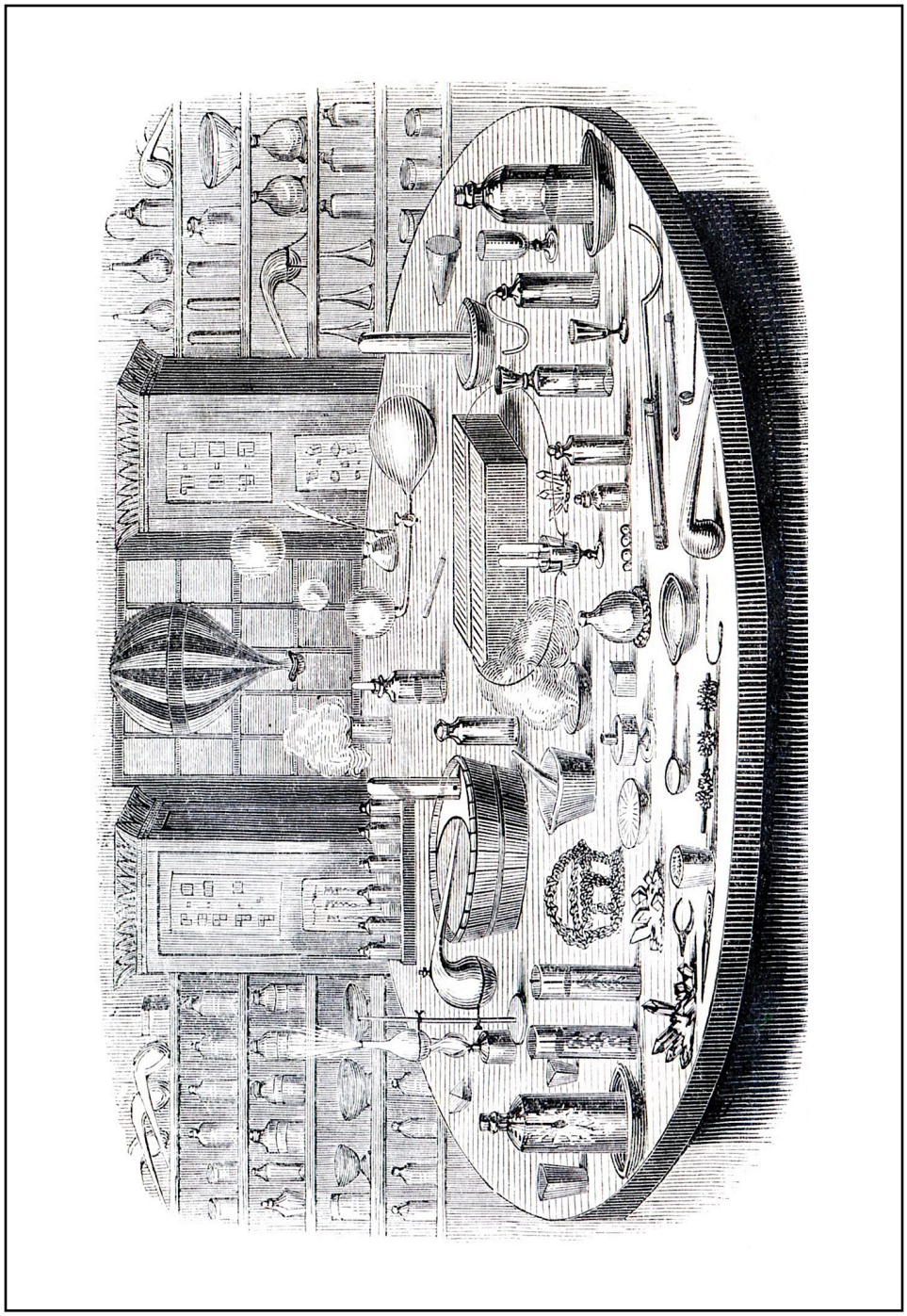
BY

THOMAS GRIFFITHS,

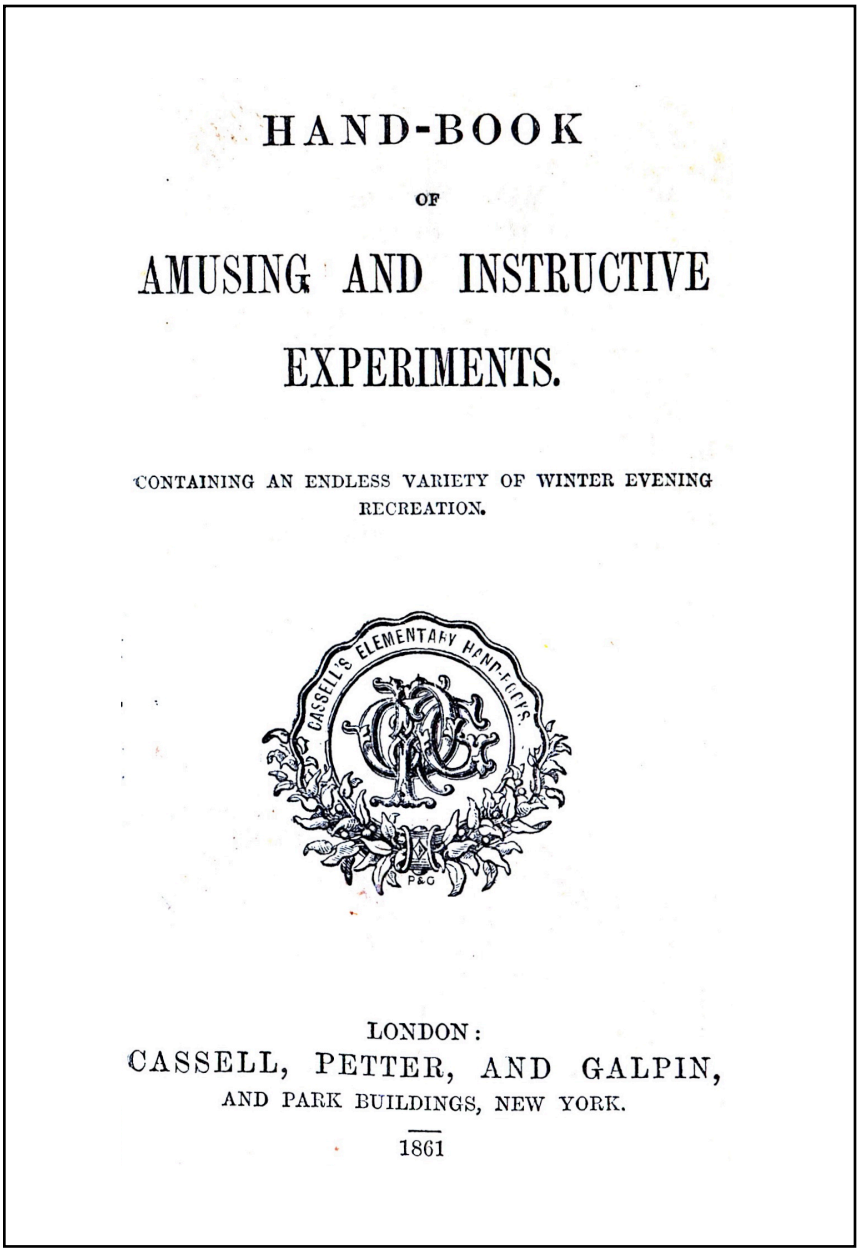
PROFESSOR OF CHEMISTRY IN THE MEDICAL COLLEGE OF ST. BARTHOLOMEW'S HOSPITAL; FORMERLY CHEMICAL ASSISTANT IN THE ROYAL INSTITUTION OF GREAT BRITAIN.

LONDON:
JOHN W. PARKER, WEST STRAND.
MDCCCL.

Number 2
Thomas Griffiths
Recreations in Chemistry
London: John W. Parker
1850



Frontispiece to item 2 showing Griffith's rather unrealistic view of the average home laboratory.



HAND-BOOK

OF

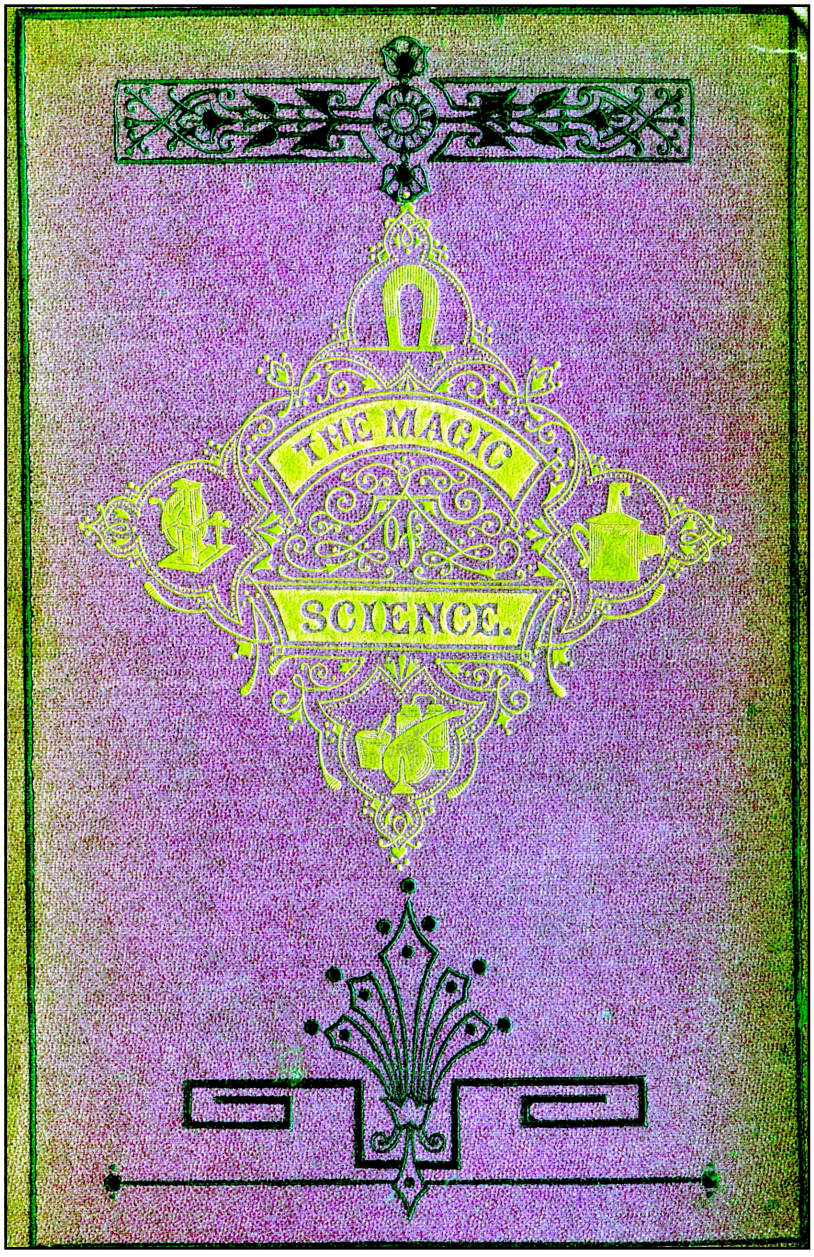
AMUSING AND INSTRUCTIVE

EXPERIMENTS.

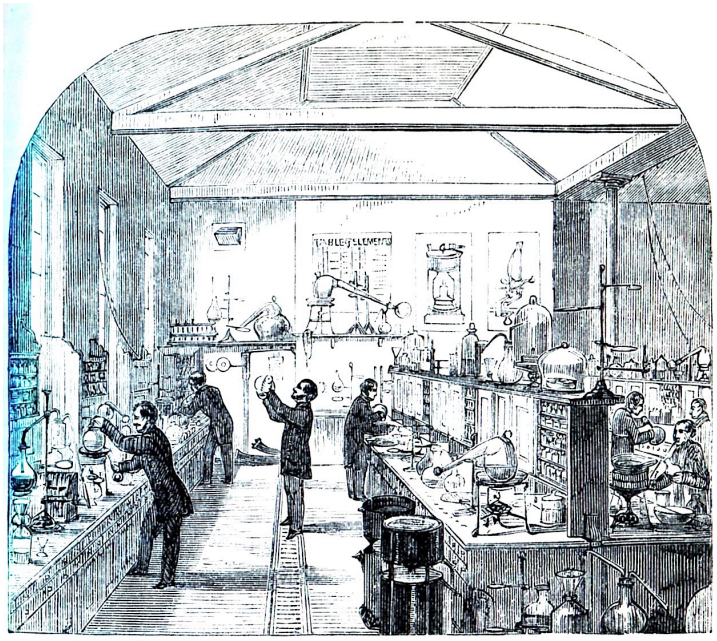
CONTAINING AN ENDLESS VARIETY OF WINTER EVENING RECREATION.

LONDON:
CASSELL, PETTER, AND GALPIN,
AND PARK BUILDINGS, NEW YORK.
1861

Number 3
Anonymous
Handbook of Amusing and Instructive Experiments
London: Cassell, Peter, and Galpin
1861



Number 4
James Wylde
The Magic of Science
London: Charles Griffin and Company
1861



THE LABORATORY OF THE ROYAL COLLEGE OF CHEMISTRY.

EXPERIMENTS IN CHEMISTRY.

OXYGEN.

As we do not propose attempting to make our readers proficients in science, we shall omit giving details of *various* ways of obtaining the gases, &c., with which we intend experimenting; and shall only name the best, easiest, and simplest plan, leaving advancing students to seek for further information in the works of Fownes, Griffin, Turner, Brande, or Graham.

Oxygen gas affords us a great variety of beautiful experiments; but, before describing its preparation, we shall mention a few results obtained by very simple means which will illustrate some of its properties.

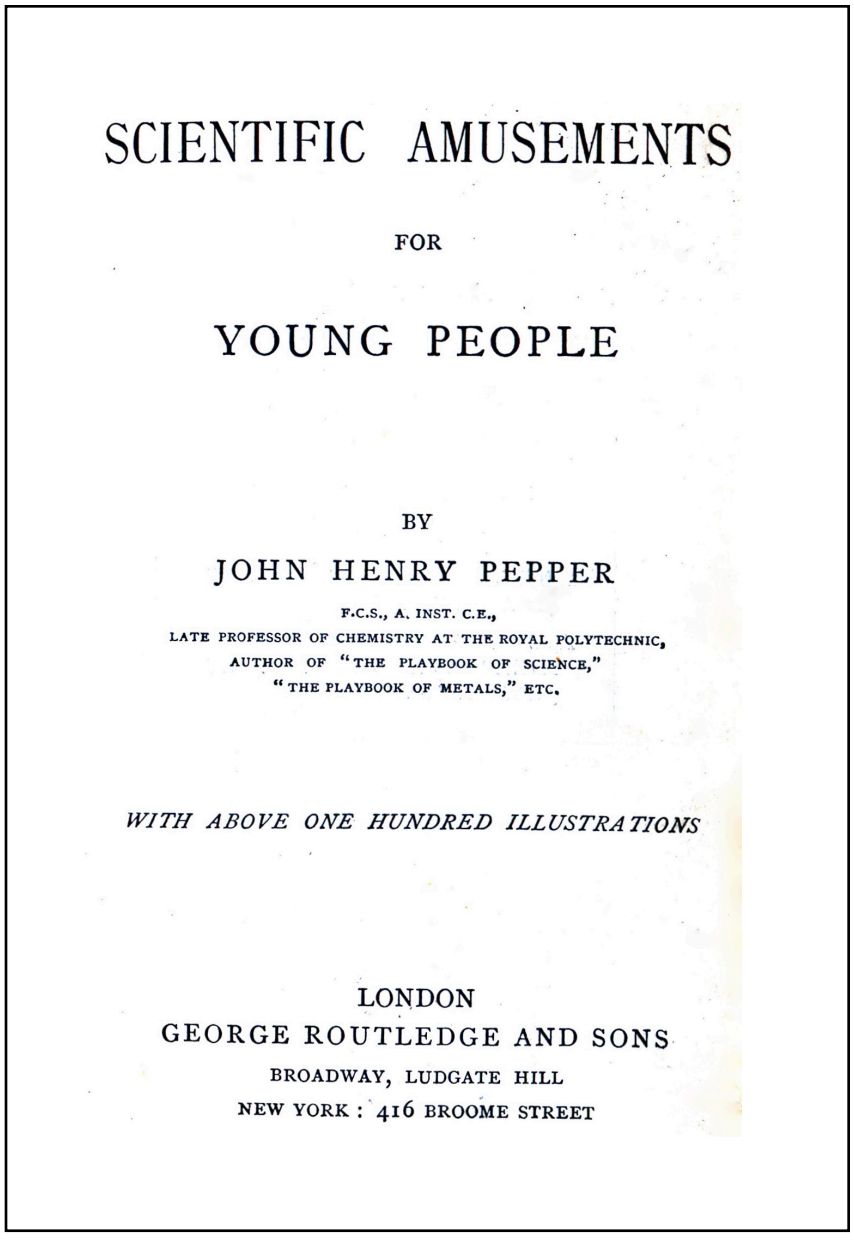
EXPERIMENT 1.—Into a common fire throw a teaspoonful of

B

Opening page to Wylde's book and the section dealing with chemical experiments.

John Henry Pepper (1821-1900)

John Henry Pepper was born in Westminster and educated at King's College School, where he became interested in chemistry. By 1848 he was teaching analytical chemistry at the Royal Polytechnic Institution of London, where he initiated a series of popular public lectures on science illustrated by spectacular demonstrations. He was soon launched on a highly successful career as a popular itinerate lecturer, that would eventually take him to the United States and Australia. His most famous demonstration was an optical illusion known as "Pepper's Ghost." In addition to items 5 and 6, Pepper would author roughly a dozen books, including *The Playbook of Metals* (1861) and *Cyclopedic Science Simplified* (1866). However, many of his later books are not independent publications, but rather reprints of sections of his earlier books.



SCIENTIFIC AMUSEMENTS

FOR

YOUNG PEOPLE

BY

JOHN HENRY PEPPER

F.C.S., A. INST. C.E.,
LATE PROFESSOR OF CHEMISTRY AT THE ROYAL POLYTECHNIC,
AUTHOR OF "THE PLAYBOOK OF SCIENCE,"
"THE PLAYBOOK OF METALS," ETC.

WITH ABOVE ONE HUNDRED ILLUSTRATIONS

LONDON
GEORGE ROUTLEDGE AND SONS
BROADWAY, LUDGATE HILL
NEW YORK: 416 BROOME STREET

Number 5
John Henry Pepper
Science Amusements for Young People
London: George Routledge and Sons
[1861?]

Fig. 29. The jar of hydrogen and the toy in hand.

EXPERIMENTS WITH HYDROGEN.

When a gas jar is filled with hydrogen, it may be lifted carefully from the pneumatic trough without fear of any gas escaping, and placed on a stand sufficiently high to admit of the hand being inserted into the jar; if one of the squeaking toys be first worked in the air and then in the jar of hydrogen, the effect is very laughable, as the sound becomes so shrill, in consequence of the levity of the gas. A bell sounded in air and afterwards in hydrogen is also an amusing experiment.

CURIOUS SOUNDS EMITTED BY BURNING HYDROGEN FROM A JET OVER WHICH GLASS TUBES OF VARIOUS SIZES ARE PLACED.

Take the generating hydrogen bottle, and fit a long jet with a small orifice; if the hydrogen is set on fire, and a tube placed over it at a certain place, the hydrogen flame begins to flicker and emit a sharp sound, which is varied according to the length and diameter of the glass tubes. Sometimes many tubes may be tried before the sound can be obtained.

SYNTHESIS OF HYDROGEN AND OXYGEN, AND FORMATION OF WATER.

If the jet over which hydrogen is burning is held under a cold glass jar, the steam is very soon condensed, and trickles down the sides in drops of water, produced by the combination of the hydrogen with the oxygen of the air, as every nine pounds of water consist of eight of oxygen and one of hydrogen.

EXPERIMENTS WITH OTHER GASES.

NITROUS OXIDE, OR LAUGHING-GAS, AND NITRIC OXIDE GAS.

TAKE two or three ounces of pure nitrate of ammonia in crystals, and put them into a retort, then apply the heat of a lamp to the retort, and take care that the heat does not exceed 500°. When the crystals begin to melt, nitrous oxide gas will be evolved in considerable quantities. Nitric oxide gas may be produced by pouring nitric acid, diluted with six times its weight of water, on copper filings, or small pieces of tin. The gas is evolved until the acid is saturated with oxide of copper, when the process may be stopped.

A page from the section of item 5 dealing with chemistry experiments.

Number 6
John Henry Pepper
The Boy's Playbook of Science
London: George Routledge and Sons.
1866

Ninth Experiment.

Phosphide of calcium is quickly prepared by placing some small pieces of lime in a crucible and making them red-hot; if lumps of dry phosphorus are thrown into the crucible, and the cover placed on quickly, and immediately after the phosphorus, the latter unites with the calcium, and forms a brown substance which produces gaseous phosphide of hydrogen (PH_3) when placed in water, and the gas takes fire spontaneously when it comes in contact with the air.

Tenth Experiment.

Phosphorus placed in a retort with a tolerably strong solution of potash, and a small quantity of ether, affords a large quantity of phosphide of hydrogen (commonly called phosphuretted hydrogen) when boiled. The neck of the retort must dip into a basin of water, and the object of the ether is to prevent the combustion of the first bubbles of gas *inside* the retort, which by their explosion would probably break the glass. If the neck of the retort is kept under water in which potash is dissolved, the gas may be generated for many days at pleasure, although it is not a desirable experiment to renew too often, on account of the disagreeable odour produced. (Fig. 157.)

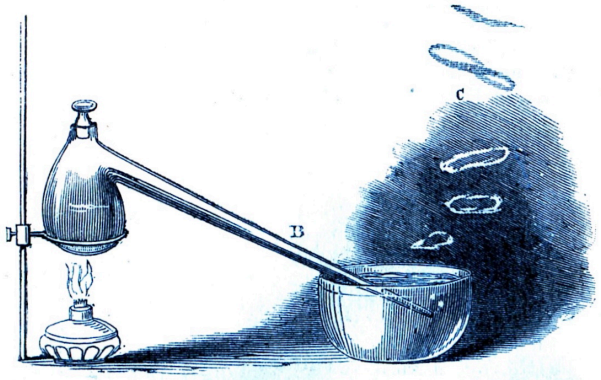


Fig. 157. A retort containing the phosphorus, water, potash, and ether. B. Neck dipping into a basin of water. C. The gas burning, and producing beautiful rings of smoke.

Eleventh Experiment.

When a jar of oxygen is held over the neck of the retort generating the phosphuretted hydrogen, a bright flash of light and explosion are observed; and if the experiment is performed in a darkened room, it is just like a sudden flash of lightning. A bottle of chlorine held over the neck

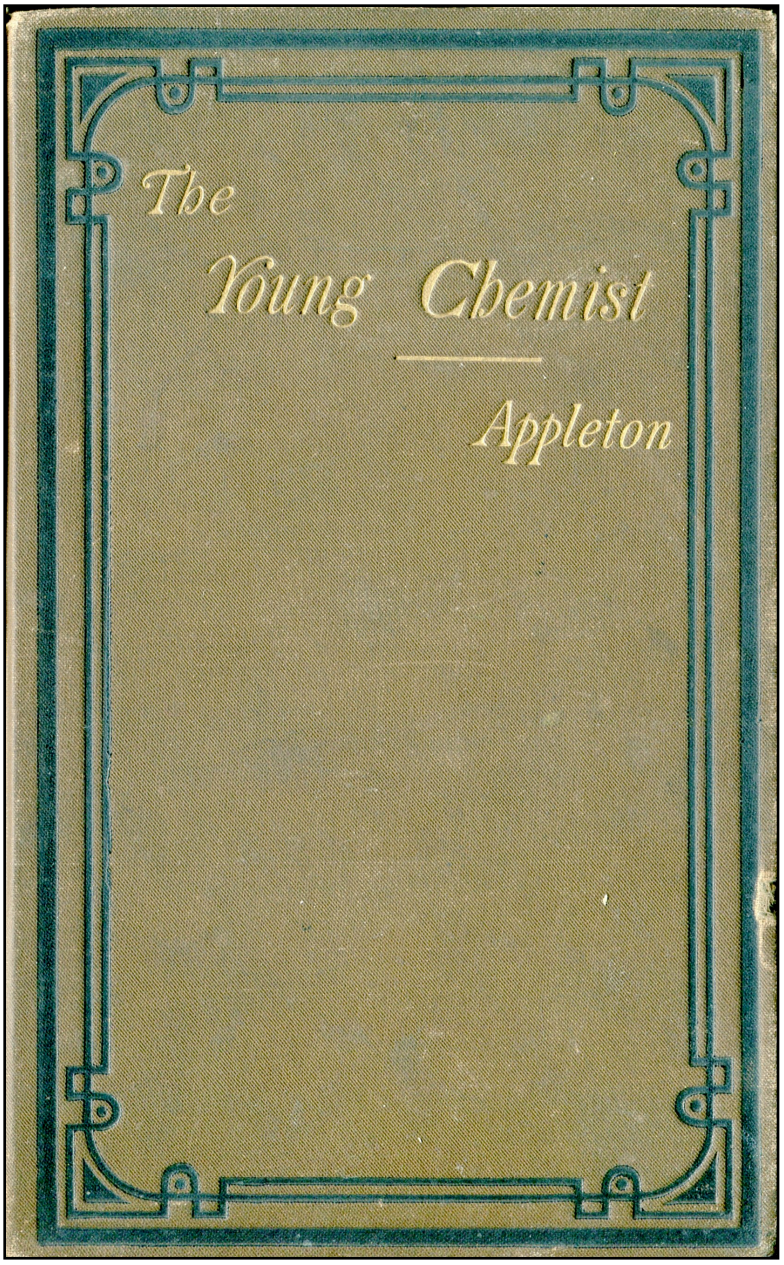
A page from item 6 describing the preparation of phosgene, which Pepper used to explain the Will-o'- the-Wisp shown in the lower left corner of the book's cover.

John Howard Appleton (1844-1930)

John Howard Appleton in Portland Maine. While still a child, his family moved to Providence RI, where he later attended Brown University, receiving his bachelor's degree in 1863 and a master's degree in 1869. Starting as an assistant instructor in analytical chemistry at Brown in 1863, he advanced to full instructor in 1865 and to Professor of Applied Chemistry in 1868 – a position which he held until his retirement at age 70 in 1914. He also served as the Rhode Island State Sealer of Weights and Measures, a term as Vice-President of the American Chemical Society, and remained active in campus affairs until his death at age 86.

Appleton would publish about a dozen books in his career, all of them either textbooks related to the teaching of undergraduate chemistry at Brown or popularizations intended for the general public. Perhaps the most successful of these popularizations was his 1888 volume, *Beginners' Hand-Book of Chemistry: The Subject Developed By Facts and Principles Drawn Chiefly from the Nonmetals*, which sported hundreds of woodcuts and about a half dozen colored lithographs, reproductions of which are currently being sold on the internet.

Despite its title, it is unclear whether item 7 was intended primarily for the amateur home chemist or for use in Appleton's chemistry course at Brown. All that is known is that it was used in the former sense by the famous American horror story writer, H. P. Lovecraft, who was an avid home chemist as a child and teenager.



Number 7
John Howard Appleton
The Young Chemist
Philadelphia: Cowperthwaite & Co.
1878

Ammonia-gas, NH_3.

97. The test for *free* Ammonia.

Experiment.—Pour some Spirits of Hartshorn (Ammonic hydrate, NH_4OH) into a small flask; shake the flask; the Ammonic hydrate gives off colorless, pungent-smelling Ammonia-gas (NH_3). Suspend in the upper part of the flask a glass rod previously dipped in concentrated Chlorohydric acid. Fumes of Ammonic chloride (NH_4Cl) appear.

$$NH_3 + HCl = NH_4Cl.$$

The fumes are minute particles of a white solid, NH_4Cl.

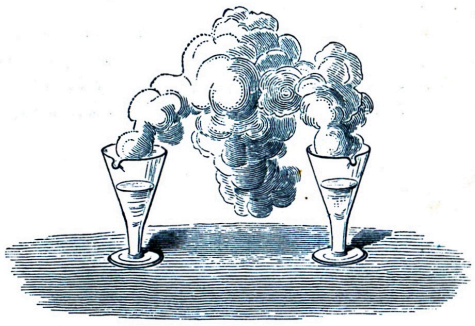


FIG. 23.—Ammonia-gas and Chlorohydric-gas meeting in the air and forming Ammonic chloride.

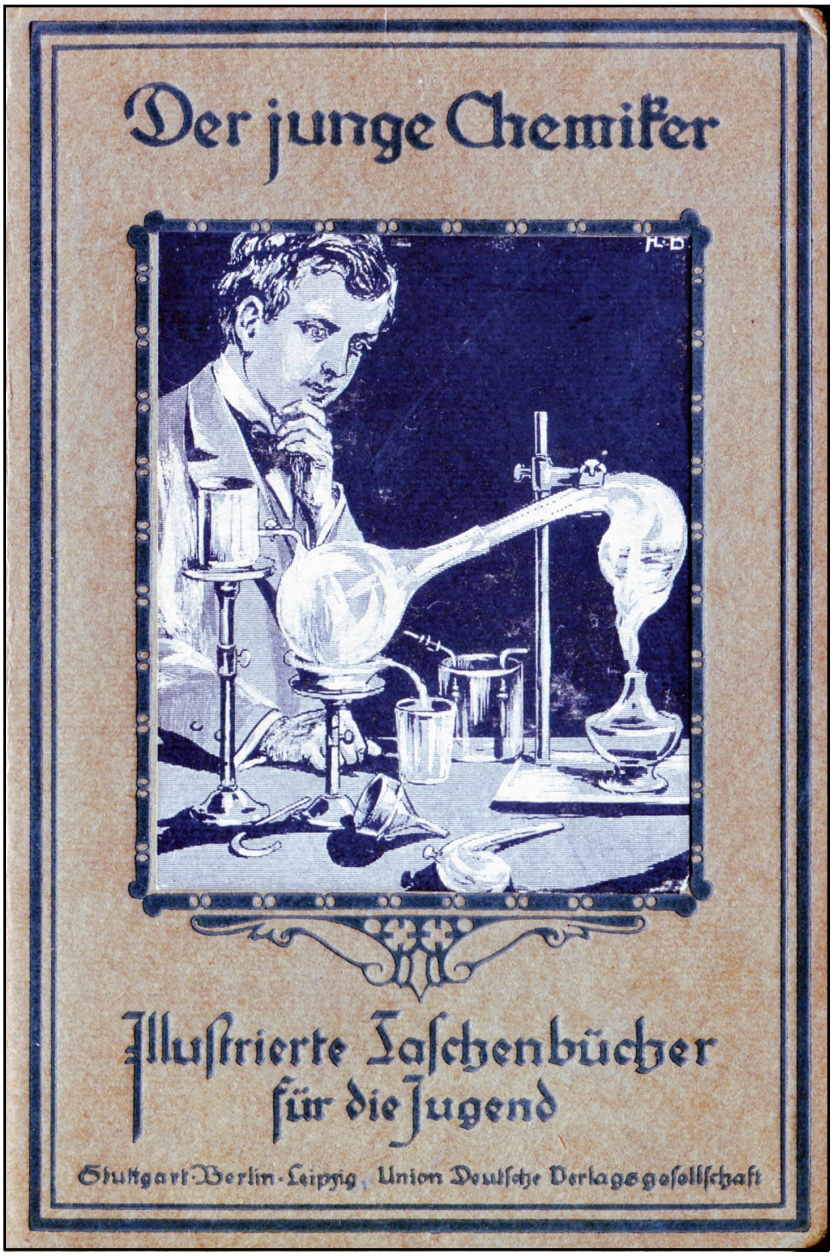
98. Another method of producing the cloud of Ammonic chloride.

Experiment.—Place in a wine-glass or beaker some strong solution of Ammonic hydrate. Place near it another similar vessel, containing concentrated Chlorohydric acid. A cloud of Ammonic chloride forms in the air between them, especially noticeable when the two glasses are moved from side to side.

99. To test for *combined* Ammonia, having first liberated it.

Experiment.—Into a small flask pour a small quantity of solution of Ammonic chloride (NH_4Cl). Try with the rod and Chlorohydric acid. There should be little, if any, fume. Now add solution of Sodic

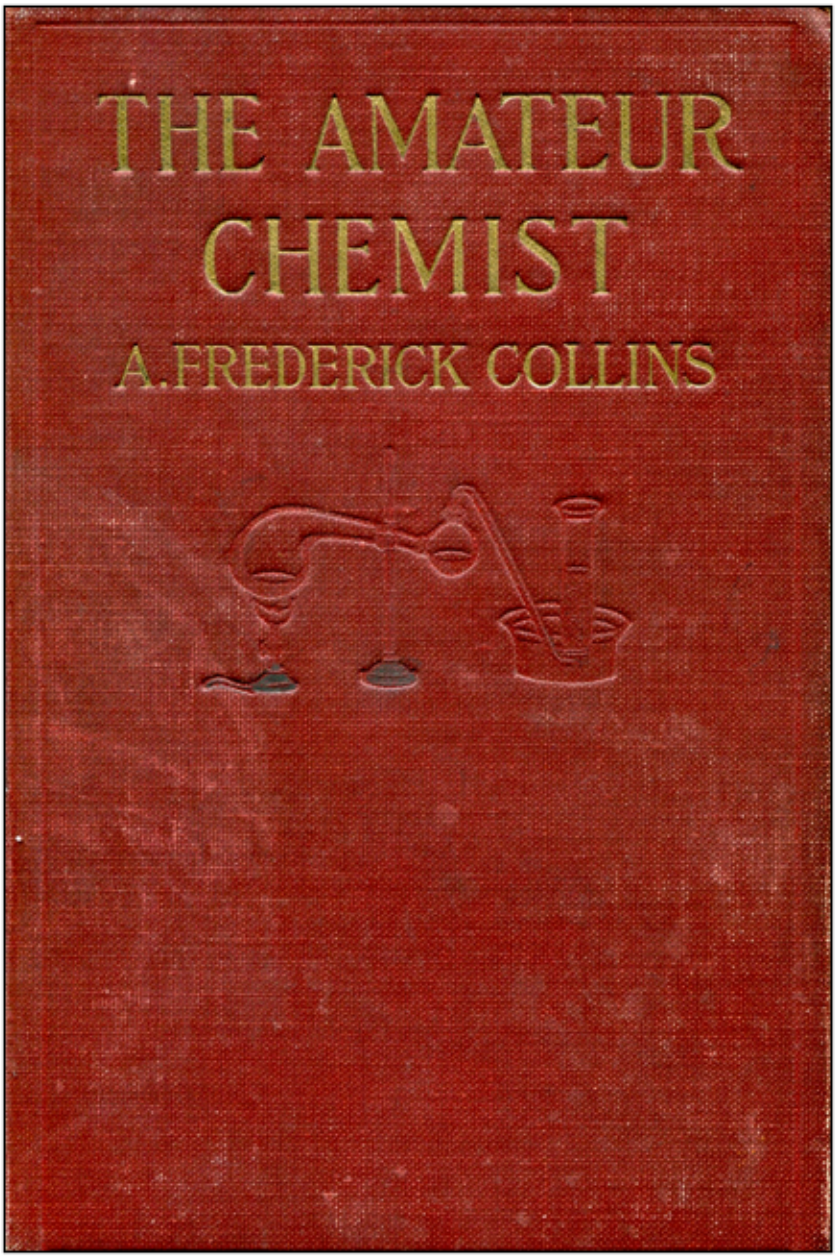
A page from item 7 describing some experiments with ammonia.



Number 8
Anonymous
Der junge Chemiker
Stuttgart: Union Deutsche Verlagsgesellschaft
[1910?]

Archie Frederick Collins (1869-1952)

Collins was not a chemist, but rather a self-taught electrical engineer and inventor who did pioneering work on the early development of radio. He is credited with more than 188 books, ranging from serious technical monographs on radio and wireless telegraphy to hundreds dealing with popular science and technology and with almost every imaginable hobby. In many ways he is a prototype for what will follow. Whereas professional, and at times even famous, chemists continued to author popular chemical books throughout the 19th and 20th centuries belonging to the first four categories discussed in the introduction, the same is not true of the books surveyed in this booklet. At best their authors might be secondary or elementary teachers, often with degrees in education rather than science, but most frequently they are without degrees and belong to a class of professional authors specializing in the writing of hobby books and other literature intended for children and adolescents. Item 9 is really a hybrid presentation containing only a few experiments to illustrate the descriptive chemistry in the text, whereas Collins' second book on chemistry (item 12) is devoted solely to experiments for the home laboratory.



Number 9
Frederick Collins
The Amateur Chemist
New York: D. Appleton
1919

Zinc + Hydrochloric acid HCl_2 makes Zinc chloride $ZnCl_2$ + Hydrogen H_2

The zinc chloride when dissolved in water makes a good soldering fluid. In *Chapter III* you will remember it was stated that the gastric juice contains small amounts of hydrochloric acid (HCl_2) and mi-

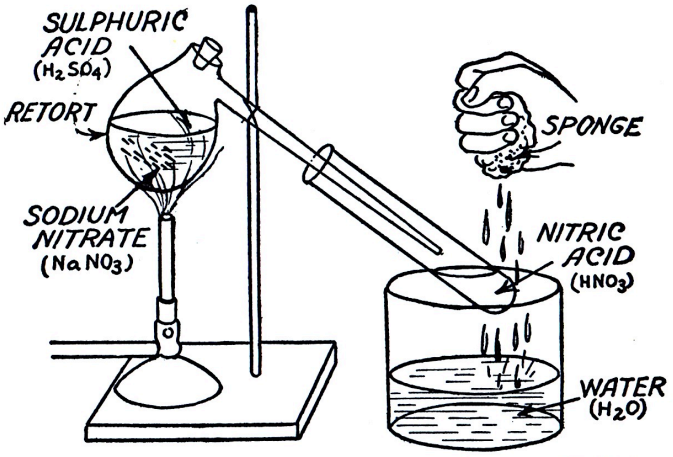


FIG. 30. APPARATUS FOR MAKING NITRIC ACID (HNO_3)

nute dosages of it are prescribed by doctors for indigestion. Hydrochloric acid is used on a large scale for making chlorine (Cl) which, in turn, is used to make bleaching powder, etc.

How to Make Nitric Acid.—*The Apparatus.*—To make *nitric acid* (HNO_3) get (1) a 2-ounce *glass retort* with a *stopper* in it, (2) a test tube and fix the retort to it, and (3) a *stand,* as shown in Fig. 30.

The Experiment.—Put one ounce of *sodium ni-*

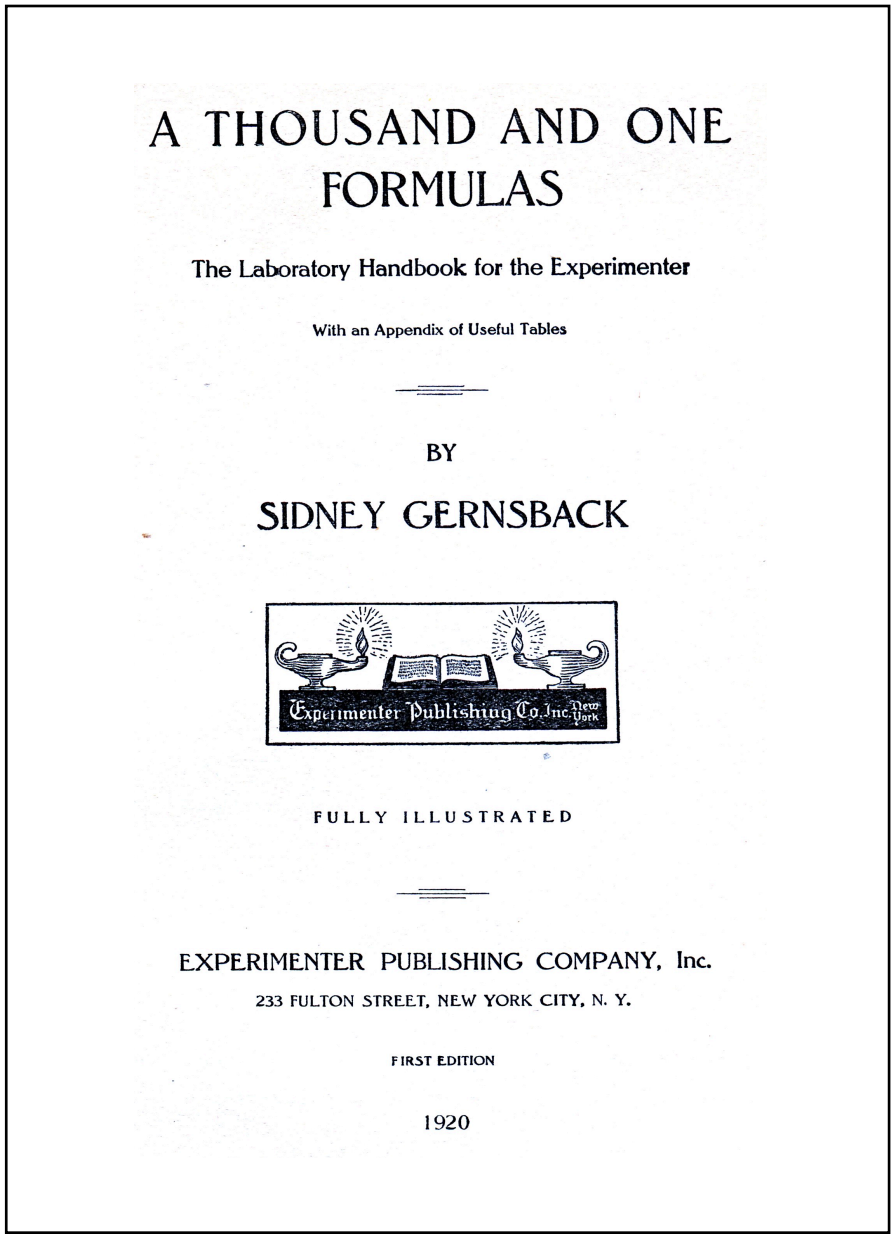
78

A page from item 9 describing the preparation of nitric acid and showing Collins' drawing style.

Sidney Gernsback (1876-?)

Born in Luxembourg, Sidney Gernsback was an older brother of Hugo Gernsback (1884-1967), who is well known for his pioneering publication, starting in the 1920s, of various science fiction pulp magazines, such as *Amazing Stories*. Hugo also published numerous magazines and books dealing with radio and electrical experimentation that explicitly targeted the home amateur. Among his many publication ventures was the Experimenter Publishing Co., for which his brother Sidney wrote and/or edited several books, including item 10.

BOOKS OF EXPERIMENTS FOR THE HOME CHEMIST



A THOUSAND AND ONE FORMULAS

The Laboratory Handbook for the Experimenter

With an Appendix of Useful Tables

BY

SIDNEY GERNSBACK

Experimenter Publishing Co. Inc. New York

FULLY ILLUSTRATED

EXPERIMENTER PUBLISHING COMPANY, Inc.

233 FULTON STREET, NEW YORK CITY, N. Y.

FIRST EDITION

1920

Number 10

Sidney Gernsback

A Thousand and One Formulas

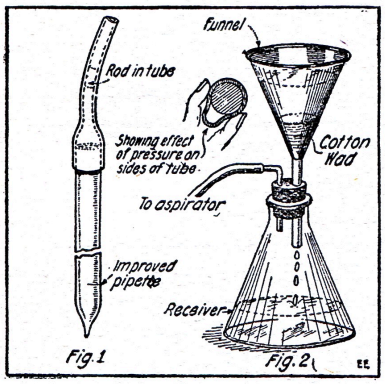
New York: Experimenter Publishing Company, Inc.

1920

Laboratory Hints and Experiments (Chemical).

PRACTICAL CHEMICAL LABORATORY DEVICES.

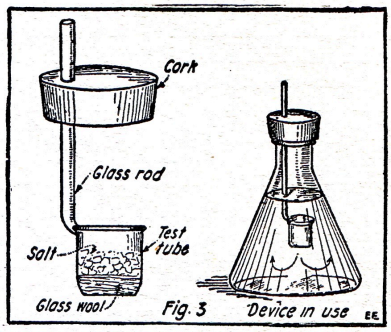
There are many instruments and operations in chemistry that can be so improved as to make them handier or to shorten the time required for a given process. Many of these are in everyday use in large laboratories but the experimenter hears but little of them.



Here Are a Home-made Burette-Pipette and a Vacuum-Filter of Simple and Ingenious Construction Welcome in Every Laboratory.

A form of burette, or more properly a pipette, having several advantages is shown in Fig. 1. Instead of the usual form with the stop-cock at the bottom, a plain graduated tube is fitted at the top with a 6-inch length of rubber tubing. The valve in this case is made by sliding a short length of glass rod into the rubber tube, locating the same midway of its length. The tube is normally kept closed by this rod but a slight pressure on one side of the rubber will cause the tube to buckle out and form a channel through which liquids or air can flow.

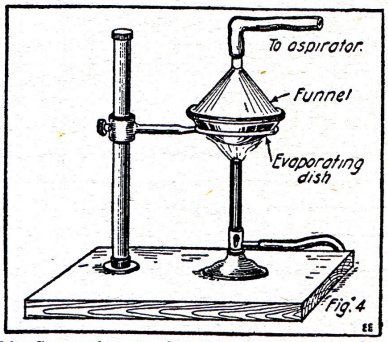
The device can be filled either by sucking the fluid up into the tube with the mouth or by immersing it into the fluid with the valve open and removing after the valve is closed. This valve will give a finer regulation of the discharge than the usual stop-cock, a drop



An Automatic Saturator Is Easily Made as Shown in Above Diagram and May Come in Handy.

at a time or a steady stream being readily attainable.

VACUUM FILTER: When filtering thick fluids the process may be speeded up by the use of a vacuum filtering device. To create the vacuum, use can be made of the glass aspirators which are procurable at a very



This Suggestion to Get Rid of All Obnoxious Fumes in the Small Laboratory Is Certainly Meritorious and Shows What a Little Ingenuity Will Attain.

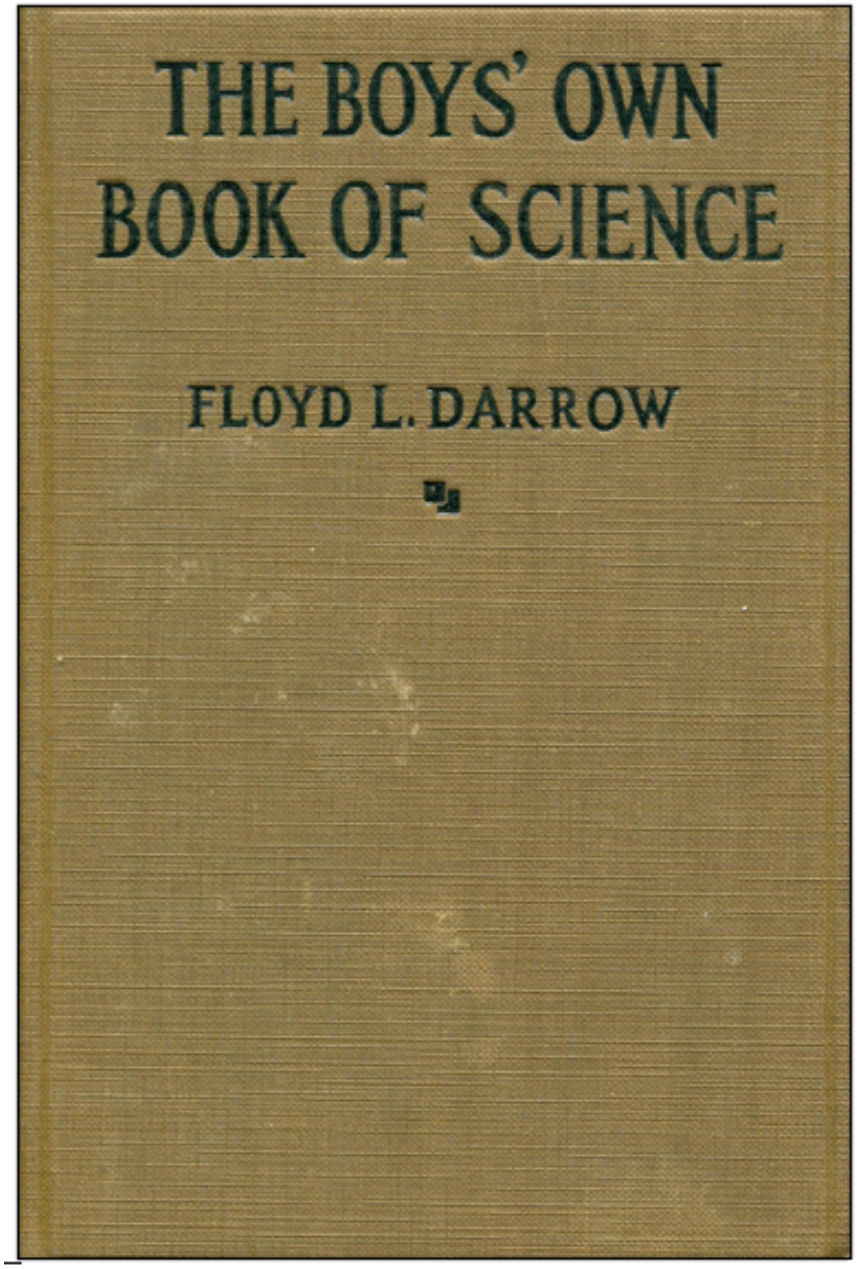
reasonable price. To use this for filtering, the receiver is fitted with a cork having two holes. One, large enough to take the spout of the funnel, the other having a short glass tube inserted. See Fig. 2.

87

A page from item 10 containing some practical laboratory tips for the home chemist.

Floyd Lavern Darrow (1880-1967)

Darrow was Head of the Science Department at the Preparatory County Day School of Brooklyn. In addition to item 11, he also authored the *Story of Chemistry* (1927), as well as at least seven more popular books dealing with science, invention, and religion. Despite its general title, item 11 deals exclusively with chemical experiments and is illustrated by numerous photographs of boys in suits, ties and, as befits the 1920s, knickers, all of them doing chemical experiments at the same professional lab bench using professional chemical equipment, thus suggesting that all of the photographs were taken at the school using Darrow's students as models.

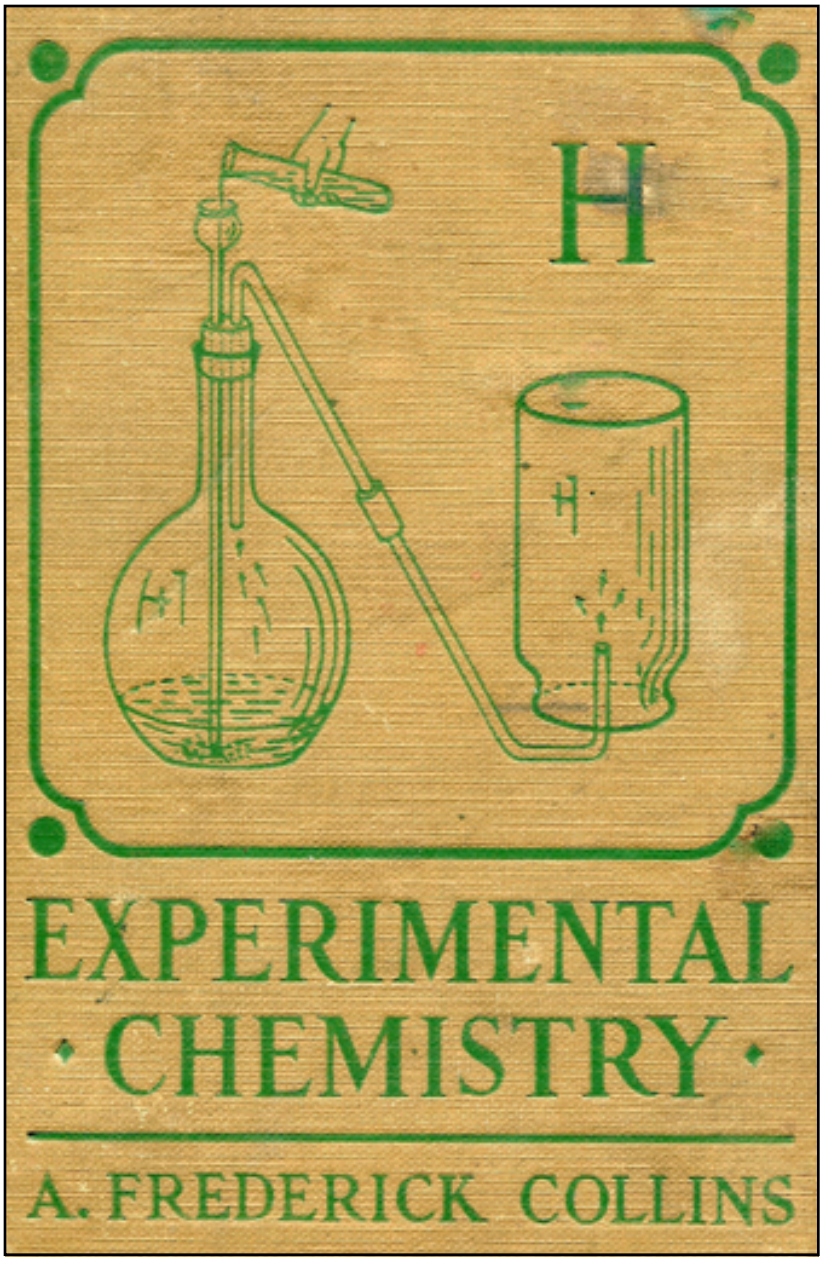


Number 11
Floyd L. Darrow
The Boy's Own Book of Science
New York: Macmillan Co.
1923

Determining the strength of an acid by titration.

79

One of the plates from Lloyd's book showing a student in suit, tie and knickers performing a titration.



Number 12
A. Frederick Collins
Experimental Chemistry
New York: D. Appleton
1930

tory. To do this make a stout bench 3½ feet high, 2 feet wide and 3½ feet long. As you will need a constant supply of water (H_2O) you can improvise a sink and this you do by using an oblong tin meat pan that is about 12 inches wide and 18 inches long; the exact size does not matter. Now cut a hole ¾ of an inch in diameter in the bottom of it

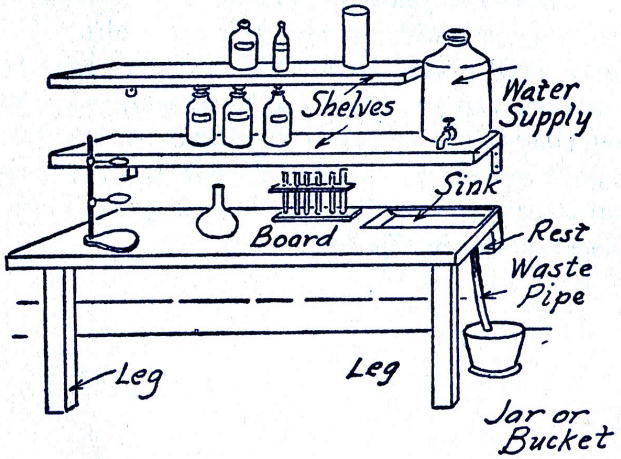


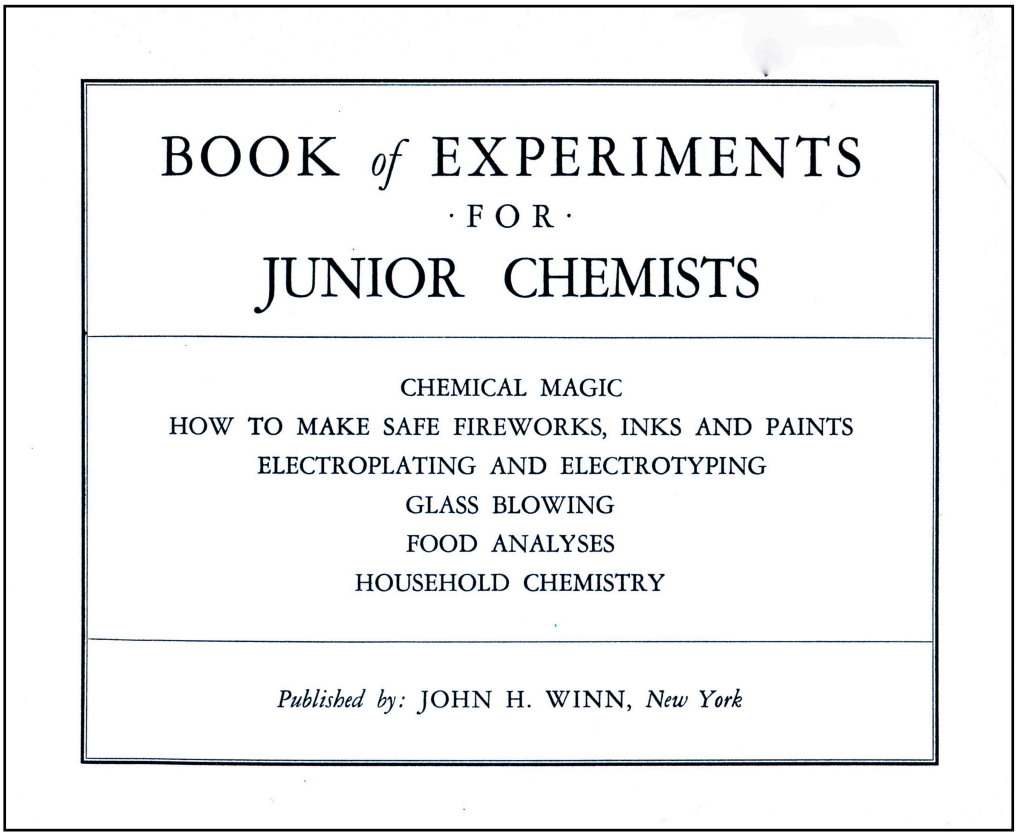
FIG. 108.—A CHEMICAL LABORATORY BENCH

close to one end and solder a 2-foot length of galvanized iron pipe to it.

The next thing to do is to cut a hole in the rear right-hand end of the top of the bench and set a pan in it. To prevent it from rusting give it several coats of white enamel. Set a bucket or a large jar under the open end of the pipe to catch the waste

A page from Collins' second book on chemistry showing how to construct a bench for a home laboratory.

Number 13
Anonymous
Magic Chemistry
New York: John H. Winn
1931


BOOK *of* EXPERIMENTS
· FOR ·
JUNIOR CHEMISTS

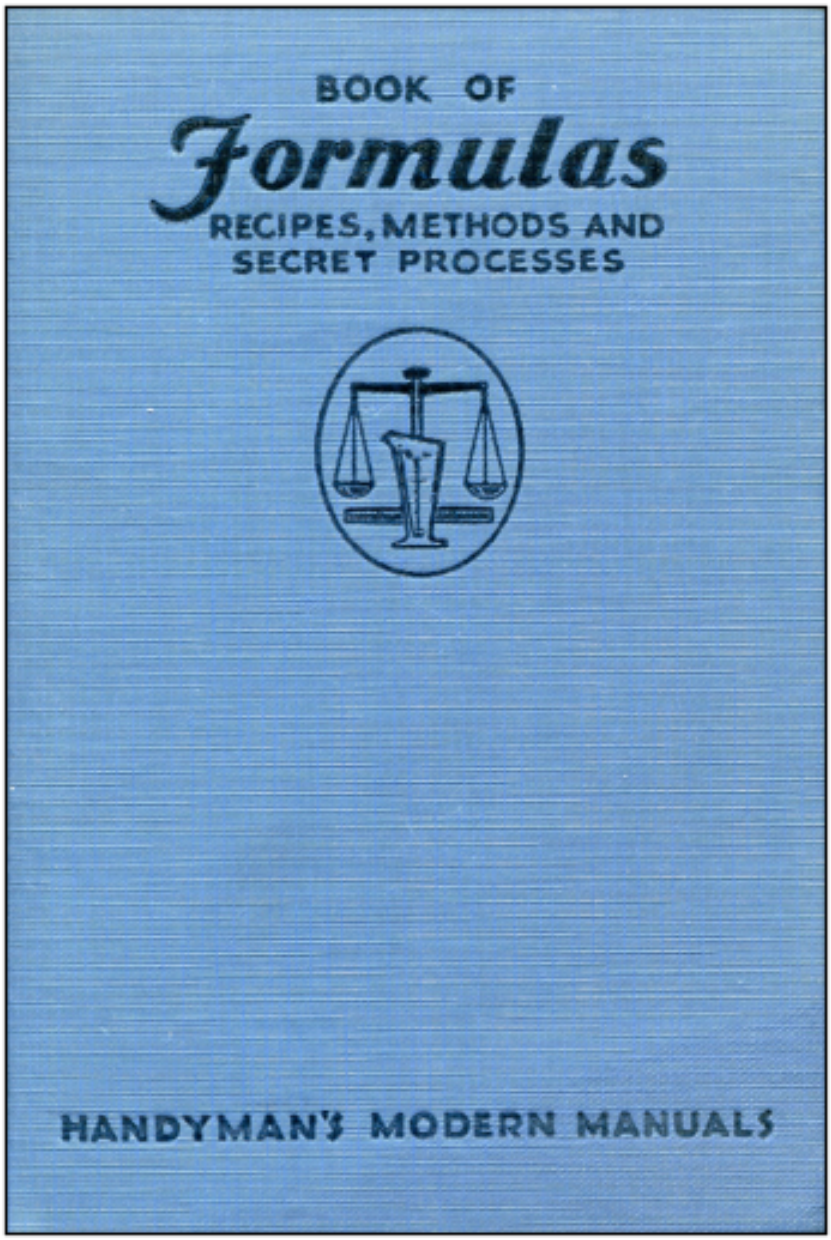
CHEMICAL MAGIC
HOW TO MAKE SAFE FIREWORKS, INKS AND PAINTS
ELECTROPLATING AND ELECTROTYPING
GLASS BLOWING
FOOD ANALYSES
HOUSEHOLD CHEMISTRY

Published by: JOHN H. WINN, *New York*

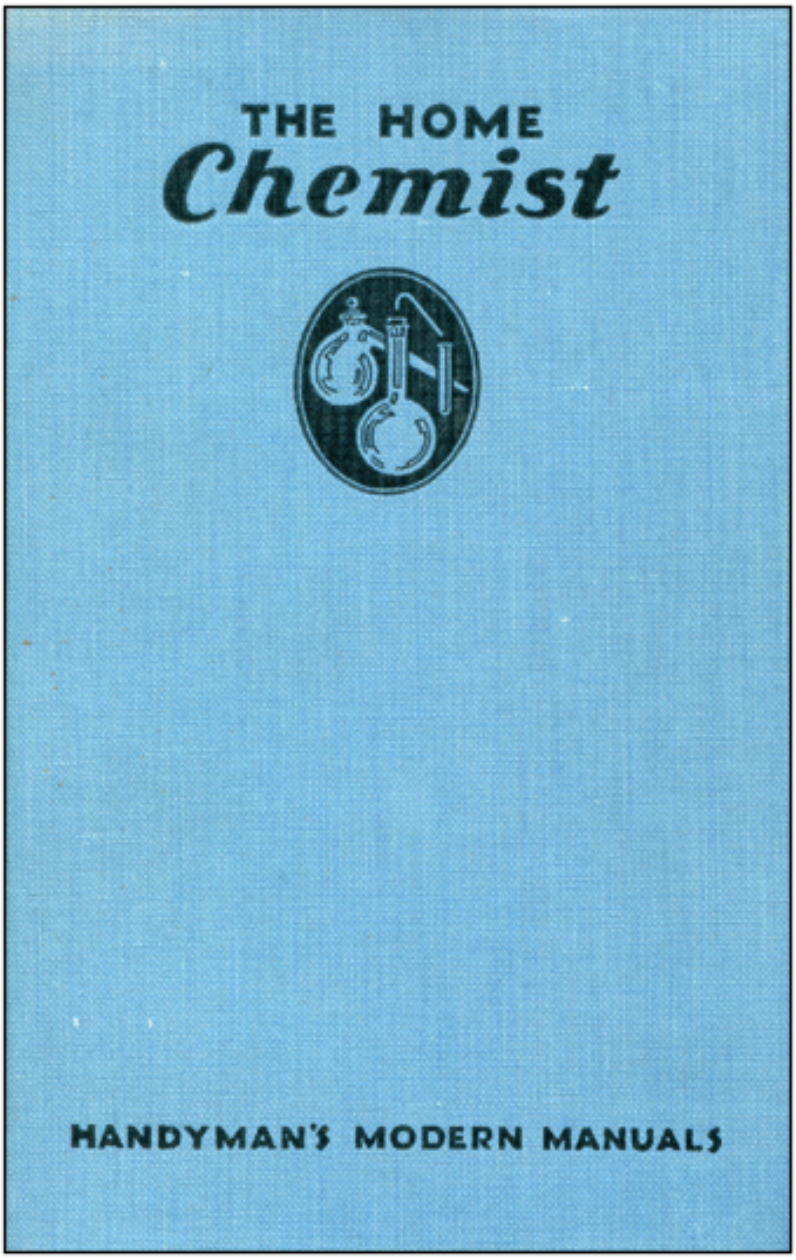
Item 13 is an anonymous oversized book of home chemistry experiments dating from 1931. The title given on cover differs from that on the actual title page (above), which reads: *Book of Experiments for Junior Chemists; Chemical Magic, How to Make Safe Fireworks, Inks, and Paints, Electroplating and Electrotyping, Glass Blowing, Food Analysis, Household Chemistry*. The triangular frame surrounding the ideal family on the cover, which lists the advantages of chemistry as a hobby, is simply repeating the mantra used by manufacturers of chemistry sets since the 19th century, though the precise distinction between "educational" and "instructive" remains unclear.

Popular Scientific Monthly

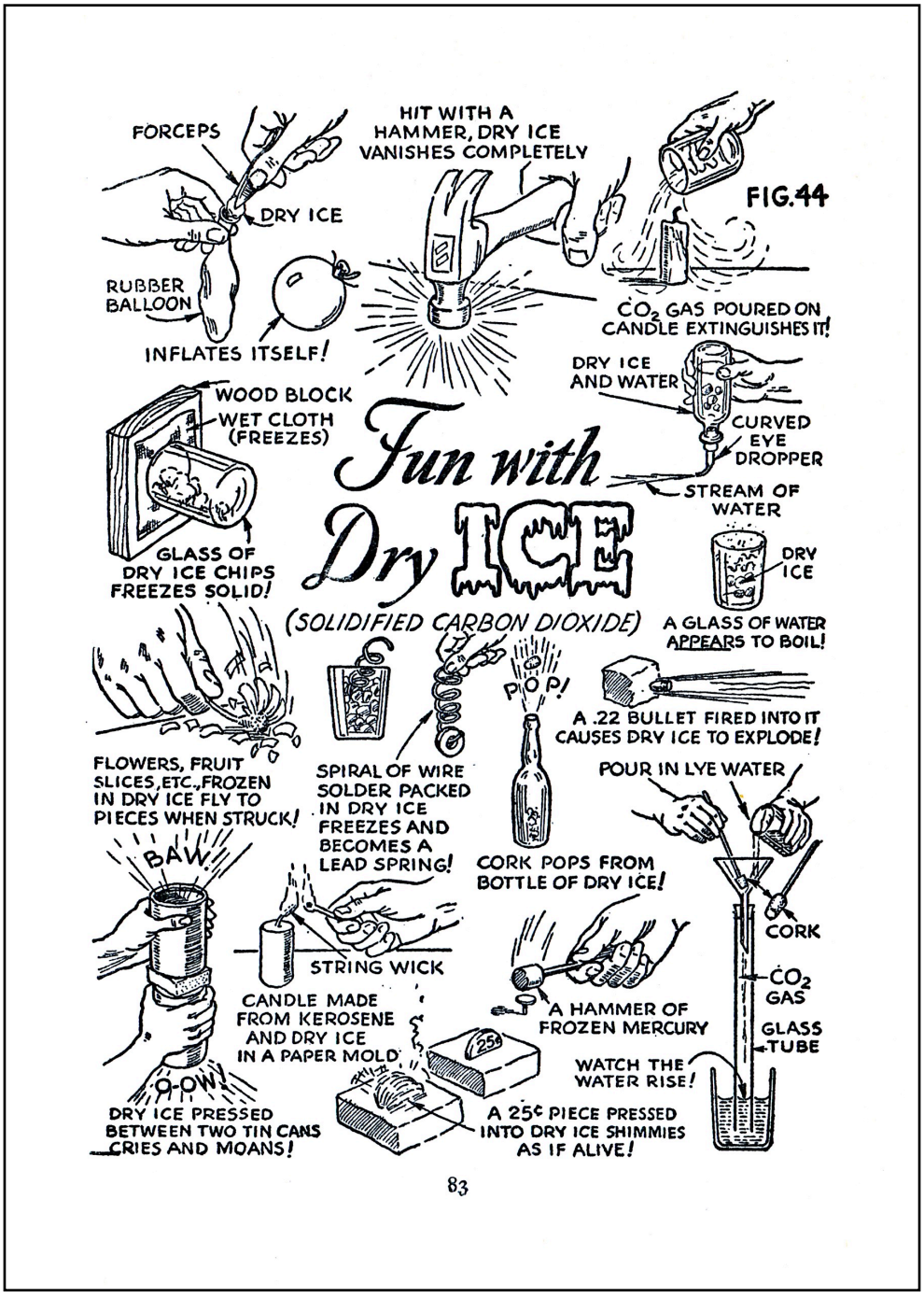
Items 14 and 15, which date from 1932 and 1934 respectively, were both compiled by the editorial staff of the magazine *Popular Science Monthly*. This magazine was founded in 1872 and featured general, albeit rather academic, articles until 1915, when it changed its format in an attempt to appeal to the general public and the amateur science buff. It subsequently published occasional features dealing with chemical experiments, as well as practical hints for building up a home laboratory. This is reflected on the title page of item 14, which carries the subtitle: *How to Set Up and Operate a Home Laboratory with Full Instructions for Numerous Experiments and Tests*.



Number 14
Editorial Staff of Scientific Monthly
Book of Formulas
New York: Popular Scientific Publishing Co.
1932



Number 15
Editorial Staff of Scientific Monthly
The Home Chemist
New York: Popular Scientific Publishing Co.
1934

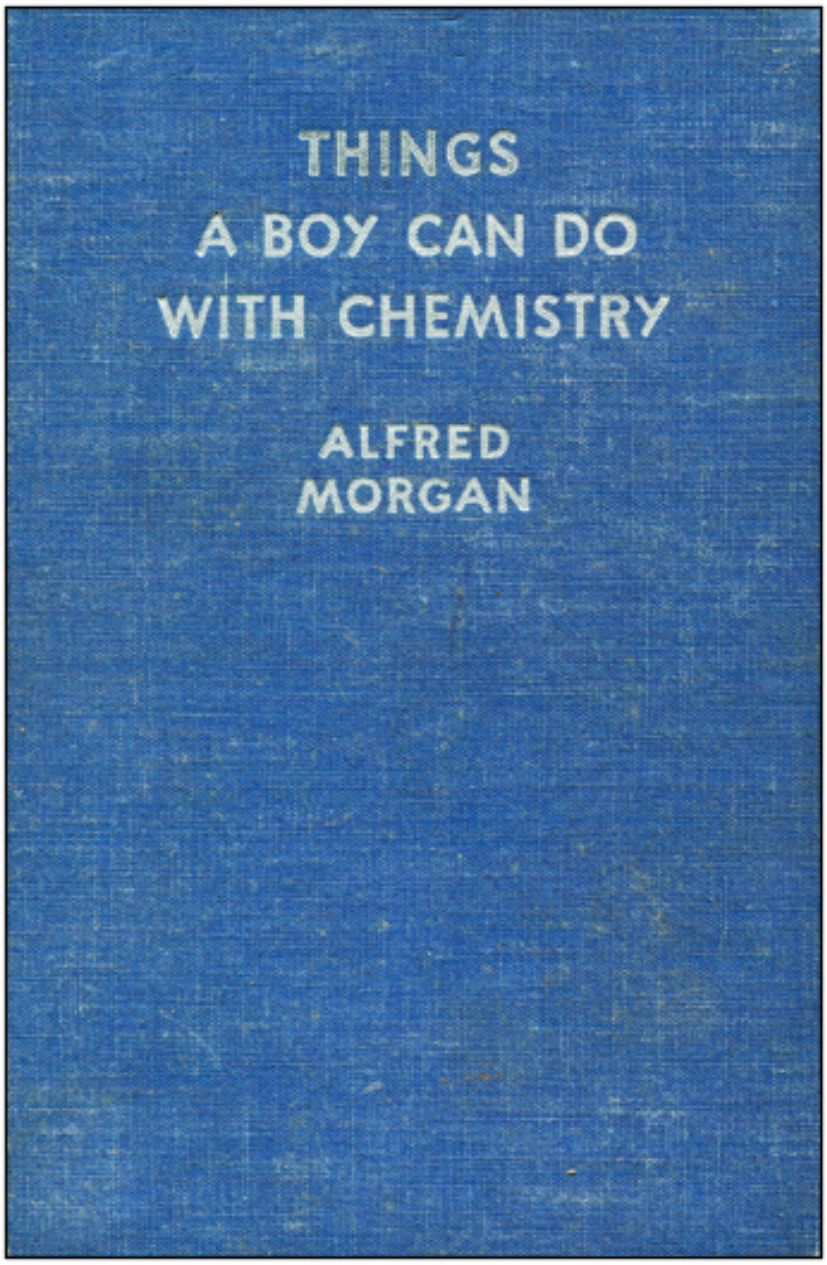


A full-page drawing from item 15 illustrating various experiments with dry ice.

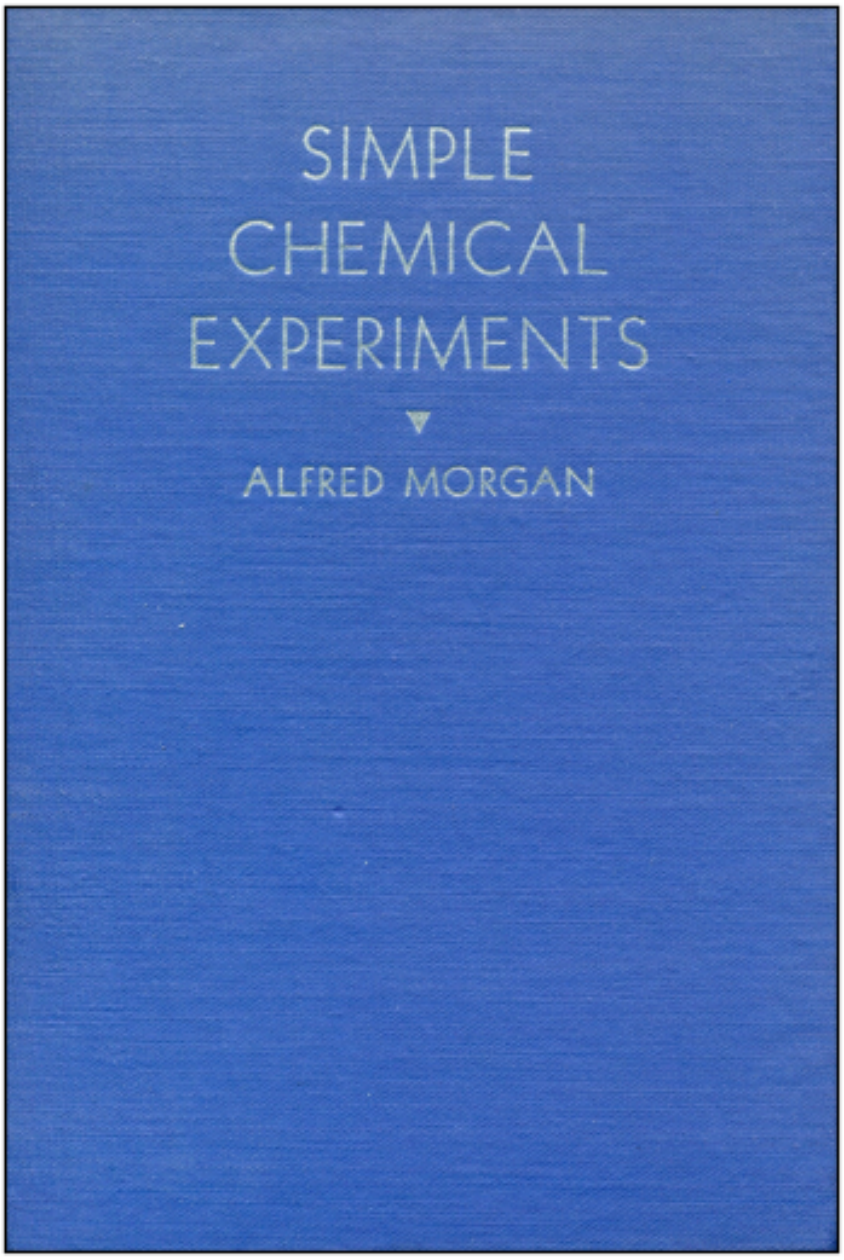
Alfred Powell Morgan (1889-1972)

We now come to my favorite author as a young boy chemist – Alfred Morgan. Morgan, like Collins before him, was an electrical engineer, albeit in this case with a degree from MIT. Like Collins, he was heavily involved in the early development of radio and for a while ran a company called AMCO that manufactured radio construction kits for amateurs. Beginning about 1913 he began, like Collins, to write "hobby" books for young boys on such subjects as radio, electronics, carpentry, mechanics and even fish aquariums, all of which he illustrated himself. As a boy I was particularly taken by his 1941 book *Simple Chemical Experiments* (Item 17) which contained an entire chapter on making homemade fireworks.

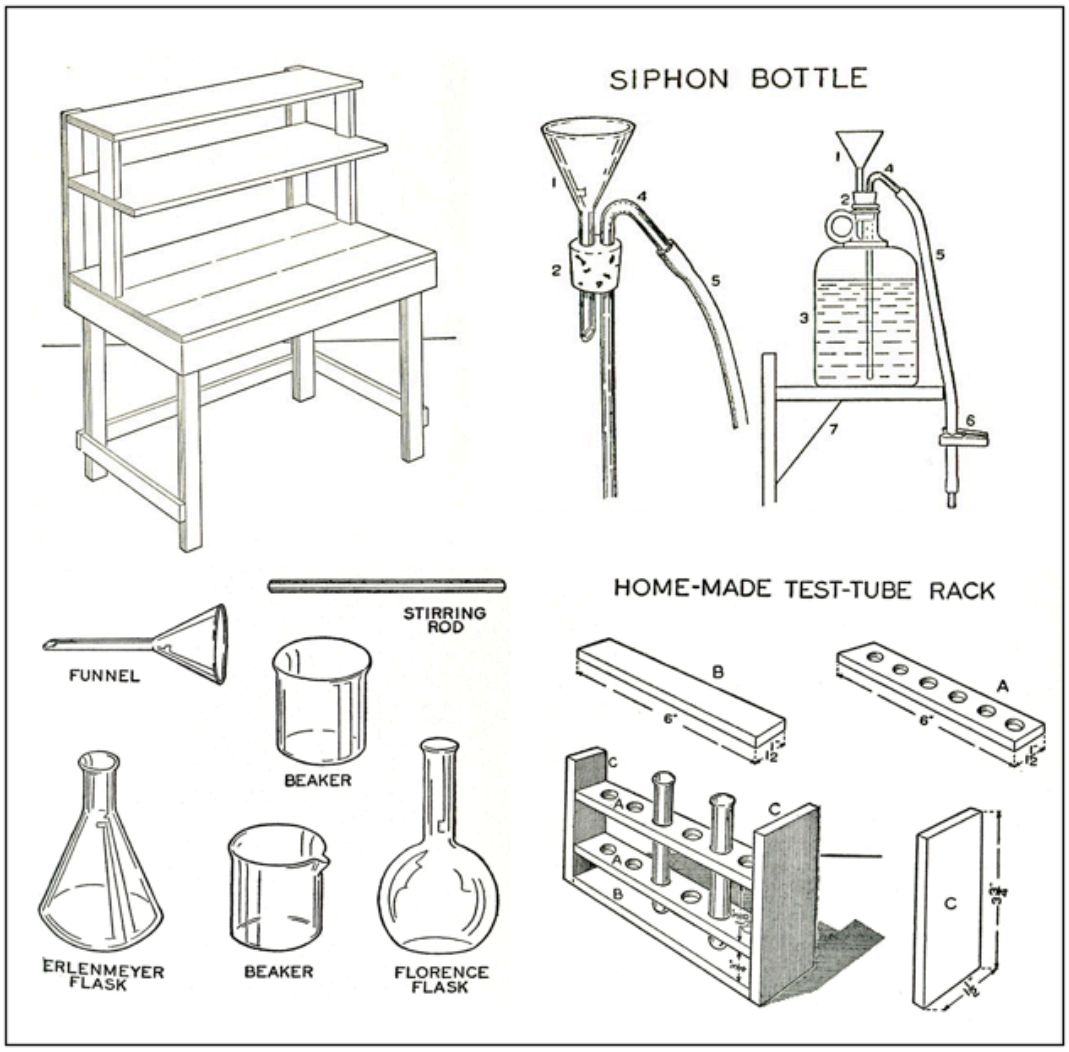
Morgan had four sons and his hobby books were originally written with them in mind, whence such titles as *Things a Boy can Do with Chemistry*, or *A Boy's First Book of Radio*, etc. However, by the late 1950s such gender specific titles were becoming politically incorrect. This is illustrated by his book *Things a Boy Can Do with Electrochemistry,* which was first published in 1940, but reprinted in 1959 under the revised gender-neutral title of *Adventures in Electrochemistry* (item 28). In other cases Morgan's original drawings of boys performing experiments were replaced with drawings by commercial artists showing both boys and girls (item 21). Of the various chemistry books by Morgen shown in this booklet, only item 17 dealt solely with experiments, items 16, 18, 21 and 28 being hybrid presentations with only a few selected experiments intended to illustrate the descriptive text.



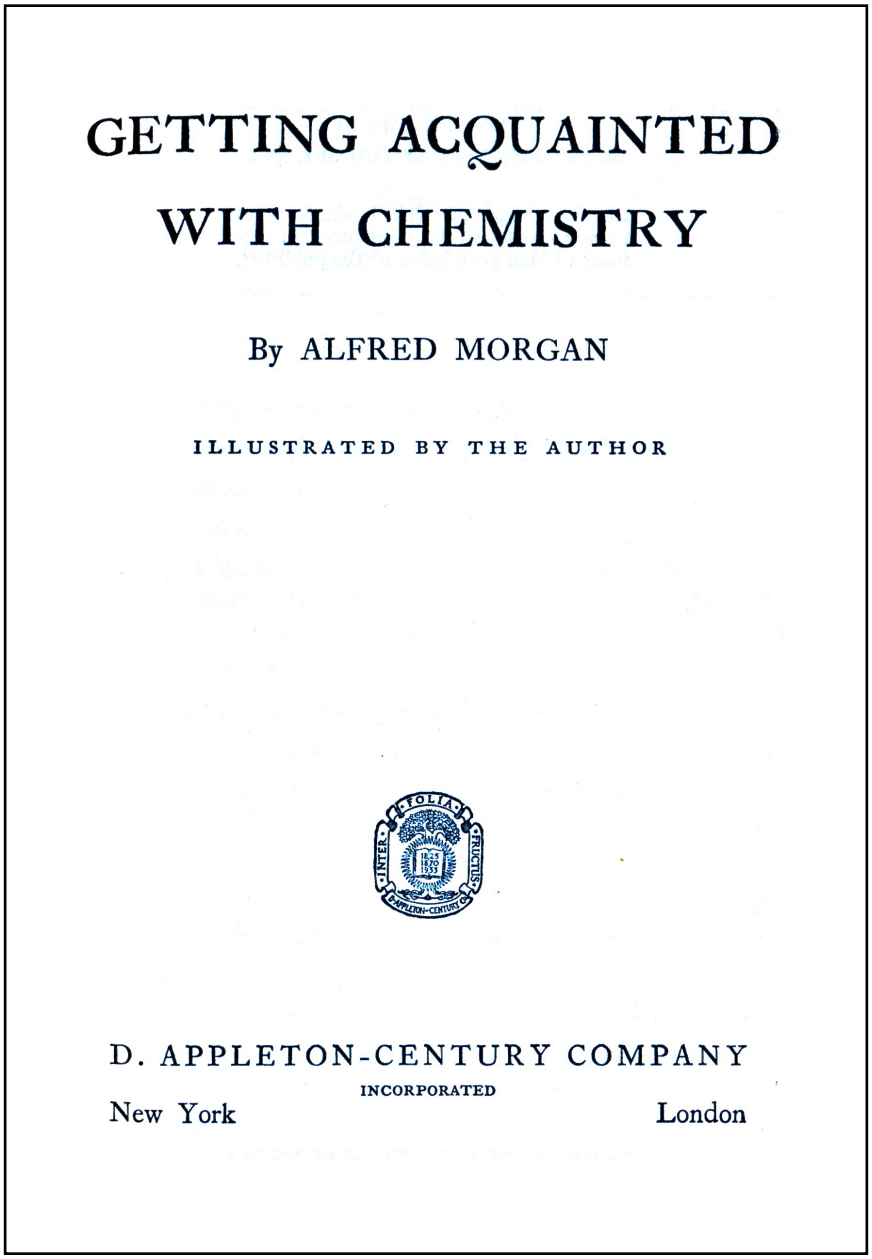
Number 16
Alfred P. Morgan
Things a Boy Can Do With Chemistry
New York: D. Appleton-Century Co.
1940



Number 17
Alfred P. Morgan
Simple Chemical Experiments
New York: D. Appleton-Century Co.
1941



A selection of drawings from item 17 of both professional and home-made laboratory apparatus.



GETTING ACQUAINTED
WITH CHEMISTRY

By ALFRED MORGAN

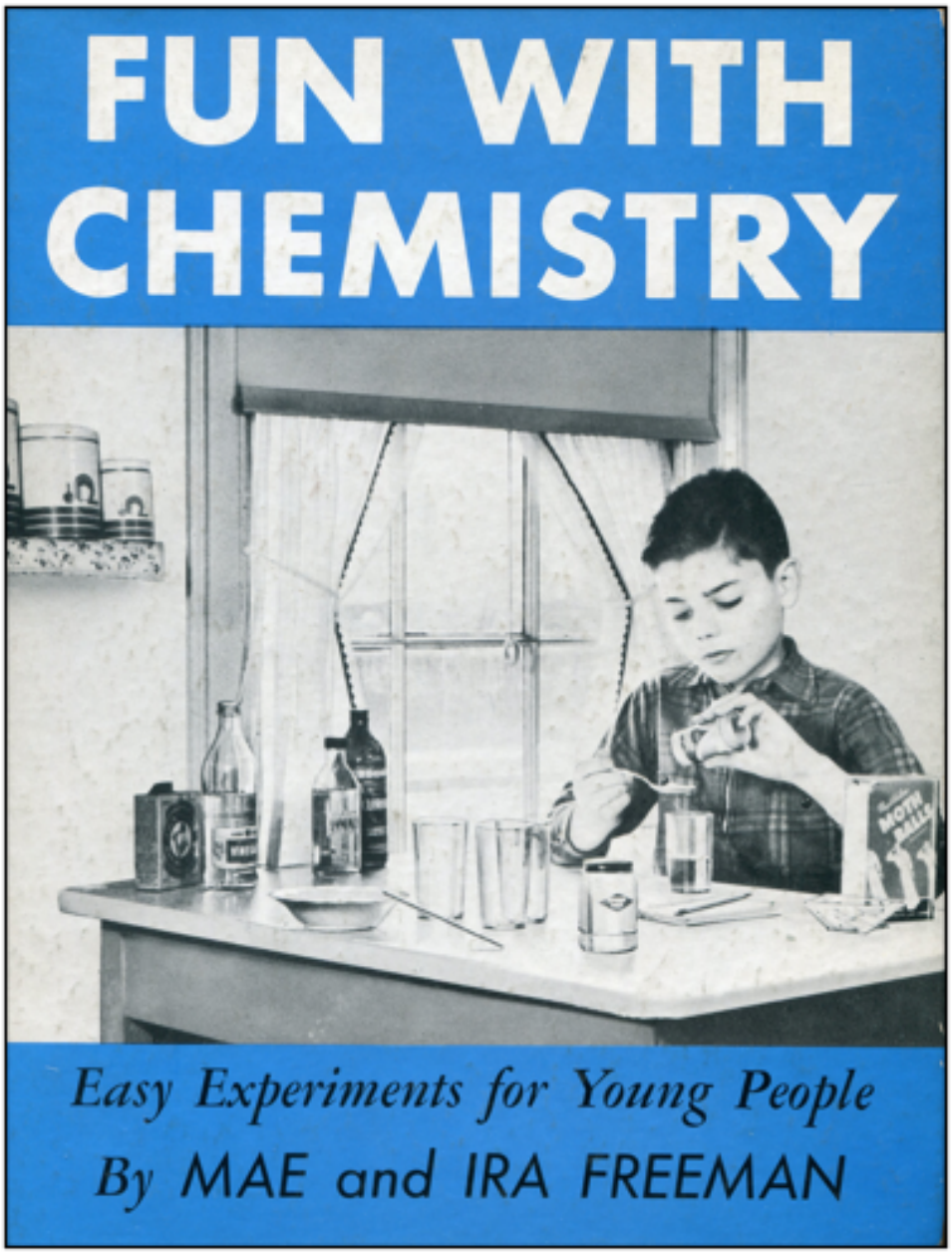
ILLUSTRATED BY THE AUTHOR

D. APPLETON-CENTURY COMPANY
INCORPORATED
New York London

Number 18
Alfred P. Morgan
Getting Acquainted With Chemistry
New York: D. Appleton-Century Co.
1942

Ira Maximilian Freeman (1905-?)

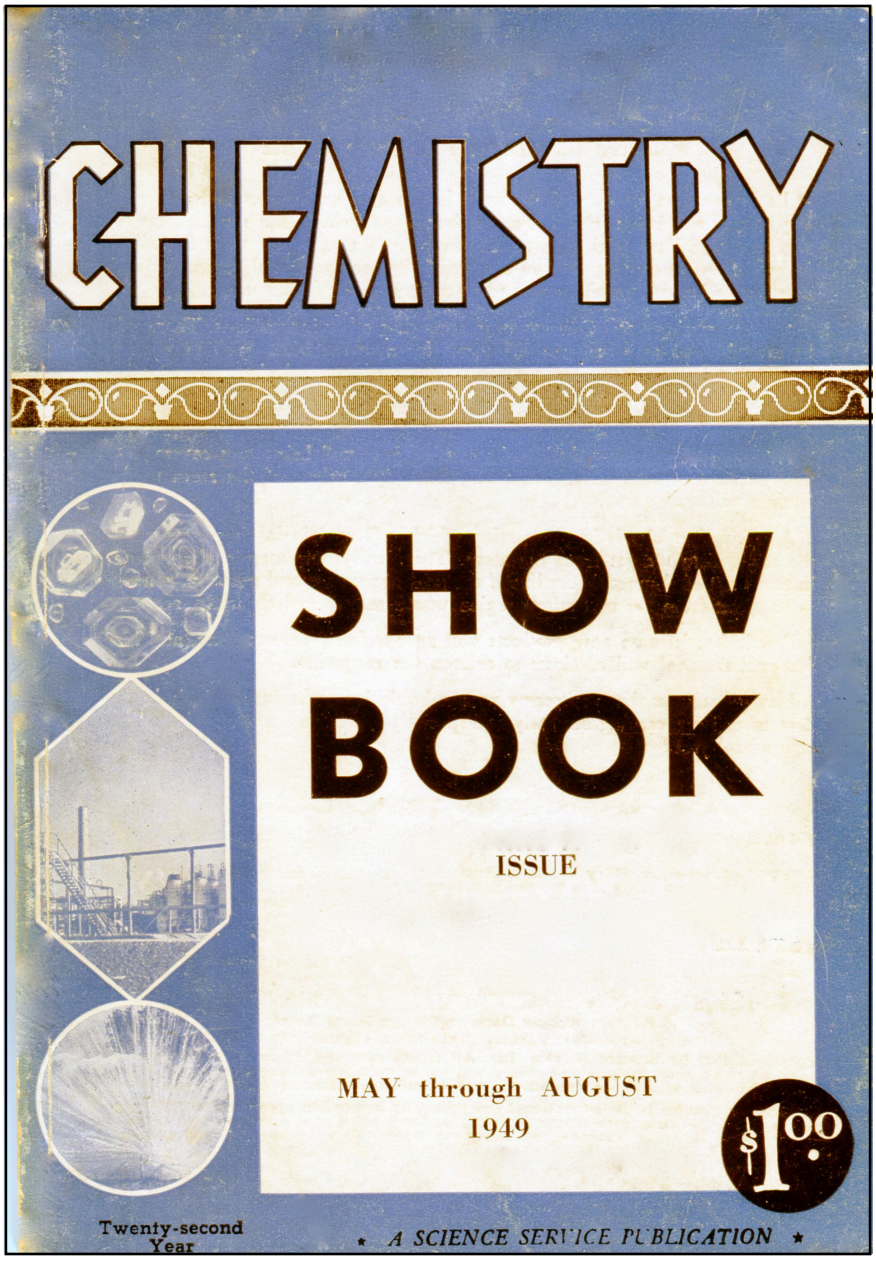
Item 19 by Mae and Ira Freeman, though more than a decade old when I encountered it in the 5th grade in 1958, was my first chemistry book. Its simple experiments used only common household chemicals which my mother provided from her pantry and I can recall performing them at the kitchen table under her supervision. Ira Freeman had a doctoral degree in physics from the University of Chicago and had authored several physics texts, as well as translating a classic advanced monograph by Georg Joos on theoretical physics (1934). He would go on to write numerous science and math books for children (WorldCat lists 91), many coauthored with his wife Mae. Other chemistry titles included *All About the Wonders of Chemistry* (1954) and *All About the Atom* (1955), though these were of the descriptive variety and, unlike item 19, did not deal with chemistry experiments for the home chemist.



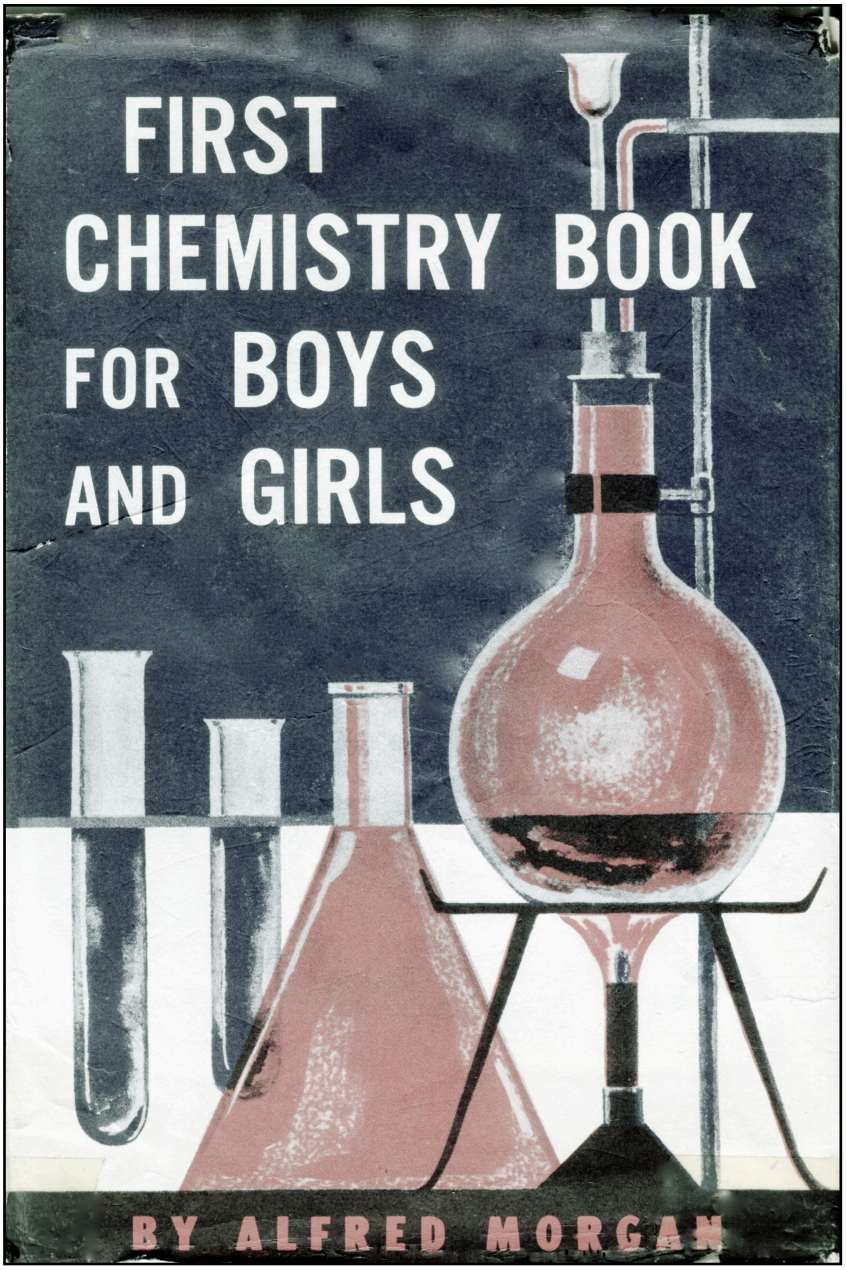
Number 19
Mae and Ira Freeman
Fun With Chemistry
New York: Random House
1944

The Science Service

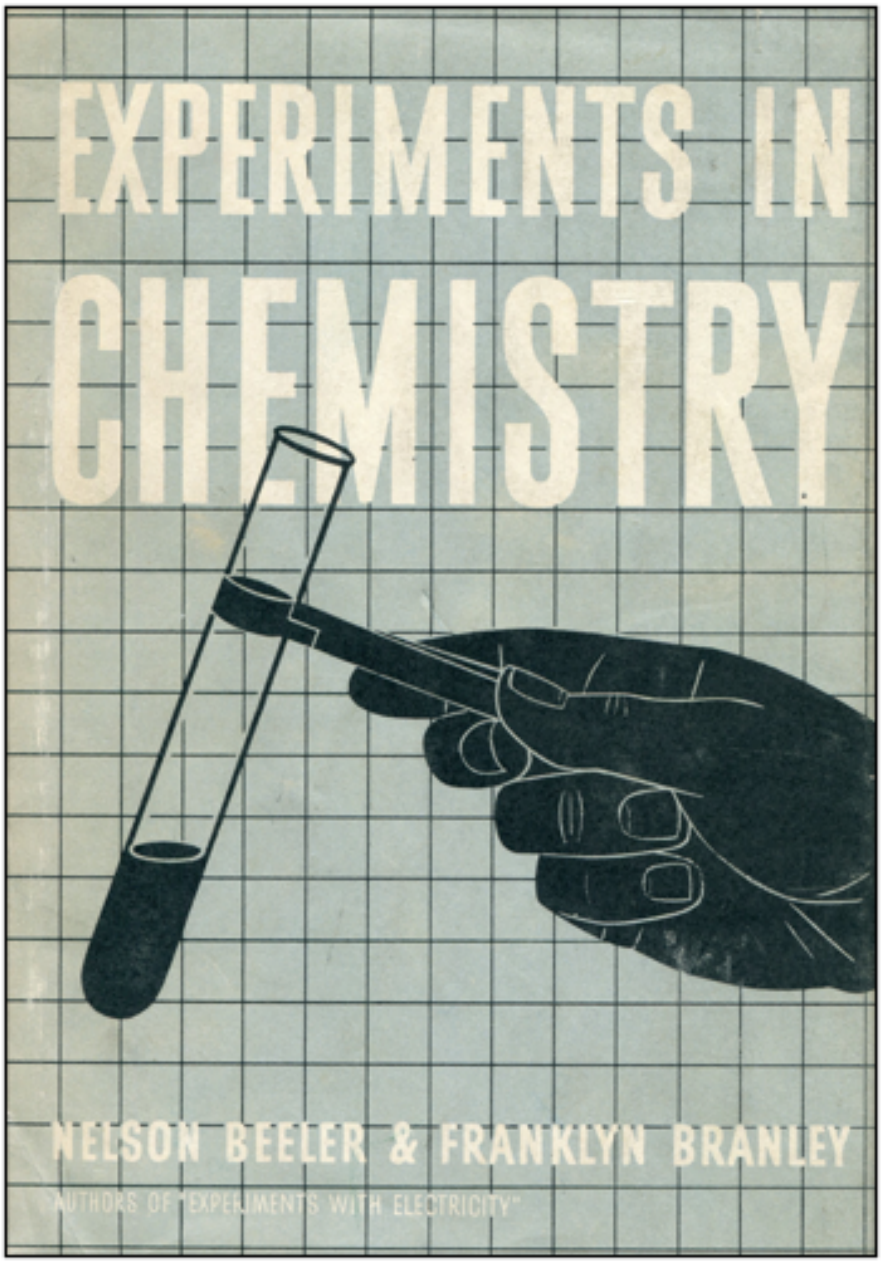
The Science Service was founded in 1921 as a nonprofit organization dedicated to informing the public of the most recent advances in science using popular and nontechnical language. Its best known publication was the *Science News Letter*. In the 1940s it acquired the *Chemistry Leaflet*, a publication began in 1927 by Pauline Mack as a pamphlet-like supplement for use in high school chemistry courses. The Science Service expanded this into a magazine format under the editorship of Helen Miles Davis and the revised title of *Chemistry*. Item 20 is an extended issue of the magazine and is an independent 111-page booklet of chemistry experiments and plays for use in connection with chemistry clubs. Davis would later edit several separate hardcover booklets dealing with science fair projects (1951) and the discovery of the chemical elements (1952). About the same time the Science Service also published several volumes of laboratory experiments by Burton L. Hawk for the home chemist (See items 23 and 24). These were advertised in *Chemistry* magazine, to which I had won a subscription at a local science fair while still in junior high, and I eagerly ordered copies of both for my home lab.



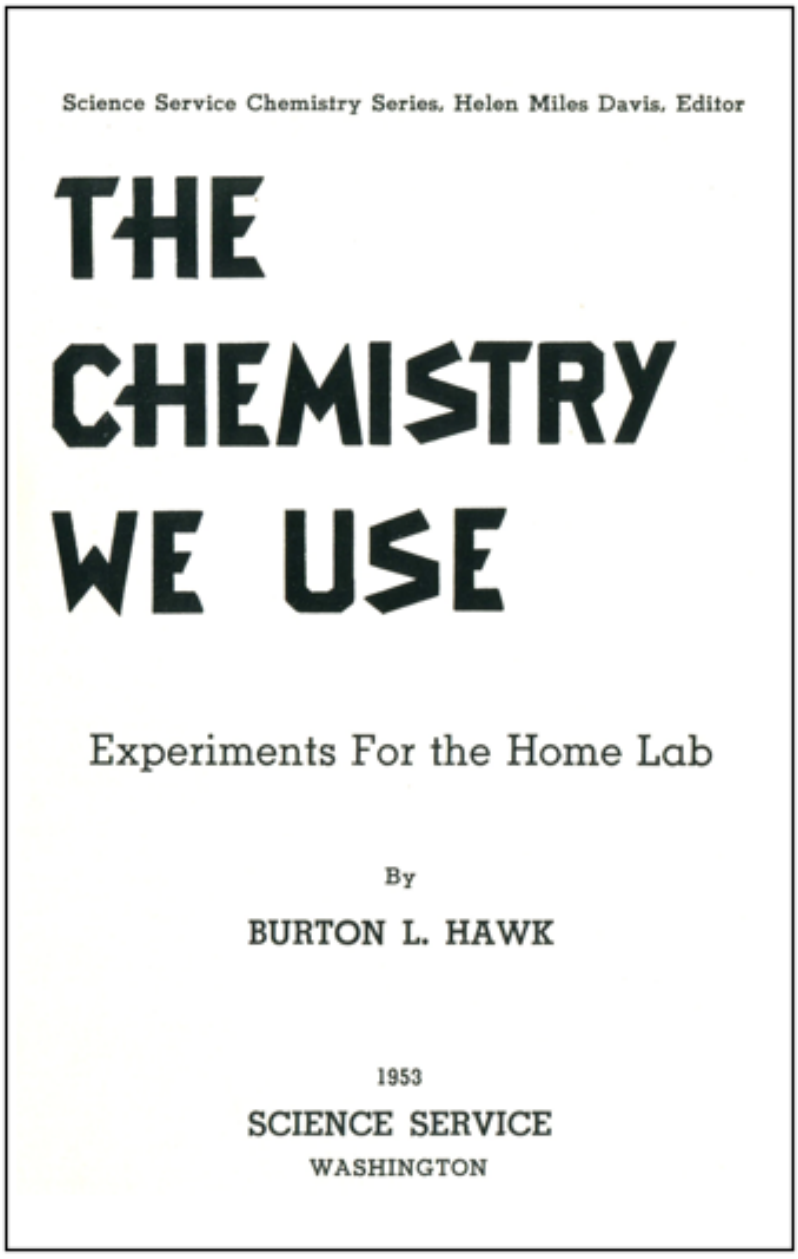
Number 20
Helen M. Davis
The Chemistry Show Book
Washington DC: The Science Service
1949



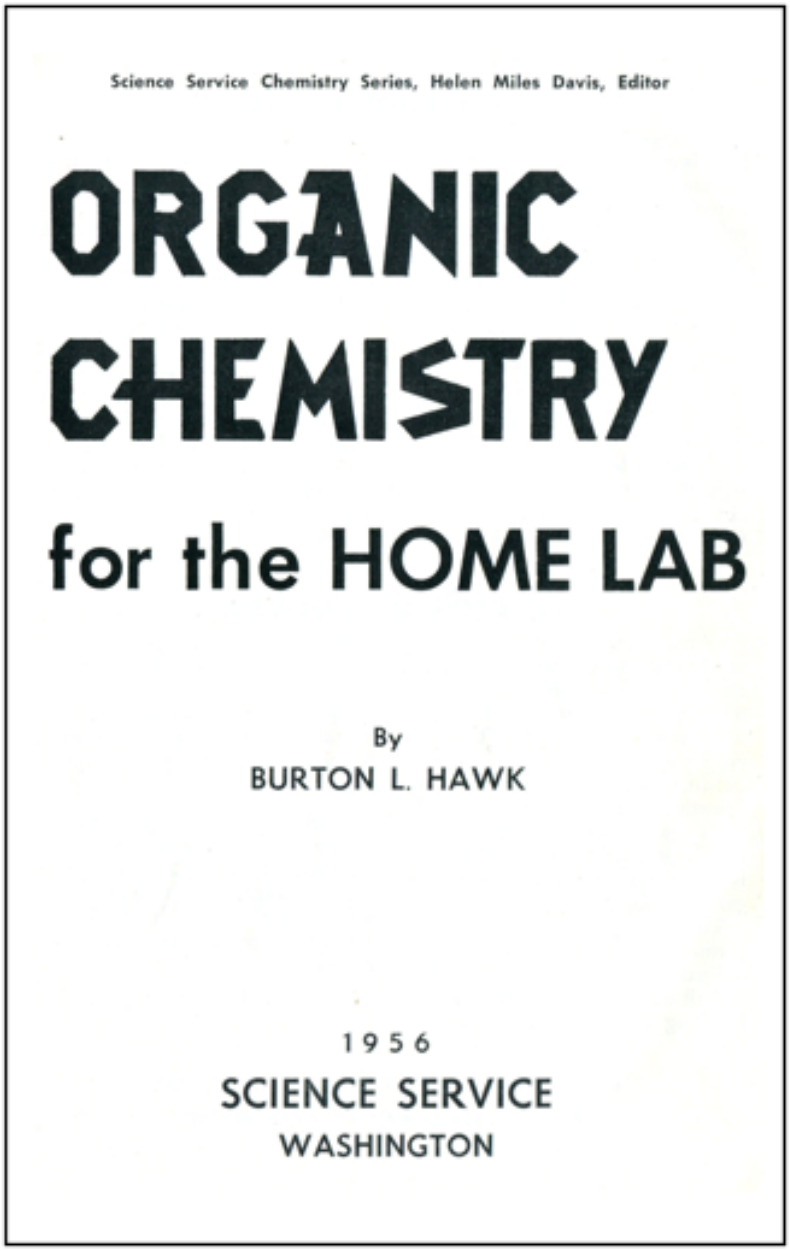
Number 21
Alfred P. Morgan
First Chemistry Book for Boys and Girls
New York: Charles Scribner's Sons
1950



Number 22
Nelson Beeler & Franklyn Branley
Experiments in Chemistry
New York: Thomas Y. Crowell Co.
1952



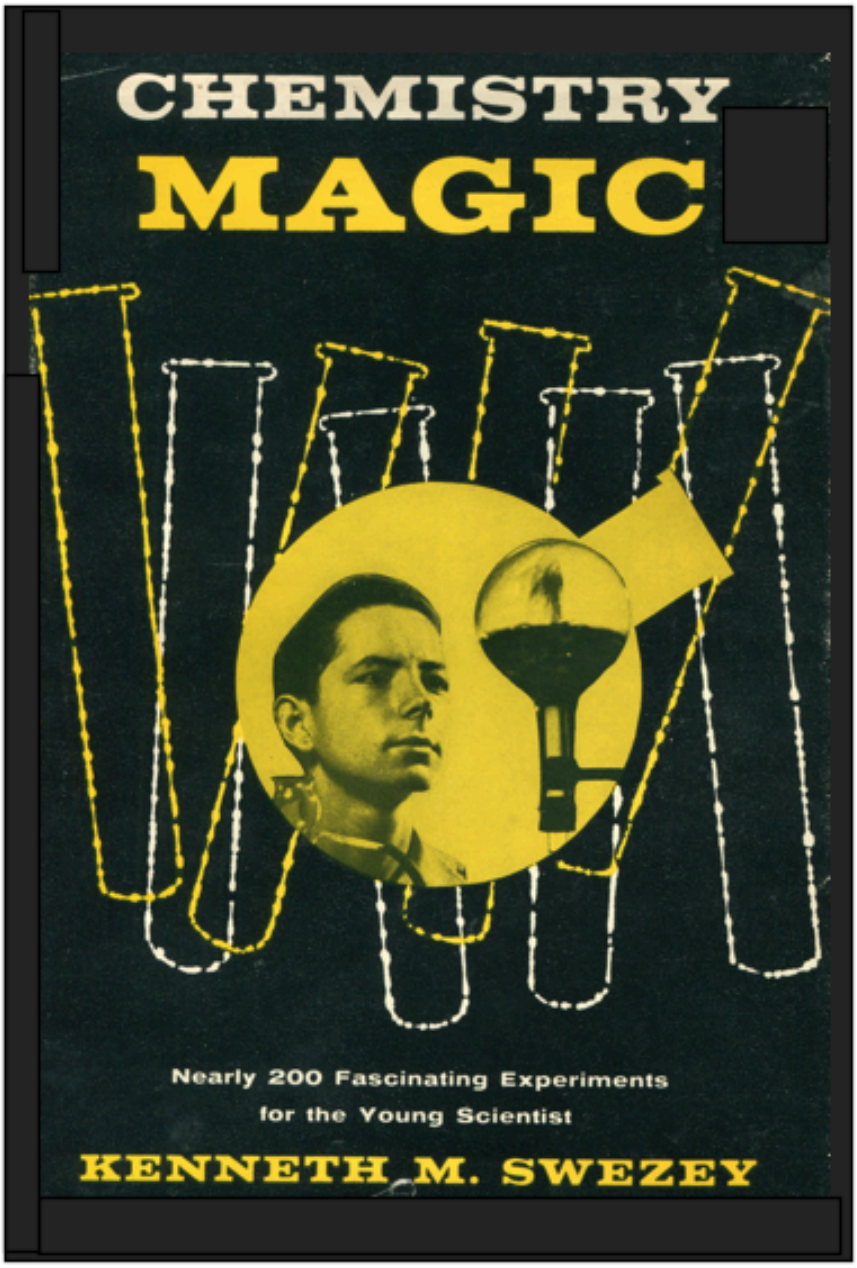
Number 23
Burton L. Hawk
The Chemistry We Use
Washington DC: The Science Service
1953



Number 24
Burton L. Hawk
Organic Chemistry for the Home Lab
Washington DC: The Science Service
1956

Kenneth M. Swezey (1905-1972)

Item 25 by Kenneth Swezey was the product of a column on "Home Chemistry" that Swezey ran in the magazine *Popular Science Monthly*, starting around 1944. We have already noted two books from the early 1930s (items 14 and 15) based on articles in this magazine and a similar column was run by one Raymond B. Wailes from 1932 to 1940, though I am unaware that his columns were ever made the basis of a book. The Swezey book was directed primarily at high school students and is illustrated with excellent photographs. Other books of science experiments by Swezey included *After-Dinner Science* (1948), *Science Magic* (1952), and *More Science Magic* (1971).



Number 25
Kenneth M. Swezey
Chemical Magic
New York: McGraw-Hill Publishing Co.
1956

Chlorine is generated in the flask and flows into the center jar when the pinchcock is open. Waste goes into the scrubbing tube.

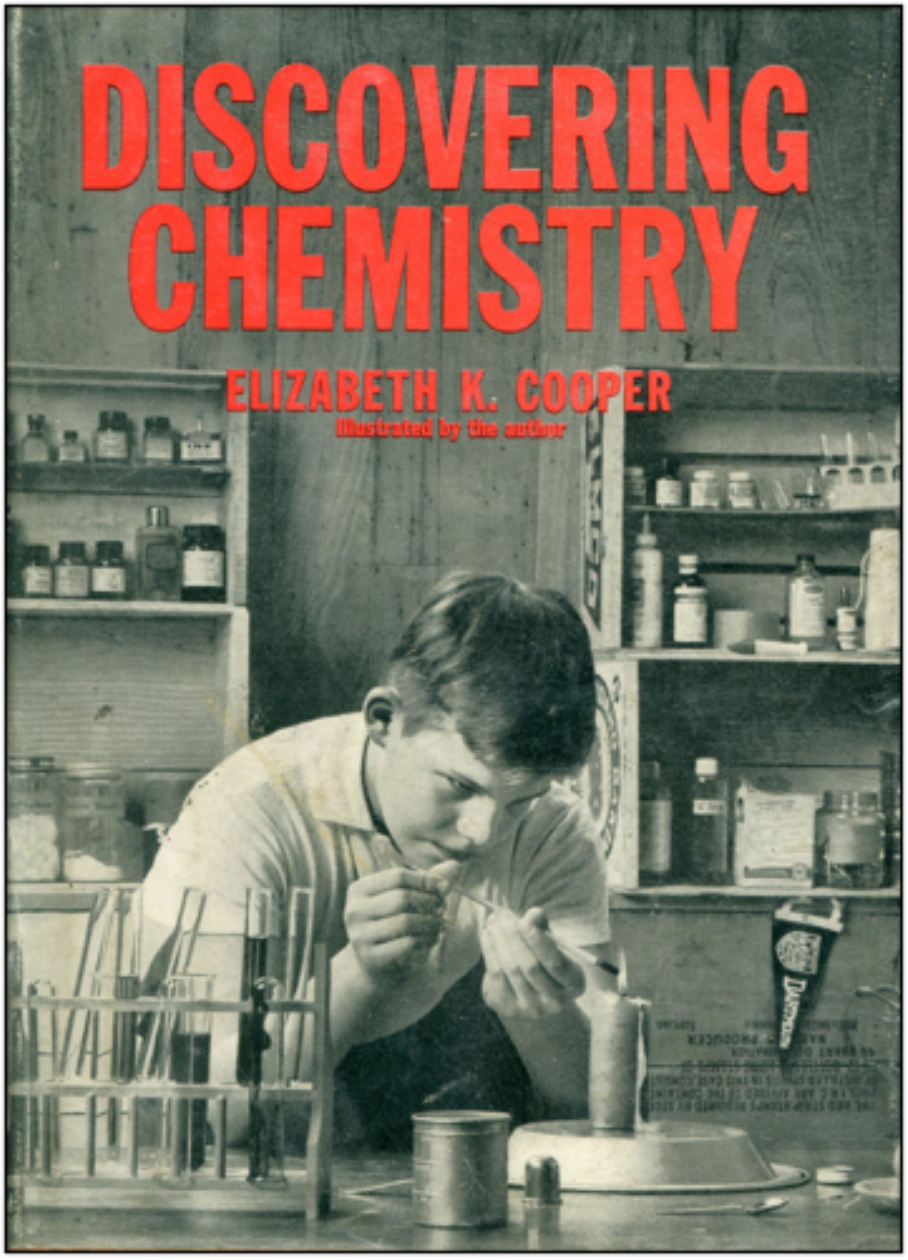
Chlorine Takes Life and Saves It

LIFESAVER and killer—that is the Jekyll-Hyde role of chlorine, the most plentiful and useful of the halogens. In peacetime industry, more than 1,500,000 tons of chlorine are used yearly for bleaching paper and cloth, in making dyes, solvents, insecticides, fire-extinguishing liquids, and other organic chemicals, and in purifying water. In warfare—should it become necessary to use deadly gas—phosgene, mustard gas, and lewisite are compounds of chlorine. Titanium tetrachloride produces dense white smoke screens.

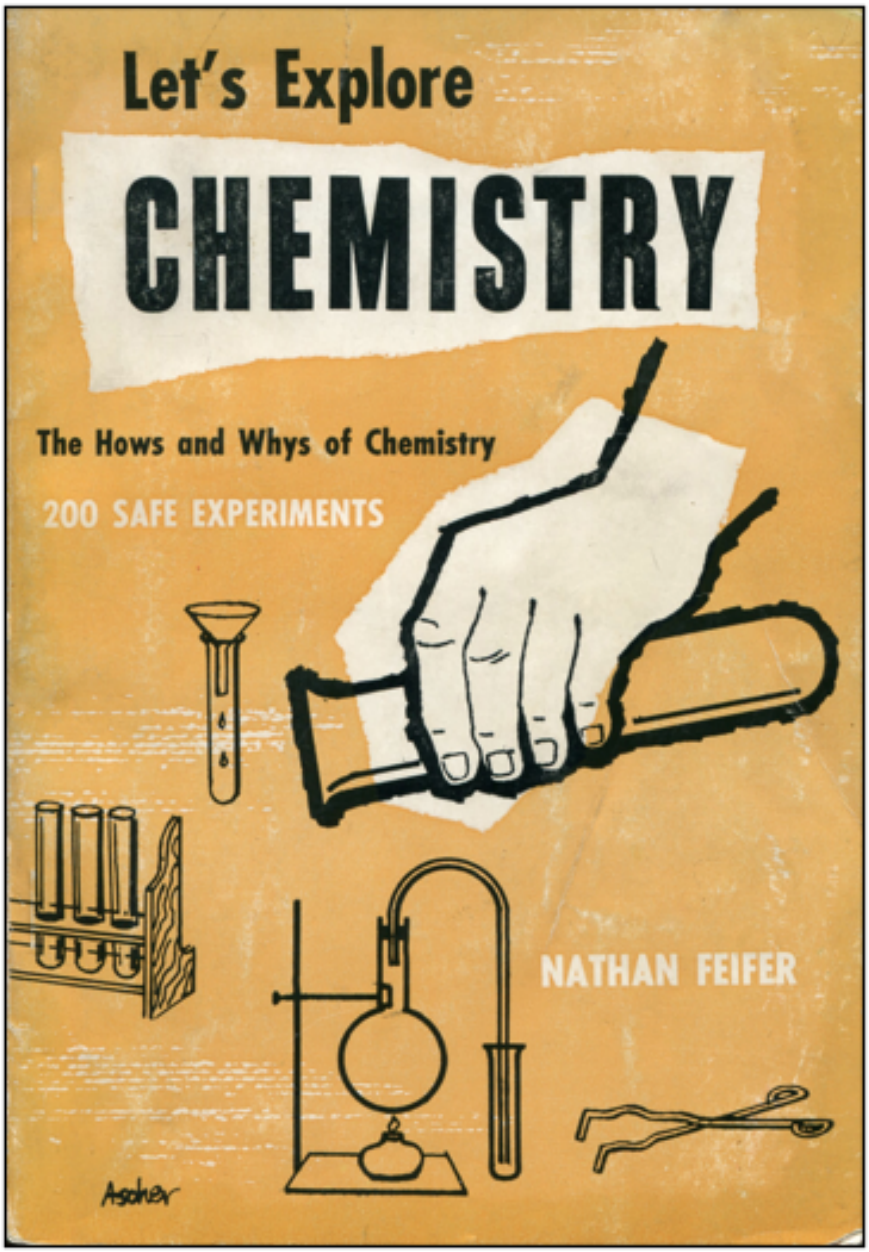
Chlorine gas is produced commercially almost entirely by electrolysis (see page 73). In one process an electric current is passed through a strong solution of common salt—producing chlorine at the anode,

52

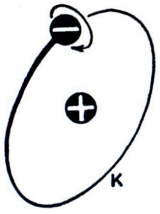
A typical page from item 25. Most of the photos feature teenagers dressed in suit jackets using professional chemical equipment.



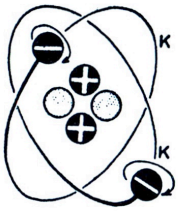
Number 26
Elizabeth K. Cooper
Discovering Chemistry
New York: Harcourt, Brace and Company
1959



Number 27
Nathan Feifer
Let's Explore Chemistry
New York: Sentinel Books
1959



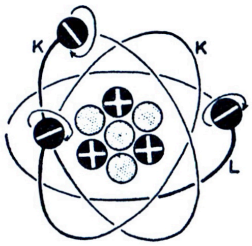
Adventures in Electrochemistry



by

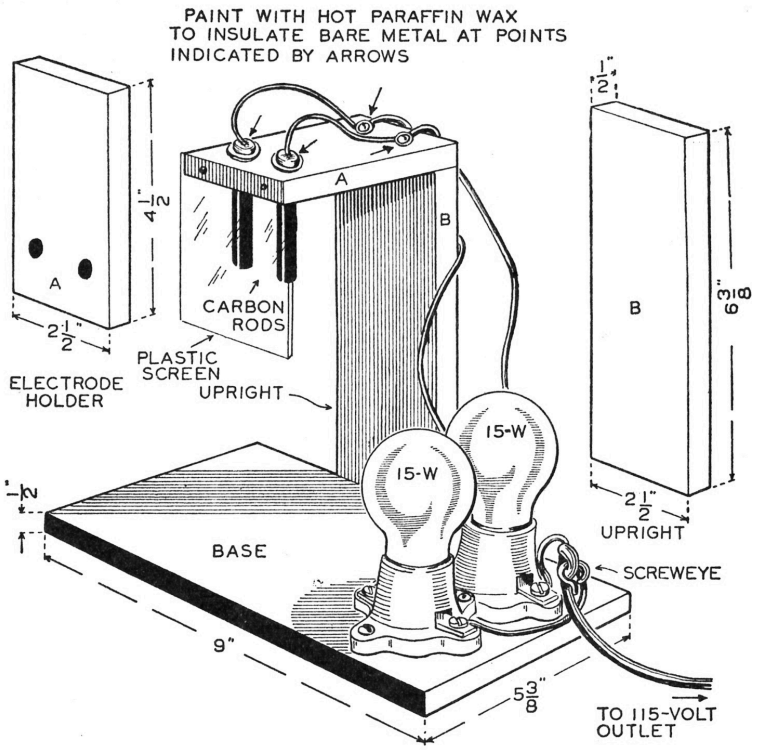
ALFRED MORGAN

WITH DIAGRAMS BY THE AUTHOR



CHARLES SCRIBNER'S SONS *New York*

Number 28
Alfred P. Morgan
Adventures in Electrochemistry
New York: Charles Scribner's Sons
1959

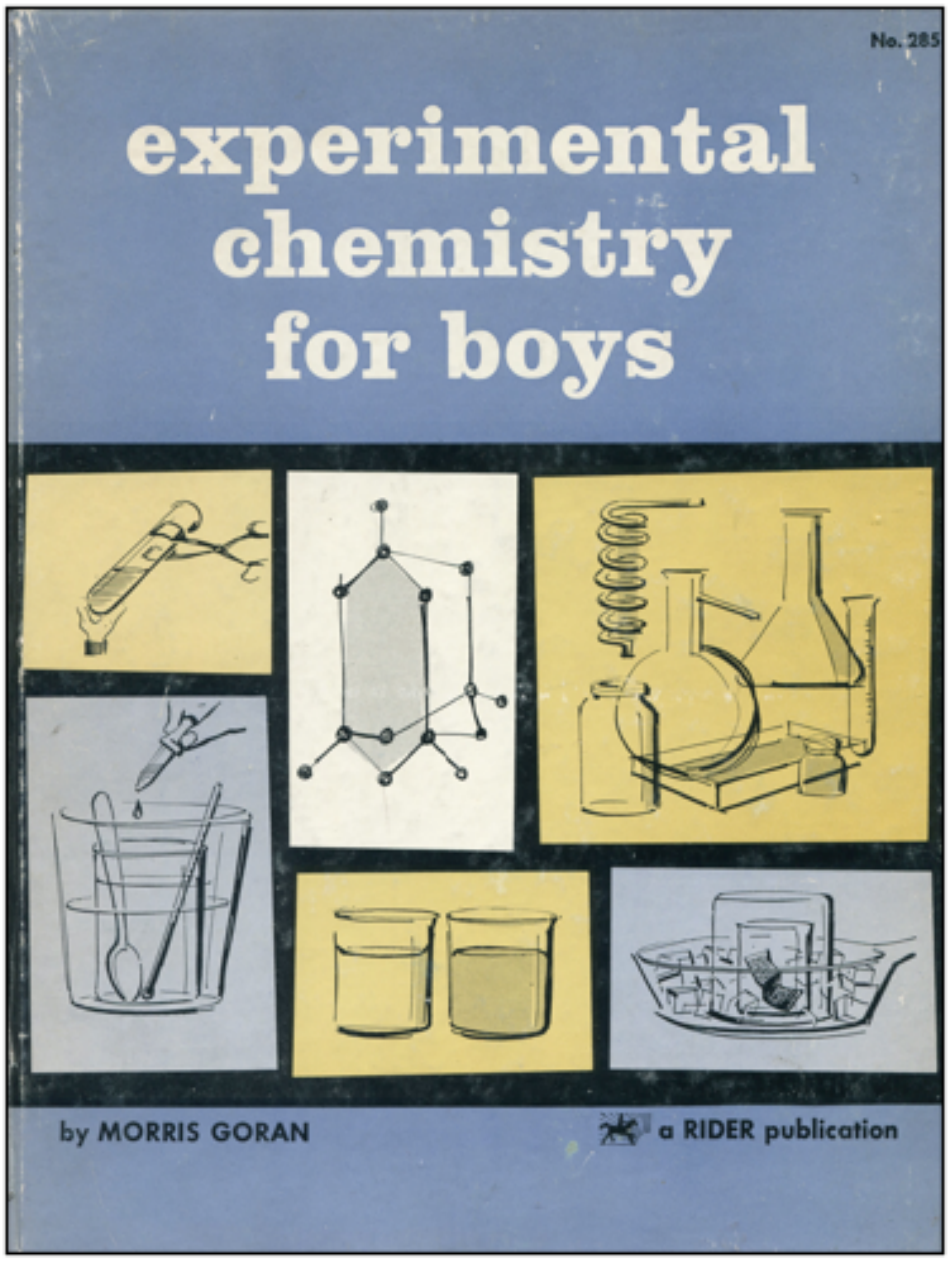


HOMEMADE APPARATUS FOR DETERMINING ELECTROLYTES AND NON-ELECTROLYTES

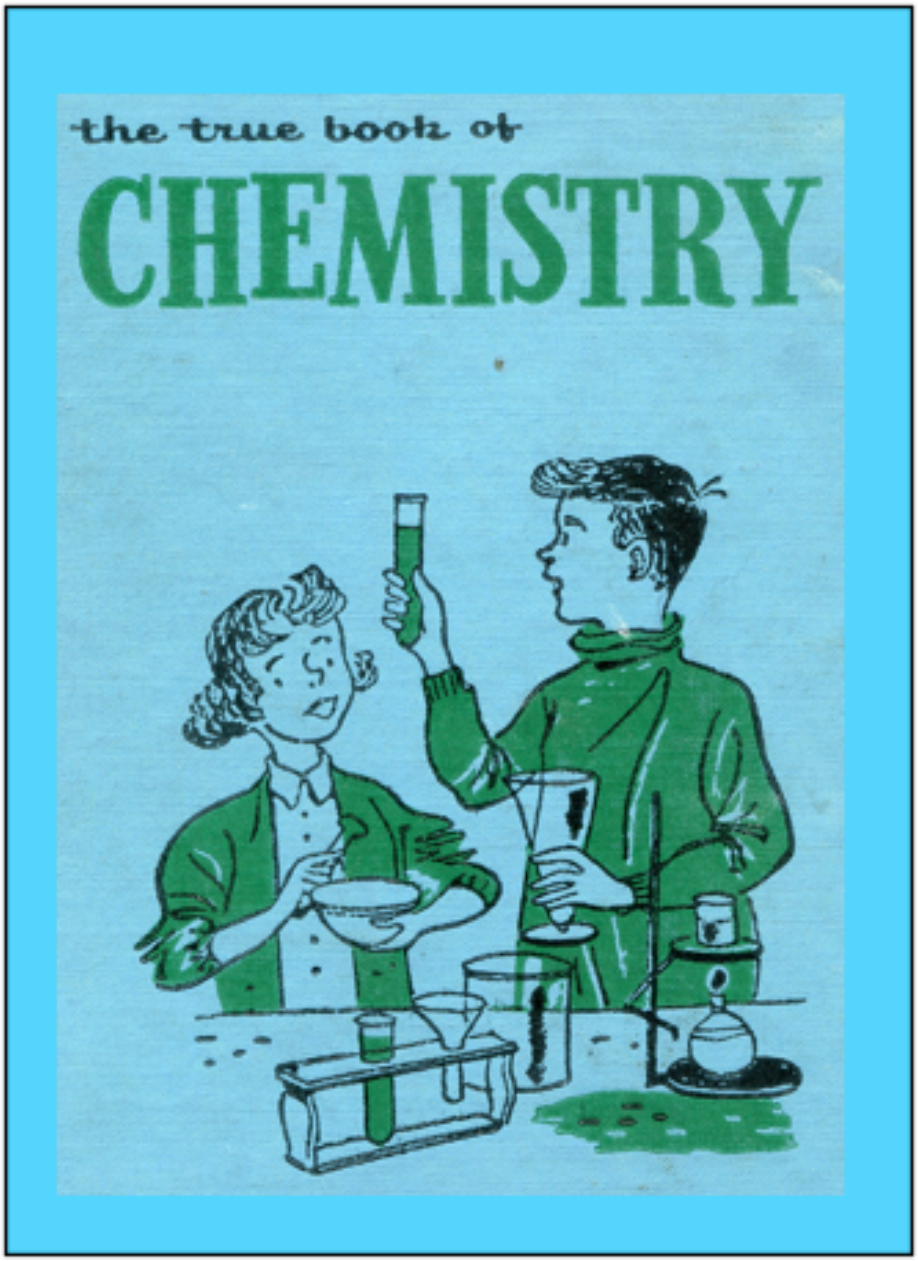
Two 15-watt, 120-volt incandescent lamps, two porcelain lamp sockets, wire, screweye, two carbon rods from size D flashlight cells, and three pieces of ½-inch plywood are needed to construct this apparatus. In a laboratory, platinum wires would be used as electrodes, but platinum is too costly for the average amateur experimenter. The carbon rods must be boiled in hot water and thoroughly rinsed to remove the sal ammoniac (ammonium chloride) and zinc chloride which may have penetrated the carbon. Otherwise these salts might go into solution in the distilled water which is to be used in an experiment. The water would then be impure and the experiment spoiled.

Connection can be made to each rod by soldering a copper wire to the brass cap. Use rosin-cored solder or rosin as the flux, in order to avoid the chemical contamination which might result from using soldering acid or paste.

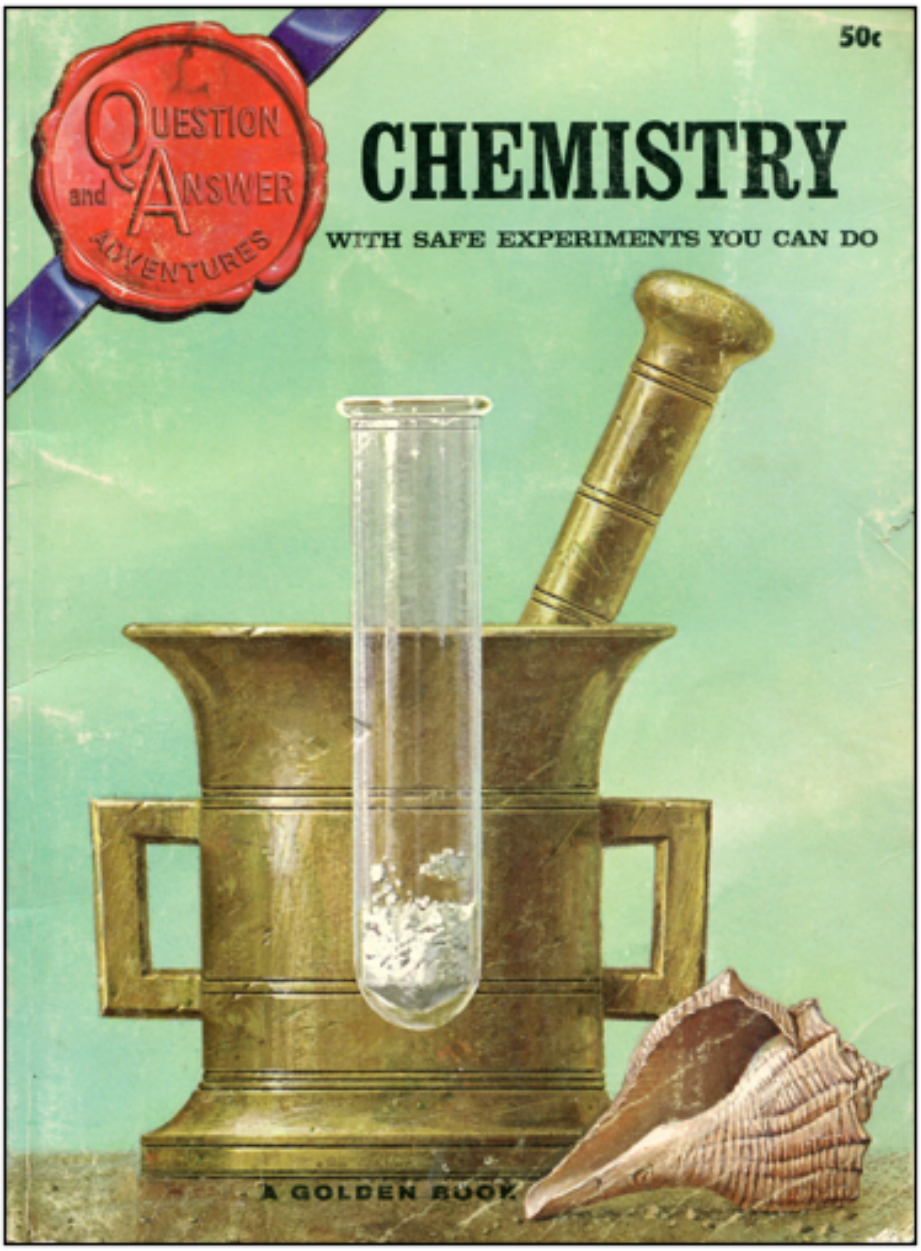
An illustration from item 28 highlighting Morgan's superb drawings of home-made laboratory equipment.



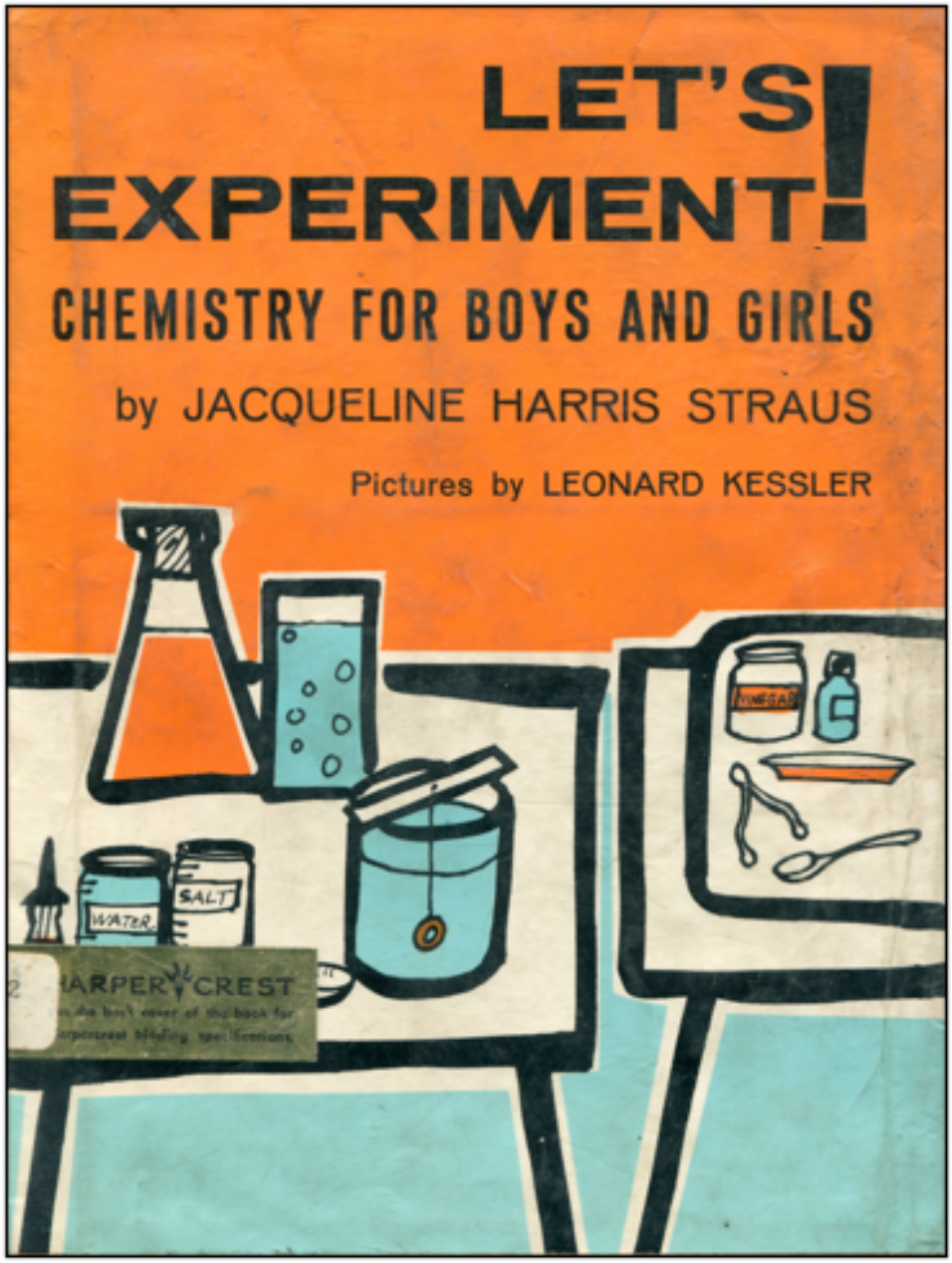
Number 29
Morris Goran
Experimental Chemistry for Boys
New York: John F. Rider
1961



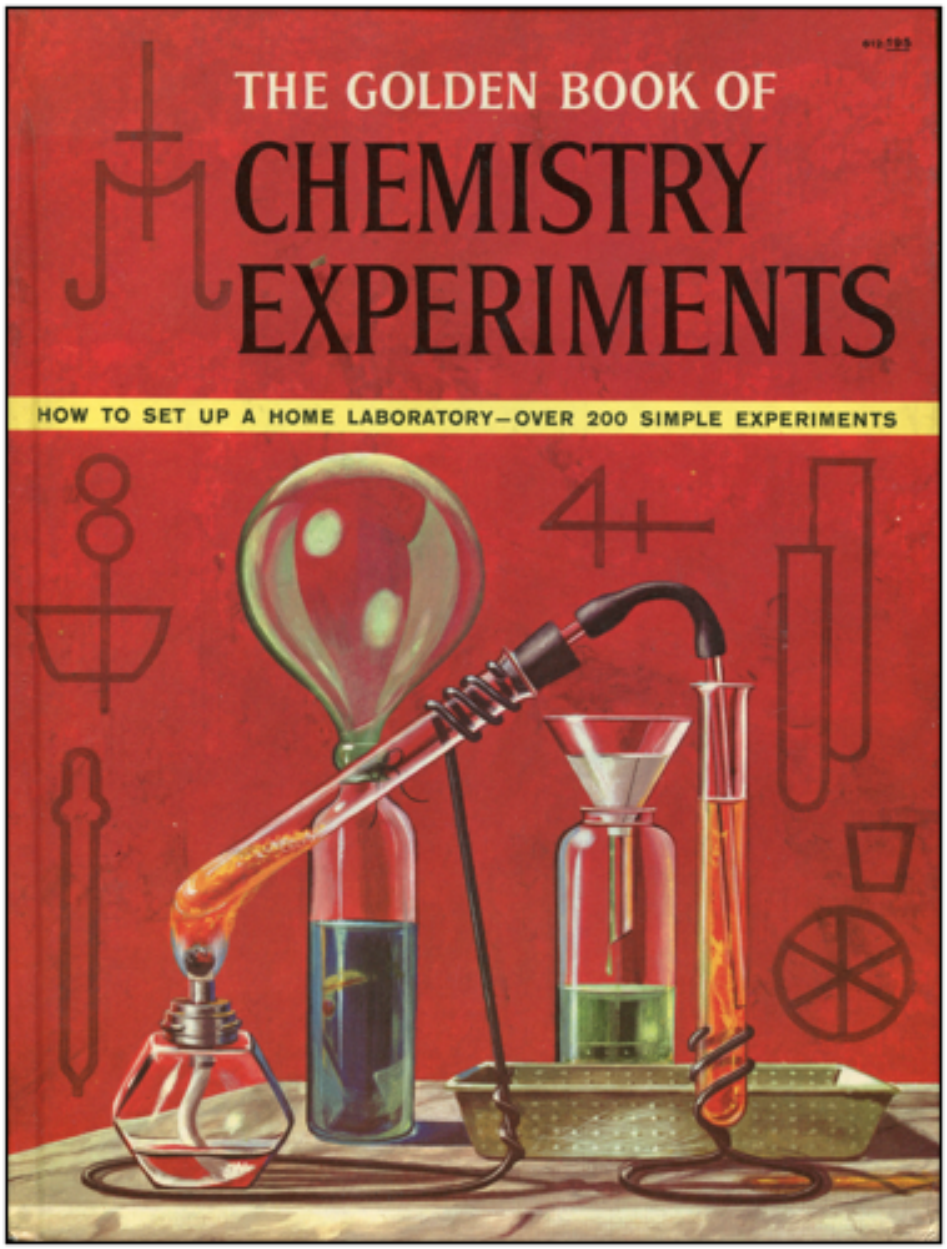
Number 30
Philip Corona
The True Book of Chemistry
Chicago: The Children's Press
1962



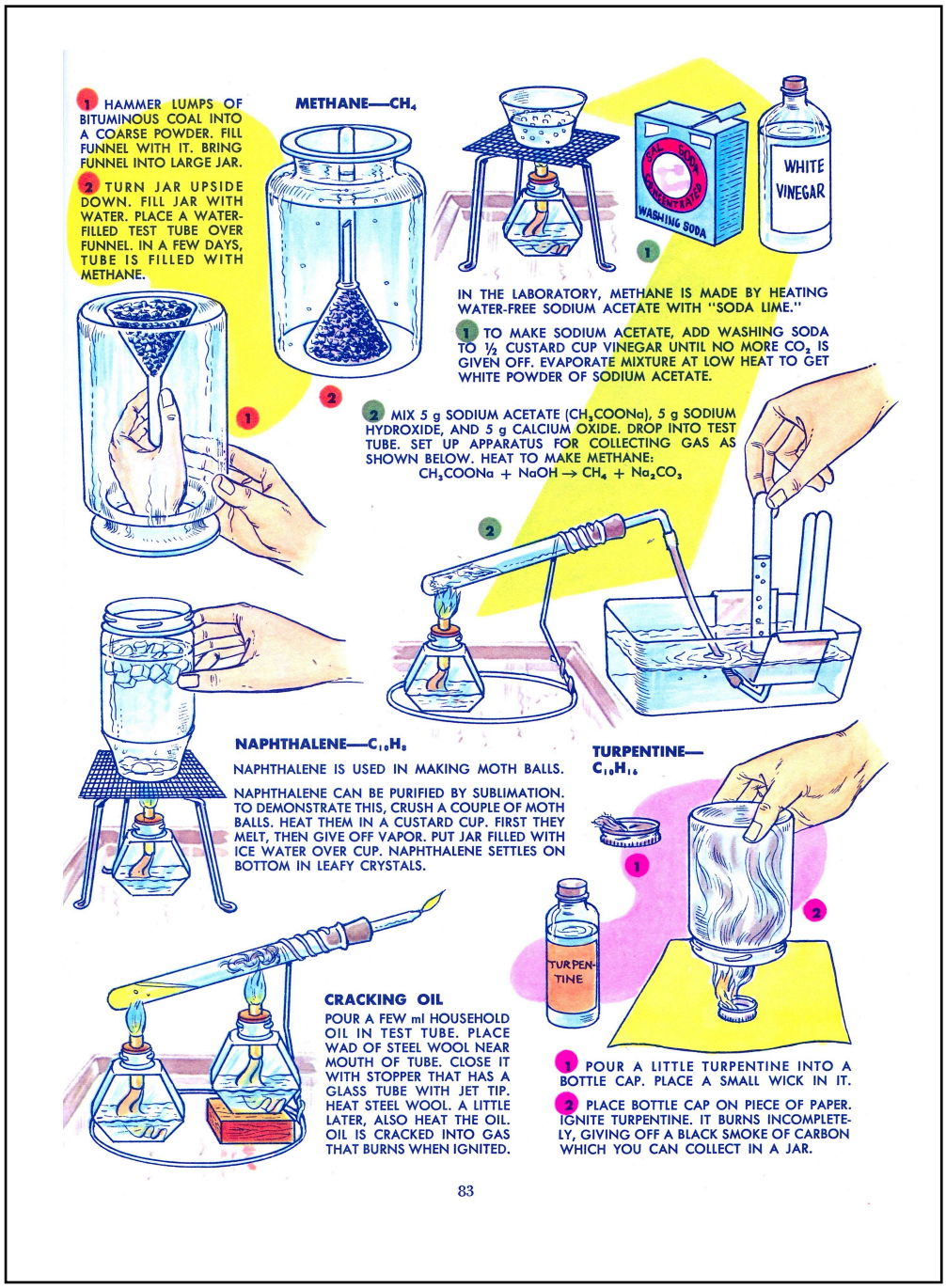
Number 31
Lazer Goldberg
Chemistry
New York: Golden Press
1962



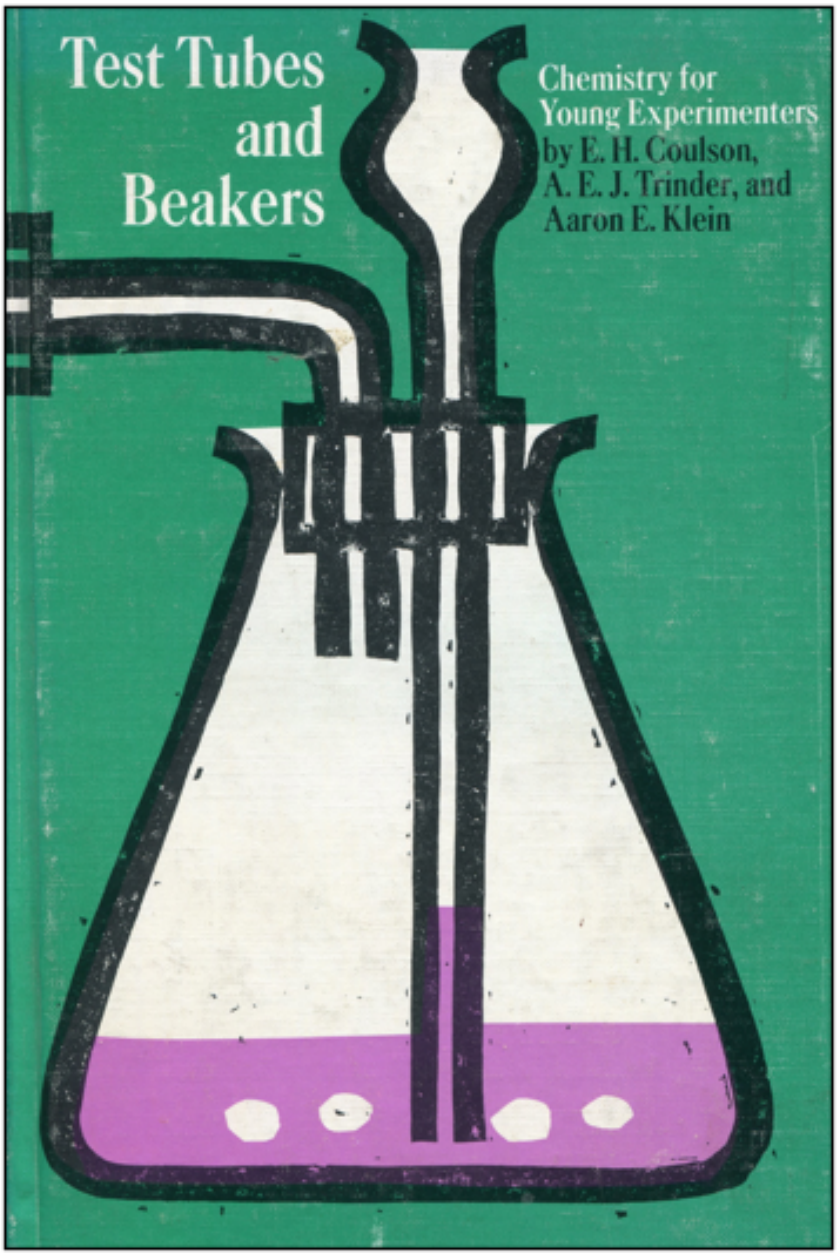
Number 32
Jacqueline Harris Straus
Lets Experiment! Chemistry for Boys and Girls
New York: Harper and Brothers
1962



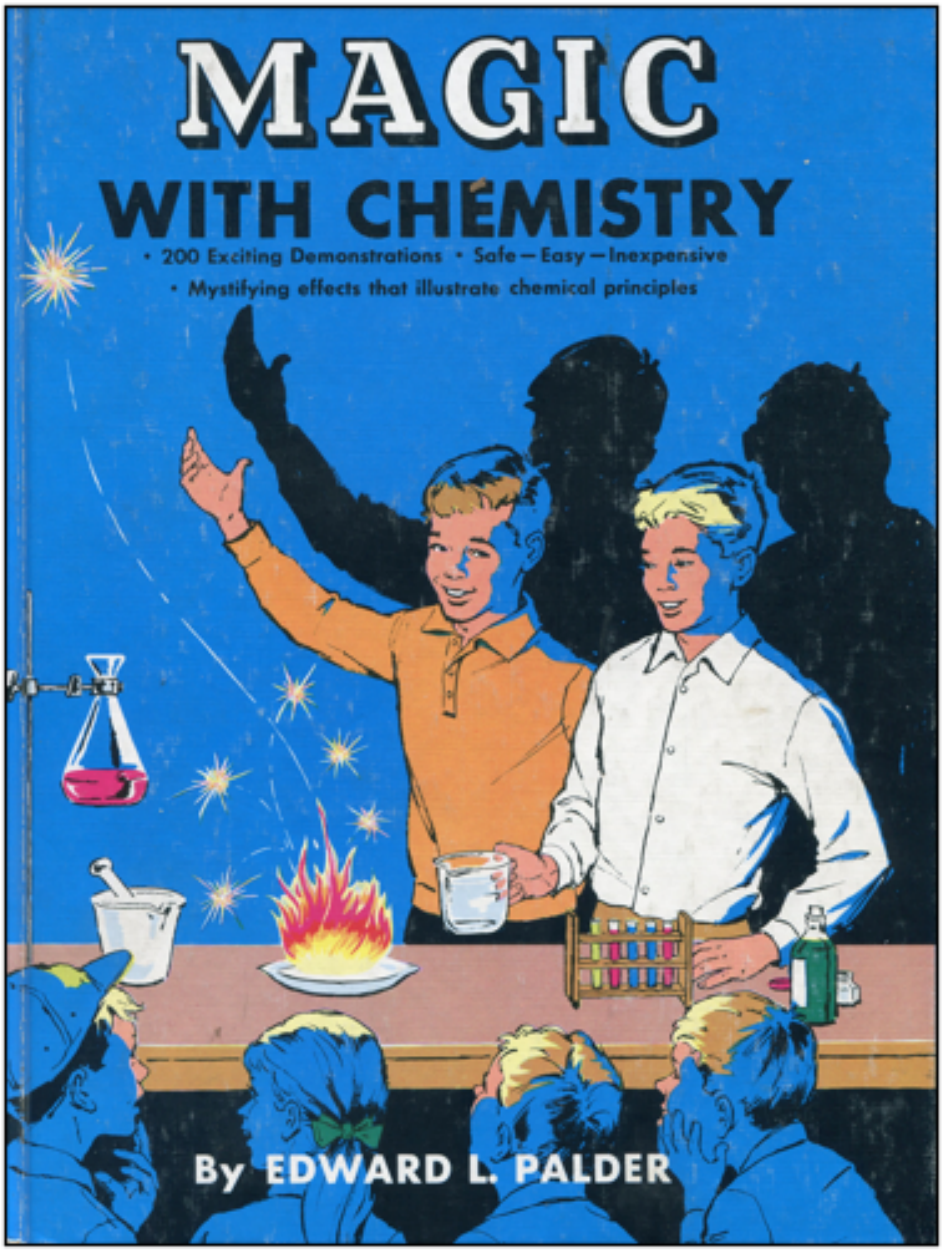
Number 33
Robert Brent and Harry Lazarus
The Golden Book of Chemistry Experiments
New York: Golden Press
1963



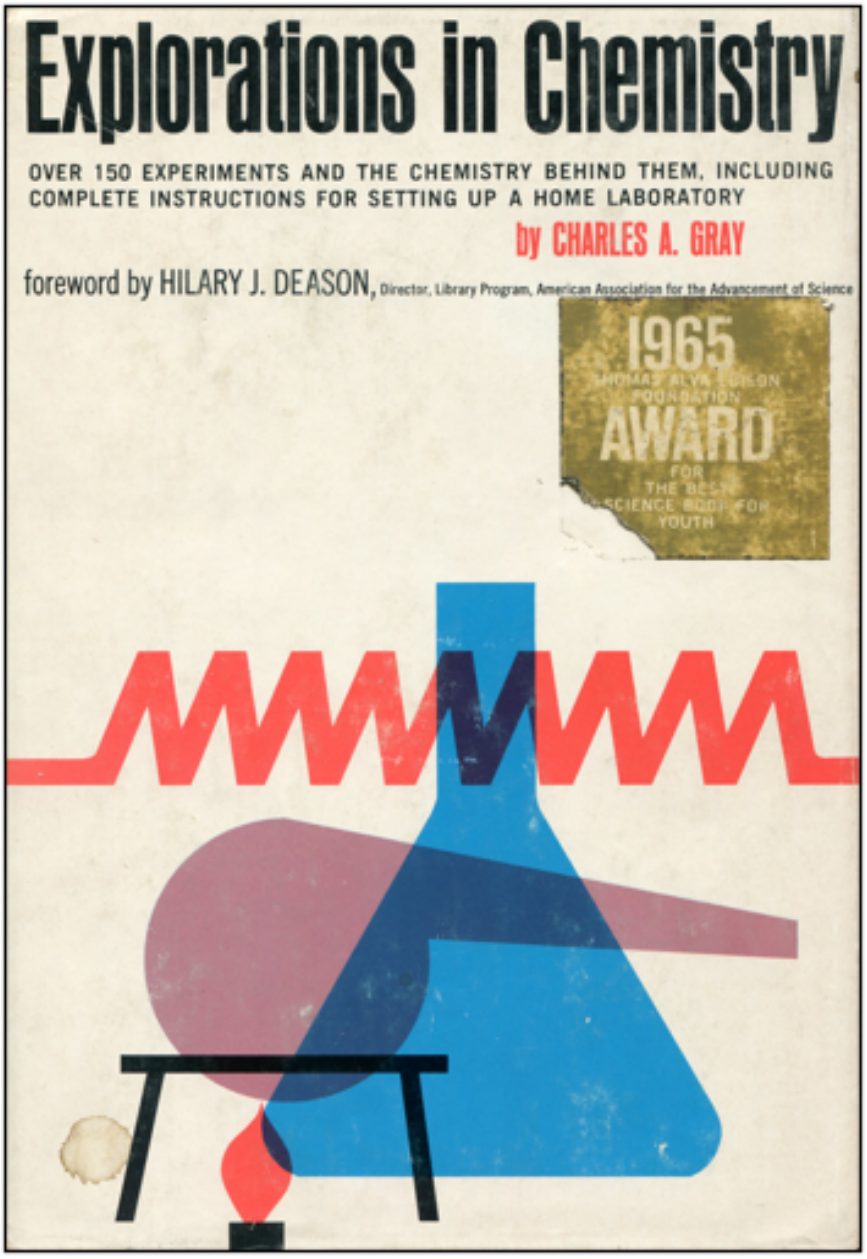
Every page of item 33 is heavily illustrated, including the above example dealing with experiments with hydrocarbons.



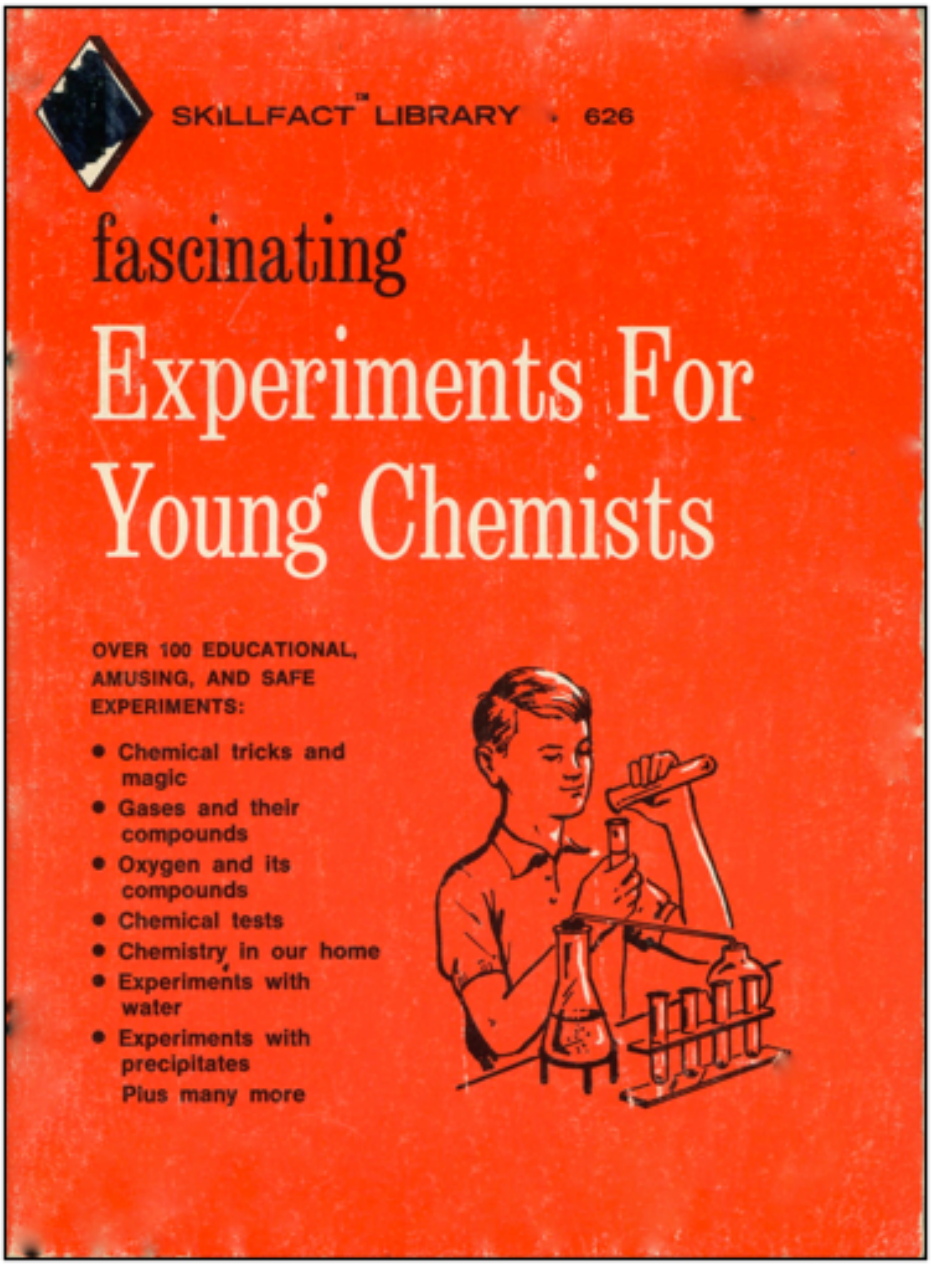
Number 34
Earnest H. Coulson, A. E. J. Trinder, and Aaron E. Klein
Test Tubes and Beakers: Chemistry for Young Experimenters
Garden City: Doubleday and Company
1963



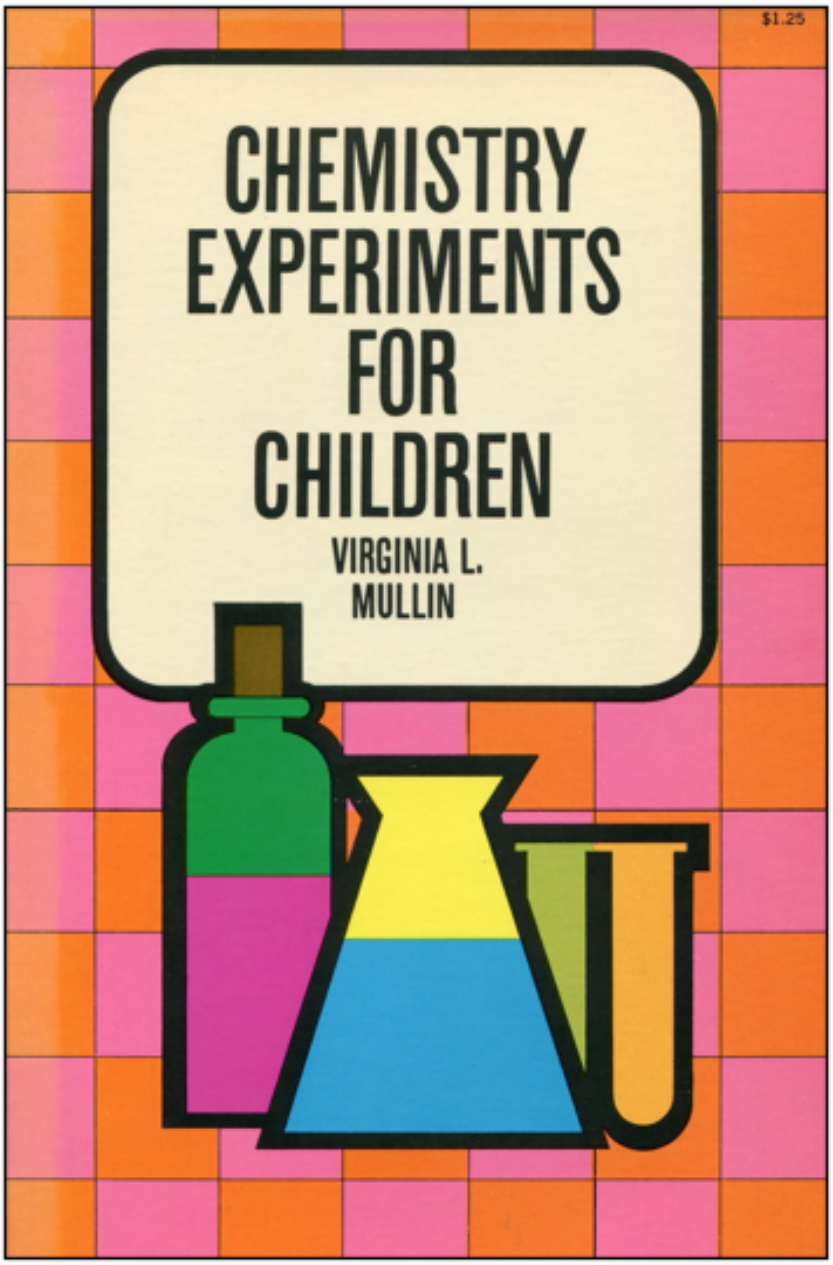
Number 35
Edward L. Palder
Magic with Chemistry
New York: Grosset & Dunlap
1964



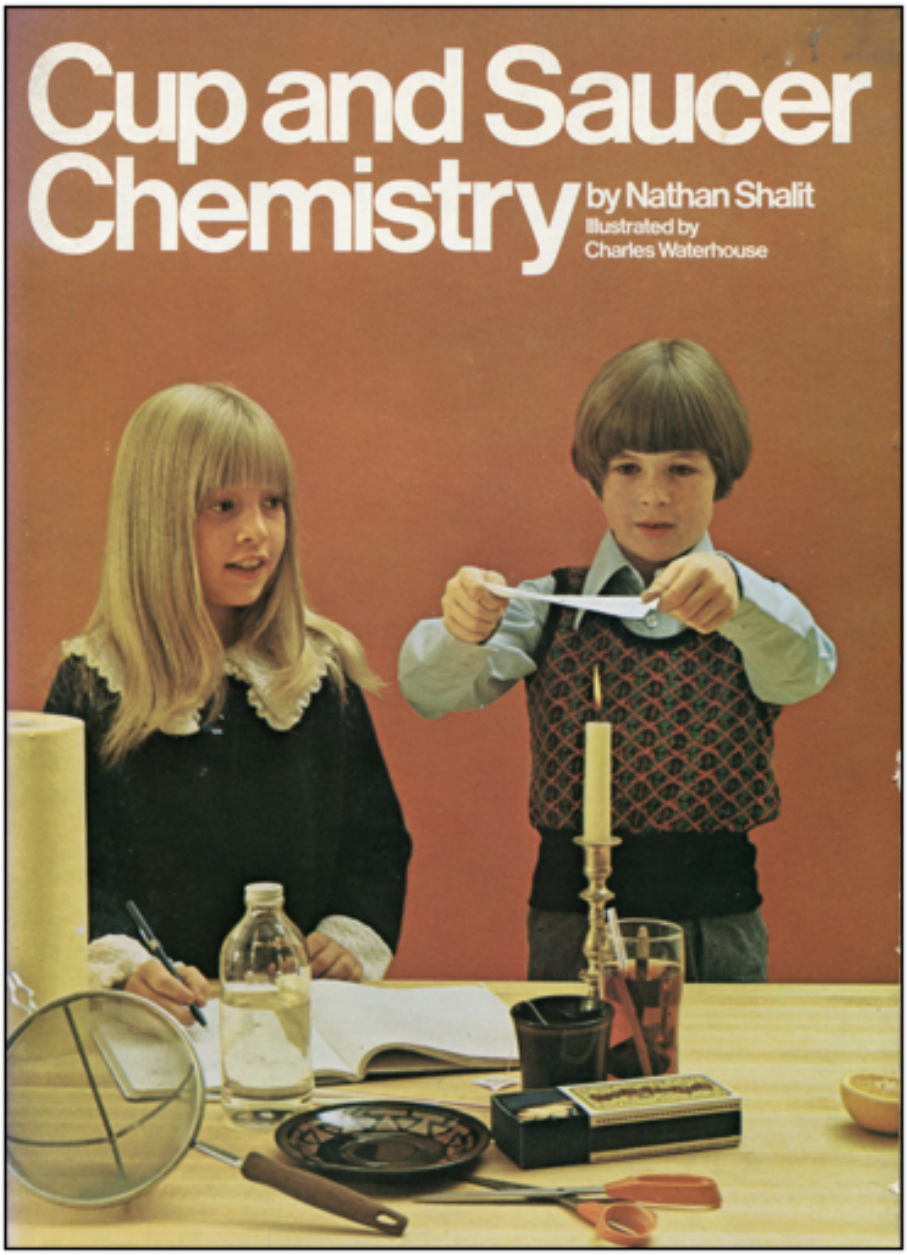
Number 36
Charles A. Gray
Explorations in Chemistry
New York: E. P. Dutton & Co.
1965



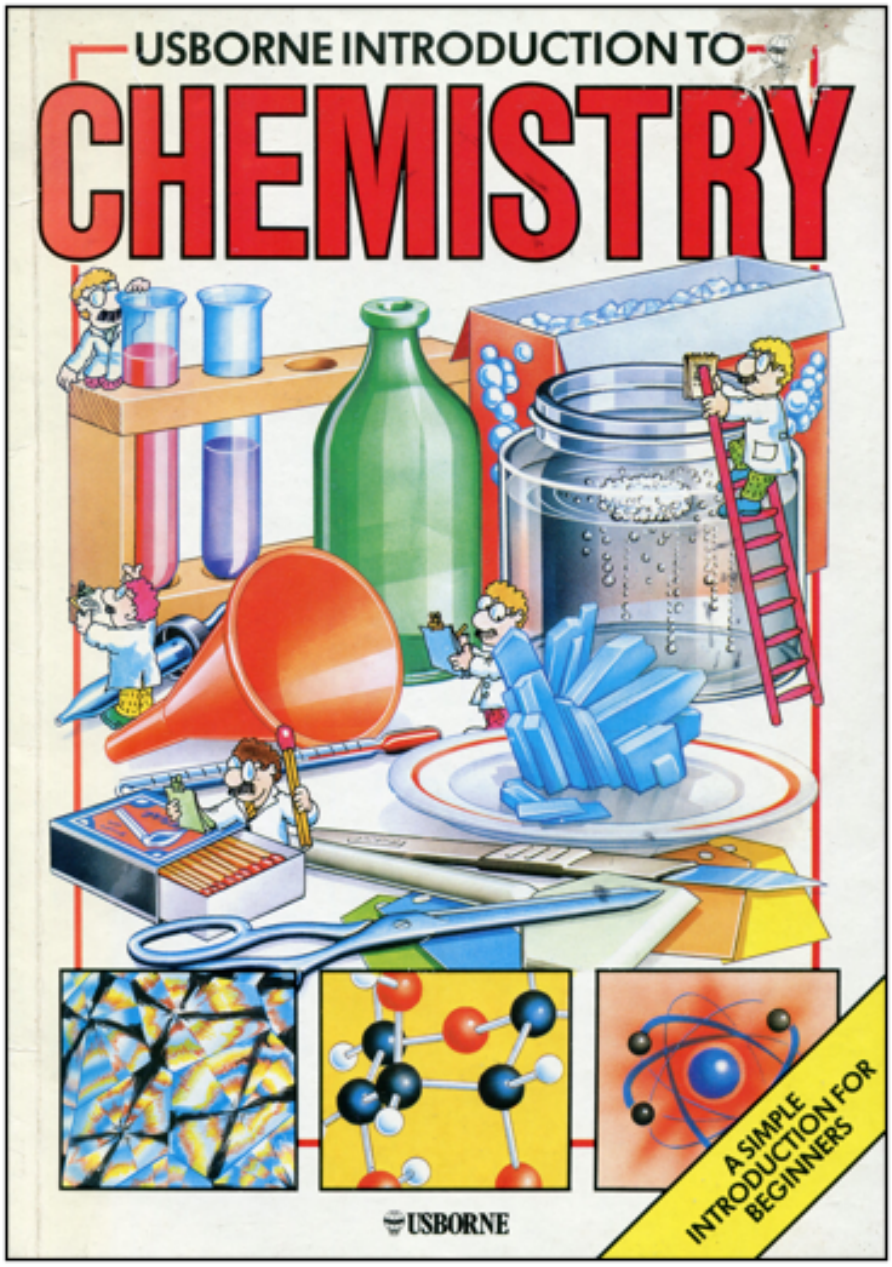
Number 37
H. Charles Woodruff
Fascinating Experiments for Young Chemists
New Augusta: Editors and Engineers Ltd.
1965



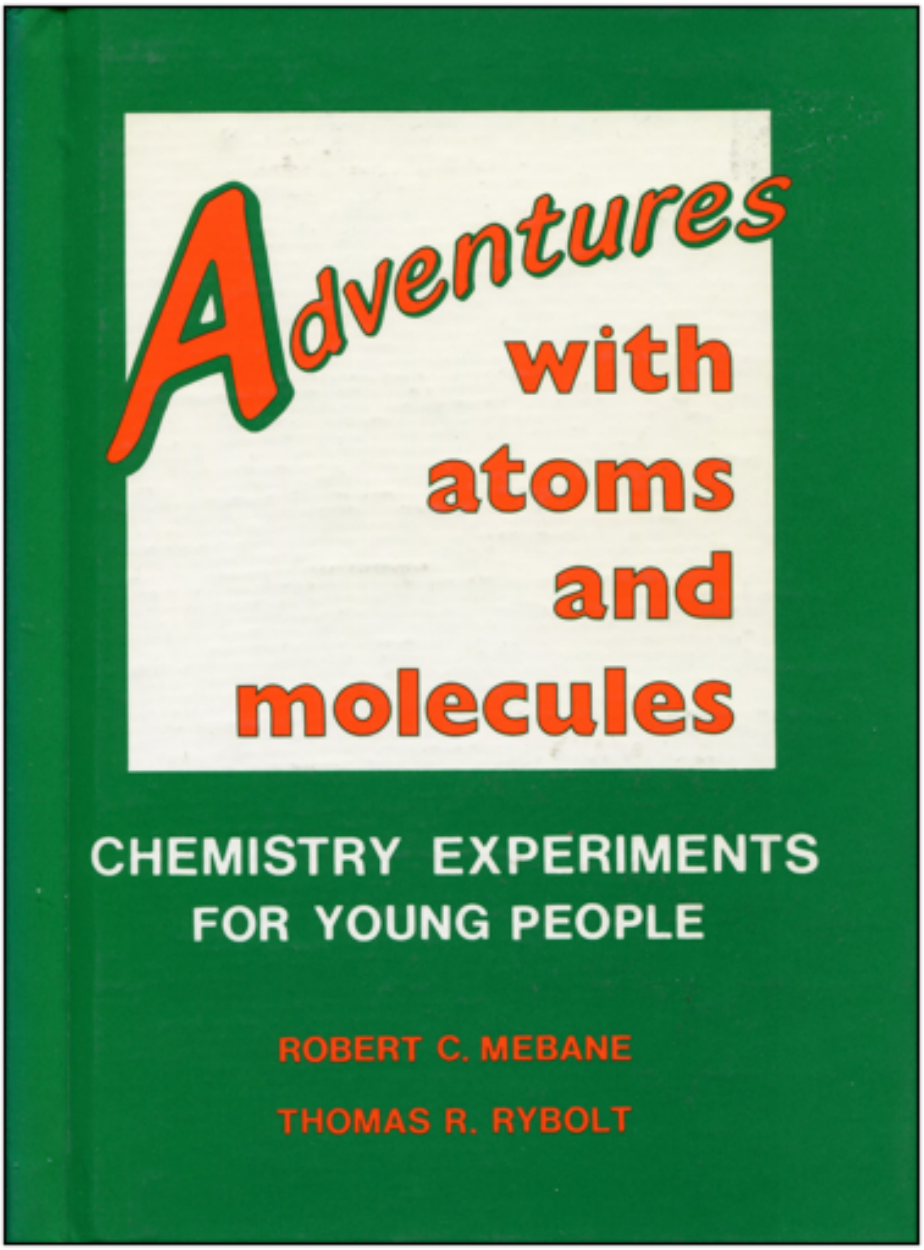
Number 38
Virginia L. Mullin
Chemistry Experiments for Children
New York: Dover Publications, Inc.
1968



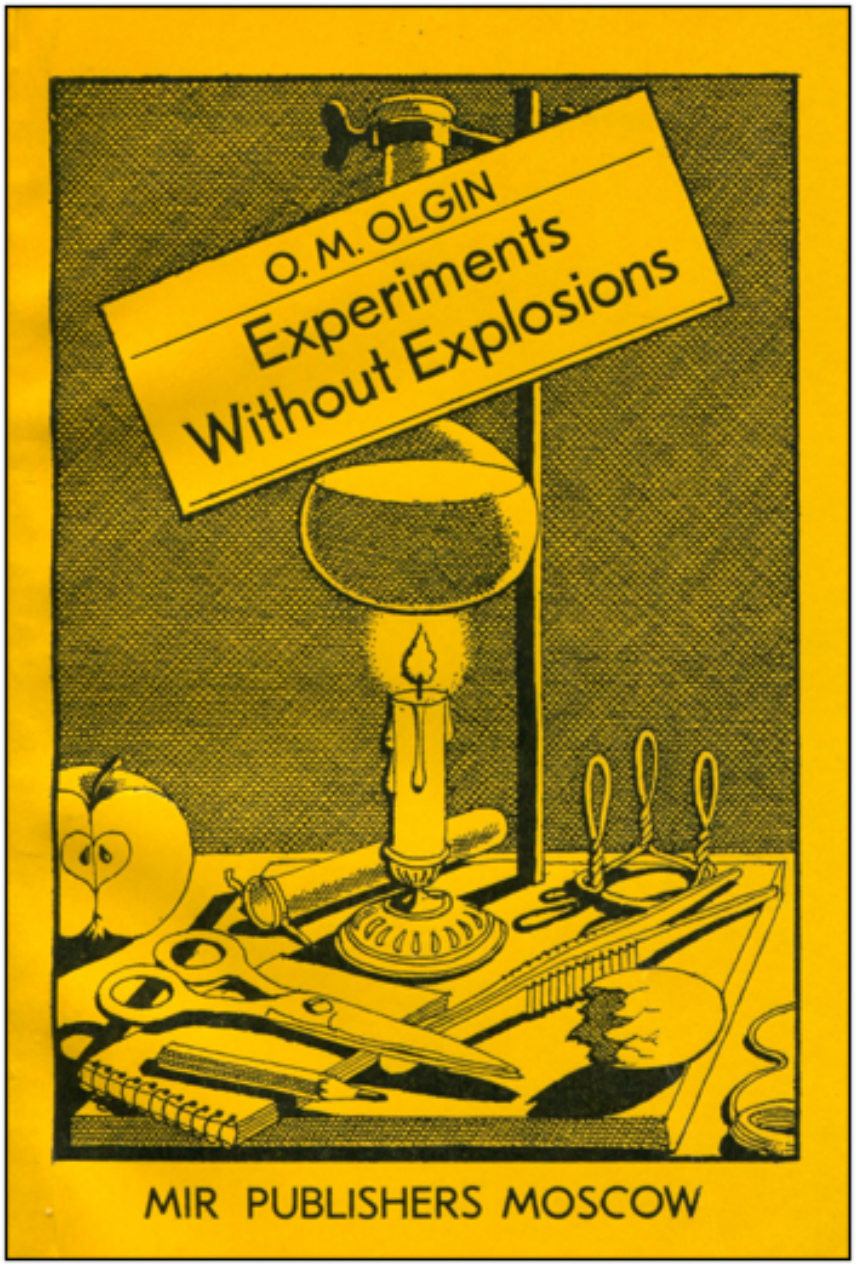
Number 39
Nathan Shalit
Cup and Saucer Chemistry
New York: Grosset & Dunlap Publishers
1972



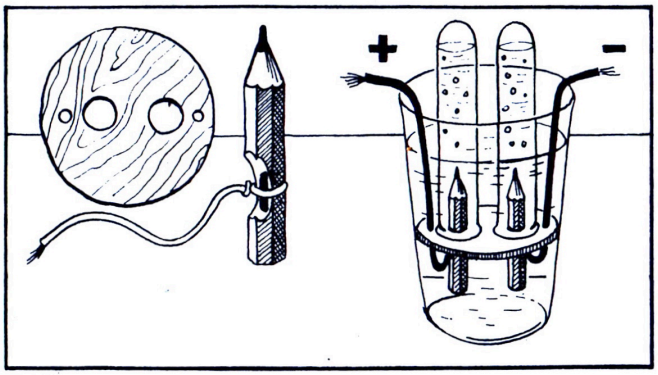
Number 40
Jane Chrisholm and Mary Johnson
Introduction to Chemistry
London: Usborne Publishing Ltd.
1983



Number 41
Robert C. Mebane and Thomas R. Rybolt
Adventures with Atoms and Molecules, 3 Vols.
Aldershot: Enslow Publishing, Inc.
1985-1991



Number 42
O. M. Olgin
Experiments without Explosions
Moscow: Mir Publishers
1986

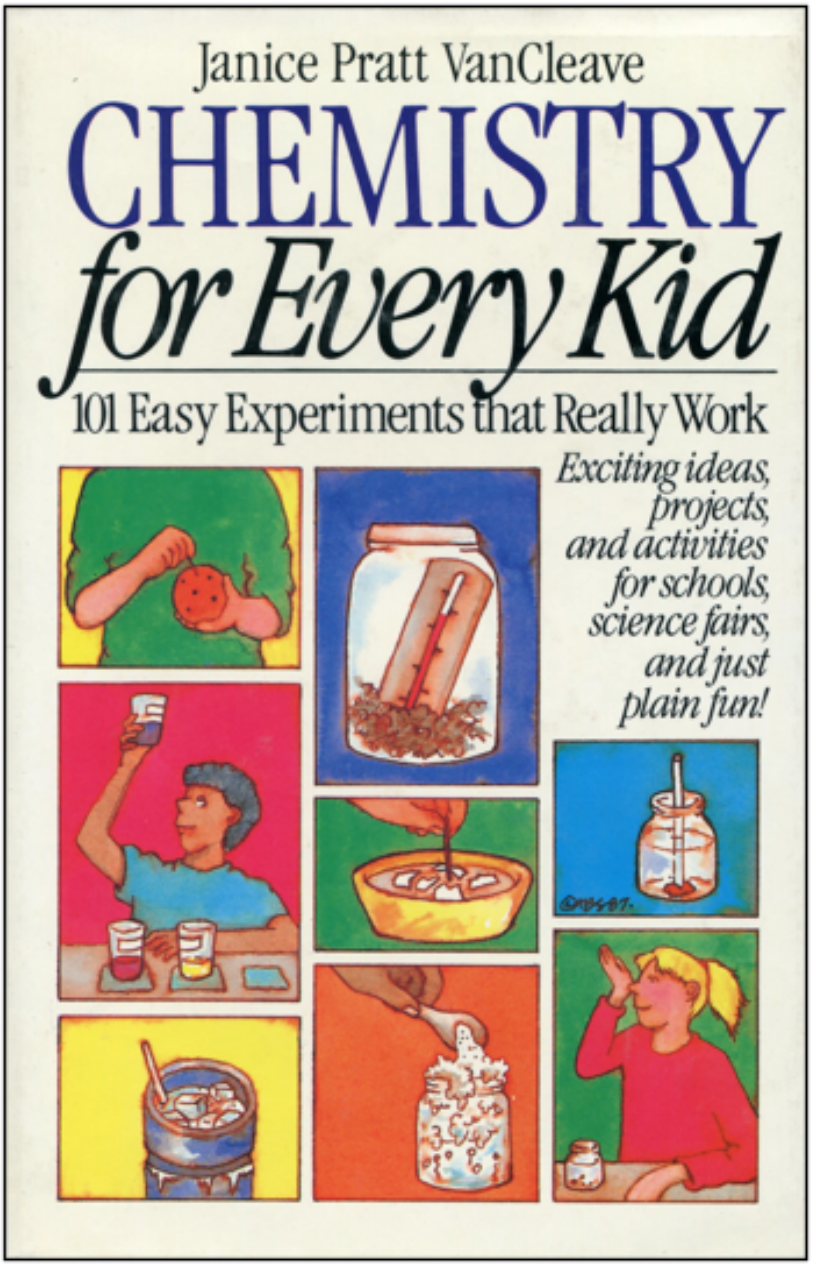


In the next experiment we will use a thick drinking glass as an electrolytic cell. Make a plywood disc with a diameter that allows it to rest in the glass three or four centimetres above the bottom. Drill two holes in the disc through which a pencil can pass (or cut a slot along the diameter of the disc), and nearby make two holes for wires with an awl. Insert two pencils that are 5 or 6 cm long and sharpened at one end into the big holes. The pencils or, rather, their leads will serve as electrodes. Make cuts near the unsharpened ends of the pencils to expose the leads, and wind uninsulated ends of wires around the leads. Now all the details of the device are ready; all that remains is to assemble it, that is to insert the disc with the electrodes inside the glass.

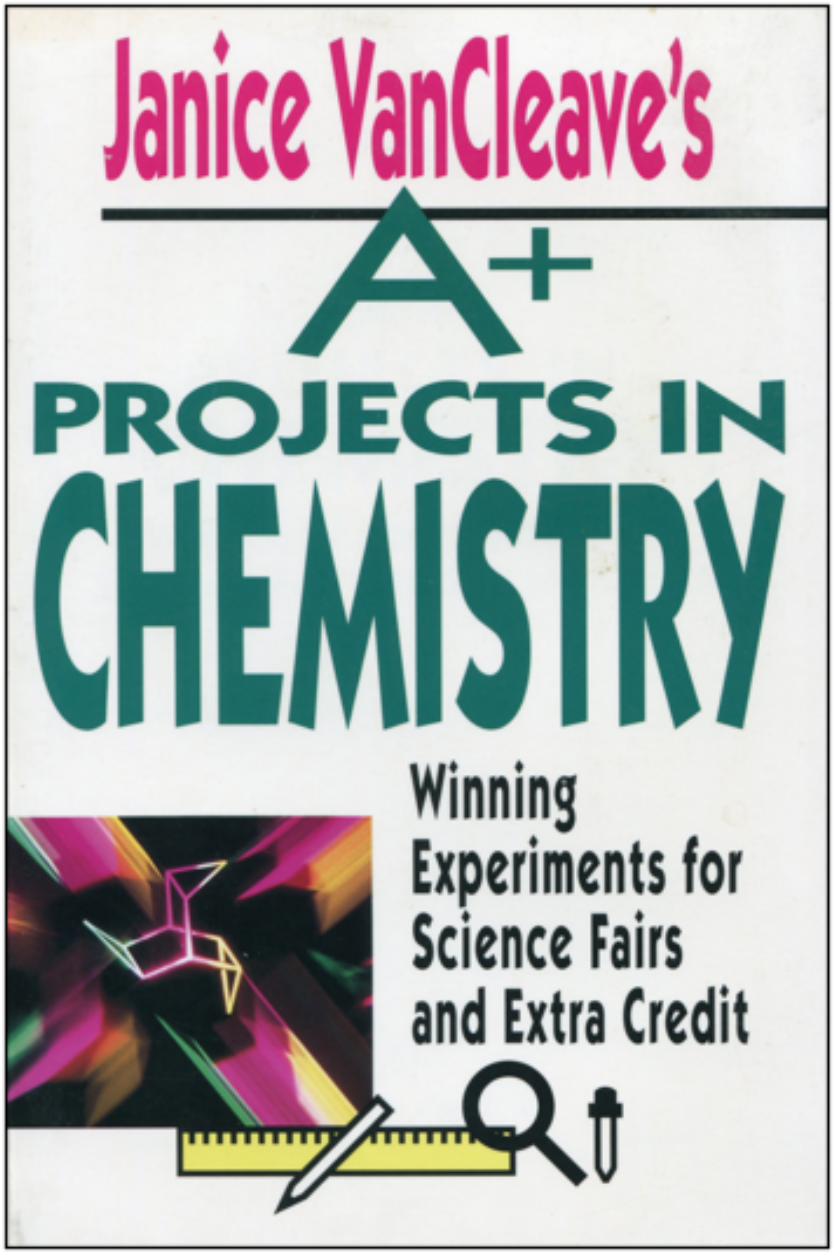
Put the glass on a plate and fill it to the brim with a solution of calcinated washing soda Na_2CO_3 (2 to 3 teaspoons of soda in a glass of water).

5–563

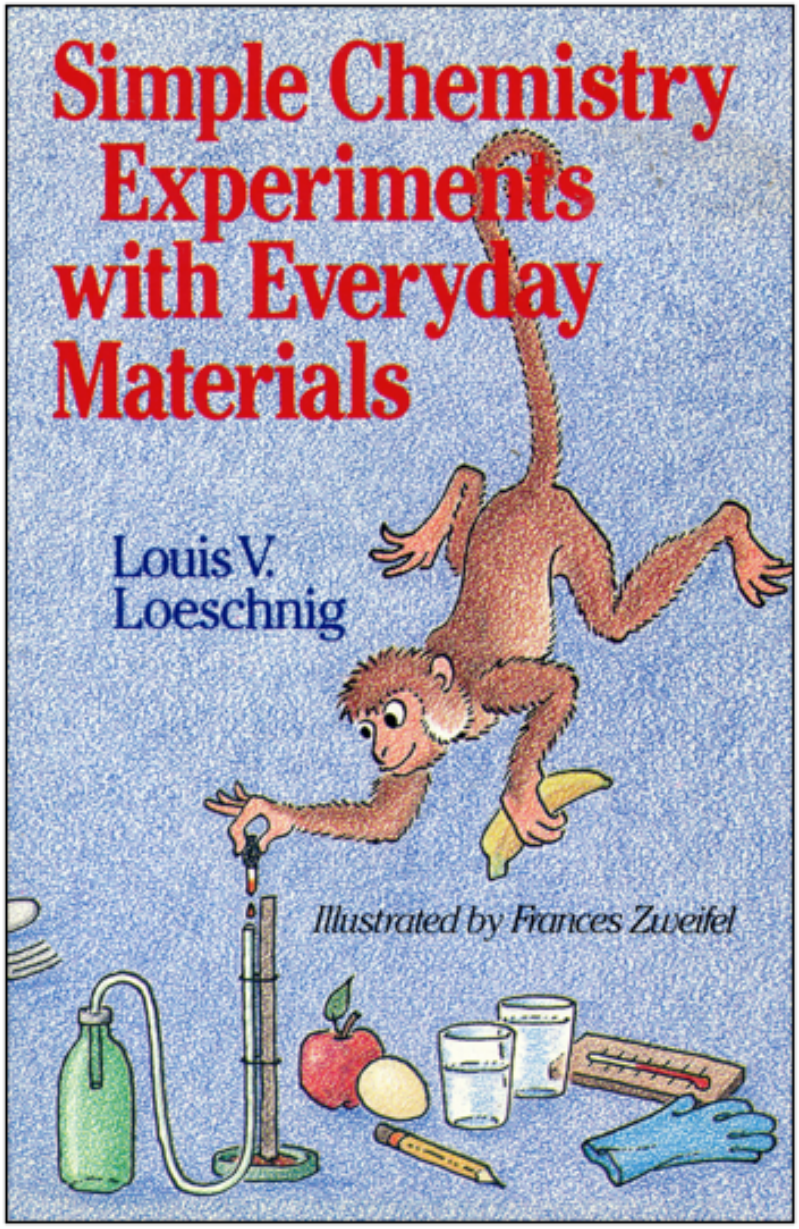
A page from item 42 showing a very clever way of making insulated carbon electrodes for electrolysis using graphite pencils.



Number 43
Janice Pratt VanCleve
Chemistry for Every Kid
New York: John Wiley & Sons
1989



Number 44
Janice Pratt VanCleve
A+ Projects in Chemistry
New York: John Wiley & Sons
1993



Number 45
Louis V. Loeschnig
Simple Chemistry Experiments with Everyday Materials
New York: Sterling Publishing Co.
1994