How a Boy should Train to Become a Champion

By Lawson Robertson

Track and Field Coach, University of Pennsylvania
Head Coach American Olympic Teams 1924, 1928, 1932, 1936

BETWEEN the champion athlete and the dub athlete there is but a hairline of difference. Yet that slight difference is the difference between failure and success.

How can the "dub" close this slight gap? By faithful attention to the details of his sport—by everlastingly keeping at the job of improving his methods until they approach perfection.

There is a lot in getting started right. In my twenty years of coaching track and field athletics at the University of Pennsylvania it has been my duty to instruct and train thousands of athletes. My hardest task has been the correction of wrong methods and poor form acquired before entering college. Some of the boys had never had any athletic instruction and had been compelled to "pick up" their events; others had been taught wrong methods. The best advice that I can give any boy who wants to become a good athlete —an athlete of championship class—is that he try hard to learn the right way of doing things—what we call good form—in the very beginning. Then he won't have things to unlearn. Unlearning always is harder than learning.

You Don't Have to be a "Natural Athlete"

There seems to be a pretty general opinion among most people that champion athletes are born and not made. I have had occasion to study the life histories of some of the world's greatest athletes, and I want to tell you, boys, that it has not been their natural qualifications or their natural physical development that has made all the best athletes into champions, nearly so much as one essential, which, in my opinion, is the most important characteristic of the great athlete. That one characteristic is the ability—natural or cultivated—of keeping everlastingly at it. The boy of average natural ability who has this sort of determination is much more likely to develop into a champion than is the "born athlete" who lacks the all-important quality of stick-to-itiveness. Cultivate the never-say-die spirit! If you do—even though you do not become a champion athlete in the end—you will be well repaid, for in the process you are building character, and developing a trait that will be helpful to you when you go out into the world to do other and bigger things.

Don't Get "The Big Head"

If you have gone into athletics determined to win success, and are beginning to show results that make you pretty well satisfied with your work, don't let your success turn your head. As they say in sport, don't get the big head. You will deprive yourself of many of the best things in life if you fail to win the friendship of your associates. Don't make them despise you by boasting. Let the results you accomplish speak for themselves. Put all you have into the game, and play hard to win, but when you are beaten, be a good loser. Always congratulate the winner as if you meant it, but be determined to do better the next time you compete against him.

Don't think that you can get through school or college purely on your athletic ability. The scholastic requirements of today are so high that no athlete can afford to neglect his studies. Therefore you should make up your mind to make a good record for yourself in the classroom as well as on the athletic field. Remember always that there are two parts to an education—the part you get inside the class-room and the part you get outside from your association with your athletic friends. They both are important, and you should not neglect one at the expense of the other. Too few athletes realize that they will not be permitted to compete unless they are up to the standard in their studies. Don't forget that many star high school athletes fail to pass their college entrance examinations because they have paid too much attention to athletics and not enough to their studies.

Physical Requirements

There really are no standard physical requirements for athletes. In running and baseball—even in football and weight throwing—small men have competed successfully against giants. However, there is no doubt that in football, weight throwing, and some other sports, the good big man usually will beat the good little man. Concentrate on the sport in which you will have the best chance of success. Having chosen your sport, do not be discouraged if you have a physical handicap. Proper training will overcome it. The main thing that I want to impress upon you is that physical attainments are relatively unimportant. It is spirit that counts most. Determination to succeed will enable you to overcome any handicap.

You sometimes hear people talk about athletics injuring young men. These isolated cases are the result of boys starting strenuous training without the precaution of taking a physical examination. Therefore it is imperative that the young athlete, even though he is apparently sound, should avail himself of this precaution. Most physical defects can be remedied easily. Discover and correct them before you enter college, for most colleges do not allow their students to take part in competitive sports until they have been proved sound by a doctor's examination.

At What Age Should a Boy Start Athletics?

I often am asked at what age a boy should start his athletic career. It is perfectly safe for a boy to start easy training as soon as he becomes interested in sport, but, at whatever age he starts, he should be careful not to overtax himself. He should work up gradually. Never let anyone put you to a task which is beyond your power to accomplish, or that taxes you too severely in the early years of your life. Start early if you want to, but go about your training systematically. It is unfortunate that young boys in preparatory schools are permitted to compete frequently in too-strenuous competition before they have attained their full physical development. The young athlete should conserve his strength, so that when he enters college—when it is most important that he should be at his best—he will have a big reserve of energy to do bigger things, and perhaps realize his ambition of becoming a champion. There are many glaring examples of boys who have burned themselves out in high school and preparatory school competition.

Proper Training

Eat plain, wholesome food, avoiding fried and greasy dishes and heavy pastries. Training is regularity. Eat at the same times, and exercise at the same time each day. Sleep nine hours every night in a well-ventilated room. A short daily bath after exercise is a necessity. If possible, take a half-mile walk before breakfast. Smoking is, of course, out of the question.

The effort of becoming a champion athlete is worth while, for even if you do not succeed, remember that in the dust of defeat as well as in the laurels of victory, glory is to be found.

The Great Forward Movement of Chemical Industry

Unlimited Opportunities and Astounding Miracles Await the Achievements of Future Chemists.

Results and accomplishments that have startled the world—discoveries that have contributed to the happiness and welfare of people and to the wealth and strength of nations, has been the reward of chemical research.

In times of stress, whether in peace or war, chemical industry has done its part with astounding achievements and out of the chemists' test tubes will come future re-actions that will revolutionize industry and see developments in chemistry that are likely to change our whole method of living.

New foods from barks and shrubs, now considered worthless, new medicines and drugs that will banish deadly diseases, new metals, fuels, fabrics, colors, perfumes, new uses for coal tar products, developments in production of liquid fuels, the manufacture of synthetic products, reclamation of waste piles and scrap heaps, are all problems that great industries will be constantly calling upon the chemist to solve.

In presenting this introduction the reader will no doubt be interested in an abstract taken from the new Gilbert Chemistry Manual, edited by Prof. Treat B. Johnson, Yale University, Ph.B. 1898, Ph.D. 1901 pertaining to the origin of the word Chemistry, Chemistry as a Science, The Chemist's Laboratory and Use of Equipment.

Origin of the Word Chemistry

The first literary work in which the word—"Chemistry"—is found was written by Plutarch, a Roman historian who lived from 46-120 A.D. In a treatise entitled—"Isis and Osiris"—that philosopher mentions that "Egypt" in the dialect of the country, was called the same name as the black of the eye, "Chemia," and from this he infers that the word meant "Black" in the Egyptian language. Some science historians believe that our word "Chemistry" means "The Egyptian Art." Others think that the word was coined to mean "The black art." Still others think that the word meant "The dark or hidden art." Another school of thinkers believes that the word has no connection with Egypt at all, but that it comes from the Hebrew word—"Chaman," meaning mystery. Another possible derivation, according to some historians, is from the Arabic word "Chema"—meaning to hide, hence "the Hidden Science." In fact, a book of secrets was written in the time of the ancient Arabians called "Kemi." Probably no one will ever know definitely which one of these possible derivations is the correct one.

Origin of Chemistry as a Science

According to some historians, the origin of chemistry as a science dates back to the time of Tubal Cain, the father of workers in metal. Credit is also given to Hermas, the Egyptian god of art and sciences. His son is said to have colonized Egypt, which was foremost in the knowledge of chemistry in those ancient days for they had developed the arts of making glass, pottery, colors, embalming fluids and other practical products to a high degree, and the early Egyptians can really be said, therefore, to have had an advanced knowledge of applied chemistry. Then Paracelsus, the Greek physician, carried the study along and discovered the influence of chemistry upon medicine in the treatment of human ills, and it was through him that the action of several inorganic salts upon the human system became known. Following this period a long time elapsed, hundreds of years, during which time contributions were spasmodically made by unknown workers in science, but which really had little influence upon the development of modern Chemistry.

Chemistry, as we know it today, is one of the newest of our sciences, and yet it is one which offers the greatest opportunities of advancement, research and fame for those today who are interested in the fuller things of life. Centuries ago there was no such thing as chemistry. Chemistry was preceded by alchemy. Alchemists were superstitious men and very often dishonest. He was a groper for mysteries, and if it had not been for this interest in the mysteries of energy and matter, modern science would never have been born. We can now visualize the old alchemist working over his pots and retorts in crude laboratories and in dark caves. Shrouded in mysticism, and his activities kept secret, his imagination fired with zeal and exercising patience, and with the purpose of a religious fanatic, he sought to make or find the philosopher's stone.

It was not until the early part of the eighteenth century that the scientists of the central European countries and the English Empire began to contribute fundamental knowledge which laid the foundation and paved the way for the development of this wonderful science. The Frenchman, Lavoisier (1743-94) may really be credited with being the father of modern chemistry.

There is hardly a science today that has greater economic influence, or holds more fascinating interest to scientists throughout the world than chemistry. If we are to unravel the secrets of our wonderful world and life, there is no science that will enable us to understand and correctly interpret these hidden things of nature that most of us think are magical and mysterious, like a knowledge of chemistry.

No large and progressive manufacturing industry can cope with its competitors today without a trained chemist to advise and assist in its development and the analysis of raw materials which it buys. The present-day physician without a knowledge of chemistry would be incompetent and unable to maintain an acceptable professional standing as a practitioner of medicine.

The great problems involved in the manufacture of synthetic drugs, dyes, perfumes, essential oils, of soil fertilization, and of the many substituted and artificial productions influencing modern civilization are every-day problems of chemistry. The regulation of our food supply calls for the services of thousands of experienced technicians who are employed as chemists by industry, municipalities and both our State and National governments. If we would have our country today improve its standards of living and at the same time accommodate itself to an increasing population, we must hereafter maintain on an even more liberal scale than ever before great laboratories of science devoted to the study of chemistry. The men and women working in these laboratories are among our priceless possessions. There is no sum that the world could not afford to pay these men who have that originality of mind and devotion and industry to carry forward in scientific advancement until its influence spreads to the comfort of every home. It was former President Coolidge who wrote as follows: "Wherever we look, the work of the chemist has raised the level of our civilization, and has increased the productive capacity of the nation."

Probably most boys are interested in science because they just naturally think they will like science. This is a perfectly good and sufficient reason in itself. At the same time, a boy who becomes interested in science would like to be reassured, no doubt, that science offers a really important field for service in the interests of human welfare. From the far-sighted point of view, the public is better off today than it was before science was developed, and so it always will be. Every boy and girl should be impressed with this fact and be made to realize that science creates jobs, and that its application makes life more comfortable and more interesting.

In order to illustrate this point of view, emphasis has been laid on experiments in all Gilbert Chemistry Manuals which show the relationship between chemistry and its application to our chemical industries and to everyday life and to the beginner we advise the use of a Gilbert Chemistry Outfit for reason of its completeness in equipment and the basic knowledge contained in the instruction books. There was a time when chemistry was regarded as being related to witchery and sorcery. Chemicals were formerly looked upon as deadly poisons and chemical reactions were associated with explosions. The men who practiced the science of chemistry had to do so in secret because they were regarded by the people with superstition and dread and as related to the devil.

Today conditions are entirely different. There is now no need for secrecy. A chemist is looked upon today as a professional man to be treated with respect, and there is a growing desire to know more about this science. To satisfy to some degree the youthful thirst for chemical knowledge, and to afford the pleasure to boys to be derived from the intelligent performance of simple experiments, is one of the aims presented in Gilbert Manuals. The second aim is to develop the power of scientific reasoning and to give to the boy an elementary knowledge of the fundamental principles upon which modern chemistry is based.

Prof. Johnson advises that all experiments should be carried out with accuracy in order to obtain satisfactory results. Remember that nature is exacting in her methods of operation, and it is the problem of the scientist to seek the truth and operate according to the "rules of the game," so to speak, by careful experimentation. He further urges that you think out for yourself, when you are performing experiments, first as to what you are doing the experiment for, second, weigh carefully the results obtained, and third, draw some conclusions as to what the results really mean to you. It is by so doing that you will develop your imagination, and an investigative mind. The performance of your experiments will prove a pleasure to you, and at the same time you will contribute to your knowledge and also advance and develop the science of chemistry.

The Chemist's Laboratory

The chemist's work-room or laboratory has several special requirements if it is to be fully satisfactory. A room somewhat isolated to avoid interruption is desirable. Good ventilation is necessary, and at least enough heat at all times to keep water solutions from freezing. While a capable chemist seldom spills anything, and, in spite of popular opinion, almost never has an explosion, it is better to have the laboratory plainly and simply furnished so that an accidental splash will do no damage. A plain wooden floor is better than a carpet, and concrete or linoleum are still better. The work table may be of plain lumber, with the top waxed frequently to protect it. A sink and a supply of running water are quite essential, but if he lacks these the ingenious boy chemist will find a way to provide himself with running water from a pail fitted with a siphon and hose. And you never will get too many shelves, cabinets and drawers for storage.

Now in picturing to you this ideal laboratory, we realize that few boys can have all this at once. In fact, a Gilbert Chemistry Set has been designed to be as far as possible a complete laboratory in itself. But we feel sure you will enjoy it more if you can at least select for it a secluded corner in den or kitchen, or even in the woodshed, cellar, or attic, where your apparatus may be left set up undisturbed and where there will be room to expand as you build or buy new equipment and supplies.

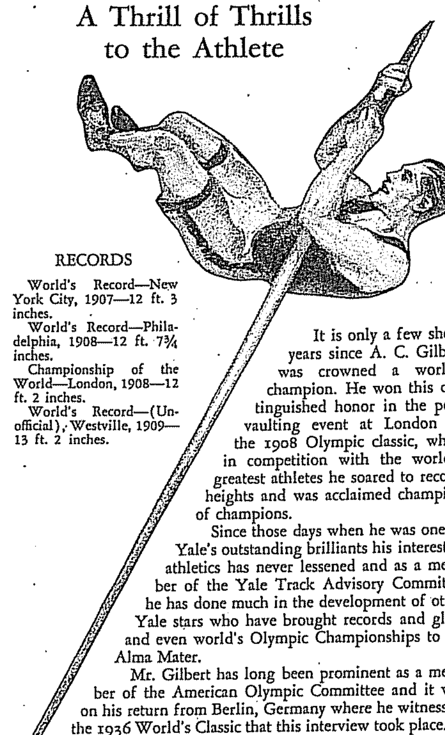
The Equipment and Its Use

Good technique can only be acquired by careful self-training. Learn what use each piece of apparatus is intended for, and the best way to handle or use it. Begin at the start by having a place to keep each and every piece, and keep it clean and in its place. Be extremely careful not to contaminate your chemical supplies by getting even traces of one into the bottle with another. And watch to keep your chemicals replaced as soon as the supply runs low.

While you have not been furnished with dangerous and poisonous chemicals in your Gilbert Chemistry Outfit, nevertheless they are not intended to be taken into the mouth, and you should begin now to train yourself, not only never to taste anything in the laboratory, but to use caution in smelling.

Winning a World's Championship

A Thrill of Thrills to the Athlete



RECORDS

World's Record—New York City, 1907—12 ft. 3 inches.
World's Record—Philadelphia, 1908—12 ft. 7¾ inches.
Championship of the World—London, 1908—12 ft. 2 inches.
World's Record—(Unofficial), Westville, 1909—13 ft. 2 inches.

It is only a few short years since A. C. Gilbert was crowned a world's champion. He won this distinguished honor in the pole vaulting event at London in the 1908 Olympic classic, when in competition with the world's greatest athletes he soared to record heights and was acclaimed champion of champions.

Since those days when he was one of Yale's outstanding brilliants his interest in athletics has never lessened and as a member of the Yale Track Advisory Committee he has done much in the development of other Yale stars who have brought records and glory and even world's Olympic Championships to his Alma Mater.

Mr. Gilbert has long been prominent as a member of the American Olympic Committee and it was on his return from Berlin, Germany where he witnessed the 1936 World's Classic that this interview took place.

"Yes," said the former champion, "It brought it all back to me as though it was yesterday and as I watched those brilliant athletes from all over the world it seemed for a moment that I must be out there with them again, and in competition, and when Earl Meadows of the University of Southern California established a new Olympic pole vault record, I know just the feeling he was experiencing; a feeling that comes to every winner of an Olympic championship, but one which words cannot express. It certainly is a glorious reward for faithful training."

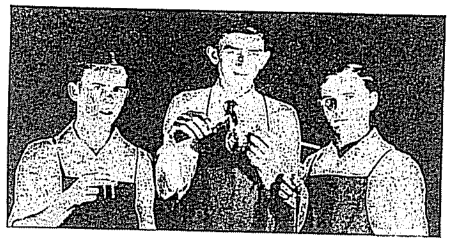
Somehow, boys, I can't help thinking that just before Mr. Gilbert made that great leap into the air and over the bar—the leap that no other athlete could equal—he had something in his heart that inspired him to make the greatest effort of his life. I like to think that as he ran swiftly forward with that long springy pole in his hands, he heard again the last line of that great Yale song "Bright College Years" and he gave a mighty bound off the earth that had every ounce of power he possessed in it—"for God, for Country and for Yale."

Just imagine, boys, Gilbert's feeling after he had won. Over 100,000 people had witnessed his great achievement and in this multitude was the King and Queen of England. "Yes," he said, as he showed me a gold medal made into a watch fob, "Queen Alexandra presented it to me; it's one of my most valued possessions and winning a world's championship is certainly a thrill of thrills to the athlete."

Three Pennsylvania Boys Win Big Gilbert Chemistry Award

Many Other Young Chemists Rewarded for Their Interesting and Practical Experiments

Dean I. Walter and Messrs. Ralph and Roland Diehl, Capture $100.00 Prize in Nationwide Contest



Ralph Diehl — Dean I. Walter — Roland Diehl
The Diehl Boys are Twins

An unusual and somewhat perplexing situation confronted the judges of the 1936 Gilbert Chemistry Contest when prizes were awarded. In fact, it was as interesting as unusual, for in final judgment, it was noted that the big award was in favor of Walter and Diehl Laboratory of Hollidaysburg, Pa. What's going on, "we are giving prizes to boys, not business houses," shouted one of the judges, but it just happens that this business house, while it may not be a corporation at this early date, is conducted by three youngesters who have an eye to the future and are actually operating on a paying basis right now.

Yes sir, the company is $100 richer today than it was before the contest started, and according to young Mr. Walter, who is manager, part of this winning is going right into the business for additional equipment and the rest will be equally divided between the three partners.

This is indeed an unusual circumstance, and decidedly different than any we have had to deal with before, and to have three young boys actually operating their own little plant is ample proof of their determination to succeed.

They have a well equipped laboratory and do electrical and mechanical work, picture developing and chemistry research. They do all their printing with their own press and relief effects obtained through resin, aluminum and organic compound yield the desired result. Etched plates and printing electros are also made as well as lubricants, gun powder, explosives, fire extinguishers, carbon-microphones, wet cell batteries, photoelectric cells, silver and copper plate, rat poison, inks, soaps, and mirrors.

The manufacture of tooth and face powders are special products, and at present they are experimenting on synthetic rubber. The writer visualizes a great future and success for these boys, if they can master this great research problem, for when perfected it will be of tremendous value to the industries.

These are the boys who arranged a scheme for catching a locker thief at their school. A pen bladder of silver nitrate solution was fastened behind the handle, and when the person grasped the handle, the solution ran out on his hand. In a short time his hands were covered with precipitated silver and his guilt was immediately exposed.

Second Successive Win for Canadian Boy

Joe Fairfield of Kenora, Ont., seems to have the knack of winning Gilbert awards, for this is his second in successive years, and it surely is indicative of his ability. His experiment is on the basis of perpetual motion, and while Joe realizes that this is out of the question, his apparatus, nevertheless, operates for long periods and is very interesting.

Joe Fairfield

Two large bottles are used—one with a three-hole stopper is half filled with a solution of water and baking or washing soda; the other with a two-hole stopper is half filled with vinegar. Bottles are then connected with glass tubing bent to desired angles, and into the third hole on bottle containing the soda solution, a medicine dropper filled with vinegar is inserted. When bulb is pressed, vinegar drops into soda solution, a boiling action takes place and gas is formed, which passes through tubing into vinegar bottle. Pressure immediately forces more vinegar back into first bottle and motion continues until vinegar is all used. Color effects are obtained by dissolving the coloring from litmus paper into the soda solution for a beautiful red—when liquid starts to boil it changes to blue.

Ohio Boy Has Novel Weather Forecaster

Ralph Koehn of Akron, Ohio, and a student in the Garfield High School has created a weather indicator which is extremely novel and interesting.

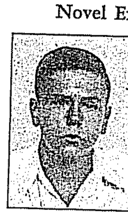
Ralph Koehn

Apparatus—A glass beaker, burner, hydrochloric acid and copper strips.

Procedure—Dissolve the copper strips as much as possible in the acid. Drive off some of the water by heating. The crystals left, which are green, prove a reliable weather forecaster.

Conclusion—When solution is liquid—expect rain. Some crystal—fair weather. All or mostly crystals—good weather.

Novel Experiment on Testing for Water



Herbert Harrell

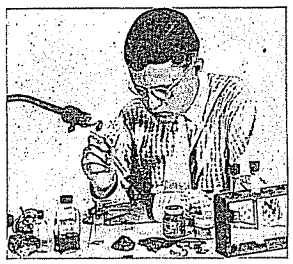
Herbert Hillary Harrell, 14 years of age, attends the Blair Junior High School of Norfolk, Va., and is deeply interested in chemical research.

He submitted a very neatly arranged portfolio containing chemistry experiments and his novel test for water netted him a $10 prize. Herbert's solution, which is extremely quick in action, is obtained by dissolving three measures of sodium ferrocyanide in two test tubes full of hydrochloric acid and shaking vigorously before using. The advantage of this chemical is its strong attraction for water and it turns blue in the presence of water. It is a very interesting experiment and not without value.

Ultra Violet Light Produces Fluorescence

Marshall Alpert of New Haven, Conn. is deeply interested in Chemistry and for a boy his age is well versed on the subject. Marshall, who is 14 years of age, and a junior at Hillhouse High School, recently gave a very interesting presentation at the factory with his Argon Glow Lamp and cleverly demonstrated fluorescence in minerals.

Moreover Marshall proved that fluorescence, which is that property that some bodies have of emitting light while exposed to the action of certain rays, is not confined to minerals alone for he divides fluorescent materials into four groups as follows: (1) chemical compounds and solutions or mixtures, (2) minerals, (3) medicines found about the home, and (4) miscellaneous objects.



Marshall Alpert

He showed how numerous materials react to the ultra-violet rays and demonstrated color changes under the incandescent light and the Argon Glow Lamp.

There are many miscellaneous things which showed fluorescence under the lamp. The numerals and hands of a "radiolite" wrist watch were especially interesting because the "radiolite" coated portions not only glowed a very bright green under the ultra-violet lamp, but continued to glow very brightly for several minutes after the lamp was turned off.

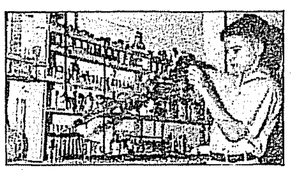
Then again a solution which had been prepared by allowing a parsnip root, cut into sections, to rot in water, though somewhat colorless and slightly murky in ordinary light, turned light blue under the ultra-violet rays.

"Three-in-One" lubricating oil fluoresced bright blue, while some transparent yellow glass "agates" became a very bright green under the lamp.

One of the most interesting of minerals was a specimen of zinc ore that had franklinite scattered through a non-fluorescent matrix. Under the lamp, the spots of franklinite glowed a bright green while the matrix was a dark purple, because of its reflecting some of the visible light of the glow lamp. The result reminded one of fireflies at night.

The demonstration proved that the property of fluorescence is a helpful aid in the analysis of different substances and that the ultra-violet ray is of value in chemical experimentation.

Oklahoma Boy Does Things with Blueing



Robert Rorschach

Bob Rorschach of Tulsa, Oklahoma, diluted one teaspoonful of Mrs. Stewart's concentrated liquid blueing; about 5 to 1, and added sodium hydroxide, stirring the mixture until the blue color disappeared and a brown precipitate formed. Precipitate was next filtered into a test tube, washed several times with hot water and allowed to go into the filtrate. He then poured hydrochloric acid over the precipitate and let it filter into the filtrate. As the first drop of acid touched the filtrate, a blue tinge came into the liquid, and as more acid was used, layers of white and blue were formed.

Hughes Powell

Texas Boy Wins

Hughes Powell, a student in the Texas Senior High School of Texarkana, Texas, presented numerous chemistry experiments all of which were very interesting, and his experiment—Creation of Artificial Life—was of exceptional merit.

Hughes is president of the local chapter of the Texas Junior Academy of Science.

Another Texas Winner

Fleming Giddings

Fleming Giddings of Waco, Texas, submitted a very interesting experiment on The Synthesis of Water, by Weight. This netted Fleming one of the $10.00 prizes.

Other $10.00 Prize Winners

NELSON DERSTINE....Hatfield, Pa.
HAROLD KULP....Hatfield, Pa.
H. DeCHAMBURE....Paris, France
LUCIEN F. KULSKI....Denville, N. J.
MISS JUNE BOWERS....Pittsburgh, Pa.

"Do You Know?" Answers

QUESTION—How to test a raisin for iron

ANSWER—Select a raisin and wash it with water. Then incinerate the raisin in a porcelain crucible by heating the crucible over your alcohol lamp until the raisin is reduced to an ash. This ash contains only inorganic matter. Digest the ash in diluted boiling hydrochloric acid solution and filter. The insoluble residue will be silica. The iron content of the ash will be dissolved, forming iron chloride. Apply the characteristic test for iron by adding some of the iron solution to the reagent sodium thiocyanate. If iron is present red iron thiocyanate will be formed. Also add some of the iron solution to a mixture of potassium ferro—and potassium ferricyanide solutions. A blue color will be formed if iron is present.

QUESTION—What chemical makes wood fireproof?

ANSWER—Wood is sometimes treated with a strong ammonium chloride solution. Another way to fireproof wood is to paint it with water glass solution.

Holding a match by the head, dip the other end in a sodium silicate solution (water glass). Allow the coating to dry for twenty minutes, then light the match. The flames will go out just as soon as it reaches the portion that has been dipped in the water glass solution.

QUESTION—How to test yourself for "acid mouth"

ANSWER—Moisten a small piece of blue litmus paper with the tongue and see if the litmus paper turns red. If it does the mouth is acid. Acid mouth is usually caused by an upset stomach or by decayed teeth. Normally the mouth should be neutral or only slightly alkaline.

QUESTION—What is "chemiluminiscence"?

ANSWER—One of the most beautiful and striking demonstrations for laboratory or lecture work is that of chemiluminscence or 'cold light." Certain chemical reactions, usually ones involving the oxidation of an organic compound, result in the development of light without other visible reaction. Even heat, which is usually associated with light of any kind, is noticeably absent.

This phenomenon of *chemiluminescence* has long been known, but has not previously been employed extensively because of difficulties encountered in the available reactions. These were complex and dangerous, produced only a limited luminescence, or required reagents not readily obtainable. But now three-aminophthalhydrazide has been made available which overcomes all of these objections. The reaction is simple, safe, and develops light of intense brilliancy.

The name "luminol" has recently been applied to this compound in place of its chemical name for convenience, to associate with it the property of luminescence.

The demonstration requires only the oxidation of luminol in dilute alkaline solution with three per cent alkaline hydrogen peroxide and a second oxidizing agent. All four compounds are necessary in the solution to obtain the strongest radiation. Almost innumerable variations can be used in the actual procedure, from the mere mixing of the required chemicals to very elaborate displays. A few of the simpler methods are given to serve as guides.

For small audiences or laboratory demonstration, the flask method is the most satisfactory. In a two-liter long-necked flask, a small quantity of luminol on the point of a knife blade is dissolved in a test tube full of five per cent sodium hydroxide and diluted to two quarts with water. In a similar flask, two knife blade portions of potassium ferricyanide is dissolved in water, a test tube full of three per cent hydrogen peroxide added and diluted to two quarts with water. When both solutions are ready and the room is darkened, one flask is grasped in each hand and the contents of them poured simultaneously through a funnel into a six-liter flask. The reaction starts as soon as the liquids mix in the funnel. After the initial development of the light has begun, the flask is swirled and a small quantity of solid potassium ferricyanide added. The brilliance is increased and can be still further intensified by the gradual addition of five per cent sodium hydroxide. At the concentrations given, the original light intensity is small, but the increased brilliance obtained by the addition of further reagents is very beautiful.

For demonstration to larger audiences, it is more convenient to use a large jar containing about 14 quarts of water. In a small flask is dissolved one spoon measure of luminol in five test tubes full of five per cent sodium hydroxide, and in a second flask, 25 spoon measures of potassium ferricyanide in five test tubes full of three per cent hydrogen peroxide. To indicate more clearly the lack of heat in the reaction, the solution may be poured simultaneously over a cake of ice which has been floated in the water. The solutions should be allowed to mix in concentrated form on the ice before being diluted with the surrounding water. After the reaction mixture has diffused throughout the water, the solution is stirred vigorously with a glass rod and further potassium ferricyanide or alkali or both added as desired.

A very beautiful display may be prepared by means of two fine sprays, which are made to interact some distance above the lecture table. Each spray of humidifier is connected to a compressed air source and to one of the stock solutions previously mentioned. Care should be taken that the spray guns are operating at the same rate. By variation of the stock solutions, the resulting mist can be changed from a hardly visible cloud to a brilliant fountain resembling a display of fireworks.

QUESTION—How to tell wool from cotton

ANSWER—A fiber of wool, when burned, is consumed slowly, a ball-like end being formed. The odor is characteristic of burning animal matter.

Burn a fiber of cotton and note that it burns quickly without giving any animal-like odor. The odor resembles that of burning paper.

Inventor of Erector tells how to become member of Gilbert Engineering Institute

The highest award an American soldier can receive is a Congressional Medal of Honor. The highest award a civilian can receive for saving another's life is a Carnegie Medal.

Likewise, the highest honor a boy engineer can win is membership in the Gilbert Engineering Institute for Boys. Founded by Mr. A. C. Gilbert, the inventor of Erector, the Institute is maintained for the purpose of encouraging and recognizing original achievements in Erector engineering. Upon election to the Institute, each new member is awarded a handsome "Diploma of Merit" bearing his name.

What To Do To Join

If you have an Erector Set, or if you are getting one for Christmas, you doubtless will want to join this illustrious group of boy engineers. Naturally, the first question is what to do to become eligible. There's no better man to tell you than Mr. Gilbert himself. Here's his advice:

"The important thing to bear in mind is that membership is strictly on a *merit* basis. The only "pull" that is recognized is your own pull of ambition. Now let's see just what that means.

"When you first start building Erector models, the chances are you build those illustrated in the instruction manual. The walking beam engine, drawbridges, dump truck, airplane beacon, etc.

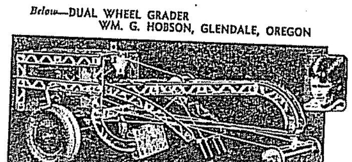
"Later, when you have gained experience with Erector engineering, you will begin to think of new and original models of your own—a piece of machinery, mechanical device, engineering project, etc. Perhaps you will get your ideas from an illustration you've seen in a book or magazine, from a trip you've taken or a visit to some factory.

"Whatever your new model is, when you've finished it, just make a sketch or photograph and mail it to me. If it is approved by the Institute's Board of Directors you will then be elected to membership and receive your Diploma of Merit inscribed with your name.

"In addition, if your original model has exceptional merit, you will be given a cash award of from $5.00 to $10.00."

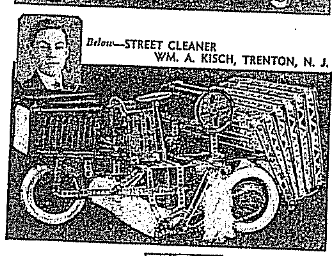
Does all this sound hard? Certainly not to red-blooded boys. Building original models is the most interesting and thrilling thing you can do in Erector Engineering. Why not decide right now that you are going to win an Institute Diploma during the coming year?

Below—DUAL WHEEL GRADER
WM. G. HOBSON, GLENDALE, OREGON

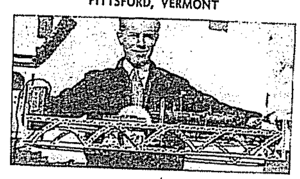


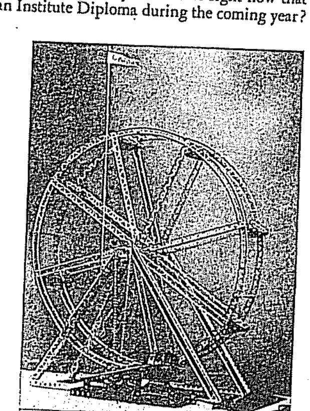
A FEW PRIZE WINNING MODELS BY GILBERT BOY ENGINEERS

Below—STREET CLEANER
WM. A. KISCH, TRENTON, N. J.



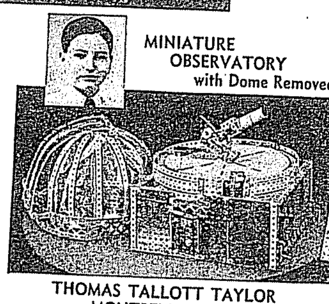
Below—SAW MILL
JAMES C. SMITH
PITTSFORD, VERMONT





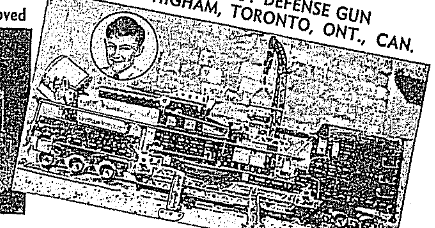
above—FERRIS WHEEL
TOM VONDER HAAR
GREENVILLE, OHIO

MINIATURE OBSERVATORY with Dome Removed



THOMAS TALLOTT TAYLOR
MONTPELIER, IND.

MOBILE SIEGE and COAST DEFENSE GUN
JACK HIGHAM, TORONTO, ONT., CAN.



With the Mounted Police in Canada

A Story of George Thompson's Adventure with a Half Breed

George Thompson was a big, powerful, rugged chap—as honest as the day is long, absolutely fearless and always keen for adventure. His wonderful physique and sterling character qualified him for membership in one of the world's greatest military organizations—the Canadian Mounted Police.

The work required was to patrol the wilds of Western Canada, keep order in the little towns where there was no established government and to see that goods were not smuggled in or out of the trading posts or that no whiskey or any kind of liquor was smuggled in to the Indians.

Northern Canada at this time was a vast, unsettled country with a trading post only here and there, where the Hudson Bay Company bought furs from the Indian trappers in exchange for food, tobacco, blankets, etc. The Police Patrol went as far north as Herschel's Island, twenty miles inside of the Arctic Ocean near the mouth of the Mackenzie River. If you look this up on your map you'll see what long, lonely trips these fellows had to take and when an order was given, a man could not report until his mission was accomplished, even if it took his life.

They trained for a year at Regina before going out into the country on active service and George Thompson said that the training was pretty stiff. He was thrown from a horse in the riding ring and when he woke up he was in the hospital with two ribs broken but not another thing could he do after his discharge from the hospital until he had ridden this same vicious horse and mastered him. That is the way they hardened these men so that no danger could be great enough to bring a thought of fear to their minds.

The winters were long and severe and when an order was given in the winter to patrol so many miles due north, etc., they had to take a dog team of usually five dogs to carry their blankets and provisions. This sounds like a picnic, just riding about with five dogs dashing through the unbroken snow banks but all the riding a man can do is to step on the team to steady it going down hill or over a particularly bumpy piece of ground, for he may travel hundreds of miles without passing a trading post or village and unless he has enough provisions for himself and his dogs, it means death. The dogs eat dried fish and one dog eats a pound of fish each day, so you see in two weeks a team of five dogs will eat 70 pounds of fish alone.

It was necessary to either travel a limited distance between two trading posts or else have stores of food "cached" along their route of travel. This was done during the summer months when traveling was easier. If you are a Boy Scout you know what a cache is but I'd better explain in case some of you don't know. Usually a tree or two trees not far apart are stripped of their bark about six or seven feet, then two more posts are put into the ground and a rough platform is built on top for the food. Flour, sugar, bacon and sometimes "pemmeican" (dried moose meat mixed with bear's grease and occasionally raisins) are left covered over with rubber blankets and the bark and boughs of the trees. By smoothing the bark off, the wild animals that prowl around that region cannot get any purchase for their claws so they cannot climb up and get the food.

It is a law of the forest that no person disturb another man's cache and the full blooded Indian is almost invariably trustworthy and honest. Thompson said that the Indians there were very friendly and rarely ever quarreled with, or stole from the whites. It is the half breeds that make all of the trouble and one of Thompson's most thrilling experiences came through a half breed named "Sechamish," which in our language means "Mosquito."

Sechamish lived not far from Fort McMurray, where Thompson was stationed and one night he broke into the Hudson Bay Store and stole some tobacco or "estomoc," and a rifle.

A member of the Mounted Police was assigned to track down the thief. It didn't take him long to find the guilty person but when he reached Sechamish's cabin, a loaded rifle was pointed straight at him and the half breed told him that if he tried to make the arrest he would be shot. Canadian Mounted Police don't stop at threats so Thompson's friend advanced and sure enough got a bullet right through his heart. When he didn't return another man was sent out to find him and soon he returned to headquarters with the body.

In the meantime, knowing that he would be punished if he remained in that section of the country, Sechamish got together four of his Indian friends and started to escape.

Indians are all naturally a lazy lot. They work only to provide themselves with necessities and as a good dog team is worth at least $125, there wasn't one of the five that owned one. So they hastily gathered their few belongings, putting them along with as many provisions as they could carry, into packs which they strapped on their backs. Then with their rifles they started off on snow shoes. You can travel very fast in this manner if you know how to manage them, but even though they lost no time, they soon realized that the police were not far behind.

Thompson and five others had been ordered out to get Sechamish "dead or alive" and they weren't losing any time either. They were following the trail very closely but the Indians had gotten a fairly good start and were still a few miles ahead.

If it had been summer time they could have hidden the trail, but with snow everywhere the only method left was to baffle the police by taking different directions. Five miles ahead there was a small clearing. If they could reach this spot they had devised a clever and elaborate system of ambush and defence.

Each took a different and circuitous route all leading to the clearing but so complex that when the police arrived at the spot where they parted, a couple of hours were wasted in getting them located.

The Indians knew that the police would surround the clearing and rush them so they made a number of peekholes of about one hundred yards in length through the heavy undergrowth of the for-

Continued on next page

With the Mounted Police in Canada

est surrounding the clearing, each going in a different direction and where the police would naturally close in on them. But, mind you, they cut the branches low enough down so they didn't come on a level with the eye but just about up to a man's chest. They could stoop down and see the police coming but the police couldn't see them.

The Indians were fairly well established when Thompson and his men reached the spot. Just as they had surmised, the police began to surround the clearing preparatory to making a charge.

While they were holding a hurried consultation over just what move each man was to make, a shot whizzed by Thompson so close it cut his coat and the man standing next to him dropped dead. Another and another in quick succession, and by the time the police had thrown themselves on the ground for protection, four of those five six-footers had been picked off and "gone west," as the boys say.

A man thinks fast when his wit stands between him and death. Thompson and his remaining companion, lying flat in the snow couldn't waste time day-dreaming. Each crawled slowly forward until they had reached a tree trunk large enough to shield them. In getting on their feet again, Thompson lost his balance and this act threw him to one side just enough to put his head on a level with the opening the Indians had made in the foliage. Bang! He had ducked just in time but in spite of nearly losing his life he was happy, for he had now reached a position from which he could give the Indians a dose of their own medicine.

It was then a five to two fight with the odds against the white men. They took off their caps and stuck them on the tree trunks so that they would show just enough to let the Indians think them still there. Then they crawled several feet away. With extreme care they rose, aimed—fired. These men were dead shots and before the Indians had time to get under cover, three had fallen and the fight was even.

It was now a fight from tree to tree. Thompson made a lucky shot and picked off the fourth Indian leaving Sechamish whom they wished to capture, alive if possible.

Thompson's companion was gradually working around behind Sechamish and at just the right moment when Sechamish's rifle was raised to fire, he clipped the Indian in the right arm. Even though he was suffering great pain and practically out of the fight, Sechamish would not surrender. He dropped behind a rock which he had been using as a barricade just as the police rushed in on him he turned his gun on himself and fired his last shot.

It was a sad journey back to Fort McMurray but even though it had cost the lives of five brave men, the mission had to be performed.

20th Century Marvels of Transportation

Continued from page 8.

save weight, holes were punched into the metal ribs and braces of the furniture, but there was no sacrifice of strength or suitability of appearance in the pieces. An all-metal piano has been made to fit approximately into the scheme of things.

All cabins are located in the inner portion of the quarters, that is, with no outside exposure, so that they must be artificially lighted. Cabin furnishings include an upper and lower berth, a wash stand with mirror and hot and cold running water, writing ledge, chair and clothes closet. Wash basins located in the cabins and wash rooms are ingeniously designed, being of the disappearing type that may be folded back flush with the wall when not in use. Each stateroom has two berths, but the upper berth is of the disappearing type for single occupancy or for extra roominess by day.

An innovation on commercial airships is the smoking room. This room is located on the lower deck, entrance to it being gained through a swinging door so designed that it forms an airlock, thus reducing to a minimum any fire hazard. The smoking room is attractively decorated and furnished with upholstered seats and chairs and with tables for serving refreshments from the adjoining bar. Windows along one side of the smoking room provide light and a chance to view the scenery below.

The kitchen is likewise located on the lower deck of the quarters, all cooking and refrigeration being electrical. The electric stove has four hot plates in addition to two baking ovens and one warming oven. The dining room is the largest room in the quarters and adjoining this is a steward's pantry, located over the kitchen and connected with it by an electrically operated dumb-waiter, by means of which food is sent from the kitchen to the steward's pantry and from there served in the dining room.

In addition to ample toilet facilities, a bath room with shower is provided in the quarters.

Soil Replaced by Chemically Treated Water in Scientist's Vegetable Garden

Chemistry is continually moving forward with new discoveries being made every day. Just think, today scientists are actually growing vegetables and flowers in chemically treated water and without the aid of soil, and the results obtained are said to be far superior to vegetables grown in soil.

Dr. W. F. Gericke of the University of California claims you don't need to have a farm in order to be a farmer. Under his method all you need is a tank of of water, chemicals, rabbit wire, excelsior and your seeds, and with this equipment he has been accomplishing wonders for the past seven years, growing fruits, vegetables and flowers in his own greenhouse. These tanks are 10 feet long, 2½ feet wide and 8 inches deep covered by ordinary "rabbit wire" and a layer of excelsior or coarse sawdust. He places his seeds on this layer of excelsior and covers them with another layer and leaves them to grow. This covering of excelsior serves a double purpose in that it helps to keep the temperature of the water at 70 to 85 degrees Fahrenheit and also acts as a support for the growing plants. Gradually the seeds begin to sprout, sending the roots down into the water where they absorb both moisture and nourishment.

Dr. Gericke does not tell us exactly what chemicals are placed in the water but he states they are exactly the elements which plants obtain from soil and he has demonstrated that his harvest of tomatoes, for instance, far surpasses that of the ordinary farmer in both quantity and quality. The doctor has been able to obtain tomatoes from his plants for eight or nine months of the year and in comparing his tanks with an acre of soil he obtains two to three hundred tons per acre whereas the farmer obtains only five tons. The doctor experimented on potatoes also and his crop was twenty times the normal rate per acre. His tobacco also grew many times beyond the normal height of the plant and was found to be of superior quality.

Of course, Dr. Gericke's experiments are not limited to tomatoes and potatoes, but also include beets, carrots, lettuce, beans and even certain types of flowers. In practically every instance the plants grow far beyond their normal size and the harvest is many times the normal rate.

Tests are now being made in greenhouses in Capitola and Montebello, Calif., to ascertain just how successful this process is and further tests in different sections throughout the country will be made to determine what methods must be used on different crops and under different climatic conditions. Dr. Gericke hopes to be able to write directions that will be available for all people to use and if he is successful the value of such a method is unlimited, especially in overcrowded countries like Italy and Japan where the climate is mild. A food shortage would then be unheard of.

Roads of Salt

Several experimental highways in the surfacing of which common rock salt was used have been constructed in the United States. The roadways are made of clay and gravel treated with a compound made of ordinary rock salt, and they are built to withstand devastating floods in areas where these occur. About 100 miles of these salt highways have been laid down in various parts of the country, and after several months' use carrying heavy traffic they have proved entirely satisfactory. The rock salt not only compacts the clay but also crystallizes in the road surface and retards evaporation of moisture, thereby keeping the surface moist and firm and providing practically a non-skid road.