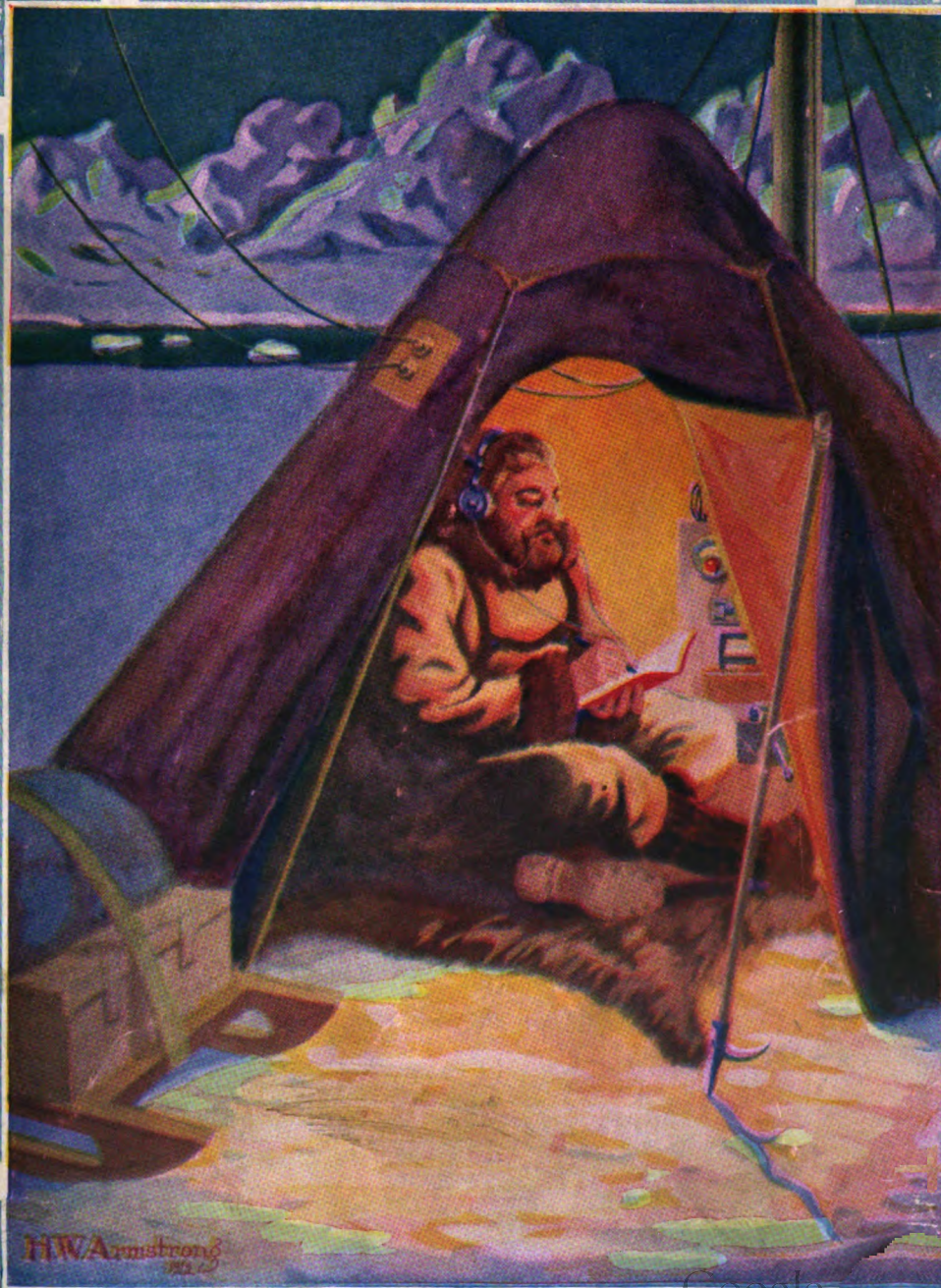


POPULAR ELECTRICITY AND THE WORLD'S ADVANCE

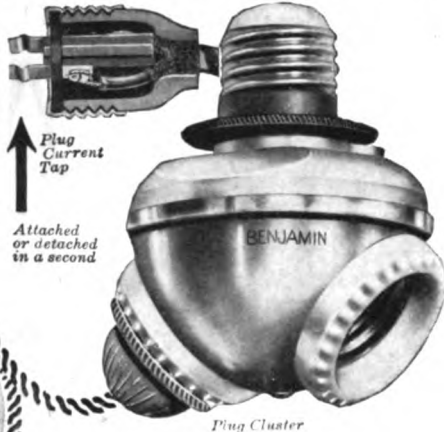
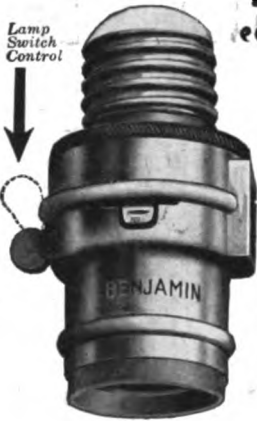
June 1914
W #2

- Admiral Peary on Arctic Wireless
- Kinglingville
- Motion Pictures
- Battleship Under Fire
- Timing the Tides
- Films of Alaska
- Electrical Workers' Department
- Gallery of Pictures

75 Subjects and 100 Illustrations In This Issue.



BENJAMIN "TROUBLE SAVERS"



Attached or detached in a second

Plug Cluster

Attachment Plug



Mrs. Goodhousekeeper says:

"I never really appreciated my electrical household devices until I became acquainted with the Benjamin Trouble Savers. They practically double their worth to me. For instance, in my sewing room there is only one socket. I could never sew there in the evening unless I pedalled my machine, as I had to use the socket for light. A Benjamin Plug Current Tap gave me both light and power from the same fixture. One of its beauties is that during the day, when no light is needed, a lever switch allows it to be turned off."



Equally enthusiastic testimonials are forthcoming on our Plug Cluster, and Attachment Plug. They are splendid conveniences anywhere in the home or office; for the percolator in the dining room, the curler in the dressing room, the washing machine in the laundry, the fan in any room.



Learn how to double the capacity of your sockets by asking your dealer, or—drop us a postal for our new Home and Office Bulletin



Benjamin "Trouble Savers"

Benjamin Electric Manufacturing Co.
128 So. Sangamon Street Chicago, Ill.
New York San Francisco
Toronto, Can. London, Eng.



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

POPULAR ELECTRICITY*and the***WORLD'S ADVANCE**350 NORTH
CLARK
STREETHENRY WALTER YOUNG, *Editor*CHICAGO
ILLINOIS
U. S. A.

Vol. VII

JUNE, 1914

No. 2

ISSUED MONTHLY BY POPULAR ELECTRICITY PUBLISHING CO., 350 N. Clark St., Chicago, Ill.
YEARLY SUBSCRIPTION, \$1.50; CANADIAN, \$1.85; FOREIGN, \$2.25; SINGLE COPY, 15 CENTS

No additional copies will be sent after expiration of subscription except upon renewal.

Entered as Second Class Matter April 14, 1908, at the Post Office at Chicago, Under Act of March 3, 1879.

Copyright, 1914, by Popular Electricity Publishing Co.

Table of Contents

Your Ice and Where It Comes From.....	129	Toledo's Triple Sign.....	194
A Convincing Comparison.....	131	The "Timber Cruiser".....	194
Rear Admiral Peary on Wireless in the Arctic	132	Aeroplane Altitude Records.....	195
Electric Wall Cabinet.....	135	The Lincoln Highway.....	195
Electricity a Nerve Saver.....	136	Perfumed Air to Suggest Seasons.....	196
One Horsepower from a Glass of Water.....	137	Nursery Milk Warmer.....	196
Work Started on New Welland Canal.....	138	Making the Mohawk Navigable.....	197
Measuring the Glare from Paper.....	138	Telephoning to Europe.....	198
The Shrewd Butcher.....	139	The Brude Lifeboat.....	201
Auto Signal Light.....	139	Nitrogen-filled Lamps to Light the Exposi- tion	201
A New Mobile Battery.....	139	Electric Street Car Line for Jerusalem.....	203
The Sevres Blue.....	140	Getting Advance Information on the Tides..	205
Safety First Instruction Car.....	140	Low Electricity Rates in New York Towns..	205
All Around Battery Truck.....	141	Chauffeur's Hindsight Goggles.....	206
Contractor Does Mill Work on the Job.....	141	Automobile Fender Trunk.....	206
America's First Chinese Cannery.....	142	Practical Body for Salesman's Car.....	206
Blasting by Electricity in Coal Mines.....	144	Gasoline Electric Vaporizer.....	207
Radium and Its Power to Cure.....	161	Tail Light Detector.....	207
Multiple Photographs.....	166	Snap a Switch.....	207
The Ancient Art of Alchemy.....	167	In the Service of War.....	208
The Historic Subsoil of Paris.....	167	How a Famous Quack Divulged a Great Secret	209
A Failure.....	167	Scooping Fender.....	212
Portable City of Ringlingville.....	168	New Kind of "Telephone Plant".....	213
Wiring the Old Homestead.....	170	Fulfilling a Sculptor's Dream.....	214
What Happens to a Battleship Under Fire..	172	Bunker Hill Monument Compared to Keokuk Dam	216
The Symmetroscope.....	174	A Veritable Floating Island.....	216
The Electric High School.....	174	Shooting by Spotlight.....	217
Curious Process of Making Steel Rods.....	176	Cure of Lead Poisoning by Electricity.....	217
The Carat.....	176	No Landmarks in Space.....	217
Eels and Electric Lights.....	176	Dumping a 50 Ton Ore Car.....	218
An Array of Camera Men.....	177	Cleaning Up the Liners.....	219
Public School at Hollywood Studios.....	177	Mining Dollar-Fifty Ore.....	220
Moving Pictures Made at Night.....	178	Where Insanity is Treated as Sickness.....	222
Creating Good Will with Motion Pictures..	179	The Ideal Artesian Basin.....	223
The Battle of the Phagocytes.....	180	Electrical Men of the Times—Hon. Allan B. Walsh	224
How the Motion Picture Originated.....	181	Ideal Baker's Oven.....	226
Delayed Only Forty-eight Hours.....	182	The Diaphragm Telegraph Scunder.....	226
Courted Death for Film.....	183	The National Conduit Wiring Machine.....	226
A Paragraph on Film Footage.....	183	A New Tire Pump.....	227
Fascinating Alaska Shown in Films.....	184	A Cord Switch.....	227
Motion Pictures in Japan.....	189	Electric Coin Handling Machine.....	227
What Happens to the Scenario.....	190	Hotel Door Bolt Switch.....	228
Ironing Motion Picture Film.....	192		
Electra Ferla—Marvel of Science.....	193		
Sources of Lithium.....	193		

Continued on Page 12

Table of Contents

Continued from Page 11

Adjustable Fixtures for Factory Machine.... 228
 New Time Switch..... 228
 Heating Pad in Aluminum Case..... 229
 The Wallace Electric Lamp..... 229
 Adjustable Light Holder..... 229

Adjustable Drawing Board with Movable Light 239
 Float Stops Pumping Engine..... 239
 Electricity in Twentieth Century Office..... 240
 Short Circuit Test for an 8,000 Volt Generator 243
 Combination Tool for Electricians..... 244
 Cutting Induction Coil Core Wire..... 244
 Telephone Installer's Lamp..... 244
 Running Bride Wires on Buildings..... 245
 Small Electric Steam Boiler..... 245

For Practical Electrical Workers

Soldering Iron with Special Features 230
 Bismuth Coil Regulator..... 230
 To Prevent Tape Tearing..... 231
 Helping an Electric Fan Sale..... 231
 Adjustable Support for Desk Telephone..... 231
 Dripless Candle..... 231
 Making a Water Level Alarm..... 232
 Commutator Slotter..... 232
 Construction of a 1/8 H.P. Dynamo or Motor. 233
 Heating a Metallic Stream..... 237
 Anchoring Telephone Drop Wires..... 237
 Telephone Line Between Neighbors..... 238

Popular Electricity Wireless Club

Incoming Waves Signal Wireless Operator... 246
 An Automatic Wireless Tuner..... 246
 New Telegraph Relay..... 248
 Memorial to Heroic Operators..... 248
 Construction of a Lightning Switch..... 249
 Variation of Radio Station Range..... 251
 New Books..... 252
 Patents and Old Fashioned Bible Honesty... 254

RENEWALS When your subscription expires, you will find a renewal blank enclosed here. You should fill out and return with remittance at once to avoid missing a number. Positively no copies will be mailed on any subscription after same expires unless renewed, and we cannot agree to begin subscriptions with back numbers. The date on wrapper of your magazine shows issue with which your subscription ends. The extension on this date to period covered by renewal is sufficient receipt. If any other is desired it should be requested at time of renewal.

CHANGE OF ADDRESS Notify us promptly of any change in your address, giving both the old and new location. Since our mailing list for each issue closes the 5th of the preceding month (i. e., list for March closes February 5th), changes received after the 5th must necessarily take effect with issue for second month following. Postmaster as well as Publisher should always be notified of changes in order to forward mail sent to old address.

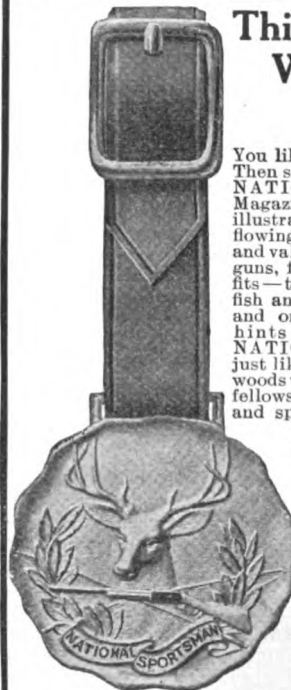
THE OLDEST PHOTOGRAPHIC
MAGAZINE IN AMERICA

WILSON'S PHOTOGRAPHIC MAGAZINE

is published for all interested in photography, and the subscription price is within reach of all. Whether you practice photography as a business, or follow it for pleasure, you will find a subscription to this Magazine a profitable investment. It will keep you informed upon all that interests the world's photographers; it will give you the most recent methods of work and new processes; and by its illustrations you may become acquainted with the best work of the best photographers in all departments of photographic activity.

Three Dollars a year in advance. \$1.50 for six months. Sample Copy, Ten Cents.

EDWARD L. WILSON CO., Inc.
122 East 25th Street, New York City



This Handsome Watch Fob FREE

You like to HUNT and FISH. Then surely you will enjoy the NATIONAL SPORTSMAN Magazine, with its 160 richly illustrated pages, full to overflowing with interesting stories and valuable information about guns, fishing tackle, camp-outs—the best places to go for fish and game, and a thousand and one valuable "How to" hints for Sportsmen. The NATIONAL SPORTSMAN is just like a big camp-fire in the woods where thousands of good fellows gather once a month and spin stirring yarns about their experiences with rod, dog, rifle and gun.

Special Offer

Mail us 25c in stamps or coin for a 3 months' trial subscription to the NATIONAL SPORTSMAN and we will send you absolutely

Free of Charge

One of these Handsome Ormula Gold Watch Fobs with russet leather strap.

Don't Delay—Send your order Today

NATIONAL SPORTSMAN, 34 Federal St., Boston, Mass.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

POPULAR ELECTRICITY

AND THE

WORLD'S ADVANCE

VOL. VII

JUNE, 1914

No. 2

Your Ice and Where It Comes From

By J. M. C. HAMPSON

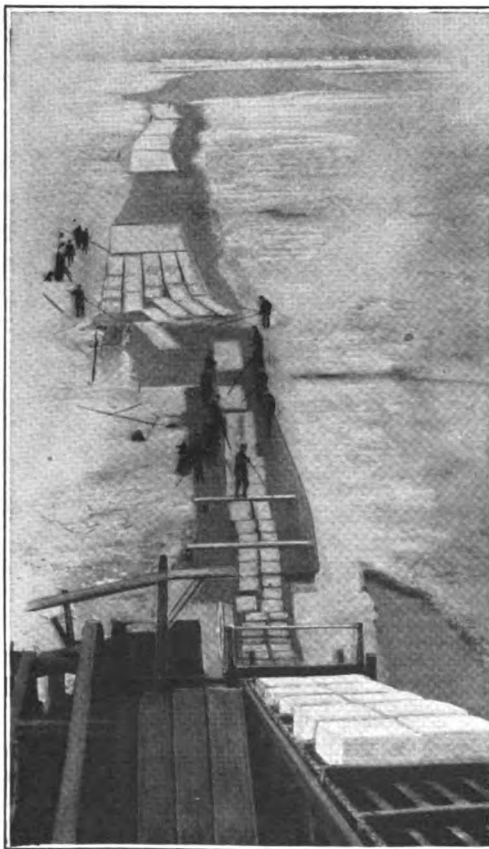
Brown's lake near Burlington, Wis., is a pretty little stretch of water about a mile and a quarter long and about a mile across, with many picturesque bays and inlets. In these summer months it is a much sought resort on account of the unspoiled rural character of its surroundings. In winter it is another story. Then is the seed sown for the iceman's harvest, and in the last weeks of January and all of February the bountiful crop of crystal ice is garnered.

It is an interesting process, this ice cutting and ice storing. One of the largest ice companies in the world has ice houses at the lake and this is what they do.

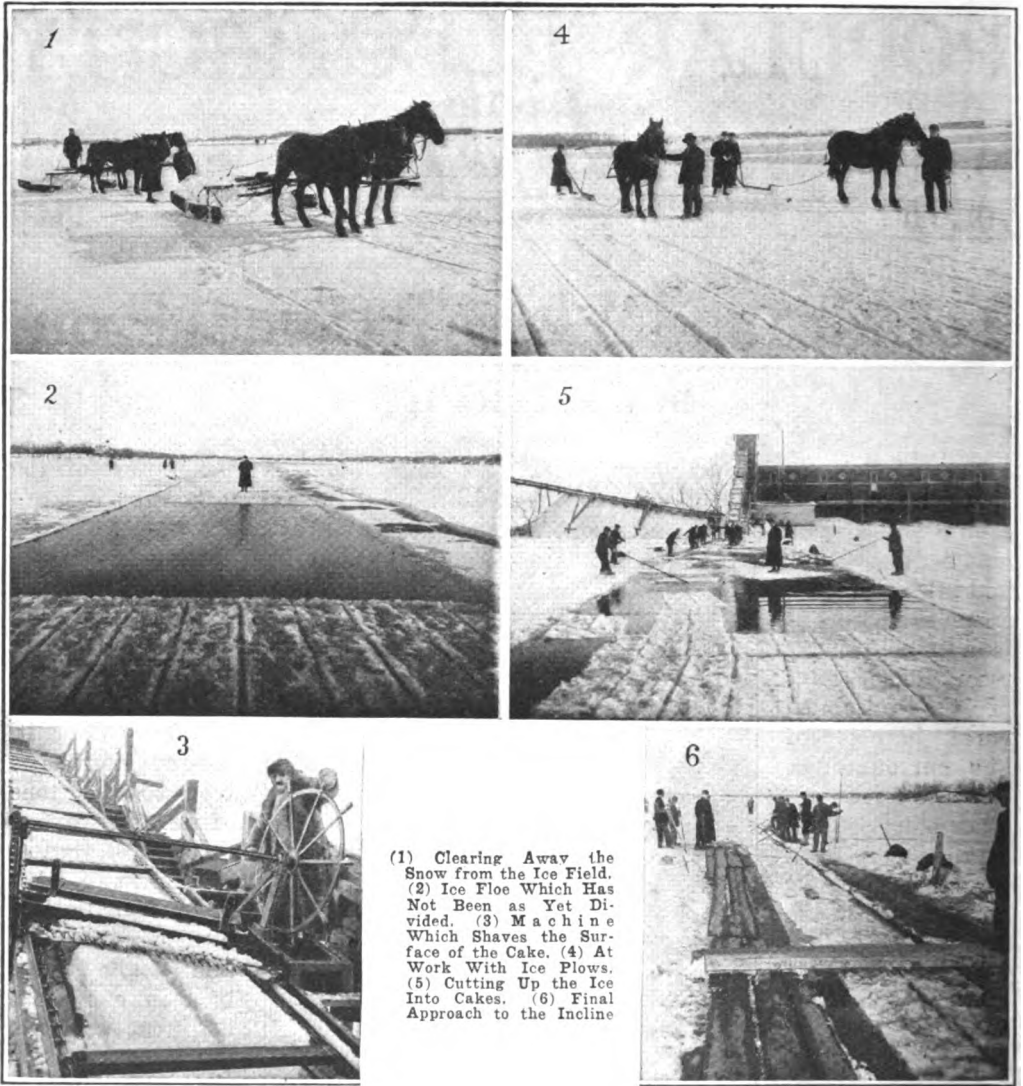
During the six or eight weeks of harvesting, the store of ice in one

ice house alone is 30,000 tons of the clearest and purest ice known: it is all derived from excellent spring water. They also ship from fifteen to 20 car-

loads daily to their storage houses in Chicago—they can ship as high as 60 cars in the 24 hours and have done it. A car contains from 20 to 30 tons of ice. In reaping the harvest, that is, cutting the ice, from 250 to 350 men are employed and while these men in one sense don't cut much ice, for they are for the most part a motley crew of peripatetic hoboos, in another sense they do, as the fact that the conveyor at one ice house last season took up 31,000 cakes of ice in an eleven hour day—that was on February 26 of this year — most convincingly proves.



A General View of Ice Harvesting Operations



(1) Clearing Away the Snow from the Ice Field. (2) Ice Floe Which Has Not Been as Yet Divided. (3) Machine Which Shaves the Surface of the Cake. (4) At Work With Ice Plows. (5) Cutting Up the Ice Into Cakes. (6) Final Approach to the Incline

The average cake of ice is 22 inches square and has a depth of from twelve to 20 inches. In the season of 1913 the depth or thickness was nineteen inches. This season it averaged $12\frac{1}{2}$ inches. And just think of it, in Chicago's heated period one of these cakes sells for perhaps more than a dollar.

The men are divided into snow scraping, ice plowing, or cutting, and loading gangs, with men at the entrance to the conveyor cutting the long floats of ice, already cut part way through, into the

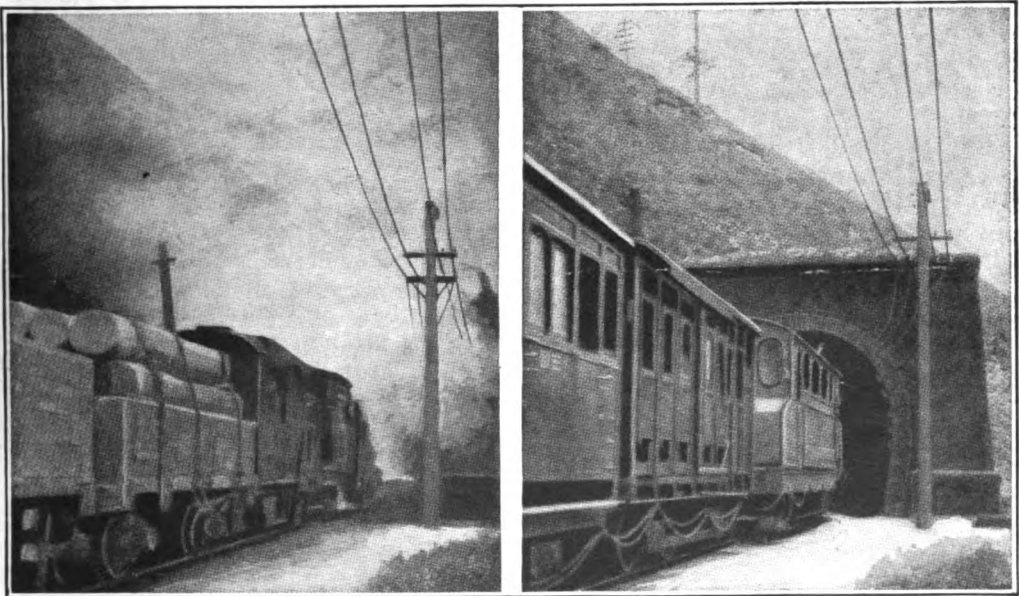
cakes that pass up the conveyor into the ice house. These floats average 500 cakes—50 long by ten wide. In the actual work a start is made right at the entrance to the boxed channel leading to the conveyor. A wide channel is gradually cut out into the lake down which the large floats cut from the sides and forward are passed. If necessary the plows are sent over the fields of solid ice marked out as "good ice" by the field foreman, the snow being banked at the sides. Then comes the plow

which in symmetrical lines cuts six inches deep and which has a sharp marker like that on a sewing machine, set at 22 inches, marking the next line; the plow is then passed over the field at right angles which cuts it up into 22 x 22 inch cakes, not finally detached until each float reaches the home channel, where men with long handled and sharp pointed knives strike the final blow which separates the float into blocks of two cakes and into single cakes as it reaches the conveyor. The float is either pulled or poled down the channel. The scrapers and plows are drawn by horses guided by men. As it passes up the conveyor incline and before being taken into the "house" each cake is trimmed and smoothed by the planer shown in one of the illustrations which tells the

story very well. Discarded cakes are sent by another conveyor to the "slush pile." No cakes are allowed to go through with "sap" on, that is frozen snow and clouded water on the top. The parallel veins seen in some blocks of ice are the "freezing weeks" caused by sudden thaws followed by sharp frosts.

About 80,000 tons are taken each season by the concerns cutting at this lake. The lake produces perhaps 500,000 tons, but it is not available ice. Responsible, well paid men are employed at the ice-houses all the year round. They do the shipping in the summer months and live in the nearby town.

As a servant electricity is always ready; as a saver of time and energy it has no equal.



A CONVINCING COMPARISON

We know that besides other very important advantages of electric railroads the absence of smoke is sometimes an important factor, especially in connection with tunnel work. The accompanying pictures show very clearly how smoke and steam obstruct the view of the tunnel before the electrification and how this is entirely avoided after the electrification. It is further interesting to know that these pictures show an electric railroad in Japan which passes not less than 26 tunnels.

REAR ADMIRAL PEARY ON WIRELESS IN THE ARCTIC



An interview with the great Arctic Explorer in which he gives his views upon the usefulness of wireless in connection with polar expeditions Also what the Government is doing with wireless in Alaska

BY WALDON FAWCETT

"The scientific world is just now awaiting with no little interest the verdict as to the value of the wireless in the Arctic, which we may expect from the McMillan expedition now in the Far North."

Thus spoke Rear Admiral Robert E. Peary, discoverer of the North Pole, in the course of an exclusive statement made to **POPULAR ELECTRICITY AND THE WORLD'S ADVANCE**.

"Nothing whatever has been heard from the McMillan expedition," continued the explorer, "although I believe that the American Museum of Natural History, under whose auspices the expedition was undertaken, sent northward by wireless a 1913-1914 holiday greeting to the members of the party in

the hope that it might reach them in the Arctic, even though the power or radius of their wireless equipment did not permit a response to reach civilization.

"In the meantime we hear interesting things of the achievements of the wireless in the Antarctic. I am under the impression that neither Scott nor Amundsen attempted any use of the wireless, but I hear that Mawson, the Australian explorer, is meeting with considerable success in his use of this method of communication. Indeed, one of the principal objects of Mawson's



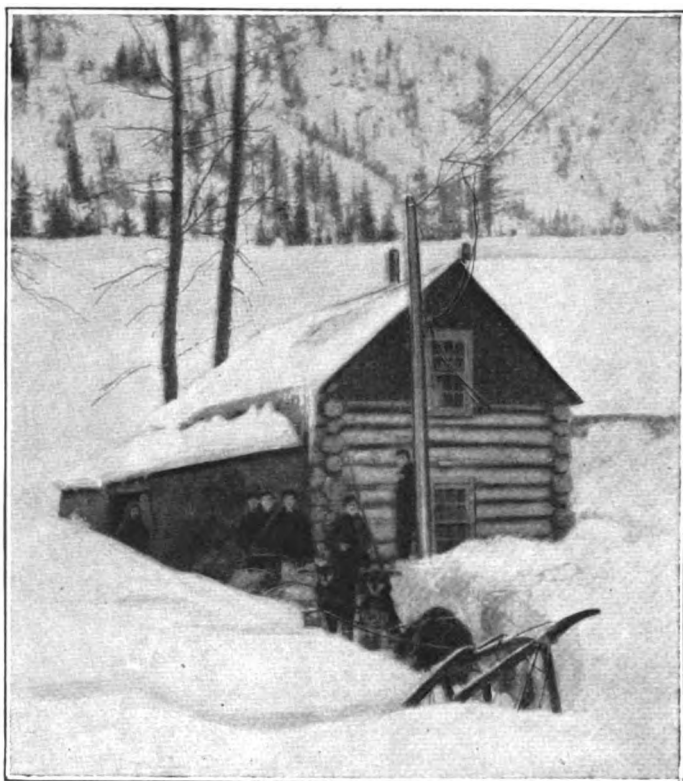
U. S. Army Signal Corps Transport Outfit in the Arctic

work is the establishment in the Antarctic of a meteorological station which will give warnings by wireless of those severe storms which originate in the Antarctic and which do so much damage to shipping in Australian waters."

Admiral Peary, in speaking of the advance of wireless, mentioned the fact that his old ship, the Roosevelt, has been fitted with a radio outfit by Arbuckle Brothers. Asked whether he would place reliance upon the wireless were he to again invade the frozen north, the veteran explorer said:

"That would depend upon circumstances. Such improvements have been made in recent years, especially in the matter of decreasing the weight of wireless equipment, that I have hopes that ere long a stage of development will be reached where every explorer will be justified in carrying a radio outfit.

"I went into the whole subject of the wireless for Arctic exploration very thoroughly just previous to my last trip, but I decided against an attempt at its use at that time for the reason that there were then few wireless stations in the far North, and it seemed to me that it would be necessary, in order to maintain communication, for me to establish several relay stations. And I could not give up the space to the equipment that would be needed or spare the men to operate such a chain. As for the use of portable wireless outfits with sledge teams, I am afraid I am a bit old fashioned. It has always been my theory that in outfitting a sledge team everything else should be

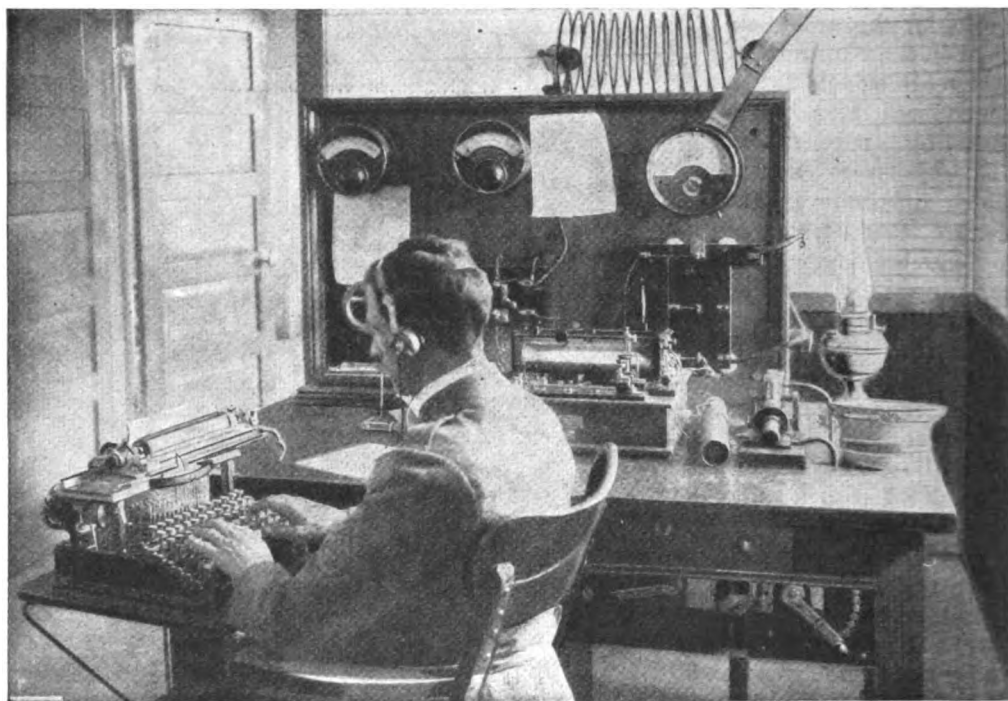


Radio Operators of the U. S. Signal Corps and Their Quarters in Alaska

sacrificed to food for the men and the dogs. This would make me loath to give space to a wireless outfit unless it was very compact and light in weight."

The radio experts of the United States Army Signal Corps are very enthusiastic as to the future of the wireless in the Arctic. Expressing himself on the subject for the benefit of the readers of this magazine, the Assistant Chief Signal Officer, Major Edward Russel, said: "The Arctic should prove the ideal field of operations for wireless. Radio messages are always transmitted to better advantages in darkness than in daylight; it is easier to communicate over water than over land; and finally there are less opportunities for interference from any cause."

Use of wireless in the frozen North is an activity wherein the executive heads of the Signal Corps have probably had more experience than any other officials



Interior of Uncle Sam's Newest Wireless Station in Alaska, Showing the Operator at Work

in the world for the reason that this branch of the United States government has for years maintained a chain of radio stations in Alaska, the installation and maintenance of which have involved almost all the problems identified with the use of this mode of communication in the regions farthest north. There are now ten of these stations, and under severe weather conditions that put out of commission almost all the land lines, they enable continuous communication entirely across Alaska from the Canadian frontier to the tip of the peninsula, and, in case of necessity, across to Siberia.

Our Post Office Department may soon be operating these radio stations in Uncle Sam's northernmost possession. That is contemplated in a recommendation which has just been transmitted to the Secretary of War by Gen. George P. Scriven, the Chief Signal Officer of the Army. Gen. Scriven says that the military cable, telegraph and radio system in

Alaska has undoubtedly helped materially in the development of the territory, but he feels that the time has now arrived when the system has little worth for military purposes, and he hopes that within a year Congress will authorize the taking over of this entire service by the Post Office Department.

Radio stations in Alaska, as well as the land telegraph lines in the northwestern corner of the continent, have lately been handling commercial business in excess of the aggregate of official business. All operators are instructed to send such private messages as may be offered for transmission at a regular scale of charges, and during the fiscal year 1913 this private business totaled nearly \$184,000, as compared with official messages to the value of about \$180,000.

Whereas the installation and maintenance of the telegraph lines in Alaska have involved tremendous difficulties, risks and hardships, the construction

and upkeep of the radio stations have presented few electrical or technical problems. However, there has been ever present the disadvantages of working and living in a very severe climate, and the Alaska radio men have a most creditable record for bravery, pluck and endurance. Moreover, there has been continual difficulty in securing sufficient experienced radio operators to man these northern stations, and consequently it has often been necessary for an operator to prolong his "trick" far beyond regular hours. When you think of it, too, a corps of five officers and 200 enlisted men is a rather small complement for the conduct of so extensive a radio, telegraph and cable system. They operate, all told, 2,636 miles of submarine cable and 1,047 miles of land lines in addition to the ten radio stations.

Portable wireless outfits have not been used to any extent in Alaska, but there is no reason why they should not be should circumstances require. Indeed, the distances between some of the permanent radio stations are only 30 to 50 miles.

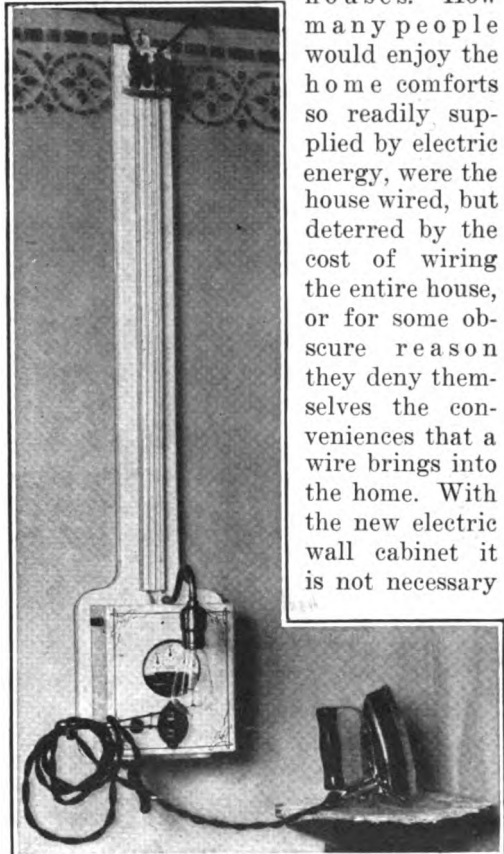
When the radio stations were first established in Alaska the whole thought was that they would merely supplement the land line service, especially when winter storms interrupted communication by wire, but as it has worked out the radio system has proven capable of meeting the full responsibility.

From the outset of this extensive work there was adopted the plan of routing a certain amount of business each day by way of the radio in order to insure that the stations be kept in perfect working condition, but the radio operators have attested their ability at any time to take up the work of handling the business of the entire system. Then, too, the radio stations have been in practically uninterrupted operation—immune from the forest fires, the snowslides and break-up of the Yukon, which constitute the chief menaces of the land lines in this region.

ELECTRIC WALL CABINET

The electric wall cabinet is a portable means for introducing electric service quickly and at low cost, into unwired

houses. How many people would enjoy the home comforts so readily supplied by electric energy, were the house wired, but deterred by the cost of wiring the entire house, or for some obscure reason they deny themselves the conveniences that a wire brings into the home. With the new electric wall cabinet it is not necessary



Electric Wall Cabinet

to wire the entire house to have the modern labor saving conveniences.

This outfit can be installed by one man. He drives a nail into the wall about nine feet above the floor, hangs the cabinet as shown, plumbs it, puts in the bottom screw, bores a couple of holes just above the fuse blocks, puts in two porcelain tubes and then pushes through the two wires already provided, making connection with the line drop outside. The meter is encased in an iron box fastened to a wooden base. There is an extra outlet or socket providing service connection for any house comfort device.

Electricity a Nerve Saver

The United States government would be glad to find a simple, dependable means of operating electrically the card punching machines which have come into such extensive use for clerical and statistical purposes. These are at present operated by hand, much on the same plan that a typewriter is operated, but with an expenditure, it is claimed, of much more muscular and nervous force than is required in the case of a writing machine.

These card punching machines form one of the units in the equipment for bookkeeping by machinery—the Twentieth Century method of keeping accounts that is rapidly displacing, in all large business establishments, the time honored figure of the man bending over a ponderous ledger. Only, as it happens, the card punching portion of the work is the only one of the three main steps in this new fangled bookkeeping that necessitates the expenditure of energy sufficient to tax the strength.

The tabulating of the punched cards and the sorting of these cards is done well nigh automatically by remarkable electrically operated machines. In other words, it is already “electrical bookkeeping” two-thirds of the way, and it is now the

ambition to make it electrical bookkeeping all the way.

By the irony of fate, too, the tabulating and sorting of the cards in which tasks electricity bears the brunt of the burden are conducted by men, whereas the card punching where manual labor unassisted is involved is almost exclusively in the hands of women. At least that is the practice in the government offices which rank as the world’s largest users of this new form of bookkeeping and also in many large railroad offices and other business beehives.

Some of the women who are engaged in pounding all day long the keys of these card punching machines have complained to the United States Public Health Service that their nerves are affected and accordingly this branch of the government has taken up the problem of finding means to make electricity do a portion of the work. There are already some electrically operated card punching machines in existence,

but for one reason or another, they have not been adopted in the quarters whence comes this present demand.

The Federal health experts began to give serious attention to this subject when oper-



Hand Punching of Cards in the New Book Keeping System — A Task for which Electrical Aid is Sought

Copyright
by Walden
Fawcett

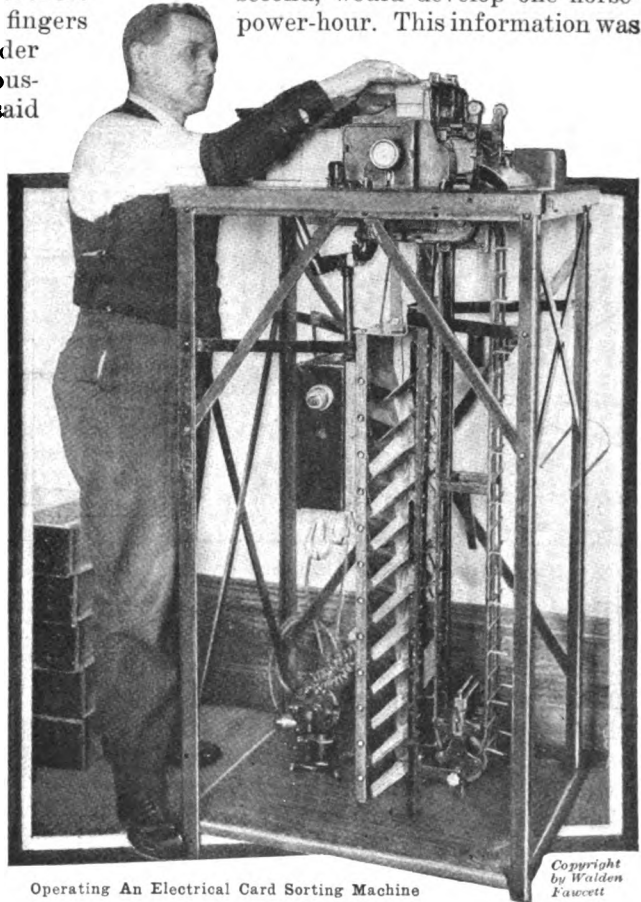
ators complained of sore fingers due to the pressure required to depress the numbered keys of the punching machine. In some instances the soreness that at first appeared in the fingers spread to the arm and shoulder and other symptoms of nervousness followed, whereas, it is said that in some instances there have occurred complete nervous breakdowns which have been attributed directly or indirectly to such causes.

Many of the young women who are now operating these card machines have resorted to the expedient of depressing the keys with the blunt end of a lead pencil instead of with the tip of the finger, but this is not an ideal solution of the difficulty and moreover it decreases the capacity of the operative. It is no slight chore, as may be imagined, to punch 2,500 of these cards—a normal average daily stunt for an operative—and the tax upon muscle and nerve tissue is the more severe from the fact that in the manipulation of these keys, unlike those of a typewriter, it is necessary to do practically all of the work with the right hand.

ONE HORSEPOWER FROM A GLASS OF WATER

The Big Creek development of the Pacific Light and Power Corporation is utilizing its water at the total head of 4,000 feet, by passing it through two power stations. It is interesting to note that at this head the amount of water which would fill an ordinary whiskey glass, for one second, is equivalent to one theoretical horsepower; in other words, it would develop one horsepower-

second. Thirty-six hundred such glasses of water falling through the 4,000 feet, at the uniform rate of one every second, would develop one horsepower-hour. This information was



Operating An Electrical Card Sorting Machine

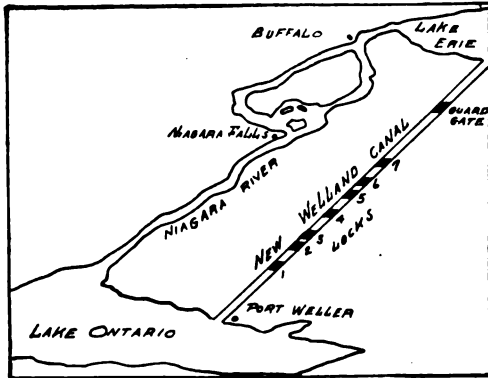
*Copyright
by Walden
Faucestt*

given by Mr. Edw. N. Lake of the Stone & Webster Engineering Corporation in a recent address before a meeting of electrical men in Chicago.

Tea should not be boiled any more than coffee should; the use of the adjustable tea ball makes an arrangement whereby the strength of the beverage can be gauged to an exact degree. At the proper moment the tea ball is drawn up out of the water by the chain which slides through the cover. The electric tea samovar consumes 400 watts and makes about nine cups at a cost of two cents.

WORK STARTED ON NEW WELLAND CANAL

Another great engineering project, second only to that of the Panama Canal, and which is sure to excite universal interest, is being started by Canadian authorities in replacing the Welland Canal, connecting Lake Erie



Map of New Welland Canal District

to Lake Ontario, by a new and shorter route which will shorten the travel by $2\frac{1}{2}$ miles.

The first canal connecting these lakes was started about 90 years ago. In 1872 the second canal was dug, which necessitated 27 locks to overcome the drop of 300 feet in the 25 miles between the lakes. According to the new plans now under way the drop will be accomplished with only seven locks. This plainly shows what engineering science is achieving.

The bottom of the new Welland Canal will be 200 feet wide, providing ample room for much larger boats than are in use to-day. The large metal gates of the new canal will weigh 1,100 tons, being 400 tons more than the heaviest gate on the Panama Canal. The locks, which are to be 900 feet long, are designed to overcome the present danger of the gates being carried away, which frequently happens, delaying traffic and endangering lives.

The future locks will be filled by culverts on the side, replacing the old

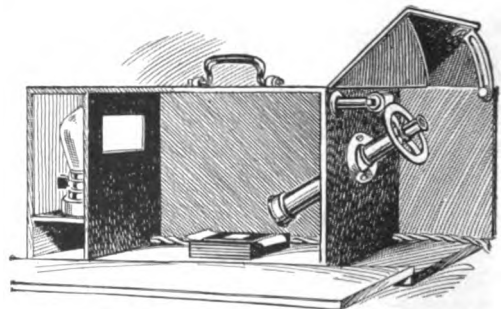
method of filling them through the gates. Each lock means a lift of 46 feet. The 7,000,000 cubic yards of earth to be dug out will be carried by an especially constructed railway to Port Weller, the terminal of the new canal, named in honor of the engineer in charge of the construction. Here the dirt will be dumped into the lake to form the sides of a harbor which will extend a mile into the lake.

Several villages lying in the route of the new canal will suffer by the loss of much property containing buildings, as the government is already buying the property needed, and it is stated that very liberal prices are being paid the owners. About \$50,000,000 will be expended to finish the canal.

MEASURING THE GLARE FROM PAPER

Nearly every one has experienced the necessity of moving to a position under the evening lamp so that the eyes may not receive the glare from the printed page. That paper will doubtless be studied with reference to eliminating this eye strain is evidenced by the invention of an instrument used at the United States Forest Products Laboratory, Madison, Wis., for measuring the glare.

The most effective angle from which to observe the paper is 57.5° from the



Apparatus for Measuring Glare

vertical. The eye piece is as shown, therefore, set at this angle. Without going into technicalities, the paper to be examined is placed upon a flat surface within the cabinet and the light from a

40 watt tungsten lamp after passing through two thicknesses of tracing cloth falls upon the paper and then upon prisms in the eye piece. By an ingenious use of a smoked glass, which absorbs one-half of the light, and two prisms, the two halves of a circle in the eye piece are made to look alike by turning the eye piece, and this rotation gives a reading from which the glare may be figured.

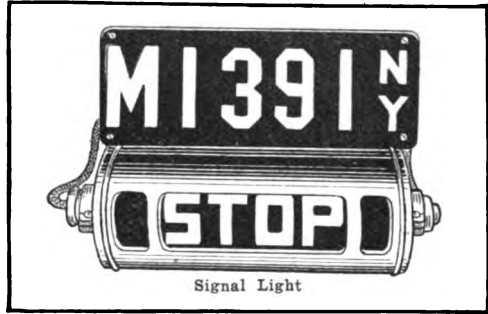
The instrument will enable the printer to order paper with, say, 20 per cent glare and the paper maker will know if his paper fulfills this specification.

THE SHREWD BUTCHER

A certain English butcher, who sold about 30 cooked legs of pork per week, said his loss was formerly 40 per cent and is now only 22 per cent in the electric oven, or a clear saving of 18 per cent. After deducting the cost of the current at 1d. per unit, his saving amounted to 2s. per leg of pork, or £3 per week extra profit. On being told that he had only saved water, he answered: "Perhaps so; but, you see, my customers pay me 1s. 2d. per pound for it!"

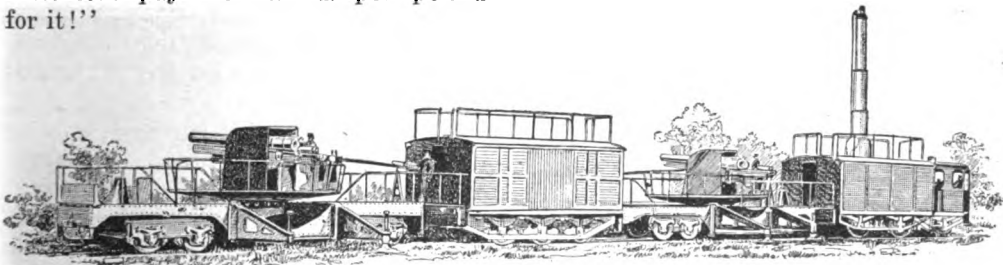
AUTO SIGNAL LIGHT

This device consists of a signal which will show that the vehicle is to turn right, left, stop or continue in the course. Combined with the signal in a tail light and license bracket all is



compactly contained in a cylinder measuring five and a half by twelve and a half inches.

A small lever is used to operate the instrument. This lever is operated by the chauffeur slightly in anticipation of stopping in his course. Simultaneously there appears in the auto "Signalite," respectively, "Stop," "Right," "Left" or a red light. An electric light illuminates the signals at night.



A NEW MOBILE BATTERY

A new form of mobile battery has been built by a famous firm in France, for coast defence. Each complete train is made up of a small locomotive, a car for the crew and officers in charge, an ammunition car and a couple of trucks for guns. The car for the personnel is equipped with a telescopic observation tower which is easily raised, thus enabling the observer to make a comprehensive survey of the coast and at the same time he can communicate with those below by means of a speaking tube.

The train can run on regular or emergency tracks. The gun truck is firmly anchored before firing. An ammunition car between two gun trucks can feed both guns while the ammunition is run out to them through a chute.



Special Instruction Car for Educational Service

THE SEVRES BLUE

The most noted blue is that imparted to the porcelain ware which, for so many years, has been manufactured at Sèvres, in France. For a long time it was believed that this famous blue was the result of a secret process, and there have been many curious legends connected with it.

Not long ago, however, it was demonstrated that it is a mistake to suppose that Sèvres blue cannot be produced elsewhere. As a matter of fact, it is produced in many French factories, where sufficient care is exercised, and where pure oxide of cobalt is employed. Formerly it was difficult to procure this substance without impurities, which injured the color; but chemical science has overcome this difficulty.

The above statements also apply to the Chinese green known as "celadon." It was invented in China, but it is no longer a secret and can be perfectly reproduced elsewhere.

SAFETY FIRST INSTRUCTION CAR

Recently a metropolitan daily newspaper contained an account of reckless driving of a street car by a motorman through a crowded district. The passengers took the controller away from the motorman and complained that their lives had been greatly imperiled by his unsafe methods of operation.

In this connection it is interesting to note the unique experiment inaugurated by the Detroit United Railway in its safety first campaign for the purpose of imparting to its employees practical knowledge of safety methods. A safety first instruction car specially fitted up is taken about once a month over all of its lines to carry on this educational service.

The car is equipped with miniature trolley poles and wires whose uses and dangers are explained by a practical electrician; the operation of the air brakes, controller, and other mechanical features are demonstrated, together with safe and unsafe methods of operation. A company physician talks on the subject of accidents.

"In equipping this car and starting it over our line," said Mr. A. H. Sarvis, of the Detroit United Railway, "the general safety board appreciated the fact that it was purely an experiment. The interest which has been manifested by the employees, however, insures that the car will be maintained and operated for some time."

No one can pass a florist's window that is skillfully lighted by electric lamps. The effect is fairylike, and electric light does not harm the most delicate flower. The mercury vapor lamp produces some beautiful effects when used to illuminate green foliage.

ALL AROUND BATTERY TRUCK

This electric truck, aside from its regular duties about the premises of the manufacturing plant where it is in daily use, also takes occasional trips across town to the freight depot. Although the wheels are not high, it negotiates the ordinary pavements very well and there is an abundance of power in the storage battery under the platform.

There are a number of things immediately noticeable about this vehicle. The total length of load and vehicle is scarcely more than that of the load itself—there is only about half the cause here for congestion as with the horse drawn vehicle. The operator has perfect control of starting, stopping and speed, by means of the foot pedal and the lever in his right hand. He does the steering



Portable Outfit That Makes Big Saving On Built-in Features

makes the greatest saving on jobs where built-in features are demanded. He can cut his own odd sizes for panels, cupboards, disappearing beds and buffets, and save the time he and his men would waste while waiting for mills to deliver such material. He persistently beats the mill-work prices by doing his own sawing.

Each time the outfit is moved to a new job it is attached to a heavy plank platform in a convenient place where the carpenter can reach it without extra steps. The entire outfit, including saws, tables, motors, pony-planer, sander and emery, cost about \$600. The circular saw is a sixteen inch, driven by a seven horse power motor, and the cross cut saw is run by a five horse power motor. The circular saw can be used for dadoing, tenoning, ripping and plowing.

When once an electric motor has been installed in a home, a great many uses will be found for it not previously anticipated. The energy consumption is comparatively small, while in addition to the labor saved, the convenience is a great item.



Operator Can Steer No Matter Whether Facing Front or Rear of This Vehicle

easily with his left hand, by means of a vertical hand wheel; and he can operate this wheel no matter whether he faces the front or rear of the vehicle.

CONTRACTOR DOES MILL WORK ON THE JOB

A contractor at Santa Monica, Calif., uses circular and cross cut table saws, electrically driven, in reducing big dimension lumber to whatever size he needs on a job, and thereby reduces his lumber bills from 25 to 35 per cent. He

America's First Chinese Cannery

In the days when the Tongs warred, when a deadline prevailed at the far turn of Doyer Street, when every Chinaman's blouse concealed a shining Colt and when New York's Celestial colony bore a decidedly belligerent aspect, one Ling Wally, a diminutive Chinese merchant, conceived a single bright idea. That one thought has today developed into a full-fledged corporation and Ling is a rich man and president of the only Chinese canning company in America.

Ling Wally's business in Chinatown depended, for the most part, on the number of American visitors—curiosity seekers—attracted to the Oriental settlement on the lower East Side. But during the periods when Hip Sings fought with On Leongs, or when three-cornered clashes resulted from intervention by the Four Brothers, the curiosity seekers became few and far between. Gun battles in the narrow streets of Chinatown did not appeal to the average New Yorker or visitor to New York, and the result was that for weeks at a time Chinese restaurants were vacant and Chinese merchants found their

stock growing dusty on their shelves.

This condition troubled Ling Wally considerably. He tried hard to invent some way whereby Chinese wars and business could be conducted at the same time. And suddenly, and most unexpectedly, he hit upon the idea. The trend of his thought was thiswise.

Chinese restaurants are by far the most interesting establishments in Chinatown from the visitors' point of view. Many Americans have learned to appreciate Chinese cooking. Well, since wars kept these Americans from feasting on Oriental fare.



Tom Lee, Chief Cook. During a Busy Period He is in Charge of 15 Cooks

Photos by New York Edison Co.

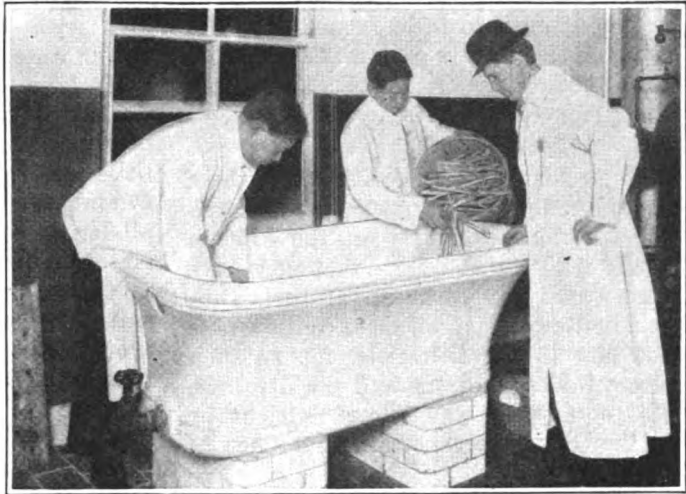
why not send the food to them? But how? Why in cans, of course. Hence the organization of a little canning factory down in a remote corner of Chinatown, or, to be more exact, at 65 Park Street.

That Ling Wally's idea was practical is evident from the thousands of shining cans of bird's nest soup, chop suey, yo-kimain, squab, duck and shell fish that are shipped from the establishment each week. A curious thing about this shipping, too; the Chinese packers put two dozen unlabeled

cans into a single box; then take two dozen gaudy labels, made to fit around the cans, and place them in a neat pile on top of the shipment. The attaching of the labels is left to the retail merchant, whoever he may be.

All of the cans are packed by hand and the contents of each is scrupulously weighed before the receptacle is taken to the canning machine or electrical contrivance used to seal it up.

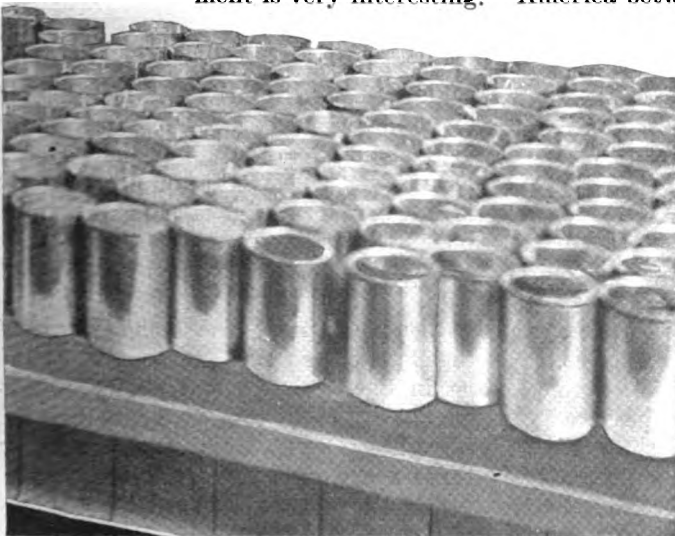
A trip through Ling Wally's establishment is very interesting.



Ling, Although He is "Boss," is Not Above Putting on an Apron and Helping. Here He is Emptying Celery Into a Huge Bathtub Preparatory to Scouring It

The rear of the loft occupied by the firm is used as a kitchen; not a dingy, low ceilinged, Chinese kitchen as one would expect to find, but a fine, roomy place, with white tiled walls and a sanitary stone floor that cost \$1200 to install. In this kitchen are various large basting ovens, retorts, steam tables, a canning machine and several modern versions of the Chinese stove, the Far Low.

When Ling Wally is busy trying to fill orders that come from anywhere in America between Montreal and New Orleans, or Denver and Boston, there are fifteen white clad cooks, all Chinese, scurrying about the steam filled kitchen. These cooks are said to be the best that have ever been brought across the Pacific, and the product of Ling's kitchen attests to that fact. Most of the activities are centered about the huge basting oven on the right side of the room. This oven is at least ten feet tall and in it are scores of iron rods suspended from the top, to which are attached



a series of hooks. When ducks, chickens or small pigs are to be basted they are hung on these hooks and at intervals deluged with a savory brown sauce, the preparing of which is one of the many secrets of the Chinese.

The remarkable ease with which these cooks handle the various gas and electrical cooking appliances in the kitchen would lead one to believe that they have never used any other apparatus. But, as a matter of fact, all these contrivances are new to the Celestials, for no such steam tables, caldrons and the like have yet found their way into the Orient, or if they have they certainly are not in common use.

BLASTING BY ELECTRICITY IN COAL MINES

In coal mines it is desirable for various reasons to fire all the shots in the mine at one time. Batteries or hand dynamos do not have capacity enough to fire the large number of shots necessary. A mine producing 1,000 tons daily will require about 500 shots to be fired at one time. So a better method had to be resorted to.

The shooting lines are now run into the mine in the same manner as a lighting line would be. Holes are drilled in the walls or roof and wooden plugs are driven in the holes. The insulating knobs are nailed to these plugs and the wires tied to the insulators in the ordinary manner. Rubber covered wire is used because the weatherproof wire will not last nearly so long in the atmosphere of the mine. At the neck of each room a branch circuit is run to the working face of the room. These room circuits are connected in parallel. There are five shots in each room and these are connected in series. A double pole switch is placed at the neck of each room. These switches are left open until just before the shots are to be fired. They prevent any premature explosions being caused by the shoot-

ing wires accidentally coming in contact with the trolley wire or other power lines.

The electric exploders are very much similar in appearance to an ordinary blasting cap, except that they are a little larger and have two small wires coming from one end. Inside the exploder there is a small piece of fusible material connecting the two wires; as soon as a current passes, this material and the explosive material packed around it is fused. In order that the two lower holes, or "breaking shots" as they are called by miners, be fired first, delay exploders are used on the three top holes. These delay exploders do not explode for a fraction of a second after the current begins to flow. This allows the breaking shots to do their work before the others explode, resulting in the coal being broken more evenly.

The voltage used for a shooting system is usually 110 or 220. In some cases where alternating current is not available the direct current from the trolley is used; in these cases it will be 250 or 500. Any voltage between these limits can be used and either direct or alternating serves the purpose equally well.

The large shooting switch which fires the shots throughout the entire mine is usually located in the mine foreman's office.

The shots are never fired in the best regulated mines until it is certain that all the men are out of the mine. By the use of an electric shot firing system many lives are saved annually, as there is no danger of the men running into blasts which they were not aware were to be fired.

Electric fans in the home drive out the close, sultry air of summer days and let in the freshness and purity of outdoors. By night they bring coolness for refreshing sleep. Equipped with a three speed switch, they range from a gentle movement to a hard blow of air.



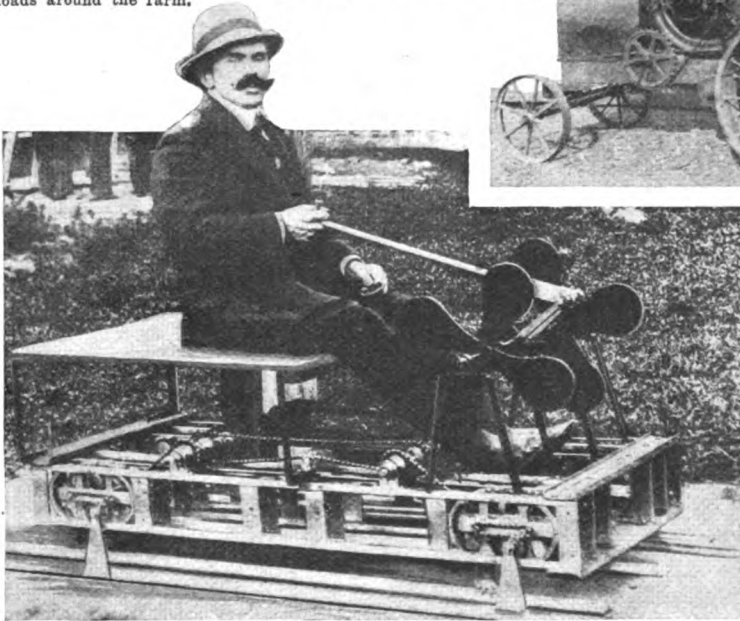
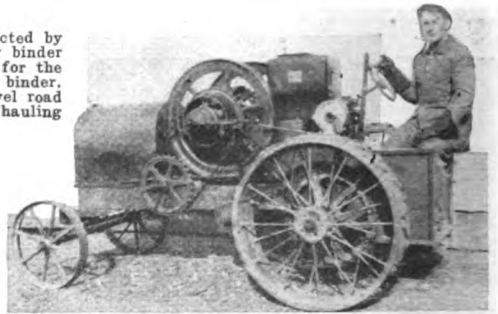
The World's
Picture Gallery



Copyright by Underwood & Underwood, N. Y.

Sunny Monday; washing and bathing in a stream in the outskirts of Manila, Philippine Islands.

A novel, five horsepower tractor was recently constructed by J. E. Almquist of Essex, Ia., with a couple of Deering binder drivers for the drive wheels and ordinary truck wheels for the front. The differential gear is made of gearing from a binder. This home-made tractor will pull a ton of coal on a level road with ease. It is used for grinding feed and grading and hauling loads around the farm.



A rail and wheelless vehicle which has just been completed after many years of experiment by Mr. F. W. Gobel. It is operated with the feet by pedal and it is claimed that it can also cross rivers.

A newly invented instrument by which the correspondence is dictated into the machine and the records then reproduced through a loud speaking trumpet which does away with the ordinary ear tubes.



Mrs. J. C. Crawford, wife of the assistant curator of the National Museum, at work arranging the new collection of butterflies.



Interior view of a wretched native home in the province of Santiago, Cuba.

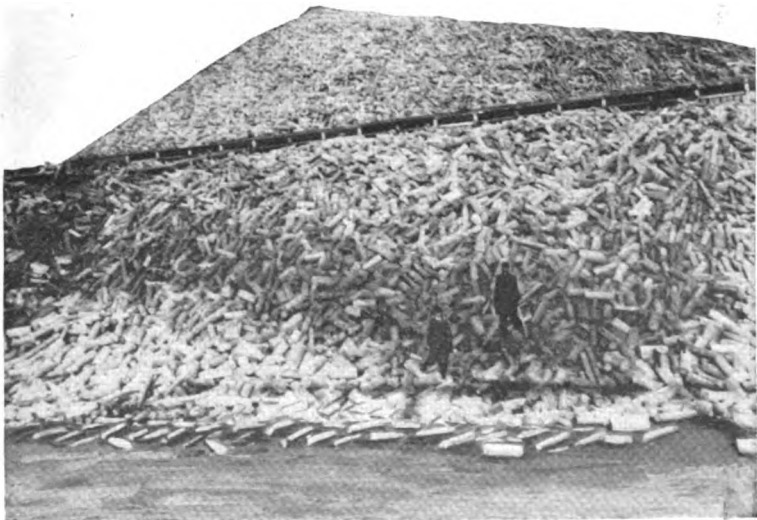


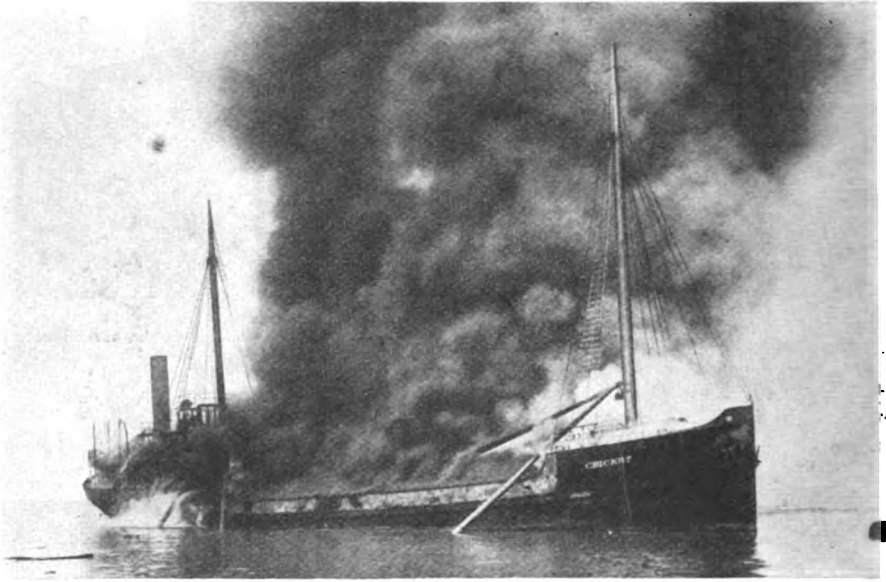
The new armored auto which carries seven machine guns as used by the Mexican rebels.



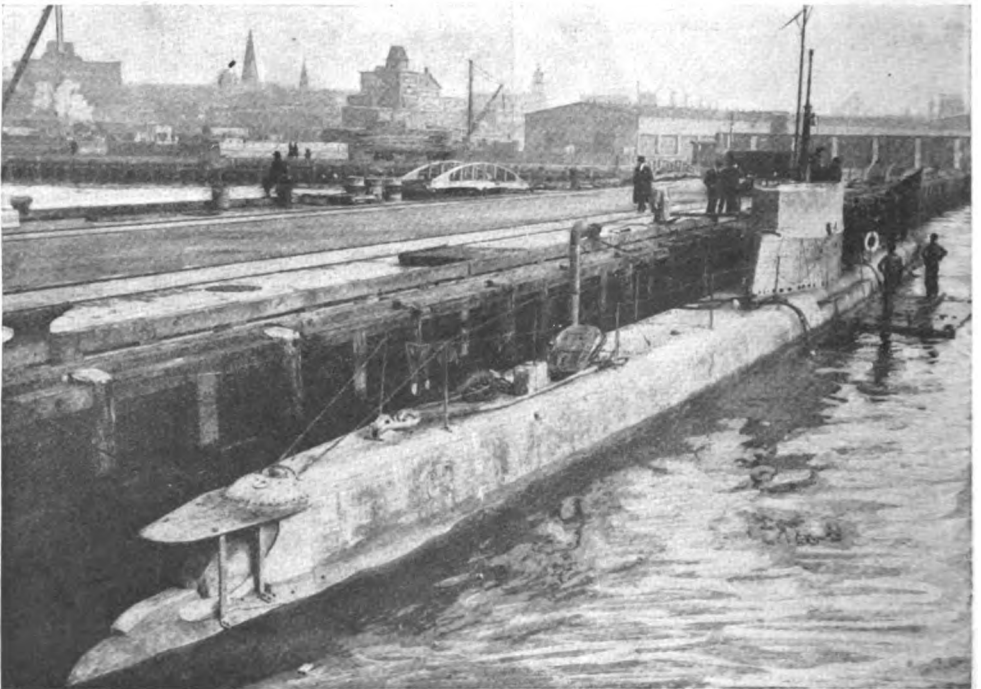
This curious picture is really a bear hunt with a man on horseback and a dog. It is the skillful work of a man who arranges skeletons as the bones are arranged in life. This group is to be seen in a museum in one of the universities in the state of New York.

No doubt many people have seen huge wood piles but seldom is there such a wonderful lot of wood gathered in one place. This pile is owned by the International Paper Co., at Niagara Falls. It is the winter's supply for 1913-1914. This pile of wood will be made into paper. Under modern methods, a cord of wood with bark removed gives about a ton of pulp. On the whole, what a lot of stories this wood pile will tell!

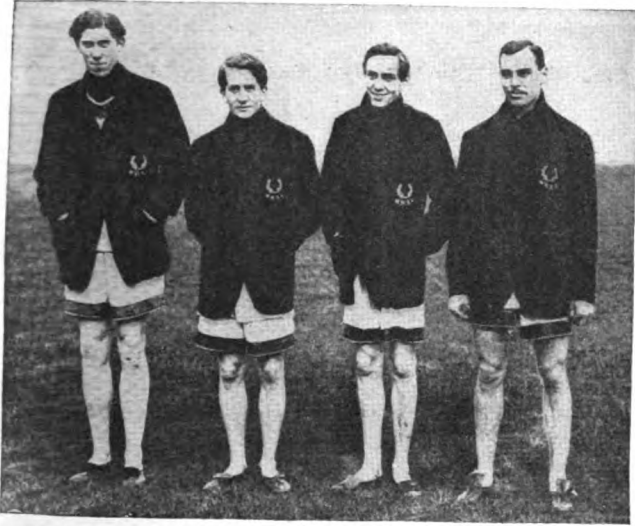




The big water front fire which occurred recently at Portland, Ore., destroyed many vessels. This picture shows the steamer "Cricket" loaded with asphalt, all ablaze from stem to stern, floating down the river.



A fighting craft of unusual power, the new submarine G8 attracted much attention recently as she lay in the New York navy yard. Longer than any of her predecessors, 180 feet over all, she presented the appearance, at first, of a small destroyer. The G8 is commanded by Captain Needham and carries a crew of twenty.



Oxford team that has invaded America. This team came to America in April to compete against Pennsylvania University in a relay race of four miles. Left to right the men are A. N. S. Jackson, G. M. Sproule, D. N. Gausson and N. S. Taber. Jackson won the 1500-meter race at the last Olympic games and the other men are all excellent cross country runners, with established records.



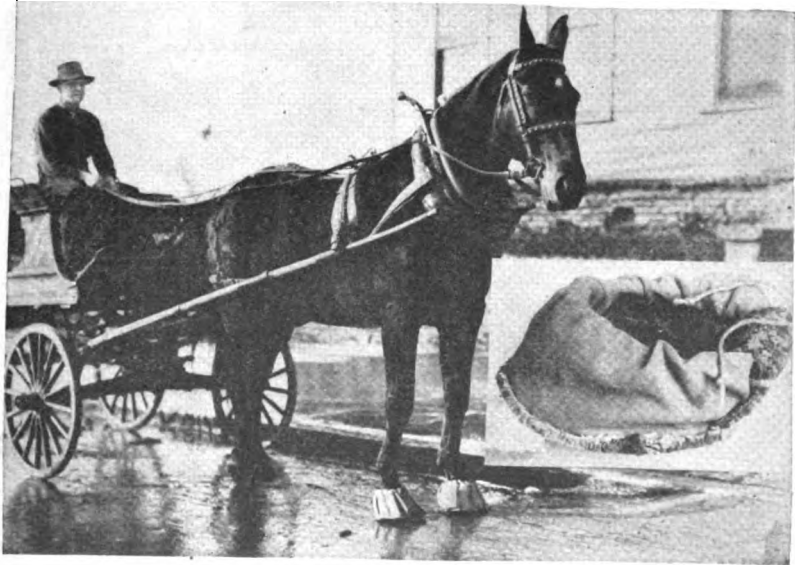
Copyright by Underwood & Underwood, N. Y.

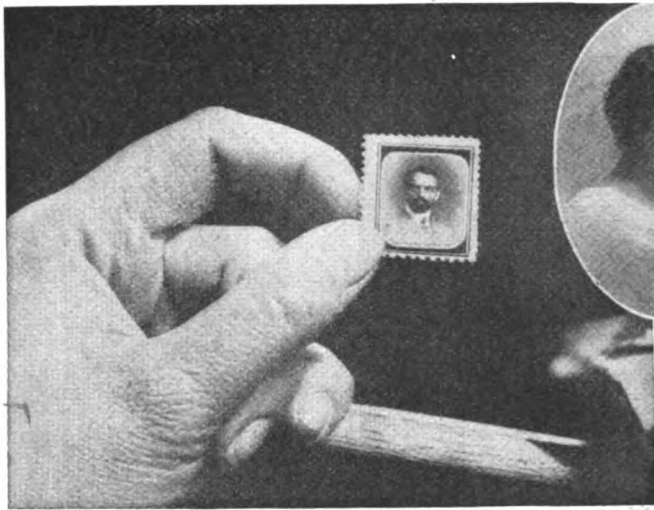
Girl steeplejack climbing an 85-foot pole surmounting the 420-foot Equitable Trust Building in New York city. Constance B. Bennett is seen accomplishing this feat.



Shoeing an ox in France.

The San Francisco Society for the Prevention of Cruelty to Animals gives free to all teamsters who apply at headquarters, a set of the new horse slippers or overshoes which will prevent horses from slipping on wet or hilly streets. The shoe is a round pad of carpet the size of a hoof to which is attached a top of burlap.



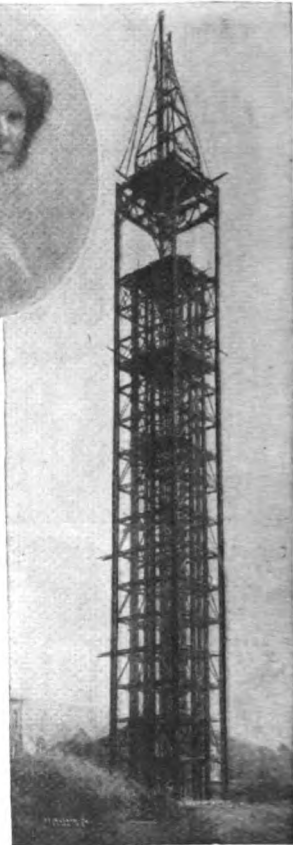


Copyright International News Service

Women are now having photographs of their admirers in stamp form to be kept in albums where they may be classified according to the taste of the owner of the stamp album.



Copyright International News Service



When the contractors for the steel framework of the new 300-foot Campanile on the campus of the University of California decided to give a banquet to their structural ironworkers, they had difficulty in getting someone to serve the meal. When the banquet was first announced, several caterers were candidates, but as soon as they learned that the banquet hall consisted of some loose boards laid across the beams at the 250-foot level of the tower, they hesitated. After contemplating the long series of ladders leading aloft, one by one they shook their heads. The banquet seemed about to fail for want of a caterer, when Vivian Bowers, eighteen years old, volunteered her services. Her offer was thankfully received and accepted and in spite of a stiff 30-mile wind, she made the daring ascent and served the banquet. The others looked on—from below.

Christening of the "Oklahoma" by Miss Lorena J. Cruce, daughter of the governor of Oklahoma, at Camden, N. J.



Sewing

Making sails for cup defender "Defiance." The three designers who are looking after the three cup defenders now building are paying great attention to the sails those yachts will carry and some wonderful creations of canvas will be sported in the races this season. These photographs show the sails that will adorn the cup defender "Defiance," being made at the works of Wilson and Silsby, Boston.



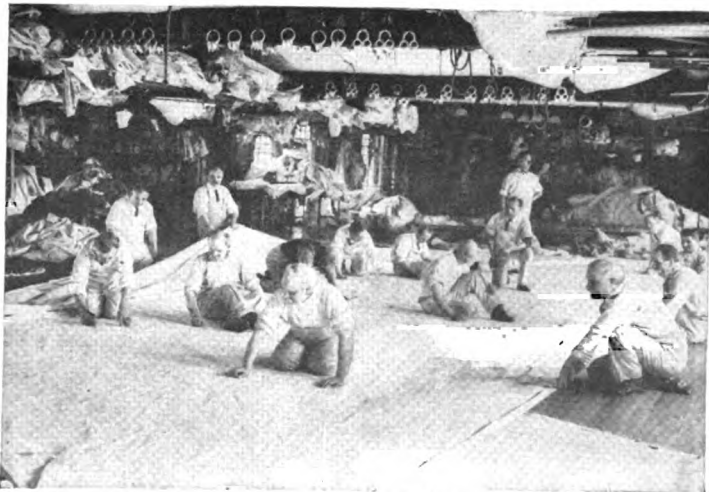
Hemming



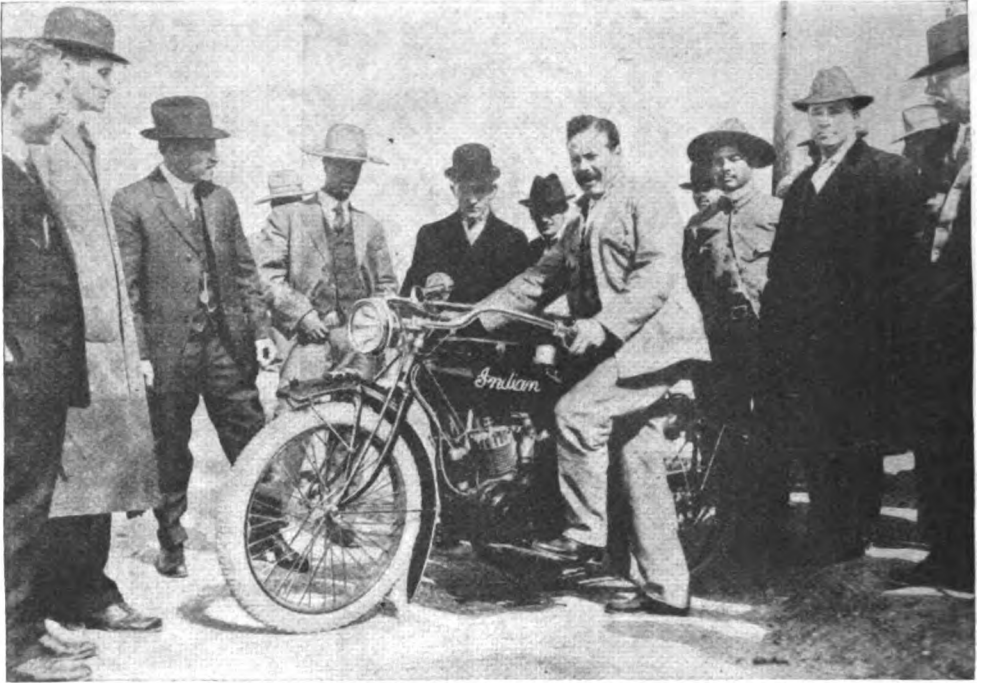
Roping—the Finish

Laying out canvas for cutting and designing.

The "America's" cup, won at Cowes from an English fleet Aug. 22, 1851, by the schooner "America" was presented as an international challenge trophy to the American people in 1857 and has been fruitlessly sailed for by foreign challengers a number of times. Mr. Thomas W. Lawson, the owner of the "Independence," was the first to give the yachting world all possible information about the building of a cup defender. There are certain definite specifications for a vessel of the cup class, but every designer has his own theories as to what constitutes an efficient form of sail, although nearly all agree that the forward portion of the sail is the most effective. The "Independence" had seven tons of sails of special yacht duck.

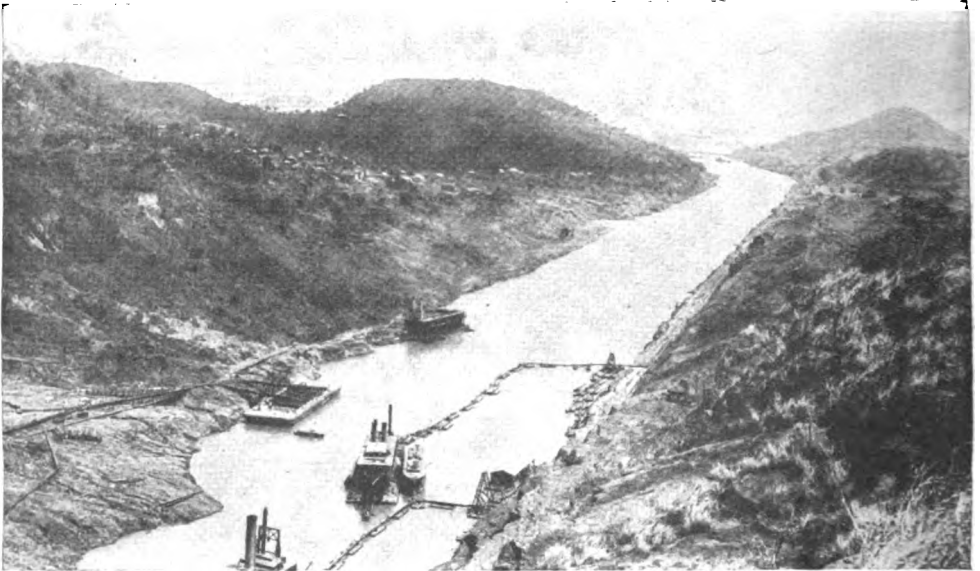


Photos Copyrighted International News Service

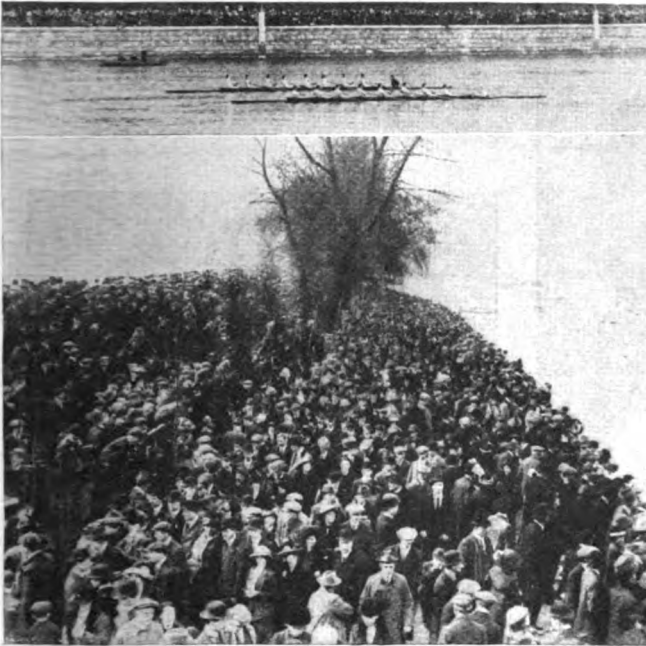


Copyright Underwood & Underwood, N. Y.

Gen. Villa, the Man of the Hour in Mexico, forsakes horse for the electric starting and lighting motorcycle. The doughty leader of the revolutionists is very partial to motorcycles as a result of his experiment with three machines for dispatch duty at the battle of Ojinaga. At Torreon, Villa's motorcycle couriers covered themselves with glory. This photo was taken at Villa's headquarters at Juarez just before the advance on Torreon commenced.



This is a bird's-eye view of Panama Canal looking south from Contractor Hill. The view shows half of Culebra Cut. Miraflores Lake may be seen in the distance.

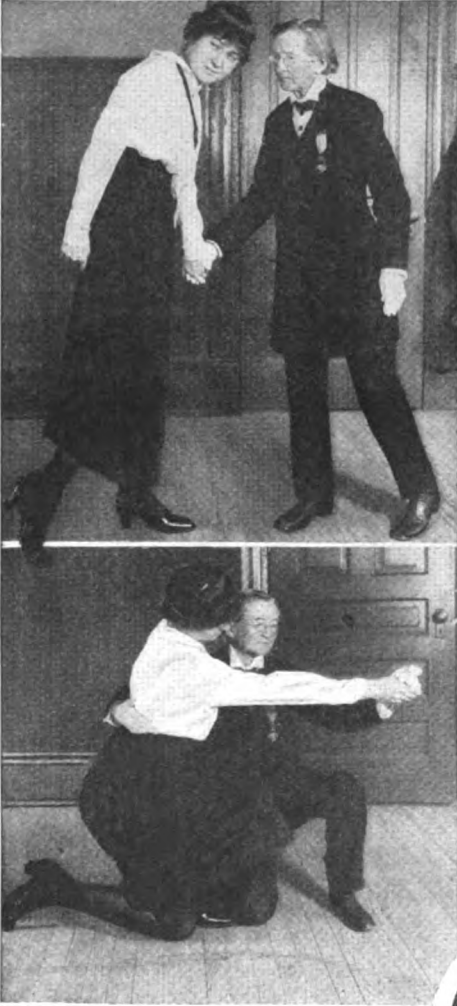


Crowd waiting for the boats to appear, at the Oxford-Cambridge race, Putney, England. In the view by the wall the two boats are shown at the start and in the mid-river view Cambridge, which finally won, is seen leading.

Photos Copyrighted by the International News Service, N. Y.



The two most valuable Irish wolfhounds in the world, owned by Michael Creighton, of Chicago, and worth \$10,000 each. This wonderful strain is now almost extinct—there are less than 100 living. Histories of the breed have been written, dating back to the year 391 when the Roman Consul received a present of seven of them from England. All Rome viewed them with wonder, and well they might, for these dogs can outrun a greyhound, they will fight any animal that has four legs, and they are the only dogs known that can run down and kill a wolf "single handed."



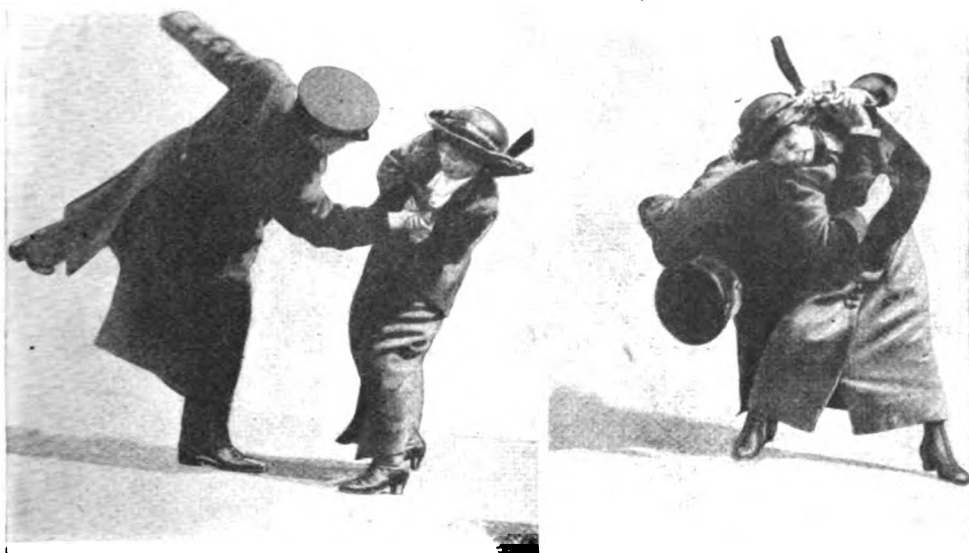
Dr. Mary Walker of Washington, D. C., who, it will be remembered, was permitted, by special act of Congress some years ago, to wear men's clothes, is proficient in the tango, hesitation waltz and the new dances generally.



Photo: Copyright International News Service, N. Y.

In New York's school for policemen; instructor is demonstrating the pin hold for free hands, which enables the officer to summon assistance.





Miss Ai Kishi giving an exhibition of Jiu Jitsu in the city hall of Philadelphia for the benefit of Director Porter and his aides. One of the first rules is to destroy your opponent's balance, or to work so rapidly as to keep out of his reach.



A society in Berlin has been formed for the study of air and flying. All classes of young people over fourteen years of age may attend. Those interested in military aeronautics are furnished with uniforms. Experienced aviators teach the young men.



Copyright International News Service

Refugees in camp waiting their turn to be shaved. Note the men seated telling story to the victim while he is being shaved.



Copyright International News Service

United States Custom Inspectors Rumsey and Petty at Laredo, Texas.



Hemp plays an important part in the life of the primitive Filipino. An instance of its use is here shown where a Negrito is on hunt with his big bow and a r r o w, the latter strung with hempen cord.

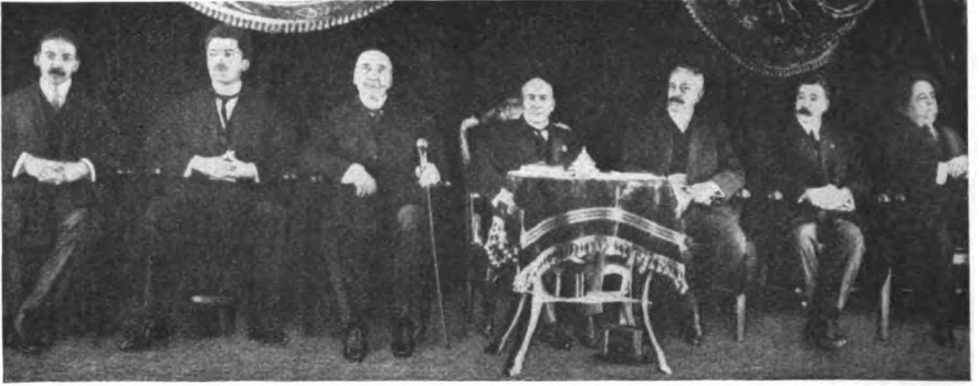


Emootiek, at top, and Natuk, two Eskimos, who visited New York last winter. They are shown here climbing a tree in Central Park and enjoying real Arctic conditions.



Chief Fred Lookout of the Osage tribe of Oklahoma in conference with Commissioner Sells at the office of the latter in Washington. Chief Lookout is a progressive and successful farmer and a graduate of Carlisle. The Osage Indians of which he is chief are the wealthiest in the United States. They own many acres of oil land, a large part of which is in active production.





Recent photograph of Huerta and his cabinet—as they might have appeared when hesitating about saluting the Stars and Stripes.



And at that time, and before the United States took a hand, Huerta needed recruits badly. These are some of the citizens from the streets who were called upon to resist invasion.



Photos Copyrighted by the International News Service.

At the same time crack regiments of United States infantry in marching equipment were hovering on the border.

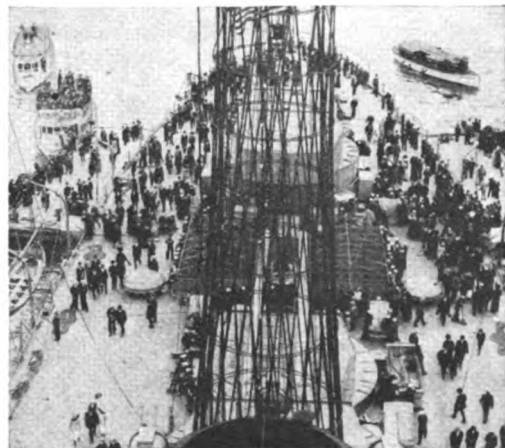


Copyright by E. Muller, Jr., & Puck

In the meantime the big fighting armada known as the Atlantic Fleet swept on its way under command of Admiral Badger (right) to enforce the demand of Admiral Mayo (left) for a flag salute from the Mexicans. Admiral Fletcher (center), commander of the forces at Vera Cruz.



United States marines boarding a transport.



Copyright International News Service

Main deck of the dreadnaught Wyoming, flagship of the great fleet.



Governor Dunne of Illinois shows recruits how to work first tractor to be used on Lincoln Highway in Illinois.

Governor Dunne turns first shovel of dirt at Mooseheart, Ill.

At Joy Morton's farm, Governor Dunne removes an obstacle.

Crowd at Franklin Grove, Ill., where Governor Dunne spoke.



The first good roads day was proclaimed by Governor Dunne of Illinois early in the spring, and actual work was started on the state road system on April 15, when the governor and party, filling seven motor cars, left Chicago in the early morning, dashed through Maywood, and made the first stop at the Joy Morton farm, where 50 teams were working on the road.

At Mooseheart, the governor shoveled the first dirt and drove the first tractor to be used on the Lincoln Highway in Illinois. Stops were made at all towns along the 134-mile route, and speeches were made.

Radium and Its Power to Cure

By D. WATERSON

PART II.—CANCER CURE; THE PSYCHICAL SIDE; THE SOURCES OF RADIUM; THE NEW TRINITY; THE PRICE OF RADIUM, ETC.

WILL RADIUM CURE CANCER?

The attempt to obtain a cure, even if unsuccessful, generally gives relief, and, for this reason, radium is often used in hopeless cases, particularly in breast cancer, where it promotes the healing of ulcers and checks the growth of secondary deposits.

But exact information can only be based on exact knowledge, and, to the popular demand for information, doctors can only say they are confronted by two great mysteries—the origin of cancer and the working of radium. Take cancer. It is almost impossible to make any statement concerning it to which exception may not be taken. Beginning in a single, tiny focus, it may be multiple from the start; usually steadily enlarging, it may actually diminish in size while it develops; usually showing little power of development, the malignant cells may organize into higher tissues so completely as to make it impossible to recognize the signs of a malignant growth.

What then of radium, the youngest of the sciences? It is potent, it is wonderful, but its exact action upon living tissues is unexplained and variable, and, at present, uncontrollable. The great question at the back of all reported "cures" is, has the cancer cell really been attacked and rendered impotent?

AN EXPERIMENT

In 1904 Professor Neuberg, of Berlin, took two pieces of cancerous tissue and put them in water. On one he placed an open radium capsule, i. e., one from which emanation was escaping, and this

piece decayed seven times faster than the other, giving good evidence of increased activity in the autolytic ferments.

Freund, of Vienna, one of the first to use radium, says he has noted recurrences four years after apparent cures of cancer, and doubts whether it is possible to bring sufficiently strong rays to act upon the tumor without doing injury to other organs.

Exner, of Vienna, also a pioneer, though he has obtained specially good results in carcinomata of the skin and has seen cancer in the throat greatly improved, also reports recurrences after seven and nine years. He believes in the cure by radium, but thinks that control of dosage is not yet sufficiently understood.

Dr. A. E. H. Pinch, of the Radium Institute, London, notes betterment of malignant cancer cases, but no cures. In the first report issued about 600 to 700 cases were given, including 134 suffering from superficial cancer. Of these 134, seven were "apparently cured"; 39 decidedly improved, 22 died, 20 showed no improvement, 23 gave up treatment; fifteen received preventive raying and eight were too recent to be classified.

Falk claims never to have seen complete healing, and three other leading German doctors all note definite improvement, but no definite cures of malignant cancer.

CANCER OF THE TONGUE NOT CURABLE

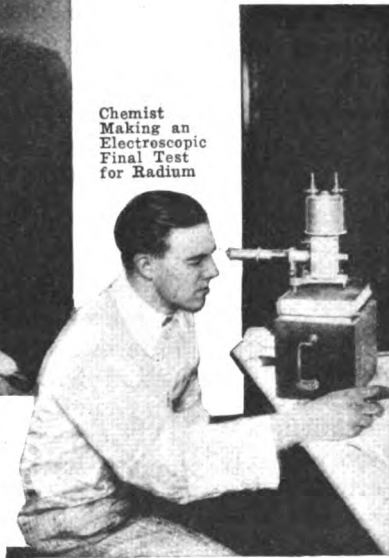
The "cures" of this much dreaded disease which from time to time raise hope in those so afflicted, are only those of "benign" growths, though these



Angus Cameron, President of the Radium Company of America

a few weeks or months. Increased use of radium becomes too painful, although at first it acted as an anodyne. After a malignant disease has become general, surgery is useless, and radium, too, at present, is powerless.

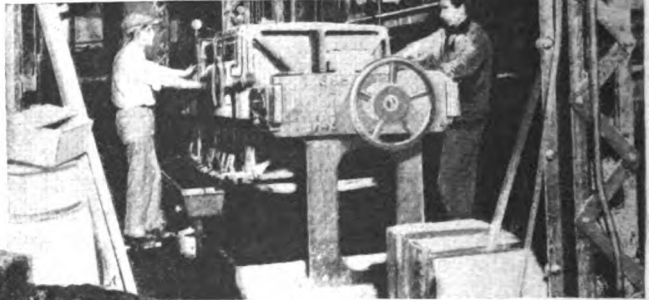
Chemist Making an Electrosopic Final Test for Radium



WHAT IS METASTASIS?

In one sense it is a word used by the pessimist to indicate that, though the main source of infection may be healed, there may be "metastasis" or transportation of cancer cells to other parts of the body ready to produce fresh tumors, the transportation occurring always by one of

are bad enough and may, unless quickly treated, become "malignant" and inoperable. Dr. Robert Abbé, of New York, has cured many of the first kind after one or two applications of radium, but in malignant ones he sees only alleviation, for the



View in a Radium Factory Showing the Vats Where the Successive Precipitations and Eliminations Take Place in Obtaining the Concentrates Rich in Radio-active Material



Some Specimens of Carnotite Ore—Hundreds of Tons of This Produce a Few Milligrams of Radium Salts

two routes, the blood current and the lymph current.

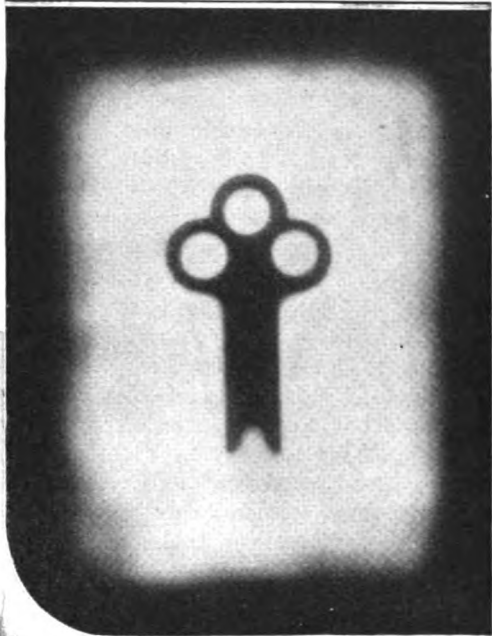
This is true, but the optimist can truthfully answer that the enemy at outlying posts can be attacked and disposed of as soon as he declares himself, early operation by knife or radium invariably

cancer may shrink and leave a tolerably clean surface, only to light up again in being attended with success, so that, *with the main infection controlled, and*

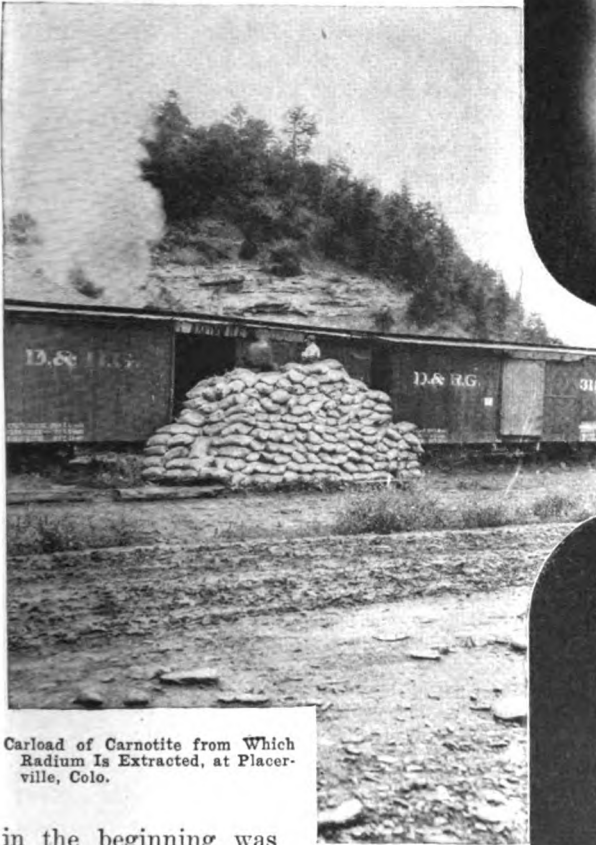
the transported cells subjected to radical treatment, there seems no reason to despair of cure.

THE PSYCHICAL SIDE

The doctors are ready to admit that the wonderful cures, real or apparent, which attend the advent of a new cure, are somewhat aided by the creation of fresh hope in the patients. But radium

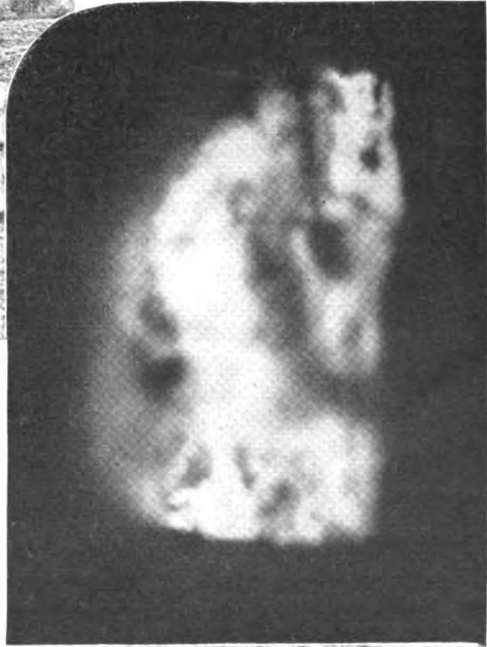


Key Photographed by Rays from Carnotite After 50 Hours' Exposure



Carload of Carnotite from Which Radium Is Extracted, at Placerville, Colo.

in the beginning was never advertised as a "cure-all." For more than ten years it has been silently making its reputation, while other vaunted treatments for tuberculosis, syphilis, epilepsy, etc., are as dead as those who underwent them. Moreover, every case treated is most anxiously watched and the return of disease after apparent cure faithfully reported.



Pitchblende Which Photographed Itself After 15 Hours' Exposure

THE USE OF CARNOTITE

Hitherto there were but three sources of radium—Austria and to a small extent in South Australia and Cornwall, England. Now a considerable territory is being worked for the radium bearing mineral, carnotite, in southwestern Colorado, over 28 tons of pure uranium oxide being secured from the western ores in 1912, but, curiously, while America needed radium, these ores were shipped to Europe, and America had to go there to get a supply. In 1913 the Standard Chemical Co. of Pittsburgh, Pa., exported 45 milligrams of radium sulphate of high purity to Vienna. Of course, the extraction and chemical processes are tremendously expensive, but a process has been invented by the U. S. Bureau of Mines and, under the endowments of two Americans, a building has been opened in Denver, Colorado, where, if the promised process is successful, enough radium will be secured for urgent needs.

Wherever uranium exists, radium is also found in the mineral. Uranium and, therefore, radium are found in carnotite and its associated minerals. Carnotite is a pale yellow mineral, usually found in pockets of sandstone deposits. It may be in the form of light yellow specks disseminated through the sandstone or more or less massive, associated with blue, black or brown vanadium ores. It stands the real test as to radio-activity by discharging an electroscope and affecting a photographic plate. In varying degrees of strength it is applied in pulverized form to superficial skin diseases.

It is claimed for the Colorado carnotite that its value is only slightly below that of the Joachimsthal mine in Austria.

MESOTHORIUM FAVORED IN GERMANY

Mesothorium, discovered by Otto Hahn, is a product of thorium, one of the uranium family, the other products being radio-thorium and thorium X. The

German doctors claim that it has a softer action than radium and needs no screens save the talc covering of the tube. Kuznitzky, a Vienna dermatologist, recently reports cures of nineteen out of 24 skin cancers. It has the advantage of being cheaper than radium, one milligram costing about \$47, and it is hoped to obtain large quantities from the monazite sands found in South America.

The reports made early in 1913 at the Gynecologic Congress at Halle of the success following the use of larger quantities of mesothorium in cancer of the uterus caused so great a demand that the price went much higher, but, as Dr. Stefan Meyer, director of the Radium Research Institute in Vienna, says: "If a milligram of mesothorium costs about \$47 and will half decay in $5\frac{1}{2}$ years, it certainly has no advantage over radium bromide, which lasts 2,000 years and costs, per milligram, about \$75. Moreover, the emanation cannot be used, for it has a life of only 58 seconds, whereas that of radium lasts $3\frac{1}{2}$ days.

THE NEW TRINITY

There has recently been invented a new control of the X-ray, the device originating with Dr. W. David Coolidge, of New York, who claims that deeply penetrative rays can be passed into the human body and regulated at will by the operators, so, step by step, the two handmaids of surgery, radium and Röntgen rays, are becoming more helpful to, but not wholly superseding surgery, for, in many cases, the one can but expose the field of operation, and the other make an operation possible or complete the surgical work. The time may come when the use of the knife may be an exception, but until then the triune fight will be continued.

In March, 1914, fresh discoveries were announced concerning the beta rays in healing. Dr. Robert Abbe spoke of a new electro-magnetic machine which would permit of using the beta rays alone and Dr. Alexis Carrel is also studying their effect on living tissue at the

Rockefeller Institute. Dr. Abbe calls it dissociation of "the rays.

The exploratory operation and guess-work probings are superseded by an X-ray diagnosis, and often an aperient medicine has been found the only treatment required.

THE SWALLOWED TUBE

The X-ray was once of good service when a patient with cancer of the mouth swallowed the tiny tube of radium. Two or three pictures of his interior were taken daily and the progress of the tube through the intestines until ejected made an interesting study, more so because it was valued at some \$600. The patient suffered no harm.

THE PRICE OF RADIUM

Dr. Lazarus Barlow, director of the Cancer Research Laboratory at the Middlesex Hospital, London, says that those who control the radium market are inflating the prices so as to get as much as possible while the demand lasts. There is arising a strong protest against radium products being sold out of the country from whence they are obtained. Austria stopped that long ago, but only recently an English firm, which offered Cornish radium at \$75 a milligram to English hospitals and failed to get that price, obtained \$100 for it in Germany. In 1913 the larger part of the radium sold came from Colorado carnotite, but it was sold in Europe, while America sorely needed it.

In 1903 the price of a milligram was \$2, which rose in 1912-13 to \$75 and in 1914 to \$80 and \$100.

The only hope of cheapness seems to be in state annexation and control of radio-active ore-producing mines, and the discovery of other radio-active minerals or some cheaper form of extraction and preparation. To obtain radium from pitchblende means months, perhaps a year, of labor, for, even when the active impurities are removed, there is a succession of crushing, fusing, washing and

dissolving processes to reduce a ton of ore to a few pounds of radio-active substance, which, again, is subjected to many repetitions of fractional crystallization before the radium chloride is isolated and the bromide prepared. Eight tons of uranium ore only yield one grain of pure radium chloride.

In 1912 the Austrian government bought up all the mines at Joachimsthal, Bohemia, whence radium is extracted. The price paid was nearly \$500,000. The bulk of the output will be given to the Radium Institute; some to hospitals and some sold to physicians.

RADIUM INSTITUTES

The first to be opened was in Paris, owing to the exertions of Madame Curie, Henri Becquerel, Henri Danlos and others. It was but a small place at first, but 1913 saw the new "Radium Palace," wherein the "Curie building" is for laboratory work and courses on radio-activity, under Madame Curie herself, but the most interesting building is the "Temple of Radium," where the radium is kept and experimental work done.

The second to be opened was the one in London, founded (1911) through the generosity of Lord Iveagh and Lord Ernest Cassel. It owns the largest quantity of radium of any institute, but has to hold a day and night clinic in order to treat the ever increasing number of patients. The head of it is Mr. A. E. H. Pinch, F. R. C. S.

On April 1, 1913, a radium institute, through the efforts of Prof. His, was opened in Berlin. It is financed through an appropriation by the Kaiser Wilhelm Society for Scientific Research and grants from private industrial societies. Like most German institutions, it is thoroughly equipped, having fifteen departments, including three laboratories and several clinics.

There is also one in Heidelberg, with Professor Lenard at the head; one at Vienna, directed by Dr. Riehl; one at

Edinburgh, with Dr. Dawson Turner, a pioneer writer on radium-therapy, as director, and Madame Curie founded one last year at Warsaw; Geneva is to have one this year, and the one founded in New York City by Dr. Howard Kelly and Dr. James Douglas in 1913 is soon to become operative. It has obtained the rights to mine 27 claims in the carnotite district in Paradox Valley, Colorado, and, under agreement with the Bureau of Mines, the latter will superintend the technical operations at the mines.

FRESH DISCOVERIES OF RADIUM

Recently the Bolneological Society of Budapest was told by Dr. Wesselsky, professor of chemistry, that under Buda-

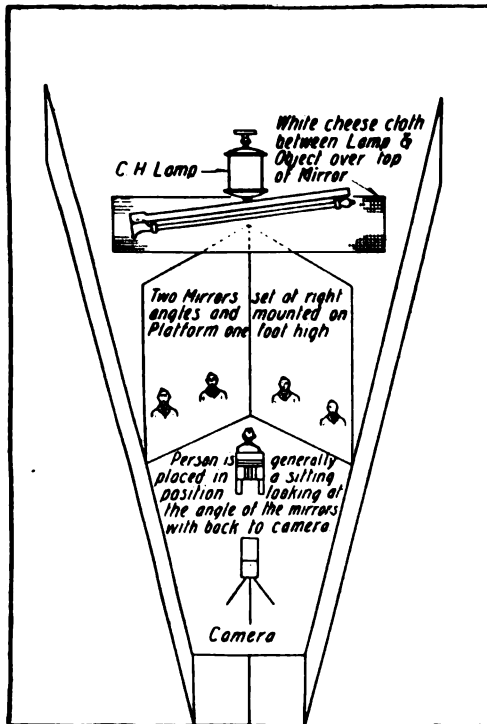
pest there are vast radium strata and that it is these which impart the high temperature and healing virtues to the thermal springs, which contain 35 mg. of radium to every ten litres of water.

In December, 1913, a discovery of carnotite ore was made at Mauch Chunk, Pennsylvania, in a cut made by the Tamaqua trolley line along the eastern base of Mount Pisgah, and government experts determined about two per cent uranium oxide. The deposits are the property of the Lehigh Coal & Navigation Company, and they have turned the property over to the government for scientific work. Should any great quantity of radium be produced it will be given to philanthropic medical work.

MULTIPLE PHOTOGRAPHS

The scheme of showing in a photograph four or five likenesses of one individual has always proved an attractive one because of a certain air of

mystery surrounding it. To the average person it is quite mystifying how the different poses can be secured of the same individual all on one plate. The attached sketch shows how this may be effected.



Multiple Photograph Plan

There are two special mirrors with frames only on three sides, each five feet high and three feet wide, placed at an angle of about 75° , the angle being formed by the edges of the glass alone.

The subject sits at a table with his back to the camera, facing the right angle formed by the mirrors. The camera then points at the back of his head, and the reproduction obtained from the combination of the mirrors results in showing on the plate a reproduction which looks as if five men were sitting at the table, each an exact duplicate of the other.

Not the least important feature of this scheme is that of securing the right light with the proper diffusion. In this case, a Cooper Hewitt mercury vapor lamp is suspended directly over the man's head, and about half way between the location of the man and the mirrors. White cheese cloth is placed between the lamp and the object over the top of the mirrors in order to further increase the diffusion.

THE ANCIENT ART OF ALCHEMY

“Chemistry owes a heavy debt to the early workers and writers,” declares James Campbell Brown, in his fascinating history of the subject, “for the art of alchemy, commonly supposed to be occupied with the search for the philosopher’s stone and the elixir of life, was in reality the rudimentary stage of the science of chemistry. The most ancient alchemists exercised their skill in practical operations. They studied the metallurgy of the metals known to them, practised the arts of preparing drugs, and perhaps poisons, of making, tinting and working glass, painting and staining fabrics and of making soap and developed the use of antiseptics and the hydrocarbon industries.

“In ancient times many fanciful modes of representing chemical changes were suggested. These generally took the form of assuming that like attracts like; that substances which combine to form a different substance contain some principle or essence common to both and that such bodies are constituted of particles of various forms, round or angular, pointed or hooked, straight or spiral. Lucretius explained why wine passes rapidly and oil slowly through a sieve

by the assumption that the particles of oil are either larger than those of wine or are more hooked and interwoven

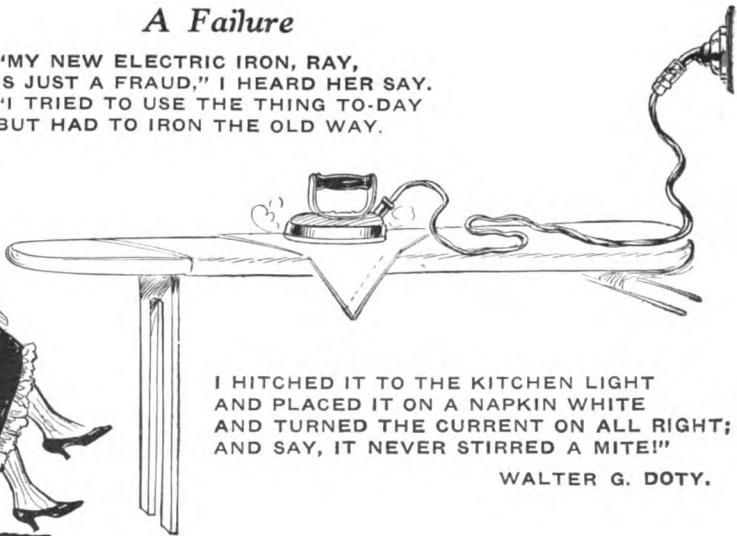
THE HISTORIC SUBSOIL OF PARIS

In the course of certain investigations having for their purpose the determination of the nature of the subsoil of Paris, the authorities drove a well in the Place de l’Hotel de Ville. The result of this operation threw great light on the manner in which great cities, in the course of centuries, bury the relics of their past.

In the present case there was found first a layer of rubbish, nearly four and a half feet thick, and dating from the Sixteenth Century to the Nineteenth. The second layer, a little over two and a half feet in thickness, consists of rubbish recognizable by the character of its fragments as pertaining to the period from the Fourteenth to the Sixteenth Century. This is separated from the first layer by a thin deposit of sand, and a second sandy deposit covers the third layer which plainly shows relics of the Eleventh and Twelfth Centuries. At the bottom is a clayey deposit filled with fragments of pottery belonging to the Gallic and Gallo-Roman periods.

A Failure

“MY NEW ELECTRIC IRON, RAY,
IS JUST A FRAUD,” I HEARD HER SAY.
“I TRIED TO USE THE THING TO-DAY
BUT HAD TO IRON THE OLD WAY.



I HITCHED IT TO THE KITCHEN LIGHT
AND PLACED IT ON A NAPKIN WHITE
AND TURNED THE CURRENT ON ALL RIGHT;
AND SAY, IT NEVER STIRRED A MITE!”

WALTER G. DOTY.

Portable City of Ringlingville

From yanking out the aching molar of an elephant to stringing the wires for the electric illumination of the "big top," the three ring circus is full of human interest happenings. System and special time saving equipment enable the portable city of Ringlingville, covering 20 acres, and with a population of 1,370 people, 735 horses and 1,090 animals, including 41 elephants, to move from town to town with less confusion than the city flat dweller can move to the flat across the hall.

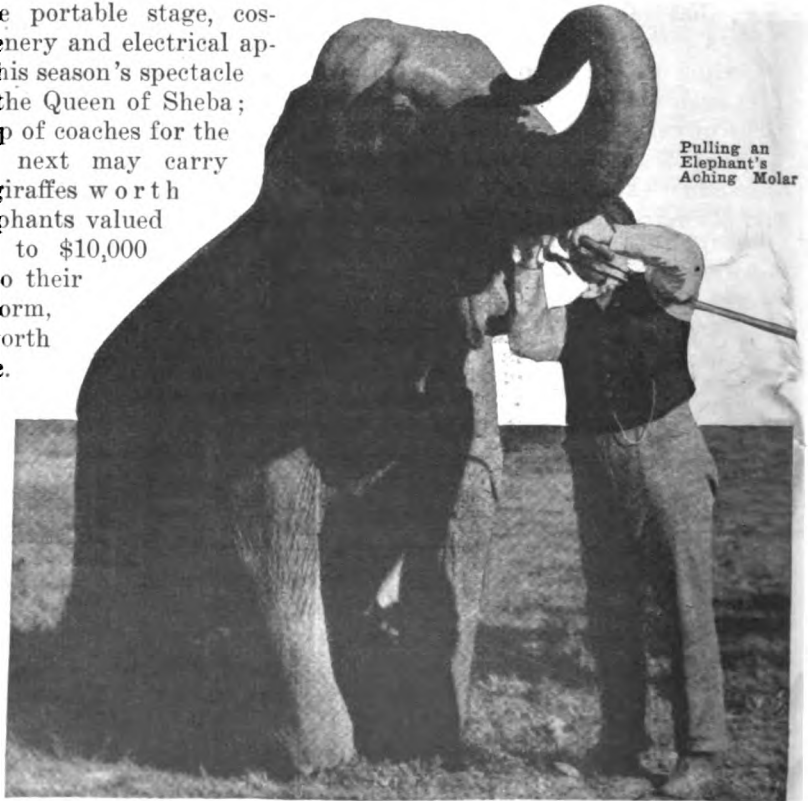
The cost to keep this strange city together averages \$8,000 a day. To transport this tented enterprise over the country, 89 double length railroad cars are required, divided into five, and sometimes six, sections. One section of 20 cars hauls the parade equipment, another carries the portable stage, costumes, special scenery and electrical apparatus used in this season's spectacle of Solomon and the Queen of Sheba; a third is made up of coaches for the performers; the next may carry the menagerie—giraffes worth \$12,000 each, elephants valued at from \$5,000 to \$10,000 each, according to their ability to perform, trained horses worth \$1,000 apiece, etc.

The feeding of the menagerie and the people of this aggregation is accomplished with perfect ease. The gigantic canvas hotel has the largest kitchen in the world. A force of 90 chefs, cooks and waiters serve

over 4,000 meals a day. The cooking is done on a range weighing more than half a dozen touring cars and in caldrons and pots of giant proportions heated by steam.

Since a majority of this season's performers come from foreign lands, interpreters are carried for them and native dishes are prepared for their tables. A classification of the people of Ringlingville discloses the fact that nineteen languages and dialects are spoken by its inhabitants.

Contributing especially to the comfort of both spectators and performers is the electric illumination of both the grounds and the big tent interior and it should be mentioned also that the animal cages are lighted with incandescent lamps, the lamps being securely protected and read-



Pulling an
Elephant's
Aching Molar

ily taken out and replaced. Four arc lamps illuminate the



Manicuring a Mammoth

front of the principal entrance, while 28 are placed inside the main tent where the circus performance is given, lighting the rings and stages and the seats, which provide for 15,000 people. All ticket sellers' wagons are electric lighted and two strong spotlights are used to play upon the stages between the rings. A huge wagon, which is used



for a workshop, is also equipped with a powerful searchlight mounted on its top, which is directed to different parts of the grounds, while taking down tents and loading after the evening performance.

The current for lighting is furnished by two gasoline engine driven generators, each mounted on a truck. They are duplicates, so that if one should by any chance become disabled the other can sup-

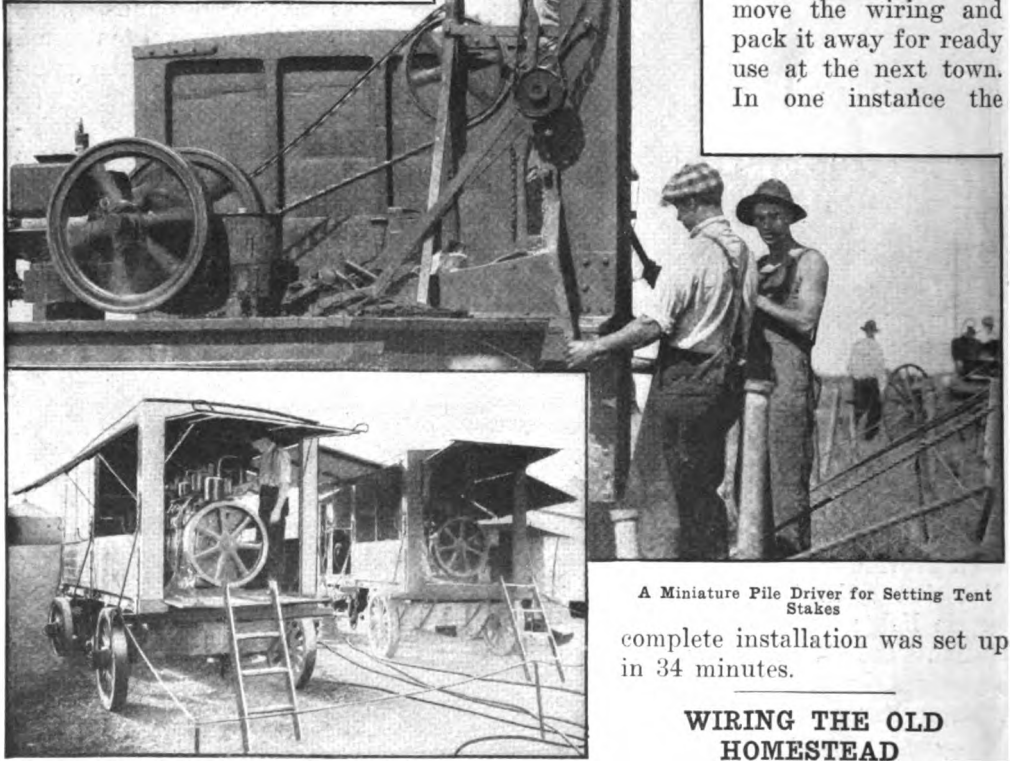


Scissors Will Not Do Here

ply the current for at least half the lights. The generators are arranged, however, to be operated together; that is, in multiple. Being of special design, they are built to run evenly, so that there is no flickering of the lights and no storage battery is used, as this would add too much weight to the equipment

for frequent and easy transportation.

Probably the most interesting feature in the daily installation



The Portable, Engine Driven Electric Generators which Supply the Current for All the Illumination

of the outfit is the putting down of the cables. These are of varied lengths, of well protected wire wound on reels resembling those used to reel up garden hose. From the switchboard upon each truck these cables are dropped to the ground and unreeled to the points where they connect with the lighting circuits. Should they lay in places where there is apt to be traffic of any sort they are placed in a trench about six inches deep in the ground and covered with earth. The tents are all equipped with protected wiring, which can be easily and quickly installed and removed each time the tents are erected and taken down. The electricians are, therefore, on the grounds in the early morning, when the

first center poles go up, to attach their paraphernalia, and, likewise, at midnight they are on hand to remove the wiring and pack it away for ready use at the next town. In one instance the

A Miniature Pile Driver for Setting Tent Stakes

complete installation was set up in 34 minutes.

WIRING THE OLD HOMESTEAD

Electric wiring is invariably installed in a new house while it

is in the course of construction, but the "old homestead," the house in which grandmother dwelt, or any ready built house is easily converted into a modern abode in a few hours by the electrician and his helper.



"Some Job"—Carrying Water to the Elephants



Conversing with the Grey
Haired Matron While
Awaiting Their Cue in
the Dressing Room



Getting Ready for the Parade

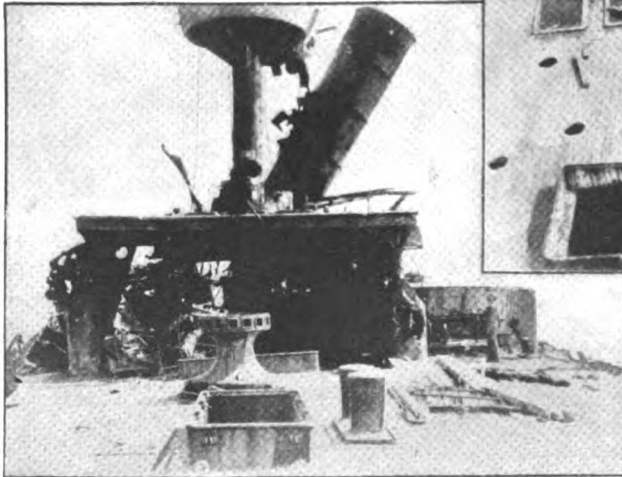
WHAT HAPPENS TO A BATTLESHIP UNDER FIRE

When two great battleships approach within a range of 20,000 yards and prepare to wage war, one of those ships is doomed to destruction. Scores of projectiles filled with deadly high explosives, terrible in their destructive powers, will be hurled forth, and so remarkably accurate is the aim of Uncle Sam's gun pointers that if the American ship gets the range of the enemy first—the enemy is lost!

A modern naval battle will last about five or six minutes. On the Arkansas recently a turret crew established a world's record by firing six shots in 57 seconds and securing six hits.

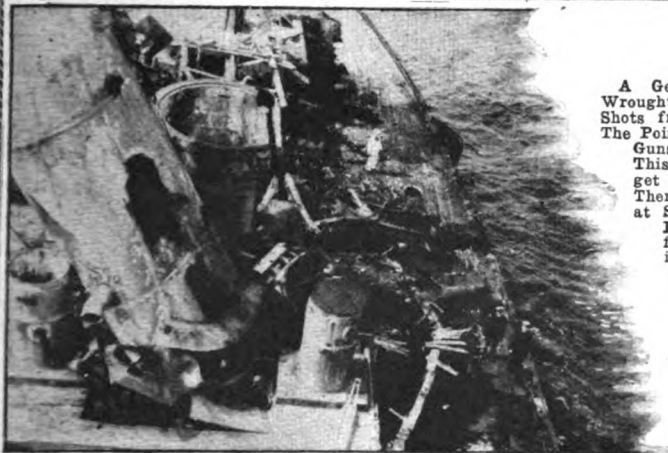
To determine the effect of gun fire on battleships, the Navy Department used the old Texas, now the San Marcos, as a target. The conclusion was reached that if a battleship was to win a battle, it must strike the first blow, something like the theory of the boy who says that he who punches first wins the fight.

This remarkable set of photographs has been a closely guarded secret of the Navy Department, but as the ships used today are of a much newer design and they are built to withstand more severe punishment, the pictures have been released for publication, thus enabling POPULAR ELECTRICITY AND THE WORLD'S ADVANCE to give to its readers a clear idea of what happens to a battleship under fire.

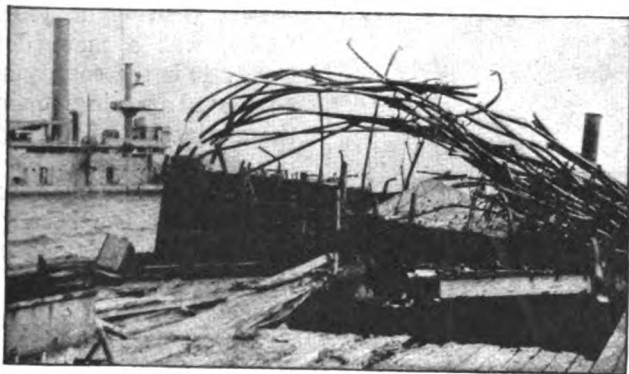


The Superstructure of the San Marcos After a Few Minutes of Firing. Great Projectiles Tore Gaping Holes in the Sides and in an Instant There Was Laid in Wreckage What Was Once a Trim Man-o'-War

Showing the Base of the Cage Mast Erected on the Stern of the San Marcos Just to Be Knocked Down Again by the Big Guns of the Fleet. Apparently Fragile in Construction—It Is Made of Tubular Steel of About Two Inches in Diameter—Woven in a Form of Basket Work; the Tremendous Strength and Durability of the Mast Surprised Even Its Inventors



A General View of the Havoc Wrought by the Firing of Some 40 Shots from the Navy's Great Guns. The Pointers and Trainers of the Big Guns Get Excellent Training from This Firing at a Real Ship. Target Practice Is Very Fine, but There Is an Excitement in Firing at Something Real That Goes a Long Way to Steady the Men for the Real Work of Battle in the Future



The Basket Work or Cage Mast Is Essentially an Institution in the American Navy; Other Navies the World Over Have Pronounced It Valueless. The Mast Shown in the Photograph Was Erected on the San Marcos and Made the Target of the Idaho. It Took More than a Dozen Shots to Bring the Fire Control Mast Tumbling Down. One Shot Wrecked the Old Style "Fighting Top" Mast

Examining the Result of the Fire. Immediately After the Tests, a Party of Officers and Bluejackets Went Aboard the Ship to Determine the Effect of the Projectiles. They Were Amazed. Nearly Every Shot Fired at the Ship Had Been Placed in a Vital Part. This Shows a Man Standing Just Within the Top of the Smoke Stack

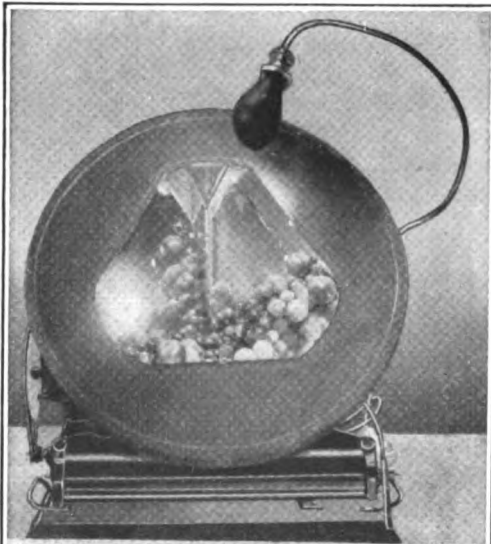


THE SYMMETROSCOPE

New York advertisers have become unusually enthusiastic over another electrical device for advertising purposes. This newest invention is called the Symmetroscope and is primarily meant to attract attention to an advertiser's show window.

The Symmetroscope is in the form of a huge horn of plenty with mirrored sides. A handful of coins or fruit is dumped into the horn and a tiny motor

started. This motor slowly revolves the horn, which action tumbles the coins or fruit over the mirrors, producing a myriad of reflections giving the observer the impression that the horn is brimming over with good things. And just when one becomes very much interested in the contents of the horn the motor stops, a clutch throws the horn backward and in its place, exactly where the observer's eyes are focused, appears a large advertising sign which unrolls from a cylinder. There are ten of these signs and the Symmetroscope displays one after every three revolutions of the horn.



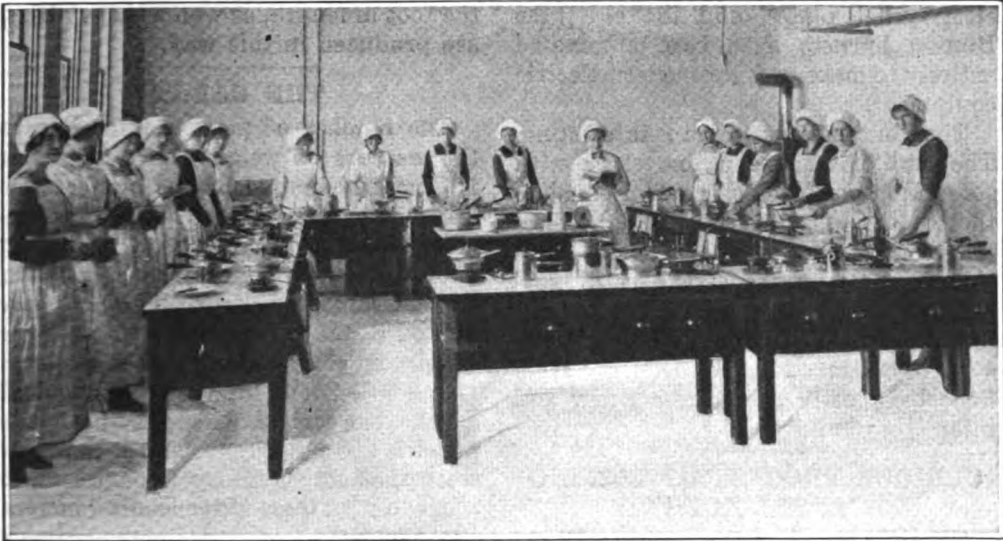
Novel Electrical Device Which Attracts Attention in a Show Window

THE ELECTRIC HIGH SCHOOL

Less than eight years ago, Rupert, Idaho, was a mere dot on the map. Today it is the county seat of a thickly populated farming community and bears the distinction of having a school building heated entirely by electricity. In addition to heating this building, electric current has been put to so many uses in this very modern school, that it is known as the "The Electric High School."

Rupert is in the heart of the big Minidoka Irrigation Project. In the winter the Government sells its surplus current from its own power house at a cost low enough to compete with coal. The cost of heating the new school by electricity was estimated at \$1,760. Coal might have been used at a cost of about \$1,000.00, but by the use of the electrical heating system, the wages of an engineer at \$75.00 per month was saved, and the cost of installing the electric system used proved to be \$3,000.00 less than for any other known system of heat. After a severe test during the winter months just past the original estimate of \$1,750 has proved too high by about \$250.

The system used in this three story high school is remarkable for its simplicity. The common arrangement of hot air pipes, or flues, has been followed, but a battery of electric heating units,



Domestic Science Room in Electric High School

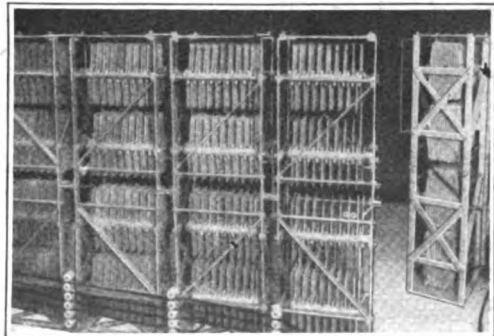
resembling those used in large electric bake shops, has taken the place of the furnace and steam coils. In the furnace room are 20 eighteen kilowatt units installed in pairs, each pair with a separate control of the current from a switchboard in the office of the principal. An emergency switch is also installed in the office which will cut off the current from the entire building.



Science Laboratories Have Electric Hot Plates Instead of Bunsen Burners

Electricity has been put to work in every nook and cranny of the building. A ten horsepower motor drives the ventilating fan and supplies all necessary power for the saw and lathes in the manual training department. An electric water heater furnishes hot water for shower baths in the gymnasium and in the various lavatories.

In the domestic science room there are 20 electric disk stoves, chafing dishes and other electrical cooking apparatus. Here is also installed a modern electric range for the preparation of cafeteria lunches for students who remain all day at the



Electric Heating System

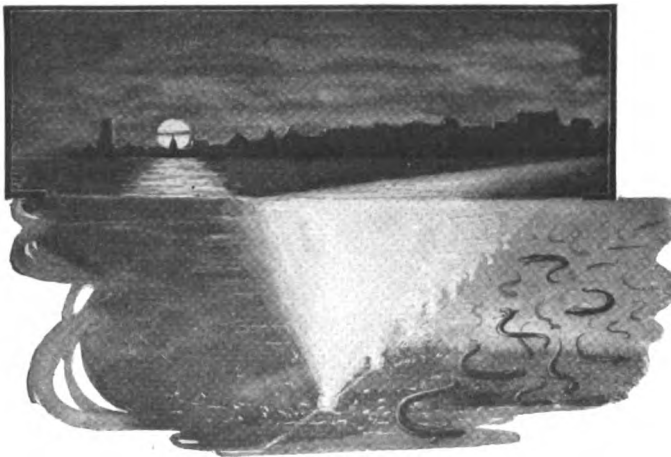
school. In the science laboratories, students of chemistry are provided with

electric hot plates, and the old time Bunsen burners have been eliminated entirely to make way for modern electric equipment.

The illuminating system is interesting. The auditorium has a fine stage with stage lights and switch control equal to that of the best theaters. All the electric equipment was planned by local electricians with the assistance of government engineers employed at the power station. Mr. George L. Dilworth, superintendent of the Rupert High School, is justly proud of his new and interesting building.

CURIOUS PROCESS OF MAKING STEEL RODS

There is employed a comparatively new process for making bars of steel and other metal. This process consists in heating metal until it becomes plastic, and then forcing it, with the aid of a hydraulic ram, from the compressing cylinder through a die. It issues



Wall of Illuminated Water Which Prevents Migration of Eels to the Sea

from the die in the form of a rod, like sausage from a sausage machine. The rods are round, square, or hexagonal, according to the shape of the die, and it is claimed that they possess greater tensile strength than rolled bars of equal size. Wire so small that it weighs only one one-hundredth of a pound to

the foot in length, as well as heavy bars, are produced in this way.

THE CARAT

The number of persons interested in the measure of weight called the carat is generally limited by the number who are able, or are disposed, to possess precious stones of great value. Of course, it is of the utmost importance to jewelers, and, inasmuch as slight differences have existed in the estimation of this delicate weight, an effort has been made to obtain the adoption of an international standard carat. The weight which has been proposed is 200 milligrams, and it is understood that our Treasury Department, in common with those of the leading powers, has adopted the new standard. It has hitherto been customary in English speaking countries to reckon a carat as equal to 3.2 grains. The uncertainty of the original measure is indicated by the derivation of the word from the Greek word for the fruit of the carob.

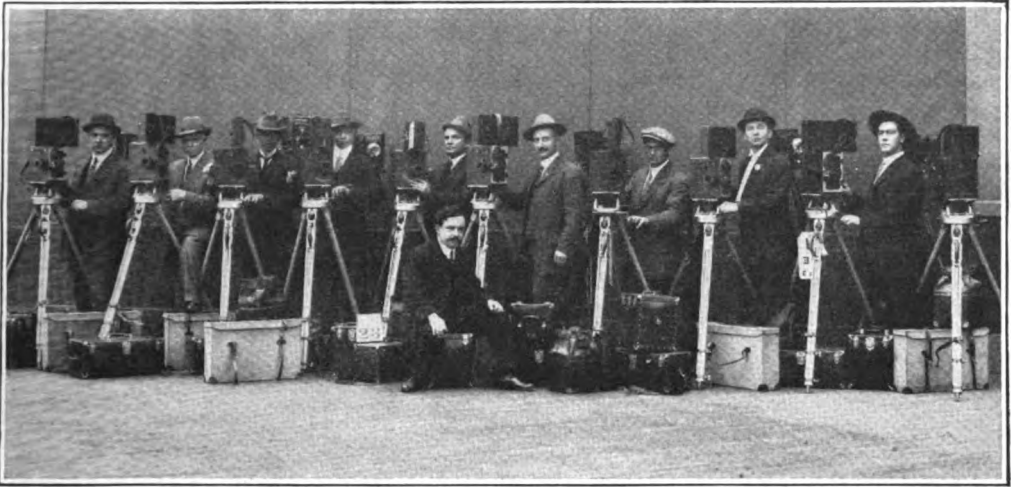
EELS AND ELECTRIC LIGHTS

Pursuant to the recommendations of biologists of the University of Copenhagen, the Danish Government has caused to be placed a row of electric lights along a submarine cable extending from the coast of Funen to the Island of Fano, to prevent the migration into the sea of the eels which inhabit the inner waters and the escape of which

is a great loss to fishermen. Eels migrate only during the hours of darkness, and accordingly the lamps are turned on as soon as night approaches, thus interposing a wall of illuminated water which the eels are afraid to pass.

A similar plan has been used in Italy to retain eels in shallow water.

MOTION PICTURES



AN ARRAY OF CAMERA MEN

Since the camera man cannot very well take his own picture, the theater goer knows little of him. He is, however, a very businesslike individual and, like the referee in a boxing match or wrestling bout, has to be "on his pins," so to speak, quite as much as the principals. In this picture are to be seen a part of the staff of Lubin photographers with their paraphernalia. They are not averse to being looked at for once themselves.

PUBLIC SCHOOL AT HOLLYWOOD STUDIOS

For the interest and advancement of children who work in films, a public school has been established at the Hollywood, Calif., Universal studios. It is a branch institution of the Los Angeles public schools, but it was built, furnished and will be supported financially by the Universal company.

From fifteen to 25 children, ranging from nursing babies to boys and girls well along in their teens, are used regularly, a few hours each day, at the Hollywood studios and at the ranch in the San Fernando valley.

"In the portrayal of various phases of society for the camera," says Mr. Bernstein, west coast manager, "the use of children is indispensable. Their presence during the acting of the drama, even if they have no acting parts to sustain, lends inestimable dramatic sincerity to the production as well as effecting a true-to-life tone to the performance.

"On the other hand, their parents and society owe them a proper education. Professional children often grow up without schooling of any sort. This is unjust to the child. That we may use the children and at the same time not do

them the injustice of interfering with their schooling, a school has been established at the studios."

The schoolroom has been fitted out in a renovated portion of the building which was originally used by the costuming department. This building was left vacant when the department was

added that in etching this halftone plate the engraver took special pains to preserve exactly the effect of the original photograph.

The inventor, Mr. Morris E. Hair, of Chicago, described his idea as a new kind of light made by burning metallic magnesium and aluminum, which gives



Photograph Taken on a Dark Night Under Adverse Conditions: a Four-Second Exposure With Two Candles

moved to its new quarters in the second story of the new property building.

There are desks to accommodate 50 pupils and a teacher. The room is some distance from the large stages so that the noise incident to big productions will not interfere with study.

MOVING PICTURES MADE AT NIGHT

The photograph reproduced herewith was made on a very dark night by the aid of a new magnesium candle, as it is called. It will be noted that buildings a block or more away are shown in fair detail, while in the immediate foreground effects approaching those of daylight were obtained. It may also be an intense white light with violet ray,

similar to that of flashlight powder, but continuous and more actinic. These ingredients are put up in the form of candles by a fireworks company, for considerable experience and knowledge of that class of work is required to make them. The candles are lighted with a fuse.

It is said that light—that is, light suitable for photographing, is carried $33\frac{1}{2}$ times as far with one of these candles as with an ordinary arc lamp.

Evidently, from the continuous nature of the light and its power, it will be of considerable value to film manufacturers—in fact, Mr. Hair, being superintendent of a film company and incidentally an expert camera man, developed the light with that end in view.

**CREATING GOOD WILL WITH
MOTION PICTURES**

One of the most interesting series of commercial pictures produced during the past year was a 3,000 foot subject taken by Charles F. Stark, head of the Essanay commercial department, entitled "Building a 20 Inch Gas Main." The film was contracted for by the East Ohio Gas Company.

The scenes were taken in the mountainous regions of West Virginia and show the drilling of a gas well, surveying for the pipe line, panoramic views of the hills and mountains necessary to be crossed with the pipe line, which is to supply gas for the principal cities of eastern Ohio, the making of the couplings, the hauling of pipe by narrow gauge railroad up the mountains and by six horse teams, digging trenches, and the final laying of the pipe.

One of the most spectacular scenes shows the difficulties encountered in hauling pipe, as good roads are few and far between and it was necessary to drive the six horse teams up a river bed.

At present the pictures are being shown to the public, accompanied by a lecturer who gives an interesting talk on the advantage Cleveland residents have over those in other large cities who pay 80 cents per thousand cubic feet for gas, while Cleveland buys its natural gas of a considerably higher heating value for 30 cents per thousand.

The motion picture as a media for creating public good will for public service companies is incomparable, and the results secured by the East Ohio Gas Company have been so gratifying that six other natural gas companies in the middle west have purchased copies of this film for use in their communities.

Mr. R. W. Gallagher, general manager of the gas company, stated that his company had secured more good publicity and had aroused more interest through the use of motion pictures than it would be possible to secure through any other media for the same expenditure.



A Gas Well



Digging Trenches



Hauling Pipe Across a Stream



Lowering Pipe Into the Trench



Digging Trench Up a Mountain Side

The Battle of the Phagocytes

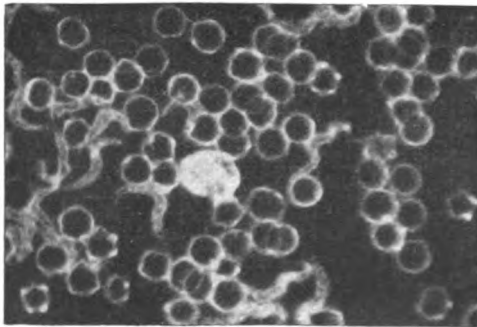
Wonderful Films Made by the French Scientist Comandon, Showing the White Blood Corpuscles at War with the Germs of the Dreaded Sleeping Sickness

The moving picture machine has been used for many widely separated purposes, from the study of the work of athletes to correct their faults to factory operations for the purpose of doing away with useless motion and raising the standard of efficiency. But the most interesting, perhaps, of all its applications is that made by a French scientist in the study of microbes. In collaboration with M. Levaditi and M. Mutermeleh, M. Comandon, a noted biologist, has been investigating, with the help of both the cinematograph and the microscope, the strange phenomena of phagocytosis. Before a session of the Academy of Medicine in Paris he has given the results of his studies. One knows the great battle that the leucocytes, or white corpuscles of the blood, are continually waging against disease microbes of all kinds. In other words, the name of phagocytosis has been given to the phenomenon by which a body defends itself, by grace of the little white corpuscles, against the invasion of disease. Those particular types of leucocytes showing a marked tendency toward fighting disease microbes are called phagocytes.

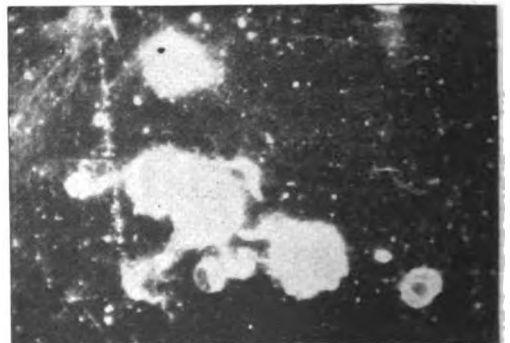


Biologist Comandon in the Center—At His Right Is His Collaborator, M. Levaditi

M. Comandon and his colleagues conceived the idea of making visible this internal struggle and through this to learn



Trypanosomes, the Microbes of the Sleeping Sickness, Wandering in the Blood Stream. They Are the Faint, Elongated, Snake Like Objects. In the Center Is a Leucocyte or White Blood Corpuscle Not Yet Wakened to Activity



Here, However, the Leucocytes Are Seen in Actual Battle With the Trypanosomes. One of the Latter Is Just About to Be Enveloped and Swallowed

better how to give relief and assist the action of the white corpuscles. So he selected one of the most redoubtable microbes, the *trypanosome du nagana*—that is to say, the terrible sleeping sickness.

They prepared to make this study of the microbes and white corpuscles under varying conditions: without the use of a serum; then with a normal serum, and finally with the specific serum. They made cinematographic films of these various actions, tremendously enlarged, of course, and finally the films thus obtained were exhibited before the members of the Academy.

The snake like trypanosomes were seen, moving freely and with an astonishing quickness in the midst of the leucocytes, touching them with impunity, passing through the same channels without difficulty.

Then, when the appropriate serum had been introduced, the scene changed. These trypanosomes, always agile, became, at the touch of a white corpuscle, immediately detected, caught and held like a sailor enveloped in the tentacles of an octopus or cuttlefish, and, despite all its efforts to free itself, held closer and closer. Finally the movements of the trypanosome ceased entirely and it died, swallowed up by the leucocyte.

Here, for the physicians who watched the moving films, was a more interesting drama than the most thrilling that could be penned by the scenario writer. But

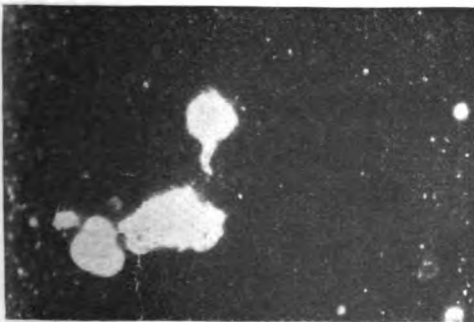
more than the interest of the action of the trypanosomes and leucocytes was the revelation to the physicians of the means by which the microbe of the sleeping sickness can be destroyed within the human system.

HOW THE MOTION PICTURE ORIGINATED

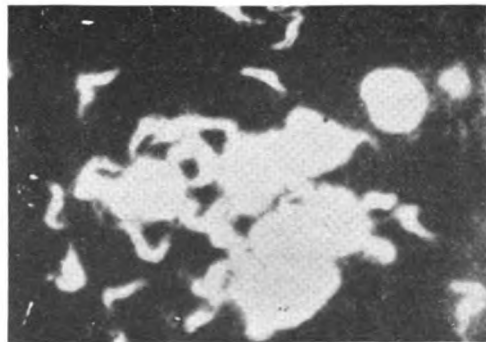
The origin of the popular motion picture may be traced to an after dinner discussion that occurred, almost a hundred years ago, between Sir John Herschel and his friend, Charles Babbage.

Sir John had asked Babbage how he would show both sides of a shilling coin at the same time. Babbage said that the thing might be done by holding the coin before a mirror, a suggestion, however, which did not satisfy the scientist, who thereupon proceeded to give his guests a better example. He spun the shilling on his dinner plate, at the same time inviting attention to the peculiar fact that, if the eye were placed on a level with the rotating coin, one could see both sides thereof at the same time. The result of his little diversion was that Babbage imparted the information to a scientific friend named Fitton, who constructed a working model based upon the idea.

Now Fitton's device consisted merely of a disk, on one side of which was shown the drawing of a bird, while on the other side was drawn an empty



Completion of Phagocytosis or Destruction by the Leucocytes (Phagocytes). One of the Trypanosomes Has Not Been Completely Swallowed, but to All Intents and Purposes the Battle Is Ended



In This Case the Story Is Different. Here the Trypanosomes Far Outnumber the Leucocytes and a Tremendous Battle Is On

Boston Photo News Co.

birdcage. So, when the disk was rapidly revolving on a silk thread, the bird was made to appear imprisoned in the cage. Here, for the first time, was shown that persistence of vision whereon all moving pictures depend for their effect. The eye retains the image of the object seen for a fraction of a second after the object has been removed. Fitton called his model the thaumatrope.

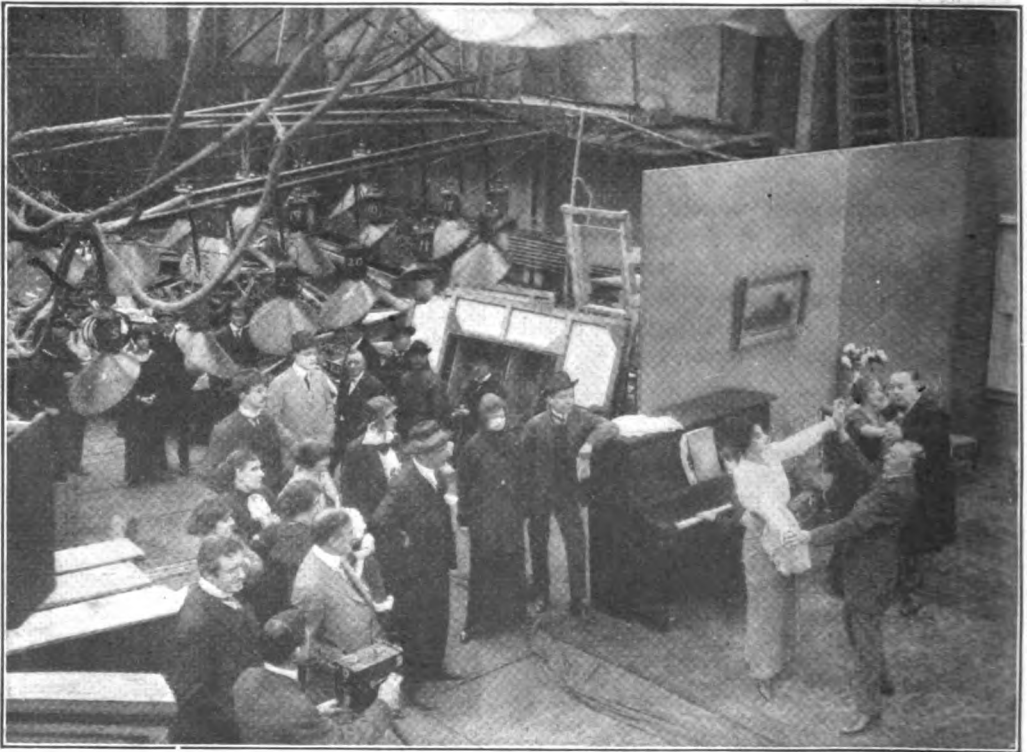
The next stage of development was seen in the "wheel of life," or zoetrope, a device consisting of a cylinder perforated with a series of slots. Within this cylinder was placed a band of drawings of dancing men. When this device was caused to rotate slowly, the figures seen through the slots gave the effect of a dancing motion.

The first systematic photographs of moving creatures taken at regular intervals were not, however, made until 1877.

DELAYED ONLY FORTY-EIGHT HOURS

A record in resourcefulness and quick action was recently made when the Edison studio burned, as Director Charles Seay had his company at work on the studio floor in a hastily constructed "set" exactly 48 hours after the last fireman retired from the premises.

Those in the neighborhood of the Edison studio in New York the morning of the fire had the odd experience of watching such stars as Marc MacDermott, Ben Wilson, Augustus Phillips, Mary Fuller, Mariam Nesbitt and Bliss Milford working in a real fire scene, for all were busily engaged in saving their wardrobes and trunks and aiding in getting the film negatives safely transferred from the storeroom to private homes in the neighborhood. Manager and Mrs. Plimpton were to have sailed for Europe on the Olympic at 10 o'clock on the morning of the fire, but a telephone call



The First Scene Taken at the Edison Studio After the Fire

reached Mr. Plimpton on the dock and he instantly returned to the studio and

factory, though the steamer sailed with a stateroom full of luggage, fruit, flowers and other tokens of esteem—though without its passengers.

As soon as the news of the fire reached Thomas A. Edison, who was in Fort Myers, Fla., at the time, he wired Manager Plimpton as follows:

“I learn that the artists at great risk to themselves helped to save all they could. This is very fine. I appreciate it. We are all one big family anyway.

“Thomas A. Edison.”

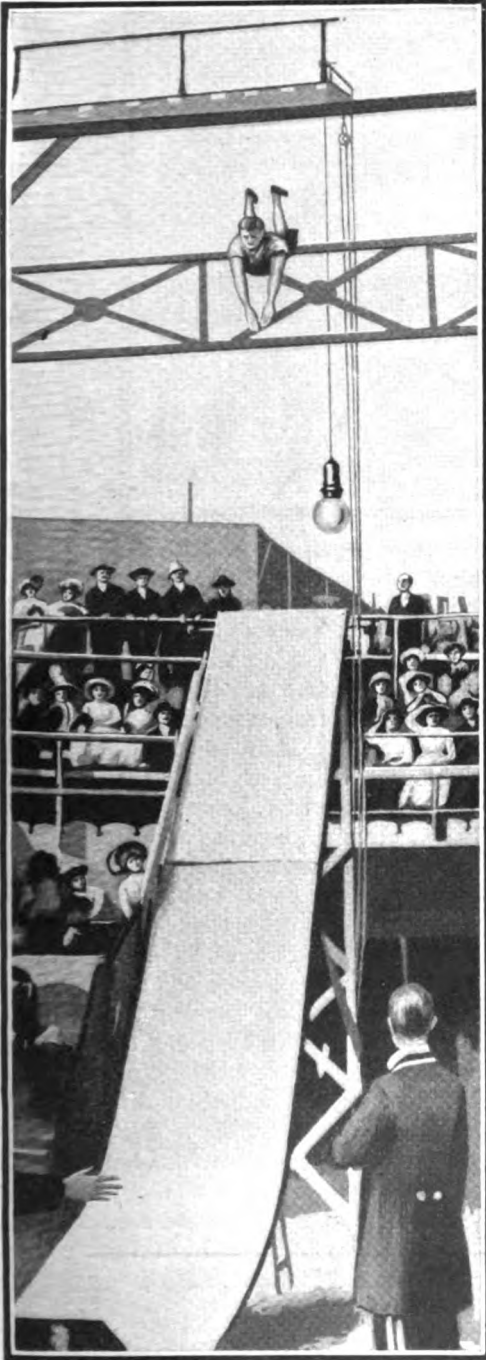
COURTED DEATH FOR FILM

In making a film near Berlin, Germany, an actor of the company took his life in his hands, when he dived from a platform onto a slide board 75 feet below. By good luck he was not killed, although this is one of the most daring and sensational “thrillers” staged by the modern circus and seldom if ever before attempted by the non-professional diver.

A PARAGRAPH ON FILM FOOTAGE

The vast extent of the motion picture industry may be surmised by the amount of Vitagraph film used. The weekly output of this company’s plant is about ten reels, each reel averaging 1,000 feet in length. America uses about 60 copies of each picture, while the European Vitagraph plant, located in Paris, France, makes more than 250 copies of each picture. This Parisian plant supplies the entire world excepting the United States and Canada. Computation shows that in all more than three million feet of film is used weekly by this one concern. In one year it uses enough film to extend around the world.

Some of the recent Mexican films prove that the camera man was well within the fighting zone when the fighting was at its hottest, for within the range of the camera’s eye the forces of the enemy can be clearly seen.



An Actor Leaps from a Platform Onto a Slide Board 25 Yards Below. The Picture Was Taken for a Film, Near Berlin

ascinating Alaska Shown in Film



Photographs Copyrighted by

An Intense Moment—Hunting Walrus

F. E. Kleinschmidt

Lovers of motion pictures, becoming jaded, perhaps, with the ordinary studio dramas, produced amid canvas backgrounds of the film studios and enacted by stars of note in the photoplay world, often enjoy by way of variety such films as those taken by Captain Scott and his brave followers in their dash to the South Pole, or those snapped by daring Paul Rainey, who penetrates the jungles of Africa and films wild animals in their native haunts. For such "fans" the six reels of motion pictures taken by Captain F. E. Kleinschmidt in the Arctic regions and which are now being exhibited as feature attractions in a number of America's largest cities will prove a never ending source of delight, for they combine all the stirring action and interest which attaches to the ordinary studio "thriller" and, in addition, possess a wonderful educational value, since they are in reality nothing more or less than an animated natural history.

You are sure to hold your breath during the exciting seal fight and the dangers which beset the captain when taking the pictures at the risk of his own life,

and to marvel at the antics and habits of the animals encountered.

Views of Seattle flash upon the screen at the beginning of the exhibition and then we are taken up that wonderful scenic route, "The Inside Passage," to Alaska, arriving at last at an Indian village with great, carved totem poles, inscribed with legends of Hydah and Thlinket. Proceeding up Glacier Bay, we pass enormous icebergs 300 feet high, which have broken off from the largest glacier in the world—the "Muir" glacier. We are shown the vessel of the expedition breaking its way through the ice fields in front of the great wall of ice, 800 to 900 feet high, and as the camera swings about to take in the huge mountain of ice with its spires, domes and rugged peaks, we suddenly see a wall of ice the size of a 20 story building break off and fall into the sea, creating a tidal wave 30 feet high that comes, with foam on its crest, racing toward the spectator.

Reel two shows us the reindeer of Alaska and close-up views show the fine antlered male, the does with their fawns.

feeding on the reindeer moss or lying in secluded places calmly chewing their cuds. Herds of a thousand or more deer pass in review before the camera. Next comes one of the most marvelous pictures ever recorded on a strip of film. By means of Captain Kleinschmidt's camera we penetrate the waters of a river and behold salmon, under water, in great masses, ascending the stream. It is spawning time and the salmon



Captain Kleinschmidt with a Moose He Has Just Shot

are on their way from the sea to a place up-river where they can safely deposit their eggs and then die. The great silver horde moves slowly along beneath the surface of the water and suddenly runs into a net, set at right angles to the course of the stream. The net forms a trap and as the inner heart of the net is raised we behold over 30,000 salmon and codfish held captive within a comparatively small enclosure. A boat suddenly enters the trap and fishermen spike out the codfish and throw them away, while the bailing net is used to dip out a thou-

sand salmon at a time and load them aboard the waiting steamer.

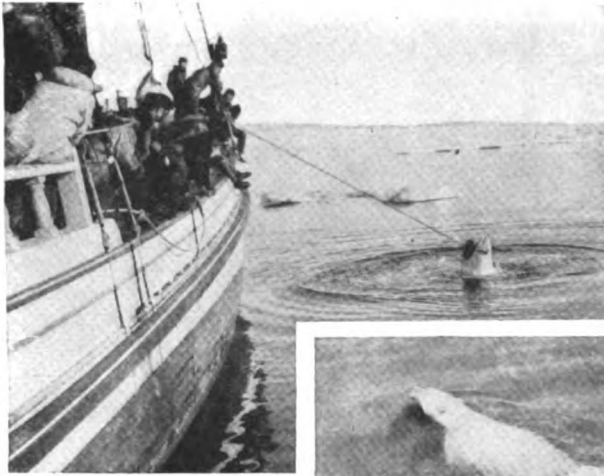
Views of Stellers Lions, the largest of the seal species, breeding on Bogoslof Island, are next shown and we see the huge male seals, each with his harem of females and puppies, sunning themselves on the warm beach sands. One of the harems is invaded by a huge bachelor seal and immediately a fight takes place. Gigantic fangs are bared and powerful jaws slash at each other's necks. A female tries to desert her lord and master and is immediately disciplined. So

human are their actions that the spectator can almost believe it is a domestic drama in civilized life he is witnessing. One large bull seal comes up to within fifteen feet of the camera and stands there barking and showing his fangs. Captain Kleinschmidt suddenly enters the picture, armed with a rope, and attacks the animal. At first the seal flees, but beholding the captain standing amid the puppies he comes ashore again and madly



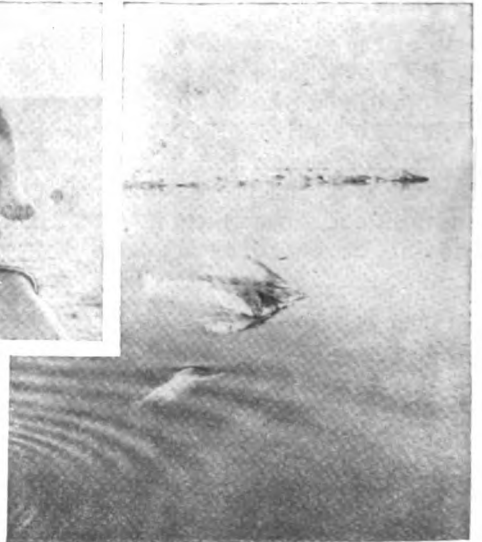
Cooking Lunch on the Ice—the Main Dish Is Seal Blubber

The Two Pictures Below Show an Enormous Polar Bear Being Drawn Over the Rail, and at the Bottom a Group of Men Roping a Polar Bear Within 18° of the North Pole



Roping a Polar Bear from the Ship's Rail

Polar Bear Mother and Cub Out for a Swim, the Cub Hanging to Its Mother's Tail

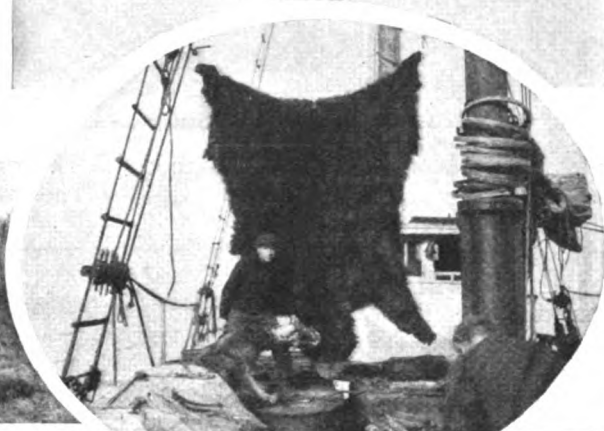


Polar Bear Coming to the Surface After a Long Dive

charges him. The captain retreats and the sea lion boldly takes his place amid his puppies and issues a challenge to all the world. As Captain Kleinschmidt again approaches he rears his head and

the captain hurls his lasso. The noose slips off the pyramid like neck and he charges the captain again. Then the noose settles around his neck and the captain quickly throws a half-hitch on

Captain Kleinschmidt Is Here Seen as He Looked When Taking a Sleigh Ride in the Far North, Drawn by Reindeer. In the Picture Just Below That Is Seen the Largest Kodiak Bear Skin on Record



Above We Have a View of a Kodiak Bear Which Fell to Captain Kleinschmidt's Gun and at the Bottom a Glimpse of a Most Remarkable Film Showing a Run of Salmon



top of the loop and, with a companion to help, tries to hold the huge beast. All in vain. The seal drags them down to the water and even though the line is made fast around a boulder, he snaps it like a thread.

The third reel takes us into the in-

terior of Alaska on a moose hunt. We see a cow moose feeding within 50 feet of the camera, a young bull swimming a lake, and a great monarch of the forest, surprised by the camera, shaking his huge antlered head at the strange machine clicking in front of him. The



Huge Sea Lion Roped After an Exciting Chase

thousands of sea lions who have climbed the steep rocks and upon our approach come tumbling down several hundred feet. You wonder that they don't break every bone in their bodies, as one after another is seen to come tumbling down the face of the cliffs and plump into the water. Mother seals are taking their babies in their mouths, dropping them several hundred feet below and then tumbling after

next scene takes us to Boyroslof Island, where we see a volcano in active erup-

them.

The vessel of the expedition is seen

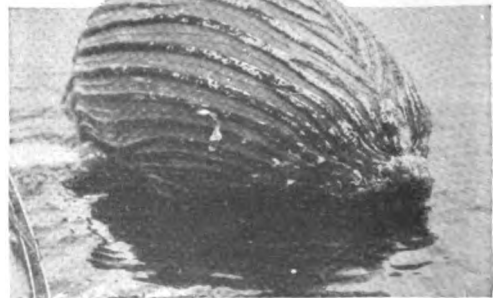
tion, the hot lava transforming the sea into a steaming cauldron. Closer views of the volcanic rocks show every foot of the surface covered by breeding birds—millions of them—of every variety and species. The reel closes with what resembles a snowstorm, although closer inspection proves the snowflakes to be the thousands of birds all in flight at once.

The dangers of navigation on such an expedition as this, where the mariner has no chart to guide him in the hitherto unexplored waters, are aptly illustrated in reel four. We finally land and are taken on a caribou hunt in the foothills which lie beyond the volcano. Unusually close-up views are obtained of these antlered creatures on their feeding grounds, and in the next scene a giant Kodiak bear is seen lying in the alders with his mate standing motionless nearby. Alaskan porcupines are glimpsed and as we pass the seal rocks in front of Resurrection Bay we behold



Section of Film, Although Not Very Clear, Shows a Polar Bear Actually Charging the "Still" Camera Operator at the Left. Farther Along in the Film the Bear Came Uncomfortably Near

penetrating the Arctic ice pack as reel five begins, guided by the captain from the crow's nest on the mast. The party



Sulphur Bottom Whale

here had an accident that almost wrecked the vessel. A severe storm carried away the rudder and for hours the vessel drifted while a new one was being rigged. The ship was steered by means of a plank for 300 miles to the nearest harbor. We behold three of the crew sitting on the plank or rudder to weight it down and lend purchase to the steering.

After much difficulty a new 2,000 pound steel rudder is constructed and after seven days in harbor we leave again for the frozen north. A swimming polar bear is discovered and a chase begins. The bear dives again and again, and finally runs across the ice to escape his hunters. The crew pursue in skin boats and finally return with a polar bear and her cub as their trophies. The camera records the bringing in of the bears after the long trip across the ice, the hoisting of them aboard and skinning them.

In the sixth and last reel we are taken on a walrus hunt by Eskimos. We view the animals at a distance of 20 feet on the ice, the bulls with their great ivory tusks fighting and stabbing at each other, and on being disturbed see them plunge into the sea. These huge marine elephants come up blowing, snorting and rolling their eyes within a few feet of the camera, stationed on the edge of the ice floe.

We are permitted to watch the Eskimos skinning a walrus on the ice and learn how necessary the walrus is for the existence of the natives. The skins are hoisted aboard, a single skin weighing 1,024 pounds, and, later, we behold the expedition landing the Eskimos at the native village and giving to the half starved inhabitants the meat and blubber of the walrus. The dogs are even hungrier and we witness a fight between 50 or more wolf like dogs in their struggle to obtain the best portions of the walrus meat which has been tossed to them.

The closing scene of the film depicts a leviathan of the deep—a huge sulphur

bottom whale. Passing within 20 feet of him as he lies on the surface, you behold, by means of the motion picture camera, a sight which few human beings have ever witnessed and one which will probably never be completely effaced from your memory.

The films have been shown to the National Geographic Society at Washington, D. C., and most highly endorsed by that body. The New York Zoological Society and other gatherings of men noted in science and letters have witnessed the exhibition of the Kleinschmidt pictures and now the public in general is to be given an opportunity of beholding the results of this very successful expedition.

MOTION PICTURES IN JAPAN

Many of the motion picture theaters in Japan, particularly in Tokio, where there are over a hundred, are quite as elegant as some to be found in any American city. You can secure admission for as low as five cents up to as high as 50 cents. In the cheaper portions of most theaters, the natives sit cross-legged on the floor in characteristic Japanese fashion. They remove their shoes before entering and an attendant takes charge of these.

Both American and European pictures are shown, but the principal attraction is a long Japanese play, which is presented in a very unique fashion. In fact, it may be said that the Japanese have real talking pictures.

The film is produced in the same manner as a stage play, with every portion of dialogue spoken.

When the picture is projected an actor and actress stand on each side of the screen and repeat the dialogue in full view of the spectators. The two reciters share the parts played by the different characters. As their spoken words keep strict time with the lip movements of the silent artists, the result, as may be imagined, is very effective.

What Happens to the Scenario

In this, the last installment of the series, the successful Scenario Author is permitted to obtain some insight in the actual marketing by the film manufacturer of the finished product which has resulted from the carefully prepared plot and outline of action which he sent out some months before; how the theater managers secure the positives from the film exchanges; "first runs"; films for out of town exhibitors, etc.

As many positive prints are made from the negative film as the sales manager has orders for. In most of the big manufacturing plants orders are received for as many prints of any subject as the General Film Company, the Mutual Film Corporation, or the Universal Film Company have exchanges throughout the country, although, frequently, a single exchange will buy several copies or "prints" of a particularly desirable subject, and, again, there are some prints which are not purchased by each of the exchanges. Almost without exception, as many, if not more, prints of any given subject are sold in Europe as in the United States, for the continental film buyers supply the programs for theaters located all over Europe, Asia, Africa and the greater part of South America.

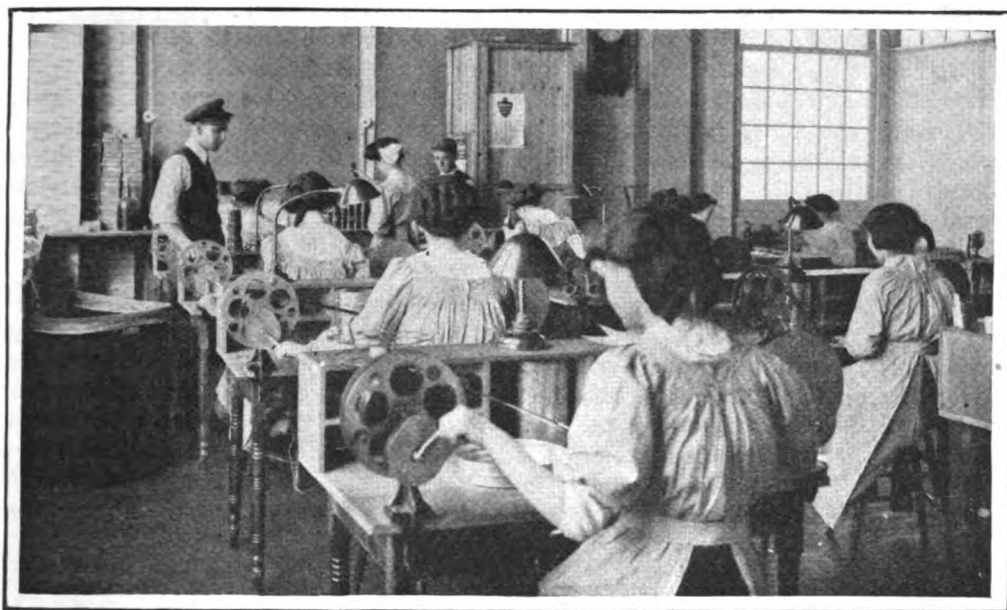
The positive films having been printed they are immediately taken to the developing room, where they go through the same process as did the negative film, which was described last month, winding up with the glycerine bath, as did the negative film. This glycerine bath is necessary since the film must be kept pliable as long as possible, and even after the film has been released and exhibited for a number of weeks, most of the glycerine is lost through evaporation or from other causes, and the film becomes brittle and readily breaks when running through the projection machine. Another treatment in a glycerine bath will usually, however, restore it to its original pliability.

All of the beautiful "firelight," "moonlight" and "dawn" effects are

put into the pictures by means of a tinting solution, which colors the whole surface of the film the color or tint desired. "Tinted" or stained films are dyed over their entire surface with a single color and when projected give the impression of being thrown on a colored screen or through a colored lens. The high lights, or the light portions of the picture, are the only parts affected from the standpoint of the spectator, for the shadows appear black as in the ordinary black and white picture. A red stain gives a most realistic fire scene, and adds much to the interest and beauty of scenes played, for instance, in front of a fireplace, while blue tinting gives the effect of moonlight, and yellow adds greatly to a sunlight view. The "dawn" effect is usually obtained by tinting the film a delicate pinkish shade. When the pictures contain more than one color the process of making them is much more complicated and expensive, for then the colors must be applied individually by hand, or by a complicated mechanical system.

The last process the film goes through before leaving the factory takes place in the "joining room," where the short 200 or 150-foot lengths are assembled and joined together, the necessary subtitles, reproductions of letters, telegrams, etc., are inserted at the proper point, and the picture is united in just the form you see it on the screen.

Long before this time a release date has probably been set for the picture which we have followed through the factory, and several days before the day scheduled for its first public exhibition



Inspecting the Films in the Joining Room

it is carefully boxed up in its tin receptacle and sent by express to the exchange or rental office from which the exhibitor obtains or rents it. The exchange pays the manufacturer for the subject at a stipulated price per reel; thus a two or three reel subject usually costs twice or three times as much as a single reel subject.

The time element enters largely into the business of the exchange, for, naturally, the manager of a theater who is showing the film the first day it is released pays more for its rental than does the manager who books it for his theater when it is a week or two weeks old. The man using it first is called a "first run" customer—that is, he runs it first or before any other exhibitor in his city or neighborhood. By the time the picture is two weeks old—has been shown fourteen days—its rental price is considerably reduced and the exhibitor then booking it expects to pay considerably less for his service.

At the exchange the film is unpacked, inspected, and numbered, so that it can be readily found in the stacks and stacks

of others which are carefully stored in the film room. After a number has been attached to the film, as a means of identification, the same number is usually affixed to the posters which illustrate and describe it, and which are sold to the exhibitor at the same time that he rents the film. The out-of-town exhibitor—that is, one who lives in a city outside the one in which the film exchange is located—usually has little choice in the selection of his program or the films which he will show, as the booking man at the exchange sends him such films as his contract calls for in point of age limit, and such as happen to be "in," or available at the time the shipment must be made. For instance, if John Brown at Podunk is paying for three films a day, a price which entitles him to "30-day stuff," or films 30 days old, the booking man will each day ship Mr. Brown three films which have been in the exchange 30 days and shown that number of times by other exhibitors. Usually, though, the little theater runs one reel about two weeks old, one about three weeks old, and one four weeks or

older, so that much care and attention is necessary to see that Brown receives only films of the age for which his contract calls.

The city exhibitor, living in a city in which an exchange is located, has a decided advantage over his country brother, for he can go down to the exchange and himself witness the films which are going to be released. In a city like Chicago, for instance, the theater managers assemble in large numbers on the afternoons in which the exchange gives its "show" and sees all the films which will be released during the next week projected on the screen.

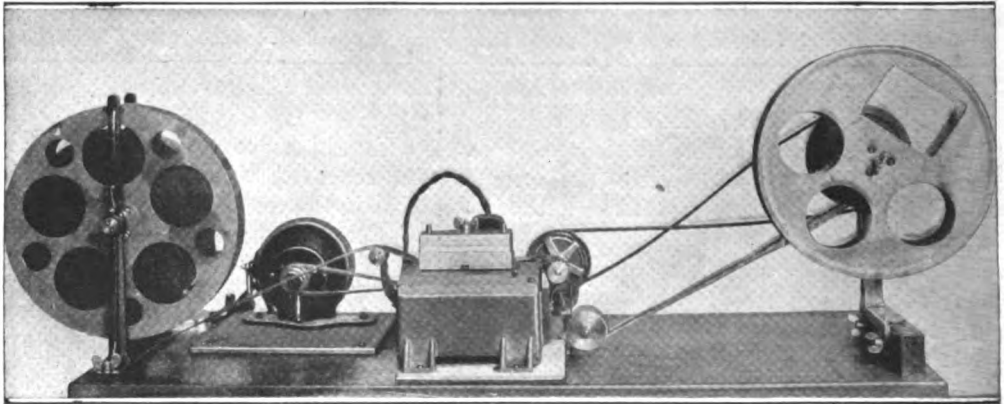
By seeing them himself he can instantly decide whether the picture will

on his hands, sends it out to the Podunk customer, who has to accept what the exchange sends him.

After booking his program, and securing the posters which advertise the pictures he is to show that evening, the exhibitor packs the films in his carrying case and journeys out to the neighborhood in which his theater is located.

IRONING MOTION PICTURE FILMS

In an effort to overcome the trouble of "sticking sprockets" in motion picture theaters, caused by the emulsion on the edges of first run films, an electric film iron has been invented by a New York firm. This machine is composed of two large reels and a tiny electric iron



Electric Film Iron to Overcome Trouble of "Sticking Sprockets"

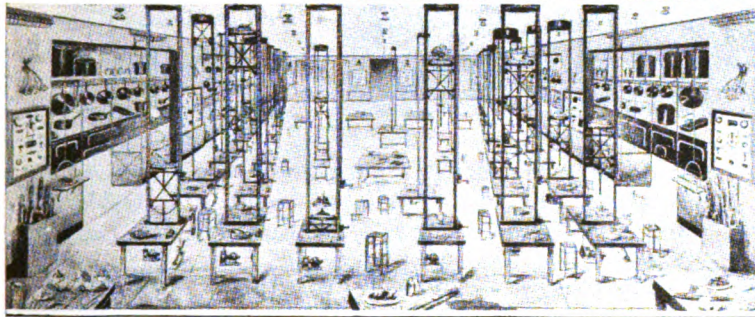
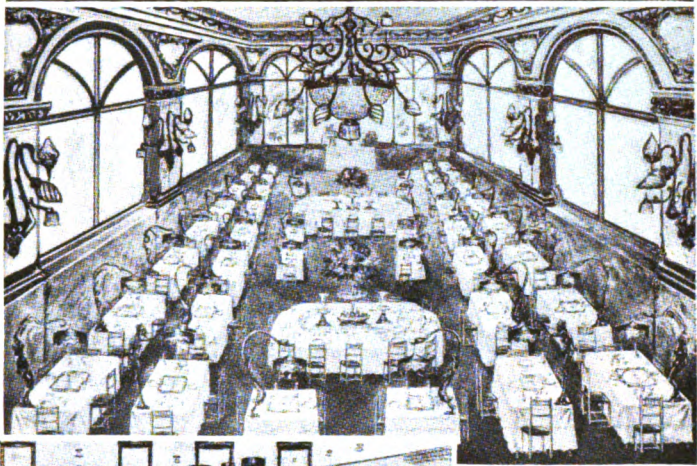
appeal to his patrons or not, and pick and choose what he will "book" on the day that certain subjects are released. For instance, he may see a comedy made by the Puritan Company, which he knows will not please his patrons, and a two reel drama made by Selig or Essanay, which he feels quite certain will satisfy his customers. Accordingly, when it comes time to book his program, he tells the booking man that he wants the Essanay or Selig drama released on Wednesday, Thursday, or whatever day it is scheduled for "first run," and not under any circumstances to book him the Puritan comedy. The booking man then, being left with the Puritan comedy

with an eighth of an inch surface on either side. New films are put on the reels and run through the compartment containing the iron. The heat generated by the electricity keeps the iron at a temperature hot enough to melt the emulsion and remove it from the sprocket holes in the film but at the same time the iron is not permitted to get hot enough to ignite the film.

Heretofore the sprocket holes of first run films have been filled with sticky emulsion. This gluey substance would come off on the sprocket cogs of the first projection machine using them and the result would be that the mechanism would be crippled temporarily.

**ELECTRA FERIA—
MARVEL OF
SCIENCE**

Electra Feria, the new electric hotel in Paris, was constructed by M. George Knap, whose famous electrical house has already been described in the pages of this magazine. In



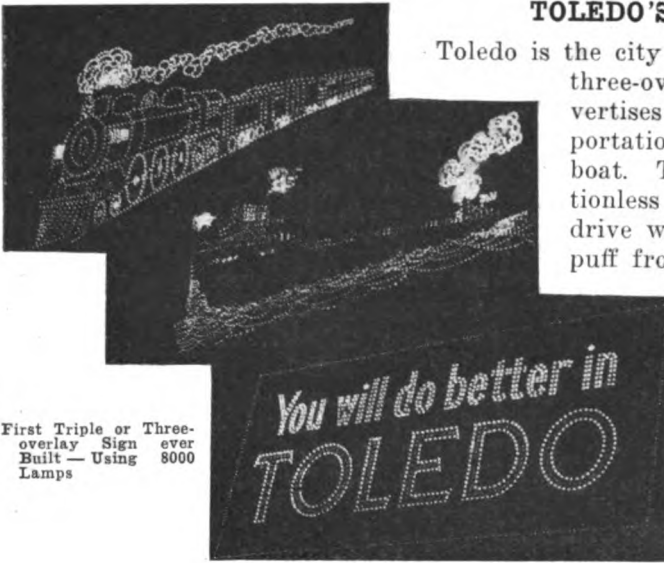
Dining Room in Paris Electrical Hotel, and Beneath it the Electrically Operated Kitchen from which the Food is Hoisted to the Tables by Dumb Waiters.

the large dining hall of this strange hostelry there are no waiters to be seen, but all is sent up to the tables from below, so that the dishes appear on the table as if by magic. A bronze decorative bracket at one corner of the table serves to support a cluster of electric lamps, and concealed in the lamp shade is a loud speaking telephone. Pressing a button sends a signal below, and the waiter's voice comes from the device and requests the order. This is then given by simply speaking in the ordinary tone and without using an apparatus, and soon afterward the dishes appear at the middle of the table in a silver tray which opens up and then closes again. A large basement room corresponds to the dining room, and has a small electric lift under each table for sending up the dishes. Near by are the large electric ranges, where all the cooking is done, and all is laid out so as to secure a rapid service. Payment is made according to

office upon leaving. The rooms of the hotel also have automatic service, with an electric lift for each room. An elaborate system throughout the hotel performs all the work and secures the greatest amount of comfort owing to the many ingenious applications of electricity.

SOURCES OF LITHIUM

During the past few years, it is stated, the operation of mines of the mineral amblygonite in South Dakota has resulted in reducing the price of lithium carbonate from \$2.50 to 50 cents a pound, or even less. Carbonate of lithium, which is extracted from the amblygonite ores, is used in making storage batteries, in the preparation of fireworks and in medicine. Lithium bromid is used to some extent in photography and medicine, but pure lithium, which is the lightest metal known, has no practical use.



First Triple or Three-
overlay Sign ever
Built — Using 8000
Lamps

TOLEDO'S TRIPLE SIGN

Toledo is the city to flash the first triple or three-overlay sign ever built. It advertises electrically the city's transportation facilities, by rail and by boat. The first flash shows a motionless railroad train, then the drive wheels start, there is a puff puff from the smoke stack and as the train appears to gain in speed the rails slip backward with rapidity.

The second display is a large freight steamer with waving flag and water breaking over the front. This effect is shown for eight seconds

and then the city slogan, "You will do better in Toledo," is flashed next in eighteen foot letters. Almost 8,000 Mazda lamps are used.

THE STAIR LAMPS OF EUROPE

Imagine the typical flat dweller in this country coming home in the wee sma' hours and stumbling around through the doorways and hallways to find the button which will allow him to light the electric lights for just long enough for him to reach the top of the stairs and repeating the same operation to the top of the next stairs, etc.

In many of the apartment houses of Europe this is the approved fashion. These apartment houses are provided with automatic stair lamps which can be lighted by the touch of a button at the bottom or the top of the stairs. The lamps burn for two or three minutes, automatically extinguishing themselves at the end of this period.

In the event of any electrical heating device failing to do its work, it is the wisest plan to look first and see if the plug and cord are in good shape.

When the flexible cord used to connect the wall plug receptacles with the heating apparatus becomes frayed, worn or kinked, it should immediately be repaired; as otherwise, when the wear becomes greater through neglect, it is apt to short circuit and the fuses may blow out.

THE "TIMBER CRUISER"

This is the name given in the West to those who seek out new timber regions. The "timber cruiser" knows that the tips of the grass always incline toward the south, and that they are less green on the northward side. In the forest the slender twigs on the boughs bend southward so slightly, it may be, that only the trained eye can detect the deflection. The moss on the tree trunks is always on the north side, the bark is smoother and more supple on the east than toward the west, and southward the mildew never attacks the tree. In such way does the timber cruiser "box the compass" while navigating the wilderness.

The timber cruiser undertakes the most arduous journeys with little else than a blanket and a few days' provisions. The location of a choice tract of timber is a secret to be guarded with his life. Weeks, even months, may intervene before the lands can be "taken up" and entered on the records at Washington.

AEROPLANE ALTITUDE RECORDS

The drawing opposite was taken from the French journal *La Nature* and shows how fast and how far the aeroplane altitude records have climbed since the first flight of Wright in 1908. Records of Frenchmen, only, who have successively held the record for a brief space of time, are shown, with the exceptions of Wright and Latham. Legagneux, last December, went up almost five miles, still far below the top of the mighty Everest.

THE LINCOLN HIGHWAY

“The idealists who have energetically pressed forward the great project of a Lincoln Highway from coast to coast have accomplished wonders towards crystallizing a nation wide demand for the consummation of such a desirable project,” declared Henry B. Joy, president, in the address to the conference of governors at Colorado Springs, August 26, 1913, on the Lincoln Highway. It was resolved that the Lincoln Highway now is and henceforth shall be an existing memorial in tribute to the immortal Abraham Lincoln.

The route begins in New York City; to travel westward from this city one must go 150 miles north to Albany, thence westward or south to Philadelphia 100 miles and thence westward. The state highway work planned and in progress will make the route westward through Pennsylvania the most direct. After crossing this state, Ohio northern roads lead directly over state planned highways connecting by excellent topographical conditions across Indiana with the Overland Trail of history, the open door to the scenic wonders and outdoor playgrounds of the great west.

The government standardized this trail for the ox team, the stage coach and the mail route because of its directness, shortest distance, topography and the conditions of the soil. The Lincoln Highway mileage is about 3,500 miles.





W. S. Gilbreath, Secretary of the Indianapolis Automobile Club, Standing on the Seat of a Touring Car with Flag and Pennants

It traverses almost the center of the United States.

The Lincoln Highway serves more population and there are more lateral connecting roads to points of interest than from any other possible main route. Among the latter are the National Capital, Gettysburg, Mammoth Cave, birthplace of Lincoln, burial place of McKinley, the wonders of Colorado, Wyoming's curiosities of Nature, Glacier Park in Montana, Grand Canyon in Arizona, Yosemite National Park and half a dozen other national forest reserves.

PERFUMED AIR TO SUGGEST SEASONS

Air in the Hotel Alexandria, Los Angeles, Calif., will very shortly be laden with perfume suggestive of and varying with the seasons.

The delicate fragrance of violets, the perfume of orange blossoms, the balmy

odor of pine needles, the suggestion of roses, carnations, lilies of the valley, etc., will be among the perfumes which are to be enjoyed. Electric fans will pass the air through a stream of scented water and other fans will force it along to different points in the building.

NURSERY MILK WARMER

When milk is warmed over fire in the ordinary way, the heat is applied to one spot only, the bottom of the vessel. The milk at once becomes uneven in temperature, being hottest at the bottom and coolest at the top. The nursery milk warmer consists of a coil tube heater that surrounds the glass bottle and heats the water in which it is immersed evenly and quickly. Both coil and bottle are



set in the nickel plated receptacle and the milk heats within three minutes after the current is turned on.

The indispensable water heater will make a cup of tea in three minutes for nurse and boil a pint of water in six minutes. The cup may be freely carried about anywhere, as the cord is easily removable at the cup by means of the quickly detachable connector.

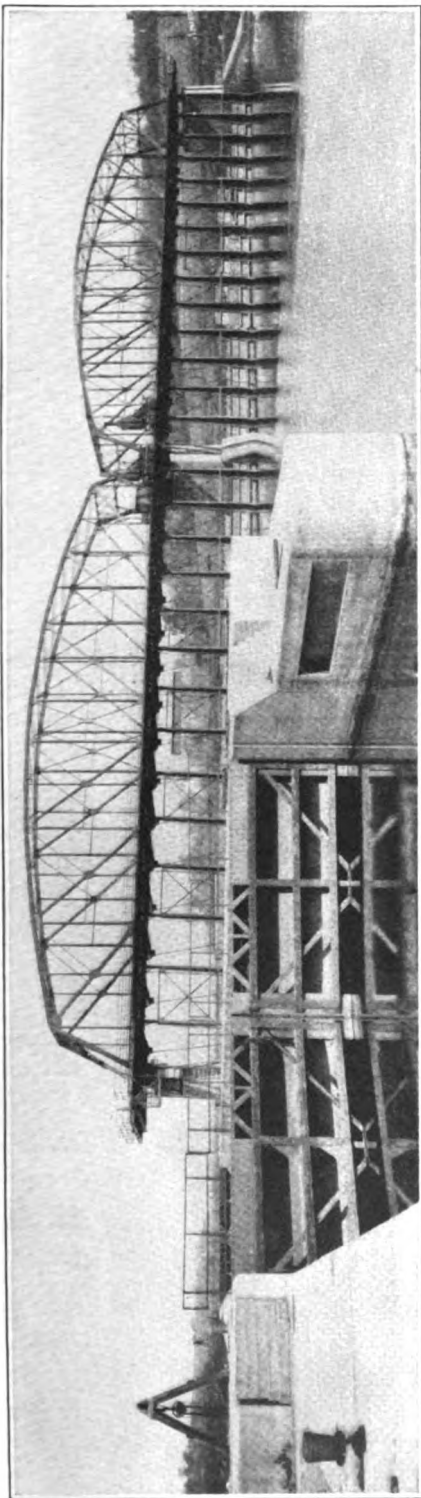
**MAKING THE MOHAWK NAVI-
GABLE**

The Mohawk River is soon to become a great highway of commerce through Central New York. A series of locks and movable dams, eight in number, will form a chain of deep, navigable pools 50 miles in length. Electricity will contribute largely to the successful operation of this system of river canalization.

The movable dam consists of a bridge of heavy structural steel resting on massive concrete piers. From the lower chord of the bridge are suspended steel frames resting against a concrete sill in the river bed. Each frame carries two gates of steel plate, which slide up and down much like ordinary window sashes. Heavy chains operated by steam and electric winches will raise and lower the gates. By lifting one or more gates, the water level above the dam will be regulated. Twelve feet will be the minimum depth for navigation. In flood time all the gates and frames can be swung up under the bridge floor, leaving a clear channel for the rapid discharge of high water. The bridges will be lighted by arc lamps and connected with each other by telephone.

The locks are 328 feet long, and will accommodate six barges of the size now in use on the Erie Canal. The lock gates are of steel. Valves, gates and buffers—in fact, all the mechanism of the locks—will be operated by electric motors set in recesses in the lock walls. The entire apparatus will be electrically controlled from a convenient central point. Numerous arc and incandescent lamps will illuminate the locks and approaches. Power for operating the whole system of locks and movable dams will be supplied from one big hydro-electric plant.

Electric heating apparatus should never be immersed in water unless intended for that purpose and cooking apparatus must not be allowed to boil dry or it will be spoiled just as it would over an ordinary fire.



Lock and Movable Dam. Eight of these Structures on the Mohawk Will Form a Chain of Navigable Pools 50 Miles Long

Telephoning to Europe

By JUDSON D. STUART

On the strength of Dr. Musso's invention, which he claims will enable him to telephone from New York to Europe, a corporation has been formed to advance the idea from the present experimental laboratory stage to success or failure under working conditions—over land and under seas. In printing this interview with the inventor, his opinions, only, are expressed. When set at the task of transmitting speech under a real ocean some thousands of miles across, instead of through an "ocean equivalent" of inductances, capacities, resistances, etc., the system will meet its real test. In the meantime, although the inventor does not tell the real secret of the system, the general features as he outlines them are interesting.—
EDITORIAL NOTE.



Dr. Musso

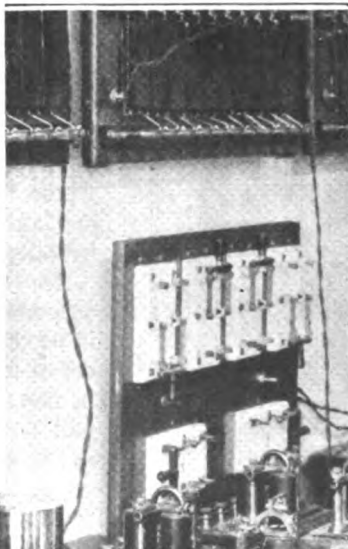
this friend. Pouf! it is simple, it is nothing."

This was Dr. Giuseppe Musso's reply when I said,

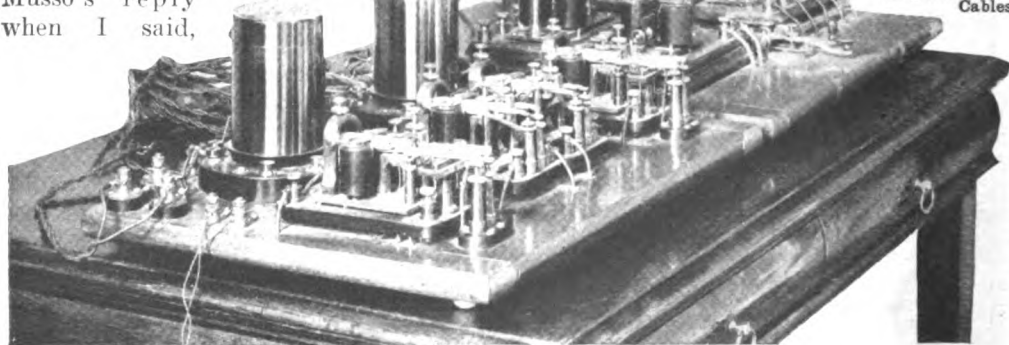
"You have a friend in London, St. Petersburg, Cairo, Calcutta,—anywhere? Sit in your office in New York, Chicago, San Francisco or any other place in America, take down your telephone receiver, get central to connect you, and then talk with

"Tell me, doctor, just what your recently incorporated company proposes to bring about by means of your invention?"

It was in Dr. Musso's laboratory in the company's offices at 80 Maiden Lane, New York City. To a layman the apparatus in this laboratory was most imposing, and even the expert electrician would be puzzled at many of the things, especially the huge apparatus on the wall representing the equivalent in cable distance between



Transmitter for Long Submarine Cables





The Bank of Resistances and Capacities at the Farther Wall Represents, Electrically Speaking, Several Thousand Miles of Ocean Cables

New York and Paris. The Italian inventor's statement that his company proposed to make it possible for anyone to telephone promptly, clearly and distinctly to any part of the world was promptly followed, on the part of his questioner, by the inevitable "How?" whereupon Dr. Musso proceeded to explain, at least up to a certain point.

"It will not be long," declared Dr. Musso enthusiastically, "after our cables are laid before a telephone conversation from New York to St. Petersburg or any other European city will become so common that it will not excite the slightest interest.

"The principle of my 'longest distance' telephone, as I call it, is really simple. Previously attempts to perfect extremely long distance telephoning have failed because the current sent along their cables has been deflected and otherwise interfered with by various currents and natural electrical magnets.

Efforts have been made to overcome

these difficulties by loading the cables with induction coils and similar aids, but they have never been successful.

"My principle is simple, because, instead of trying to remedy the evils of a long cable, I use an ordinary cable and when this tends to distort the message in a certain way, I distort the message at the sending station in exactly the opposite way. Hence the two distorting tendencies nullify each other and the message travels as easily over a distance of 39,000 miles as it does over ten miles."

I suggested that 39,000 miles would take the message entirely around the earth's largest circumference and 14,000 miles beyond the sending station.

"Let me explain," hastened the inventor, "electrically speaking, it is thirteen times as far from New York to Paris as it is from New York to San Francisco, although geographically the distances are about the same. By this I mean that the resistance to be overcome in telephoning from New York to

Paris is thirteen times as great as that to be overcome in telephoning to San Francisco because in the former case the cable must be grounded while in the latter instance an aerial line is possible all the way.

"When my system has been universally installed, a man in Chicago may talk to a friend in St. Petersburg or Calcutta simply by calling up 'central' and asking for St. Petersburg or whatever foreign city he wants. In front of the operator there is a board connecting with a number of circuits. Each circuit is regulated to cover a distance of 250,000 square miles; that is, to connect with any place within a radius of 500 miles.

"If you wish to speak to a party 1,000 miles away 'central' pushes in a plug connecting you with a circuit automatically adjusted to that distance. If you wish to speak with a party 4,000 miles away you are connected with the corresponding circuit.

"Now I do not mean by distorting a message that it is vocally distorted; what I mean is that if the conditions are such that some counter attraction, some natural magnetic power, tends to deflect the sound wave, my apparatus will deflect it in the opposite direction, and the result is that the sound wave is unbroken and the words carry evenly and distinctly along the cable.

"To make myself clearer let me explain. There are two kinds of lines used at present by commercial telephone companies, cable wire lines and open wire lines. The cable wires are insulated and usually laid under ground or under water. The others are bare wires running overhead. Either kind connecting two stations is a circuit. Of course the telephone circuit consists of a pair of wires. Under the present system it is impossible to telephone much more than 1,000 miles even with the help of 'loading coils.' Under my system it will be possible to telephone to Cuba, Bermuda, Nova Scotia, Europe or anywhere by

means of plain cables of such gauge as to insure a great economy of copper. Another economy of my system is that in telephoning across the continent a person need not be near a central station where a specially loaded wire terminates, as is now the case even for short calls. At present what we call long distance telephoning is made possible by using the 'phantom' circuit instead of the physical circuit. A 'phantom' circuit, you understand, is one resulting from the combination of two physical circuits. This necessitates two complete circuits for the successful operation of only one.

"By my system the transmission is equally good through the 'phantom' and through each of the two physical circuits. Thus, by using exactly the same wires the Musso system establishes three circuits where the present system establishes but one.

"This invention of mine may be used simultaneously for both telegraphy and telephony, and it does not require any apparatus of special manufacture or design. The transmitting and receiving instruments are identical with those now in use. But in the central station must be installed my invention for distorting the sound waves—a simple, inexpensive apparatus. This is the secret of telephoning around the world. My apparatus must be used to enable the sound waves to overcome all counter attractions in transit. When this is done verbal messages may be sent and received at any place and every place on the face of the earth, regardless of distance, wherever cables may be laid and wires strung, and this apparatus in no way complicates the sending or embarrasses the operator."

That illuminant or energy carrying medium that requires the least oxygen in its utilization is undoubtedly the most healthful—electricity requires none. It does not contaminate the air in the least and can be adapted to every conceivable form of illumination.

THE BRUDE LIFEBOAT

About four years ago a unique craft sailed across the Atlantic from Norway to Boston under her own canvas and without convoy. That little fourteen foot vessel was an early type of the Brude lifeboat. She was weeks in making the voyage and had to battle with more than one violent winter gale. She was in effect a sort of gigantic egg of

This is a very distinct advance upon the ordinary lifeboat. The latest type will be equipped with small motors.

NITROGEN-FILLED LAMPS TO LIGHT THE EXPOSITION

A system of lighting never before utilized in expositions—for the reason that the mechanism making it possible has never before been perfected—will



There Is Room to Seat 33 People Inside the Brude Boat and Several More Can Cling to the Outside

steel, and within her sheltering walls her crew of four seamen made the trip in comparative comfort.

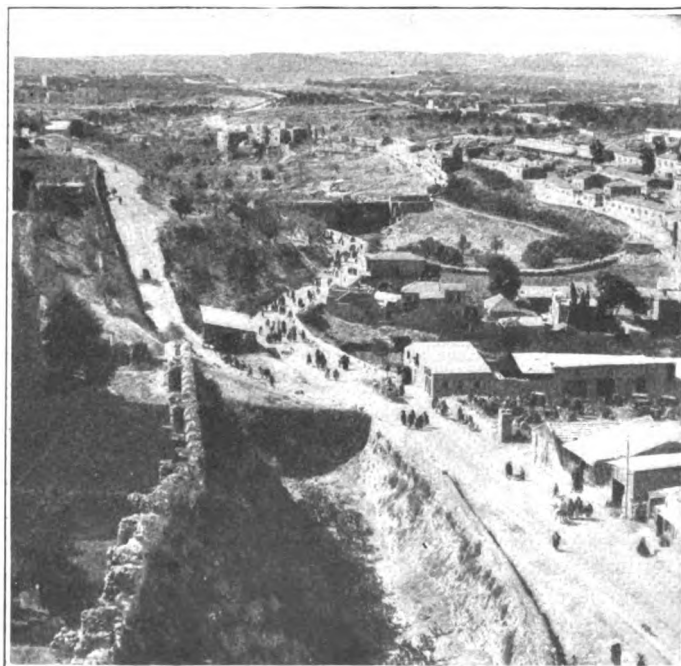
The Brude lifeboat is now installed upon more than 60 ships, and the big car ferry steamer "*Ashtabula*" is the first vessel upon the Great Lakes to profit by this valuable innovation in the way of a life saving appliance for navigation. The boat is so planned that it will always bob top-side up no matter how it may fall or be dropped hastily into the water. Being built of steel and globular in shape it is peculiarly sturdy, and recently built models are able to seat comfortably, inside, 30 odd persons. This means that the passengers will be protected from swamping seas, the boat will float despite any storm and the perils of an icy blast are neutralized. In short, the people will be assuredly kept afloat and sheltered until succored.

maintain, at night, the chief zone of illumination throughout the 625 acres of the grounds of the Panama-Pacific International Exposition, to a height of 125 feet, with a variation of five per cent.

This light will for the most part be created by the new nitrogen-filled lamps described in last month's issue. The lamps will be ranged up and down standards of from ten to 30 feet in height, and the eye of the observer will be shielded from the powerful direct rays by metal banners. In fact, all the lighting of the exposition palaces and grounds will be by the indirect "flooding" system, from concealed sources. The main advantage of this system over the old outline plan of using electric bulbs along the architectural lines of buildings, as at previous expositions, is that it permits the beauty of perspective and shadows to be preserved.



*Photos Copyrighted by
Underwood & Underwood, N. Y.*



Tombs of the Prophets, Famous Biblical Landmarks of Jerusalem Which Will Shortly be Visible from the Windows of Passing Trolley Cars

One of the Trolley Lines Will Traverse this Road to Bethlehem, Which Lies About Six Miles Away

ELECTRIC STREET CAR LINE FOR JERUSALEM

Jerusalem, the Holy City, will soon be provided with modern electric street car service and electric light. It is also to have a much needed water supply. In order to put in these improvements, it is necessary to demolish some of the picturesque ancient walls and massive towers of the city.

The rapid growth of the Holy City owing to the return of the Jews in great numbers to the home of their ancestors, has made these changes necessary. To the north and west of the old city, large Jewish colonies have sprung up within the past ten years, making populous residential sections, with convents, schools and other buildings, so the result today is a larger city without the walls than within.

The work of laying the rails for the new electric line began in April, 1914. Four separate routes are to be laid down. They will all start from Jaffa Gate, the principal entrance into the city, and run outside the city walls through the newer parts of Jerusalem. The first, which will be about two miles long, will give easy access to what is termed the business quarter of the Holy City. The second line of similar length will link up the large Jewish colonies to the north with the gate on the north side of the city.

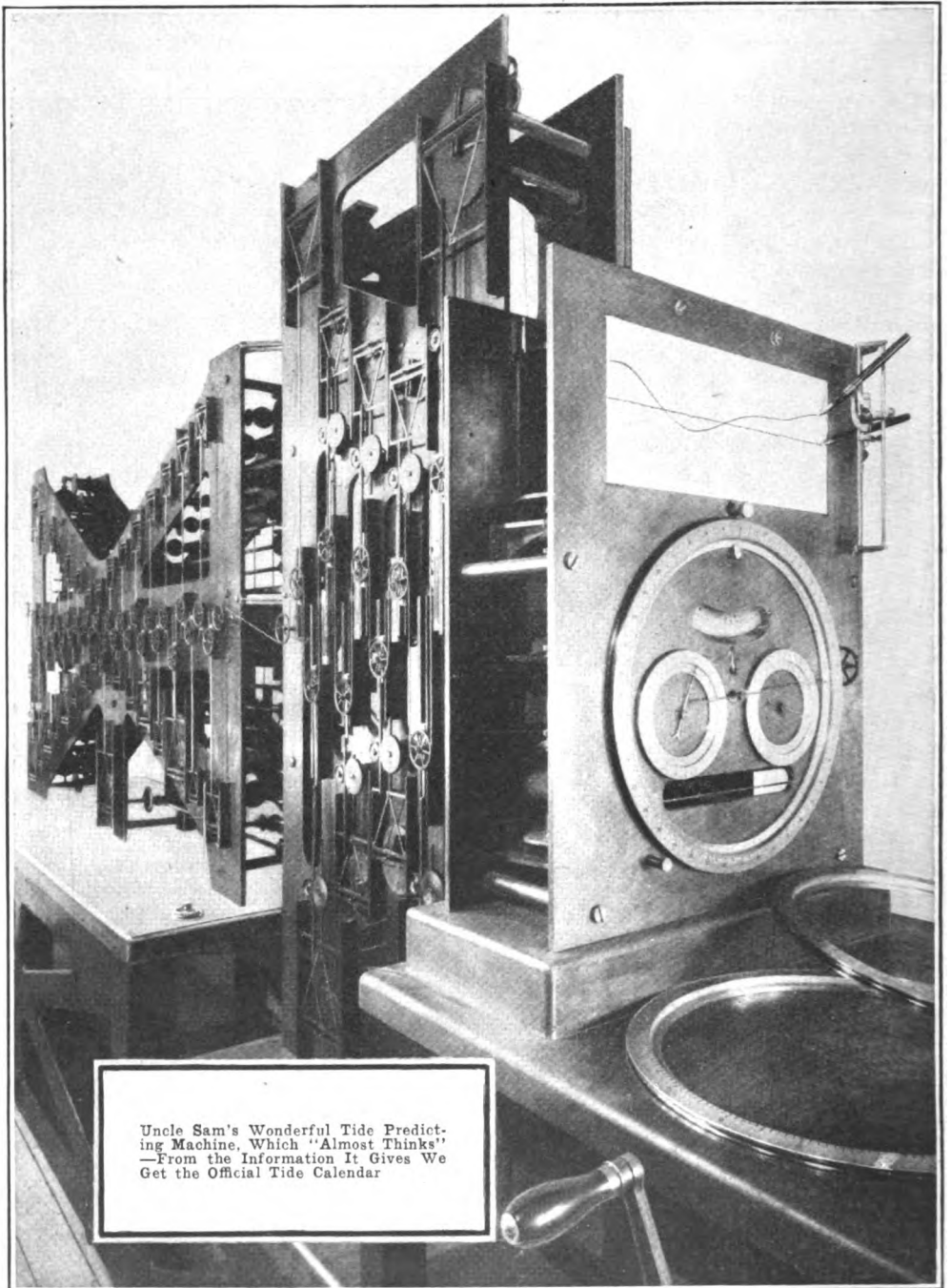


Damascus Gate, the North Gateway to Jerusalem, Through Which One of the Lines Will Pass in Going to Large Jewish Colonies Farther North



Photos Copyrighted by Underwood & Underwood, N. Y.

The Old Wall of Jerusalem, Looking South from Jaffa Gate Tower



The third one of the lines will encircle the ancient city, embracing many historic sites, such as the Tomb of the Kings and the Mount of Olives. The fourth line will extend from Jaffa Gate to

Bethlehem, six miles away, traversing the most sacred thoroughfare in the world.

The city walls, which have a circumference of about three miles and rise in

places to a height of almost 40 feet, are now being offered for sale by the government, as building material. It is expected, however, that efforts will be made to save isolated sections, more particularly the massive towers. Influential citizens of Jerusalem have formed a society with a view to preserving "David's Tower," which they propose to convert into a museum.

GETTING ADVANCE INFORMATION ON THE TIDES

There is one "big brother" of the everyday computing machine that is worthy of a place among the important electrical novelties of the age. This is the "tide predicting machine" which has been invented by the instrument experts of the U. S. Coast and Geodetic Survey. The function of this machine "that almost thinks" is to supply Uncle Sam with the advance information for the official tidal calendar or "Tide Tables." This publication, it may be explained, is issued annually and gives information one or two years in advance as to the time and magnitude of the tidal fluctuations of the sea. It is, indeed, a peep into the future that is of vastly greater value to the mariner and engineer than is the ordinary almanac to any person ashore.

What the ingenious tide predicting machine does in detail is to work out, with very little human aid, the time (to the minute) and the height (to a tenth of a foot) of every high and low water in the year at the 70 principal ports of the world; and, indirectly, to supply like information for 3,000 other ports. Since tides are dependent upon the effect upon the sea of the force of attraction of the sun and moon it goes without saying that it would be a comparatively simple matter to foretell the tides from astronomical data alone if the world were entirely covered by water, but since there are continents and islands to upset such calculations, it is

necessary to base all predictions upon observations made by automatic tide recording gauges. The data thus obtained are worked out mechanically by the intricate structure of wheels and cogs and pulleys, designated as a tide predicting machine.

Electricity is the form of energy employed in the operation of this tide predictor and some of the services performed by the magic current in this connection are very interesting. One of these is the notation making. As will be noted from the accompanying illustration a fountain pen is mounted on a shaft carrying armatures of two electromagnets. Successive contacts throw the pen downward, thus marking off the hour spaces, midnight being indicated by a double mark. The electric current is also employed to stop the machine automatically and thus relieve the human operator of the strain of watching the machine for the exact moment when the apparatus should be stopped in order to copy from its face the readings of high and low water.

LOW ELECTRICITY RATES IN NEW YORK TOWNS

Lowering of rates for electricity is progressing, even in small communities. Mr. G. B. Mills, president of the Wayne Power Company of Sodus, N. Y., writes that a rate, for cooking, of only 3.2 cents a kilowatt hour is made in Avoca, Wallace, Cohocton, Atlanta and North Cohocton, Steuben County, N. Y. These are small villages of from 300 to 1,200 inhabitants. The Marion Power Company makes a rate of four cents in Marion, and the Sodus Gas & Electric Light Co., 3½ cents in a number of small towns. Mr. Mills says: "We have small families cooking for \$3 a month, and large families from \$5 to \$6 at these rates, including baking of bread."

The housekeeper finds a new delight in cooking by electricity on the table—it is so cleanly and convenient.

CHAUFFEUR'S HINDSIGHT GOGGLES

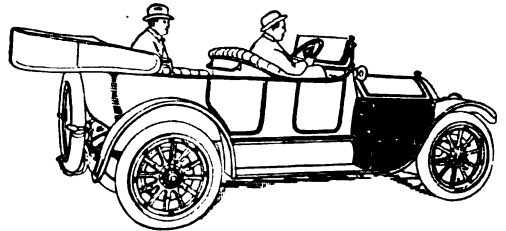
A motorman's mirror so placed that he may see passengers board or leave at the rear of the car has been in use for some time. The same principle has recently been applied to an invention for the motoreyclist and the chauffeur, a small mirror being fastened to goggles. With it the wearer is able to see what is going on in the rear without turning his head. At the same time there is no interference with a clear view ahead.



Goggles with Side Mirror

AUTOMOBILE FENDER TRUNK

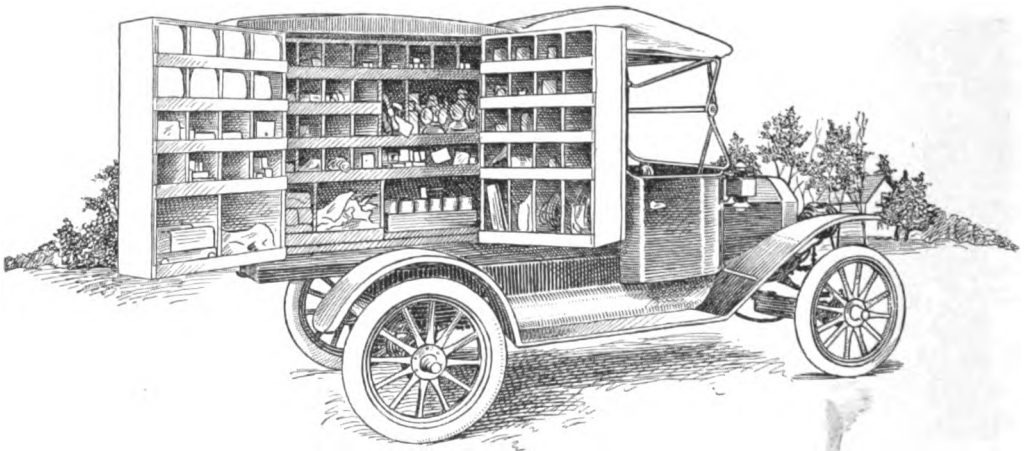
The Cole fender trunk is one of the latest devices for economizing space on an automobile. The trunk utilizes fender space otherwise not occupied and is not in the way of side doors. The exterior is built dust and water-



Trunk Which Utilizes Fender Space

proof and access to it is had at the side.

The trunk contains two suit cases and at the bottom is considerable extra space. It is made for both the right and left sides of the car so that the tourist can carry two, one on each side of his car.



PRACTICAL BODY FOR SALESMAN'S CAR

A practical body for the motor car used by a traveling salesman has been constructed for a firm in Philadelphia that deals in auto supplies and accessories. Of course such a line of goods is heavy and bulky so that sample trunks would be burdensome, while the use of photographs or printed matter instead of samples would result in fewer sales. The problem was very neatly solved by making the body of the light automobile in the form of a set of shelves and pigeon holes, which unfold in the manner shown in the drawing. This makes a display that is readily exhibited and easily carried.

GASOLINE ELECTRIC VAPORIZER

The Sure-start vaporizer is a patented device for supplying hot gasoline vapor for starting any gasoline engine regard-

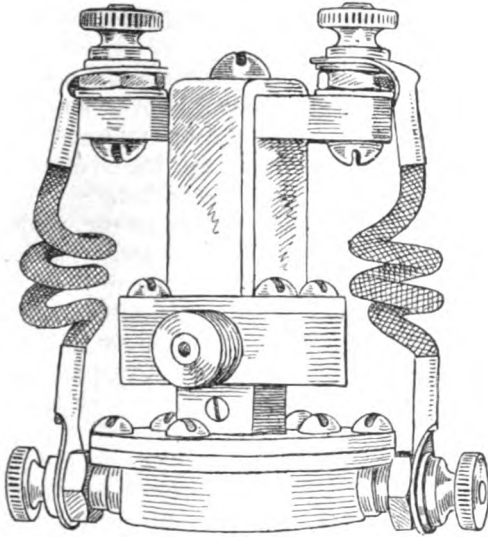


Fig. 1. The Gasoline Vaporizer

less of cold gasoline, cold engine, or long stops, and is especially adapted to automobiles.

The vaporizer, which weighs ten ounces, is illustrated in Fig. 1. The location, manner of attaching it to the engine and the connections are shown in Fig. 2. A switch on the dash controls both the supply of gasoline and the electric current.

In starting the engine the directions are to proceed in the ordinary way but

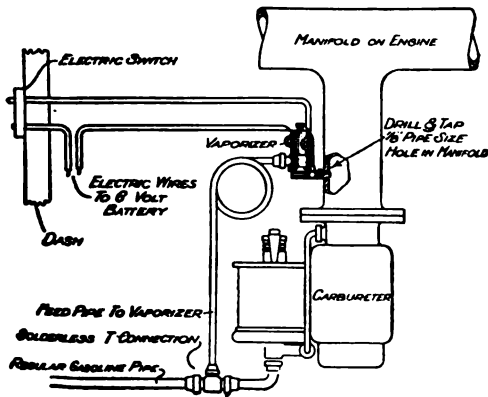
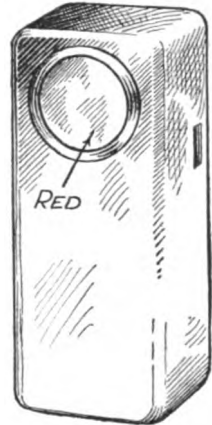


Fig. 2. Method of Connecting the Vaporizer

not to open the gas throttle more than a quarter of the usual distance. Turn on the vaporized switch, wait about ten seconds, then start the engine. As soon as the engine is running, change the throttle to the usual position and open the switch. Under extremely cold weather conditions the vaporizer should be left on a little longer than at other times.

TAIL LIGHT DETECTOR

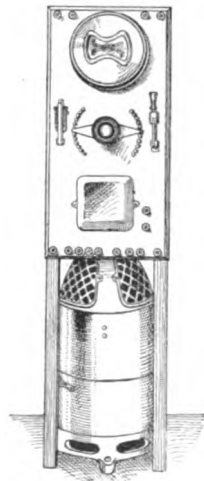
This device has been designed to meet and overcome the unpleasant and expensive, as well as annoying experience of having your rear lamp fail you while driving. With this detector when trouble does occur, either in lamp, wiring or poor contact, it immediately shows a red warning light on your dash.



Tail Light Detector

SNAP A SWITCH

The Wotton charging outfit makes simple the charging of the batteries by use of a rectifier; it is easy to snap a switch. Throw the switch and it starts automatically; should the current go off during the night charge, it would stop and restart automatically. When the battery is full the device operates to cut off the charge automatically. All forms of alternating current are met in this vertical Wotton. Whether you have direct or alternating current, you can have a home charging plant that is automatic.



Charging Outfit

AUTOMOBILES IN THE SERVICE OF WAR

Here is an example of an automobile diverted from its original purpose; from the joy of the road it has passed to the service of war. Huerta, Mexican war leader, has been quick to avail himself of the motor vehicles. First, there is the greater rapidity of transportation made possible by their use and quick delivery of supplies; then there is the

saving in carts and horses and fewer hands are needed.

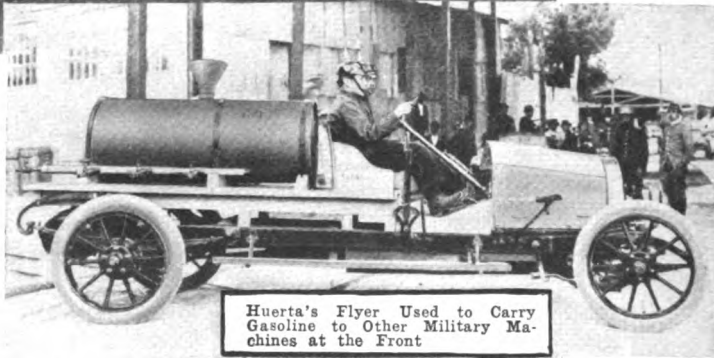
There is no outlay for running expenses except for fuel and sundries while actually en route. There is the very great advantage of the speedy conveyance of troops and goods over long distances, when it would be impossible for animals to compete in the matter of locomotion.

The motor vehicle lends itself particularly well to the peculiar guerrilla warfare practised by the Mexicans. An automobile, "hot with the hatred of spurned miles," may dash up close to the enemy wading a river; then there may be a series of sharp



Photos Copyright
By International
News Service

Machine Guns
Mounted on an
Automobile
Seat in this
Manner Were
Used in the
Battle of
Nuevo Laredo



Huerta's Flyer Used to Carry
Gasoline to Other Military Ma-
chines at the Front



Automobile Recently Purchased by
Huerta, Designed to Carry a Large Number of Troops
and Flying Squadrons

reports from a rapid fire gun mounted on the seat of the car. Such a combination was used with disastrous effect on Villa's men, who were crossing a river at Torreon, although later the advantage was lost through the superior sagacity of Villa.

How a Famous Quack Divulged a Great Secret

By WILLIAM BRADY, M. D.

Save for a searching scrutiny by the customs officials at the frontier, no one paid much attention to a full chested, gray whiskered, solitary old fellow with a heavy grip who traveled from Berlin to Paris one day in the spring of 189-. He had been on a visit to the German clinics, but the professors were so busily engaged in the laboratory that they scarcely had noticed his presence at all. Naturally enough, this sort of treatment peeved the pilgrim, so he had cordially consigned the Fatherland to the evil one and hied

himself to France. The French, he had been told, were an artistic people. Well, he should soon see about that. Stowed safely away in the toe of his woolen sock the eccentric traveler had something that certainly ought to interest science and art. He would give the Frenchman a fair chance; but, mind you, he didn't care a hoot in G-sharp whether they took up the proposition or not. There were others.

Arrived in Paris, the stranger lost no time in seeking out one Elie Metchnikoff, a laboratory expert of some little reputation. While it is considered incompatible with the spirit of medical ethics to fraternize openly with irregulars until they prove their claims beyond reasonable contention, nevertheless Professor Metchnikoff had his ear to the ground from the very instant the pil-

grim entered France. The savant received the visitor with an open mind and in the privacy of his laboratory watched specimens of living inflamed tissue under the microscope, the stranger meanwhile applying his secret method of treatment to the specimens under observation. Metchnikoff's only desire, as is now a well known fact, was to wrest away the charlatan's secret if possible and give it to the world. For hours, days at a time, the strange pair were engaged in their investigations, and finally the French scientist



The French, He Had Been Told, Were an Artistic People

grim entered France. The savant received the visitor with an open mind and in the privacy of his laboratory watched specimens of living inflamed tissue under the microscope, the stranger meanwhile applying his secret method of treatment to the specimens under observation. Metchnikoff's only desire, as is now a well known fact, was to wrest away the charlatan's secret if possible and give it to the world. For hours, days at a time, the strange pair were engaged in their investigations, and finally the French scientist

saw a ray of light. "Eureka! Eureka!" he cried excitedly, much as poor Balthazar did when he learned at last the enigma in *The Quest of The Absolute*. "Eureka!" And he rushed out bareheaded to the nearest publisher. In the excitement of the moment the graybeard was utterly forgotten. With a grunt of disgust he gathered his papers and specimens and betook himself to a nearby cafe for solace and oblivion.

What Metchnikoff had discovered was simply that man is a combination of cells which possess more or less cannibalistic properties. *Phagocytosis*, the Professor called this one celled cannibalism on which our health and life so largely depend. *Phago* means "I swallow;" *cyto* means "blood corpuscle;" a phagocyte is a blood corpuscle that swallows things

—mostly microbes. Metchnikoff had actually seen the white blood corpuscles engaged in this occupation. He saw a wicked little bacillus attack a helpless tissue cell; then the pale, tremulous, protoplasmic form of a white corpuscle crept cautiously along inside the capillary vessel wall, clinging to the wall to avoid being bowled away in the blood stream and lost in the eager rush of red corpuscles. As he gazed spellbound, all unconscious of the pilgrim who stood smiling beside him, the Professor, marveling at the primal tragedy of life, saw a secret door in the capillary wall open very slowly, the little white corpuscle slip through, and the door close softly behind it. The scout crawled along, slyly, carefully, like a cat stalking a bird; he extended a slimy arm toward the invading bacillus—and in a twinkling had gobbled it up, as a cuttlefish devours its prey! No wonder Metchnikoff cried Eureka. He thought he had grasped the Big Idea, the Great Secret.

The publisher did his part and the news was soon flashed around the world that Prof. Elie Metchnikoff, the famous French bacteriologist, had discovered how the body protects itself from destruction by pathogenic germs, etc., etc., with never a word about the mysterious stranger. The despatches stated that Professor Metchnikoff and his assistants were now at work with experiments looking toward the discovery of a chemical or drug which would stimulate a prompt and rapid multiplication of phagocytes, or cannibal cells, in time of hostile microbial invasion—something which would rouse the cannibalistic propensities of man's white corpuscles to a savage pitch.

But alas! the silent old quack with the full chest and the gray whiskers flitted away without waiting to see how successful the quest for the unknown chemical might be. As a matter of fact, the old rascal had that chemical still snugly stowed in the toe of his sock. Elie Metchnikoff and his corps of as-

sistants would be live ones if they could catch him napping, he mused laughingly to himself. And they'd have to hurry, for he was going to England the very next day. Germany had given him the cold, vacant stare. France had dealt him a treacherous blow. What would England do?

The unrecognized promoter sneaked out of Paris on the midnight express, bound for Calais. His whiskers were dyed green for the occasion and tucked carelessly inside his red and yellow mottled waistcoat. The Great Secret nestled



Rushed Out to the Nearest Publisher

comfortingly under his great toe. On the packet crossing the channel the Prince of Charlatans plied a lively, or, to be more accurate, a deadly practice among his fellow passengers, curing up numerous cases of *mal de mer* in his characteristic manner after nostrums and legitimate remedies by the score had dismally failed to give the desired relief. The treatment was not pleasant, to be sure, yet it cured them one and all by the time they set foot on solid British soil.

Undaunted by the two previous rebuffs, the eccentric quack disembarked as soon as the boat made a landing, put on waterproofs and a chest protector and sought out the residence of Sir Almroth Wright, a London surgeon of international distinction. Sir Almroth had said and done things in public that encouraged the pilgrim to approach him boldly with his scheme; the surgeon was

reputed to have an independent mind of his own, and that was precisely what the green whiskered pilgrim was looking for.

At first the Londoner showed the peculiar visitor scant courtesy. But when the steaming stranger had explained in detail the nature of his mission to England—from France—Sir Almroth was inclined to warm up just a trifle and crack a faint smile of welcome.

"They say this man Metchnikoff's creating quite a stir with his phagocyte discovery over there," said the surgeon, sponging off the fog that continually blurred his pincenez.

"Him? He's nutty—crazy as a loon!" exclaimed the vindictive quack. "Him and his phagocytes—huh! Why, them frothy Frenchmen—"

And he went on with a dreadful tale of ill usage and unkindness, never stopping till Sir Almroth literally clapped his hand over the garrulous mouth.

"Now, can that sorehead stuff and go on with your proposition, whatever it may be," commanded Sir Almroth, if not in these words then in words to the same effect.

"Well, I'll tell you," resumed the mysterious visitor, fondly stroking his green and dew bedabbled beard. "Elie is on the right track, all right, but just between you and me, Allie, he's a dreamer—he ain't practical. That's the trouble—he ain't practical. Now a good substantial British mind like yours—a mind that reaches its own conclusions without regard for the speech of the people—a good substantial British mind—"

Here the interesting visitor reached down and pulled off one boot. Sir Almroth looked at him in speechless indignation. The visitor now began to tug at the toe of his gray woolen sock and the London scientist rose and summoned the butler.

"Show this gentleman out!" he commanded. "Show him out at once, I tell you!"

"Hi beg your pardon, this way out,

sir," called the butler from the doorway.

"Aw, fade away, bub," laughed the queer old fellow, yanking the sock off at length. "There, Allie, take a squirt at that, will you!"

He had thrust one hand into the toe of the sock and drawn out something, which he now threw into Sir Almroth's lap.

Sir Almroth gasped and blinked. He picked the thing up, turned it over curiously, fell into a long study. The old quack sat watching him intently.



He Saw a Wicked Little Bacillus Attack a Helpless Tissue Cell

The butler softly withdrew. At length the surgeon gave a little cry.

"Why, I have found it!" he said in good everyday English.

And indeed he had found the Great Secret.

The discovery of the principle of vaccination as a preventive of disease is credited to some peasants of the countryside in 1774, from whom Jenner received the idea and put it in practice in 1796. But the use of killed virus as a remedy or a cure for disease was introduced by Sir Almroth Wright scarcely ten years ago, and today the so called bacterial vaccines are in general use throughout the world in the treatment of many diseases of which the specific causative germs have been identified.



Nurse Administering a Dose of Vaccine to Prevent Typhoid Fever

The secret—the Great Secret which the famous quack gave Sir Almroth—was nothing else than a revival of the ancient homœopathic apothegm, “a hair of the dog that bites you.” In other words, a hypodermic injection of a given number of the killed bodies of the same germs from which you are suffering will stimulate the cannibalistic function of your phagocytes, and these defenders then proceed to clean up every microbe in sight—dead or alive, savage or missionary—and you just naturally get well.

And so our story ends.

Oh, yes—the name of the famous quack who peddled the big secret? You surely ought to have guessed his name long ago.

It was Old Doctor Nature.

SCOOPING FENDER

Illustrations here given of the four different operating positions of a new type of automatic fender show clearly the method of operation. A



Unconscious of Danger

child, unconscious of danger, is crossing the track in front of a car. The fender, in the first picture, is in normal position, with the scoop held up by a



Shield Tripped by the Contact

simple trigger.

Next the overturnable shield is automatically tripped by contact with the child's body and thereby instantly fills the space be-



“Scooping” Up the Child

tween the fender and the street surface, making it impossible for the child to become wedged beneath the fender. The third picture shows the



Safe in the Basket

shield completely tripped, "scooping up the child." Lastly, the child is safely landed in the basket of the fender.

In its operating position, while the car is running, the fender projects about two feet beyond the bumper, and it is so attached to the car by pivoted hanger rods that it may be swung out of the way beneath the car when it is at the rear end.

It can be easily released from the operating position by the motorman and swung back under the platform of the car when a collision with a vehicle or

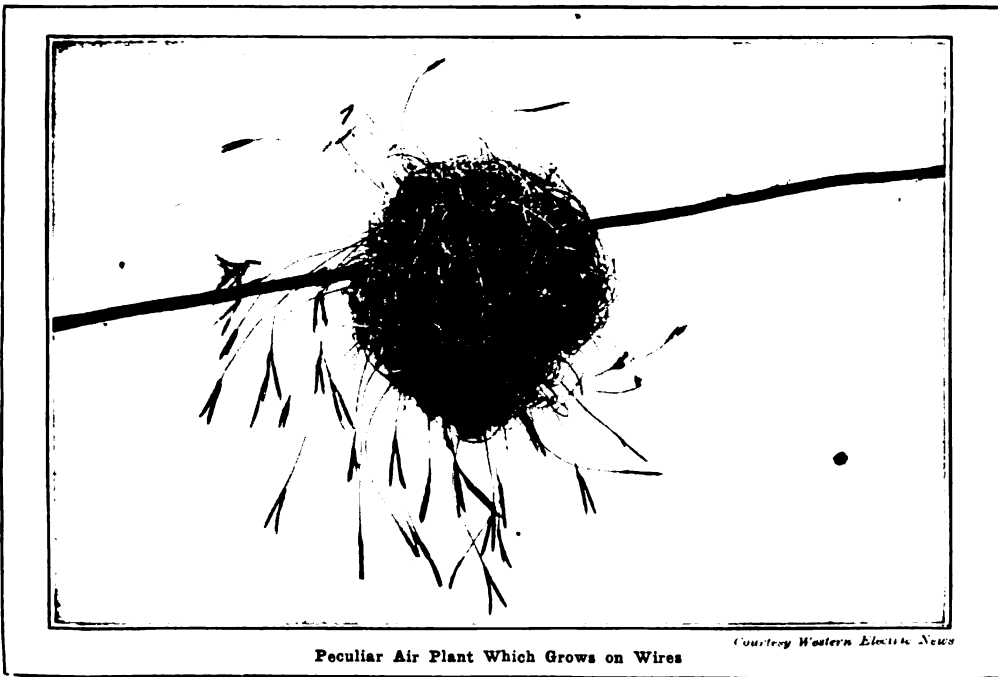
other inanimate body is unavoidable. Its position is, in fact, governed by the judgment of the motorman, as a foot lever and chain enable him to set the fender in operating or carrying position at will. The position of the scoop, however, is governed by a trigger spring, which holds it in the normal operating position. After it has been tripped it is necessary to reverse the scoop and set the trigger by hand. The fender is constructed entirely of steel, with the exception of the scoop, which is made of oak encased in sheet steel.

NEW KIND OF "TELEPHONE PLANT"

The accompanying picture is of a peculiar air plant which is often found growing on out door lines of insulated wire in Porto Rico. This specimen was secured by G. E. Mather, chief engineer of the Porto Rico General Telephone Company.

The mass of the plant is about five inches in diameter and from this

nucleus the flower stalks project in all directions. Although frequently found on outdoor, bare, rusty, iron wire, the growth has never been known to occur on copper wire or cable or on new, bare, iron wire. No trouble is ever experienced from the plant as it does not reach such a size as to cross up two wires.



Peculiar Air Plant Which Grows on Wires

Courtesy Western Electric News

Fulfilling a Sculptor's



Roughing Out the Marble by Means of an Electro-pneumatic Chisel

Electricity, transformed into mechanical energy at the chisel's point and directed by the man whose mind and soul are wrapped up in the tremendous work of beautifying Chicago, is slowly but perfectly modeling the marble statues that will one day grace Chicago's Midway. The center of this activity is the studio of Lorado Taft.

Ordinarily, marble statues are cut out of the block with mallet and hand chisel. This method, however, is exceedingly slow as compared with the pneumatic chisel, which is driven by air at a pressure of 70 or 80 pounds per square inch,

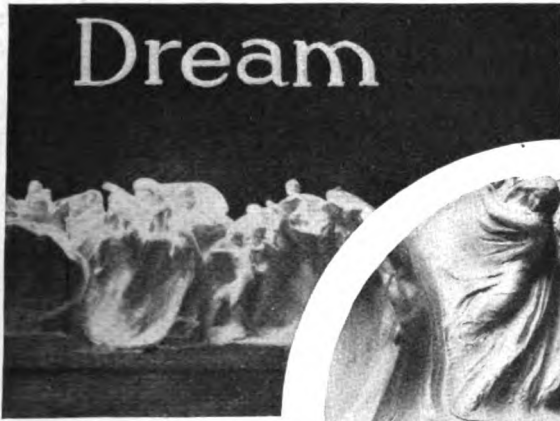
the air being compressed in a large tank by means of an electric motor. The air, passing through a flexible tube, drives the chisel back and forth against the stone just as if the chisel were hit by a mallet but, of course, many times more per minute. The chisel is used only to roughly outline the statue, the finishing work all being done by hand.

Mr. Taft's work of transforming the Midway of the World's Fair into the most artistic formal boulevard in the world has just begun. The plan is so huge that years will be required to carry it out and it will involve an outlay of something like \$1,500,000. In result the project will carry into permanent effect a mile-long vista of water, lawn, trees and sculpture such as has never been approached, except in the temporary structures of the World's Fair.

At present the Midway is a grassy strip, a mile in length and about 1,000 feet wide, connecting Washington and Jackson parks. It has always been the intention to extend the depression of the Midway from the lagoons of Jackson park to the small lakes of Washington park, thus forming a waterway from park to park. Mr. Taft's plan presupposes this straight and formal canal, which is to occupy the present depressions at a level lower than the street.

The canal bisecting the Midway will fill the present central depression and

Dream



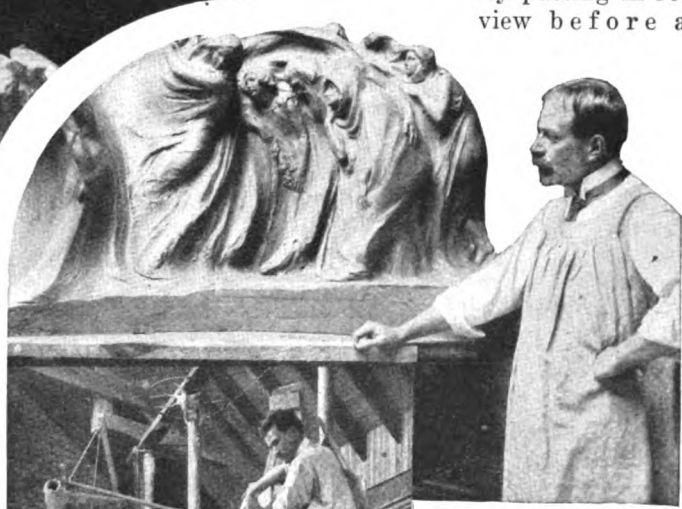
ten feet in height, arranged in ascending planes.

The "Fountain of Time" will show a great procession of humanity passing in review before a

will be about 100 feet wide. It is to be spanned by three white marble bridges, monumental in design, dedicated to the three great ideals of the human race—science, art and religion, which will be known as "The Bridge of Sciences," "The Bridge of Arts" and "The Bridge of Religion," respectively.

At half-block intervals, along the elevated strip of land some distance back from either side of the waterway, are to stand bronze statues of the world's great idealists.

Probably the most artistic work of the general scheme will be two large fountains erected in the lagoon at either end of the Midway moat. At the east end will be the "Fountain of Creation"; at the west, the "Fountain of Time." The former takes for its subject the origin of the race, the latter mankind's spectacular journey from life to death. There will be twelve groups in the "Fountain of Creation," containing in all 36 figures



Lorado Taft and the Model of His "Fountain of Time"

craglike figure of Father Time. The throng of pushing figures passing as in review under his eyes, each aiming at some individual goal, will show a wavelike suggestiveness typical of the unsubstantial and ephemeral nature of human life.

This fountain will be 80 feet long, and the figures ten feet high, except the central one, which will be about fifteen feet. Father Time's massive form will tower



Mr. Taft Superintending the Construction of the Framework for a Large Statue

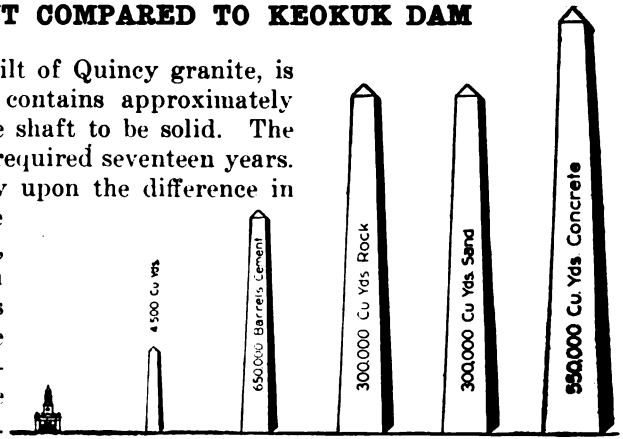
to a height of 20 feet.

And these massive sculptured pieces will mark the beginning of the fulfillment of Lorado Taft's dream of "beautifying Chicago."

BUNKER HILL MONUMENT COMPARED TO KEOKUK DAM

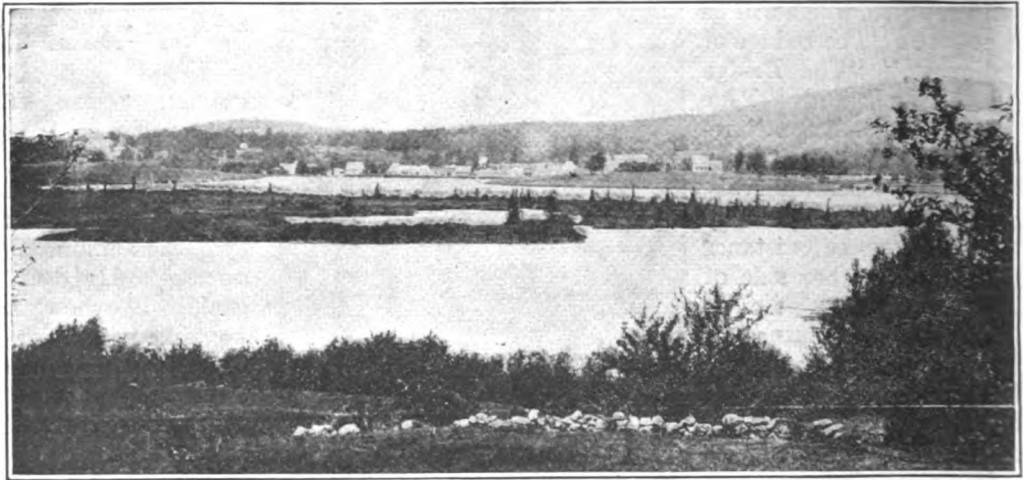
Bunker Hill Monument is built of Quincy granite, is about 220 feet in height and contains approximately 4,500 cubic yards, assuming the shaft to be solid. The construction of this monument required seventeen years. It is an interesting commentary upon the difference in methods of construction to note that, with the forms in place, this shaft could have been poured of solid concrete in less than seventeen hours by the concrete plant employed in constructing the dam across the Mississippi River at Keokuk, Ia.

This interesting statement was made by Mr. Edw. N. Lake at a meeting of the Jovian Order in Chicago. He also showed a lantern slide, reproduced herewith, which gives in comparative form the concrete materials



Comparison of Volumes of Material in Keokuk Dam, Bunker Hill Monument and the Old Church

required upon the entire work at Keokuk, compared to Bunker Hill Monument and the Old Church at Concord, which has a steeple exactly 100 feet high.

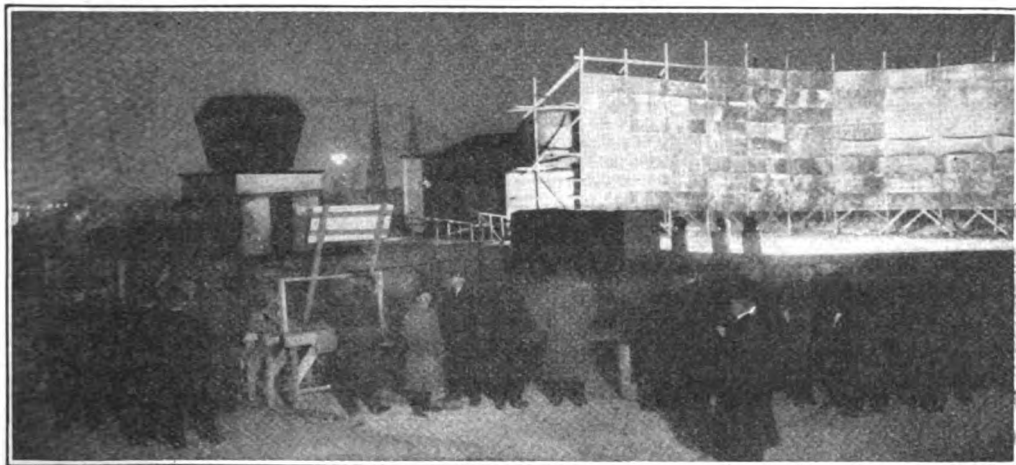
**A VERITABLE FLOATING ISLAND**

Floating islands have occasionally been the theme of imaginative sailors when called upon to tell marvelous stories of the sea. As a matter of fact, however, there is actually such an island in this country. It is on Lake Sadawga, at Whitingham, Vt. Nature, for some unknown reason, joined together in a vast inextricable tangle the innumerable roots of reeds, willows and other water loving vegetation. Soil accumulated upon this, so that now there are actually about 75 acres of land buoyed up on the bosom of the lake. Moss, cat-tails, etc., grow here in great profusion. Even fir and beech manage to attain a growth of 25 or 30 feet. It is not at all unusual for the shrewd fishermen of Whitingham to cut holes through the land in winter, and thus catch the fish below, as is done through the ice in less favored regions.

SHOOTING BY SPOT LIGHT

Forty-eight thousand watts of moon-light (artificial, of course) was furnished by the New York Edison Company for the recent Sportsman's Show, held at Grand Central Palace. The Edison company's Bureau of Illuminating Engineering arranged all the lighting

indicate that lead poisoning may be cured by means of an electrolytic bath. Full details are not yet forthcoming, but it is known that Sir Thomas Oliver and a Newcastle-on-Tyne doctor have made experiments with rabbits which were subjected to lead poisoning. By means of an electrolytic bath the rabbits were cured, and as a result the



Trap Shooting Range on a Skyscraper Roof

for the exposition, replacing the usual lighting on the main floor of the building by 150 and 200 watt tungsten lamps, the bulbs of which were stained to produce a pale blue glow. Added to this was the light of nitrogen lamps placed in the urns around the balcony rail and suspended in the well of the building. There were 24 of these lamps, each in a glass reflector and shaded with green gelatine screens. The fly casting tank and the trap shooting range on the roof were illuminated by spot lights and incandescent lamps. In the picture is seen how trap shooting was done at night by the aid of the spot lights.

method has been tried on human beings. Two baths are used: one for the feet and the other for the arms and hands. The effect of the treatment is the elimination and deposit in the bath of the absorbed lead, which, if complete, brings about the total recovery of the patient.

NO LANDMARKS IN SPACE

“There are no landmarks in space; one portion of space is exactly like every other portion, so that we cannot tell where we are. We are, as it were, in an unruffled sea, without stars, compass, soundings, wind or tide, and we cannot tell in what direction we are going. We have no log which we cast out to take a dead reckoning by; we may compute our rate of motion with respect to neighboring bodies, but we do not know how these bodies may be moving in space.”
—Maxwell.

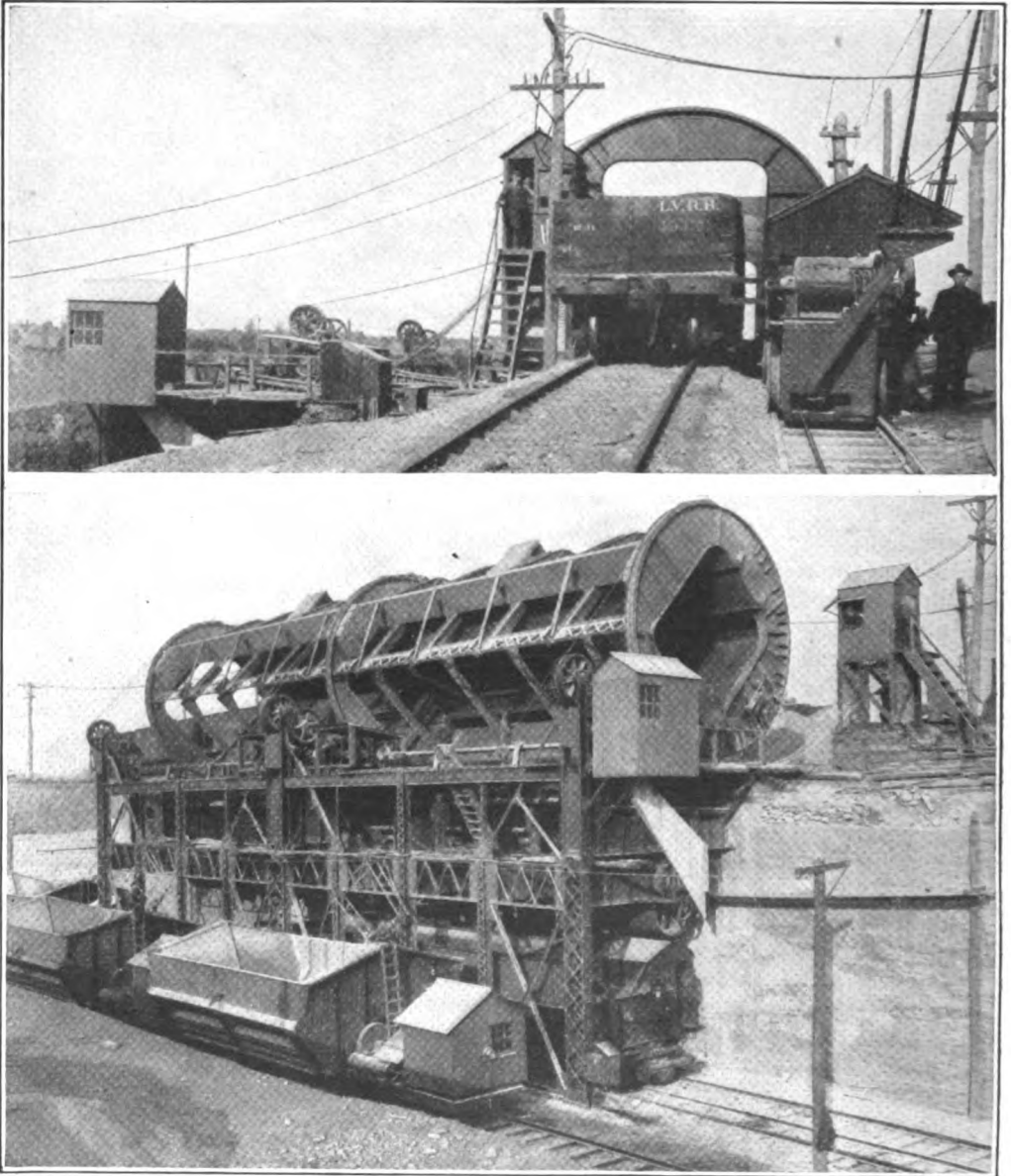
CURE OF LEAD POISONING BY ELECTRICITY

The German magazine *Elektrotechnische Anzeiger* reports a therapeutic discovery which has caused quite a sensation in England and which seems to

DUMPING A 50 TON ORE CAR

A car loaded with 50 tons of ore comes trundling along a track situated on a high embankment. It is moved by a little electric locomotive traveling on a parallel track and is provided with an arm projecting out at right angles.

With this arm the locomotive pushes the big ore car along. Presently the car comes to a square opening in a great cylindrically formed contrivance made of massive steel girders and braces. When the car is inside the cylinder, electric motors are immediately set in motion and act upon horizontal and vertical



The Upper Picture Shows the Ore Car, Pushed by the Locomotive, Entering the Dumper. The Latter, in the Lower Picture, Has Turned Over and Dumped the Contents of the Car

clamps which grip the car so that it is immovable within the cylinder.

A 100 horsepower motor now takes up the work and rolls the cylinder over and outward through 180 degrees. At the end of the roll the ore car is bottom side up and its contents has been dumped out and has fallen down into a series of pockets below and thence into waiting transfer cars on the lower track level shown in the illustration.

This is the sequence of operations of a modern electric car dumper as performed at a great ore transfer point in Pennsylvania. The ore is here taken from storage or from cars direct and dumped into the waiting transfer cars as above described, to be then drawn a mile and a quarter to the blast furnaces.

The transfer cars on the lower track are in themselves interesting. They have a capacity of 60 tons each and are equipped with four 35 horsepower traction motors. They are provided in addition with one motor of 5½ horsepower, which runs an air compressor for the brakes, and another of 7½ horsepower, which operates the side doors when the cars are finally dumped at the blast furnaces.

CLEANING UP THE LINERS

When an ocean liner has docked and its passengers have gone ashore, the officers and crew are not, as might naturally be supposed, at liberty until the vessel sails again. On the contrary, it is then that much of their very hardest work begins—real drudgery. It is then, between the docking and the departure, that the great craft must be thoroughly overhauled and cleaned from stem to stern, inside and out. Moreover, this immense task must, generally speaking, be accomplished within a period of 36 hours.

The first job is the repainting of the hull. Next the funnels must be scraped and brightened with a fresh coat of color. Then every bit of ma-

chinery is inspected and tightened up. Even the masts and rigging are looked after.

This cleaning up is a big job. The mere refurbishing of the first cabin dining room is in itself a task. Such a saloon may seat 500 or 600 guests without relay. The carpeting must be cleaned with vacuum machines, each table must be repolished, the floor must be cleaned until it shines like a mirror, every bit of paint or gilding must be carefully washed, all chairs are inspected and repolished and many other jobs accomplished before the saloon is pronounced again ready for the passengers.

The same work must be done in the second dining saloon, the drawing rooms, the library, the smoking rooms, etc. In addition, there are several hundred staterooms and bathrooms that must be inspected.

A tedious phase of the ship cleaning consists in the inspection of the furnishings. For instance, it is necessary to count, sort and check some 35,000 pieces of linen. No linen is, however, washed on board. It is placed in sacks each containing from 200 to 250 pieces and sent to the laundry. Upon its return to the ship, there again occurs the tedious task of counting, sorting and checking.

Much attention must be given to the silverware, which may number many thousand pieces. Glassware on a liner seldom numbers less than 25,000 or 30,000 pieces, while the number of dishes, plates, cups, etc., often reaches 70,000. Every piece of this glass and china must be washed and polished during the housecleaning of the ship, although they have been kept scrupulously bright during the voyage. Each department is under the charge of a special employee—one for the silverware, one for the linen, one for the china, etc., and each of these men is, in turn, answerable to the head

steward, to whom is brought a report of the total number of pieces on board.

All sheets, towels and tablecloths found to be worn to an appreciable degree are immediately discarded, for no "rags" are tolerated on a first class liner. During the course of one trip a liner will use something like 300 Turkish towels and as many as 1,000 smaller

ones for the first cabin passengers alone.

In the steerage the cleaning is conducted along somewhat different lines. Everything that might be damaged by water is taken out of the steerage quarters and the hose is brought into play. Then the whole steerage is scrubbed down.

Mining Dollar-Fifty Ore

By GEORGE FREDERIC STRATTON

It is doubtful if in any other mining exploitation in this country such remarkable returns from very low grade ore are shown as in the wonderful Oquirrh Mountains in Utah. Every hundred tons of material and ore excavated produces only one hundred and fifty dollars' worth of metals—gold, silver and copper; and to secure that the mines have to be operated, the ore freighted for 20 miles over the roughest mountain country in the intermountain region, and then reduced in the concentrating mills and smelter.

Dollar-fifty ore has no temptation for the average mine operator. Nothing under eight or ten-dollar ore is considered worth exploiting. For 40 years the immense deposits of that low grade porphyry copper were well known in the Oquirrhs, but neither capital nor labor were attracted by them until about ten years ago, when a mining engineer and capitalist, D. C. Jackling, shot ahead of the ordinary development methods and by his startlingly comprehensive scheme of working that ore, enthused other capitalists—big capitalists—and formed the Utah Copper Company.

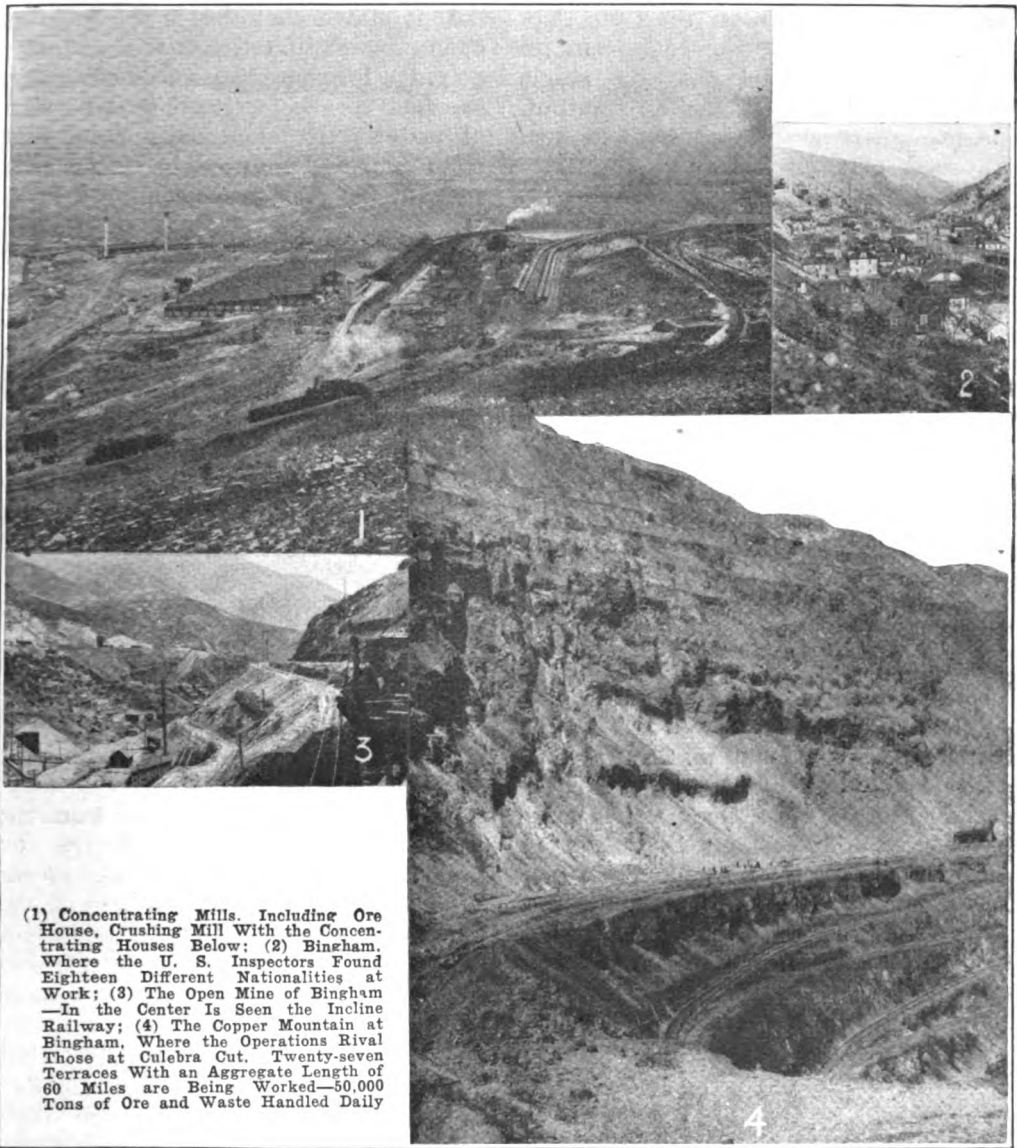
The result is the excavation of 50,000 tons every day of material and the reduction of 20,000 tons of ore. From the great mills and smelter come daily

400,000 pounds of copper, 2,000 ounces of silver and 200 ounces of gold, with an aggregate value of \$75,000 and at a production cost of about one-half.

That gigantic and profitable output has been reached by the most stupendous exhibition of clear grit ever shown by industrial exploiters. The expenditures for equipment before any profit was in sight were enormous. The usual methods of sinking shafts and running tunnels were disregarded entirely, for Col. Jackling proposed to use steam shovels instead of picks and hand tools. Tracks were laid around the mountain and the heaviest of power equipment provided. Two of the greatest concentrating plants in the country were built on the comparatively level ground outside the mountains and 20 miles from the mines; and a special railroad—the most difficult and most expensive industrial railroad on record—connects the mines with the reduction plants.

The completeness and efficiency of it all is shown by the fact that upwards of one-third of the total copper mined in the United States is produced from that remote low grade ore at a cost last year of less than 7½ cents per pound.

Although the general average of the ore shows 1.42 per cent of copper, the company has demonstrated, in poor



(1) Concentrating Mills. Including Ore House, Crushing Mill With the Concentrating Houses Below; (2) Bingham. Where the U. S. Inspectors Found Eighteen Different Nationalities at Work; (3) The Open Mine of Bingham—In the Center Is Seen the Incline Railway; (4) The Copper Mountain at Bingham. Where the Operations Rival Those at Culebra Cut. Twenty-seven Terraces With an Aggregate Length of 60 Miles are Being Worked—50,000 Tons of Ore and Waste Handled Daily

streaks of less than one per cent of metal, that it can treat such ore at a profit; for the cost of mining and reducing it has been ten cents per pound for the metal secured.

Fifty thousand tons of material—overburden and ore—per day is not handled without gigantic equipment. There are 27 terraces around that mountain of ore, at levels of 50 to 60 feet above each other. The working

tracks on the terraces are 60 miles in length. There are 22 enormous steam shovels, hundreds of steel ore cars and scores of shifting engines. In breaking down the overhanging ledges and reducing great masses to loading size, six tons of explosives are used each 24 hours.

Although the Denver and Rio Grande Railroad Company built a spur track up into Bingham Canyon some years

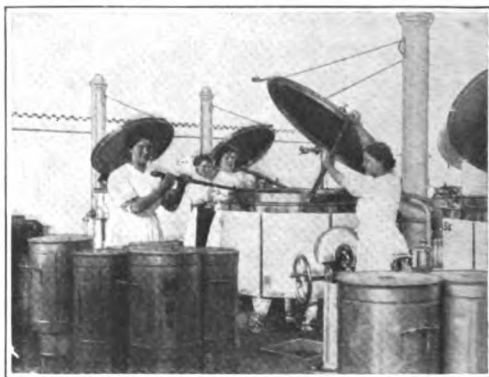
ago, it was found, after the Utah Copper Company got its equipment in good running shape, that the single track road could not handle its output. The company accordingly built its own railroad, officially known as the Bingham and Garfield Railroad, for the latter is the locality where are established the concentrating plants and the smelter. Popularly, the road is known as the High Line, for instead of being run along the canyon bed, it is several hundred feet above, skirting around the waists of great mountains, or tunneling through them, or crossing weird, precipitous canyons on trestles two to three hundred feet high. At Bingham, the great mining camp, the only public approach to that railroad is by a special inclined electric railway, running up the mountain side at an angle of 40 degrees for a length of 1,000 feet. A short distance beyond Bingham the road strikes onto the mountain which is being demolished, and there the ore cars are connected up from the various levels and hauled away to Garfield. The heaviest mountain locomotives ever built at the time they were ordered are on these hauls. They are the Mallet, articulated, compound type, with four cylinders and sixteen driving wheels. Their weight for engine and tender is 450,000 pounds, and their total length is 90½ feet.

At Garfield are the two gigantic concentrating mills built by the company, with a capacity of 20,000 tons of ore per day. They are designed for extension as required. Near them is the smelter of the American Smelting and Refining Company, which smelts all the Utah Copper Company's ores, as well as others which are shipped in from other points. These plants are built on the slopes at the base of the mountains, and gravity is used as much as possible, each process through which the ore goes from the sampler to the converter being on a slightly lower level than the preceding.

It is stated that this is the greatest open mine exploitation in this country. So much for size. As regards efficiency, the fact speaks for itself that 23 tons of material is taken daily from that mountain, and reduced to its metallic content, for every man employed.

WHERE INSANITY IS TREATED AS SICKNESS

In Bedburg, Prussia, is the most remarkable institution in the world for the care of the insane. Half a million dollars were spent in putting up the buildings. Here the inmates are not "lunatics" but "patients"; they are not "crazy" but "sick"; they are given "treatment" instead of the "strait-jacket" and the result has

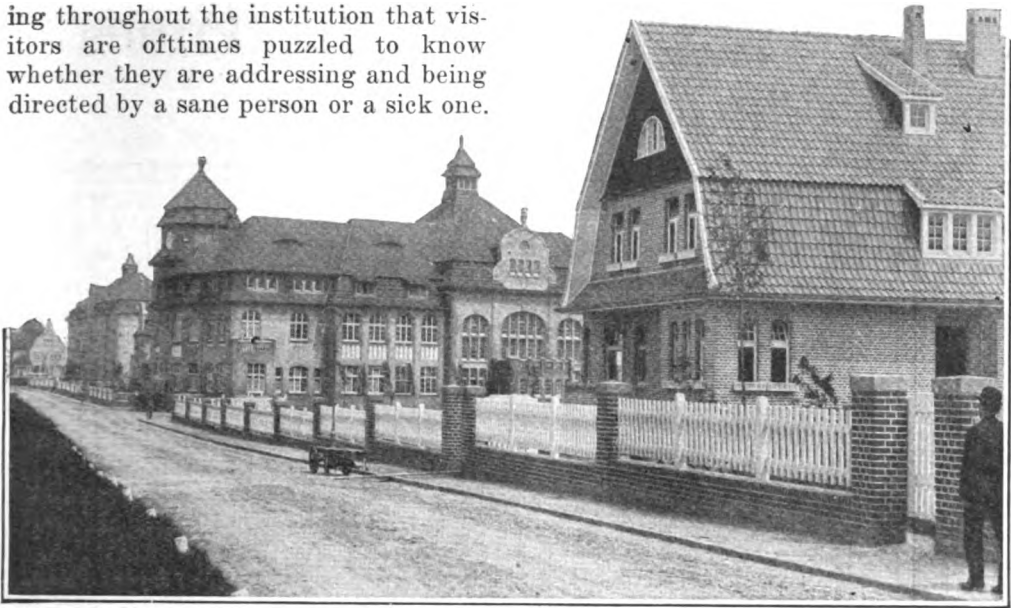


Insane Patients in the Laundry Instead of in Strait-Jackets

been that 20 per cent of those admitted are sent away cured each year.

The method employed at the institution is to allow the patients perfect freedom. Besides a farm and garden, there is an ice plant, a bakery, water works, tailoring and dressmaking shops, a slaughter house and other establishments necessary to make the place in reality a small city independent of the outside world. The workers do all work voluntarily, stopping when they choose. At all times they are observed by specialists who seek to find out how this one or that one may be cured. Such is the condition prevail-

ing throughout the institution that visitors are oftentimes puzzled to know whether they are addressing and being directed by a sane person or a sick one.

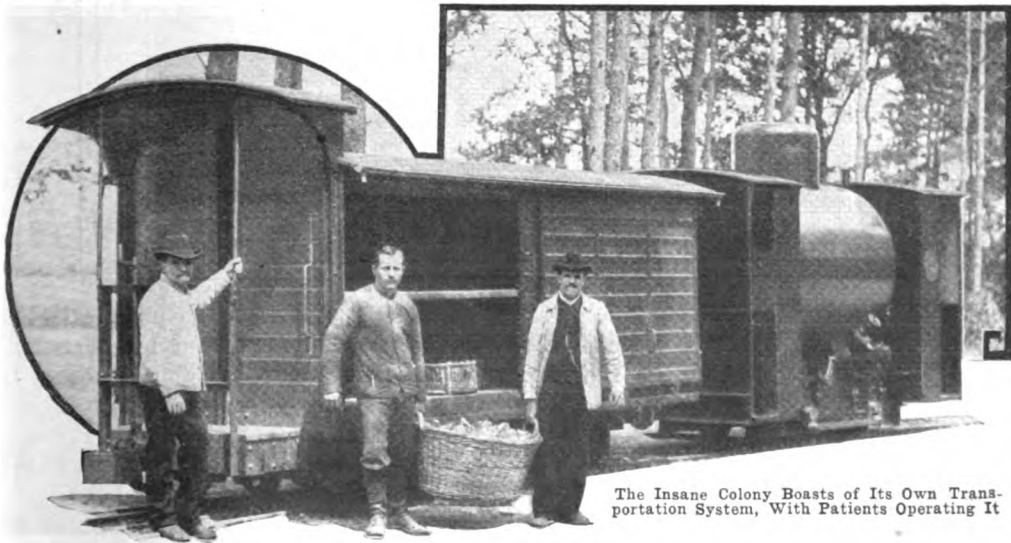


A Model City Where Only the Insane and Their Attendants and Physicians Live

THE IDEAL ARTESIAN BASIN

This is the term given in a bulletin of the hydrographic department of the United States Geological Survey to the San Luis valley in southern California. Its length, north and south, is about 150 miles, and its greatest width about 50 miles. Although the streams that flow down into it from the bordering

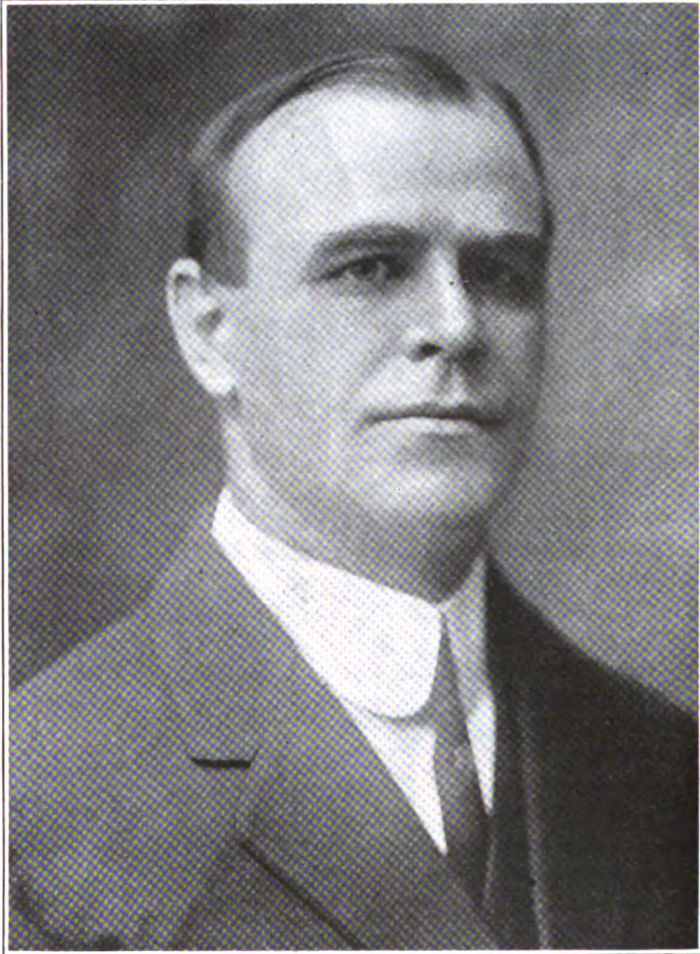
mountains disappear as soon as they reach the alluvial slope, there is an abundance of water underground contained in beds of fine sand varying from one foot to 20 feet in thickness, and separated by beds of blue clay from one foot to several hundred feet thick. No less than 3,234 wells already exist, capable of irrigating 25,000 acres.



The Insane Colony Boasts of Its Own Transportation System, With Patients Operating It

Electrical Men of the Times

HON. ALLAN B. WALSH



This Congressman-Electrician Is Prepared to Smash Precedents

An electrician has come to Congress from President Wilson's "home district" in New Jersey, and, like the present occupant of the White House, this congressman-electrician had no sooner established himself at the national capital than he prepared to smash precedents.

Allan B. Walsh is the practical electrician from Jersey, and his overturning of time honored custom is found in a project for electrical voting in the House of Representatives. In furtherance of it he has graduated into the ranks of electrical inventors.

Congressman Walsh, who is about 40

years of age, has been engaged in the electrical industry ever since he left school in his native city of Trenton. In the beginning he entered the employment of the Trenton Light & Power Company, but in a short time advanced to a position in the electrical testing department of the John A. Roebling's Sons Company at Trenton. Here he made good to such an extent that he was promoted to the position of superintendent of the electrical testing department, a post he occupied until he entered political life.

When Mr. Walsh came to Washington with a mind trained to think in the terms of instantaneous electrical communication he was astonished and annoyed by the extravagant waste of time in what are known as "roll calls" in the House of Representatives. Under the system that has been in vogue from time out of mind, an interval of about 45 minutes is wasted every time the congressmen are called upon to indicate how they stand on a pending measure or to give proof that there is a quorum present. Particularly has this time-consuming method of muster proved irritating when filibustering is resorted to in order to delay legislation.

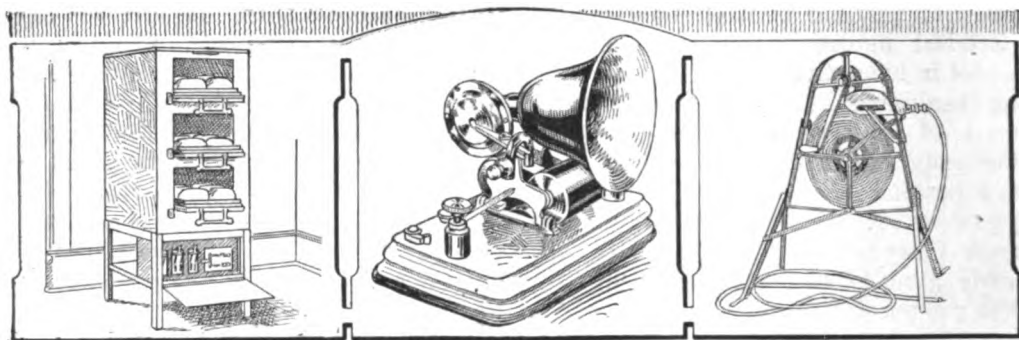
The legislator fresh from the electrical workshop pondered over this problem for several months, devising and experimenting, and finally he has evolved a scheme for electrical voting that has received the approval of Speaker Clark and the Rules Committee of the House, which is equivalent to saying that it is about to be adopted. By means of this electrical voting machine the 435 members of the House of Representatives will be enabled to register their "yeas" and "nays" simultaneously in just about as much time as is required to close an electric circuit and flash a lamp.

As yet, and pending an appropriation by Congress, no step has been taken for the actual construction of this unique voting machine at the Capitol, but all the details have been worked out. For

voting purposes each member of the House will have assigned to him a numbered seat in the hall of the House and at each such seat there will be placed an electrical device whereby the mere pressing of a button will enable the member to record his vote. To prevent unauthorized persons from voting, each voting device will be under lock and key and accessible only to the Congressman whose station it is. The voting buttons at the members' seats will be marked respectively "yea," "nay" and "present," with the possible addition of a fourth button labeled "paired."

The electrical recording apparatus which will record all votes will be constructed somewhat on the principle of the adding machine. Automatic punches, impelled by the magic current, will punch holes—placed according to the nature of the vote cast—in individual cards which will be provided (one for each member) and inserted in the apparatus in alphabetical order. Totals will be indicated by the machine much in the same manner that an adding machine may be made to indicate totals upon pressure of a lever. All cards punched by members and also the records of totals will, at the conclusion of a vote, be removed from the machine and kept on file by an authorized clerk as the official record of the vote in question.

Aside from the recording apparatus, this electrical voting equipment will comprise several indicators, which will show the result of the voting while this latter is in progress. A bulletin board will be provided with lenses of different colors set opposite the name of each Congressman. Any one of these lenses can be illuminated by means of an incandescent lamp, and as soon as a member has voted the fact will be signaled by a gleam of red if he has voted yea, and by a flash of blue if he has said nay. Mr. Walsh says that from a technical and practical standpoint the construction and installation of the devices described will offer no difficulties.



Improved Electric Oven

Diaphragm Sounder that Intensifies
Sound

Conduit Wiring Machine

IDEAL BAKER'S OVEN

This new baker's oven represents a radical departure from former and existing types of ovens because in it is accomplished an ideal condition of heat distribution. Uniform distribution in all ovens is an absolute requisite to insure excellence in cooking and the accomplishment of this has always been the difficulty in large ovens where the electric unit is the prime source of heat.

Instead of placing the heating elements in the bottom, depending on an uncertain and variable circulation of hot air, the elements in this oven are divided, thus placing beneath each shelf or rack the correct proportionate amount of heat for a constant, even baking. The heat is most active just where it is needed.

This oven is designed for use in bakeries and restaurants.

THE DIAPHRAGM TELEGRAPH SOUNDER

Many devices have been employed with a view of making the relay loud enough to read without a sounder, but the diaphragm sounder is the only instrument that actually creates additional sound and intensifies it, to practically any degree desired. The concussion takes place within the air tight diaphragm, starting the vibration through the intensifier similar to the reproduction of the human voice by the phono-

graph. It is provided with a sound regulator by which the sound can be modified when receiving from other instruments; that is, adjustments may be made so that no two instruments need sound alike.

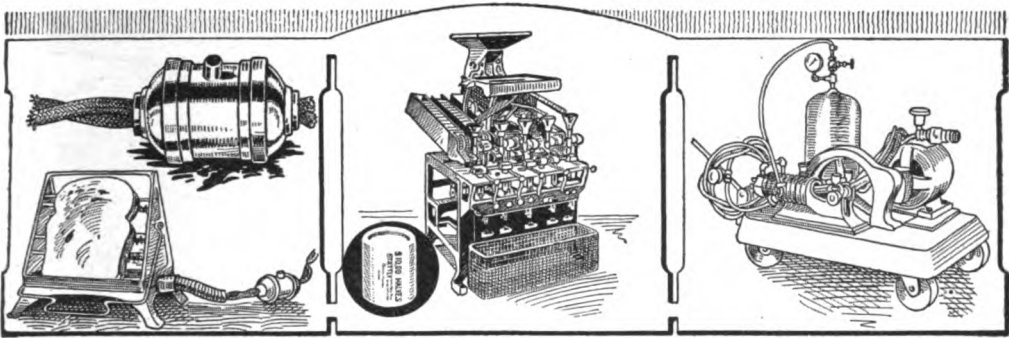
The diaphragm sounder is substantially made of brass with steel sounding fork, all finely plated and highly polished. It entirely does away with batteries and is attached to any standard relay by loosening one screw.

THE NATIONAL CONDUIT WIRING MACHINE

The conduit wiring machine herewith illustrated is an indispensable labor saving device for electrical installation. It embodies the patented principle of propelling a fishing tape from the periphery of a coil by means of a superimposed tape which is wound on a second wheel. Any conduit can be fished in half the time required by hand fishing.

The lighter tape being wound on the small upper wheel forces the fishing tape through the flexible steel hose and thence through the conduit. By placing the crank on the lower wheel and turning it, both tapes are re-wound and at the same time the lead wire or insulated conductor is drawn back through the conduit.

At ordinary speed and around the usual number of bends permitted by city ordinance, the fishing tape travels at a speed of five feet per second.



Cord Switch Controls Current

Machine that Sorts and Counts Coin

New Tire Pump

A NEW TIRE PUMP

The illustration shows a new tire pump suitable for public and private garages. It is simple and compact in construction and being mounted on a truck, it can be easily taken around the garage or outside to the curb. A tank twelve inches long by six inches in diameter, into which the pump discharges, prevents condensation and oil does not enter or injure the tire. The pumping action is rapid, since a 35 by 4 inch tire can be pumped from flat to 70 pounds in about one and a half minutes. The electric motor is one-fourth horsepower in capacity and can be operated from a lighting circuit.

A CORD SWITCH

The easy control of electrical appliances is now possible by the brass shell cord switch. Providing as it does an easy means for turning the current on and off, it makes the operation of all heating devices more satisfactory, saves current and saves wear on the socket mechanism.

This dainty polished nickel switch placed alongside of a table device gives a ready means of controlling the current and regulating the temperature. The Code rating makes the switch suitable for use with practically every type of electric appliance used in the household.

Being designed for installation on the cord it can be used with any make of

device; it is not subjected to temperature changes of the appliance controlled and therefore escapes the hard usage to which a switch on the device is subjected. The operation of the electric iron is improved by the cord switch. The switch solves a difficult problem and gives the easy control so greatly desired by the user. It is safe and durable and makes the use of electrical appliances more satisfactory.

ELECTRIC COIN HANDLING MACHINE

The electric coin handling machine will sort different denominations of coins, count them and register the count in dollars and cents. Dump a lot of miscellaneous coins into this remarkable machine, start the small motor that drives it and the machine will sort and count them, wrap them up in standard packages or sack them as you prefer, separate the mutilated coins and throw them into another receptacle.

Evidently this machine is going to become popular among companies that have to handle small coins in large quantities, such as street railway companies, department stores, gas and electric companies, water companies, tax receiving offices, banks and moving picture theaters. It cuts down the time required to handle money and reduces the cost considerably. It also eliminates errors in counting and checks up collections accurately.



Bolt Switch for Hotel Door

Fixture for Factory Machine

New Time Switch

HOTEL DOOR BOLT SWITCH

When the guest of a hotel leaves his room, he cannot forget to switch off the lights if they are controlled by the hotel door bolt switch. The lock bolt turned from the corridor side of the door shuts them off automatically. No current is wasted and therefore there is no needless expense.

The lights in the room are controlled from the inside by a push button switch, the lock bolt having no effect when operated from the side of the door next to the room.

ADJUSTABLE FIXTURE FOR FACTORY MACHINE

When factory work involves the use of sewing machines and the concentration of the eye or mind on details, the best results are obtained by a low general illumination and a higher localized illumination by the use of the illustrated adjustable fixture, especially designed for a factory sewing machine.

The special feature of the fixture is an easily adjustable ball joint by which the fixture may be set at any angle or it may be shifted by the lightest touch of the hand. The close fitting reflector directs the light of a ten watt lamp to the work and not to the eye of the operator.

This last mentioned system is of special value where the operators are called upon to exercise any particular thought in the handling of their work as

the brain is better able to concentrate its forces while operating under such conditions than if the illumination is purely general.

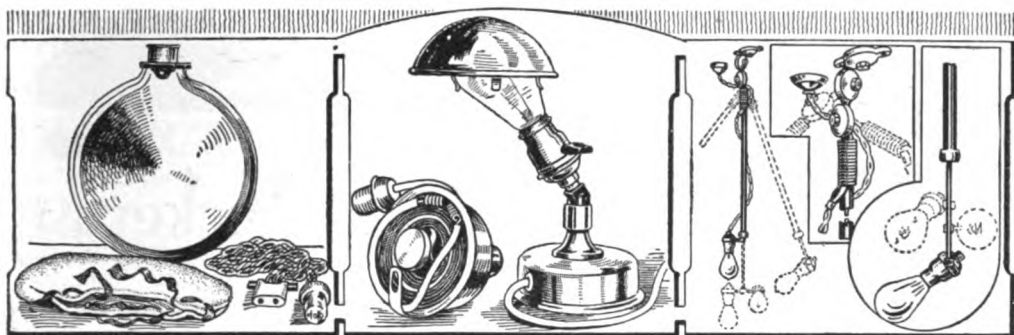
NEW TIME SWITCH

This new time switch is a device which will automatically stop the flow of electric current at any predetermined time that the user desires, without any attention other than winding the clock. It is a simple device consisting of the very finest of clock movements made expressly for the purpose. All the wheels are of heavy brass with spindles on steel bearings.

The switch is suitable for a great variety of circuits, the rating being 30 amperes and 250 volts so that it may be used for motors, burglar alarms, electric signs, ventilating systems, also for charging autos.

All live parts are enclosed in a standard knock-out box and switches are so constructed that they may be hand tripped without opening the box. The construction is such that the switch and clock operate independently of each other except at the time at which the clock has been set for release.

Being automatic in action the switch will not release until time set for such operation or thrown by hand trip. The switch is said to have a powerful throw and the clock is set to throw the switch by the alarm movement, similar to that in any ordinary alarm clock.



Electric Heating Pad in Metal Case Lamp that Lends Itself to Every Re- Adjustable Light Holder for Workshop
quirement

HEATING PAD IN ALUMINUM CASE

The electric heating pad shown here has a durable metal case making an effective protection for all electrical parts. This pad is perfectly sanitary and can be easily cleaned. It is absolutely safe, being of non-inflammable materials and fully protected from over heating by a safety cutout device. Electric current for its operation costs about one-fifth cent an hour.

The pad is concave on one side and convex on the other, thus fitting the body curves comfortably and it is extremely light. It is said that the automatic control will maintain the heat all night at the exact degree that may be determined on.

Moist heat may be obtained by wrapping the pad in damp flannel. In cases of lengthy illness the pad may be kept in constant use at a uniform temperature if needful. It is a great convenience in all homes equipped with electric service connections.

THE WALLACE ELECTRIC LAMP

Here is a lamp of peculiar excellence. It hangs, sticks, stands or clamps any place you put it. It lends itself to every requirement. There is no place it will not go. It is a boon to the household and indispensable in the hospital. The adjustable and instantly removable shade throws the light at any angle.


There is a disappearing hook for hanging on the wall.

The lamp can be fastened to any mirror, window pane, or non-porous surface by a suction cup. It is convenient for shaving, hair dressing, millinery parlors or for theatrical make-up. When not in use the cord winds up into the hollow base of the lamp. It can be carried in a hand grip when traveling and it is a good light to shave by, as it will clamp to the mirror frame or it may be attached to the surface of the mirror by the suction cup.

ADJUSTABLE LIGHT HOLDER

There are electric light holders without number, drop lights, desk lamps, rigid and flexible, but Anderson holders can be placed at any height or angle or position. They can be shifted from one end of a work bench to another. They may be moved without effort from the ceiling clear down to the floor. They are six feet in length when in ordinary position and may be extended to eleven and a half feet to cover a maximum diameter of 23 feet or a maximum area of more than 400 square feet.

These holders keep the light where it is needed. They are very convenient in that it is possible to transfer a stationary overhead light to any point within a considerable radius without occupying any floor space and their being adjustable to any angle saves time and labor of moving material.

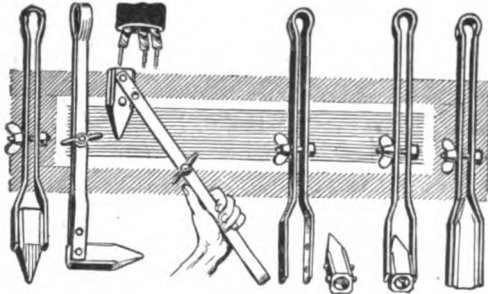


For Practical Electrical Workers

SOLDERING IRON WITH SPECIAL FEATURES

A soldering iron which has several novel features, shown in the illustration, is the invention of L. C. Opitz, Clinton, Ia.

The iron can be folded in such shape that its length is shortened so that it can be carried in a small tool bag, and the nose of the



Features of Soldering Iron

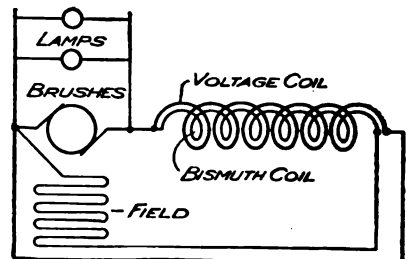
iron is thus kept from damaging the bag. When the nose is turned into a straight position for use, a thumb nut is tightened to hold it rigidly. The nose may be set at any desired angle for convenience in reaching difficult positions. If necessary, the nose may be readily removed from the handle and another nose picked from the fire. The most important feature is that the nose has an opening in it large enough to serve as a melting pot for solder. Ends of stranded lamp cords, other stranded wire conductors, outlet box or "pig tail" splices, etc., can be dipped in the molten solder and the pot will remain right side up, on account of its swinging suspension. There is also a groove in the soldering iron for soldering what are called Western Union splices.

The street lighting of the business district of Hartford, Conn., will be done by means of the new half watt Mazda lamp beginning June 1.

BISMUTH COIL REGULATOR

I had a very simple though efficient type of shunt wound dynamo which I wished to install on my car to supply current for lighting purposes. The installation of the machine itself was a comparatively simple matter, the drive being taken directly off the cooling fan pulley. I foresaw trouble, however, in the regulation of the output at the varying speeds, but solved the problem of maintaining the output constant in the following manner.

The resistance of bismuth increases when it is placed in a magnetic field and the amount of increase is directly proportional to the strength of the field within certain limits. Accordingly I designed the regulator shown by the diagram. A coil of bismuth wire—the method of forming it is described below—was placed in series with the field of the dynamo and was made the core of a voltage coil which was connected across the lamp circuit. Under these conditions, the bismuth coil was subjected to the fluctuations of the field in the voltage coil and the resistance of the bismuth varied accordingly. When the voltage rose, due to the increased speed, the



Circuits of Regulator and Dynamo

field strength increased and the resistance of the bismuth increased in proportion so that the strength of the field current was diminished, tending to keep the voltage normal. As a regulator, it works very satisfactorily.

The principal trouble was in the formation of the bismuth coil since that metal is too brit-

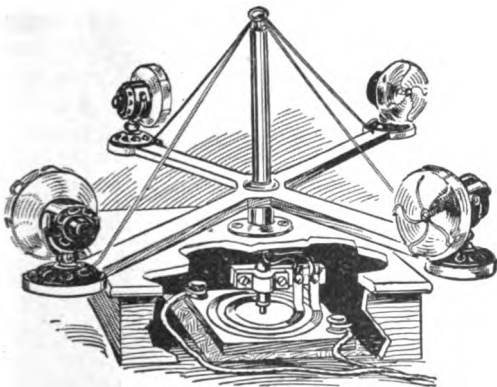
tile to be drawn to a filament. This was done by embedding a long steel spring, loosely coiled, which had been dipped in oil, in plaster of Paris, and after the material had set, unscrewing the spring from the plaster. The bismuth, molten of course, was forced into this mould with the aid of a dentist's vacuum casting machine. When the plaster was carefully broken away a perfect coil of bismuth was left.—J. NAVEMAN.

TO PREVENT TAPE TEARING

Electricians and others who have occasion to use friction tape know the tendency it possesses to tear at the edges while unrolling. This may be easily prevented. With the point of a sharp knife make light cuts on both sides of the roll from the center out to the circumference. This allows the tape to be peeled off very easily without the usual sticking and tearing at the edges.

HELPING AN ELECTRIC FAN SALE

A plan employed by a southern electrical shop to call attention to an electric fan sale is here illustrated. The device may be made by a good mechanic in accordance with materials obtainable. Four twelve inch swivel and trunion fans are secured to the circular bases at the ends of the wooden arms and the speed of the apparatus can be readily adjusted by shifting the fans on their swivels, the slightest varia-



Interior Construction of Fan Display Device

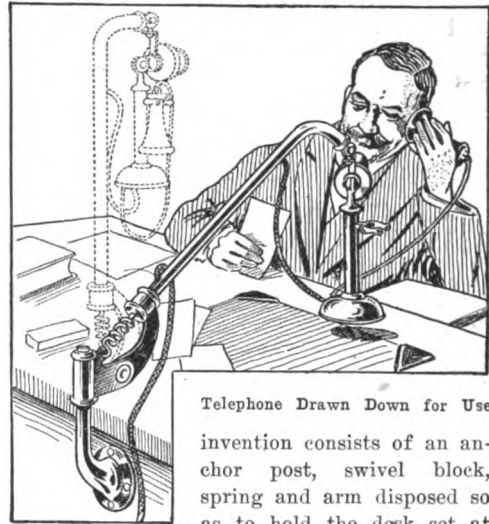
tion in the angle making a noticeable difference. Very slow speed is attained by setting the fans to blow almost directly away from the center of the circle.

Wires from the fans run on the under side of each arm and connect in multiple to the two spring copper brushes on the arm in the cab-

inet. These brushes make sliding contact on two rings of sheet copper. These rings are secured to the underlying asbestos board with small brads driven into the outer and inner edges of the circles. A circular floor may be laid upon the arms and small electrical appliances displayed upon it.

ADJUSTABLE SUPPORT FOR DESK TELEPHONE

A patent upon a support for a desk telephone set has been issued to Kempster B. Miller and Chas. G. Ashley, Chicago, Ill. The



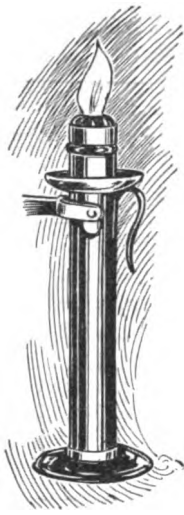
Telephone Drawn Down for Use
invention consists of an anchor post, swivel block, spring and arm disposed so as to hold the desk set at

the end of the arm in position for use and to support the set out of the way when the arm is placed in a vertical position. Besides the movement to and away from the vertical position, the arm may turn around the anchor post as a center.

DRIPLESS CANDLE

A dripless candle has not been found, but the plant department of the Chicago Telephone Company, according to the *Bell Telephone News*, has something as good—a dripless candleholder.

The candle is put into the barrel of the holder and is forced upward against a ferrule at the top of the barrel by a strong spring. The ferrule has an opening a little over half the diameter of the barrel itself and can be removed by being given a quarter turn, allowing the candle to be renewed. As the candle burns the spring feeds it upward. The entire candle is thus burned without waste,



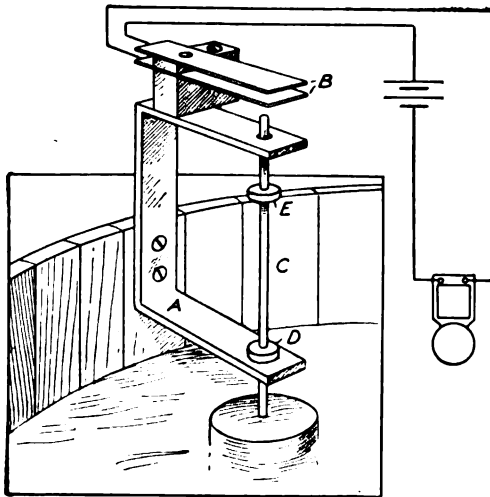
Dripless Candle

the only melted wax being a few drops immediately around the base of the candle wick. This grease cannot run out unless the holder is tipped at a considerable angle. In case the holder should accidentally be tipped, the wax is caught in the emergency drip cup immediately under the ferrule.

On one side of the barrel is a spring which may serve either as a handle or to hang the candle to a ladder or case of a telephone. Opposite this are two clamps to fit boards of different thicknesses.

MAKING A WATER LEVEL ALARM

A simple water level alarm and the method of constructing it are shown in the accompanying illustration. A piece of $\frac{1}{8}$ inch brass (A) is bent as shown in the illustration with two springs (B) mounted on top of it. These springs are insulated from (A) and



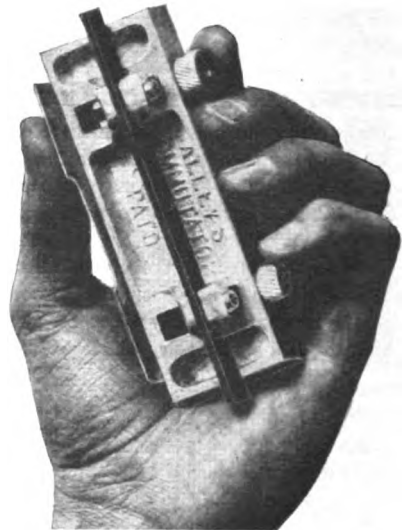
Float and Bell Connection

from each other. A small brass rod (C) passes through two holes in the piece (A). The lower end of the rod is connected to a float of sufficient buoyancy to rise or fall with the water. The movement of the rod is limited by two washers (D) and (E). When the rod is raised by the float to its upper

position, the lower spring is raised and makes contact with the upper spring, closing the bell circuit and notifying the attendant that the water in the tank has reached a predetermined level. The bell can, of course, be located in the engine room or in any other convenient place, without regard to the position of the tank. More than one bell can be connected to the circuit if the duties of the attendant take him to various parts of the building.—MAXWELL SNAVELY.

COMMUTATOR SLOTTER

The Alley commutator slotter is a tool that, it is claimed, will save sandpapering and stoning a commutator by cutting a V slot with a round bottom. The slot is straight, smooth and even with no sharp corners left for dirt



Showing the Cutter

to collect in. The cutter is a special make of straight file and extra hard.

In operation start one or two slots without using the guide and then adjust the cutter and guide and use the guide in the slots already made, working the tool back and forth, and lifting the guide when the cutter has started. The tool is made in three sizes.

Mr. Ernest Freeman, president of the National Electrical Contractors' Association, in a recent address explaining the purposes of the association, stated that one of these was to secure the passage of laws in the various states providing for the licensing of electrical contractors.

Construction of a 1/8-H.P. Dynamo or Motor

By ROLAND JENS

In small dynamo construction the construction should be such that the amateur builder should not be bothered with cumbersome small patterns and the like. In the 1/8 horsepower dynamo or motor here described only two patterns are necessary, and these are of very simple construction.

The dynamo may be divided into the following parts, which will be explained and de-

scribed one by one with the aid of the working drawings: ameter. In this space the field magnet wires are wound later on. The 1/8 inch stock is left for finishing. When these circles have been drawn, the two 1/2 inch holes may be laid out 2 1/8 inches from the center, respectively, up and down. The bearing brackets are fastened on the 1/2 inch pieces of steel that go through these holes. The bearing brackets are not parallel with the base, but perpendicular to it.

LIST OF MATERIAL			
FIG. NO.	M'T'R'L	NO. WANTED	DESCRIPTION
1	SHEET IRON	1	FRAME
15	"	1	ARMATURE
2	STEEL	1	SHAFT
3	BRASS	2	BEARING BRACKET
5	STEEL	2	B'G BRACKET STUD
14	BRASS	2	BRUSH HOLDER
11	WOOD	2	BRUSH HLD'R BAR
9	BRASS	1	BRUSH HLD'R B'CKT.
8	WOOD	1	COMUTATOR CORE
	BRASS	8	" SEGMENTS

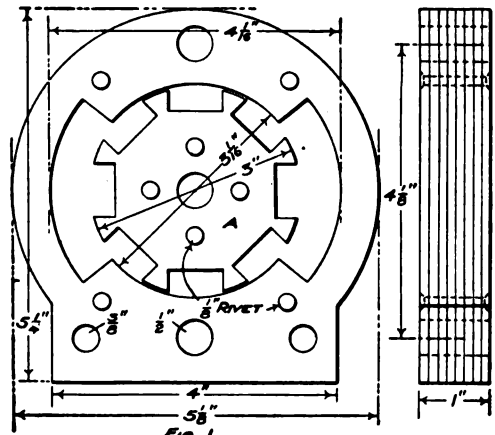
Reference Numbers and Material Required

scribed one by one with the aid of the working drawings:

(1) frame (magnets), (2) shaft, (3) armature, (4) commutator, (5) brush holders and brushes, (6) winding of armature, (7) winding of field magnets, (8) general assembly.

FRAME

The magnets are a part of the frame. The main frame of this dynamo is made of sheet iron of 1/2 inch thickness. Fig. 1 shows an end view of the frame and also a side view indicating the thickness. The sheet iron sheets may be slightly thicker or thinner, whichever may be procured the easier by the builder. Enough sheets are cut so that they will have a thickness of one inch when clamped tightly together. Cut the sheets 5 3/4 inches square. When enough sheets have been cut, center them with a center punch and with a divider draw circles of 2 3/4 inches diameter on each. This will leave 1/8 inch stock when the 3 1/8 inch hole is bored out later on. When these circles have been drawn, draw circles 5 1/8 inches in diameter on each sheet, but not the entire distance around. Leave four inches for the base, as shown in Fig. 1. Now go over the sheets again and draw circles four inches in diameter, not all the way around, but just as far as shown in Fig. 1 at the 4 1/8 inch di-



End View and Section of Frame

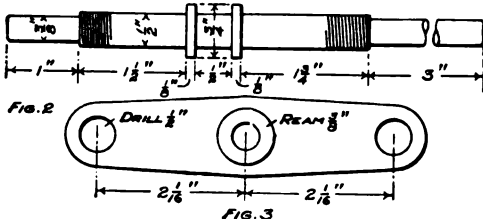
be square with the side of the frame. This may be done either by planing or filing.

SHAFT, BEARING AND BEARING BRACKETS

The shaft of this motor is made of cold rolled steel. Cut a piece 8 1/4 inches long and

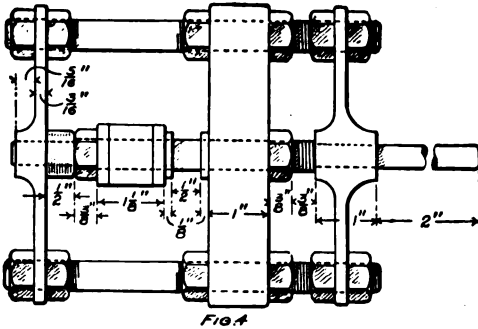
$\frac{3}{4}$ inch in diameter and turn it off as shown in Fig. 2, which shows the finished shaft. The threads are cut for $\frac{1}{2}$ inch nuts.

The bearing brackets are two in number and are made of brass. Fig. 3 gives a plan view



Shaft and Bearing Bracket

of the bracket and in Fig. 4 another view is shown. A pattern will have to be made for the brackets, but only one is necessary, as the one on the left side is just the same as the one on the right side, Fig. 4, except that the inside of the former is turned off to $\frac{3}{4}$ inch diameter to receive the brush bracket when the dynamo is assembled later on. Center



Plan View of Partially Assembled Machine

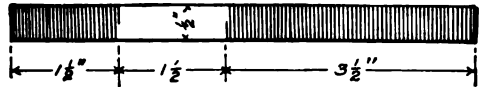
punch the $\frac{3}{8}$ inch hole and the $\frac{1}{2}$ inch hole on each end $2\frac{1}{8}$ inches from the $\frac{3}{8}$ inch hole. Drill the $\frac{1}{2}$ inch holes with a $\frac{1}{2}$ inch drill. The $\frac{3}{8}$ inch hole may also be drilled, but be careful to get it in the center of the boss. Drill it $\frac{23}{64}$ inch and ream $\frac{3}{8}$ inch, as this makes a smooth job. The ends of the bearing brackets are $\frac{1}{8}$ inch thick.

The two bearing studs may also be made at this time, Fig. 5. Take two pieces of cold rolled steel $\frac{1}{2}$ by $6\frac{1}{2}$ inches and cut on threads with a $\frac{1}{2}$ inch die, as shown. Cut $3\frac{1}{2}$ inches of thread at one end and $1\frac{1}{2}$ inches of thread at the other end.

ARMATURE

The armature, Fig. 1, is built up of sheet iron, just as is the frame. The sheets are $\frac{1}{2}$ inch

thick, except the ones on the outside, which are $\frac{1}{4}$ inch thick, so as to make strong sides. Cut the sheet round, $3\frac{1}{4}$ inches in diameter. This leaves $\frac{1}{4}$ inch stock to be turned off later on. Cut enough sheets to make a thickness of one inch when they are clamped together tightly. Drill the $\frac{1}{8}$ inch holes and rivet with $\frac{1}{8}$ inch rivets. Now put this core into a lathe and drill the $\frac{1}{2}$ inch hole at the center. Drilling $\frac{31}{64}$ inch and reaming to $\frac{1}{2}$ inch is advisable, as it gives a more accurate hole in size. Put the core on a mandrel and turn off to a three inch diameter. The slots may now be milled, or filed, whichever way the builder prefers. The slots are eight in number. They are $\frac{3}{4}$ inch wide and $\frac{1}{8}$ inch deep. The depth, $\frac{1}{8}$ inch, is measured at the side of the slot and not at the

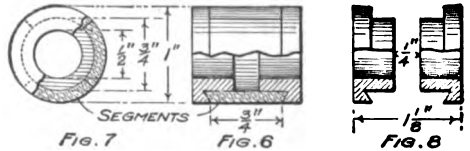


Bearing Stud

middle. Measuring at the middle, the depth is $\frac{3}{8}$ inch, making a diameter of $2\frac{1}{4}$ inches from the bottom of one slot to the bottom of the opposite one. Opposite slots are exactly opposite. Before starting to mill or file, lay out the slots on the sides of the core. When the slots are done, the core is put into a forge and heated to a dull red heat, then allowed to cool slowly. This anneals it, or makes it softer.

COMMUTATOR

Turn off a brass bushing to a diameter of one inch and while still in the lathe drill through a $\frac{3}{4}$ inch hole. Make the bushing $\frac{3}{4}$ inch long and turn the edges to 60 degrees,



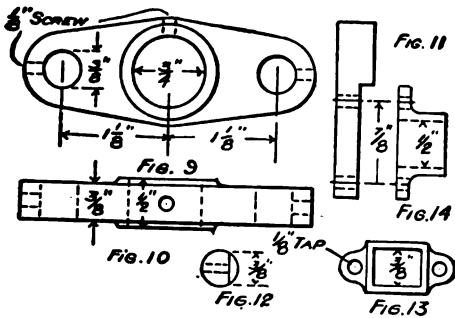
Details of Commutator

as shown by the segment, Fig. 6. Now take it out of the lathe and cut it into eight equal parts or segments, the long way, with a hacksaw, Fig. 7. Drill a $\frac{1}{8}$ inch hole in the extreme upper end of each segment about three-fourths of the way through. Now take a piece of fiber, or oak wood will also serve the purpose, and turn a piece in the lathe to a one inch diameter and one inch long. From

the middle part $\frac{1}{4}$ inch is now turned off to receive the commutator segments. Fig. 8 gives a clear view of this part. The piece is now cut in two, cross-sectionally, so that the commutator segments may be tightly clamped between the two pieces. Drill a $\frac{1}{2}$ inch hole through the middle before cutting for the shaft.

BRUSH HOLDERS AND BRUSH BRACKETS

Fig. 9 shows a plan view of the bracket and Fig. 10 shows a side view. This piece is made of brass, only one being required. The $\frac{3}{4}$ inch hole is first laid out in the middle of the



Brush Holders and Brackets

boss and the $\frac{3}{8}$ inch holes are drilled $1\frac{1}{2}$ inches from it on each side. Drill the $\frac{3}{4}$ inch hole and the two $\frac{3}{8}$ inch holes and at the same time drill the hole in the end $\frac{1}{2}$ inch and tap it $\frac{1}{8}$ inch. The latter hole later receives a $\frac{1}{8}$ inch screw to hold the brush bar in position. The brush bar, Fig. 11, is made of some non-conducting material such as oak wood or fiber. It is turned off to $\frac{3}{8}$ inch diameter in a lathe and then a portion is cut off with a knife, in order to have a flat rest for the brush holder. The two $\frac{1}{8}$ inch holes are drilled $\frac{7}{8}$ inch apart from center to center. Later on the brush holders are screwed on here with $\frac{1}{8}$ inch screws. Two of these bars are needed. Fig. 12 shows an end view of the bar.

A plan and a side view of the brush holder are shown in Figs. 13 and 14, respectively. Two brush holders are required and are made of brass. The two $\frac{3}{8}$ inch holes are drilled in the bosses $\frac{7}{8}$ inch apart from center to center, and are tapped with a $\frac{1}{8}$ inch tap to receive $\frac{1}{8}$ inch screws. The inside dimensions are as indicated. To form the interior, drill a few $\frac{1}{16}$ inch holes through and then file out the rest. Be sure to get exact dimensions and square corners.

The brushes are two in number and are of carbon. The carbon of an old dry cell will

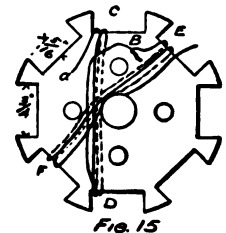
do if filed to fit the holder. Carbon brushes of this size can be bought at any well-stocked electrical shop.

ASSEMBLY OF BRUSH HOLDER AND BAR

Place each brush in its brush holder. Put a small piece of sheet copper or tin over the back part of each holder, so that the brushes will not slide through. Bolt each holder to its brush bar with a $\frac{1}{8}$ inch screw. Insert the round $\frac{3}{8}$ inch end of each brush bar into its $\frac{3}{8}$ inch hole in the brush bracket and tighten with the $\frac{1}{8}$ inch screw in the end of the bracket. Before the brushes are placed in the brush holders, put a small spring in each brush holder to hold the brush tight against the commutator.

ASSEMBLY OF COMMUTATOR

Slip a $\frac{1}{2}$ inch washer of one inch diameter with a $\frac{1}{2}$ inch hole onto the shaft on the commutator end. (When speaking of the shaft, the terms "commutator end" and "pulley end" are used.) In Fig. 4 the right end is the pulley end and the left end the commutator end. Put the washer tight against the $\frac{3}{4}$ inch shoulder. Slip on one of the commutator cores; that is, the part made of oak wood or fiber. The other end is now put on and the commutator segments placed in the spaces provided for them. Put mica between the segments to insulate them from one another. The thickness of the mica is the same as the thickness of the segments. The commutator will then be perfectly round. Put on another washer of the same size as the first and tighten with a $\frac{1}{2}$ inch nut. The nut should be flat at the end, so that a flat surface will wear against the bearing bracket, and should be of such thickness that its outer surface will be flush with the end of the thread; that is, no portion of the thread should be left uncovered by the nut. The $\frac{1}{2}$ inch nut should be quite tight, so that it will not loosen when the commutator core will break. Drill a $\frac{1}{8}$ inch hole through the nut and shaft and insert a $\frac{1}{8}$ inch pin.



Armature Winding

WINDING OF ARMATURE

Fig. 15 shows the method of winding the armature. After the armature core has cooled from the annealing, rub off all the dirt that has collected on it. Then put the armature

core on the shaft from the pulley end and tighten it against the $\frac{3}{4}$ inch collar with a $\frac{1}{2}$ inch nut. Now insulate all the slots, the sides of the core and also the shaft for a short distance on each side, so that the wire that is wound on will not come in contact with any iron. For insulating, use fiber paper or other good, strong paper. With fiber paper use two sheets well shellacked. With other paper use two sheets with a piece of linen between, all well shellacked. Insulating is a very important factor and the efficiency of your generator will depend upon this. Wind the core with No. 21 double cotton covered wire. Start in any slot and wind in it and the opposite one. For instance, start with slot (C) in Fig. 15 and wind in slots (C) and (D) until there are two layers of sixteen turns each in both slots. When around from (D) to

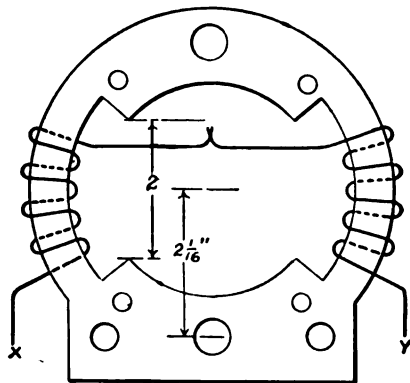


Fig 16
Field Magnet Winding

(C) the thirty-second time, make a loop in the wire as shown and start to wind through (E), then around to (F) and back to (E), and so on until there are two layers of sixteen turns each in the two slots. Then leave another loop and go on to the next. With two layers of sixteen turns each in a slot the slots will be half full. Now shellac the whole and tap the windings down in each slot with a piece of wood. Place two pieces of well shellacked fiber paper over the winding in each slot to insulate the winding that is there from the one that is going on top of it. In winding past the shaft, a good way is to wind half of the turns on one side and the other half on the other side. This will make an evenly balanced armature and the lumps of wire near the shaft will be smaller. Now in the same manner as before wind two layers of sixteen turns each on top of the other winding in each slot.

When completed there will be seven loops. Now take the end of the wire and the beginning and twist them together and there are eight loops. The loops should be about three inches long. With this system of winding you can see that there is not a cut in the wire throughout the entire winding. After you have completed the winding, tap the winding down tightly in the slots with a piece of wood, shellac the whole thoroughly and let dry. This finishes the winding of the armature. About one pound of No. 21 double cotton covered magnet wire is required.

WINDING OF FIELD MAGNETS

Fig. 16 shows a view of the winding of the field magnets. Insulate the frame with well shellacked paper, as used for the armature, at the two places where the wire is going to be wound. No. 18 double covered wire is used. Start at (Y) and wind in the slot (H) and around the outside until six layers of wire have been wound on. Then go over to the other side and wind six layers on that side, shellac while winding and when completed. About a pound to a pound and a quarter of wire will be required.

GENERAL ASSEMBLY

Fig. 1 shows an end view of the armature in position in the field magnets and Fig. 4 shows a side view of the entire motor assembled, except the brushes, brush holders and brush bars. The loops of wire from the armature are inserted in the small $\frac{1}{8}$ inch holes drilled in the near end of the segments and fastened there with solder. If the loops are too long, cut them off, insert both ends and solder.

At the pulley end of the shaft the $\frac{1}{2}$ inch nut that holds the armature does not entirely cover the thread. That this thread will not twist into and injure the bearing, a washer is placed on the $\frac{3}{8}$ inch portion of the shaft between the bearing and the thread and should fit tight.

The brush bracket is placed on the $\frac{3}{4}$ inch turned off part of the left side bearing bracket. The brush bracket can be moved around and tightened by the $\frac{1}{8}$ inch screw.

The armature should be balanced after it has been wound, and when placed in position it should be exactly between the two pole pieces.

The generator can be fastened to a wooden base with angle irons fastened to the base

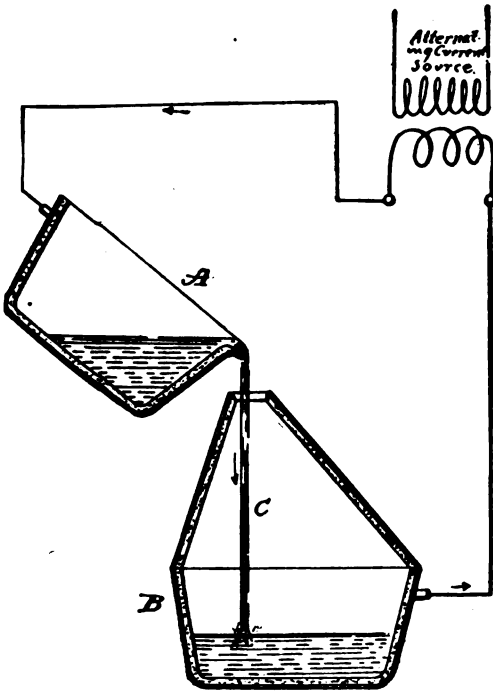
and to the $\frac{3}{8}$ inch holes in the frame by means of bolts.

The dynamo is series wound; that is, the end of the wire (Y) of the field winding, Fig. 16, is fastened to one of the brushes and the other end of the wire (X) goes to the outgoing circuit.

The generator should run at about 2,000 r. p. m. and then should give a potential of about 25 volts.

HEATING A METALLIC STREAM

A rather novel method of heating a liquid by passing electric current through it as it is being poured from one vessel to another is the subject



Falling Metal Heated by Electric Current

of a patent issued to William S. Franklin, South Bethlehem, Pa. The lining of each vessel is connected to the circuit. In ordinary iron foundry work, for example, it is sometimes desirable to melt a small charge of chromium or other refractory metal preparatory to its admixture to the cast iron in the large ladle. For this purpose a small amount of melted cast iron or slag may be drawn off into the ladles (A) and (B) of the jet furnace, heated up to any desired temperature by pouring, after which the chromium or other metal may be added and the elec-

tric treatment continued, if necessary to attain a still higher temperature, before the melt is poured into the main mass of cast iron.

ANCHORING TELEPHONE DROP WIRES

It is no longer an uncommon thing to find a pay station telephone in depots and waiting rooms of trolley lines but in installing this service a special kind of line construction is employed.



Fig. 1. Running Bridle Wire Over Trolley Line

Fig. 1 shows the close proximity of the telephone drop wires and the trolley wires in bringing the drop across the latter as is sometimes done. If the clearance between the trolley wire and the bridle wire is great enough to allow for sag in the line, the bridle may be run as shown at (B),

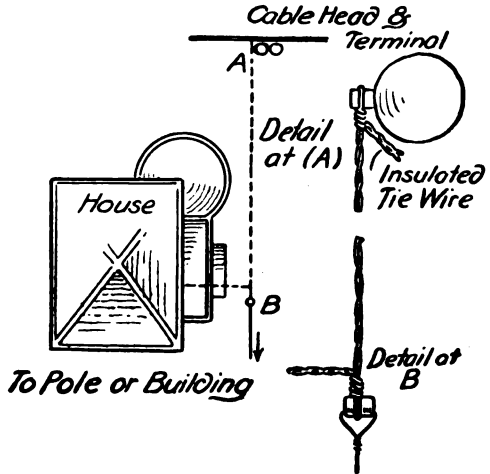


Fig. 2. Attaching Drop Wire to Guy Wire

Fig. 2, which illustrates how the drop wire is attached to the guy wire that supports it at the point where it turns to enter the building. If, however, there is not enough clearance to allow the bridle to sag slightly, then a messenger, No. 12 galvanized iron wire, should be run and the

bridle carried over on that, being fastened with clamps, rings or tape.

The same idea shown in Figs. 1 and 2 illustrate a method of bringing in a subscriber's drop wire when it may be impossible to attach it directly to the house.

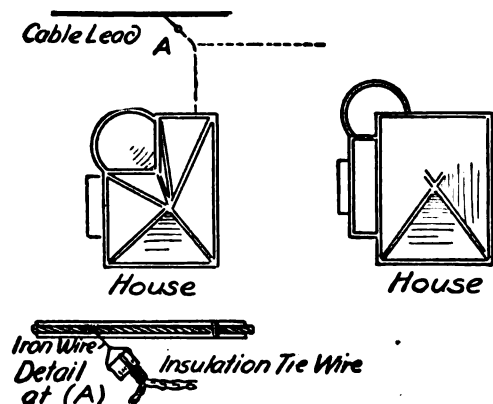


Fig. 3. Another Way of Bringing in Drop Wires

Another method somewhat similar to both of the above is shown in Fig. 3, in which a subscriber's drop wires are brought in without stringing the wire across the property of another party. The detail (A) shows the method of fastening at the corner.

Again, when bringing in two subscribers' drop wires it may be impossible to attach to the front of the building. Then the method shown in

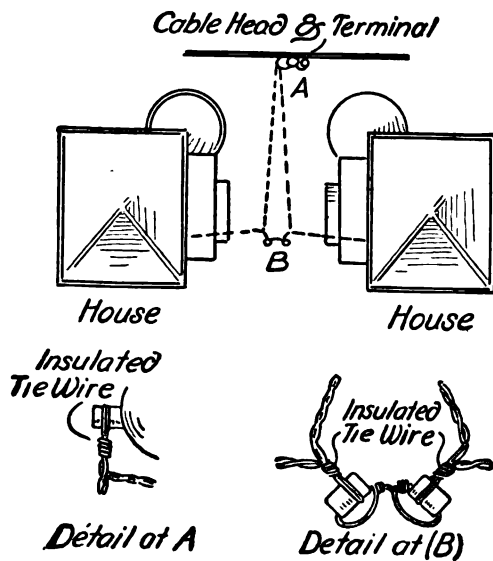


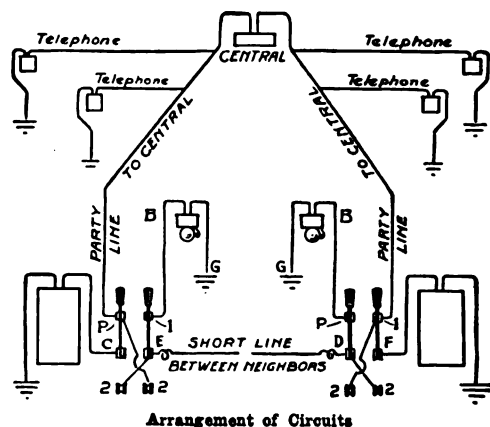
Fig. 4. Bringing in Two Lines

Fig. 4 is sometimes used. This method is rather neat and there are cases, even when conditions do not require it, where the drop may be run in this manner to much better advantage than by attaching to the building.

GEO. M. PETERSON.

TELEPHONE LINE BETWEEN NEIGHBORS

We are on a different telephone line from central than one of our closest neighbors and sometimes when we wished to talk the line was busy, so we decided to run a line, a diagram of which is shown. Two common door bells were purchased and about 20 cents' worth of No. 34 d. c. c. wire. The wire was divided and wound upon one of the electromagnets in each bell after the other wire had been taken off. The spring on each bell was adjusted so

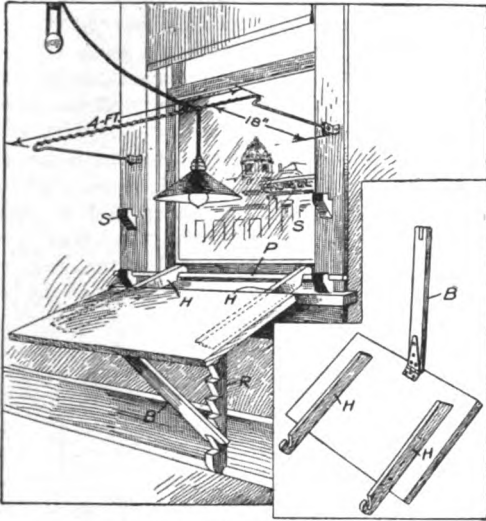


that it would operate as single stroke. These bells can be rung with the same generator as the regular telephone bells.

The line is half a mile long and works perfectly. During a recent snow storm one of the lines from central was broken and we acted as central for that line for a time. For either neighbor to call the other, the knife switch (F) is thrown from (1) to (2) or switch (C) is thrown from (P) to (2), depending upon which party is calling. The regular telephone bell is disconnected with the other switch of the pair. This makes the ringing easier when calling. To connect the party lines, throw the switches (D) and (E) down. It is not necessary to use another grounded wire for the bells than the one on the telephone, but it is better to do so as this gets rid of all danger from cross talk over the two lines.

ADJUSTABLE DRAWING BOARD WITH MOVABLE LIGHT

A piece of 1/4 inch iron rod or heavy wire is bent to the shape shown and hinged to the window casing about 6 1/2 feet from the floor. The rod should be heated and flattened on its ends and riveted to the blades of an old knife switch, the pivoted joints of the blades being set



Light and Board in Position

up rather tight so that they will hold the rod stationary at any angle.

An incandescent lamp with shade is swung over the rod and may be moved back and forth along its length the long way of the board, or to any position across the board by raising or lowering the rod, the familiar two ball cord adjuster permitting an up or down movement of the light.

A heavy piece of twine is wrapped around the front part of the rod its entire length, leaving about an inch space between the coils, which are covered with a layer of insulating friction tape to prevent the cord from slipping when the light is placed where wanted.

An effective and inexpensive method of making the drawing board adjustable to any convenient angle is to secure four wooden supports to the window casing, as shown at (S). The lower supports should be about 2 1/2 feet above the floor, and the upper ones about 16 inches higher.

Two wooden hangers (H) with notches cut in one end as shown, are fastened to the bottom of the board. These notches are to engage a rod of gas pipe (P) which is to be laid in either pair of supports, depending upon whether the

draftsman wishes to sit or stand before his work.

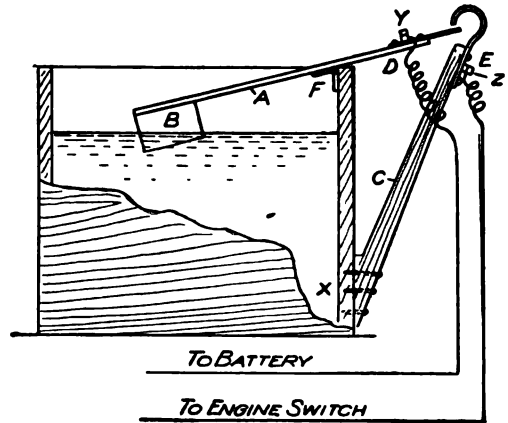
The brace (B) hinged at one end to the bottom of the board and notched at the other end to fit the piece (R) below the window sill, permits of easy adjustment of the board to any convenient angle.

When not in use, the brace may be folded and the board hung against the wall on the gas pipe.

FLOAT STOPS PUMPING ENGINE

I have a water tank in the attic of my house which is supplied by a gasoline power pump in the basement. To avoid overflowing the tank, I arranged an automatic switch like the following which breaks the sparking current and shuts down the engine when a certain height of water has been pumped.

(A) is the float rod of any light wood an inch square and about three feet long. At one end secure a float (B)—an empty coffee can with the cover tightly soldered on. At the end (D) fasten with screws a strip of brass two inches long. Six inches from (D) hinge the rod to the edge of the tank by a small strap hinge (F). Saw out a piece of wood the shape of (C) and screw onto the side of tank at (X), and at the end (E) secure a piece of stiff brass bent to form a suitable con-



Float and Electrical Connections

tact with (D). (Y) and (Z) are binding posts to which are attached wires leading to the engine circuit.

By adjusting the height of (C), the contact between (Y) and (Z) will be broken when the water reaches a certain height and raises the float (B), thus shutting off the engine and discontinuing the pumping.—L. B. ROBBINS.

Electricity in Twentieth Century Office

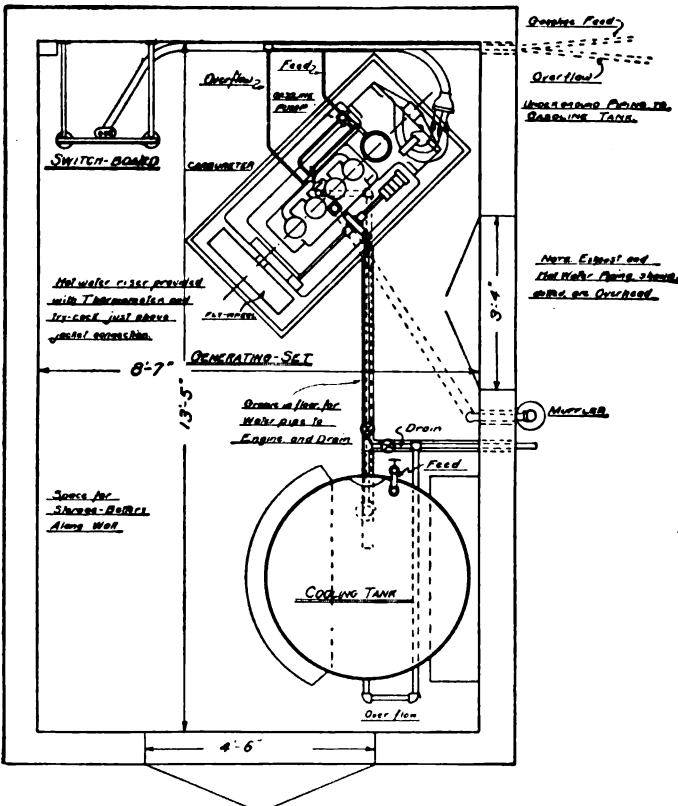
If it were desired to pick out a modern office which should be exemplary of up-to-date practices as regards efficiency, one that should contain all the latest office appliances and should be equipped with the most complete of filing systems, and which should be engaged in a work large enough to warrant expenditures on a scale which would produce noteworthy results, the search would probably commence in some of our larger cities. It is highly improbable that a

modern office practices. The work of this association has to do with the promoting of "Good Roads Everywhere."

The offices are not confined to one building, but consist largely of additions to one main office. There is one building devoted to the printing room and stenographic department is connected by a passage to the main office building, where are situated the filing and executive departments and private office. Adjoining this is a large drafting room, of which one side is occupied by the engineering and drafting departments, the other side being devoted to the desks of some of the officials of the association. The arrangement of the various office buildings is made with the end in mind of having the main, private offices, drafting room, etc., quiet. All offices are equipped with electric light, intercommunicating telephones, an electric computing machine, and in the printing department, electrically operated folding, sealing, stamping and printing machines. This arrangement of electric devices results in a fairly constant demand for power and as South Yarmouth is quite a distance from any central station, it is necessary that there should be means of generating power on the premises.

Situated about 75 feet from the nearest office building is the powerhouse. It is built entirely of fireproof materials.

The walls are of concrete block plastered with cement plaster inside and the arch roof is of cement brick of standard size, plastered both inside and out with waterproof cement. As the power is generated by a four cylinder gasoline engine, which is more or less noisy from valve mechanism, it was desired to keep as much noise from the offices as possible. To accomplish this, the walls of the building toward the offices were built entirely blank, and the only openings left are on the two remaining



Plan of Powerhouse of National Highways Association

little village on Cape Cod, about half-way between Buzzards Bay and Provincetown, would be thought of; but there is, in the village of South Yarmouth, just such an office. It is that of the National Highways Association. With its separate departments dealing with filing, stenographic drafting, publicity, and mailing, work and the machines and appliances used in these departments to accomplish results, it surely typifies the most advanced spirit in

sides, there being no opening in the roof. In this powerhouse is a General Electric Co., three kw., direct current gasoline-electric set; also the large cooling tank for the water from the engine jackets and the switchboard for the installation. Space is also provided should a storage battery become necessary. At the right of the engine is a window, having small doors below the sash, which provides an opening for gasoline fumes to escape and fresh air to enter. In the front of the building, as seen in the picture, are large double doors. Above these is a small hinged window providing escape for warm air and gases. Directly inside these doors, mounted on a cement base, is the cooling tank. The switchboard is located in the corner opposite the engine.

By reference to the drawing, the arrangement within the powerhouse will be easily understood. The gasoline tank supplying fuel to the engine is buried just outside the powerhouse, being connected by feed and overflow piping to the set. The tank is of ample capacity for over two months' supply of gasoline under ordinary operating conditions. On the switchboard are two separate main circuits, one for light and one for power. The feeder lines leave the board through lead covered cables and run underground, the light circuit running to the main entrance of the offices and the power circuit running direct to the printing room.

The power circuit is carried directly to six floor outlets of the polarized type in the printing room, and all machines are so wired that they may be changed to any position in the printing room with the polarity of motors remaining the same. The polarized type of plug prevents any of the machines being operated from any lighting circuit. The equipment consists of a multigraph, which is used in bulletin and addressing work, a folding machine for letters and bulletins and a sealing and stamping machine for completing the series of operations. These machines are so arranged that the operations are continuous; that is, as soon as the bulletins are finished on the multigraph, addressing is commenced and the mail passes from the addressing machine to the folding machine, is put in envelopes and goes directly to the sealing and stamping machine which completes the operations. All electrically operated machines, with the exception of the electric computing machine, are operated from this power circuit; but as it is necessary that this computing machine should be moved to the different departments wherever needed, it is the only electrically operated device provided with

an attachment plug which will fit a standard lamp socket. Having but a 1/12 horsepower motor, it does not produce any great voltage fluctuations on any light circuit to which it may be attached.

The feeder for the light circuit runs directly to the main entrance of the offices and to the main switch and from there direct to the distributing panel box. All lighting circuits are controlled by this panel and all fuses for the various circuits are in the same box. Mounted directly on each cut-out is a snap switch for controlling that particular circuit. The circuits from this box run through conduit to the various rooms where needed and with the exception of the stenographic department and the printing department, all construction is of the conduit type. In these two departments, the buildings being of plastered construction, moulding is used with Fielding rosettes and drop cords. In the



Powerhouse with Main Office in Distance

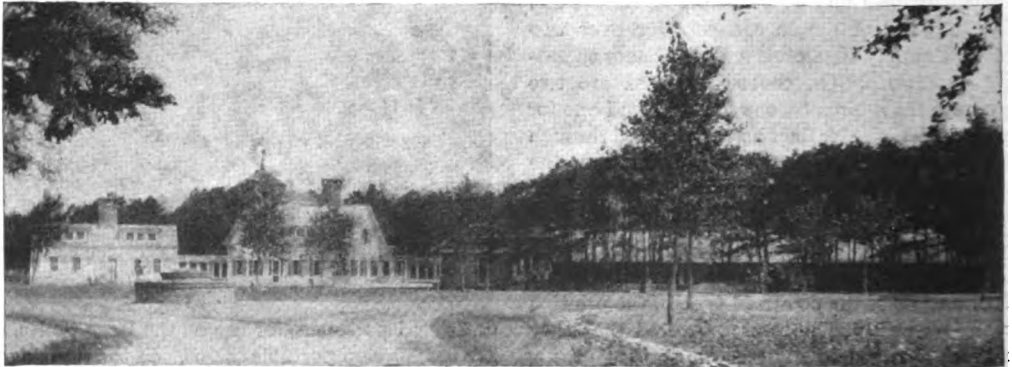
drafting department, for use on the large tables, are flexible arm portable lamps. In the drafting section the circuits are run symmetrically with the building; that is, there is one continuous line of 1/4 inch conduit on each side of the building and one line along the center. The connections for the portable lamps on the side circuits are furnished through short drop cords about two feet long. These cords are long enough to be within easy reach of the floor, but are at the same time short enough so that the cord which is attached to the portable swings freely from the socket and does not lie on the drafting table in the way. For work at the various officials' desks and also over the filing cabinets in the center of the room, the same provision is made for portable lamps. At filing cases a flexible arm lamp stands on the top of the case and is bent forward and down, so that the light is thrown directly into the file proper. All portables are equipped with aluminum reflectors and all drop lights such as are used over typewriter desks and similar places are equipped with green porcelain

shades, the idea being to keep down the general illumination as much as possible and to confine the light to the space needed. The light through the sides of the green porcelain shades is ample for ordinary illumination and as there is no direct bright light visible to the eye, the effect is very restful and at the same time light directly on the paper is plentiful.

As the engineering and drafting departments are in a building with an unsheathed roof, conduit is run directly on the rafters, but in the private office, where it is desired to have as much of the work concealed as possible, another type of construction has been used; that is, baseboard outlets. Directly beside each desk in this office is situated the flush type of baseboard outlet, so that the cord from the portables on these desks is practically out of sight. This does away with hanging cords. The baseboard outlets are fed from circuits beneath the floor. There are lights provided in the various passages

to install a storage battery, owing not only to the initial expense, but also that it might not be necessary to spend time in caring for the same and the liability of derangement of the battery in a place where experts and materials were not easily accessible.

The engine of this set is equipped with a carbureter of the overflow type, returning excess gasoline to the supply when an excess is being pumped. The gasoline consumption is nearly constant at all loads, being two pints per kilowatt hour at 100 per cent load (three kilowatt), equivalent to six pints per hour's operation and six pints per kilowatt hour at 25 per cent load or less, which means the same total consumption. The average run is about five hours, for 300 days in the year, which would mean, assuming four gallons per day, that 1200 gallons of gasoline would be used. At eighteen cents, this would cost \$216.00. Fifty gallons of oil at 40 cents would cost \$20.00. Labor, assuming 10 percent



Buildings and Grounds of the National Highways Association

and toilets of the offices through ordinary conduit construction. Where conduit is used, the conduit outlet is employed, which provides for cord connection to the mains, with no soldered joints whatever, and no large outlet box is necessary.

The lamps in all cases are of the high efficiency Mazda type and it has been found that the 25 watt light gives ample light for any service whatever when used under the conditions which prevail here. For minor cases, such as passageways, the 15 watt is ample. There are altogether about 90 to 95 lamps in service and of these probably one-half are in operation at any given time. The power requirements are such that power can generally be used during the day and would not be needed at the time when the lights are in operation although the generating capacity is ample for such a condition. It was decided not

of a man's time at \$1,000.00 per year, would cost \$100.00. Ten per cent, allowed on \$2,500.00 for depreciation and interest, equals \$250.00. Summing up, one year's operation costs:

Fuel.....	\$216.00
Oil.....	20.00
Supplies, lamps, etc.	14.00
Labor.....	100.00
Interest and depreciation.....	250.00
	<hr/>
	\$600.00

Assuming the ordinary demand at one kilowatt, 1500 kilowatt hours per year for \$600.00 means 40 cents per kilowatt hour, which is undoubtedly very high; but as operation costs are practically the same at 100 per cent load as at 25 per cent load, if the demand is kept at three kilowatts, the kilowatt hour cost is reduced to 13½ cents, which under the circumstances appears allowable.

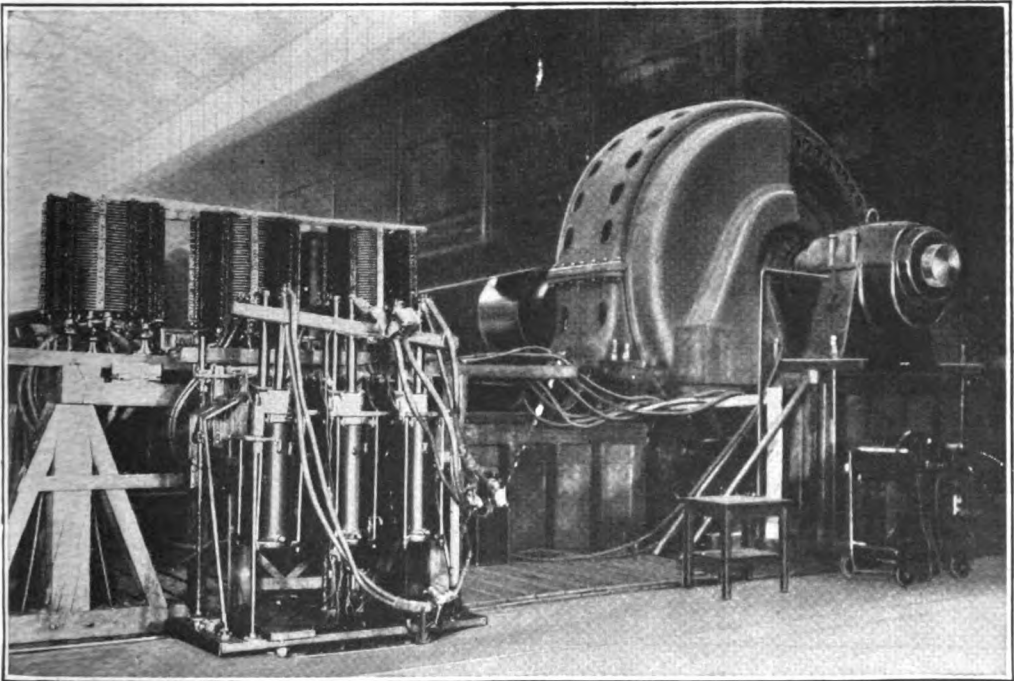
The plant can be put in operation at any time by any one, needs little attention and is very compact. The set has been in operation for some time, has proven satisfactory and is as economical as can be expected under these conditions. Being a four cylinder engine running at about 800 r. p. m., the voltage is steady and there is none of the flickering and unsteadiness of light so noticeable in many small isolated plants. The generating set is equipped with a speed governor and a slightly overcompounded generator and regulation is nearly automatic, making it unnecessary to have an attendant at the powerhouse.

SHORT-CIRCUIT TEST OF AN 8,800 VOLT GENERATOR

In the presence of a number of representatives of central stations recently, the engineers of the Westinghouse Electric & Manufac-

such a test would have wrecked the machine, but in the present instance no damage whatsoever was done. The only visible effect was a static flash between the field and the armature.

The test was performed to prove the fact that generators are being built that require no outside protection from outside short circuits, the generator itself being so designed as to be self-protecting. Unless the generator is properly constructed, a complete short circuit tears out the armature coils, which, coming into contact with the revolving field, cause extensive wreckage. Furthermore, the static flash, which always occurs under such circumstances, will destroy inferior insulation. With generators of the type tested, however, both results are guarded against by firmly securing the armature coils and bracing their ends, on one hand, and by the use of mica insulation on the other. In consequence, even so severe an ordeal as



Short-Circuited Generator and Apparatus Used in Test

turing Company deliberately short circuited a 16,700 kva., 8,800 volt generator, running at full speed and without resistance or any other protection in the circuit. Measuring instruments showed that a current of 21,000 amperes, $12\frac{1}{2}$ times the normal current, flowed through the generator.

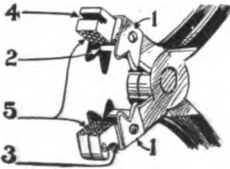
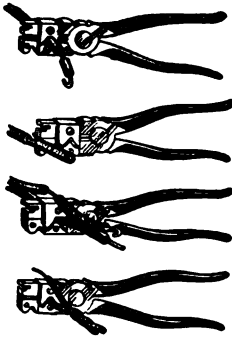
With generators designed some years ago

this test was withstood without harm, although it was repeated many times with the same machine.

Where insulating joints are required, fixture canopies of metal should be thoroughly and permanently insulated from metal walls or ceilings, and from outlet boxes.

COMBINATION TOOL FOR ELECTRICIANS

A pair of pliers made to perform no less than six different operations in the hands of



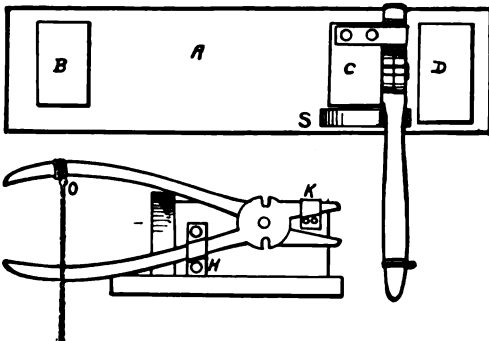
Combination Tool

the electrician is here shown. The different illustrations in order show the tool cutting insulation on a single wire, pinching the insulation between the jaws of the pliers and pulling it away from the wire, cutting the insulation of one strand of duplex wire after the outer braid has been slit and cutting the insulation on lamp cord. The parts of the pliers which are designed for the different purposes as indicated by the numbers are, (1) knives for cutting insulation, (2) knife for splitting insulation, (3) knife for scraping wire, (4) slots for bending loops in the ends of a wire, (5) jaws for pulling off insulation.

CUTTING INDUCTION COIL CORE WIRE

Some of the work in building an induction coil is in cutting the iron wire to length. Recently having about three pounds of No. 22 wire to cut, I rigged up the device shown, which proved a great time-saver.

On a piece of board (A) three blocks (B), (C) and (D) were nailed in the position shown.



Wire Cutting Device

To the side of block (C) a heavy pair of side cutting pliers was fastened, using two tin cleats

(H) and (K). So that the free side of pliers may move freely without rubbing against the block, a square of 1/16 inch cardboard should be placed under the side of the pliers where fastened to the block. The cutter should project about 1/8 inch above the block. A piece of clock spring (S) is fastened to the base and bears up on the under side of the movable handle, tending to keep the cutters open.

To operate, the machine is fastened to the edge of a table and a heavy cord (O) is fastened to the handle, the other end being a loop for the toe of the shoe, so that with the heel resting on the floor and the toe raised about two inches, the cutter of pliers will be open and when toe is pressed down the pliers will close. —J. P. LEWIS.

TELEPHONE INSTALLER'S LAMP

The adaptation of the pocket electric flashlight idea to the service of the installers in telephone exchanges is shown in the accompanying illustration.

The battery, according to the *Bell Telephone News*, is carried in a small leather pouch on a



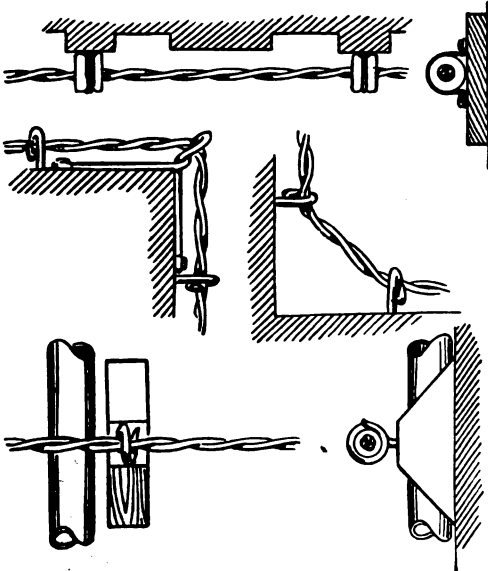
Installer Using Lamp

strap across the breast. Straps over the shoulders and secured to the belt allow the lamp and battery with its reflector to be moved up or down. When the lamp is not needed the coat can be buttoned over it, but the lamp is always ready for immediate use. It is a handy little trouble finder, practical and convenient.

RUNNING BRIDLE WIRES ON BUILDINGS

The illustration shows several methods of carrying bridle wires past obstructions on frame and brick buildings, and fully explains itself, but there are a few suggestions which may not come amiss. When installing this class of work, be careful to do it neatly and

affected and its reactance coil will prevent the current in it from rising to too high a value. The voltage will be maintained at the bus bars and no disturbance will be felt in the remaining feeders. This happens, of course, provided that the generators are self-protective; if not, such an event may bring about a serious injury to them.



Illustrations of Bridle Wire Installation

fasten everything securely, as even little things which work loose and fall from a great height may injure someone. When carrying the bridle wires past windows, etc., always, when possible, carry them over the top of the window frame instead of under the sill, because the temptation to the small boy is not so great.

POWER PLANT PROTECTION

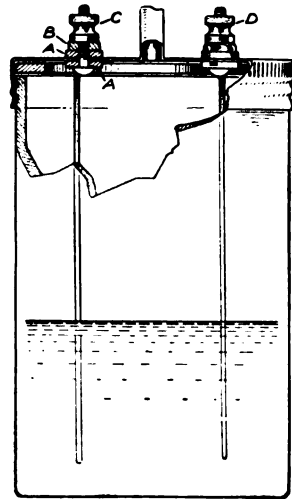
The practice recommended by the Westinghouse engineers is to protect the feeders and not the generators. If the generators are protected and a short circuit occurs on any of the feeders, even a poorly designed generator will not suffer, but the voltage will fail on all the feeders, all synchronous motors will be thrown out of step, and an overwhelming overload will be thrown on the circuit breaker of the short-circuited feeder, since it will carry the total current of all the generators in the station. If, however, protective reactances are placed in each feeder circuit, and a short circuit in a feeder occurs, only that feeder will be

SMALL ELECTRIC STEAM BOILER

The illustration shows a steam generator that has given excellent results while feeding small toy steam engines and similar devices. It consumes less than three amperes at 110 volts.

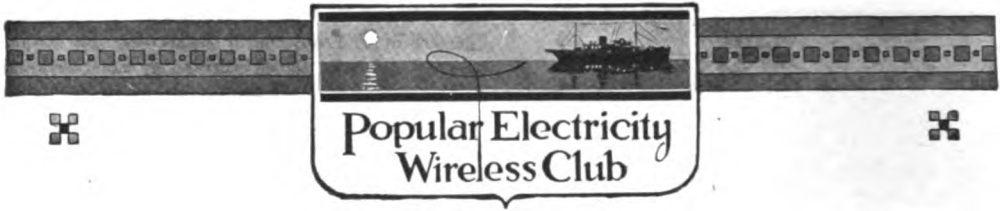
The boiler is a pint glass jar with a metal top, screwed down upon a rubber gasket. The steam outlet is a small brass nipple, soldered over a hole punched through the center of the cover.

Two 1/4 inch holes are punched through the cover on opposite sides of the outlet. Through each hole is passed a brass bolt, removed from the carbon of a discarded dry battery. Soft rubber washers (AA) are provided to make a steam tight insulating joint. While each bolt is held in the center of its hole, the nut (B) is tightened, forcing the rubber well around the bolt and making the whole secure. On the head of each bolt is soldered a length of copper wire, not smaller than No. 12. This should extend almost to the bottom of the jar and be well stripped of insulation. The jar is now filled about a fourth full of water and a pinch of salt is added. The terminals (C) and (D) are connected to opposite sides of any ordinary lighting circuit.



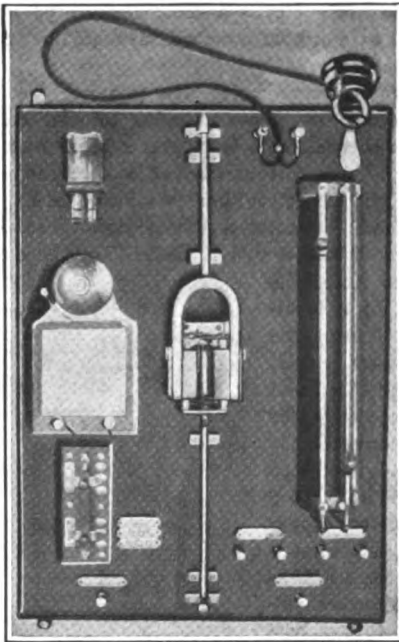
Boiler for Glass Jar

After the boiling of the water begins, the production of steam is quite steady and not greatly influenced by the height of the water.—LUTHER MCKNIGHT.



INCOMING WAVES SIGNAL WIRELESS OPERATOR

Inventors have been occupied with the question of an alarm call for use with wireless telegraphy outfits so that incoming waves would give a signal that can be heard without needing to keep a telephone always held to the ear. The operator need, therefore, give no



Signaling Outfit on Board

attention to the apparatus until he hears the signal, just as in the use of a telephone or telegraph. A recent invention is designed by Mr. Chomeau, a Paris constructor, and as will be seen, the whole wireless receiving outfit is mounted in compact shape upon a small board. At the middle is a permanent horseshoe magnet having between its branches a swinging coil of very fine wire, and when the current of the detector passes in this coil, it turns about under the magnet's action. The coil carries a light arm which comes against a fine spring blade so

as to make contact and this sends a current from a battery into the electric bell. The moving coil of the magnet device is simply connected in between the detector and the telephone receiver of the usual outfit, and a switch (seen above the electric bell) serves to make this connection while waiting for a signal. When a signal comes in and the bell rings, the magnet device is cut out of the circuit by the use of the switch, so as to leave the detector directly on the telephone, and after taking the message the switch is thrown into the original position. On the left is seen the tuning coil and telephone, and on the right a liquid detector.—F. P. MANN.

AN AUTOMATIC WIRELESS TUNER

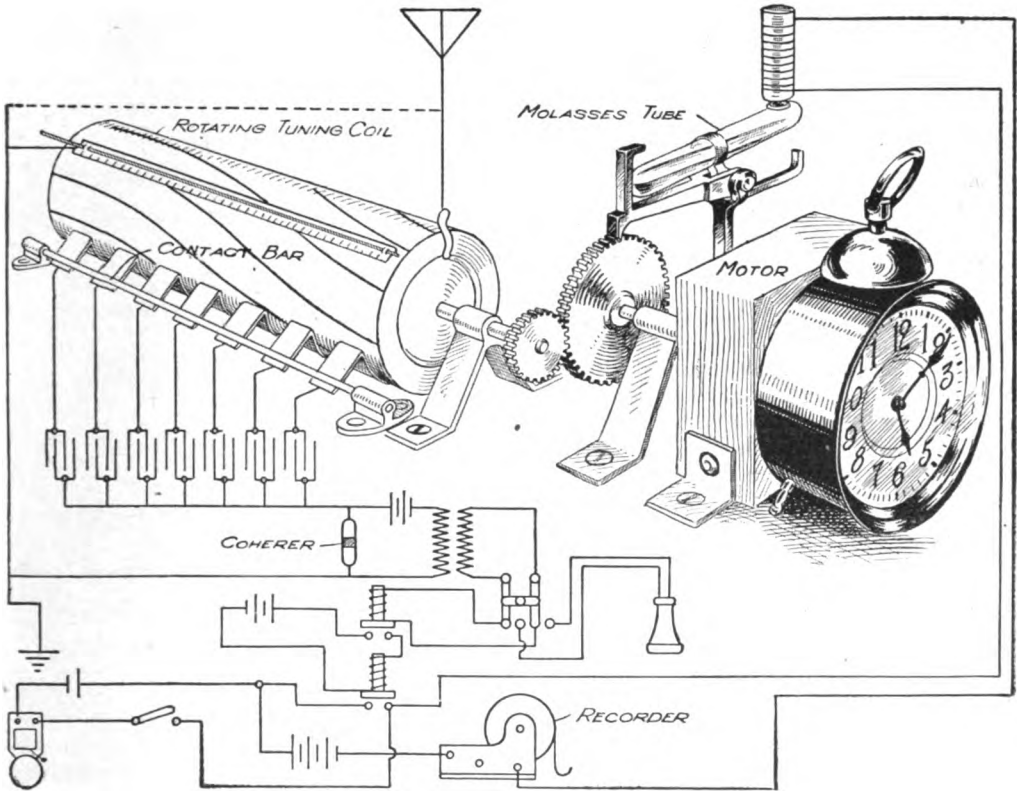
Can a wireless receiving apparatus be so equipped that it will automatically attune itself to the wave length of a message flashed within its range, with only so much manual attention as may be required to secure a fine adjustment if the receiving is done by ear? And if so, can the self-tuned receiving apparatus be made to record the message so that the message may be received while the operator is off duty?

An ingenious answer to both of these questions is shown in two United States patents just issued to Earl G. Stalnaker, a telegraph operator of Chicago. Mr. Stalnaker started out with the idea that if the tuning of a coil were continually varied within wide limits including the range required for the wave lengths in ordinary use, some of the waves comprising a message would strike the receiving apparatus at times when the apparatus was momentarily attuned to the message. Consequently, a sensitive detector connected to the apparatus could be actuated by the wave at the moment when the coil is in tune with it and this detector could close the circuit for operating a latch to lock the coil in the attuned position. Then the messages can be received in the usual manner, and after releasing the latch continued and rapid variations in the adjustment of the coil could again be started while awaiting some other message.

In working along this line, the inventor wound his tuning coil with enameled wire having bare spots exposed along lines passing diagonally or in zigzag formation from one end of the coil to the other. A contact bar having its edge split into a series of narrow fingers bears against the surface of the coil and makes contact to the coil at continually shifting points as the coil is rotated under this contact brush.

Consequently, the inductance of the coil is continually varied and if the coil is rapidly

may also close another battery circuit through a bell to summon the operator, thus obviating the necessity of having the latter continually on duty. In practice there is usually a slight time interval between the acting of the detector and the stopping of the motor or clutch which turns the coil, hence a little adjustment is provided whereby the operator may rotate the coil slightly after it is stopped, so as to adjust it more accurately to the message to which it has approximately attuned itself.



Arrangement of Coil and Circuits for Automatic Tuning

rotated by means of a motor, the inductance may be varied over the entire range every few seconds. Then when such a rotating tuning coil is included in a receiving circuit within range of a wireless message, it will only be a matter of comparatively few seconds before one of the waves strikes the coil at a time when the circuit is substantially in resonance with the wave length of the message. As soon as this occurs, a sensitive detector closes a local battery which operates a relay and the relay in turn closes the battery circuit through a magnet which drops a latch to stop the coil. The relay

The same general arrangement can also be used for switching a ticker or other recording instrument into the circuit at the moment when the detent stops the rotating of the coil, so that the message may be automatically recorded without requiring any attention on the part of the operator. However, this introduces the new difficulty that the coil would be locked in its attuned position for the first message received during the night, or at other times when the operator is not on duty, so that it will not be ready to receive messages of other wave lengths. To avoid this, the inventor has pro-

vided an automatic time release which will unlatch the coil and allow it to resume its rotation after a message has been recorded. For this purpose the lever which operates the detent is made of a tube filled with glycerine or some other syrupy liquid which will be sluggish in moving from one end of the tube to the other. When the magnet moves this tube to set the latch, the liquid will flow toward one end of the tube and after the magnet loses its strength when the wave has passed, the liquid will retard the return of the tube to its former position. Consequently, if the flashes come at brief intervals, as during the sending of a message, the tube will not have a chance to return to its normal position and to unlatch the detent until after the whole message has been received. Then when there has been no flash for a considerable period of time, the liquid will gradually restore the tube to its original position so as to unlatch the coil and allow this to rotate again in its search for attunement with another message.

The same automatic tuning arrangement might be used also to save the necessity for tuning the ordinary receiving apparatus after the usual fashion, but its greatest field would seem to be for use at night and at such other times when it is not feasible to have an operator continually on duty.

MEMORIAL TO HEROIC OPERATORS

As a memorial to wireless telegraph operators who have lost their lives at sea, it is planned to erect a fountain in Battery park, New York. The fountain will be of white granite with seats of the same material at either side. At the back will be a column upon which the names of the operators will be inscribed as follows: Jack Phillips, of the Titanic, April 15, 1912, Atlantic Ocean; George C. Eccles, the Ohio, Aug. 26, 1909, Pacific ocean; Stephen P. Sczapanek, the Pere Marquette, Sept. 9, 1910, Lake Michigan; S. Lawrence Prudhunt, the Rosecrans, Jan. 7, 1913, Pacific ocean; Donald Campbell Perkins, the State of California, Aug. 18, 1913, Pacific ocean; Ferdinand J. Kuehn, the Monroe, Jan. 30, 1914, Atlantic ocean.

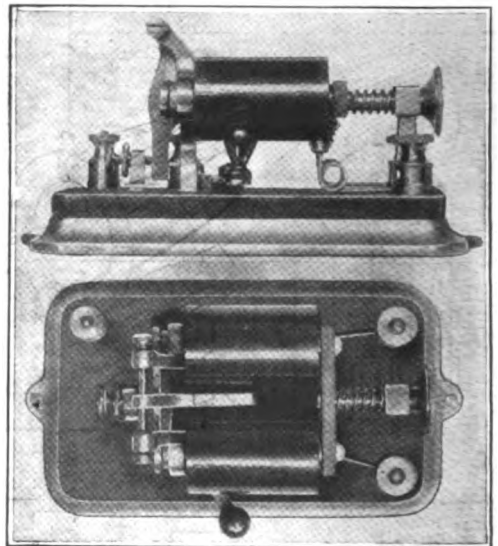
REVIVING A DRY CELL

One way of reviving a dry cell is to file a notch in the side about a quarter of an inch from the bottom. Then place the cell in a saturated solution of sal-ammoniac and allow it to stand for 24 hours. Remove from the solution, solder up the opening and the cell is ready for use.—F. F. SENGSTOCK.

NEW TELEGRAPH RELAY

The standard relay used by telegraph and railroad companies contains 63 parts, including every minute portion, such as screws, washers and wires. The new single adjusted relay contains only 32 parts which include a local circuit breaker, an added valuable feature. Requiring this small number of pieces the instrument is constructed at reduced cost.

The instrument possesses another important feature, the balanced weighted lever. The relay is also devoid of springs. The spring on the front adjustment of the standard relay is the cause of nearly all the trouble



Telegraph Relay of Few Parts

operators have with it. There is no spring on the new relay, its place being taken by the balanced weighted lever. Through the absence of this spring the work of adjusting the sounder to all sorts of wires under all weather conditions is practically eliminated.

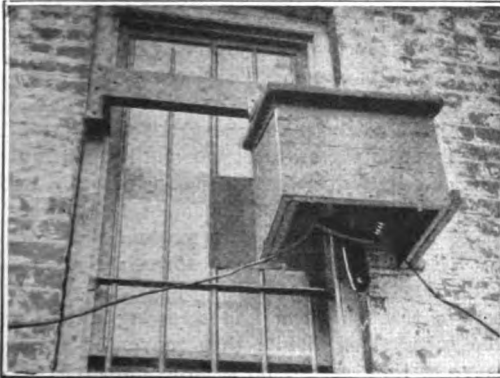
The local circuit breaker, placed on the upper fiber base, acts in conjunction with the lever and is especially placed there to silence the sounder, which makes it convenient for an operator who is compelled to work another wire and also to use the telephone. This circuit breaker does away with the operator's habit of sticking a pen or pencil between the tongue and magnets to silence the sounder.

The average peak lighting and power load at the Panama-Pacific Exposition will be 8,500 kilowatts.

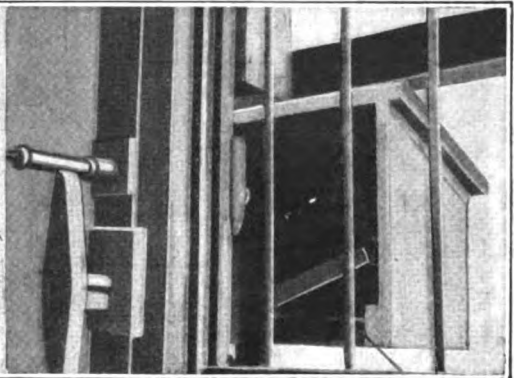
Construction of a Lightning Switch

Articles appear from time to time describing practically every part of the wireless outfit, but few deal with that important adjunct,

is as high as the average antenna. The ordinary switch is deficient in this respect. Following is a description of the apparatus



Exterior View of Switch and Enclosure



View from Instrument Room

the grounding switch for protection from lightning. It is customary to use simply a 100 ampere 500 volt single pole double throw knife switch. This answers the purpose as far as proper protection is concerned, but the matter of convenience is not considered. The writer has developed a type of grounding

made clear by reference to the accompanying drawings.

By reference to Fig. 1 it will be seen that the switch consists of a heavy brass bar mounted on the top of an ordinary ten inch electrose antenna insulator and two heavy brass clips, one similarly mounted and the

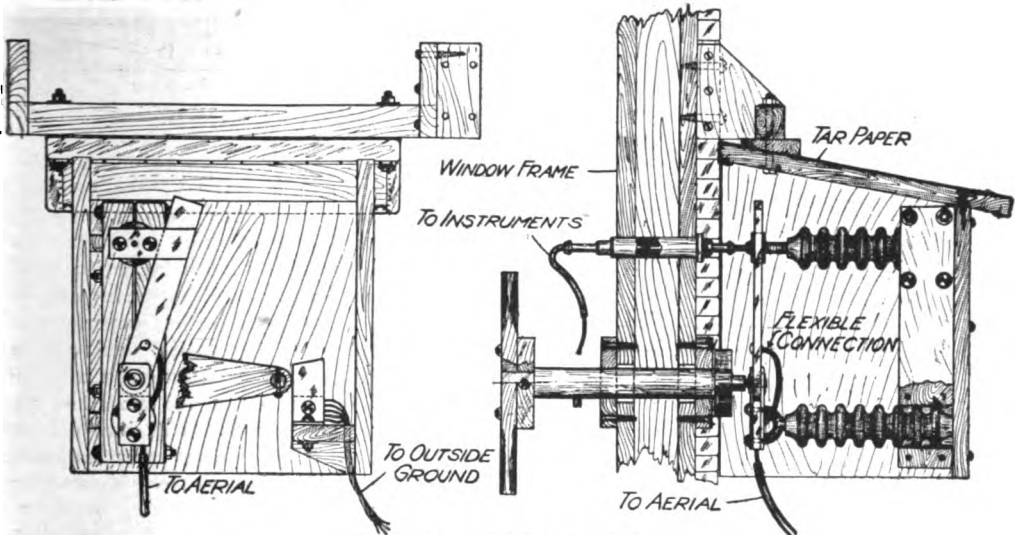


Fig. 1. Assembled Switch and Housing

switch which can be thrown from the inside of the operating room without the necessity of opening the window. A further advantage is that the insulation of the conducting parts

other mounted on a shelf which is formed on the case. When the bar is in the upright position, connection is had from the antenna to the instrument lead, and when in the hori-

zontal position the antenna is connected to the ground outside of the house. A lever is arranged adjacent to the switch and having the same center as the switch bar. This lever is mounted on one end of an insulating rod,

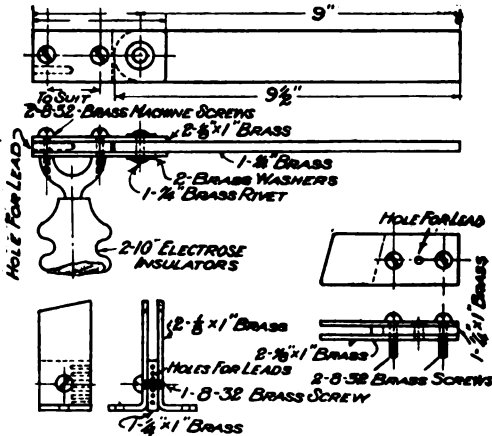


Fig. 2. Switch and Insulator; Fig. 3. Aerial Leadlip; Fig. 4. Ground Wire Clip

the other end of which extends through the window frame and has mounted on it a cross bar which serves as handle. It will be noticed that this insulating rod is able to slide longitudinally in its bearings. The reason for this will be apparent when the operation as below is understood. The rod remains normally pulled in to its limit and with the crank hanging down, that is, entirely out of contact with any part of the switch. Now when it is desired to throw the switch, the rod is pushed out to the other limit and rotated

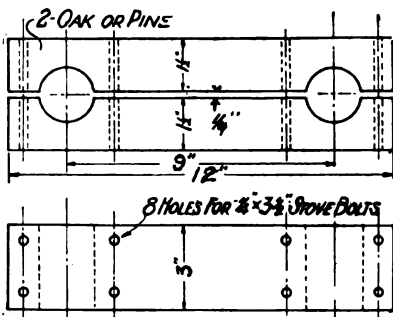


Fig. 5. Insulator Supports

until the pin on the crank engages the switch bar and pushes it in either direction. It is surprising how quickly and easily the switch can be manipulated. The switch is mounted in a wooden box which is made watertight

with a roofing of tar paper and a coat of paint. The lead from the aerial is brought in a loop to the under side of the box and soldered into a hole in the proper clip. The lead from the instrument is soldered in like manner and carried through an arrangement of porcelain tubes or a regular electrose lead-in insulator to the instruments. The box is hung in the proper position by means of a cross bar and some angle pieces attached to the window frame.

We will now consider the parts one by one. Fig. 2 shows the switch lever and its bearing and how it is attached to the insulator. The bearing is built up, as shown, of two strips of 1/8 by 1 inch brass strip and one piece of 1/4 by 1 inch bar. These three strips are held together temporarily by putting 8-32 screws through them and screwing nuts on the other side. While thus prevented from moving, they should be securely sweated together with solder, thus making a solid piece. The switch lever rotates on a 1/4 inch rivet which is hammered down on each end and over a brass washer. In order not to get the bearing too tight, it is a good plan when riveting, to insert a thin piece of metal be-

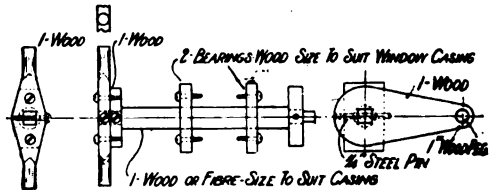


Fig. 6. Throwing Lever

tween the lever and the bearing on one side. This prevents the sticking of the bearing. When riveting is done this piece is removed. When the bearing and the bar have been attached to each other, the bearing is fastened to the top of the insulator by means of the 8-32 screws. The insulator is prepared for this by having one ring entirely cut off, as shown in the assembly drawing and the other cut through in the center and smoothed up with a file. Then two 8-32 holes are drilled and tapped in the surfaces thus exposed. The bearing can then be securely screwed on and this part is finished.

Fig. 3 shows the clip to which is attached the aerial lead. This is made the same as the bearing, but is beveled over to make the switch lever enter easily. No dimensions are given on the clip. This is necessary, as the rings on the insulators are not always the

same and the length of the clip depends on the distance between the holes for fastening. Dimensions have been purposely left out. The builder can make these to suit his ideas or limitations. This clip is attached to the insulator in the same manner as the other one.

The remaining clip for connection to the ground is shown in Fig. 4. The dimensions can be made to suit the lever. The ground wire is shown composed of seven No. 14 copper wires soldered into the clip. Seven No. 14 wires are about equivalent to a No. 4, which is required by the underwriters.

In Fig. 5 is shown the supporting pieces for the insulators. Care should be taken that the large holes be cut not too large, as otherwise the insulators will not be clamped.

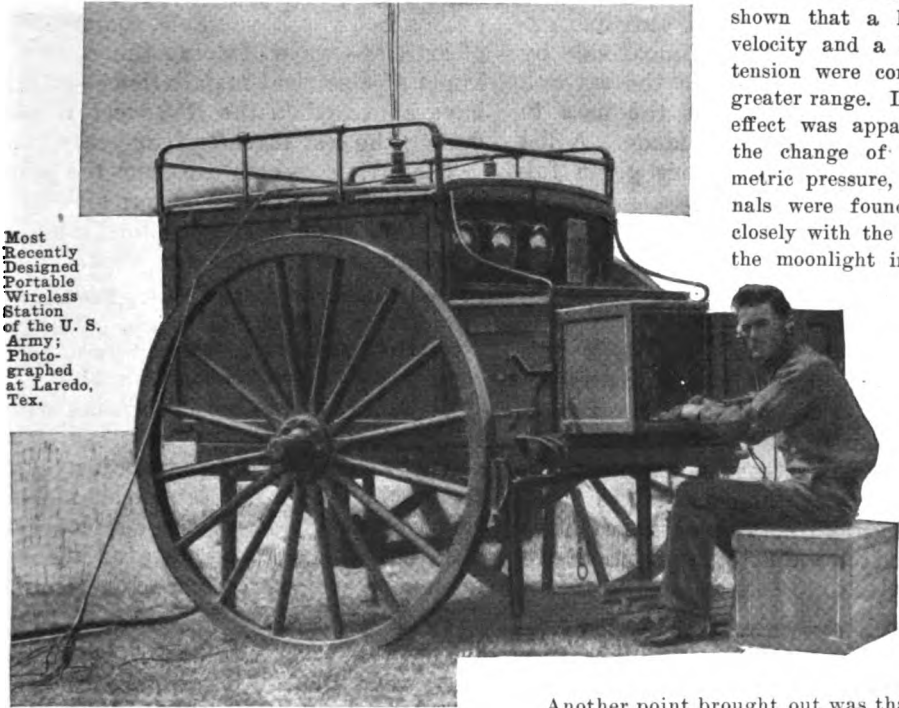
satisfactory. The box or housing is best built up around the switch after all the other parts are assembled. When completed the housing is given a coat of paint. The top or roof should be covered with tar paper to keep out the rain.

The photographs are of a switch similar to the one described which the author has had in use for about six months with very satisfactory results.—CHAS. HORTON.

VARIATION OF RADIO STATION RANGE

At a recent meeting of the Institute of Radio Engineers at Columbia University, N. Y., Mr. R. H. Marriott in a paper, "The Variation of Range of Radio Stations," gave some of the results of experiments made in Colorado and on the Atlantic coast.

From these results it was shown that a high wind velocity and a low vapor tension were conducive to greater range. Little or no effect was apparent from the change of the barometric pressure, while signals were found to vary closely with the inverse of the moonlight intensity.



Most Recently Designed Portable Wireless Station of the U. S. Army; Photographed at Laredo, Tex.

When the stove bolts are inserted and the nuts screwed up, the two parts clamp the insulators and hold them securely. Before the insulators are set up the wood parts shown in Fig. 5 should be given a coat of asphalt varnish.

Fig. 6 shows the parts of the throwing lever. The shaft or rod is preferably of hard fibre but hardwood will be found quite

Another point brought out was that most of the so-called "freak" long distance work is done in midwinter and in support of this it was remarked that Marconi did his first trans-Atlantic work on Dec. 12 and 13. In general, the greatest distance work is done when the temperature is lowest. It was stated that of course the range would hardly be affected directly by the temperature but that it does cause other conditions which themselves affect the range.

NEW BOOKS

PRACTICAL USES OF THE WAVE METER IN WIRELESS TELEGRAPHY. By J. O. Mauborgne. New York: McGraw-Hill Book Company. 1913. 67 pages with 42 illustrations. Price, \$1.00.

In its original form this work was first printed for reference use at the Army Signal School, Fort Leavenworth, Kansas, and in 1912 was, by direction of the Secretary of War, adopted for use at the school. The present book is intended for commercial and technical school use.

WIRELESS TELEGRAPHY. By C. L. Fortescue. New York: G. P. Putnam's Sons. 139 pages with 20 illustrations. Price, 40 cents.

In writing this book the author has kept the reader in mind and has explained much of the technical side by means of analogy. From the seventh chapter on, a survey of the uses to which wireless is put is made. A list of books on the subject is given following the last chapter.

AMERICAN ELECTRICIANS' HANDBOOK. Compiled by Terrell Croft. New York: McGraw-Hill Book Company. 692 pages with 791 illustrations. Price, \$3.00.

This is a practical handbook into which the compiler has gathered information for the wireman, contractor, lineman, small plant superintendent, operator and construction engineer. Illustrations and diagrams have been freely used and many special problems are solved to indicate the applications of rules given.

ELECTRIC CAR MAINTENANCE. By Walter Jackson. New York: McGraw-Hill Book Company. 270 pages, with 140 illustrations. Price, \$3.00.

The material in this volume, except some braking and wiring diagrams, has been selected from the columns of the *Electric Railway Journal*. It should appeal to the man in charge of electric railway car maintenance, and places in compact form data that would be lost to most shopmen within a few months after publication in a periodical.

ELEMENTARY PRINCIPLES OF ILLUMINATION AND ARTIFICIAL LIGHTING. By Arthur Blok. New York: D. Van Nostrand Company. 230 pages, with 126 illustrations. Price, \$1.25.

This book is written to students, engineers and such others as may be concerned with the distribution of light or the installation or upkeep of lighting equipment. The numerical treatment throughout has been kept as simple as possible and the methods of calculation which are exemplified will be found to require only elementary mathematical knowledge.

HANDBOOK OF ELECTRICAL METHODS. Compiled from the *Electrical World*. New York: McGraw-Hill Book Company. 277 pages with 383 illustrations. Price, \$3.00.

This book is a valuable compilation of articles—ways of doing things in all kinds of electrical installations—which have appeared in the *Electrical World* during the last three or four years.

The articles which are from the pens of many different contributors give useful information to the practical man in installation or maintenance work.

SWITCHBOARDS, SWITCHING AND PROTECTIVE APPARATUS. By C. C. Adams. Chicago: American School of Correspondence. 109 pages with 72 illustrations. Price, \$1.00.

The author of this book speaks with exceptional authority, for he has been solving switchboard problems for years for one of the large electric companies. The practical side of the subject has been emphasized and helpful wiring diagrams are shown covering almost every possible situation.

WIRELESS MAP OF THE UNITED STATES OF AMERICA. By B. Francis Dashiell, Athol Terrace, Irvington, Baltimore, Md. Price \$1.00.

This map is 28 by 38 inches. All wireless stations of one kilowatt or over, commercial, government or amateur are shown with call letters, power and class. All important ship routes are noted with calls of vessels and also distances of foreign stations from important cities.

QUESTIONS AND ANSWERS ON AUTOMOBILE DESIGN, CONSTRUCTION AND REPAIR. By Victor W. Pagé. New York: Normal W. Henley Publishing Co. 608 pages with 329 illustrations. Price, \$1.50.

The arrangement of the subject matter in this book is in the form of lessons consisting of questions and answers. The contents have been logically arranged and the reader is brought progressively from a study of one element of a car to the next related part. In the illustrations arrows point to various parts which are named on the illustration. An appendix gives valuable information upon running and storing a car and contains also a digest of motor laws and regulations.

THE NEW PHILOSOPHY. By Calvin Samuel Page. Chicago: Science Publishing Company. 800 pages with 160 illustrations. Price, \$3.50.

This New Philosophy is remarkable for its conflict with established theories of present day scientists. "Nature does not abhor a vacuum' and whoever invented that libeled Nature. He did not know that Nature's aversion for even an air vacuum is only one-half as severe on Mt. St. Elias as in New York City," says the author.

The New Philosophy is based upon Rex, described as a new atomic element having no weight and repelling its own atoms.

MOTION PICTURE MAKING AND EXHIBITING. By John B. Rathbun. Chicago: Charles C. Thompson Company. 236 pages, with 63 illustrations. Price, cloth, \$1.00; leather, \$1.50.

It has been the endeavor of the author to lead the reader through the subject in a systematic manner, starting with elementary principles of motion photography, through the process of taking and making the picture, and finishing with the projection of the completed picture on the screen. The chapters devoted to the taking of the pictures, a subject probably of most interest to the lay mind, have been made as complete as possible and are illustrated by views

taken around the studios of well known film producers.

ELECTRIC TOY MAKING FOR AMATEURS. By T. O'Conner Sloane. New York: The Norman W. Henley Publishing Company. 206 pages, with 77 illustrations. Price, \$1.00.

This is the twentieth edition of this book, which is revised and to which several new chapters are added. The amateur is shown how to make numerous experimental and toy devices. It is believed that the ideas suggested will tend to cause the amateur to apply many of the ideas to apparatus of his own devising.

WIRELESS STATION LOGBOOK. Published by Wm. J. Murdock Company, Chelsea, Mass. 123 pages. Price, 25 cents.

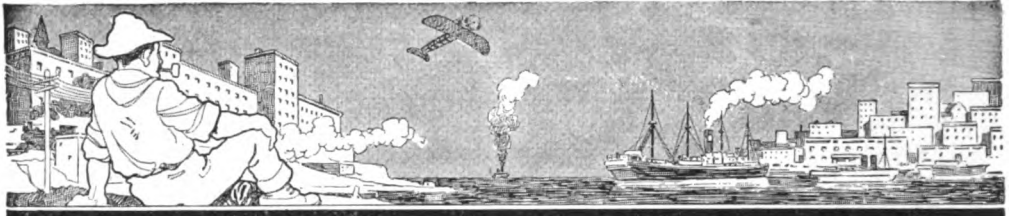
This book offers the amateur wireless operator a bound volume in which he may enter on blank page forms occurrences, such as messages, weather record, interference, time of day, etc. Each logbook as filled may be filed and in time such a set should be valuable. The international abbreviations adopted for amateur operators are given at the back.

HOW TO BUILD UP FURNACE EFFICIENCY. By Jos. W. Hays. Chicago: Jos. W. Hays, Publisher. 126 pages with 24 illustrations. Price, \$1.00.

This is the seventh edition of this book. It has been thoroughly revised and illustrated and is written in a popular way to show managers, superintendents, engineers and firemen how to get the most out of coal. The average steam plant wastes a quarter of its fuel. The author suggests methods to stop this waste.

ELEMENTARY MAGNETISM AND ELECTRICITY. By C. M. Jansky. New York: McGraw-Hill Book Company. 206 pages with 121 illustrations. Price, \$1.50.

This book is intended for individual or home study. The reader is expected to perform simple experiments and observe what takes place, then by questions and discussion he is led to formulate conclusions. The apparatus called for is inexpensive and most of it can be made by an ingenious student.



On Polyphase Subjects

Announcement

This issue marks the last number of **POPULAR ELECTRICITY AND THE WORLD'S ADVANCE** under that name.

With the July number it will be merged with **MODERN ELECTRICS AND MECHANICS**, both of which will be published in the future as one magazine under the title of **POPULAR ELECTRICITY AND MODERN MECHANICS**.

For some time it has been evident to the publishers of both magazines that the fields covered by each were essentially the same, although the editorial policies differed slightly in some respects. After due consideration it was shown conclusively that the merging of the two papers would effect economic advantages, making possible the publication of a magazine absolutely unparalleled in its wealth of material in this particular field.

The new magazine will be published by the Modern Publishing Co., 32 Union Square, New York City, and its editorial policy will be quite unique in the field of popular scientific literature. The aim will be twofold, namely, to afford both entertainment and practical instruction in the world of science, electricity, wireless and mechanics.

The present policy of **POPULAR ELECTRICITY AND THE WORLD'S ADVANCE** in presenting bright and newsy stories of the latest achievements of science will be fully carried out and enlarged upon, and each number will be replete with profusely illustrated articles covering all that is new and interesting in the **World's Advance**.

The plan for the departments of practical instruction has been evolved only after a most careful study of the requirements of the host of readers to whom this section of the magazine is most interesting. It is believed that there is a growing demand for authoritative information covering modern practice in the design, construction and use of electrical, mechanical, wireless and scientific apparatus of both unusual and special types. The available textbooks and reference works have not always given this information in a form conveniently available to the practical

worker who wishes explicit but concise instruction, free from burdensome theory and confusing terms. It will essentially be the scope of the new magazine to supply this information, for, when all is said and done, the most complete reference book is but a resumé of all that had been published in the periodicals during a certain period of time, supplemented by the personal knowledge and opinions of the authors.

In presenting the first issue of POPULAR ELECTRICITY AND MODERN MECHANICS next month, the publishers feel that they will be taking the initial step toward the realization of an ambition to supply a journal of practical and useful information, the object of which shall be to tell the readers "how to make and how to do." Every effort will be exerted to supply data based upon the practical experience of the author in the actual construction and use of apparatus and devices described; further than this, the efforts will be extended to the acquisition of material hitherto unpublished in any form. The result, it is hoped, will be a veritable gold mine of suggestions and aids to the man with a hobby, the practical electrical and mechanical worker, the experimenter, the high school or college student, the manual training or physics instructor, the lecturer, and the man or boy who wishes to absorb all available knowledge pertaining to electricity, mechanics, wireless telegraphy and the allied arts.

In order that the ambition of the new publishers may be fully realized, the hearty co-operation of our readers is necessary. The magazine is to be published for you; without your support it could not exist. Therefore, your suggestions will be more than welcome. On the appearance of the first and succeeding numbers of POPULAR ELECTRICITY AND MODERN MECHANICS, will you not voice an opinion which may aid its publishers in realizing their highest ambition—to give you a magazine you will refer to as your ideal?

SWORN STATEMENT OF OWNERSHIP UP TO AND INCLUDING THIS ISSUE

Statement of ownership, management, etc., of Popular Electricity and the World's Advance, published monthly at Chicago, Ill., required by act of August 24, 1912.

Editor—Henry Walter Young, 350 N. Clark St., Chicago.

Business Manager—Frank William Harvey, Jr., 350 N. Clark St., Chicago.

Publisher—Popular Electricity Publishing Company, 350 N. Clark St., Chicago.

Owners: (If a corporation, give names and addresses of stockholders holding one per cent or more of total amount of stock.)

E. J. Doyle, 350 N. Clark St., Chicago.

Known bond holders, mortgagees, and other security holders, holding one per cent or more of total amount of bonds, mortgages, or other securities.

None.

(SIGNED)

FRANK WILLIAM HARVEY, JR., Business Manager.

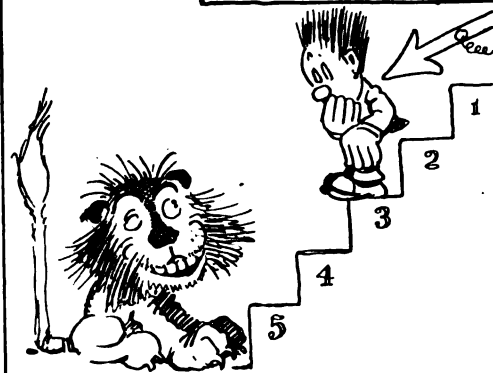
Sworn and subscribed before me this 18th day of March, 1914.

(SEAL.)

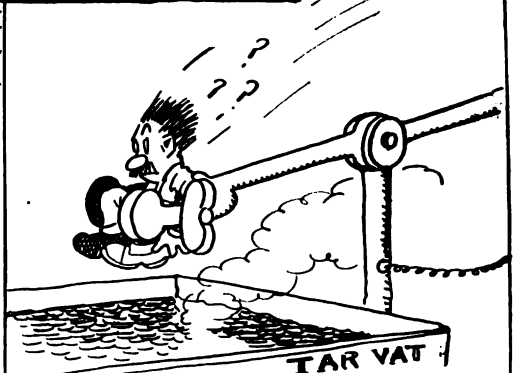
OLIVER WILLIAMS, Notary Public.

(My commission expires April 4th, 1917.)

Appropriate Punishments for the Perpetrators of Modern songs & dances



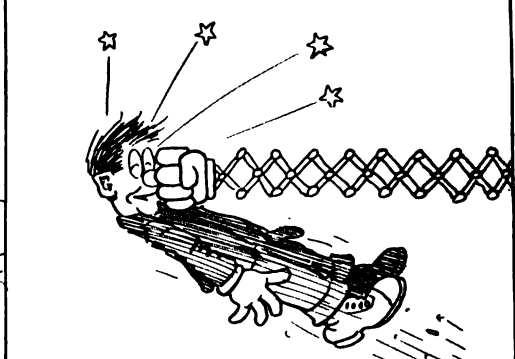
For the inventor of the five step



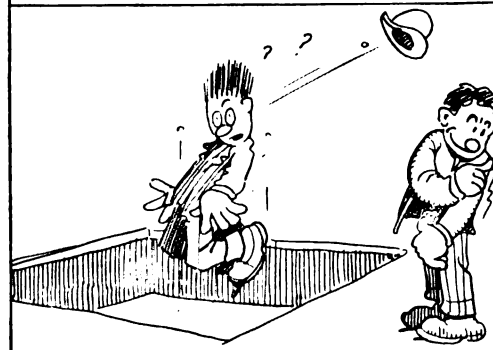
Fitting fate for the originator of the dip



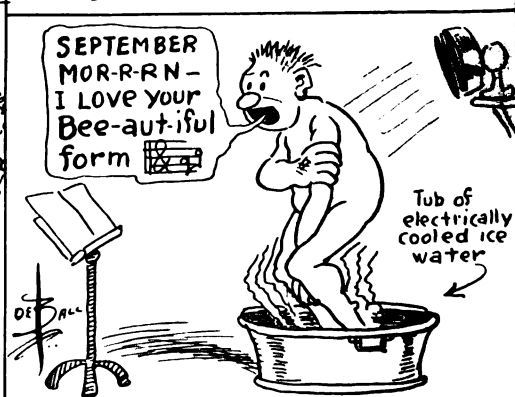
This for the writer of "This is the life for me"



Dream land for the fellow who got up the so called "dream waltz" stuff.



Electric trap door to punish the person responsible for the various ripples, wiggles, flops & squirms



For the author of the song about September Morn - this -

Refreshing Breezes Add to Efficiency

On hot summer days as the temperature goes up, efficiency goes down. This summer, when the heat tempts you to unbutton your collar, think how much more comfortable — and workable — you and your employees would be if your offices were equipped with cooling

G-E ELECTRIC FANS

These fans represent the latest development in fan construction. Their oscillating motion creates the nearest approach to the breeze-flow of Nature. Their blades designed upon exact mathematical principles, give the greatest possible displacement of air for the power expended. And, according to size, they can be run from

*Three to Four Hours
for One Cent*

Accurate balance makes them smooth-running and noiseless, and by avoiding the wear and tear of vibration, also assures a long life-time of satisfactory service. Being self-oiling they require no attention, and as all running parts are enclosed they are always free from dust-collecting oil.

The Desk-Bracket type may easily be changed from stand to wall use without the use of screw-driver. G-E Fans are also made in wall, desk, ceiling or upright types, and in all sizes. The nearest electrical dealer or your lighting company will show you the one most suited to your special need. Always look for the big G-E Trade Mark on the face of the fan. It is a guarantee.

GENERAL ELECTRIC COMPANY

Largest Electrical Manufacturers in the World

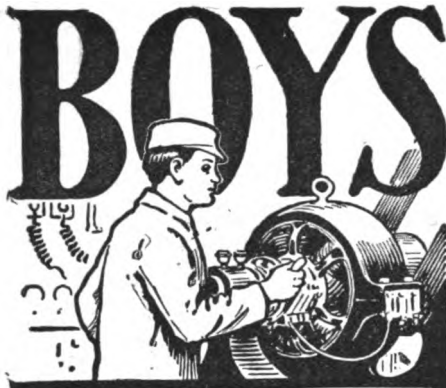
Sales offices in
all large cities

The Guarantee of Excellence
on Goods Electrical

Agencies
Everywhere



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Big Money in Electricity

The electrical field affords a wonderful opportunity to boys with a liking for electrical work. The salaries paid are large—promotion rapid, and, best of all, the profession is not overcrowded.

The International Correspondence Schools of Scranton can make you an expert in the line of electrical work you like best. Hundreds of boys have already won success through I. C. S. help. You can do the same. Everything is made so clear that you can learn in your spare time, regardless of where you live or what you do. No books to buy. See your parents about it—they want you to succeed.

There's big money in electricity. Get after it by marking and mailing the attached coupon to-day. Finding out costs you nothing.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 1102 SCRANTON, PA.

Explain, without further obligation on my part, how I can qualify for the position before which I mark X.

Automobile Running
Mine Superintendent
Mine Foreman
Plumbing, Steam Fitting
Concrete Construction
Civil Engineer
Textile Manufacturing
Stationary Engineer
Telephone Expert
Mechan. Engineer
Mechanical Draftsman
Architectural Draftsman
Electrical Engineer
Elec. Lighting Supt.

Civil Service
Architect
Chemist
Languages
Commercial English
Building Contractor
Industrial Designing
Commercial Illustrating
Window Trimming
Show Card Writing
Advertising Man
Stenographer
Bookkeeper
Poultry Farming

Name _____
 Present Occupation _____
 Street and No. _____
 City _____ State _____

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

The Key to Success Stop Forgetting



Prof. Henry Dickson, Principal

Increase Your Efficiency

The great secret of business and social success is the ability to remember. I can make your mind an infallible classified index from which you can instantly select thoughts, facts, figures, names, faces, arguments. I will enable you to concentrate, develop self control, overcome self-consciousness, bashfulness, think on your feet and intelligently address an audience without notes. My method is easy, clear, simple, infallible. It is not a theory, but scientific and practical, endorsed by such notables as Elbert Hubbard, Prof. Swing, etc. It is the result of 20 years experience in developing memories—over 50,000 students. I want to prove all I claim, so write today for copy of my book "How To Remember" FREE—also learn how to obtain FREE copy of my book "How To Speak in Public."

Dickson School of Memory, 929 Auditorium Bldg., Chicago, Ill.

My Magazine "Investing for Profit"

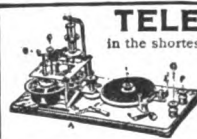
FREE for Six Months

Send me your name and address right NOW and I will send you Investing for Profit magazine absolutely free for six months. It tells how to get the utmost earnings from your money—how to tell good investments—how to pick the most profitable of sound investments. It reveals how bankers and capitalists make \$1,000 grow to \$22,000—in fact gives you the vital investing information that should enable you to make your money grow proportionately. I have decided this month to give 500 six month subscriptions to Investing for Profit FREE. Every copy is

Worth at Least \$10

to every investor—perhaps a fortune. Send your name and address now, mention this paper and get a Free introductory subscription. Conditions may prevent repeating this offer. Better take it now. You'll be willing to pay 10¢ a copy after you have read it six months.

H. L. BARBER, Pub., R414, 30 W. Jackson Blvd., Chicago



TELEGRAPHY TAUGHT

in the shortest possible time. The Omnigraph Automatic Transmitter combined with standard key and sounder. Sends you telegraph messages at any speed just as an expert operator would. Five styles, \$2 up; circular free.

OMNIGRAPH MFG. CO.

39 H Cortlandt Street New York



Amazing Profits In Mushrooms

Anybody can add \$8 to \$40 per week to their income, in spare time, entire year growing mushrooms in cellars, sheds, barns, boxes, etc. I tell you where to sell, at highest prices.

Free Illustrated Instruction Booklet

HIRAM BARTON

398 West 48th St., N. Y.

WIRELESS TELEGRAPHY

Railroad Commercial

Classes form monthly, open all summer. The oldest and largest school in the East. Write for Catalogue.

"You Know Us—Let Us Know You"

Correspondence Courses.

BOSTON SCHOOL OF TELEGRAPHY, 18 Boylston Street, BOSTON, MASS.



COPY THIS SKETCH

and let me see what you can do with it. You can earn \$20.00 to \$125.00 or more per week, as illustrator or cartoonist. My practical system of personal individual lessons by mail will develop your talent. Fifteen years successful work for newspapers and magazines qualifies me to teach you.

Send me your sketch of President Wilson with 6¢ in stamps and I will send you a test lesson plate, also collection of drawings showing possibilities for YOU.

The Landon School of Illustrating and Cartooning
 1451 Schofield Building, Cleveland, O.

LEARN TO PAINT SIGNS and SHOW CARDS



I'll teach you personally by mail. 14 yrs.' successful teaching. Big field for men and women. Thousands of merchants need sale cards, price cards, window cards, sign boards, cloth banner signs and store cards. Field is unlimited. You can **EARN \$18.00 TO \$45.00 A WEEK**

Crawford, B. C. writes, "Earned \$200.00 while taking course." Earn while you learn. Do practice work at reduced prices. Priestzner, Minn., writes, "Did job recently; got \$10.00, profit \$7.05." Did this after only one lesson. Write today for catalog, samples, etc. **Detroit School of Lettering**
CHAS. J. STRONG, Founder Dept. 906 Detroit Mich.

ELECTRICAL ENGINEERING

A CONDENSED PRACTICAL CORRESPONDENCE COURSE especially suited to those who desire a thorough knowledge of this subject either for use as an electrician or in order to be able to operate and repair all kinds of electrical machinery and apparatus.

The lessons include both direct and alternating currents, high potential and high frequency currents and the complete course will give you a thorough understanding of the subject, so that you should have no difficulty in passing an examination for either an electrician's card or to become an electrical engineer, and be able to fill responsible positions in the largest central station or isolated plant.

FREE TEXT BOOKS The necessary text books are furnished free and are the best and most practical which can be secured, because they are as free as possible from useless technical matter and therefore much easier to understand and remember than most books of this nature. This makes it possible for our students to complete the course in a few months.

GUARANTEE—We agree to furnish our students complete and practical instruction in electrical engineering until absolutely competent and until placed in a permanent paying position at first class salary.

We also have practical courses in Power Engineering, Stationary Engineering and Mathematics. Write for free particulars.
ILLINOIS SCHOOL OF ENGINEERING 2326 Morgan Ave. CHICAGO, ILL.

LEARN WATCHMAKING AND ENGRAVING



Earn while learning. Most practical watch school. Individual instructions. Graduates in great demand. Book free.

CHICAGO SCHOOL OF WATCHMAKING
 65 E. Van Buren Street Chicago

WRITE MOVING PICTURE PLAYS

\$10 to \$100 each. Constant demand. Devote all or spare time. Past experience, literary training, or Correspondence course not required. Details Free.

ATLAS PUBLISHING COMPANY, 706 Atlas Bank Building, Cincinnati, Ohio

MUSIC TAUGHT FREE
 At Your Home

By the Oldest and Most Reliable School of Music in America—Established 1895

Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc. Beginners or advanced players. One lesson weekly. Illustrations make everything plain. Only expense about 2c per day to cover cost of postage and music used. Write for FREE booklet which explains everything in full.

AMERICAN SCHOOL OF MUSIC, 38 Lakeside Bldg., Chicago

LEARN TELEGRAPH

Morse or Wireless. Also superior Station Agency course. Splendid opportunities. Demand greater than supply. Graduates assisted. We own and exclusively occupy two large modern buildings equipped with R. K. and Western Union Wires and Complete \$3000.00 Marconi Wireless Station. Oldest and largest school—est. 39 years. Investment \$25,000. Endorsed by Railroad, Wireless and Western Union Officials. Expert, practical teachers. Living expenses may be earned. Tuition low. Easy payments. Catalog Free.

Dodge's Telegraph, Railway & Wireless Institute
 21st Street Valparaiso, Ind.

DON'T STUTTER AND STAMMER It's a habit, not a disease. We correct it by practical, scientific methods. No drawing, singing or beating time. Endorsed by public schools and highest authorities. Don't let this distressing habit grow on you. We teach you to talk fluently and naturally, and the correction is permanent. To convince you our methods are correct, we give a **FREE TRIAL WEEK. SEPARATE SUMMER CLASSES** for children. Write today for our Catalog.

The Reed School, 409 Hubbard Ave., Detroit, Mich.

Can You Accept a \$2,500 Job



Have you the training that is necessary to hold down a \$2,500 job? Have you the same knowledge as the man who gets the fat pay envelope? Salaries are paid to the men who **know**.

You can get just the kind of training you need to accept one of the big jobs. There are hundreds of them open. We will help you to get one of them.

Be a Signal Engineer

Be the man who gets \$2,500 a year. Hundreds of jobs open and nobody to take them. The most fascinating of professions. As a railroad man you travel from coast to coast without it costing you a penny. You can be the man who knows. You can be the man who tells the other fellow what to do. You can be the man who gets the fat pay envelope and free transportation.

\$2,500 a Year

Yes, that is what your salary will be when you are a full fledged Signal Engineer, \$2,500 a year to start. Hundreds and hundreds of men making much more than that. Even while you are learning you can hold one of the positions under a Signal Engineer. Paying you \$75 to \$195 a month. Here is your opportunity. Send in the free coupon for full particulars.

More Men Needed

Railroads are constantly looking for competent Signal Engineers. There are not enough men to fill the positions now open. Thousands and thousands of miles of track are now being equipped with automatic signals. Hundreds of new positions will be open. **And there are no men to take them.** Here is your chance.

Free Outfit

If you will write at once you can get the big new Signal Engineer's outfit absolutely free. Our students get practical instruction. The kind the railroads demand. If you act at once the outfit is free to you. Send the free coupon for full particulars.

Send the FREE Coupon for Big New Book

Just put your name and address on the free coupon and send it in to us at once. Absolutely no obligations of any kind. We will send you the big new Signal book absolutely free. Tells you all about this most fascinating profession. How you can get into the \$2,500 class. The book is free. Get your name and address in at once.

FREE BOOK COUPON
 Department of Signaling
 Desk 140X
 493 Cass St. Chicago, Ill.

GENTLEMEN: Please send me absolutely free and prepaid your big new Signal book. Also full particulars about your great special free outfit offer. It is distinctly understood that I assume no obligations of any kind.

Department of Signaling
 Desk 140X
 493 Cass St.
 Chicago Ill.

Name.....
 Address.....
 Age..... Occupation.....

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



TO THE CALL OF OPPORTUNITY

ELECTRICITY offers the greatest opportunities to those who are practically trained to handle and control it. We are teaching a practical, live-wire, up-to-date Electrical Course. No frills or fanciful demonstrations which may amuse, but can never benefit. No book or blackboard instruction leaving the student to guess the rest. We teach the theory and then take the student to the machine or apparatus and put him to work applying it (the theory). Our instruction is individual, given by competent practical men, alive to the requirements in the Electrical Profession. Through our system of teaching, you are theoretically and practically trained by being started on a sound basis and constantly guided and coached in everything that you do.

There is no time limit to the course. You enter when you are ready and graduate when you are competent to do so. The school is open throughout the year, making it possible to continue your course during the summer months without interruption.

Visit our school, if possible, and see our students at work or write for free booklet describing our course and system of instruction.

THE
**New York Electrical
School**

40 West 17th Street
New York City



LET HIM GIVE YOU A
Real Command of English

It will take only some of your spare moments at home; no repellent grammar study; each lesson as clear as daylight, and inspiring to the highest degree. Commence now—let Grenville Kleiser teach you through his Mail Course in practical English, how to

**Enlarge Your Stock of Words—
Use the Right Word in the Right Place—
Write Tactful, Forceful Letters, Advertisements, Stories, Sermons, etc.
Become an Engaging Conversationalist—
Enter Good Society—
Be a Man of Culture, Power, and Influence in Your Community.**

Good English is absolutely necessary to the highest success in life. What material benefit is it to have good ideas if you can not express them adequately—if you can not make others see them as you do? We will send by mail full particulars of this famous Course. No cost, no obligation to you—but ask for them to-day, on a post-card.
FUNK & WAGNALLS COMPANY, Dept. 90 NEW YORK

Learn to Write

TEACH BY MAIL

WRITE FOR MY FREE BOOK

"HOW TO BECOME A GOOD PENMAN" and beautiful specimens. Your name elegantly written on a card if you enclose stamp. Write today.

Address F. W. Tamblyn, 437 Meyer Bldg., Kansas City, Mo.

LEARN JEWELRY ENGRAVING

in your own home. Earn \$20.00 to \$50.00 weekly. Personal instructions. Write for free booklet.

CHICAGO ENGRAVING SCHOOL, 614 Athenaeum Building, Chicago

WHY NOT BE AN ARTIST?

STUDY drawing at home under Expert Faculty. We have successful students in every part of the world. **Turn your Talent into money.** Our Students are filling high salaried positions. 14 years successful teaching. Endorsed by high authorities. 18 Courses in Commercial and Illustrative Drawing. Teachers' Normal and Applied Art, Profit or Culture. **Thoroughly Equipped Residence School** Artist's Outfit FREE to Enrolled Students
SCHOOL OF APPLIED ART, 776 Applied Art Bldg., Battle Creek, Mich.

ANY ELECTRICAL BOOK ON THE MARKET Can be obtained through our Book Department—Tell us your wants
POPULAR ELECTRICITY PUBLISHING CO., 350 N. Clark St., Chicago, Ill.

**Be a Doctor of
CHIROPRACTIC**

Learn at Home and In Class

Millions of people prefer drugless healing to medicine—there is a big demand for Doctors of Chiropractic—the new drugless science. Capitalize your spare time, learn this lucrative profession—earn

\$3,000 to \$5,000 Yearly Simplified course, profusely illustrated; also 14 big free charts and a spinal column—makes study fascinating—easy. Fees earned quickly pay for course.

Free Lessons Write for FREE sample lessons, illustrated catalog, names and addresses of successful graduates and big book by ELBERT HUBBARD.
National School of Chiropractic, Dept. 16 1553 W. Madison St., Chicago

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Put Yourself On the Screen

YOUR own experiences, things with which you are familiar—these would make good picture-plays; would "take" because they are real.

Mr. Leeds But for practical success you must know the technique of moving-picture production.

Our Home Course In Photoplay Writing

will give you the tools of the trade, your imagination will do the rest.

Course taught by Arthur Leeds, author of "Writing the Photoplay" and editor of THE PHOTOPLAY AUTHOR. Also courses in Short-Story Writing, Poetry and Journalism.

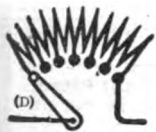
250-page Catalog Free.

The Home Correspondence School, Dept. 50, Springfield, Mass.

ELECTRICITY

CONDENSED COURSE IN ELECTRICAL ENGINEERING

Complete in One Year Bliss Electrical School



Studies restricted to theoretical and practical electricity, mechanical drawing and necessary engineering work. Teaches simplicity, concentration, hard work. For young men of energy and character. 21 years of greatest success. Graduates hold first-class positions. **Opens Sept. 23.** Write for new catalog.

102 Takoma Ave., WASHINGTON, D. C.

WE WILL MAKE YOU PROSPEROUS

If you are honest and ambitious write us today. No matter where you live or what your occupation, we will teach you the Real Estate business by mail; appoint you Special Representative of our Company in your town; start you in a profitable business of your own, and help you make big money at once. Can arrange for spare time only if desired.

Unusual opportunity for men without capital to become independent for life. Valuable book and full particulars Free. Write today.

NATIONAL CO-OPERATIVE REALTY CO.
P1686 Marden Building, Washington, D. C.

Drafting will Promote You!

These courses will give you the knowledge that means promotion and big salary. Architectural, Mechanical and Structural Drafting and Design, Estimating and Contracting, Builders' Courses and Plan Reading.

DRAFTING

Complete \$15.00
Outfit and all Blue
Print Plans FREE.

Day, Evening, Home-Study Courses. Write today.

CHICAGO TECHNICAL COLLEGE

1013 Lake View Building Chicago, Illinois

WRITE STORIES!

For Moving Pictures. Producers pay from \$25 to \$100 each for photoplays. Interesting and fascinating. No experience necessary. Work in spare time. Full particulars FREE.

MENT SPECIALTY COMPANY, 2511 W. Van Buren St., Chicago

Learn the Auto Business Earn a Splendid Salary



By practical experience we train you for a good position as automobile mechanic, salesman or chauffeur. 3,000 graduates are earning big salaries. Complete training in 4 weeks, including extensive practice in repairing and driving high powered cars. Tuition and board reasonable.

Send today for catalog W and list of graduates

Cleveland Automobile School
2340 Euclid Ave., CLEVELAND, OHIO



\$4.50 Starts You to a Position Like This!

Be the Boss! Be the man who holds the big job and gets the big salary. Get into the profession of Electrical Meter Engineering—that is calling for men. On this great special offer you can now begin to get the training that will qualify you for the big job for only \$4.50. Pay the balance of our low tuition at the rate of only a few cents a day. Send the coupon now for the great special offer and big new book on Electrical Meter Engineering. Act quick. Write today.

High Salaries Offered

The demand for men exceeds the supply. The profession is only in its infancy. Big money is being paid. Big jobs are open everywhere. You can get one of them. We will help you. We will teach you to become an expert Electrical Meter Engineer right in your own home—during your spare time. Do not delay. Send the coupon.

Be a Meter Engineer

This fascinating profession is one of the best paid in the electrical industry. The Electrical Meter Engineer is the man who knows. He is paid for his brains—he is the man who tells the other fellow what to do. You can be one—a regular full fledged Meter Engineer within the course of a few months. You can be the man who gets the fat pay envelope.

Men Needed

The profession is only in its infancy. Very few men have the necessary training. You can get it. You can make your services in demand. We need morem. Give yourself a chance. \$4.50 starts you.

We Guarantee and agree to refund every cent you have paid us if, after you have completed the course of instruction, you are not absolutely satisfied in every way.

Send the Coupon For Big New Book

Put your name and address on the coupon or a letter or a post card and send to us today. Absolutely no obligations. We will send you absolutely free and prepaid the big new book on Electrical Meter Engineering and full particulars of this great special offer. Do not delay an instant. The first step toward realizing your ambition is to send the free book coupon. Act now.

Ft. Wayne
Correspondence
School
Dept. 1401
Ft. Wayne, Ind.

FREE Book Coupon

Ft. Wayne
Correspondence School
Dept. 1401 Ft. Wayne, Ind.

Gentlemen: Please send absolutely free and prepaid your book on Meter Engineering! Also send me full particulars of the great special offer that is now being made to induce men to study Meter Engineering. I assume no obligations of any sort.

Name

Address

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

This \$2.00 Book of PRACTICAL ELECTRICITY Reduced to \$1.00

58,000 engineers, electricians and students of electricity paid \$2.00 for this wonderful volume. You now have the opportunity of buying it at just half that price—\$1.00.

Good As a School

This book is a school within itself. It contains twenty chapters of valuable information and teaches the fundamental principles of electricity, including designing, operation and care of dynamos and motors.


Practical Electricity was written out of the day's work—the result of our eighteen years' experience in repairing every possible kind of electrical machinery and apparatus.

This book has helped boost hundreds of men to bigger and more responsible positions. In return for the electrical knowledge they secured from this book, they boosted our repair business. We want to line up half a million more boosters—that's why we're cutting the price of the book in two.

Money Back If Not Satisfied

We couldn't begin to tell all the points and merits of Practical Electricity. We would rather send you the book and let you see for yourself. Mail us \$1 to-day and if you aren't perfectly satisfied, return it and get your money back. Order it now.

Cleveland Armature Works
4732 St. Clair Ave., Cleveland, Ohio
America's Greatest Electrical Repair Works



1 Year to Get a Practical Electrical Education



In one year spent at this school you get a complete practical electrical education. You learn house-wiring, electric light and motor wiring, complete switchboard installation and wiring, armature winding, power plant operation and power transmission, complete telephone work from instrument setting to switchboard installing. This is one of the most completely equipped and largely attended electrical schools in the country. Write today for FREE catalog

School of Engineering of Milwaukee
Division 119 Milwaukee, Wis.

Get SPEED

Expert Typists Earn Big Money!

The Tulloss Touch System, entirely different from all other methods, so easy any one can learn it, will quickly double—even TREBLE—your speed, accuracy, INCOME. Standard speed-method for 13 years. Taught direct by mail only. Send for

48-pg. Typewriting Book—FREE

Describes this famous system in detail. Explains how YOU can quickly qualify as expert, free your work from errors, write at highest speed, earn \$25, \$30 a week and up! Spare-time study. Fits right in with regular work. If you want more speed; more accuracy; more salary—send *Every Finger Specially Trained* for this book today.

THE TULLOSS SCHOOL,
3766 College Hill, Springfield, O.



FREE—Send for This

Large Illustrated Catalogue of

HOME-STUDY Books

ON

Electricity, Engineering, Carpentry, Building, Painting, Business

Check the subjects you are interested in and mail with your name and address. We will send full particulars by return mail.

.... Electrical Engineering	.... Gas Engine Engineer
.... Elec. Light and Power Supt.	.... Automobile Mechanician
.... Electrical Wiring	.... Bookkeeper
.... Telephone Expert	.... Plumber
.... Architect	.... Mason and Bricklayer
.... Building Contractor	.... Carpenter
.... Architectural Draftsman	.... Painter, Signs and Card Writing
.... Concrete Engineer	.... Letter Writing
.... Mechanical Draftsman	.... Railroadng
.... Steam Engineer	.... Motorman
.... Stationary Engineer	.... Traction Farming
.... Telegraphy	.... Civil Service

FREDERICK J. DRAKE & CO.
D 10—1325 Michigan Ave. CHICAGO, ILL.

YOUNG MEN

Prepare for good future; take our course of practical Automobile Engineering. Write for Free Booklet E. Northwestern Motor Institute, 2807 Wells St., Milwaukee.

AUTOMOBILE SCHOOL

TRICK BOOK **JOKES**

Big Entertainer 320 Jokes and Riddles, 153 Parlor Games and Magic, 15 Tricks with Cards, 73 Toasts, 7 Comic Recitations, 3 Monologues, 22 Funny Readings. Also Checkers, Chess, Dominoes, Fox and Geese, 9 Men Morris. All 10c. postpaid.

J. C. DORN, 709 So. Dearborn Street, Dept. 50 Chicago, Ill.

DO NOT STAMMER

My book, "How to Stop Stammering"—a treatise on "Scientific Talking." Price \$1.00. School literature FREE.

M. L. HATFIELD, 1918 Grove Street, Oakland, Cal.

HOFFMAN'S ATTACHABLE DRAWING BOARD BRACKET

for Artists, Designers, Draftsmen, Cardwriters. Attach to table, Adjustable height. Tilt any angle. The Board Revolves. Strong. Firm. Indestructible. Write for free booklet E32.

A. HOFFMAN & CO., 51 Kenwood Ave., ROCHESTER, N. Y.



LEARN DRAFTING

I am now in a position to give my personal attention to a limited number of additional students in Mechanical, Structural or Architectural Draftsmanship and Designing. My home-study course is simple, easy—can be mastered in a few months. This is your chance to prepare yourself for this profitable, pleasant work. Hundreds of big paying positions now open. Steadily increasing demand for trained Draftsmen and Designers everywhere, at salaries of from \$125 to \$175 per month. I guarantee to teach you until you get a position. Write today for free catalog and full particulars.

C. W. R. EICHOFF,
Chief Engineer, Chicago Engineering Works,
Dept. 51-X. Illinois and Cass Streets, Chicago, Ill.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

FREE

\$60 Drafting Course

There is such an urgent demand for practical, trained Draftsmen that I am making a great special offer in order to enable deserving and ambitious men to get into this line of work. I will instruct you in Drafting and Designing until you are drawing a salary of \$125.00 a month. You need not pay me either for my personal instruction or for complete set of instruments. Send for free book.

\$125 a Month

Starting salary according to my agreement and guarantee. Draftsman's work is pleasant and profitable. Send me the coupon and let me tell you about it. Thousands of men are needed who have just the kind of training I will give you. You can get this training during your spare time—in your own home. Send the coupon.

Chief Draftsman Will Train You Personally

on practical Drafting-room work until you are competent and until you are in a permanent position at a salary paying at least \$125 per month. Here is an exceptional opportunity for a few selected ambitious men, between the ages of 16 and 40. Send the coupon for the free book.

I Guarantee

To instruct you until competent and in a permanent paying position at a regular Draftsman's salary of at least \$125 to \$175 per month and guarantee to furnish you free complete Draftsman's working outfit at once.

FREE This \$15.00 Draftsman's Working Outfit



They do not cost you a cent if you enroll at once. A genuine working outfit—given to you absolutely free. Regular working instruments the kind I use myself. You will be ready to start work as soon as you get them. Remember—given to you absolutely free.

Send the free coupon.

Earn While Learning

You can be earning a handsome income while learning at home. This is a special offer I am making. Absolutely no obligations of any kind in sending the coupon. But you must write at once, as I limit the number of my students.

Send the FREE Coupon At Once

my book—"Successful Draftsmanship," also list of open positions, and for the free offer to be earning good money at once while learning at home. This offer is limited and in order to benefit thereby, act at once.

Chief Draftsman Engineers' Equipment Co. (Inc.)
Div. 140x Chicago, Illinois

Free Course Offer Coupon

Chief Draftsman

Engineers' Equipment Co.
Div. 140X Chicago, Ill.

Without any obligation to me whatsoever, please mail your book, "Successful Draftsmanship," and full particulars of your liberal "Personal Instruction" offer to a few students free and prepaid.



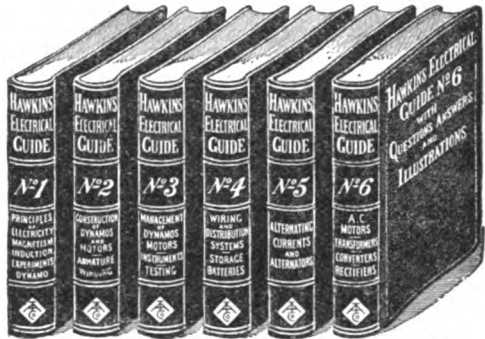
Name _____
Address _____

HAWKINS LIBRARY OF ELECTRICITY

In 6 Leather \$1 Pocket Books Price per Volume

Here is a set of books that no man in the ELECTRICAL FIELD should do without. This is the ELECTRICAL AGE in which we live; ELECTRICITY now controls more trades, directs more men, offers more opportunities than any other power that man has yet discovered. Do you wish to know the underlying principles of MODERN ELECTRICAL PRACTICE?

If so, HAWKINS ELECTRICAL GUIDES will give you the information. In reality they are a school within themselves, containing a complete study course with QUESTIONS, ANSWERS AND ILLUSTRATIONS, written in plain everyday language so that a practical man can understand the "HOW, WHEN AND WHY" OF ELECTRICITY.



"THAT'S JUST WHAT I NEED"

Read over the titles shown on the back of each volume and note the scope of each book. They are handsomely bound in flexible black leather with gold edges and will readily go in the pocket. THEY ARE NOT ONLY THE BEST, BUT THE CHEAPEST WORKS PUBLISHED ON ELECTRICITY.

Each book is complete in itself and will be supplied \$1.00 per copy, but we believe that the complete set is the best bargain.

The books can speak for themselves and a careful examination, page by page, and illustration by illustration, will convince you of their big value.

If you will fill out the following coupon giving all the information requested, WE WILL SUBMIT THE SIX VOLUMES FOR EXAMINATION ON CONDITIONS NAMED.

FREE EXAMINATION OFFER

THEO. AUDEL & CO., 72 5th Ave., NEW YORK

Please submit me for examination HAWKINS ELECTRICAL GUIDES (Price \$1 each.)

Ship at once, prepaid the 6 numbers; if satisfactory I agree to send you \$1 within seven days and to further mail you \$1 each month until paid.

Signature _____
Occupation _____
Business Address _____
Residence _____
Reference _____

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

**Make this car
your office—**
there is \$900.00 to \$1800.00
a year in it for you



Examinations will likely
be held everywhere soon

Rapid advancement to higher Government Positions. "No layoffs" because of STRIKES, FINANCIAL FLURRIES or the WHIMS OF SOME PETTY BOSS. THE POSITION IS YOURS FOR LIFE.

Country residents and city residents stand the same chance for immediate appointment. Common-sense education sufficient. Political influence NOT REQUIRED.

We will prepare 25 candidates FREE! Write immediately for schedule showing the places and dates of all SPRING examinations. Don't delay. Every day you lose means the loss of just so much coaching before the rapidly approaching examinations.

FRANKLIN INSTITUTE, Dept. G111, Rochester, N.Y.

Hundreds of Parcels Post Railway
Mail Clerks Needed NOW!

COUPON

Franklin Institute (The pathway to plenty), Dept. G111, Rochester, N. Y. The coupon, filled out as directed, entitles the holder to free specimen questions; a free copy of our book, "Government Positions and How to Obtain Them," a list of positions now available, and to consideration for Free Coaching for the examination here checked.

- ... Railway Mail Clerk (\$900 to \$1800) Customs Positions (\$800 to \$1500)
- ... Bookkeeper (\$900 to \$1800) Stenographer (\$800 to \$1500)
- ... Postoffice Clerk (\$900 to \$1200) Internal Revenue (\$700 to \$1800)
- ... Postoffice Carrier (\$600 to \$1200) Clerk in the Department of Washington (\$800 to \$1500)
- ... Rural Mail Carrier (\$500 to \$1100) Canadian Gov't Position
- ... Automobile Chauffeur

Name..... Address.....

Use this before you lose it. Write plainly.



Do You Like to Draw?
That's all we want to know

We will not give you any grand prize or a lot of free stuff if you answer this ad. Nor do we claim to make you rich in a week. But if you are anxious to develop your talent with a successful cartoonist, so you can make money, send a copy of this picture with 6 cents in stamps for portfolio of cartoons and sample lesson plate and let us explain.

THE W. L. EVANS SCHOOL OF CARTOONING
825 Leader Bldg., Cleveland, Ohio
Artist De Ball of this Magazine was a former pupil

FREE BOOK ON MOTORING



Explains how we assist YOU in the Auto Business as Repairman, Chauffeur, Salesman or Auto Mechanician with DYKE'S NEW IDEA WORKING MODEL SYSTEM of teaching by mail and our new idea EMPLOYMENT PLAN. Let us tell you the names of some of our students and the salaries they are drawing. Don't miss it--SEND FOR BOOKLET NOW!

Beware of imitators. This is the original and only system of its kind in the world. Models made in London.
DYKE'S SCHOOL OF MOTORING, Box 2, Roe Bldg., St. Louis, Mo.
All Electric Starters, Lighting Systems and Magnets Simplified.

**Any Electrical Book
on the Market**

Can be obtained through
our Book Department.
Tell us your wants.

Popular Electricity Publishing Co.
350 N. Clark Street, Chicago, Illinois

BE A SALESMAN
EARN \$1,000 TO \$5,000 A YEAR

We will teach you to be a high grade Salesman in eight weeks by mail and assure you definite propositions from a large number of reliable firms offering you opportunities to earn good wages while you are learning. No former experience required. Write today for particulars, large list of good openings and testimonials from hundreds of our students who are now earning \$100 to \$500 a month.

Address nearest office, Dept. A-32
National Salesmen's Training Association
Chicago New York Kansas City San Francisco

Handy Electrical Dictionary
"Just Fits The Vest Pocket"

Designed to meet the needs of the beginner, and at the same time furnish a compact, reliable reference for the electrical worker and expert.

224 pages—"Plain English" definitions of over 4,800 electrical terms and phrases—7 pages of diagrams

Everyone Interested in Electricity Needs it

Price, Cloth, 25c
Full leather, full gilt, 50c

Popular Electricity Publishing Co. Book Dept.
350 N. CLARK STREET CHICAGO, ILLINOIS

Sit at This Table and Earn \$200 a Month



A COMPLETE DRAWING OUTFIT

Consisting of board, T-square, triangles, fine set of instruments, scale, tacks, pencils, rubber, curves, etc., for only..... **\$6.50**

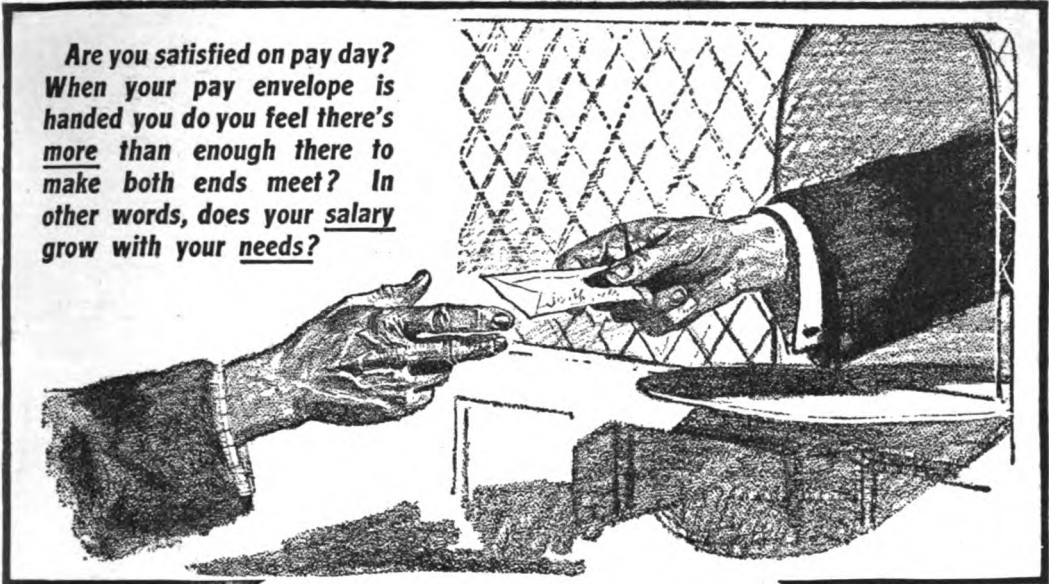
Instructions in Drafting Free With Each Outfit

The greatest draftsman on earth can use these instruments. If you have any mechanical or architectural ability, buy this outfit and learn to draw. There are many good positions open all the time for good draftsmen. If not perfectly satisfied return in ten days and money will be refunded. Send for circular P. E. at once.

THE T-SQUARE & TRIANGLE CO.
32 CLINTON STREET NEWARK, N. J.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Are you satisfied on pay day? When your pay envelope is handed you do you feel there's more than enough there to make both ends meet? In other words, does your salary grow with your needs?



Does Your Salary Grow With Your Needs?

Do you want to earn more? You **CAN**. Do you want to secure a better position? You **CAN**. Do you want to follow some line of work that really appeals to you? You **CAN**. In your own home and spare time do you want to acquire the training that will make all this possible? You **CAN**.

The thing for you to do to learn how you can, is to mark the attached coupon and mail it today to the International Correspondence Schools. Without charging you a penny or placing you under any obligation the I. C. S. will explain just how you can become proficient in some chosen, well-paid occupation.

Thousands of other ambitious men have won success through I. C. S. help. Salary increases due to I. C. S. help are voluntarily reported at the rate of over 400 a month. The I. C. S. didn't care where these men lived, what they did, what they earned, what little schooling, cash, or spare time they had—so long as they could read and write, and were ambitious, the I. C. S. way was open—just as it is open to you.

Twenty-one years of unparalleled success in raising salaries proves the ability of the I. C. S. to make YOUR salary outgrow your needs. The first step is YOURS—mark and mail the coupon now.

International Correspondence Schools Box 1102, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for a larger salary and advancement to the position, trade, or profession before which I have marked X.

<ul style="list-style-type: none"> • Electrical Engineering • Electric Lighting • Electric Railways • Electrician • Electric Car Running • Dynamo Foreman • Wireman • Mining Engineer • Telephone Expert • Surveyor • Civil Engineer • Automobile Running • Agriculture 	<ul style="list-style-type: none"> • Mechanical Engineer • Mechanical Draftsman • R. R. Construction • Concrete Construction • Architect • Contracting and Build'g • Architectural Draftsman • Plumbing and Heating • Chemist • Bookkeeper • Advertising Man • Civil Service Exams. • Salesmanship
--	---

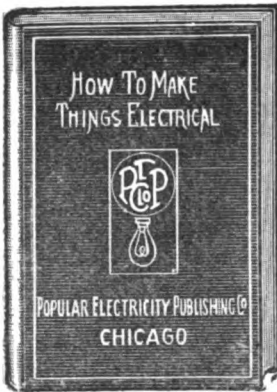
Name _____

St. and No. _____

City _____ State _____

Present Occupation _____

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



This Book Will Show You How to Make Things Electrical

Complete Directions For Building Over 100 Pieces of Electrical Apparatus Together With a Series of Electrical Experiments

A Workshop Manual for the student or experimenter showing the construction of everything electrical, from a simple battery cell to an electric starter for a balky horse, including such useful household appliances as Motors, Electric Toasters, Stoves, Clocks, Bell Transformers, Immersion Water Heater, Soldering Iron, etc. In addition to a wide range of new and novel devices that every experimenter would like to know how to make.

Clear, concise directions and over 180 careful drawings are features of this book that should not be overlooked.

No other work contains in such compact form as many up-to-date designs of apparatus that can be made by the experimenter of ordinary ability. Only ordinary tools are required to do the work.

Read This List of Articles Covered

To Take Your Photograph. Photographing Birds. Firing Flashlights Electrically. Homemade Device for Printing Pictures. Ruby Lamp for Dark Room. Construction of a Dry Cell. Homemade Battery. Gravity Battery. Crow Foot Gravity Battery. Closed Circuit Cell. Bichromate Cell. Storage Batteries. Adjustable Water Rheostat. A Simple Magnet Motor. How to Build a Simple Electric Motor. Miniature Alternating Current Motor. Construction of a Laminated Motor. How to Build a $\frac{1}{8}$ Horsepower Motor Without Castings. Simple Controller for Toy Motors. How to Vary Power from Dry Cell Set. How to Make a Direct Current Dynamo. To Make a Small Magneto. To Make a Selenium Cell. Watch Demagnetizer. Apparatus for Demagnetizing. A Simple Static Machine. Odd Static Generator. Reversing Switch Reversing the Polarity. A Simple Circuit Breaker. An Odd Telegraph Set. Telegraph Sounder From an Old Bell. Telegraph Key. How to Make a Polarized Relay. To Make a Simple One-way Telephone. How to Make an Electric Bell. High Water Alarm. A Water Level Indicator. Homemade Cash Drawer Alarm. Electric Bedroom Alarm. Burglar Alarm Circuit. Door and Window Alarm Contacts. Combined Call Bell and Burglar Alarm. A Simple Door Alarm. Door Alarm. Office Bell. Open Door Alarm. Tell-tale for the Ice Box Drip Pan. Mail Box Alarm. Bell as Shocking Device. Shocking Outfit from Electric Engine. How to Construct a Shocking Coil. How to Build a Simple Induction Coil. The Magic Buzz Saw. Shocking Push Button. A Step Down Transformer. A Simple Transformer. Two Hundred Watt Closed Core

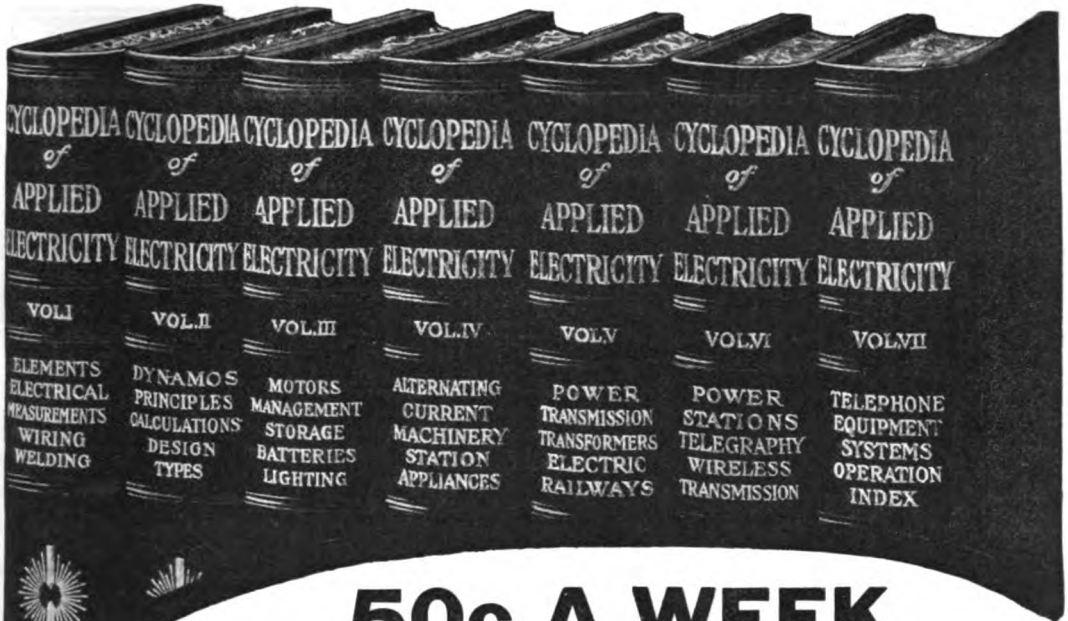
Transformer. How to Make a Bell Ringing Transformer. Construction of Ring and Core Type Transformers. Construction of a Tesla High-frequency Apparatus. How Electrical Clock Operates. An Electric Pendulum Clock. How to Make an Electric Furnace. Portable Electric Heater. Electric Stove and Toaster. How to Build an Electric Toaster. Immersion Water Heater. A Simple Arc Lamp. Making an Arc Lamp. How to Make a Speaking Arc. How to Make an Electric Gas Lighter. Construction of a Simple Microphone. Simple Galvanometer. Making a Galvanometer. A Hot Wire Meter. Unique Ammeter. How to Make a Direct Current Ammeter. Electric Soldering Iron. Wind Direction Indicator. Wind Vane Indicator. Leyden Jar Made From a Fruit Jar. Construction of an Adjustable Condenser. How to Build a Variable Condenser. Rectifier. Electrolytic Rectifier. Wehnelt Interrupter. Luminous Goblet. Rotating Spiral. Interesting Experiments in Magnetism. The Magic Toboggan Slide. The Traveling Wheel. To Make an Electrophorus. Shocking Money. Barlow's Wheel. Electro-Magnetic Rotation Experiments. Experimental Geissler Tube. Formation of Imitation Crystals. Simple Experiments With Electricity. The Magnetic Navy. Electric Fortune Teller. The Dancing Doll. A Test Bell. An Electrical Scarecrow. Electric Starter For Balky Horses. Bed Warmer. Electric Counting Machine. Homemade Night Watch Lamp. Hearing the Telephone Bell. To Make Bell Strike the Hours. Electric Bell Attachment for Dark Board. Turns the Fan Off. Clock Operated Time Switch. Floor Tread Switch. Steps Turn Off Cellar Lights.

200 Pages, Price \$1.50 Postpaid, 184 Illustrations

Send for this book today. Our offer of "Money refunded if not satisfactory" protects you if it is not what you want.

POPULAR ELECTRICITY BOOK DEPARTMENT
350 North Clark Street, Chicago, Illinois

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



50c A WEEK

This seven-volume set of electrical books—just now offered at a discount of almost 50% and on the easiest of easy payment plans—will be sent, **express prepaid**, for seven days' free examination; returnable at our expense. Send no money—simply fill out the coupon and we will send you the most complete and up-to-the-minute reference work of its kind ever published. You, whether student, worker or expert, can gain from these books an intimate knowledge of your work—knowledge which will eventually mean success and higher pay. The work of thirty-two experts, this library is recognized as a standard reference work by technical schools, libraries and practical men throughout the country.

The American Technical Society's Cyclopedia of APPLIED ELECTRICITY

Contains 3,200 pages, 7x10 inches; 2,600 illustrations, full page plates, diagrams, etc.; hundreds of valuable tables and formulas; carefully cross-indexed for quick, easy reference. The books are substantially bound in half red morocco, gold stamped, and are printed in large clear type on special quality paper.

Important Subjects Covered by These Great Books

Elements of Electricity—Electrical Measurements—Underwriter's Electrical Requirements—Theory, Calculation, Design and Construction of Direct Current Generators and Motors—Types of Generators and Motors—Management of Electrical Machinery—Electric Lighting—Alternating Current Machinery—Power Transmission—Electric Railways—Self-Propelled Railway Cars—Trackless Trolleys—Power Stations—Switchboards and Switching—Storage Batteries—Applied Electro-chemistry—Electric Elevators—Electric Welding and Heating—Wireless Telegraphy and Telephony—Land and Submarine Telegraphy, Telegraphone, etc.

Get These Books at Almost Half Price

The complete seven volumes, not a sample volume, will be sent, **express prepaid**, for seven days' free examination; returnable at our expense if the books do not contain the information you want. If you keep them, pay \$2.00 seven days after receipt and then \$2.00 a month—50c a week—until you have paid the special introductory price of \$19.80. The regular price of this great Cyclopedia is \$35.00. Just fill in and mail the coupon. It won't cost you a cent to examine the books. We know they'll be worth many times their cost to you. Mail the coupon now and you'll receive your books promptly.

\$12.00 Consulting Membership Free

With every set is included a year's Consulting Membership, regular value \$12.00, entitling you to the free advice of a staff of Electrical Engineers. This will give you practical help in handling working problems which are too specific to be taken up in detail in the Cyclopedia. There will be no limit to this service. A single problem solved for you might be worth more than the first cost of the books.

AMERICAN TECHNICAL SOCIETY
CHICAGO, U. S. A.

7 DAY EXAMINATION COUPON

Pop. Elec. 6-14
A. T. S.

Please send me Cyclopedia of Applied Electricity for seven days' free examination. I will send \$2.00 within seven days and \$2.00 a month until I have paid \$19.80; otherwise I will notify you and hold the books subject to your order. Title not to pass until fully paid.

Name

Address

As I have had no previous dealings with you, I refer you to

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

**The
JUNE
McClure's**



**Intensely
Interesting
from Cover
to Cover**

**Out
May 15th**

**15c All
Newsstands**

A FEW OF ITS BIG FEATURES

Painless Childbirth

A new and painless method of childbirth has been developed and has been used in five thousand cases with practically unvarying success. This is the first authorized account of it.

The Crime Master and How He Works

A system of detective science, compared with which American police methods seem medieval in their crudity, has been worked out by a great living prototype of Sherlock Holmes. This man is Dr. Hans Gross of the Austrian University of Graz. A representative of McClure's has made a first-hand investigation of the wonderful Gross system, and gives here the first complete account of it.

Penalty by Basil King

The story of a man and woman who were first married and then divorced. Both married again. Seven years later, on a London boat-train, they met by accident. The episode told here deals with what took place between them.

Illustrations by James Montgomery Flagg

Wild Honey by Cynthia Stockley

A wonderful story. A romance of the African veldt; by the author of "Poppy," "The Mollmeit," "Wanderfoot," etc.

Illustrations by David Robinson

The Grouch by Wallace Irwin

The story of a man who was a child-hater, and of a woman whom he loved.

Illustrations by R. M. Crosby

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Every User of Electric Light

should know of the many advantages Electric Shop offers to purchasers of Electrical Goods. The Commonwealth Edison Company, owner of Electric Shop, is well established, and its financial reputation affords the opportunity for purchasing in vast quantities, thus enabling it to offer the highest grade of electrical merchandise, art lamps, etc., of the best manufacturers at advantageous prices.

Electric Shop offers selection from the largest and most complete line of Things Electrical in the West.

**HERE ARE A FEW SUGGESTIONS
ELECTRICAL, FOR SUMMER COMFORT:**

*Fans
Flatirons*

*Washing Machines
Vacuum Cleaners*

*Percolators
Toasters*

ELECTRIC SHOP—CHICAGO

Jackson and Michigan Boulevards



“I’ll Pay You \$175⁰⁰ per Month!”

That’s what many a Superintendent or Manager has said to our **Graduates**. That’s what he’ll say to YOU. It’s not out of the ordinary. It’s not impossible. In fact, it’s just what **will** happen if you become a trained man. We teach **only the Best Paying Trades**. **Electricity, Plumbing, Bricklaying, Drafting and Designing and Moving-Picture Operating**. No needless theory. The **Actual and Practical** work done in the Schools. Expert Instructors. Complete Equipment. Instructions given with tools, instead of books. No previous training required.

You Can Learn While You Earn

Everything has been arranged for the benefit and convenience of our students. Day and night classes—whichever you prefer. We assist you in earning your way through School. Employment Bureau places graduates in good paying positions Free. We help you start a business of your own.

1,000 Young Men Needed

As Electricians, Plumbers, Bricklayers, Draftsmen & Moving-Picture Operators

The demand for men skilled in these trades is far greater now than ever before. Glance over the “Help Wanted” columns of the city newspapers and technical magazines and see the hundreds of calls for men trained in these Profitable Trades. They pay \$5.00 to \$8.00 a day all over the country. **Exceptional opportunities for starting a business of your own**. We give you the kind of training necessary to attain prosperity and future independence.

Mail Today

Mail Today

Fill in this coupon and mail today. We’ll send you our School Catalog “Trades That Pay” and full particu-

L. L. COOKE, Director
COYNE NATIONAL
TRADE SCHOOLS
Dept. 1406

51 East Illinois St., Chicago, Ill.
Dear Sir:—Please send me your booklet “Trades That Pay” and full particulars of how I can become an expert and earn \$175.00 a month. Send everything FREE AND PREPAID. I assume no obligations.

lars. Everything sent to you FREE AND PREPAID. Let us tell you how YOU should earn \$175.00 a month—after a short, thorough training in our Schools. Get the facts at once. Mail coupon NOW—while you think of it.

L. L. COOKE, Director
Coyne National
Trade Schools
Dept. 1406

51 East Illinois St., Chicago
Oldest, Largest and Best
Equipped Trade Schools
in America



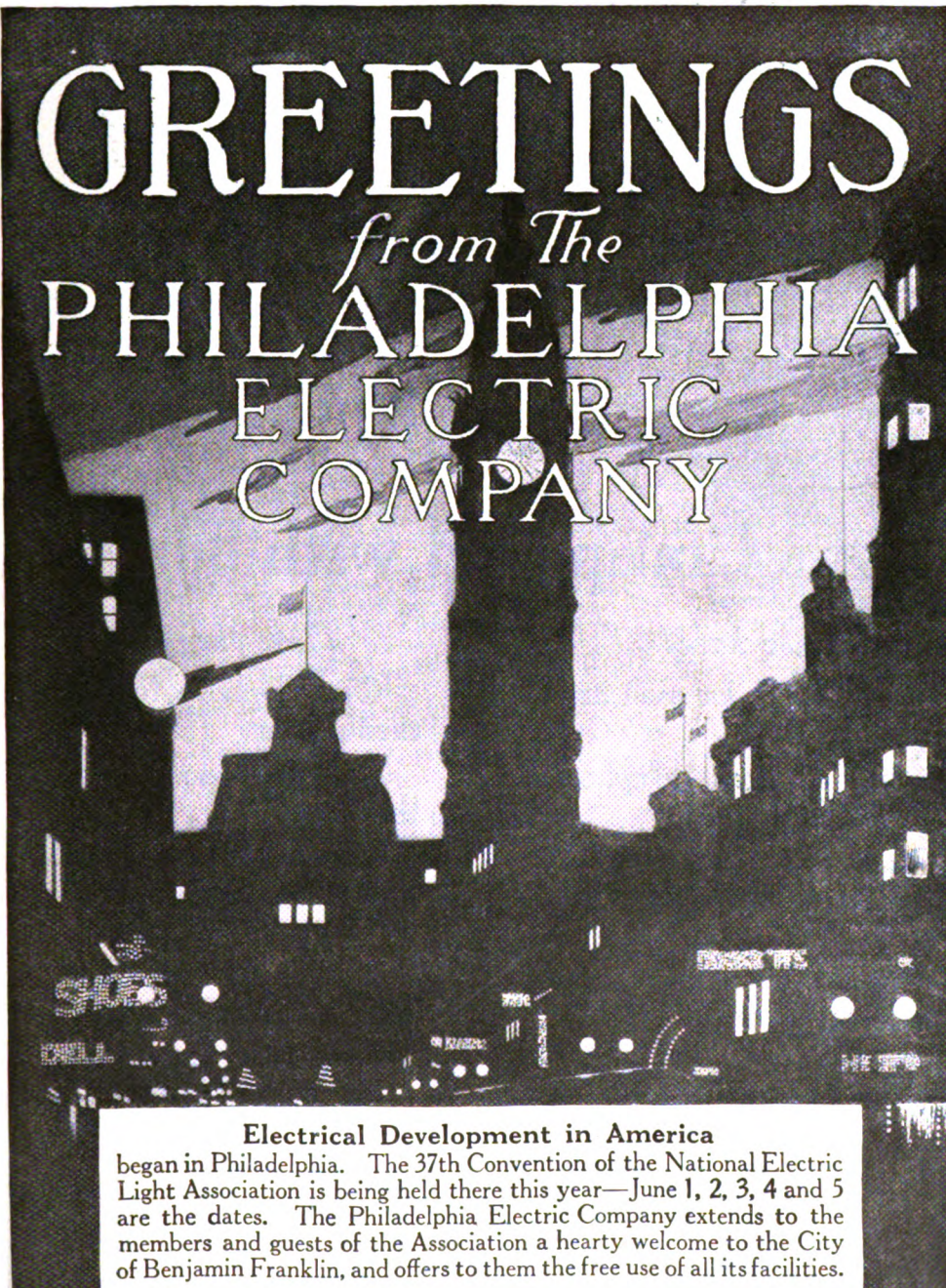
Name.....

Address.....

COME TO CHICAGO, THE BUSIEST CITY IN THE WORLD

WE OCCUPY ENTIRE BUILDING

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



GREETINGS

from The

PHILADELPHIA ELECTRIC COMPANY

Electrical Development in America

began in Philadelphia. The 37th Convention of the National Electric Light Association is being held there this year—June 1, 2, 3, 4 and 5 are the dates. The Philadelphia Electric Company extends to the members and guests of the Association a hearty welcome to the City of Benjamin Franklin, and offers to them the free use of all its facilities.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Results Compared with Theories

Here we have:

Ten telephones for each hundred persons.

Nearly one rural telephone to every two farms.

Reasonable rates fitted to the various needs of the whole people.

Telephone exchanges open continuously day and night.

Policy—prompt service.

There they have:

One telephone for each hundred persons.

Practically no telephones on the farms.

Unreasonable rates arbitrarily made without regard to various needs of the whole people.

Telephone exchanges closed during lunch hour, nights and Sundays.

Policy—when your turn comes.

America's Telephones Lead the World with the Best Service at the Lowest Cost.



**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**

One Policy

One System

Universal Service

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



SUNBEAM

Come Out of the Gloom

Stop wasting electricity in carbon lamps.

Don't cheat yourself out of the three-fold light you can get at the same cost from SUNBEAM MAZDA Lamps — National Quality.

Come out of the gloom!

Put a SUNBEAM MAZDA Lamp in every socket and enjoy fine, steady, cool white light — three times as much as carbon lamps will give at the same cost.

Carbon lamps are good heaters but poor lighters.

They eat up current like a stove. Out with the relics—a third of a century behind the times.

SUNBEAM MAZDA lamps are the product of the finest lamp research laboratories in the world. Efficient, economical, durable, brilliant, up-to-date, long-lived and low-priced. Used in all progressive, thrifty homes. Proved by broadsides on battleships—rugged as carbon lamps.

Get SUNBEAM MAZDA Lamps and make your home a really comfortable, hospitable place to live. Look for "National Mazda" on the bulb, and the "SUNBEAM" label.

SPECIAL NOTE—Figure the wattage of carbon lamps against their candle-power. Compare the result with the figures for Sunbeam MAZDA Lamps, and prove to yourself that you actually save money in current cost by breaking your carbon lamps and replacing them with Sunbeam MAZDA Lamps—everywhere—in homes, stores, offices, factories.

Western Electric Company

Manufacturers of the 8,000,000 "Bell" Telephones

New York
Buffalo
Philadelphia
Boston
Richmond

Atlanta
Savannah
Detroit
Chicago
Milwaukee

Pittsburgh
Cleveland
Cincinnati
Indianapolis
St. Louis

New Orleans
Kansas City
Oklahoma City
Minneapolis
St. Paul

Denver
Omaha
Salt Lake City
San Francisco
Oakland

Los Angeles
Dallas
Houston
Seattle
Portland

EQUIPMENT FOR EVERY ELECTRICAL NEED

Member of the Society for Electrical Development—"Do It Electrically."

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Our Congratulations



are extended to the men of the electrical industry of this country, who have made possible the

Thirty-seventh Convention of the National Electric Light Association in the City of Philadelphia

That this year's gathering will be as successful as those of former years, and that as much or more benefit will be derived by the organization and the electrical industry in general, is the sincere wish of

The New York Edison Company

NATIONAL MAZDA

THE QUALITY LAMP



For Your Car—
NATIONAL MAZDA
Lamps

For Your Home—
NATIONAL MAZDA
Lamps



The rugged lamps that stand the racket on rough roads;
The lamps that stay bright; the lamps that are made right;
The lamps that are approved and used by ninety-three per cent of all Automobile Builders as a result of their own laboratory and service tests;
The embodiment of quality, efficiency, uniformity and durability;
Your guaranty of safety at night because each lamp is standardized; made for every car whether gasoline or electric;



Dr. Chas. P. Steinmetz, the Master Engineer, recommends MAZDA lamps for efficiency, economy and durability.

Name your car and any National Mazda agent will supply you with lamps of correct brightness, voltage and style of base.
Sold everywhere by garages and electric shops in the miniature Blue Convenience-Carton, singly, or in the handy compact lamp chest containing a complete set of six lamps especially selected to fit your car.

For Scientific Lighting Everywhere NATIONAL MAZDA Lamps at New LOW PRICES

From pocket-flash to boulevard, from battleship to dining car, from factory to mine, for every socket everywhere there's a National Mazda lamp with a guaranty of quality. Every National Mazda lamp represents the results of researches in the best lamp laboratories of the world.
Buy at the new low prices. Insist on seeing the name "NATIONAL MAZDA" etched on the glass—

The low priced lamps that pay for themselves after a very short period of use—by tripling the lighting value of your current; the lamps that by giving more light for the same cost have made all other types of home illumination obsolete;
The lamps that offer you the choice of many sizes and shapes, all with threefold efficiency, for every kind of fixture; the lamps that are rugged, fit any socket, burn in any position, don't discolor and use only one-third as much electricity as carbon lamps of the same candlepower;
The lamps for the most modest home or the most elaborate mansion; for stores, offices, factories and mills;
The only lamps that urge in the Blue Convenience-Carton that opens the way to better light. Put a NATIONAL MAZDA lamp in every socket before you pay your next light bill and have more light.

and buy the original Blue Convenience-Carton containing five lamps. Get National Mazda lamps at the store that shows them in the windows. Any National Mazda agent in any business center will give you information on the choice of proper lamps for every room and fixture in your home, or for any part of your automobile, or you may have free descriptive booklets on request by addressing any of our Divisions or

Any of these labels marks a NATIONAL MAZDA lamp and is a guaranty of National Quality



NATIONAL LAMP WORKS
OF GENERAL ELECTRIC CO.



Member of Society for Electrical Development
"DO IT ELECTRICALLY"

33 Nela Park, Cleveland, Sixth City



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

From
this
size
up



Weight.
2 pounds

FORT WAYNE Fractional Horse Power Motors

Not toys, but real, efficient, reliable power producers for actual service.

Specializing as we do in small motor applications of all kinds, we are called on continually to design and build some peculiar types.

Sometimes it's light weight, or noiselessness, or unusual size or shape, the ability to work equally well on A. C. or D. C., or perhaps it's extraordinary starting torque, or overload capacity that's required.

It's all the same to us--if one of our standard motors (and no one makes a more complete line) won't fill your requirements our Engineering Department challenges you to put an application up to them that they can't solve.

If you have a machine or especially if you market a product and wish to equip it with the best fractional horsepower motor it will pay you to send for our Bulletin 1146 and learn what we are doing for the majority of the leading manufacturers of industrial and domestic power driven devices.

Fort Wayne Electric Works

Of General Electric Company
"WOOD" SYSTEMS

1603 Broadway

Fort Wayne, Ind.

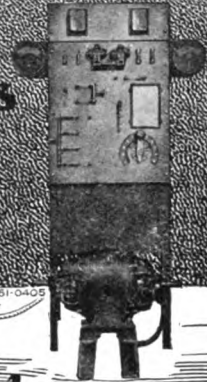
BRANCHES IN ALL LARGE CITIES

M42

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Wagner Alternating Current Converters

for charging Storage Batteries



and for Moving Picture Projection

A Simple, Reliable Outfit

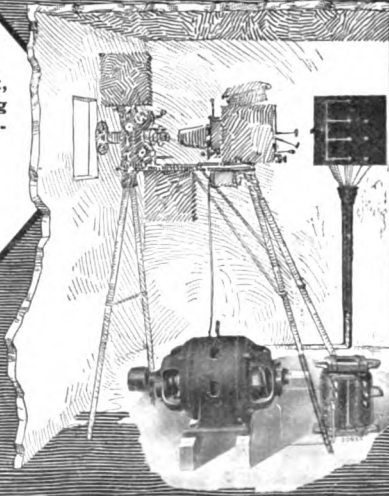
for charging vehicle batteries in the home or public garage, or for motion picture work.

Anyone Can Operate It

It is a simple matter to plug into the battery socket, start the converter and adjust the current for charging the battery. In moving picture work it is only necessary to operate a switch.

No Renewals to Make

No fragile parts—nothing delicate. An occasional oil supply to the bearings is the only attention required. It is always ready.



Wagner Converters may also be used as power motors for operating small machine tools, tire pumps, vacuum cleaners, etc. Bulletin 1003.

Member of Society for Electrical Development... Do It Electrically.

Wagner Electric Manufacturing Company, SAINT LOUIS, MISSOURI

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

A New Light-Weight FEDERAL Cleaner for Only \$37.50

The Federal Junior has been designed by the builders of the well-known \$125 Federal Vacuum Cleaner—the best and most efficient

portable cleaner made. Made with the same care, in the same factory, by the same men, to fill the demand for a smaller, lighter household cleaner at a lower price.

Housework now becomes *much easier* in homes that never before could own any electric cleaner. For, with this new FEDERAL JUNIOR, for the first time you can obtain a really *efficient* small-type cleaner at a very moderate price.



The New FEDERAL JUNIOR Electric Suction Cleaner

Seven thousand times a minute, the powerful fan revolves—drawing the air through the nozzle and into the dust bag. Being the only cleaner made with a *double* exhaust, the FEDERAL JUNIOR moves more air than any of them. It takes up *all* the dirt and dust from rugs or portieres; mattresses or upholstery. Keeps your home *more* than clean—but *spotlessly, sanitarily* clean every day in the year.

Write for Full Particulars Today

The price of the new FEDERAL JUNIOR is \$37.50; with extra attachments, \$45. Write today for complete information. Learn how easily you can obtain a FEDERAL JUNIOR.

Address Vacuum
Cleaner Dept.

**THE FEDERAL SIGN
SYSTEM (Electric)**
Lake and Desplains Streets
CHICAGO, ILL.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Get the Most Breeze for Your "Electricity Money"

BREEZE is what you are buying when you buy an electric fan. Not only breeze for this summer, but for many summers to come. That is why it pays to take a little trouble if necessary to get a Westinghouse Electric Fan.

Every Westinghouse Fan Motor is built with the same care as the largest piece of machinery, in shops that are famous for fine machinery. Yet at the same time all its workings are so protected that no attention is needed beyond lubrication once a season.

Westinghouse Electric Fans

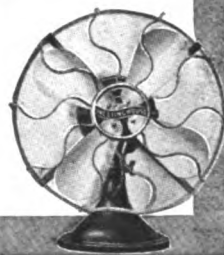
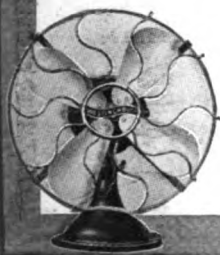
are most beautifully designed fans, all new models having the modern light, strong drawn-steel frame.

Breeze can be regulated from a zephyr to a strong wind. Direction of breeze can be controlled from any position. Patented base bottom, felt lined to prevent marring polished surfaces.

Send for fan booklet 4268 showing all types and sizes and ask for name of Westinghouse dealer before buying.

Department A. F.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



The Comfort Link Between Rooms or Floors.



You can easily have this home convenience

A home telephone from upstairs to kitchen. Costs but a trifle. Can be put up by anyone, without marring the walls. A clear-speaking little instrument which carries your directions without loss of time or waste of strength. Stops useless running up and down stairs and loud calling through the rooms. In every well-ordered home it is just as necessary as the door bell, and just as easy to install. Nothing complicated about it. Nothing to get out of order. Always ready for use. Of the same high quality as all "Bell" telephones. The pictures show

Western Electric Inter-phones

installed in bedroom and kitchen, and indicate how neat and satisfactory they are.

This two-station set costs only \$15, complete, ready to put up. You should be able to get it at your local electrical dealer's store. If not there, we will supply you direct at the same price.

We also make Inter-phone sets, for use where it is desired to connect more than two points in the house, or about the grounds.

Upon request we shall be glad to send you our illustrated booklet, "The Way of Convenience." Ask for booklet No. 33-AT

There is an opportunity for agents to represent us in some unoccupied territories.

WESTERN ELECTRIC COMPANY

Manufacturers of the 7,500,000 "Bell" Telephones

463 West St., New York

Houses in All Principal Cities of the United States and Canada.

Agents everywhere

EQUIPMENT FOR EVERY ELECTRICAL NEED

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

The Security of an Investment In Commonwealth Edison Stock

WHILE the stock of any well-managed public utility company is usually reliable, it is its possession of this quality of stability to a very marked degree that makes Commonwealth Edison stock particularly desirable as a secure investment.

The Commonwealth Edison Company's franchise will not expire until 1947.

More than 200,000 customers are now being served — with a practically limitless field for further development.

Commonwealth Edison stock is selling for about

In order to continue the well defined policies of the administration in the future, the Chicago Central Station Institute, financed by the Commonwealth Edison Company together with other electric utility companies, is used for training the company's men.

The purpose of this Institute is to select young men who are above the average in education and intelligence, giving them a special training in Central Station Practice, thereby furnishing the company a superior type of trained men.

Employees are thus drawn into closer union with the company's interests. And the assurance of the permanence of the company in its present healthy status is doubly safeguarded for the stockholders.

\$135 a share. It is paying 8% dividends. From time to time, new issues of capital stock are made and offered to present stock holders at par (\$100.) Such an issue was made recently.

We will gladly forward full particulars of Commonwealth Edison stock, if you are interested. Write today; no obligation.

EDWARD P. RUSSELL

WALTER S. BREWSTER

C. L. PENISTON

RUSSELL, BREWSTER & CO.

116 West Adams Street

CHICAGO

New York Office:
111 Broadway

Members: New York Stock Exchange
Chicago Stock Exchange

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Let the *Eden* Turn Your Wash Days into Play Days



Let it give you *leisure on wash-day*—five or six hours of leisure—in which to rest or read or visit.

A washing requiring seven hours of your grandmother's time — *of your time if you still use your grandmother's methods*—takes about one and one-half hours when done by

The *Eden* Electric Washing and Wringing Machine

at a cost of only a few cents for power.

Actual tests covering more than a year have proved that the average family's washing done with an EDEN takes less than five cents' worth of electric current.

This low cost is due directly to the simple construction of the EDEN—no belts or chains to create friction and waste power. Its smooth-running 'trouble free' mechanism eliminates repair bills. The EDEN is the only machine guaranteed by the manufacturers to give a *life-time of satisfactory service* in the home.

The absolute *safety* of the EDEN is another important consideration. Every moving part is completely protected—no exposed cog wheels, chains or belts—no possible chance of catching your apron-strings, clothing or loose locks of hair in the EDEN. The specially designed motor has an automatic releasing clutch—it can't burn out.

The all zinc cylindrical clothes container is absolutely rust-proof. Perforated by 10,000 smooth, round holes, through every one of which the warm suds churns every three seconds, it souses the clothes up and down until they are spotlessly clean. The EDEN electrically *wrings* the washing, too, rapidly thoroughly, easily. It is the *simplest, strongest, safest* and *most economical* electric home washing and wringing machine. It *pays* for itself many times over in the lengthened life of clothes, the saving in laundress' wage, time and effort.

A Free Demonstration in Your Own Home on Your Own Washing

proves these things. Let us arrange this, absolutely without obligation or cost to you, by signing and sending the attached coupon today.

BROKAW-EDEN MFG. CO.

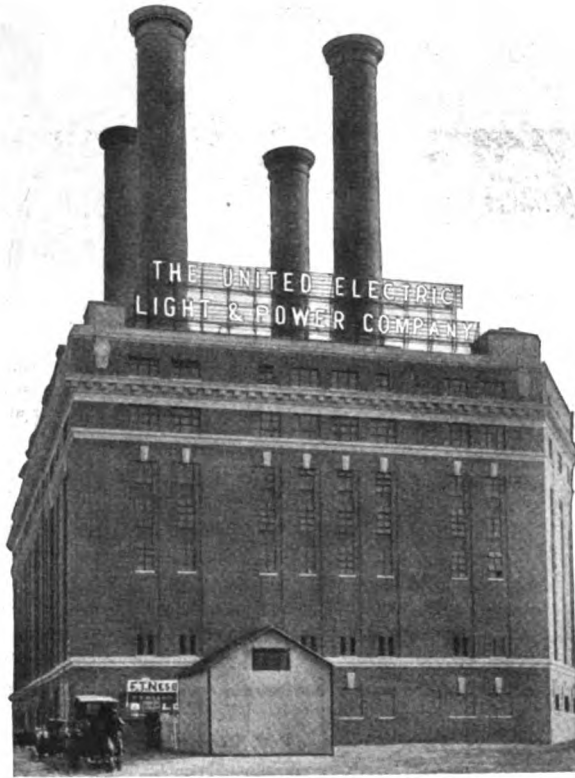
2319 S. Western Ave.
CHICAGO

Sign and Mail
the Coupon
Today



FREE DEMONSTRATION REQUEST
I am interested in the EDEN Electric Washing and Wringing Machine and would like to arrange for a free demonstration. Kindly send me descriptive literature and full particulars regarding your Free Trial.
Signed.....
Address.....
City.....
State.....

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Delegates to

The National Electric Light Association Convention

Philadelphia

June 1st to 5th

who will visit New York, are cordially invited to inspect the

201st Street Generating Station of

The United Electric Light & Power Co.

Ultimate Capacity, 120,000 K. W.

General Offices
130 East 15th Street, N. Y.
Telephone: Stuyvesant 4980

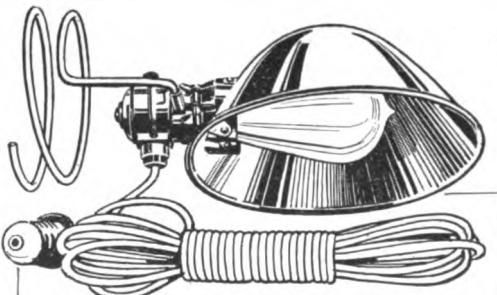
Branch Office and Showroom
138 Hamilton Place, N. Y.
Telephone: Audubon 4000

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



This Handy Lamp Bracket —Yours for \$2.25

Sent prepaid to you—no matter where you live—upon receipt of \$2.25! This handsome, beautifully finished Handy



This handy lamp bracket is finished in brush brass. It has a flexible wire stand, one light and parabola shade with 8 ft. of cord and attachment plug. Weight, 8 lbs. Sent prepaid to any address upon receipt of price, \$2.25.

Lamp Bracket *hangs or rests anywhere*, fits any electric socket—gives a strong, steady light just where you need it most. Use it for reading or writing—for shaving or on dressing table; use it in the office or factory; ideal, too, as a piano lamp or for sewing; gives a perfect bed-side light for reading; convenient in a dark clothes closet. Just the lamp that *every-one* needs at just the *right price*—\$2.25. Order now.

When ordering, please write name and address plainly (preferably in ink) and wherever possible, send remittance (\$2.25) in form of post-office or express money order or bank draft. Currency should be sent by registered mail.

ELECTRIC SHOP—CHICAGO
Corner Michigan and Jackson Boulevards



Western Electric CONLON WASHER & WRINGER



**8 O'Clock
The Day
Begun**

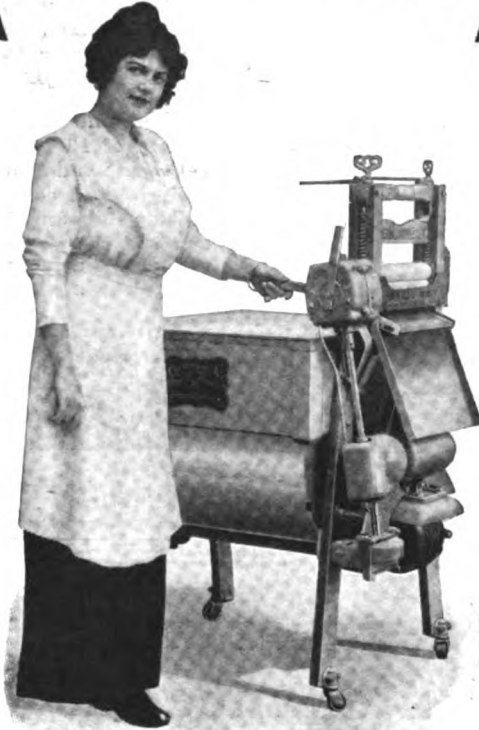
Fully
Guaranteed

Simple
Construction

Parts
Enclosed

Chainless and
Beltless

Fool Proof



**10 O'Clock
The Washing
Done**

Simple to
Operate

Time, Labor
and Money
Savers

No Gears
Inside

Safety Electric
Wringer

Sanitary

A Country-Wide Distribution

has been arranged exclusively through the

Western Electric Company

with a Distributing House near you

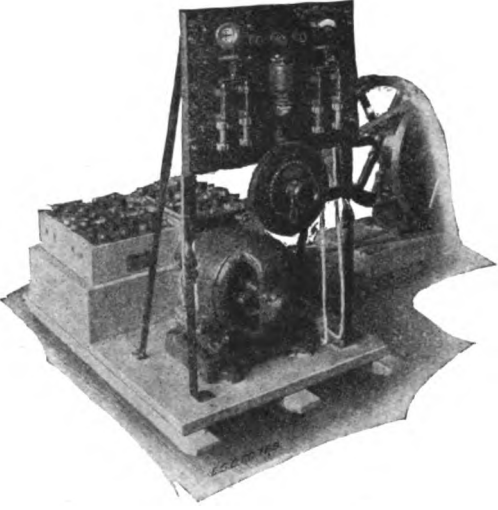
Apply today for literature at our nearest branch and we will arrange for a free demonstration

New York	Chicago	Kansas City	San Francisco	Montreal	London
Buffalo	Milwaukee	Oklahoma City	Oakland	Toronto	Berlin
Philadelphia	Pittsburgh	Minneapolis	Los Angeles	Winnipeg	Paris
Boston	Cleveland	St. Paul	Dallas	Calgary	Rome
Richmond	Cincinnati	Denver	Houston	Vancouver	Johannesburg
Atlanta	Indianapolis	Omaha	Seattle	Edmonton	Sydney
Savannah	St. Louis	Salt Lake City	Portland	Antwerp	Tokyo
		Detroit		New Orleans	

EQUIPMENT FOR EVERY ELECTRICAL NEED

N. E. L. A. MEMBERS BE SURE TO SEE THIS MACHINE AT THE PHILADELPHIA CONVENTION, JUNE 1 TO 5

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



“Myray-Exide” Electric Plant Units

Here are simple, compact and perfected electric plant units which make it possible for every farm, country home, hotel, store, etc., not near a Central Station to have its own electric lighting plant.

These units consist of a “Myray-Exide” Battery of 16 cells assembled in rubber jars (charged) and a switchboard, all mounted on a single skid as shown. This Unit can be quickly and easily installed, is shipped in one box and can be readily handled. The addition of a generator and engine makes a complete electric plant.


Write our nearest office for catalogues and full information.

“Myray-Exide” Battery and Switchboard Unit with generator in place connected to engine, making a complete electric plant.

THE ELECTRIC STORAGE BATTERY CO.

1888	PHILADELPHIA, PA.	1914
New York	Chicago	San Francisco
Boston	St. Louis	Portland, Ore.
	Cleveland	Los Angeles
	Atlanta	Seattle
	Denver	
	Toronto	
	Detroit	

Save 80% per year in Fuse Maintenance



ECONOMY RENEWABLE FUSES CARTRIDGE

are affecting this big saving in industrial plants, mines, department stores, steam and electric roads—in short wherever Economy fuses have replaced the expensive, non-refillable fuse.

25 blowouts of an ordinary non-refillable fuse cost \$10.12½—where 25 blowouts of ECONOMY renewable cartridge FUSES cost \$2.10—and Economy fuses provide positive electrical protection under all conditions. They never hold a sustained arc nor vent fire. They are absolutely safe.

Why spend four times more than necessary in annual fuse maintenance—write today for full information and list of prominent satisfied users—ask for Bulletin 30.

Two Economy Renewal Elements are now furnished with each Economy fuse.

ECONOMY FUSE & MFG. CO., Kinzie and Orleans Sts., CHICAGO

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



THE IDEAL FUSE STRIP

Can Only be Used in "DAUM" Refillable Fuses to Give Maximum Protection at Minimum Cost

Example:—Above is a 100 ampere renewable fuse. If you want 85 ampere, you cut to first line (marked 85).



If you want 75 ampere, you cut to second line (marked 75), etc. You can't go wrong because

these fuse strips are made to fit only in different sizes of Daum fuse shells.

The capacity is marked on all fuses on inner end of fuse roll.

You are never "up against it" with these fuses. You have (safety first), any anything under the (safety limits) you can make your fuses.

Can also make fuse in rolls of 65 amperes, 75 amperes, etc., on up to 600 amperes, without lines, at same price.

NOW IN REGARD TO COST

Daum made the first successful refillable fuse on the market and is making the first refillers with scribed lines on, that you can make anything under the maximum capacity.

Prices on Application

A. F. DAUM CO. Sole Manufacturers **Pittsburgh, Pa.**

To Earn \$360 How Many Sales Must You Make?

Isn't there a good prospect for that many sales and more in 7,200 calls?

For \$360 I will send six selling talks about your product to each of 1,200 prospective users of it.

The talk will be clear—to the point—every argument backed by a fact or reason. I will send them at regular intervals in an accumulative series.

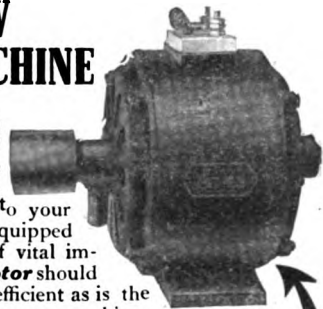
Prepare the way for your salesman with these talks. They will perform the missionary work and make him a closer. Eliminate the lost motion in your sales organization.

Now is the time to do it. Write me today.

William D. McJunkin
(Pres., Wm. D. McJunkin Adv'g Agency)
35 So. Dearborn St., Chicago, Ill.

YOU KNOW YOUR MACHINE

but what do you know about motors? Now if your machine is to be motor driven, and you supply it to your consumers ready equipped with a motor, it is of vital importance that the *motor* should be just as good and efficient as is the *machine*. You know your machine, but what do you know about motors? If you install



Peerless Motors

($\frac{1}{8}$ to 1 H. P.)

you don't need to know anything about them. We'll gladly furnish names of other manufacturers of small machines who furnish Peerless Motors as standard equipment for all their machines. Ask them what they think of Peerless motors. Besides, our guarantee stands back of every motor we make.

And if you don't know just what size and type of motor to use, our free Engineering Service will help you. Let's get together on this motor question.

Write for information and prices. We also make standard D. C. motors from $\frac{1}{8}$ to 30 H. P.

PEERLESS ELECTRIC COMPANY
700 Market Street Warren, Ohio

Reduce Current Consumption in Direct Proportion to Every Speed Reduction



AN EXCLUSIVE FEATURE OF
Kimble Motors
Variable-Speed Alternating-Current

By its current saving alone, Kimble Motors pay dividends of 5% monthly on their cost over any other a-c motor.

They increase efficiency by not less than 25%.

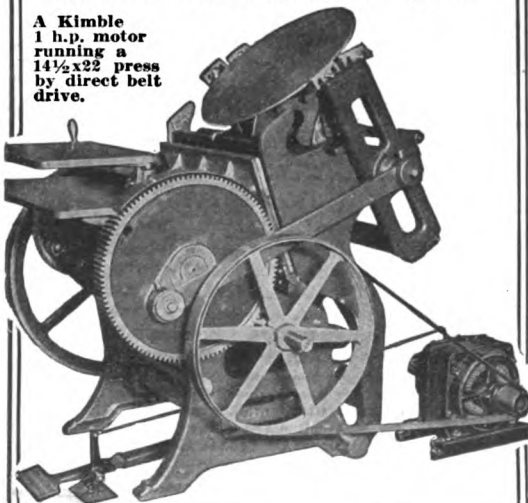
This saving makes them ideal for running machinery or equipment on any work where variable speeds are required on jobs where the load, or torque, is fairly constant.

Low starting current, finely graduated steps, and other features of Kimble Motors are bound to be intensely interesting to you if your work is of the above character.

Write for the Red Catalog. It gives the full particulars. It also gives interesting data on a-c drive. When writing for your copy, tell us your immediate problem. Our suggestions will help.

Kimble Electric Company
The Alternating Current Motor Specialists
 632 North Western Avenue, Chicago, Ill.

A Kimble 1 h.p. motor running a 14½x22 press by direct belt drive.



Reduce Insurance Cost Central Station Men!

Fire in *your* plant would entail more than immediate private loss. It would mean costly interruption of an important public service as well. This, and the fact that your annual insurance premiums can be decreased from 10 to 50 per cent, suggest the necessity for reducing fire hazard to a minimum.

Our Engineering and Inspection Service Shows You How—It's Free

Without a penny of expense to you, one of our insurance engineers will inspect your plants, recommend simple methods for reducing the fire risk and we will then write your insurance at the lowest possible rate for the best indemnity.

Some of the largest central stations in the country have availed themselves of this expert counsel and as a result are securing their insurance at rock-bottom rates. From Montreal to Mexico City, from Portland, Maine, to Portland, Oregon, we are extending this service and handling insurance for public service companies.

The first step toward getting this information as to how to safeguard your properties and cut down your premium cost is to write us TODAY.

Marsh & McLennan
Insurance Exchange Chicago
 BRANCH OFFICES: New York, Duluth, London, Minneapolis

Write for NEW Catalog



Write for new catalogue and special prices on this lighting, ignition and starting battery. Longer life in service. Fully guaranteed. We manufacture all kinds of batteries for the trade.

Universal Battery Co.
 3414 N. Peoria St., Chicago

If You Want to Vary the Speed HERE YOU ARE

No rheostats or controllers. Simply turn the end cap on the Motor until proper speed is attained. To run Motor in one direction start with cap turned in that direction. Can anything be more simple? Just the thing for vacuum cleaners, wireless instruments, dentists, printing presses and a hundred others.



THE BARNES

Runs absolutely without heat. Variable Speed and Reversible.
 A post card brings our catalog.
Barnes Mfg. Co., 107 Belmont Street
 Susquehanna, Pa.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

THE NEW



Will Increase Your Sales

This attractive and efficient electric sign placed in your window or on the counter will add dignity to your store. The bold white letters with black background compel the attention of everyone.

Tell your customers a new story as often as you like; it only

takes a minute to change the letters. It is 4 feet 3 inches long and 8 inches high. Special lengths made to order. Will stand anywhere or can be hung. Comes complete with 8 foot cord and plug, 120 letters, blanks, figures, etc., and hanger chain. Inexpensive to operate.

Write today for illustrated booklet and complete information

Dealers—These signs are quick sellers, write today for our proposition

ILLINOIS ELECTRIC COMPANY

308 W. Madison St., CHICAGO

261 So. Los Angeles St., LOS ANGELES

NEW

6 VOLT 8 AMPERE GENERATOR

FOR **AUTOMOBILE
MOTORCYCLE
MOTORBOAT** and all
MINIATURE LIGHTING

IT IS A WONDER



also Motors and Fans
178 Summer Boston
No Toys



The Only Way
to satisfactorily support vertical wires.

Thesco Wire Clamp

Write for Catalogue of Sizes and Prices.

THE STATES CO.
17 New Park Avenue
Hartford, Conn.

TESTED APPARATUS

MEANS THE ELIMINATION OF FAULTS IN YOUR PRODUCT

Electrical and photometrical tests of every description. Checking electrical instruments of all kinds and classes. Inspecting and testing new electrical machinery, apparatus and material at factories and after installation. Tests on any electrical machinery and apparatus made anywhere. Arc and incandescent lamp tests, either electric, gas, acetylene or oil. Illumination tests made anywhere. Secondary standards of candle-power furnished. Facilities furnished to experimenters and investigators.

We have recently added to the above, Coal Testing, and are now prepared to make proximate analyses and calorific determinations on samples of coal, promptly and accurately.

ELECTRICAL TESTING LABORATORIES

80TH STREET AND EAST END AVENUE NEW YORK, N. Y.

Have you a sign like this on your door?

**PLEASE KNOCK,
BELL OUT OF ORDER**

The chances are that the bell is O. K., but you are simply having
BATTERY TROUBLE—AGAIN!

A Viking Bell Ringer

installed in place of your batteries will do away with your bell troubles for ALL TIME. IT LASTS FOREVER.—No moving parts inside to wear out. Ask your dealer about it.



GET A VIKING TOY TRANSFORMER for your boy—useful and instructive. Full information on request. ADDRESS DEPT. D.

Viking Electric Company, Inc.



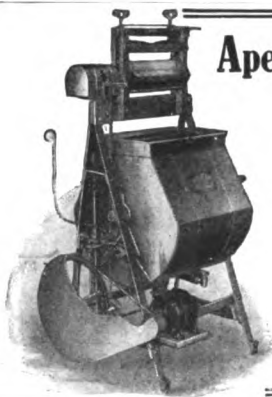
150 Chambers Street
New York, N. Y.

**AGENTS
NEWEST
ELECTRICAL APPLIANCE**

Here is a dignified proposition. You do business with the best class of people. You are marketing the finest class of goods. A unique electrical device that cuts the cost of lighting in half; saves the eyes; gives comfort and convenience. Sold where ever there is electricity; in homes, office, store, factory; large towns and small towns; hotels and hospitals. Weighs one pound. Our sales-driving samples get the business. No previous experience necessary. A General Course in Salesmanship, careful instructions and selling plans for every agent. A clean money-making proposition for energetic men. If you belong to this class, send for particulars. Our proposition will surely interest you. Address

The Handy Light Co.
268 Handy Light Bldg., Cincinnati, O.

**REDUCES ELECTRIC BILLS.
NO EXPERIENCE NECESSARY.
DOUBLES ILLUMINATION.
NO WORK TO INSTALL.**



Apex Electric—Safe, Sanitary, Mechanically Perfect

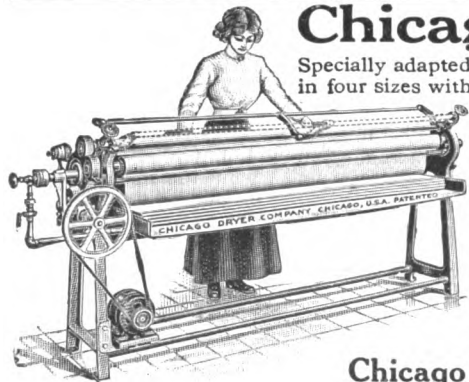
- IT will save two-thirds time on wash-day.
- IT will not wear or tear the finest garments.
- IT will outlast any other make machine.
- IT is noiseless in operation.
- IT has no mechanical defect.
- IT has all the latest safety appliances.
- IT is manufactured in three sizes and nine styles. Don't purchase before you have seen the "APEX". For full particulars write us today for our illustrated booklet and prices.

APEX APPLIANCE COMPANY

3223-3229 West 30th Street

CHICAGO, ILL.

Chicago—Three-Roll Ironer



Specially adapted for use in residences, hotels, hospitals and institutions. Made in four sizes with rolls 37", 42", 50" and 75" long. Heated by means of gas or gasoline. Operated by means of 1/8 H. P. electric motor which may be attached to any electric light socket, or by means of belt power.

This machine is 100% perfect. Will iron all kinds of flat work, such as table cloths, napkins, bed linens as well as the most delicate fabrics or embroideries, without wear or injury. Will eliminate the hardship of ironing flat work by hand and will pay you big dividends on your investment. Our machine makes good as it is the best, most efficient and most conveniently and economically operated ironer on the market. Sold under positive and absolute guarantee to fulfill all claims made. Write today for prices and booklet R-1.

Chicago Dryer Company, 503, 630 S. Wabash Ave., Chicago

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Now Electricity Roasts! Bakes! Broils!

Do you think of electric stoves as toys? Here is a stove that performs every operation of cooking, even including the fireless cooker operation, and does them all better than coal, wood, or gas stoves.



HUGHES "50"

Hughes Electric Ranges

are absolutely safe, clean and economical. No poisonous gases, ashes, soot or dirt. Simple figures show that five solid years of drudgery are saved by this practical invention.

Ordinary kitchens are hot as boiler rooms. Electric cooking means a cool kitchen. Write for our booklet, "Perfected Electric Cooking," sent free.

HUGHES ELECTRIC HEATING COMPANY

209 West Schiller Street

CHICAGO, ILLINOIS

Largest manufacturers of Electric Stoves and Ranges in the world.

FREE 80 PAGE BOOK ON VIBRATORY MASSAGE

Send for it at once and learn, how you can regain health and strength by Vibratory Massage with Arnold Massage Vibrator and all details of our FREE Trial Offer.

STANDARD ELECTRIC WORKS

1237 West 12th St. RACINE, WIS.



8½ Pound Electric Vacuum Cleaner

At last a vacuum cleaner a woman can handle as easily as a carpet sweeper. Weighs no more. Takes up only two-thirds as much room. Is absolutely guaranteed. Rolls on rubber-tired wheels without effort. As powerful as many big unieldy machines.

The Morrow

10 Days Free Trial We take all the risk, write today for our Free Book.
The MORROW CO., Dept. 140X, Waukegan, Ill.
Good Territory Still Open—Agents and Dealers Write

JUST OUT, IT'S NEW

Safety First Electric Lantern

A whirlwind seller and money-maker for agents. Sells on sight. Great for Autolists, Farmers, Campers, Sportsmen. Every home and merchant needs one.

FREE LANTERN

Send \$2.50 for Sample Lantern. We will send it to you Parcel Post Prepaid. This amount is allowed you on our agent's agreement. Send for sample and agent's proposition now.

VALE MFG. COMPANY, 20-24 So. Clinton St., Chicago

'PELOUZE' Electric Flat Iron

The only iron that has no obstruction at the front—it irons where others can't—ideal for sleeves, pockets, arm holes, etc. Prevents burnt fingers. Heats evenly—saves current. Nickel finish; complete with cord and attachment plug. No stand required—simply tip iron on end.

THIS UNUSUAL LOW PRICE \$3.75

At this special price, \$3.75, this Pelouze Progressive Iron is an unusual value; guaranteed satisfactory. At your dealer's; or order direct from us. Ask for catalogue.

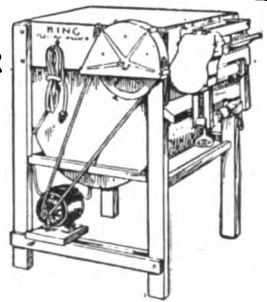
Pelouze Manufacturing Company
232-242 East Ohio St. Chicago, Ill.



THE KING ELECTRIC WASHER AND WRINGER

is the simplest cylinder washing machine with reversing wringer on the market. Reasonable in price. Note the absence of complicated mechanism. Made in four sizes to cover all needs. Cost of current is less than five cents for average family wash.

Our double King Washer handles two washes of sixteen sheets or thirty-five shirts at one time. Inquire of your regular Electrical Dealer or write us.



OPEN FOR WRINGING

REX MANUFACTURING CO.
DEPT. A JOHNSTOWN, PA.

CLOSED FOR WASHING

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

IT REALLY COSTS YOU NOTHING TO OWN A SIMPLEX IRONER



In fact, you will be money in pocket, figuring the many hours of time and labor you will save 52 weeks a year for many years. Not to mention the EASIER WORK, BETTER FINISH, and LONGER WEAR of goods ironed. It will earn its price over and over again.

If you fully realized the MANY advantages of using the "Simplex" Ironer you would get one immediately, as have many thousands of progressive housewives.

The "Simplex" will do the greater part of the ironing, all the heavy pieces that take so much time, press trousers, etc. It will iron a table cloth in three minutes that would take you 20 by hand, and DO IT BETTER. IT WILL DO AN AVERAGE IRONING AT TWO TO FOUR CENTS' EXPENSE. Think of it! You really cannot afford to be without a "Simplex" Ironer.

Write for name of our Local Dealer, 30-Day FREE TRIAL OFFER, and Booklet.

American Ironing Machine Company 168 N. Michigan Ave. CHICAGO, ILLINOIS

Here's Health and Power, Vim and Vigor



All yours! Strength that is more than mere muscular strength. The strength, health, power and vigor of youth is now within your reach through the White Cross Electric Vibrator. Be strong—be healthy. Enjoy things the way you used to. You can be strong and healthy if you will.

White Cross Electric Vibrator
With this machine in your home you can give yourself the same treatments for which specialists receive \$3 to \$5. Can be connected up as easily as an electric lamp. Or if your home is not wired for electricity, it will run perfectly on its own batteries.

Write Today for Big Free Book Just your name and address on a letter or post card is enough. We will send you absolutely free and prepaid, our new book, "Health and Beauty." It tells you all about vibration and our special 60 day price reduction offer. Write today. Lindstrom-Smith Co., Dept. 140X, 1100 S. Wabash Ave., Chicago

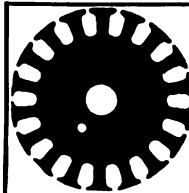
Good Health For You

Banish all your aches and pains. Send the blood tingling and surging thru your veins—know the joys of health.

BE YOUR OWN DOCTOR

Give yourself right at home, the same treatments now given by the world's greatest specialists. The Good Health Electric Vibrator relieves and benefits almost every ailment. Write today for our amazing special introductory offer—free booklet and free trial offer. Our vibrators run on any lighting circuit, also on dry batteries.

AGENTS WANTED: Largest offer in the country. **BETTER HEALTH VIBRATOR COMPANY, 344 N. Clark St., Chicago**



DYNAMOS MOTORS

We make a specialty of small, compact, sturdy little dynamos for charging storage batteries and private lighting plants. Capacity, 5 to 20 six-candle-power twenty watt tungsten lamps. They are correctly designed, well built, have brush rocker, reaction brush holders, removable bronze bearing shells, are about wound for ratings from 6 to 110. Also motors for from 100 to 200 watts for voltages from 6 to 220. Send for Circulars for prices, also all parts for dynamos and motors.

FRED R. HELLMAN
444 Niagara St., Buffalo, N. Y.

Send \$5.00 today for telephone convenience and permanent desk order



The Equipoise Telephone Arm places your telephone always within your reach, and keeps it always out of your way. It is the impossibility of keeping the instrument out of your way that keeps your desk in disorder.

You only have to spend \$5 once; and if you think the Equipoise Arm is not worth every cent of the investment, your money back willingly:

NATIONAL OFFICE APPLIANCE CO.
703 State Street Camden, N. J.

INSULATION

Bakelite-Dilecto **Vulcanized Fibre**
For Wireless and other High Voltage Work For Ordinary Purposes

THE CONTINENTAL FIBRE COMPANY
CHICAGO NEW YORK
McCormick Bldg. NEWARK, DEL. Woolworth Bldg.



Weight less than four pounds

Diehl Residence Type 8 inch Fans

Durable — Efficient — Noiseless
DIEHL MANUFACTURING COMPANY
Elizabeth - - - New Jersey



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Turn Down Your Electric Lights with A DIM-A-LITE



Dim-a-lite, 3-8 size

Not a lamp—a small portable attachment for dimming a single incandescent lamp. Pull the chain—get five degrees of light. DIM-A-LITE is a necessity. Think of the convenience, not to speak of the savings effected in your electric light bill. Can be attached by any one in a few seconds. Will last a lifetime.

At your dealers or by mail \$1.00. Special introductory offer to the trade.

WIRT COMPANY
Germantown, Philadelphia, Pa.



Dim-a-lite and lamp

Your Best Buy

in electric washing machines is the



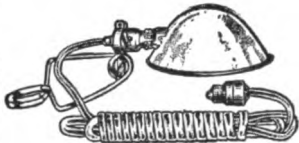
which does better and quicker work due to exclusive advantages. Wrings and washes at same time. Copper tub, smooth as glass inside, protects the most delicate garment. Simplest, safest and easiest to operate and clean. Gravity spring action gets superior cleansing at less cost. 15 days free trial in your home to prove it.

JUDD LAUNDRY MACHINE CO. Peoples Gas Bldg. Chicago

Write and learn about our 15 day free trial plan

THE COMFY LIGHT OF THE HOUR

The Comfy gives you light where you need it, when you want it, can be attached anywhere in less than a second at any angle required to give best illumination. Field unlimited for its uses.



Agents Wanted Everywhere

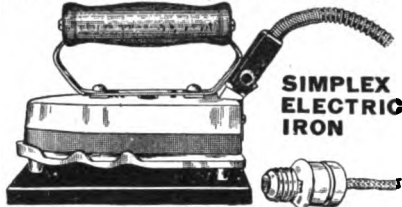
Agents are making \$50 to \$100.00 per week and not killing themselves doing it. Write for full particulars at once. Territory is being fast taken up.

THE COMFY LIGHT COMPANY
608 Marquette Bldg., CHICAGO, ILL.

IN SUMMERTIME the comfort, cleanliness and convenience of **SIMPLEX Electric Specialties** are particularly welcome.

SIMPLEX LAMP-SOCKET SPECIALTIES

cover almost every domestic need. They are the standard of efficiency, durability and elegance.



SIMPLEX ELECTRIC IRON

Just turn a switch and the iron is ready for work, either for the regular ironing or to do a little pressing. Can be used anywhere there is a lamp-socket—in kitchen, chamber or out-of-door. Simplex Irons have the fewest parts and enjoy a superior reputation for efficiency and durability.

SIMPLEX CHAFING DISH

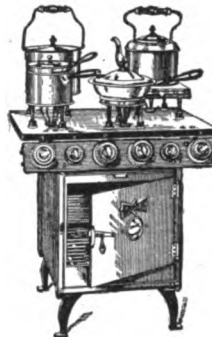
Three parts—a stove, hot water pan and chafing dish. Use the stove for toasting or in combination with either or both pans for a variety of purposes. The pans detach from stoves for serving and cleaning. Useful at many times and in many ways in every household. A wide variety of styles and prices.



Other Simplex Specialties include Electric Toasters, Heating Pads, Percolators, Curling Irons and Table Ranges. Our booklet, "The Dainty Way to Keep House," is full of interesting suggestions and will be sent free upon request.

FOR HEAVY SERVICE

SIMPLEX HOUSEHOLD RANGE



Cooks the food "just right" every time. Heat goes direct into cooking process, leaving the kitchen cool, free from odors, dust or smoke. Broils, boils, bakes, fries at the turn of a switch. Convenient, safe and economical.

SIMPLEX ELECTRIC HEATING COMPANY

Manufacturers of Everything for Electric Cooking and Heating



Cambridge, Mass.

15 S. Desplaines St., Chicago
612 Howard St., San Francisco, Calif.
Belleville, Ontario.

Send for Copy of Our New Wireless Manual E1



It contains 104 pages and tells how to erect and maintain wireless telegraph stations. Shows a number of diagrams. Has the Morse and Continental Telegraph Codes. Illustrates the best instruments to use; tells what they are for and how to use them. Do not wait until some other time, but sit down now and send your name and address, and get one. It costs you nothing.

Send for Our Pocket Catalog E26

It contains 212 pages, with over 1,000 illustrations, and describes in plain, clear language all about Bells, Push Buttons, Batteries, Telephone and Telegraph Material, Electric Toys, Burglar and Fire Alarm Contrivances, Electric Call Bells, Electric Alarm Clocks, Medical Batteries, Motor Boat Horns, Electrically Heated Apparatus, Battery Connectors, Switches, Battery Gauges, Wireless Telegraph Instruments, Ignition Supplies, Etc.

It Means Money Saved to You to Have Our Manual and Our Catalog When You Want to Buy

MANHATTAN ELECTRICAL SUPPLY COMPANY

NEW YORK, 17 Park Place

CHICAGO, 114 So. 5th Ave.

ST. LOUIS, 1106 Pine St.

SAN FRANCISCO, 604 Mission St.

Empire Wireless Transformer

Most efficient and up-to-date device of its kind. Four different voltages—4,000, 8,000, 12,000 and

15,000 Volts

can be obtained. Very compact; measures only 7x7x7 inches. Durable and substantial insulation.

Saves on other equipment as it is

Equipped with Spark Gap and Switch, Complete for \$15.00.

EMPIRE BELL-RINGING TRANSFORMER \$2.50

will save you expense and get rid of your battery troubles.

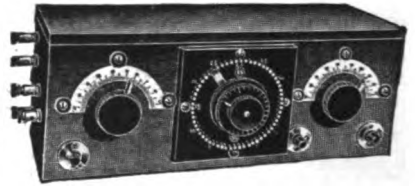
Order today—Money back if not satisfied.

EMPIRE TRANSFORMER COMPANY

2735 No. Clark Street

Chicago, Ill.

Type D Receiving Set



A harmonious unit that pleases all senses and brings joy to the lover of a perfect design skillfully executed.

For courteous attention, prompt deliveries and unequalled service, insist on purchasing wireless instruments manufactured in the Clapp-Eastham shops, in the Clapp-Eastham way: a little better than the best.

The most complete wireless catalog in America and a catalog of parts and materials for the construction apparatus sent for 4c. stamps.

CLAPP-EASTHAM COMPANY

141 Main St., Cambridge, Mass.

Aylsworth Agencies Co.
149 New Montgomery Street
San Francisco, Cal.
Western Sales Agents

J. J. Duck Co.
430 St. Clair Street
Toledo, Ohio
Central States Agents

The Experimenters' Supply House

Send 4c in stamps for the famous AMCO Catalog

We manufacture the largest line of reliable wireless apparatus in the country.

Over 100 Wireless Instruments and 200 Parts with which you can build your own instruments at a small cost, are shown in our catalog. Also, Storage Cells, Rectifiers, Transformers, Motors, Dynamos, Steam Engines, Books, Tools, Model Aeroplanes, Electric Bicycle Lamps, Flashlights and Supplies. Send now.

10 Amp. Hr. Storage Cell, \$1.00

A set of these wonderful batteries will do double the work of other batteries. No renewals. Simply recharge from direct current supply.



ADAMS-MORGAN COMPANY

Box 72 A

Upper Montclair, N. J.

Complete Receiving Set

The greatest value ever offered in a wireless set. An outfit you will be proud to own. Price, \$4.75 complete.

Send for our Catalog.



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

PARANITE RUBBER COVERED WIRES & CABLES

are made to meet all requirements of New Code Specifications. Underground, Submarine, Aerial and Inside use. Telephone, Telegraph, Fire Alarm, Electric Light and Power, Wires and Cables.

The Best for Every Purpose

**Indiana Rubber
& Insulated
Wire Co.
Jonesboro
Indiana**



THEY COST MORE



BUT THEY ARE SAFEST

"DIAMOND H" switches and receptacles cost more than others; the very good reason being that no expense has been spared in the workmanship and materials entering into a single detail.

Now just consider this fact: The additional expense of using "DIAMOND H" switches and receptacles is a very small percentage of the total wiring cost.

Insist upon "DIAMOND H" switches and receptacles for homes, stores, offices and public buildings.

Ask your contractor—he knows



Good Light for the Kiddies

It's hard to realize sometimes how much work the eyes of the little folks have to do. Their home study, their music lessons and their games should be under good light—light with the injurious glare taken out.

Beardslee Chandeliers

are correctly designed to soften, direct and control the light. The right patterns installed in your home will give every member of your family eye-protection.

Send us the name of your electrical dealer on the attached coupon and we'll mail you a beautiful

Home Lighting Portfolio

illustrating five complete sets of attractive chandeliers and explaining how you can select just the right chandeliers for your own home.

BEARDSLEE CHANDELIER MFG. CO.
227 S. Jefferson Street, Chicago

Please send me a free copy of "Home Lighting" as per your special offer.

(Electrical Dealer)

Name

Street and No.

City..... State.....

ASTOUNDING BARGAIN!

In order to get you acquainted with us, we will, for a limited time send prepaid this high-grade compass, warranted to be accurate, for the ridiculous price of **10c**. This compass sells everywhere for 25c. It measures 1 1/4" in diameter, glass cover, nickel plated band, dial in two colors. Instructions tell how to use this instrument for orientation purposes, telling polarity of magnets, tell if an electric wire is "alive" or "dead," making a voltmeter with this compass, etc., etc. You cannot afford to be without this wonderful little instrument, AND at no extra charge we will send you absolutely free our famous comprehensive electrical cyclopedia No. 12 containing over 450 illustrations and over 1600 electrical apparatus and supplies. Book contains 16 page "Treatise on Wireless Telegraphy" also 16 page copy of the new magazine "The Electrical Experimenter."

Ask for our **FREE** 160 page "Wireless Course" in twenty (20) lessons.

If you don't wish the compass send 3c. postage for the electrical cyclopedia.

Electro Importing Co., 2338 Fulton St., N. Y. C.
"Everything for the Experimenter"

10c

Do Your Own Soldering

—and Save Money

Send 55c for cloth bound Book "Simple Soldering"—and learn how to join metals, both hard and soft.

CONTENTS:

Soldering, The Uniting of Metals, Soft Soldering, The Flux, Hard Soldering or Brazing, Soft Soldering, Heating the Work, Flux for Soldering, Etc., Methods of Holding Work, Wiring Work, Silver Solder, Soldering Copper, Etc., Cleaning Up Work, Polishing, Scraping Down, Honing, Etc., Standard Apparatus, The Blow-Pipe, Foot Bellows, Etc., Home Made Apparatus.

SPON & CHAMBERLAIN
123 P. E. Liberty St. NEW YORK

WIRELESS

673 Miles with a \$25 1 K. W. Thordarson Transformer



From Waynesfield, O., to New York City—a range of mountains intervening and only a 30-foot aerial. A Thordarson 1 K. W. 20,000 volt Transformer made that record.

The Thordarson Wireless Transformer is built in 3 standard types, 5,000, 10,000, and 20,000 volts—and any special windings desired. Connect direct to A. C. mains—equipped with flexible impedance.

Write for description.

Thordarson Electric Mfg. Co.
505 S. Jefferson St., Chicago

INDUCTIVE TUNER

Want to do long-distance Receiving?



Why not begin right? Get one of our Prof. Type Tuners 7 x 7 x 15 in., has double slide, 8-point switch wound with Enameled Wire, Price \$7.00; a pair of our Superior Receivers, 2000 ohms; have no equal. Price \$5.25; a fixed Condenser, just the right capacity, price 80c, without case 40c; and an Audion Detector, nothing so good, will not jar out, price \$15.00; storage battery for same, price \$5.00. With the above list of instruments you will get results you never even looked for. Or, with the Tuner, Superior Receivers and Fixed Condenser, use any Mineral Detector, and the results will surprise you. Send 5c. in stamps for Illustrated Catalogue. None otherwise.

F. B. Chambers & Co., 2046 Arch Street, PHILADELPHIA, PA

Accurate Small Meters



**VOLTMETERS
MILLIVOLTMETERS
AMMETERS
MILLIAMMETERS**

"Peerless"
A High Grade Meter at a Moderate Price. Invaluable to All Men Who Use Instruments.

We also make a complete line of Wheatstone Bridges, Testing Sets, Galvanometers and Electrical Measuring Instruments of the higher grade. Tell us what you need.

THOMPSON-LEVERING CO., PHILADELPHIA, PA., U. S. A.

RECEIVING SETS

Just the thing for experimenters. Ranges up to 500 miles with suitable aerial. Comprises 2 slide tuner "cat-whisker" detector, fixed condenser, all mounted on handsomely finished base—a complete unit.

You Need an Audion Detector—We Have Them
Illustrated matter mailed anywhere on receipt of a 2-cent stamp.

THE WIRELESS MFG. CO., Canton, Ohio

Sterling Pocket Battery Meters



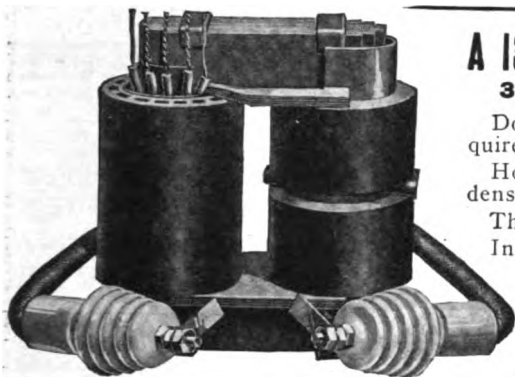
Everyone who uses batteries, whether in connection with gas engines, automobiles, motor boats, or electrical experiments, needs a good battery meter. Sterling meters show direction as well as strength of current. Convenient. Solidly constructed. Handsomely nickelled. Most accurate made. Guaranteed for two years. Ammeters for dry batteries \$1.50. Voltmeters for storage batteries \$1.75. Voltmeters for both dry and storage batteries \$2.00. Directions for use in each box. If your dealer does not handle them we will send one promptly upon receipt of price, postpaid, in U. S. and Canada. Send express or F. O. money order. Ask for Circular.

The Sterling Mfg. Co., Cleveland, Ohio

DUCK'S BIG WIRELESS and ELECTRICAL CATALOG

(325 pp.) Mailed for 8c stamps or coin which you may deduct from your first order of \$1.00. Great cost of catalog and low prices prohibit distribution except to those really interested. Most elaborate catalog of its kind published. Catalog contains more valuable information on wireless and electricity than many text books. Contains 125 pages wireless insts. and raw material for making insts., numerous diagrams, hookups, etc. 15 pages telegraph insts., 42 pages motors and dynamos. 150 pages flashlights, lamps, lighting plants, ammeters, guns, railways, books, THE J. J. DUCK CO., 428-430 St. Clair St., Toledo, O. and general electrical supplies.





A 13200 VOLT TRANSFORMER FOR \$9. 30,000 Turns of Wire on This Transformer

Do you realize that to meet the government requirements you must use a small condenser?

How will you get full power out of a small condenser?

The answer is, "Use *high-voltage* transformers."

In other words, *Packard transformers*. The above transformer is almost a 1/2 kw., for it can be used with 4 amperes primary. Order today.

The Packard Electric Co.
WARREN, OHIO



Brandes Wireless Receivers

Our "Trans Atlantic Type" is designed for professional use. Extremely sensitive and light in weight. Complete with hard rubber headband and six foot cord, wound to 2800 ohms.

NINE DOLLARS

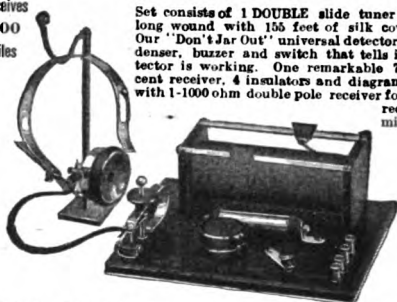
Send stamp for pamphlet describing all our receivers

C. BRANDES, Inc., 11 Liberty St., NEW YORK
AGENTS. Pacific Coast: Aylsworth Agencies, 149 New Montgomery St., San Francisco; Chicago: Winger Elec. & Mfg. Co., 711 So. Dearborn St.

COMPLETE WIRELESS RECEIVING SET

\$2.65

Receives
500
Miles



Set consists of 1 DOUBLE slide tuner 7 1/4 inches long wound with 155 feet of silk covered wire. Our "Don't Jar Out" universal detector. Fixed condenser, buzzer and switch that tells if your detector is working. One remarkable 75 ohm, 75 cent receiver. 4 insulators and diagram. This set with 1-1000 ohm double pole receiver for \$3.62 will receive 1200 miles.

Send stamp for Bulletin E or other remarkable values.

Nichols Electric Co., 35 Frankfort St., N. Y.

EXPERIMENTERS—ATTENTION

Buy wire direct from manufacturer and wind your own wireless and other coils. We have a small stock of old formula enameled wire which we offer at following prices:

No. 14— 22c	No. 15— 22c	No. 16— 22c
17— 23	18— 23	19— 23
20— 24	21— 25	22— 26
23— 27	24— 28	25— 29
26— 30	27— 31	28— 33
29— 35	30— 38	31— 44
32— 48	33— 55	34— 60
35— 65	36— 75	37— 95
38— 1.05	39— 1.40	40— 2.00

Cash with order and no order taken for less than \$1.00. Add postage.

We also manufacture cotton and silk covered Magnet Wires in any combination. Prices quoted upon request.

AMERICAN ENAMELED MAGNET WIRE COMPANY

Muskegon

Michigan

Murdock Apparatus



Fixed Condenser No. 358, 50c

A little instrument so much better than the usual half dollar kind that you will wonder at the value. Handy to have for experiment, even though you do not use it regularly, yet good enough to have "hitched in" all the time.

KEEP A RECORD

of the work of your station in the **MURDOCK LOG BOOK**. 120 pp., 9x6 inches, cloth covers, **ONLY 25c postpaid.**

Our 40-page catalog of *GOOD* apparatus free to you on request.

Wm. J. Murdock Co.

50 Carter St.,

Chelsea, Mass.

680 Howard St., San Francisco

CLASSIFIED ADVERTISEMENTS

THE COST OF ADVERTISING IN THIS SECTION IS 10 CENTS PER WORD BEGINNING WITH JULY ISSUE.

Remittance must accompany order, or advertisement will not be inserted.

Forms for the July issue close June 1st.

AERONAUTICS

COMPLETE PLAN, DRAWN TO SCALE, WITH precise instructions for building a Curtiss 3-foot model flying boat, 25c. Other plans: Bleriot, 15c; Wright, 25c; Nieuport, 25c; Curtiss Hydro, 35c; "Peoli" Racer, 25c. Set of six, \$1.25. 48-pp. Model Supply catalog, 5c. Ideal Aeroplane Co., 86B West Broadway, New York.

AGENTS WANTED

AGENTS—OROLO WASHES CLOTHES SNOW white without rubbing, hard work or injury. Free sample. Orolco Co., 12 Rose St., Fond du Lac, Wis.

WANTED—AGENTS TO ACT AS MANAGER in each county. \$150 month, easily made. No canvassing. Success guaranteed. Big expensive samples, instructions, plans and starter, all 10c postage. Manager (Dept. 46), Myers & Co., Cambridge, O.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. E, Cincinnati, Ohio.

AGENTS — STREETMEN — ELEVEN NEW money-makers. Profits exceed 50%. Latest "Live Wire Bulletin." Free. Act quick. United Sales Factory, Newburgh, N. Y.

AGENTS—SELL PERFECTION GUARANTEED Hosiery. Guaranteed from one pair up. Send for catalog of both hosiery and neckwear. Perfection Knitting Mills, 1810 E. Willard St., Philadelphia, Pa.

OUR AGENTS MAKE GOOD MONEY AND GET repeat orders easily. Dept. B, Consumers Direct Supply Co., Boston, Mass.

AGENTS—NEW PREMIUM PROPOSITION; make \$5 daily; experience unnecessary; 70c profit on \$1.20 sale; sample and particulars free. LE BEAU CO., 3311 Belmont Ave., Chicago, Ill.

AGENTS, WOULD YOU TAKE A STEADY JOB where you can clear \$20 to \$30 weekly to start and work up to yearly profits of \$3,000 or more. No experience required. Great crew managers' proposition. We manufacture. Middlemen profits saved. Get posted on our 1914 exclusive territory—business building, selling plans. Act quick. E. M. DAVIS, Pres., R-51, Davis Blk., Chicago.

AGENTS—500% PROFIT. FREE SAMPLE GOLD and silver sign letters for store fronts and office windows. Anyone can put on. Big demand everywhere. Write today for liberal offer to agents. Metallic Letter Co., 400 N. Clark, Chicago, U. S. A.

\$100-A-MONTH JOB. DO YOU WANT TO own a wallpaper cleaning business, be independent, your own boss, or would you manage a shop for me. Write today. Milligan Co., 27th St., Davenport, Iowa.

AGENTS—SNAPPIEST HOUSEHOLD LINE ON earth. Red Hot Sellers, steady repeaters. Goods guaranteed. Over 100% profit. Write quick—hurry. E. M. Feltman, Sales Mgr., 6722 Sycamore St., Cincinnati, O.

AGENTS—ONLY ONE IN THE WORLD. KER- osene (Coal-Oil) self-heating iron. Absolutely Safe. Odorless. Women wild about it. J. E. Daugherty made \$300 in one month. Your territory open. Write quick for terms. Thomas Iron Co., 261 Neal St., Dayton, Ohio.

AGENTS WANTED

SPARE TIME—NO CANVASSING. REPORT information, news, names, etc., to us. We have established markets. Particulars for stamp. "NISCO"—HBT—Cincinnati, Ohio.

AGENTS—NOVELTY KNIVES AND RAZORS are lightning sellers. 100% profit. Exclusive territory. Goods guaranteed. Novelty Cutlery Co., 27 Bar St., Canton, O.

SEE WHAT I SAY UNDER "TYPEWRITERS." ATCHISON.

DON'T ACCEPT AN AGENCY UNTIL YOU get my samples and particulars. Money makers. Address SAYMAN, 706 Sayman Bldg., St. Louis, Mo.

BIG PROFITS SELLING MY ART PHOTOS showing feminine beauty. Write Jakisch, Breslau, Germany, Weinstrasse 28 III.

MAKE AND SELL YOUR OWN GOODS. FORMulas by Expert Chemists. We obtain your Government Serial Number. Catalogue for stamp. E. Mystic Company, Washington, D. C.

AGENTS—SALESMEN; SEASONABLE SELL- er; latest \$3.50 electric invention; fills demand never before supplied; home, office, store, every- where eagerly sought; repeat orders outnumber first sales; you control territory, no competition; unlimited possibilities. Write Frank W. Aiden, Agency Manager, 244 Station F, Cincinnati, Ohio.

AGENTS TO TAKE ORDERS FOR VISITING and Business Cards; large profits. Outfit free. Forman Printery, 95-B Bank, Waterbury, Conn.

ANYBODY CAN EARN \$30 WEEKLY SELL- ing our household and office specialties. L. Shore Manufacturing Company, Michigan City, Ind.

ANCIENT EGYPTIAN SECRET—ROYAL IN- cense. Most astonishing uses a necessity and convenience; is attractively fragrant; a Mystery of Centuries; large metal box, 25c; if not satisfied, your money returned. No free samples. Agents wanted—every town. The Traffic Co., 1137X Shef- field St., Pittsburgh, Pa.

AGENTS WANTED EVERYWHERE TO SELL household specialties; easy sales; repeat orders; free particulars. Write Clarke & Stephenson, Schuyler Lake, N. Y.

400% PROFIT SELLING OUR REPEAT ORDER goods. Territory and salary; samples and cata- logue free. Bencoma Co., 7938 Bennett Avenue, Chicago.

FIFTY CENTS (IN QUANTITIES) BUYS A full size vacuum clothes washer. Patented Jan. 30, 1914. Weighs but two pounds. Women grab it at \$1.50. Thoroughly cleans tubs of clothes in 3 min. Washday now a pleasure. Mr. Marrick earned \$90 first three weeks. A 14-year-old Kan- sas boy made \$55.40 outside school hours in one month. Send for catalog today; get your county right. No charge for territory. Wendell Co., 297 Oak St., Leipsic, O.

AGENTS—A WHIRLWIND SELLER FOR SUM- mer weather. Concentrated soft drinks—7 kinds—orangeade, raspberry, grape, etc. Amazing sales—wonderful profits. Get it while it's new—write quick. American Products Co., 3012 Sycamore St., Cincinnati, Ohio.

GIVE YOUR CUSTOMER A DOLLAR VALUE for 25c and make 22c profit; buyers become steady customers. Details of 100 money-making oppor- tunities free. HUNTER COMPANY, 418 S. Broad, Philadelphia, Pa.

AGENTS SELL RICH LOOKING IMPORTED 36x68 Rug \$1. Carter, Tenn., sold 115 in four days. Profit \$57. You can do as well. Write for selling plan. Sample offer. Exclusive terri- tory. Sample rug sent by prepaid parcel post 98c. R. Condon, Importer, Stonington, Me.

AGENTS—TO SELL THE NEWEST ELECTRIC appliance on the market; sold everywhere there is electricity. In the home and office; liberal profits; sales-driving sample, weighs a pound; no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for par- ticulars. THE HANDY LIGHT CO., 28 Handy Light Block, Cincinnati, Ohio.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

AGENTS WANTED

\$200 GUARANTEE TO DEPUTIES. ASK about our sick and accident insurance plan. National Benevolent Society, 528 Westover Bldg., Kansas City, Mo.

BOYS! SELL VEST-POCKET MECHANICAL Baseball Score Keepers. Every baseball fan wants one. Big profits. Send 3c for sample. Charles Klaber, 3408 N. Kildare Ave., Chicago.

AGENTS—25c GENTLEMAN'S SCARF PIN OR ladies' broochpin for 10c, stamps or silver, to introduce our catalogue. Please address Walwen Co., 150 Nassau St., New York.

AGENTS—GET YOUR NAME LISTED, 10c; many desirable propositions will be submitted to you without asking. Canvassing Agents' Registration Bureau, 124 Hart St., Providence, R. I.

AGENTS, \$10 A DAY EASILY MADE. NEW telephone device increases efficiency of telephones 100%. Demonstrate and sale is made. Money back guarantee. 100% profit. Be the first in your territory. Other good propositions. Manufacturers' Distributing Co., Box 16, Atlantic City, N. J.

AGENTS—CANVASSERS—MAIL-ORDER MEN. Patented household specialties that are different. Big profits for you; sight sellers. Live wires wanted everywhere. Write quick for descriptive literature. The Full-Easy Mfg. Co., 20 E. Jackson Blvd., Chicago.

BURGLAR-PROOF WINDOW LOCK. NEW. Amazingly simple but effective safety device, and our folding vestpocket coat and hat holder. Two immense sellers. Both attached and removed at will. Sample of either and terms to agents, 5c postage. Fischer, 832 Elton Ave., New York.

AGENTS—LIVE, HUSTLING MEN, TO CAN- vass the homes and offices selling my new electric device. Cuts electric bills in half; a demonstration sells it; repeat order getter; you can make big money without previous experience; complete outfit and selling instructions, \$5.45, and I guarantee money back if not satisfactory; exclusive territory is going fast; write me today for my proposition. Stanley B. Freiberg, 232 Station F, Cincinnati, Ohio.

AUTOMOBILE ACCESSORIES

FIX UP YOUR AUTOMOBILE WITH BOYER'S Air-Drying Glossy Refinisher and Color Finishes. All colors. Write us condition of your car. Boyer Laboratory Company, 11 W. Michigan St., Chicago.

BOOKS AND PERIODICALS

WONDERFUL BOOK ON HYPNOTISM, PERSONAL magnetism, magnetic healing and occult science sent free to anyone. Send your address today. M. D. Betts, Sta. 129, Jackson, Mich.

"FORBIDDEN FRUIT," 25c. CATALOG 2c. Paul Duff, E-2713 Mozart, Chicago.

A BOOK FOR PRACTICAL MEN—DIRECT Current Motor and Generator Remedy of Troubles. Twenty-five cents, prepaid. THE NEW YORK ELECTRICAL SCHOOL, 39 West 17th Street, New York.

"HYDE'S TELEPHONE TROUBLES AND HOW to find them"—56 pages, well illustrated (16th edition), 25c. Hyde Publishing Co., 183 5th St., Milwaukee, Wis.

YOU CAN'T AFFORD TO BE WITHOUT THE guidance of Dr. Hall's book, "Sexual Knowledge." Scientific facts hitherto misunderstood set forth in plain language. 320 pages. Price only \$1.00, postpaid. Victor Prager, 1456 Otto St., Dept. E, Chicago.

OHM'S LAW SIMPLIFIED—A PLAIN EXPLA- nation of the law which governs the flow and action of electricity under all conditions. Twenty-five cents, postage prepaid. THE NEW YORK ELECTRICAL SCHOOL, 39 West 17th St., New York.

ELECTRICAL INSPECTOR FOR FIRE INSUR- ance companies; good pay; steady employment. All information in "Schoen's Manual of Electricity," by an insurance expert. Better than correspondence course. Price postpaid, \$3.10. THE INSURANCE FIELD, Louisville, Ky.

BOOKS AND PERIODICALS

FASCINATING BOOKS, SAMPLES AND CAT- alogue, 10c. Taylor Brothers, P2129 Clifton, Chicago.

"HOW TO RUN AN AUTOMOBILE," A 25c book for 15c, postpaid. Richard Devine, E1145 Wells St., Chicago.

BOOKS FOR MAIL DEALERS; RARE AND curious books of mystery, mail order, etc.; samples, 10c. Hammond Book Co., Box 16, Hammond, Ind.

FREE CATALOGUE OF REAL FASCINATING books on white slavery, sex, etc.; for men only. A. Williams Publishing Co., 721 North Dearborn, Chicago.

WANTED—PURCHASERS, FINEST ILLU- strated book, "How to Make Transformers," postpaid 50 cents. Address Prof. F. E. Austin, Hanover, N. H.

BEST BOOKS ON BUSINESS, SELF-CUL- ture, Success, Sexology, Occultism, Science, etc. Wholesale and retail. Circulars free. Science Institute, 6E14, Benton Harbor, Mich.

DIRECT CURRENT ARMATURE WINDINGS and Calculations. An Encyclopedia of Armature Winding Information. Thirty-five cents, prepaid. New York Electrical School, 39 West 17th Street, New York.

BUSINESS OPPORTUNITIES

START A BUSINESS OF YOUR OWN! SEND me 25c for samples and particulars. Johnson, 1819 E. Sergeant, Philadelphia, Dept. 15.

I MADE A FORTUNE IN MAIL-ORDER BUSI- nessed. From small beginning, my sales now total close to One Million Five Hundred Thousand Dollars annually. Why can't you do as well? Get my free booklet—"How to Make Money in the Mail Order Business." Randolph Rose, 223 Rose Bldg., Chattanooga, Tenn.

WE ANALYZE EVERYTHING. RELIABLE formulas furnished. Expert chemists. Laboratories, 721 C East 161 St., New York.

WE PAY 25c EACH FOR FARMERS' NAMES. Send dime for contract. "C-Sun," Leroy, Michigan.

MONEY IN ALFALFA AND PECANS. ASK "Newson," Huntsville, Ala.

MAKE FROM \$100 TO \$500 A MONTH WITH Illuminating Paint. Particulars for stamp. K. Box 35, Hagerman, Idaho.

THINK! REASON. AT NIGHT WHEN asleep, your favorite horses and cattle alone in the barn, can money replace them if burned up? My automatic fire alarm will save them. \$40.00 for county right to make and sell the alarms. Martin N. Krogstad, Menomonie, Wis.

WOULD YOU LIKE TO OWN A GOOD PAY- ing mail order business? We have a line that gets repeat orders all the time; you can start in spare time; invest a dollar or two a week and soon own a nice business of your own. Write for particulars. Nadico, 1671 Belmont Ave., Chicago, Ill.

WE START YOU IN BUSINESS, FURNISHING everything; men and women, \$30.00 to \$200.00 weekly operating our "new System Specialty Candy Factories," home or small room anywhere; no canvassing. Opportunity life-time; booklet free. H. RAGSDALE CO., East Orange, N. J.

MR. MAIL ORDER MAN—BEGINNER—OLD- timer.—Start or increase your M. O. business. We furnish fast sellers. Factory prices. High class business proposition for business people. No schemes. Copyrighted Prospectus free. MISSISSIPPI VALLEY CO., INC., 61 E. 5th, Pittsburg, Kansas.

\$5 DAILY EASILY EARNED AT HOME, spare time, silvering mirrors. No capital. Free instructive booklet tells you how to make \$5 daily. Patterson & Co., Dept. 4, Brooksville, Ky.

GO INTO THE MOTION PICTURE BUSINESS by contract. Big money. Profits sure each week. Plan, particulars and contracts, \$1.00. Lock Bx 49, Eldorado, Ohio.

MAIL ORDER MAN—SEND POSTAL FOR sample circulars and wholesale prices of my fast selling mail order books, "Big Profits." Edward J. Doyle, Box 745 C14, Mobile, Ala.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

BUSINESS OPPORTUNITIES

ADVERTISE—21 WORDS IN 50 GOOD WEEKS. \$1. Cope Agency, 3755 Olive St., St. Louis, Mo.

MANUFACTURE GOLD WINDOW LETTERS. Sample, particulars, 10c. Box 31, Detroit, Mich.

BE YOUR OWN BOSS. WE SHOW YOU HOW. One Hundred Profitable Business Chances to select from. Particulars FREE. James Clackum, Dept. 20, Tallapoosa, Ga.

SIDEWALK! NOW JUST LISTEN. PATENTED Cement Slab Sidewalk for all. You can make it in your own factory. Small expense, big profit. Don't wait. Buy territory right of your town, county or state, to manufacture or resell. A passing opportunity. Write today. C. C. McDonald, Patentee, Chenoa, Ill.

SPARE TIME—NO CANVASSING. REPORT information, news, names, etc., to us. We have established markets. Particulars for stamp. "NISCO"—HBT—Cincinnati, Ohio.

SEE WHAT I SAY UNDER "TYPEWRITERS." ATCHISON.

THE BEST MAIL ORDER PROPOSITION ON earth. Particulars free. Luther Gordon Co., Northwestern Bldg., Chicago.

SAFETY SELF-FILLING FOUNTPEN PROPO-sition. Laughlin, Detroit.

SIX BIG SELLERS, WITH INSTRUCTIONS and formulas for manufacturing them, and 200 business opportunities. Sent for 10c. Schnaubelt, Astoria, N. Y.

\$15-\$150. HOW TO WRITE PHOTOPLAYS. I correct, revise, typewrite, help sell; particulars free. Publisher, 49 Clinton St., Albany, N. Y.

BE A MERCHANT TAILOR. LEARN TO CUT men's and women's "tailor-made" garments. Big profits, small investment. We can teach YOU by mail. Success School of Cutting, Dept. 24, Jackson, Mich.

COLLECT MONEY—BY A SURE, EASY SYSTEM. Good income; quick results. Instructive booklet free. Collectors' Association, 249 E. Cuyahoga Falls, Ohio.

LEARN THE AUTOMOBILE TIRE REPAIR-ing business. You can make \$5 to \$10 a day repairing tires. It's easy to learn how. We teach you. Hundreds are earning \$3,000 to \$5,000 a year. Only requires a small amount of capital. Many have started on less than \$100, and are making big money. Write quick for Free Book, "Care and Repair of Tires" that gives full information. Don't miss this opportunity. C. A. Shaler Co., 130 Seventh St., Waupun, Wis.

PRACTICAL ADDING MACHINE, \$1; ADDS easily, accurately; capacity 99,999,999; order today; descriptive circular free. Spring City Specialty House, Waukesha, Wis.

500% PROFIT IN ORNAMENTAL CASTING OF concrete, artificial marble, plaster, papier-mache, marble dust, imitation wood, soft metals, for manufacturing interior, exterior decorations, garden furniture, statuary, artistic homes, fountains, sanitary marble flooring, tiling, tombstones, cement caskets, stuccoing buildings, life casting, ornament copying, modeling, coloring, gilding, making elastic and rigid moulds; instructions complete. \$1. Free: 200 illustrations beautiful art cast (mail address today). W. L. Mahler, 117 Russell St., Brooklyn, N. Y.

WANTED—NAMES OF TOBACCO USERS. We pay 20c each. Send 10c for blanks and agreement. Superba Co., Desk 27, Baltimore, Md.

TEN WAYS TO MAKE BIG MONEY WITH little or no investment. Success positively guaranteed. Fox, 4415 West End Ave., Chicago.

SAFETY RAZOR BLADES SHARPENED ON the "American" machines are positively sharp. If none of these machines are in operation in your locality, then send your blades to us. We will sharpen them for you at these rates: GILLETTE and other small blades, 2½c each. We also sharpen and hone the ordinary razor. Do you want to add to your income? Engage in this new, profitable business. We furnish the outfit and teach you how. Address American Sharpening Machine Co. (Inc.), Dept. PE, 184 Washington Street, Chicago.

BUSINESS OPPORTUNITIES

SIX MONTHS FREE. OUR LITTLE MAGA-zine describing splendid investment opportunities and other interesting facts concerning the great Northwest. Send for your copy today. Hanauer-Graves Co., Spokane, Wash.

START AN ORIGINAL MAIL ORDER OR Parcel Post business. Honest, independent, small capital. New Methods. Big money. W. Clement Moore, Business Specialist, New Egypt, N. J.

MAIL ORDER BUSINESS—HOW TO SUC-ceed—Interesting, instructive articles every month by those who know, in "The Business Builder"—the different, distinctive magazine of mail-order and agency selling. 68 pages, standard magazine size. Sample copy 10c, none free. The Business Builder, Randolph Rose, Publisher, 24 Rose Block, Chattanooga, Tenn.

MAKE GOOD! READ THAT EXCEPTION-ally practical booklet "How to Originate Your Own Mail Order Business." Send quarter for it now. I'll gladly refund money if disappointed. Bode, 288e Main, Hartford, Conn.

LET THE PARCELS POST HELP YOU. ADD (\$15 to \$25 weekly) to your present salary or income. Start during spare time and build up a permanent mail-order business of your own. We show you how and help you make good. No canvassing. Experience unnecessary. The Parcels Post makes success doubly sure. Our new ideas and up-to-date plans bring the money. No so-called "Course of Instruction" to sell. We give that free. Write today. Address Pease Mfg. Co., Inc., Dept. B, 70 Broadway, Buffalo, N. Y.

SALES MANAGERS, CAPABLE AND EXPE-rienced; must have record showing ability; especially wanted to handle crews of demonstrators; the article is as revolutionary as the safety razor or the fountain pen; every business man or woman a possible customer; sales in one store in one month, over \$500; absolutely new and high class; commission only. Box 343, Bloomington, Ill.

FREE FOR SIX MONTHS—MY SPECIAL OF-fer to introduce my magazine, "INVESTING FOR PROFIT." It is worth \$10 a copy to anyone who has been getting poorer while the rich, richer. It demonstrates the REAL earning power of money, and shows how anyone, no matter how poor, CAN acquire riches. INVESTING FOR PROFIT is the only progressive financial journal published. It shows how \$100 grows to \$2,200. Write NOW and I'll send it six months free. H. L. Barber, 423, 20 W. Jackson Blvd., Chicago.

CAMERAS AND PHOTOGRAPHY

COLOR PHOTOGRAPHY—PRINT YOUR LAND-scape views in colors. Send 2 stamps for circular. Isenmann, 385 Bergen St., Newark, N. J.

HAVE YOU A CAMERA? WRITE FOR SAM-ples of my magazine, American Photography and Popular Photography, which tells you how to make better pictures and earn money. F. R. Fraprie, 627 Pope Building, Boston, Mass.

BUY ENGLISH POCKET CAMERAS IN CAN-ada. Nine styles of real pocket cameras not sold by other dealers in America; high grade; finest lenses; send for particulars. R. F. Smith, Montreal, Canada.

CAMERAS, LENSES, SUPPLIES. DAINTY Ensignette, most efficient pocket camera, special \$5. Focal plane postcard camera, for films, plates, with F6 lens, complete, \$30. Moving picture camera, takes prints, exhibits, \$39. Goertz, Cooke, Zeiss lenses. Everything photographic phenomenally reduced. Get special list. Newark Photo Supply Co., Newark, New Jersey.

SAVE YOUR EXPOSURES; WRITE FOR SPEC-ial price on Quality Kodak Finishing. Camera Shop, Box 628, Portsmouth, Ohio.

FORMULAS FOR TEN LATEST FADS IN photography, 25c. Includes instructions for magic disappearing photos, photos on sofa pillows and neckties, beautiful transparent colored photos on watch cases, chinaware, brooches, etc.; phosphorescent photos and other novelties. A. E. Benson, Stewartville, Minn.

LOOK—100 PHOTOGRAPHIC POSTCARDS from any size negative, \$2 postpaid; 1,000 from 10 negatives, \$15; cards titled free. Essex Photo Co., Box 1308, Boston, Mass.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

COIN JEWELRY

EMBOSSED COIN JEWELRY. SEND FOR CATALOG. We specialize in fobs, tie clips, rings, cuff buttons, scarf pins, brooches, bar and veil pins and pocket pieces. Made with real United States money. York Producing Company, Houston, Texas.

COINS AND STAMPS

25 DIFFERENT BRITISH COLONIALS FREE to applicants for stamps on approval, who send 2c for postage. Nickles, Box 2466, Washington, D. C.

STAMPS—100, ALL DIFFERENT, FREE, POSTAGE 2c. Mention paper. Quaker Stamp Co., Toledo, Ohio.

OLD POSTAGE STAMPS ARE VALUABLE TO stamp collectors. If you have any, send 10c for our complete catalogue telling what we pay for all stamps issued to 1912. Western Stamp Co., 867A N. Clark St., Chicago.

USED STAMPS BOUGHT; BUYING LIST, 2c. A. Roessler, Newark, N. J.

250 STAMPS, ALL DIFFERENT, AND AN ALBUM for \$1, postpaid, to start your collection; fascinating and profitable. Western Stamp Co., 867A N. Clark St., Chicago.

STAMPS—100 DIFFERENT FOREIGN, 10c. Electric Stamp Co., 1642 Dickson Ave., Scranton, Pa., Dept. 13.

\$.25 EACH PAID FOR U. S. FLYING EAGLE cents dated 1856. \$2 to \$600 paid for hundreds of old coins dated before 1895. Send ten cents at once for New Illustrated Coin Value Book, 4x7. Get posted—it may mean your fortune. Clarke & Co., Coin Dealers, Box 76, Le Roy, N. Y.

OLD COINS BOUGHT AND SOLD. NEW Spring catalog just out free to collectors only. Buying coin catalogue quoting prices I pay, 10c. Wm. Hessler, Paddock Bldg., 101-C Tremont St., Boston, Mass.

CYCLECARS

CYCLE PARTS, MOTORS, STEERING GEARS, frames, springs, wheels, friction drives, new Henderson 4-cylinder motorcycle motor for sale. Catalogue free. Palmer Bros., Coscob, Conn.

CYCLECAR FRICTION TRANSMISSION parts. Ask for prices. Johnston Machine Co., South Haven, Mich.

DOGS, POULTRY AND PETS

SPORTSMAN! BEFORE YOU BUY A DOG OR pup, get my free catalogue. J. A. Cluck, Newport, Pa.

COLLIES—AIREDALE TERRIERS—SEND FOR list. W. R. Watson Box 600, Oakland, Iowa.

DRAWING MATERIALS

DRAWING MATERIALS—BIG CATALOGUE free. Stevenot Company, 9 Cooper Union, New York.

DRAWING MATERIALS. SEND FOR CATA-logue. Drawing Instructions given away free. Triangle Co., 32 Clinton St., Newark, N. J.

ELECTRICAL

GREAT BARGAINS IN SMALL MOTORS AND dynamos. Well known make. One-sixth horsepower and under. Both alternating and direct current. H. G. Crane, 226 Cypress Street, Brookline, Mass.

ENGINE CASTINGS

GASOLINE ENGINE CASTINGS, WITH DRAW-ings. Cheap. Catalog for same. Novelty Manufacturing Company, 854 West 6th St., Cincinnati, Ohio.

FORMULAS

500 VALUABLE FORMULAS AND COMPLETE encyclopedia of every-day wants. This splendid book, 10c. H. Essex, Box 476, Baltimore, Md.

RENEW OLD DRY BATTERIES. SEND 25c for complete guaranteed formula and instructions; regular price \$1.00. If dissatisfied we'll return your quarter, you keeping instructions besides. Northern Supply Company, 154 Randolph, Chicago.

FORMULAS

METAL POLISHING CLOTH, FORMULA 25c. Leroy Jipson, Rockland, Maine.

CLEAN HANDS IN 2 MINUTES; REMOVES grease, paint, stains; cheap and easily made; send 15c for formula. Geo. M. Studebaker, Jr., Dept. E, South Bend, Ind.

BUILD A BUSINESS OF YOUR OWN. GET away from wage slavery. We have over ten thousand best formulas and trade secrets bound; sent postpaid for \$3.00. Anyone is worth price asked for all. Get out of the rut! Say "I will!" Circular of list sent for the asking. Write today—NOW. Cleveland Technical Supply Co., 10217 Hampden Ave., Cleveland, Ohio.

FOR ADVERTISERS

ILLUSTRATIONS IN WASH, PEN AND COLOR for every advertising purpose; lettering, designs, human figures. Alfred Wonfer, 114 South 11th Street, Newark, N. J.

CIRCULARS HONESTLY MAILED. GET MY proposition. Wm. Morris, Rahway, N. J.

CIRCULARS MAILED TO CLASSIFIED BUY-ers, 20c per 100; efficiency guaranteed. Commercial Addressing Bureau, 2366 Amsterdam Avenue, New York.

FOR MEN

TOBACCO—PURE LEAF HAS NOT BEEN manufactured. Sample half pound prepaid, 15c. Dolan & Co., Louisville, Ky.

BOW-LEGGED MEN—RELIEF IN SIGHT. Our New Invincible Guards make trousers straight and trim. Price one dollar. Suburban Supply Company, Department C, Logan Station, Philadelphia, Pa.

GRAHAM'S SELF-GARTERED SOCKS; PAT-ented; price no higher; guaranteed never creep down; dressy, medium weight, excellent wearing quality; send 25c (six pairs, \$1.25). Size? Graham, 536D Forest Ave., Oak Park, Ill.

FOR THE HOME

INDIAN BASKETS AND RELICS—PRICE free. Gilhan, Highland Springs, Cal.

FOR SALE—EXCHANGE

BELL TELEPHONE, AND WESTERN UNION Telegraph Watch Fobs, Lapel Buttons and Ladies' Brooch Pins. A. E. Johnson, Telephone Building, Milwaukee, Wis.

SEE WHAT I SAY UNDER "TYPEWRITERS," ATCHISON.

EVERY MAN WANTS A SEPTEMBER MORN fob. Send 25c to S. A. Parrish, Coldwater, Mich., Box E-345.

TRANSFORMERS, A. C. 110-VOLT; 2-4-6-8 AND 12 volts, \$2.50; 6 volts, \$2.00. Harry J. Krumm, 173 N. Mulberry St., Mansfield, Ohio.

LAMP SHADE FRAMES, ALL KINDS AND sizes. Catalogue just out. Cooley, 555 W. Monroe St., Chicago.

FOR SALE—"SAVE THE REPUBLIC" HEAD set, \$3.95; 1 in. coil, \$2.95. Electrolytic Detector, 60c. O. C. Babel, Martinsville, N. Y.

\$.50 SELF-FILLING FOUNTAIN PEN, 39c. Money back if unsatisfactory. S. E. Muller, Maplewood 2, Malden, Mass.

SHOE POLISH OUTFIT COMPLETE AND enough polish for thirty shines (black, tan or white), fifty cents, prepaid. A. D. Nye, 10525 Elk Avenue, Cleveland, Ohio.

FOR SALE—A 1/2 HORSEPOWER HOLTZER-Cabot motor, 133 cycles, 110 volts; in excellent running order, \$20. Address Harvey Deen, 1410 Cong. Ave., Austin, Texas.

FOR SALE—ENTIRE STOCK OF VULCAN-izers at one-half price. Simplex Vulcanizer Co., Omaha, Neb.

NICKEL POWDER PUTS A HEAVY COAT OF NICKEL on auto trimmings, typewriters, etc. \$1.00 per can prepaid. GUNMETAL FINISH CO., Decatur, Ill.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

GAMES AND AMUSEMENTS

DANCING SKELETON, 10C. RULEY, JONESBORO, Ind.

CONJURING RECORD, MONTHLY MAGAZINE of magical tricks; sample copy, 5c. Lionel Bonner, 476 Clinton Ave., Brooklyn, N. Y.

INSTRUCTIONS

DETECTIVE PHONE—MAKE ONE YOURSELF. You can hear a whisper. Plans and information 25c. Lobe Mfg. Co., 167 W. 102d St. New York City.

MAKE "CLEANODUST;" CLEANS OUT stove pipe without taking pipe down; simple ingredients, easily prepared; \$1 brings \$10; instructions, 25c. W. A. Perkins Co., Allensworth, Cal.

MAKE BIG MONEY OPENING SAFES AND setting combinations. Write Wayne Strong, Box 1430, Los Angeles, Cal.

SOLDER YOUR TINWARE; COMPLETE instructions for 10c coin. Clarence Crauder, Camden, Ohio.

CHEMICALS FOR RENEWING OLD DRY batteries; large supply with directions, 35 cts. Scientek Laboratories, Dept. F, Madison, Maine.

"SEXUAL PHILOSOPHY," 12c.—CLEAR, SPECIFIC, authoritative, complete, best, satisfies. Fred B. Kaessmann, Lawrence, Mass.

"HOW TO GO ON THE STAGE" AND "HOW to Write Moving Picture Plays," two great courses of instruction, \$1.00 each. Catalogue of Wigs and Make-ups on request. Address Percy Ewing, 6 Thatcher Way, Decatur, Ill.

INVESTMENTS

DON'T INVEST UNTIL YOU GET OUR FREE advice on any stock or bond; ask us, learn the truth. O. B. Pelleter, Box 292, Johnstown, Pa.

INVENTIONS

INVENTORS: MY PATENT MADE A FORTUNE; particulars free; let me sell yours. Eugene Pearl, 23 Union Square, New York City.

LABORATORY SUPPLIES

GLASS-BLOWING, GRINDING, ENGRAVING, Chemical Apparatus, Thermometers. Laboratory Supply Co., 128 State St., Rochester, N. Y.

MAILING LISTS

300 LADIES' NAMES, 50C. RECEIVED DURING May, 1914. E. Koester, 33 South Grant, Denver, Colorado.

MAGIC

LEARN TO HYPNOTIZE AND MAKE FUN and money. Send for free book to M. D. Betts, Sta. 129, Jackson, Mich.

MAGIC POCKET TRICK WORTH 25c FREE with illustrated catalog of 250 tricks, illusions for 6c stamps. Magic Co., Sta. 17, 249 W. 38th St., New York.

MAGICIANS, AMATEUR AND PROFESSIONAL, we can save you money in the magic line; send for our free illustrated catalogue. Northwestern Supply Co., 2215 4th Avenue, N. Minneapolis, Minn.

MUSIC AND SONGS

SONG POEMS WANTED—WE WILL WRITE music to your words, publish, advertise and copyright in your name. Send us your song poem or melodies. Instructive booklet free. Marks-Goldsmith Co., Dept. 21, Washington, D. C.

MODELS AND MODEL SUPPLIES

WE MAKE WORKING MODELS OF ANY DESCRIPTION; also tools, dies, punch-press work, and special machinery; send us drawing or rough model for estimate; send for catalogue of model supplies. The Pierce Model Works, 3405 Pierce Ave., Chicago, Ill.

MISCELLANEOUS

ANYBODY CAN MAKE GOOD CUTS WITH my simple zinc etching process; price, \$1.00; specimens and particulars for stamp. T. M. Day, Box E, Windfall, Ind.

THREE MASTER KEYS WHICH UNLOCK average door lock, night lock or trunk. Each 50c, postpaid. Harbert, Locksmith, 2861 N. Clark, Chicago.

MISCELLANEOUS

RENEW "BURNED OUT" ELECTRIC LIGHT globes. Utility of globe doubled and trebled. Satisfaction guaranteed or money refunded. Complete instructions 20c. Success Supply Co., P. E. L., Hannibal, Mo.

I WILL START YOU EARNING \$4.00 DAILY at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. H, Boston, Mass.

BROTHER—ACCIDENTALLY DISCOVERED root cures tobacco habit and indigestion. Gladly send particulars. F. F. Stokes, Mohawk, Fla.

DO YOU EXPECT TO ATTEND THE PANAMA-PACIFIC Exposition in 1915 at San Francisco? Organizers wanted in every city and town for the California Travel Club. Two-cent stamp for information to California Travel Club, 1547 Devisadero St., San Francisco, Cal.

SELF-FILLING FOUNTAIN PENS AT wholesale. Sample, 25 cents. Harwood Sales Company, Box 9, 904 Madison St., Brooklyn, N. Y.

THE ANNOYANCE OF LOSING PENCILS overcome. Get one of our Patent Holders. They are neat and durable; holds three of any size; may be fastened conveniently anywhere on your garment or pocket. Price, 10 cents postpaid. Underwood Novelty Mfg. Co., Underwood, Minn.

MAGICIANS—WE ARE HEADQUARTERS FOR handcuffs, mailbags, straightjackets, milkcans and everything in the escape line. Large new catalogue, which also contains a complete line of tricks, puzzles, novelties, FREE. Oaks Magical Co., Dept. 77, Oshkosh, Wis.

BILL FOLDS, HANDBAGS, CARD CASES, from 25 cents up; your name stamped in gold FREE on every article; catalog free; cards printed, 25 cents a hundred. Tyler Sales Co., 44 Stratford Road, Brooklyn, N. Y.

MOTION PICTURE SCHOOLS

MOTION PICTURE PLAYS WANTED. YOU can write them. We teach you by mail. No experience needed. Big demand and good pay. Details free. Associated Motion Picture Schools, 674-0 Sheridan Road, Chicago.

MOTION PICTURES

I GUARANTEE \$10 FOR FIRST PHOTOPLAY you write by my method. Obtain free booklet, "How to Write Photoplays." Elbert Moore, Box 772 PS, Chicago.

WHITE PHOTOPLAYS, \$10 TO \$100 EACH; big demand; no experience, literary ability or correspondence course required; particulars free. W. K. Jourdan Co., 811 Woolworth Bldg., New York.

WE PAY CASH FOR PHOTOPLAYS, STORIES, poems, etc.; you can write them; send stamp for particulars. STORY REVISION COMPANY, Box 200, SMETHPORT, PA.

WRITE MOVING PICTURE PLAYS, \$50 EACH. All or spare time. Correspondence course unnecessary. Details free. Atlas Publishing Co., 306, Cincinnati, Ohio.

FREE CRITICISM OF YOUR PHOTOPLAY; scripts marketed; details for stamp. H. Hursh, 123 South Third St., Harrisburg, Pa.

MOTORCYCLES

MOTORCYCLES—ALL MAKES, REBUILT; Guaranteed Good as new. Indians, Harleys, Excelsors, Readings, Kultures, Merckels, Single and Twins; \$25 to \$100. Buy direct, Save Dealers' Profits. Denninger Cycle Co., Rochester, N. Y.

WILL EXCHANGE TWO NEW 2 1/2 H. P. SHAW Bicycle Motor Attachments for a second-hand motorcycle. Frank Blum, New Washington, Ohio.

OPTICAL GOODS

WE BUY, SELL AND EXCHANGE BARGAINS in microscopes, telescopes, binoculars, cameras, etc. Bargain list sent. Kahn & Son, Opticians, No. 54 John St., New York. Established 63 years.

SMALL MICROSCOPE, 100 DIAMETERS, OR 10,000 times magnifying power; can be carried in vest pocket; price, 15c postpaid and guaranteed; special type with 3 changes of power, 25c. Carroll Pfeeger, 227 Mahoning St., Milton, Pa.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

PERSONAL

GET HEALTH AND STRENGTH—GENERATE "Human Electricity" any time. Instructions 10c. Winslow B. Chase, Washington, D. C.

PATENTS

INVENTORS—WRITE FOR OUR SPECIAL offer for securing patents. Wm. N. Moore & Co., 700 Loan & Trust Bldg., Washington, D. C.

SEND FOR FREE BOOKLET—"ALL ABOUT Patents and Their Cost," "What to Invent," "Sale of Patents," etc. Shepherd & Campbell, 500-B Victor Bldg., Washington, D. C.

PATENT YOUR INVENTION; \$10,000 offered for inventions wanted; booklet and opinion free. Milo B. Stevens & Co. (established 1864), 440 F St., Washington; 351 Monadnock Block, Chicago.

SEE WHAT I SAY UNDER "TYPEWRITERS." ATCHISON.

PROTECTIVE PATENTS PROCURED promptly. Patent Books Free. Trade-marks Registered. Robb & Robb, 240-244 Southern Building, Washington, D. C.

INVENTIONS—WE MANUFACTURE METAL articles of all kinds to order. Also special machinery, tools and dies, punchings, lathe and screw machine work; metal spinnings, castings, plating, wood and metal patterns, etc. Send sample for estimate and expert advice free. THE EAGLE MFG. CO., Dept. C., Cincinnati, O.

"PATENTS AND PATENT POSSIBILITIES" is a 72-page treatise which tells all about patents, what to invent and where to sell it. It gives honest advice to inventors, and is full of valuable and interesting information. Write for it today! It is FREE. H. S. HILL, 929 McLachlen Bldg., Washington, D. C.

THE PATENTOME IS FREE. AN EDUCATION in obtaining patents. Established 1865. Anderson & Son, Attorneys, 712 7th St., Washington, D. C.

PATENTS WITHOUT ADVANCE ATTORNEY'S fees. Not due until patent allowed. Send sketch for free report. Books free. Frank Fuller, Washington, D. C.

FOR SALE, OR ROYALTY, U. S. PATENT NO. 1,649,647. The only Patented Garment Hanger that will hold the coat, vest, trousers, shirt, collar, necktie and hat. It can be carried in your handbag. A No. 1 article for any mail order house. Sidnev C. Batson, Clarksville, Tenn.

PATENT ATTORNEYS

WRITE FOR "WORDS OF VALUE TO INVENTORS." Free. John R. Woodworth, Registered Attorney, Wardor Bldg., Washington, D. C.

PATENT—ADVICE AND BOOKS FREE. Highest references. Best results. I procure patents that protect. Watson E. Coleman, Patent Lawyer, 622 F St., N. W., Washington, D. C.

PATENT YOUR INVENTION—SEND SKETCH for free expert search and report, as to patentability. Books on inventions and patents, and books of references from congressmen, manufacturers, bankers and inventors sent free. John S. Duffie & Co., 604 F St., N. W., Washington, D. C.

BUSINESS GOES WHERE INVITED AND stays where well treated. My 27 years of personal attention has procured patents for successful inventors and manufacturers. Grasp this opportunity to get the same service. Write and send sketch. Vernon E. Hodges, 631 Barrister Bldg., Washington, D. C.

PATENT YOUR INVENTIONS—YOUR IDEAS may make your fortune. Terms reasonable. Valuable patents secured. Information free. Lester Sargent, Attornev, 716 12th St., Washington, D. C.

PENNANTS, PICTURES AND POST CARDS

12 FOUR-COLOR POSTCARDS OF HANDSOME girls and scenery of Colorado, 10c. C. Goerke, Manitou, Colo.

20 POSTCARDS, ALL DIFFERENT, FLOWERS, birthdays, comics and greetings, 10c. Wm. E. Adkins, 817 E. Oregon St., Evansville, Ind.

RECEIVE PRETTY POSTCARDS FROM FAR and near. best club. membership 10c. Jolly Card Exchange, Box 126A, Decatur, Indiana.

PENNANTS, PICTURES AND POST CARDS

CINCINNATI ON POSTCARDS; COMPLETE set, 10c. Steding, Jackson St., Cincinnati, Ohio.

TWENTY-FIVE ARTISTIC ASSORTED CALIFORNIA postcards, 50c; 10 for 25c. Deer Park Specialty Co., Box 250-C, Sausalito, Cal.

"GUIDE TO FLIRTATION," 2c; "WINDOW signaling," 3c. Address E. Edwards, 1614 Kay St., Sacramento, Calif.

MAKE YOUR FRIENDS BELIEVE YOU ARE in Indianapolis; 10 views, 12c. Address, stamp, enclose in envelope and mail to us and we will mail them for you. The Classy Card Co., Indianapolis, Ind. Dept. P. E.

BETTER THAN "SEPTEMBER MORN"—TWO new pictures by same painter. These and September Morn, 25c. Artist, Box 592, Minneapolis, Minn.

POSTCARD COLLECTORS—POSTCARD VIEWS of Utah, the old Mormon Home, such as Sunset on Great Salt Lake, Mormons' Temple, Tabernacle, etc., 15c per dozen. Greiner Post Card Bureau, Ogden, Utah. Box 893P.

PANAMA - PACIFIC EXPOSITION VIEW cards now ready; positively the only official postal issued; twelve beautiful attractions, 25 cents; advance samples, 10 cents. Mutual Supply Co., Bradford, Pa.

PRINTING AND ENGRAVING

CATALOGUES COMPILED—COPY FOR FORM Letters, Folders, Booklets. Charges reasonable. Send for estimate, layout, etc. Catalogue Compiling Bureau, Graphic Arts Building, Worcester, Mass.

500 BUSINESS CARDS PRINTED TO YOUR order, 75 cents. Geo. Birt, Russell Ave., Indianapolis, Ind.

200 GUMMED STICKERS WITH NAME AND address, 10c. Pearl Card Co., Clintonville, Conn.

GUMMED LABELS—3000—\$1.00—1x2 INCHES Catalogue free. Helmers Company, Box 318, Hoboken, N. J.

GOOD PRINTING AT LOW PRICES. 1000 Good Letterheads, Envelopes, Cards, Billheads, Labels, Circulars, \$2.50. Samples Free. Catalogues, Booklets and Circulars our specialty. Ernest L. Fantus Co., 523 S. Dearborn St., Chicago.

150 LETTERHEADS AND 100 ENVELOPES printed, \$1.00 prepaid. High grade work. Samples free. H. F. Albers, Emerald, Nebraska.

SINGLE COLUMN COPPER HALFTONES, seventy-five cents. Rishell, engraver Havana, Ill.

5,000 GOOD LETTERHEADS, \$8.75; CASH WITH order; guaranteed satisfactory. Johnson Press, Royersford, Pennsylvania.

PREPAID PRINTING (600 MILES)—1,000 BOND letterheads, \$2.39; envelopes, \$2.14; return envelopes, \$1.77; invitations, typewritten letters, 150 words, \$1.73; 300 words, \$2.64; 6x9 circulars, \$1.75; art ad slips, \$1.00. Ask for prepaid prices on any printing. Good's Quick Print, Harrisonburg, Va.

MAKE YOUR OWN CUTS FOR 5c; GUARAN- teed practical home process, easily learned; samples for stamp. Modern Engraving Co., Lynn, Mass.

1,000 HIGH GRADE BUSINESS CARDS, \$1.25; 500, 70c; trial order, 50 for 25c; 100 high grade cards, name only, 30c; with address, 35c; satisfaction guaranteed. The Automatic Printing Co., Gardner, Mass.

GUMMED LABELS—3,000, \$1. 38-PAGE CATA- logue, 2c. Gold Seals. Gummmed Labels in Rolls. MacTaggart, 1235 Arch, Philadelphia, Pa.

YOUR NAME PRINTED ON 100 FINEST quality cards, 30c; address, 10c extra; plain, script or Old English; samples. Owen Dicks, Dept. E, Kenmore, N. Y.

REAL ESTATE

FLORIDA FARMS—5 ACRES UPWARDS, \$100 acre; terms. Box 66, Lakeworth, Florida.

A QUARTER-SECTION IN NORTHEASTERN Minnesota, near big markets; good land at low prices. G. H. Rhodes, Iowa Falls, Iowa.

OZARK FRUIT, POULTRY FARM; NEW COT- tage; price, \$385; monthly payments. Turkey Ridge Farm, Richland, Mo.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

SALESMEN

GENUINE CANTON POCKET KNIFE WITH your name on given FREE for one hour of your time. Quick Sales Co., Springfield, Ohio.

STEEL AND RUBBER STAMPS

RUBBER STAMPS—CUSHIONED, 10C LINE. Douglas, 751 Sixth Avenue, New York.

SAFETY RAZORS—BLADES SHARPENED

GILLETTES OR ANY MAKE, 2c. KEEN EDGE Co., Oshkosh, Wis.

SCHOOLS

SEE WHAT I SAY UNDER "TYPEWRITERS." ATCHISON.

CHIROPRACTIC DOCTORS MAKE BIG IN-comes; be independent; work for yourself; complete correspondence course, including diploma, only \$25. National College Chiropractic, 123 Monroe Ave., Grand Rapids, Mich.

WE TRAIN DETECTIVES. YOU CAN BE ONE. Splendid Opportunities. Travel. Earn \$100 to \$300 monthly. This fascinating profession taught practically and scientifically by mail at a nominal cost. American School of Criminology, Dept. G, Detroit, Mich.

SHOES BY MAIL

SAVE MONEY ON SHOES! FACTORY TO feet; you save retailer's profit and get better shoes; fit and entire satisfaction guaranteed or money back; style book free. Pathfinder Shoe Co., Dept. E, Dudley, Mass.

TYPEWRITERS AND SUPPLIES

TYPEWRITERS, ALL MAKES, UNDERWOOD, etc., like new; guaranteed; free trial; \$8.00 up; write for cut rate price list No. 10. BASSETT TYPEWRITER CO., 180 N. Dearborn St., Chicago, Ill.

TYPEWRITERS — ALL MAKES — AGENTS wanted, prices from \$5.00 to \$50.00. All guaranteed. Free trial allowed. Send for illustrated catalogue. Ribbons 4 for \$1.00. Carbons, \$1.00 per 100. Harlem Typewriter Exchange, Dept. P-23, 217 W. 125th, New York.

I WANT TO CORRESPOND WITH PERSONS who are about to buy a high-grade typewriter, and object to paying the high prices generally asked by manufacturers and dealers. Any make on approval. Catalogue, bargain list and valuable information sent free. A. E. Atchison, 112 N. La Salle St., Chicago.

SPECIAL TYPEWRITER OFFER ON GUAR-anteed machines, all makes; late No. 5 Oliviers with back spacer, \$33; No. 3 Oliviers, \$23; No. 4 Underwoods with rotary escapement, \$35; blind writers, \$8 up; trial given. H. Fox, 106 N. LaSalle St., Chicago, Ill.

TYPEWRITER BARGAINS, ALL MAKES, slightly used and rebuilt; lowest prices bar none; satisfaction assured; new appearance; perfect order guaranteed. Typewriter Sales Co., Ferguson Bldg., Pittsburgh, Pa.

\$100 TYPEWRITER, \$9.50; FACTORY REBUILT Underwoods, Oliviers, etc., at wholesale; dealers wanted. Harwood Sales Company, Box 9, 904 Madison St., Brooklyn, N. Y.

FOR SALE AT BARGAIN—REMINGTON TYPE-writer, good as new; give cash offer. G. Olive, Wilmar, Minn.

TRADE SCHOOLS

MAKE \$5 TO \$8 A DAY AS SKILLED ELEC-trician, Plumber, Draftsman, Bricklayer, Moving Picture Operator. We teach you in short time at small expense profitable trades. Free employment bureau places graduates in good jobs. Special limited offer now. Write at once for catalogue and full particulars—no obligations. Dept. 840x, Coyne National Trade School, 51 E. Illinois St., Chicago, Ill.

TELEGRAPHY

THERE'S BUT ONE SCHOOL THAT PLACES all graduates direct in railway telegraph service. It's PELNAR'S, Madison, Wisconsin.

LEARN TELEGRAPHY—SHORT HOURS—Good Pay—Great Demand. Write for catalogue; correspondence courses. Barry's Telegraph Institute, Minneapolis, Minn.

TELEGRAPH—MORSE AND WIRELESS—Railway Accounting (Station Agency) taught quickly. Railroad and Western Union Wires and complete Wireless Station in school. Big demand. Positions secured. Living expenses low—may be earned. Largest and oldest school—established thirty-nine years. Investment, \$25,000.00. Correspondence courses also. Catalog free. Write today. Dodge's Telegraph, Railway and Wireless Institute, 16th Street, Valparaiso, Ind.

DANDY POCKET EDITION, "1,000 PRACTICAL Telegraphic Abbreviations;" absolutely necessary to successful students, 50 cents, prepaid. Box 512, Salida, Colorado.

WIRELESS

WIRELESS HANDBOOK, TELEPHONE AND telegraphic, up-to-date and complete, 210 pages, illustrated, for home study; price, \$1.00. T. S. Hardy, Oakland, Cal.

WIRELESS MAP; NEW REVISED EDITION; price, \$1.00; needed in all stations; 38 by 28 inches, with scale; shows all stations, etc.; order now and get free code charts; circulars sent free; agents wanted. B. Francis Dashiell, Irvington, Maryland.

EXPERIMENTERS—MERCURION ALLOY (soft metal) 25c per ounce. Spring Sliders, 20c. Spark Gaps, Condensers, etc. Send 2c stamp for catalogue describing these and other goods. A. W. Bowman & Co., 55 1/2 Sudbury St., Boston, Mass.

HELP WANTED

ANY INTELLIGENT PERSON MAY EARN steady income corresponding for newspapers. Experience unnecessary. Address Press Correspondence Bureau, Washington, D. C.

U. S. GOVERNMENT JOBS OPEN TO MEN and women; over 15,000 appointments coming; \$75 to \$150 month; life jobs; pleasant work; short hours; vacations; common-sense education sufficient; full directions telling how to get position free. Franklin Institute, Dept. G-50, Rochester, N. Y.

HUSTLING MAN WANTED IN EACH LOCAL-ity, under 50 years, to join this society and introduce our NEW memberships; part or full time, \$50 to \$500 monthly; experience not required. Address The I-L-U, 2010, Covington, Ky.

ELECTRICIANS, ENGINEERS, TELEPHONE men act as our sales agents; sell electric appliances and supplies to your company or in your town. Electric Service Sales, Room 600, 17 N. Wabash Ave., Chicago, Ill.

GET A GOVERNMENT JOB—POST OFFICE, Railway Mail, Rural Carrier and other positions pay big money. Prepare for examinations under former U. S. Civil Service Secretary-Examiner. 64-page booklet free—write to-day. Patterson Civil Service School, Box 1715, Rochester, N. Y.

LOCAL REPRESENTATIVE WANTED. Splendid income assured right man to act as our representative after learning our business thoroughly by mail. Former experience unnecessary. All we require is honesty, ability, ambition and willingness to learn a lucrative business. No soliciting or traveling. All or spare time only. This is an exceptional opportunity for a man in your section to get into a big paying business without capital and become independent for life. Write at once for full particulars. National Co-Operative Realty Company, L-604 Marden Building, Washington, D. C.

TOO LATE TO CLASSIFY

THE AERO FAN NOW READY. 8 INCH AERO fan throws more air than any other 12 inch fan. Throws air farther. Less current. Also Utility Toaster Stove only \$2.50. Wonder seller. Every sale repeats. Write for particulars. National Electric Co., 145 W. Austin Ave., Chicago.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Special Reduction on Technical Books

**This \$40 Set
Now \$24.80—
\$2 a Month**

One of the greatest offers ever made. Here's a chance for every worker to buy the books necessary to his future success at a big saving. This is the opportunity you have long waited for. Take advantage of it today—**now!** Select the books you need from this great library of authoritative, practical and comprehensive engineering works and

Save from 20 to 50%

The Cyclopedias comprising this wonderful engineering library are not collections of theories, but complete reviews of the actual tried and tested experiences of the greatest engineers in the world—clear and simple explanations of every phase and every branch of **Engineering**.

Sent Free Look over the entire set you select for a whole week **FREE**. We'll gladly ship any Cyclopedia you desire without charge, express charges fully prepaid. See if it really does fit in with your needs, then decide whether or not you want to keep it. And don't send us any money until you decide.

Consulting Service Free With every set is included absolutely free a year's Consulting Membership, entitling you to the advice of a staff of engineering experts. These men are no further from you than your nearest mail box. They stand ready to solve your perplexing problems, to offer suggestions, to point out the things you should avoid. Absolutely no limit to their assistance—ask as many questions as you wish for an entire year. This service alone may be worth more to you than the entire first cost of the books.

The American Technical Society's Complete Library of Engineering

	Vols.	Regular Price	Special Price
Civil Engineering	8	\$40.00	\$24.80
Architecture, Carpentry and Building, with Plan Book	11	50.00	24.80
Steam Engineering	7	35.00	19.80
Mechanical Engineering	7	35.00	19.80
Fire Prevention and Insurance	4	20.00	15.80
Telephony and Telegraphy	4	20.00	12.80
Modern Shop Practice	4	20.00	12.80
Heating, Plumbing and Sanitation	4	20.00	12.80
Drawing	4	20.00	9.80
Motion Picture Work	2	12.00	9.80

Yours for \$2 a month Not only can you buy these books at a great reduction, but we offer them to you on the easiest of monthly payments. If, after seven days' examination, you decide to keep the set you have selected, simply send us \$2 and then \$2 a month until the specially reduced price has been paid. Have you ever heard of a more generous plan?

Don't wait. This means money in your pocket if you act now. Remember, you take no chances whatever—it costs nothing to inspect and you are nothing out if you do not care to buy. This offer may mean your success, so mail the coupon today—this very minute—before you turn the page.

SPECIAL DISCOUNT COUPON

AMERICAN TECHNICAL SOCIETY, Chicago, U. S. A.

Please send me set of Cyclopedia of.....

.....

for **7 DAYS' FREE** examination. I will examine the books thoroughly and, if satisfied, will send \$2 within 7 days and \$2 each month until I have paid the special price of \$..... If I decide not to keep the books, I will notify you at once and hold them subject to your order. Title not to pass to me until the set is fully paid for.

6-14

NAME.....

ADDRESS.....

As I have had no previous dealings with you, I refer you to.....

**American Technical Society
Chicago, U. S. A.**

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



EDITH STOREY



EDWIN AUGUST



CRANE WILBUR



MARY PICKFORD



CARYLLE BLACKWELL



LABEL NORMAND



JAMES CRUZE



PAULINE BUSH



ROMAINE FIELDING



BLANCHE SWEET

FREE—Ten Half of Your Choice of These

HERE is the chance you have been looking for. Here is your opportunity to obtain **free** a set of ten beautiful **half life-size** portraits of leading picture players.

More than that, you may select the ten portraits you wish from a list of twenty-four of the most popular players, thus enabling you to secure much-prized pictures of your favorites.

This is the greatest portrait offer ever made by any publication, firm or individual. The portraits are all **half life-size** (11x14) litho tinted gravure reproductions made by a new process, resulting in remarkably striking and attractive effects. In every way these portraits are works of art—the best that money can buy and the highest skill of photography, printing and engraving can produce.

You will want a set of ten of these pictures. You will want to frame and preserve them. You will prize them as decorations for your room or den. They are pictures which every Motion Picture "Fan" should have.

HOW TO GET THE PORTRAITS FREE

From the publication date of this, the June Number, May 15th, 1914 on, for a limited time, each person subscribing to the **MOTION PICTURE MAGAZINE** for one year will receive **free** his or her choice of **any ten** from the list of twenty-four portraits named in the coupon on the opposite page.



LILLIAN WALKER



JOHN BUNNY



CLARA K. YOUNG



BEVERLY BAYNE



FRANCIS X. BUSHMAN



LOTTIE BRISCOE



WARREN KERRIGAN



MARY FULLER



VIVIAN RICH

Life-Size Portraits

Twenty-four Players

The portraits are valued at 35 cents each. Only by preparing them in large quantities have we been able to make you this remarkable offer. **They are not for sale.** You can secure them only by subscribing for the **MOTION PICTURE MAGAZINE.** Those who are already **subscribers must renew their subscriptions** for one year more to be entitled to them.

Dont fail to take advantage of the greatest portrait offer ever made. Just fill out the **coupon** below, making sure that you sign your name and write your address plainly. Then cut out **coupon** and mail with subscription price of \$1.50. The ten pictures of your choice, carefully wrapped, will be sent you at once.

Every one will want these pictures. Delay may mean that the supply will be exhausted before your order is received. Better send it in today.



EARLE WILLIAMS



FLORENCE LAWRENCE



KING BAGGOT



ALICE JOYCE



ARTHUR JOHNSON

COUPON

Place an X in squares after names of the 10 portraits you wish

Carlyle Blackwell.....	Edwin August.....	Lillian Walker.....
Arthur Johnson.....	James Cruze.....	Beverly Bayne.....
Crane Wilbur.....	King Baggot.....	Mary Pickford.....
Earle Williams.....	Mary Fuller.....	Mabel Normand.....
John Bunny.....	Edith Storey.....	Blanche Sweet.....
Romaine Fielding.....	Alice Joyce.....	Pauline Bush.....
Francis X. Bushman.....	Clara K. Young.....	Vivian Rich.....
Warren Kerrigan.....	Lottie Briscoe.....	Florence Lawrence.....

Pictures not in this list cannot be supplied

1914.

Motion Picture Magazine,
175 Duffield St., Brooklyn, N. Y.

Gentlemen: Enclosed please find \$1.50 (\$1.80 Canada, \$2.50 Foreign) for which kindly ^{enter} _{renew} } my subscription to the **Motion Picture Magazine** for one year. Also kindly send me **FREE** half life-size litho tinted gravure portraits of the ten players checked above.

Name

Address

MOTION PICTURE MAGAZINE, 175 Duffield Street, Brooklyn, N. Y.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

THE WORLD'S ROMANCE

THE **WIDE WORLD** gives the Romance of present-day History! Ordinary history is mostly a story of the rise and fall of empires, of battles fought and court intrigues!

The **WIDE WORLD** is full of vividly written and strikingly illustrated articles and stories of what the World is doing **today**. It makes us acquainted with the World as it is now—one great country in which “all men under heaven are one family!” Its contributors are men and women who do things—Army and Navy officers, traders, missionaries, Government officials, explorers—people whose business or pleasure takes them into the uttermost parts of the earth.

Do not fail to get acquainted. It is an education and a delight for old and young.

Price 10 Cents

Of all Newsdealers - \$1.20 a year

The International News Company, 83-85 Duane Street, New York

Liquor and Labor

THERE IS A VITAL CONNECTION BETWEEN THE TWO. STUDY THESE FACTS:

Liquor and License Means a Smaller Number of Wage-Earners Employed.

During the last ten years, the increase in the number of wage-earners employed varied as follows:

Prohibition States	Near Prohibition States (More than 50 per cent. of population under prohibition)	Partially License States (Less than 50 per cent. of population under prohibition)	License States (Less than 25 per cent. of population under prohibition)
53%	43%	40%	36%

In the Manufacture of Liquors, Labor Gets the Smallest Share of the Money Paid Out.

The proportionate share of running expenses paid out to labor in the form of wages varies in the different industries as follows:

Cars (construction, repairs).....	88%	Paper and wood pulp.....	56%
Marble and stone work.....	73%	Leather.....	55%
Cotton goods.....	72%	Electrical machinery and supplies.....	53%
Iron and steel.....	70%	Agricultural implements.....	49%
Copper.....	67%	Butter, cheese, condensed milk.....	47%
Carriages and wagons.....	65%	Slaughtering and meat packing.....	44%
Lumber and its products.....	65%	Printing.....	40%
Furniture.....	62%	Flour mills and grist mills.....	39%
Automobiles.....	61%	Tobacco.....	36%
Bread and bakers' products.....	55%	Paint and varnish.....	25%
		MALT LIQUORS.....	20%
		PATENT MEDICINES.....	15%
		DISTILLED LIQUORS.....	1.9%

Where More Liquor is Used, More Women are Employed.

The Capital Invested in the Manufacture of Intoxicating Liquors is only 4% of the Total Capital Invested in all Manufactures in the United States.

The manufacture of distilled liquors employs only . . . 6,430 people
 The manufacture of fermented liquors employs only . . . 54,579 people
The other industries of the United States employ 6,615,046 people

These, and hundreds of other facts just as interesting and just as vital to you, are found in our

Anti-Saloon League Year Book for 1914

244 pages; price only 25c in manilla binding, and 50c in cloth. Sent postpaid to any address.

Send for a copy today. This is the most complete and most interesting handbook ever published on the liquor traffic and the temperance reform. As a thinking man, you ought to be informed on this greatest of all economic questions. Don't put it off—order today!

THE AMERICAN ISSUE PUBLISHING CO., Dept. 18, Westerville, O.

An Old Man at Fifty —A Young Man at Seventy

The Remarkable Story of Sanford Bennett, a San Francisco Business Man, Who Has Solved the Problem of Perpetual Youth

By C. E. PAGE, M. D.

Author of "Natural Cure for Consumption," "How to Feed the Baby," etc.

THERE is no longer any occasion to go hunting for the Spring of Eternal Youth. What Ponce De Leon failed to discover in his world famous mission, ages ago, has been brought to light right here in staid, prosaic America, by Sanford Bennett, a San Francisco business man. He can prove it too, right in his own person.

At 50 he was partially bald. To-day he has a thick head of hair, although it is white. At 50 his eyes were weak. To-day they are as strong as when he was a child. At 50 he was a worn-out, broken-down old man. To-day he is in perfect health, a good deal of an athlete and as young as the average man of 35.

All this he has accomplished by some very simple and gentle exercises which he practises for about ten minutes before arising in the morning.

Yes, the exercises are taken in bed, peculiar as this may seem.

As Mr. Bennett explains, his case was not one of preserving good health, but one of rejuvenating a weak middle-aged body into a robust old one, and he says what he has accomplished, anyone can accomplish by the application of the same methods, and so it would seem. All of which puts the Dr. Osler theory to shame.

I haven't room in this article to go into a lengthy description of Mr. Bennett's methods for the restoration of youth and the prevention of old age. All of this he tells himself in a book which he has written, entitled "Old Age

—Its Cause and Prevention." This book is a complete history of himself and his experiences, and contains complete instructions for those who wish to put his health and youth-building methods to their own use. It is a wonderful book. It is a book that every man and woman who is desirous of remaining young after passing the fiftieth, sixtieth, seventieth, and as Mr. Bennett firmly believes, the one hundredth milestone of life, should read.

For the purpose of spreading broadcast the methods of promoting health and longevity developed by Mr. Bennett an interesting eight-page booklet which is, in effect, a summary of his system, has been prepared by the publishers of Mr. Bennett's interesting book—the Physical Culture Publishing Company, 3606 Flatiron Building, New York City.



Sanford Bennett
at 50



Sanford Bennett
at 72

This booklet they will send free to anyone sufficiently interested to write for it.

The grandest thing in the world is Youth, and it is one of the really great hardships of life that "its beauteous morn" should pass so swiftly and give place to old age.

For having solved the problem of prolonging youth during life, the world owes Sanford Bennett a vote of thanks. Of course there are those who will scoff at the idea, but the real wise men and women among those who hear of Sanford Bennett and his return to youth, will most certainly investigate further, and at least acquire a knowledge of his methods.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



How would you like to be able to have an expert in business traveling for you, gathering ideas for you, weighing, rejecting, selecting all that is best in business life today? Then suppose this specialist gave you a monthly report of his findings in clear, vivid form, ready for your immediate use.

Wouldn't such knowledge be worth hundreds of dollars to you? This is exactly what Mr. Sheldon is doing, and this service is precisely what he offers you through the pages of



The Magazine of Practical Business Building

The Business Philosopher

Edited by Arthur Frederick Sheldon

A Few of the 50 Chapters on Salesmanship

Everyone Has Something to Sell—Salesmanship and Success—Service: The Source of Profit—What is Profit?—What is Service?—The Four Factors of a Sales Transaction—The Analysis of a Sale—How to Become a Salesman—Retail, Wholesale, Specialty and Promotion Salesmen—The Right Viewpoint in Retail Merchandising—Salesmen versus Order Takers—Mental and Moral Discipline—Difficulties—The Harm of Negative Suggestions—Positive Suggestions—Analyze Your Goods.

Live Issues Treated in This Volume

The Transaction of Business—Choice and Management of Agents—Interviews—The Treatment of Sultors—Councils and Commissions—The Value of Counsel—Advice—Secrecy—Practical Wisdom—The Education of a Man of Business—Our Judgments of Other Men—How to Win Fortune—Tactful Relations With Customers—The Importance of Audits—Analyzing a Business Proposition—Dispatch—Delays—Expense—Cunning—Get Out, or Get in Line.

\$250

To put you in touch with these good things and get you started on the right road, we are offering you THE BUSINESS PHILOSOPHER for one year. (regular price \$2.00) and your choice of either of the two above illustrated books (regular price, \$1.00), all for

\$250

Remit to SHELDON UNIVERSITY PRESS, Area, Ill.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

THE NEW HOTEL HANOVER

Arch and Twelfth Sts., Philadelphia

Five Minutes
Walk to
Convention
Hall

One block from Phil-
adelphia & Reading
Terminal. Three
blocks from P. R. R.
Broad St. Station.



European Plan

Rooms without bath, \$1.00 per day and up. Rooms with bath, \$1.50 per day and up. Running hot and cold water and telephone in every room. Service the best. Cuisine unexcelled. Table d'Hote dinner 50c, 12 to 8 p. m. Vocal and instrumental music in cafe.

CLAUDE M. MOHR, Manager

HOTEL CUMBERLAND

Broadway at 54th Street
NEW YORK

Near 50th Street Subway
Station and 53rd Street "L"

"Broadway" Cars from
Grand Central Depot. 7th
Avenue Cars from Penn-
sylvania Station.

NEW AND FIREPROOF

Best Hotel Accommo-
dations in New York
at Reasonable Rates.

\$2.50 with Bath
and up

European Plan

All Hardwood Floors
and Oriental Rugs.

Ten Minutes' Walk to
Forty Theaters.



Excellent Restaurant Prices Moderate

Send for Booklet

HARRY P. STIMSON

Formerly with Hotel Imperial

Only New York Hotel Window-Screened Throat

NEW HOTEL VENDIG

THE LAST
WORD IN HOTEL
CONSTRUCTION

PHILADELPHIA,
13 AND FILBERT STREETS,
2 Minutes from PENNSYLVANIA
and PHILADELPHIA & READING
TERMINALS -
NEAR TO EVERYWHERE.

200 Beautiful Out-
side Rooms with
Bath and Flowing
Ice Water,

\$2.00 and up.

Popular Cafe, Grill
and Restaurant

JAMES C. WALSH, Manager

Talk About



Mr. GLANCY

AND

The Marquette Hotel

400 ROOMS. RATES \$1.00 to \$3.00

ST. LOUIS, MO.)

A hotel for your mother, wife and Sister

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

"THE BLICK"

Has long passed the experimental stage. Twenty-two years of satisfactory service has proven beyond any doubt that it is the only practical popular-priced typewriter now on the market.

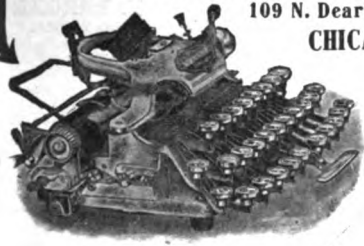
As Strong as Steel Can Make It

The Blick typewrites perfectly—is easy to operate—visible wiring—universal key board—interchangeable type and possesses features unknown to other typewriters. Does everything that can be done on any writer and more. It will serve you a lifetime.

Sent on Free Trial

Ask for Catalog E-5

BLICKENS DERFER MFG. COMPANY
109 N. Dearborn St.
CHICAGO, ILL.



\$25.
to
\$60.

Pick Out Your Typewriter and Pocket Your Saving

Typewriters Rebuilt in our own Factories, and guaranteed for one year. Here are a few of them:
Remingtons \$25 to \$65. Smiths \$23 to \$60
Underwoods \$35 to \$60. Royals \$30 to \$40
L. C. Smiths \$30 to \$50. Oliviers \$30 to \$40
We have others, of course. Send for catalog describing them, and address of nearest branch office.
American Writing Machine Co., Inc., 345 Broadway, N.Y.



Furniture On Credit

Write for Mammoth Bargain Book picturing 4,918 articles
SPIEGEL, MAY, STERN CO.
1097 West 35th Street, Chicago

Get a Broader View of Life in Bitter Root Valley

Arrange with us to join one of our coming low rate, first-class excursions and see with your own eyes the money making, health making and home making opportunities in this famous scenic environment, with good roads, hunting, fishing, and mountain climbing. Learn on the ground how you can obtain a return of \$200 an acre or more annually from a Bitter Root Valley fruit orchard. For excursion dates and particulars, address:
BITTER ROOT VALLEY IRRIGATION COMPANY
857-861 First National Bank Bldg., Chicago, Ill.

Over 80,000 in Use
Mostly sold by recommendation. For Personal Desk or General Office.
It checks mental calculations, Handsome Morocco case free. Buy Thru Your Stationer. Write for no day trial offer.
P. E. Gancher, A. A. M. Co., 115 W. Broadway, New York City.

Golden Gem's Adding Machine

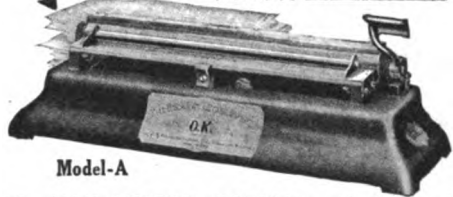
Multiplies - Subtracts

Agents Wanted

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

The RIES LETTER OPENER

PAT. OCT. 17, 1911 CAN NOT CUT ENCLOSURES
OPENS 50 LETTERS PER MINUTE OTHER PATTS. PEND.



Model-A

The RIES LETTER OPENER, aside from saving valuable time, eliminates all liability of injury to enclosures and the annoyance incurred by opening letters the old way. It is simply a marvel in the art of instantaneous letter opening and should be in use in every well equipped office.

No office appliance is more necessary than a machine of this type; if there is one thing more than another which requires rapid work and over which more time has been lost, it is in opening the mail.

MADE OF THE BEST MATERIALS IN 3 SIZES AND 2 MODELS, HANDSOMELY FINISHED.

ON APPROVAL—EVERY MACHINE GUARANTEED 2 MODELS WITH A CHOICE OF SIZES & PRICES, ADAPTS THEM TO UNIVERSAL OFFICE USE.

Write To-Day for Prices, Illustrated and Descriptive Matter

The O. K. Mfg. Co., Syracuse, N. Y., U. S. A.

Stationers Specialties; Sole Licensees and Makers of

The "SANITARY" Patent Eraser
The "RIES" Patent Letter Opener
The "WASHBURN" Patent Paper Fastener of "O. K." Fame

L. & C. HARDTMUTH, LTD., LONDON, ENGLAND.

Sole selling agents for Europe, Asia, Australia, New Zealand and South Africa.

Your Money's Worth Plus 75 to 100%
UNREDEEMED PLEDGES

PERFECT CUT GENUINE DIAMONDS
ELGIN WALTHAM ALL RELIABLE MAKE WATCHES

EXAMINE FIRST—If Satisfied, Buy—If Not, Return, We Ship, With Privilege of Examination.

The biggest value for your money—We have thousands of unredeemed pledges on which we can positively save you as much and more than half of price asked by dealers, or wholesalers. Don't make a purchase of this kind until you see our big illustrated Bargain Bulletin. As "HEADQUARTERS FOR LOANS" we have been advancing money on fine diamonds, watches, etc. for over 60 years. Our investment is but a fraction of their real value. The necessity of disposing of these unredeemed pledges the reason for our amazingly low prices.

Match These Values if You Can

No. 25777. Nine magnificent diamonds set in platinum, having appearance of 2 1/2 ct. solitaires. Try to match at \$75. Guaranteed loan \$28. Unredeemed Price, \$36.55

No. 251278. Genuine 21-jeweled unredeemed Crescent St. Waltham Railroad Watch in high grade serviceable case. Guaranteed to pass railroad inspection. Protected price on more than 1700 other watches alone \$26. Unredeemed Pr. \$17.95/178



Over 60 Years in Same Location in proof of Absolute Square Dealing—upright and fair. RATED AT OVER THREE QUARTERS OF A MILLION DOLLARS.

Money Back Guarantee. We pay expressage and run all risk of pleasing you in the examination. Your money back if unsatisfactory to you, though always exactly as represented. We guarantee LOAN VALUES. We guarantee to take back any diamond at full price in exchange for your unredeemed pledge. List for Bargain Bulletin

JOS. DE ROY & SONS, 218 DeRoy Building Smithfield St. Opposite Post Office Pittsburgh, Pa.

REFERENCES: By permission, Farmers Deposit Natl Bank, Martine Nation's Bank, Don't, Bradstreet, write any bank or newspaper in Pittsburg

Name.....
Address.....

GET YOUR NAME ON OUR LIST

Popular Educational Food Campaign

A wrong combination of eggs and an excess of starchy (paste making) and fatty foods will make you sluggish; it will give you dull, splitting headaches, lack of memory and concentration, drowsiness and inertia. A complete change to "digestible" brainy foods (suitable meat, game, fish, and dairy foods, combined with suitable vegetable and fruits according to the new brainy food plan) will produce the most marked improvements in a few weeks.



No foods sold
No fasting
No exercises

Brainy Diet

Educational
Food
Campaign

A thin man, after being out of work nearly a year through weakness, was restored in three weeks to hard work as a carpenter at full pay. In such cases the change from a clogging, death-producing diet to energizing foods causes a literal transformation.

Another consultant, deaf in the right ear, owing to a discharge caused by an excess of mucus making foods (cream, butter, cheese, etc.) was completely cured of deafness and catarrh by taking correct combinations of suitable foods.

A case of kidney and bladder trouble of ten years' standing was saved from a surgical operation, and the objectionable discharge cured within ten days, because the loss of control was due entirely to the constant irritation from certain irritating foods and drinks.

A case of prurigo or "itch" that doctors and skin specialists failed to relieve was completely cured inside of three months.

A chronic sufferer (see photo), weighing 415 pounds, unable to exercise, reduced over 150 pounds (in public life, under many witnesses), gained strength and firmer flesh, and lost rheumatism. Over one hundred similar cases have been certified by an Investigating Committee of prominent men.

During thirteen years of personal experiments in co-operation with S. Leppel and others, I have learned to produce in myself various diseases, each by eating certain wrong foods for a few days or weeks. They are—Rheumatism, catarrh, sore throat, tonsillitis, constipation, double chin, swollen glands, kidney troubles, shortness of breath, rough scaly skin, dandruff, sores, boils, pimples with white pus, blackheads, rash, and numerous other symptoms. AND I CAN CURE THESE SYMPTOMS OF ILL-HEALTH IN A FEW DAYS BY CORRECT FOODS. The foods which cause expectoration, catarrh, cough, constipation, tumors, etc., are specified in my booklet which has taught many to cure themselves.

"THE NEW BRAINY DIET SYSTEM" SENT FOR 10 CENTS

Send the addresses of your sick friends to

G. H. BRINKLER, Food Expert, Dept. 19F, Washington, D. C.



G. H. BRINKLER
Food Expert

MILLIONS ARE SEEKING DRUGLESS TREATMENT
Thousands of Drugless Doctors are Wanted

In the Practice of
Mechano-Therapy

The Marvelous Healing Art that astounds medicallscience with its wonderful cures. This Practice offers
A Rich Field For You
Taught by Pictures

And a Course of Lessons, Charts and Individual Instruction. So plain anyone of ordinary education and intelligence can master this science easily. It can be LEARNED AT HOME IN SPARE TIME.

SPARE TIME STUDY
MEN, or WOMEN, here's a NOBLE PROFESSION open to you. Rise above the rut. Become a Doctor of Mechano-Therapy.

Graduates of our College are winning FAME and FORTUNE—the world demands thousands more. It is wearied with drugs and surgeons' knives.

Earn While You Learn
Put YOURSELF in a high calling that YIELDS \$2,500 to \$6,000 Yearly
Learn all about this marvelous opportunity by sending for our FREE BOOK and COLOR CHARTS

Worth big money to any man or woman. Read all carefully. Do not delay choosing a life vocation that brings prestige, Avoid crowded fields. Live easily—be the BIG figure in your locality—and the wealthy one. Write Today.

AMERICAN COLLEGE OF MECANO-THERAPY
Dept. 963 81 W. Randolph Street, CHICAGO, U. S. A.

LEXINGTON
ATLANTIC CITY, N. J.

Located in Marlborough section at Pacific and Arkansas Avenues, close to the resort's most famous attractions. Spacious and beautiful grounds adjoin the beach and boardwalk.

Only moderate rate hotel where guests may go in bathing attire direct from house to the surf without using streets, which is prohibited. Use of bath houses with shower baths, also care of bathing suits, is free.

Guests have the same comforts and conveniences as are found in the most exclusive hotels without exorbitant cost. Use of all public baths, including the healing hot salt water baths, is free. Hot and cold running water in rooms. Private baths.

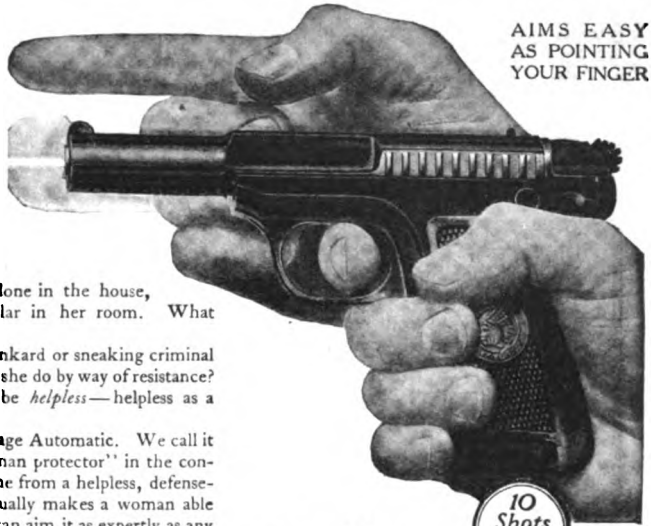
Special rates, \$8.00 to \$17.50 weekly; \$1.50 to \$3.50 daily, including choice table and attentive white service.

Orchestra. Tennis courts and croquet grounds between hotel and the beach. Beautiful glass enclosed tango parlor; free instruction. Illustrated booklet mailed free upon request.

PAUL C. ROSECRANS, Manager.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Is Yours an Egg-Shell Home?



AIMS EASY AS POINTING YOUR FINGER

SUPPOSE your wife, mother or sister, left alone in the house, should wake up tonight and find a burglar in her room. What would she do?

Suppose she were left alone and a tramp, drunkard or sneaking criminal should enter the house and attack her. What could she do by way of resistance?

Nothing. Absolutely nothing! She would be helpless—helpless as a little child.

Get her the "human arsenal"—the new **Savage Automatic**. We call it a pistol, but, in reality, it should be called a "human protector" in the condensed form of pocket arm. It converts your home from a helpless, defenseless egg-shell of a place, into an arsenal. It actually makes a woman able to put up a crack shot's defense. For any novice can aim it as expertly as any crack shot. Show her how she can shoot once for each trigger pull; how she can tell at a glance or a touch if it is loaded.

Shoots ten shots—double the number of an ordinary revolver—two more than other automatics. The only automatic that guards her against the old excuse "didn't know it was loaded." .32 and .380 calibre.

Send for free book, "If You Hear a Burglar"—by famous detective. SAVAGE ARMS COMPANY, 446 SAVAGE AVE., UTICA, N. Y.



A Brand New Savage Rifle!

THE new Savage .22 Tubular Repeater has all the original Savage features—hammerless, trombone action, solid breech, solid top, side ejection, etc. Price \$12. Send for circular.

THE NEW SAVAGE AUTOMATIC

The Boys' Magazine *FREE*

Send to-day for a *free* sample copy of THE BOYS' MAGAZINE, the finest boys' publication in the world.

THE SCOTT F. REDFIELD CO.
539 Main Street, Smethport, Pa.

See Yourself in Motion Pictures

A New Invention

ENABLES YOU TO MAKE and SHOW



Motion Pictures of yourself, family, friends, sports, travels, or anything that interests you.

FOR PLEASURE OR PROFIT

\$39.00 Cash

Also on easy payments

Your old camera taken in trade

Send for descriptive catalog B--A 400 page book, 80 illustrations --free with each camera
MOTION PICTURE CAMERA CO., Inc., 5 W. 14th St., NEW YORK
Importers and Mfrs. of motion picture apparatus

There's Money in Agricultural Blasting

WE TEACH YOU FREE

Our extensive national advertising yields thousands of inquiries from farmers, orchardists, etc., who need blasters to clear land, blast ditches, holes for tree planting, tight subsoils, etc. More than twenty million pounds of agricultural dynamite used in 1913. We refer all inquirers to nearest blaster, supply free advertising matter and help you get the business. We want to start in this independent business, reliable men who have \$200 capital for tools, magazine, and running expenses. Write for free booklet No. 405 B.

Agricultural Division, Du Pont Powder Company, Wilmington, Del.



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Consider quality and price and you'll buy a Signal Shirt

You railroad men who like to take off your coat, roll up your sleeves and accomplish things—here's a work shirt that you'll like—the Signal Coat Shirt.

Built for service—and gives it, yet stylish as a dress shirt. Does not show soil easily. Guaranteed to give good wear and last a long while.

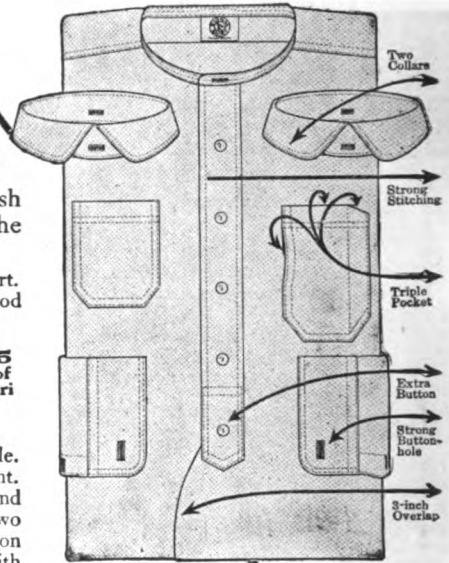
SIGNAL Coat-shirts \$1 ^{\$1.25} West of Missouri River
UNION MADE

Note these improvements: Easy-on, easy-off coat style. Extra big arm-holes, that give plenty of arm movement. Specially cut skirts, overlapping three inches in front, and with extra button at bottom to prevent gapping. Two detached or attached collars, cuffs made with both button and extra buttonhole, so they can be buttoned or used with detachable cuffs. Double needle machine stitching (prevents rips); buttons sewed on extra strong; two pockets, one a triple combination pencil, watch and handkerchief pocket. Signal Shirts are made from fast-color percales that won't shrink or fade. Big variety of neat patterns. Only expert union labor employed.

Sent at our risk Ask your dealer. If he hasn't them, tell us his name and your size, and we will express you a couple C.O.D. If not delighted with them on examination, return at our expense, without paying us a cent. Be sure and write for folder showing big variety of other styles and sample swatches.

HILKER-WIECHERS MFG. CO. 1248 Mound Ave., Racine, Wis.

Also manufacturers of the famous Signal Overalls, Coats and Shirts



Always look for this trade-mark—it's the "Safety First" Sign in buying Shirts and Overalls.



BRASS AND STRINGED INSTRUMENTS Biggest line of band and orchestra instruments for band and home use. Cornets, trombones, clarinets, drums, violins, guitars and all wind and stringed instruments. Send for a free catalog of any instrument you may want—we can save you money. We give you a fifty lesson certificate FREE with each instrument. Write today mentioning instrument in which you are interested.

JENKINS MUSIC HOUSE, 41 Jenkins Bldg., Kansas City, Mo.

ARROWS 10,000 ARROWS and SPEARS from 1/2 to 7 inches; cheap and rare. Every known **Wound Relic** found. All the kinds of Buckskin, Bead Work and Weapons of the Sioux, Elk Teeth and Gems. Wholesale and retail. Retail 22 page catalogue of Relics, 5c. Wholesale prices to dealers only, on request. 29th year. 2 story building full. Write now.

L. W. STILWELL, Deadwood, S. D.

THIS 1914 Model 30 DAYS Free Trial

Ranger

EXTRAORDINARY OFFER—30 days (one month's) free trial on this finest of bicycles—the "Ranger." We will ship it to you on approval, freight prepaid, without a cent deposit in advance. This offer is genuine. **WRITE TODAY** for our big catalog showing our full line of bicycles for men and women, boys and girls at prices never before equaled for like quality. It is a cyclopedia of bicycles, sundries and useful bicycle information. It's free. **TIRES, COASTER-BRAKE** rear wheels, inner tubes, lamps, cyclometers, equipment and parts for all bicycles at **half usual prices**. A limited number of second hand bicycles taken in trade by our retail stores will be closed out at once, at \$3 to \$8 each. **RIDER AGENTS** wanted in each town and district to ride and exhibit a sample 1914 model Ranger furnished by us. **It Costs You Nothing** to learn what we offer you and how we can do it. You will be astonished and convinced. **Do not buy** a bicycle, tires or sundries until you get our catalog and new low prices and marvelous offers. **Write today.**

MEAD CYCLE CO., Dept. F-109, Chicago, Ill.

Boys' Own Toy Maker

Tells how to make a Talking Machine, Camera, Electrical Motor, Bicycle Boat, Canoe, Boomerang, Bobsled, Wind Mill, Microscope, Water Wheel and Motor, Stilts, Toboggan, Snow Coaster and Sail Boat, Telephone, Electric Bell, Railroad, Wind Mobile, Paddle Raft, Traps, Kites, etc. All 10c, postpaid.

J. C. Dorn, 707 S. Dearborn St., Dept. 84, Chicago, Ill.

GENUINE DIAMOND CUT
California Precious Gems
Solid Gold Tiffany Setting FREE

Sparkling White Topaz (looks and wears like diamond) Rubies, Peridot, Tourmaline, Aqua Mari, etc. All gems guaranteed genuine—money back if you want it. **FREE—Book "From The Mine to You"** describing many rare and beautiful California gems set in rings, pins, etc., from \$1 up.

MOQUI GEM CO., 317 So. Spring St., Los Angeles, Cal

Ruby for Your Name

To quickly introduce our dazzling blue white Maztec Gems (United States Letters Patent) and to distribute our beautiful art catalog, "The Story of the Maztec Gem." We will, for only 2 two cent stamps to cover cost of mailing, send you free a genuine uncut Navajo Ruby bought from the Navajo Indians together with our low cost-price offer for cutting and mounting. Write today—now. (Sellers of Genuine Gems since 1902.)

FRANCIS E. LESTER CO., Dept. P68, Mesilla Park, New Mexico

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

DIAMONDS-WATCHES ON CREDIT



MEN'S 12 SIZE THIN MODEL WATCH, 17 JEWELS, ADJUSTED, ILLINOIS, ELGIN, HAMPDEN, or WALTHAM movement.
Warranted accurate. Finest gold strata case, guaranteed 25 years; engraved, engine turned, plain polished or your monogram engraved FREE. Eighty per cent of all men's watches sold today are these neat open face Thin Models. At our Special Sale price of \$18.95, with monogram engraved free, this watch has no "running mate" in the world. Sent all charges prepaid on **30 DAYS FREE TRIAL THEN \$2.00 A MONTH** If not satisfactory, return at our expense.

These Diamond Rings are the famous Loftis "Perfection" Supreme 14k solid gold mountings. Finest pure white diamonds. CREDIT TERMS: One-fifth down, balance divided into eight equal amounts, payable monthly. Sent prepaid on approval. Write for free Catalog, containing over 2,000 illustrations of Diamonds, Watches, Jewelry, etc. It tells all about our easy credit plan. Local Representatives wanted.

LOFTIS BROS. & CO., Diamond Merchants,
Dept. A 871 100 to 108 N. State St., CHICAGO, ILL.
Branch Stores: Pittsburgh, Pa., and St. Louis, Mo.



No. N75

Guaranteed 25 Years

TYPEWRITERS ALL MAKES

Visible Writers or otherwise
L. C. SMITHS, UNDERWOODS, OLIVERS, Etc.
4 to 1/2 MFRS. PRICES

Shipped ANYWHERE for Free Trial, or RENTED, allowing RENT TO APPLY.

PRICES \$15.00 UP First class Machines. Full Guarantee. Write for Illustrated Catalog 102, Your opportunity.

TYPEWRITER EMPORIUM, (Est. 1892) 34-36 W Lake St., Chicago

Be Your Own Boss

Do as many others have—
Operate a Kingery Peanut Roaster and Corn Popper. Over 40 styles. Liberal terms, excellent profits. Kingery's book of possibilities and No. 45 catalog tell you all about it.

KINGERY MFG. CO., 450 Pearl Ave., Cincinnati, O.

BUY PLUMBING and HEATING SUPPLIES

at **WHOLESALE** Will Save You **30%**

Don't pay retail prices. Full stock on hand for prompt shipment. Send for free catalog.

B. E. KAROL, 768 to 772 W. Harrison St., CHICAGO

EVERYTHING in Guaranteed Plumbing and Heating Supplies

at wholesale. Our \$200,000 establishment behind our Guarantee. Send for complete CATALOG 71.

J. HARDIN COMPANY, 30 years at 4531-33-35-37-39-41 Cottage Grove Avenue, CHICAGO

Sears, Roebuck and Co.'s Masterpiece of Value

THE HARRIS VISIBLE TYPEWRITER

\$39⁸⁰

The Harris Visible Typewriter is beyond question the greatest merchandising victory we have ever won.

The Harris is standard in size and shape—is equipped with Universal keyboard, two sets of shift keys, shift lock, release key, tabulator, back spacer, marginal release, 11-inch carriage, writes a line 9 inches long.

Hundreds of Harris Visible Typewriters have replaced other standard makes throughout our plants.

At \$39.80 we believe it is, the greatest typewriter value in America.

Compare it with any other make, regardless of price, and judge the value we are offering.

Write today, requesting Typewriter Catalog No. 83P92, which describes every detail and quotes liberal time payment terms.

Sears, Roebuck and Co., Chicago

We will gladly send you a Harris for 30-day trial and return your money if you are not satisfied with your purchase.



BUSH & GERTS PIANOS AND PLAYERS

Quality — Tone — Permanence — Beauty

One price to everybody.

To us, a piano is too noble an instrument, and our name as old established manufacturers, too honorable, to be dragged in the mire of fake puzzles, "slightly worn" sales, fake stencils and other forms of deception.

One Name—One Trade Mark—One Quality—One Price

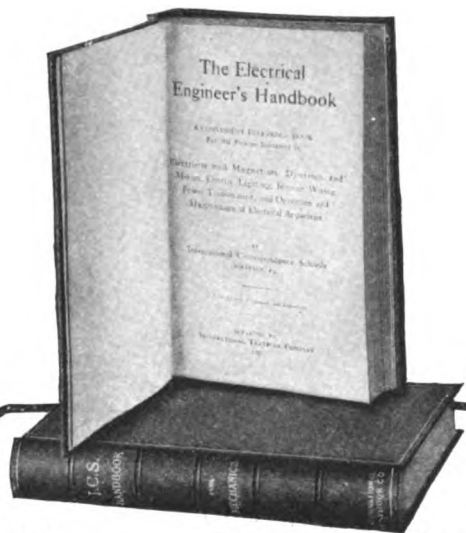
But a fine line of styles of wood and finish.

BUSH & GERTS PLAYER PIANOS

are up to the high standard of our Pianos. Our illustrated Catalog describes both lines. Send for it.

BUSH & GERTS PIANO CO.
W. S. Miller, Vice-Pres. and Mgr. Weed and Dayton Sts., CHICAGO, ILL.





These Handbooks Will Help YOU

When a puzzling formula, an elusive table, or some other equally necessary piece of information slips out of your memory—then it is that one of these little encyclopedias demonstrates its worth. They are written by the well-known textbook writers of the International Correspondence Schools and are so thoroughly indexed that you can turn instantly to any rule, formula, or other information you need. Here is a brief table of the contents of one of them:

ELECTRICAL ENGINEER'S.—Mechanics; electrical units; physical and electrical properties of metals and alloys; temperature for copper wires; wire gauges; magnetism; dynamos and motors; electric batteries; alternating current apparatus; alternators; transformers; wattmeters; electric transmission; electric lamps; wiring; electric heating and welding; electromagnets; controllers; car wiring; etc., etc., etc. The others are equally complete.

Special Offer: For a limited time we are selling shown here in the twenty-two titles listed below, durably bound in silk cloth, averaging approximately 375 pages and 175 illustrations, at a special price for each handbook of only **50c**

International Textbook Company Box 1102-G, SCRANTON, PA.

I enclose \$_____ for which please send me the books BEFORE which I have marked X.

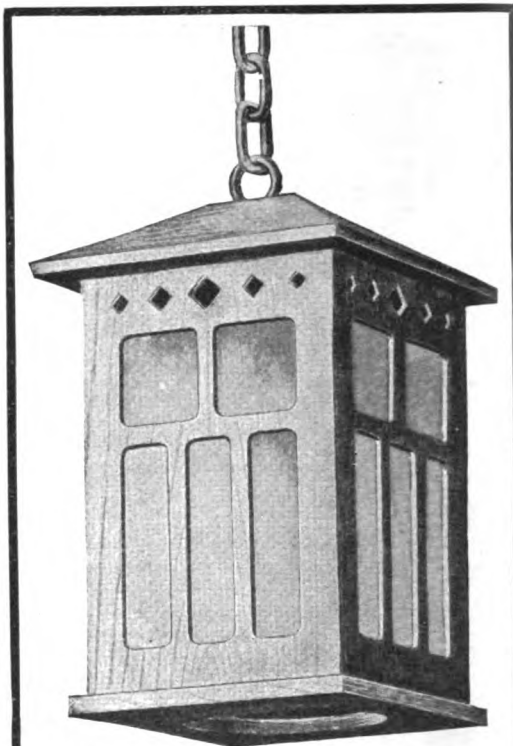
- | | | |
|--|---|---|
| <input type="checkbox"/> Mechanics' | <input type="checkbox"/> Mariners' | <input type="checkbox"/> Poultryman's |
| <input type="checkbox"/> Elec. Engineer's | <input type="checkbox"/> Business Man's | <input type="checkbox"/> Salesman's |
| <input type="checkbox"/> Building Trades | <input type="checkbox"/> Plumbs. & Fitters' | <input type="checkbox"/> Farmer's |
| <input type="checkbox"/> Advertiser's | <input type="checkbox"/> Concrete Engi- | <input type="checkbox"/> Window Trimmer's |
| <input type="checkbox"/> Steno. and Corr. | <input type="checkbox"/> ners' | <input type="checkbox"/> Chemist's |
| <input type="checkbox"/> Bookkeeper's | <input type="checkbox"/> Steam Engineer's | <input type="checkbox"/> Civil Engineer's |
| <input type="checkbox"/> Tel. & Tel. Engi- | <input type="checkbox"/> Automobile | <input type="checkbox"/> Cot. Tex. Worker's |
| <input type="checkbox"/> neers' | <input type="checkbox"/> Coal Miner's | <input type="checkbox"/> West. Air Brake |

Name _____

Street and No. _____

City _____ State _____

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Make Artcraft Electric Lamps

This Book Will Show You How

A splendid series of designs with complete directions for building the different type lamps that are used in a home—from the hall lamp shown above to a complete chandelier.

These lamps are very attractive, employing wood, art glass and metal in their makeup; still their construction is so simple as to require only ordinary tools and workmanship.

Also contains general directions for working copper and brass with a design for a hammered copper table lamp.

Clear, concise instructions and large working drawings are features of this book.

Twenty-Five Cents
Popular Electricity Book Dept.

350 N. Clark St., Chicago, Ill.

"I believe it to be the best medium-priced Cornet ever produced and that it is fully equal to the majority of high-priced instruments of other makes."
Jules Levy, Jr.

LYON & HEALY 50 years the leading house

American Professional **CORNET \$30**

Made in the U. S. from the crude metal to the finished product. The latest word in cornets. The perfect realization of the best American workmen's conception. Superb tone. Outselling all competitors. Sent on Free 6 days' trial. Our Big New Band Catalog now ready. Contains remarkable values in hundreds of styles of instruments. Write for copy. (202)
LYON & HEALY, 37-43 E. Adams St., Chicago



Rider, be our representative in your town

Earn \$40.00 Per Week

Get our **FREE CATALOG** and compare prices with your local dealer. Introduce our electric bicycles and our wonderfully improved everlasting puncture proof tires \$10.00. Sample pair \$5.00. Guaranteed one year.

PARK ROW MOTORCYCLE CO., Dept. A33, No. 26 Vesey St., New York
 Largest Eastern Supply House

INSECTS

butterflies, etc. **WANTED.** Big prices paid. All have cash value. Hundreds bring \$1.00 to \$10.00 each. rarities fetch enormous prices. I sell them to colleges and rich men for collections. Simple, interesting. Men. Women. Get market prices, valuable information. **JAS. SINCLAIR, ENTOMOLOGIST, Dept. 41, Los Angeles, Cal.**

Boy Electrician with 78 illustrations for making Batteries, Dynamos, Motors, Telegraph apparatus, Telephone, Lights, Bells, Alarms, Cols, "Wireless" Current Reverser, Electric Engine, Etc. By Electrical Experts so that anyone can understand it. With Cat. All 4 Co Paid.
J. C. DORN, 705 So. Dearborn St., Dept. 49, Chicago, Ill.

START A MAIL ORDER BUSINESS 30 new propositions. No competition. Make 95c profit on dollar orders. Complete plans, 10 cts. Mail Dealers Wholesale House 632 Franklin Bldg., Chicago

TANGO WALTZ learn to dance the tango without an expensive instructor. You can learn easy with our instructions and diagrams; postpaid 25c.
SUN BOOK CO., Dept. P. E., Harrison, Mich.

WHITE VALLEY GEMS LOOK LIKE DIAMONDS

Stand acid and fire diamond test. So hard they easily scratch a flint and will cut glass. Brilliance guaranteed 25 years. Mounted in 14k solid gold diamond mountings. See them before paying. Will send you any style ring, pin or stud for examination—all charges prepaid. No money in advance. Money refunded if not satisfactory. Write today for free catalog.
WHITE VALLEY GEM CO., 742 Wulsin Bldg., Indianapolis

PRINCE ALBERT the national joy smoke

Think Man— This Business for YOU

ANSWER this little ad—send no money—investigate this quick profit, easy, independent business. You can start at once. Own it permanently. Be your own boss.

\$50 Per Week Making Photos on Post Cards
 —Everybody's getting them. Most popular. Control your locality.

No Experience Necessary— Write at Once

Work only part or all your time. Many making more than \$50 a week. Why not you? Investigate this wonderful new business.



One Minute Camera

Press the Bulb

Makes big money Everywhere. No plates, film, printing or dark room.

Remember it costs you nothing to investigate. Address:

This camera delivers Photo Post Cards right on the spot. You make **500% Profit** every time you press the bulb.

Write a postal for complete proposition.

The One Minute Camera Co. Dept. 524, Rand-McNally Bldg. Chicago

The Brilliant Searchlight



Trouble Men's Attention

The Brilliant Search Light is just the light to locate trouble, no matter how stormy or dark the night. Being worn on the head it puts a bright light wherever you look, leaving hands free to perform all duties on the poles or in the ground. These lamps are used by some of the leading Electric Light and Power Companies, in high tension lines.

Style 1—Single lens, \$5. Dbl. L., \$6. Int. L., \$6.50.
 Style 2—Adjustable Candle Flame Burner, add 50c.
 Style 3—Adjustable Flat Flame Burner, add \$1.00.

THE NORTHWESTERN CLASP KNIFE

Opened with one hand, giving use of other. Blade is locked when open or closed. Length over all, 9 1/2 inches. Cutting edge 4 1/2 inches. Stag handle, weight, 4 ozs. Price, \$2.50. Postpaid.

Send for circular.
R. C. Kruschke, E 1006 Superior St., Duluth, Minn.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Books That Will Advance the Electrical Worker in Position and Pay



THE most practical collection of Books for the Electrical Worker ever published, having the highest endorsement of the INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS.

Don't overlook any opportunity of advancement through not being prepared for the job ahead. Help yourself now to books that will enable you to tackle anything in your line of work.

Modern Electrical Construction

By H. C. HORSTMAN and V. H. TOUSLEY.

This book treats almost entirely on practical electrical work. It uses the "Rules and Requirements of the National Board of Fire Underwriters" as a text, and explains by numerous illustrations and detailed explanation just how the best class of electrical work is installed.

It is a perfect guide for the beginning electrician and gives him all the theory needed in practical work in addition to full practical instructions.

340 Pages **PRICE \$1.50 POSTPAID**
173 Illustrations

Practical Armature and Magnet Winding

By H. C. HORSTMAN and V. H. TOUSLEY.

All practical armature windings are explained with special attention paid to details. All questions which are apt to arise in the minds of the electrician have been completely answered.

Numerous illustrations are shown, and these, taken in conjunction with the text, afford a ready means for either the study of the armature or as a book of reference. Various tables have been prepared especially for the work, and these will not only reduce to a minimum the number of calculations required, but lessen the possibility of errors.

The book is a most valuable aid to the electrician, either in the constructing or operating department.

231 Pages **PRICE \$1.50 POSTPAID**
Illustrated

Modern Wiring Diagrams and Descriptions

By H. C. HORSTMAN and V. H. TOUSLEY.

All elementary considerations have been omitted in this book to make room for "diagrams and descriptions" of just such character as workers require. Shows you how to wire for electric light and power, for call and alarm bells, for annunciators, burglar and fire alarms, telephone circuits, install and manage batteries, test circuits, locate "Trouble" and "Ring Out" circuits.

Gives all that ordinary electrical workers need and nothing that they do not need.

250 Pages **PRICE \$1.50 POSTPAID**
200 Illustrations

Electricians' Operating and Testing Manual

By H. C. HORSTMAN and V. H. TOUSLEY.

This book was written to instruct the practical electrical worker in the management, operation and testing of the more important electrical devices now in use. It is of particular value to a man in charge of a plant, as it will tell him how to install and operate all electrical devices, and what is more important, instruct how to readily locate and remedy any trouble that may occur.

The subject is covered thoroughly and it is all entirely practical.

360 Pages **PRICE \$1.50 POSTPAID**
Illustrated

Modern Illumination

By H. C. HORSTMAN and V. H. TOUSLEY.

Covers Electric Lighting from A to Z and is a practical guide for the electrical worker or contractor, containing all the information needed to the successful installation of good illumination.

It is the last word in illuminating science and construction—chock full of the information you want—written in a way you'll understand.

275 Pages **PRICE \$2.00 POSTPAID**
Illustrated

Money refunded on any of these books if you are not satisfied.

POPULAR ELECTRICITY BOOK DEPARTMENT
350 North Clark Street Chicago, Illinois



PURE WATER

is as essential to health as pure food. Filtering helps but does not insure against disease germs. Kill these germs and you are protecting yourself. Ozone sterilized water is **Free** from disease germs.

ASK YOUR PHYSICIAN

about the importance of pure water supply and if he be honest he will give you some startling facts as to the value of guarding your drinking water by some reliable purifying method.

THE HELD OZONE STERILIZER affords an inexpensive but thoroughly tested apparatus which, by the pressing of a button, causes the water you use to be filtered and sterilized. The apparatus can be used any place where there is a water faucet and electric current.

Booklet and particulars free

THE HELD COMPANY
11-17 S. Desplaines St. CHICAGO, ILL.

What the National Electric Light Association Members

are interested in is good lighting—that goes without saying—and that good lighting is the result of proper lighting fixtures also naturally follows.

New, snappy line is now ready for those who write for advance illustrations.



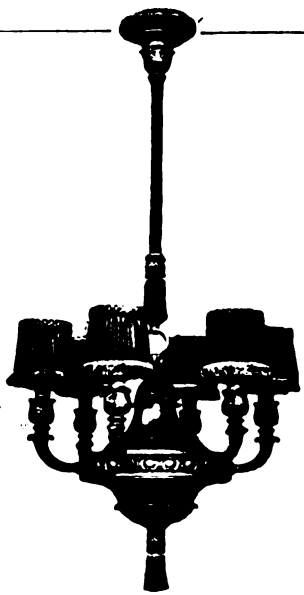
Resident Type Electric Fans

Residence type Electric Fan A. C. or D. C. current, silent running. Price \$9.50

delivered, prepaid anywhere in the United States.

We have all types of fans in stock. If interested obtain our Fan Catalog and best discounts.

Newark Electrical Supply Co.
We Sell Everything Electrical
281 Market St. Newark, N. J.



R. Williamson & Co.

Washington and Jefferson
CHICAGO

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

You can now get this large "YANKEE"

with spring in the handle to drive it back quickly
for the next push.

A quick and powerful tool for carpenters. Drives or draws most any wood screw in one-tenth the time of an ordinary driver. Takes all the Yankee attachments.

Your dealer sells the "Yankee"

Send for the "Yankee" Tool Book anyway

"YANKEE"
Quick Return
No. 131



NORTH BROS. MFG. COMPANY, Dept. Philadelphia, Pa.

Send for Booklet of 3000 Red Devils



If your dealer can't supply you send \$1.25 for sample 1950. 8 in. heavy Lineman's Plier

RED DEVIL TOOLS for ELECTRICIANS

Over 30 years manufacturing experience. Highest grade material obtainable. The best skilled labor the market affords, has made us the largest manufacturers of Linemans and Electricians Tools in the world.

SMITH & HEMENWAY CO.
159 Chambers St. New York City

This Vest Pocket Snip

Costs \$1.00
But

and is the handiest tool a man can have in his kit. It will cut 18 gauge, made of Jessops crucible tool steel and handsomely finished. If your dealer cannot supply you send your order direct to us.

BARTLETT MFG. CO., Boydell Bldg., Detroit, Mich.



Sell "Matchless" Gas Lighters

Lights any gas or gasoline. Price 50c. One agent made \$68.90 one day. Many others from \$15.00 to \$25.00.



Safe, convenient, cleaner and cheaper than matches. Send 25c for agent's sample and start now to Make Money Fast.

Steel Stamping Co., 145 W. Austin Ave., Chicago



Sometimes You Want to Cut Metal

Now and then you would find it very handy to be able to cut metal quickly and easily; to shorten a screw or bolt, for instance, or to shape out a piece of sheet steel for a repair job. You can do all this sort of work very handily with our new

STAR

Hack Saw Frame No. 1027

the frame with the "pistol grip." The shape of the handle gives you the grip you need to work easily and maintain perfect control of the frame. It's a big improvement over frames made with the usual straight handle. In other respects, too, this frame excels. Has reinforced, extensible back for blades from 8" to 12" and blades may be faced in four directions.

Ask your Dealer, who probably carries Millers-Falls Tools and the "pistol grip" Hack Saw Frame. If he doesn't, write us and we'll send you the name of a Dealer who can take care of your needs. New Catalogue on request.

Millers-Falls Co., Millers Falls, Mass.

Every Wireless Operator or Amateur Needs This Book

The handiest and most useful
Book for the Wireless Operator, Amateur
or Professional, ever published.



**AMATEUR'S
WIRELESS
HANDYBOOK**

What It Will Do for You

Contains a complete list of wireless Call Letters, 1500 in all, enabling you to locate the origin of any certain call immediately; also the owner of the station or ship and power rating.

The Morse and Continental Codes are shown on two large-full page charts so that they can be read from a distance, also a Beginner's Speed Chart so arranged to assist in learning the Codes quickly.

All the abbreviations used by operators to save time and labor. And last but not least over 100 Hook-ups and Diagrams. No matter what instruments you have you will find a perfect hook-up that works in this book. Blank pages are provided for keeping a record of your own hook-ups.

Price Twenty-five Cents

POPULAR ELECTRICITY BOOK DEPARTMENT
350 N. Clark St., Chicago, Ill.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

MARINE AERIAL


ROBERTS

AUTOMOBILE STATIONARY

The Motors That Never Backfire

In Which Motor Are You Interested?


The Roberts Motor Co., 401 Columbus Ave. SANDUSKY, OHIO



Best grade cedar canoe for \$20
Detroit canoes can't sink

All canoes cedar and copper fastened. We make all sizes and styles, also power canoes. Write for free catalog, giving prices with retailer's profit cut out. We are the largest manufacturers of canoes in the world.

DETROIT BOAT CO., 48 Bellevue Ave., Detroit, Mich.



CANOES, \$18 and up. ROWBOATS, \$18 and up. FISH AND HUNTING BOATS, \$18. KAYAK, \$18. BOATS FOR DETACHABLE MOTORS

MOTOR BOATS with or without engine, 16, 18, 20, 22 and 24 ft. Send for Free Catalog

THOMPSON BROS. BOAT MFG. CO.
93 Ellis Ave. PESHTIGO, WIS.

ELECTRIC Home, Store, Farm or Theater Lighting Plants. Wonderful Economy, Bicycle, Carriage, Hunting, Fishing, Necktie, Xmas Tree, Motorcycle, Motorboat, Auto, Musicians, Finger and Flash Lights, Motion Picture, Massage, Ozone, Shocking, Cautery and Tattoo Machines, Sewing Machine and Power Motors, Laundry Irons, Heating Pads, Belts, Storage Batteries, Transformers, Hydro Electro Dynamos, Water Wheels.

MOTION Picture Theater Complete Equipments Start You in the Most Profitable Business in America. Big Advantages. Small Audiences Pay. Railways, Dynamos, Engines, Telephones, Belts, Batteries, Catalog 3 cents.

OHIO ELECTRIC WORKS, D26 CLEVELAND, OHIO.

DO YOUR OWN WIRING

We supply all material and show you how to wire your home. Anyone can do it by our method.

Home Construction Co., Pt. Pleasant, N. J.



Voltamp Motors
"Little Dickie" Prepaid \$1.10

SPECIAL OFFER, 30 DAYS.

This perfect Motor with Switch and "Motor Hints" mailed anywhere in U. S. or Canada on receipt of \$1.10. Every boy and grown-up should have the new VOLTAMP Catalog.—just the book for the experimenter. Wireless, Telegraphs, Telephones, Motors, Dynamos, Transformers, Rectifiers, Miniature Railways and Parts, Raw Materials and hundreds of others. Sent only for 6c in stamps or coin. Largest Electrical Mall Order House in U. S.

Voltamp Electric Mfg. Co., Park Bldg., Baltimore, Md.



FOLDING CANVAS BOATS AND CANOES

Light, easy to handle, no bathhouse, leaks, or repairs. Safe anywhere, always ready, check as baggage, carry by hand. Safe for family, or bait casting standing. All sizes. Ribbed longitudinally and diagonally. Non-sinkable. Stronger than wood or steel. Used in the U. S. Navy and Army, and Canadian and Foreign Governments. Awarded First Prize at Chicago and St. Louis World's Fairs. We fit any of our boats for Outboard Motors. Catalogue.

KING FOLDING CANVAS BOAT CO. 663 Harrison St., Kalamazoo, Mich.

Modernize Your Country Home



Fairbanks-Morse Electric Light Plants

supply light that is clean, easy on the eyes, and absolutely safe. Fifty light set cares for every lighting need of club or large country home. An independent unit—includes Kerosene Engine, Dynamo, Switchboard and Storage Batteries. Easy to install—easy to care for.

Write for Catalog 22 D 1163.

FAIRBANKS, MORSE & CO.

Chicago New York San Francisco and Many Other Cities.

ELECTRIC LIGHT AND POWER

DAY AND NIGHT SERVICE
The Junior No. 1 Equipment

DIRECT CONNECTED DYNAMO, GASOLINE ENGINE SET, COMPLETE SWITCHBOARD, 16-CELL "AMERICAN" STORAGE BATTERY } \$265

The most complete, reliable equipment ever offered at this price. We want a representative in every county.

AMERICAN BATTERY CO.
Est. 1889 1143 Fulton St., CHICAGO

MULLINS STEEL BOATS CAN'T SINK



Built of heavily galvanized, tough steel, like Gov. Torpedo Boats, safe as Life-Boats—A coat of paint keeps them in commission—Guaranteed absolutely against puncture and leaking—Equipped with 4 or 2-Cycle Motors—Silent under water exhaust—Easily started and operated by beginners. Write today for beautiful free Motor Boat Book.

THE W. H. MULLINS CO., 193 Franklin St. The World's Largest Boat Builders Salem, O., U.S.A.

Cost Less - Last Longer than Wood Boats

GRAY MOTORS FOR BOATS



Engines of both 2-cycle and 4-cycle type for boats of all sizes. Material and workmanship absolutely guaranteed. We are largest builders of 2-cycle marine engines in the world and there are over 1000 dealers who sell Gray Engines and give Gray service. Write today for our three valuable books about Gray Motors and complete Motor Boats. **GRAY MOTOR CO.,** 694 Gray Motor Bldg., Detroit, Mich.

3 H.P. \$55 WITH COMPLETE OUTFIT

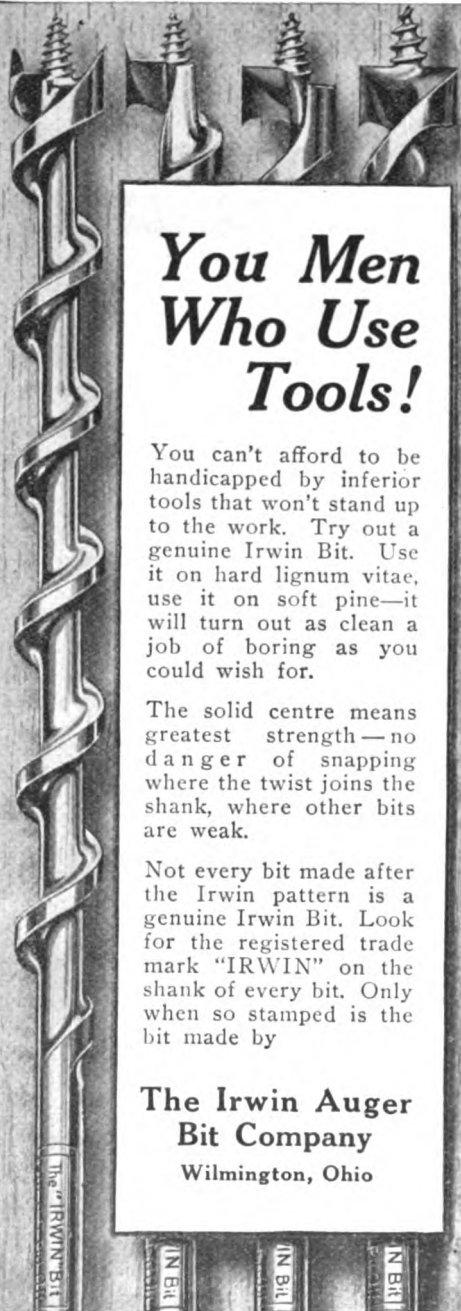
OTHER SIZES FROM 45 TO 30-45 H.P.—110 & UPWARDS

Do Your Printing!



Cards, circulars, books, newspaper. Press \$5, Larger \$18, Rotary \$60. Save money. Big profit printing for others. All easy, rules sent. Write factory for press catalog, TYPE, cards, paper, outfits, samples.

THE PRESS CO., Meriden, Conn.



You Men Who Use Tools!


You can't afford to be handicapped by inferior tools that won't stand up to the work. Try out a genuine Irwin Bit. Use it on hard lignum vitae, use it on soft pine—it will turn out as clean a job of boring as you could wish for.

The solid centre means greatest strength—no danger of snapping where the twist joins the shank, where other bits are weak.

Not every bit made after the Irwin pattern is a genuine Irwin Bit. Look for the registered trade mark "IRWIN" on the shank of every bit. Only when so stamped is the bit made by

The Irwin Auger Bit Company
Wilmington, Ohio

The IRWIN Bit
Reg. U.S. Pat. Office



Yours for the Asking

Write for a Copy
Mailed FREE on Request

It contains a lot of information about tools of all kinds. You'll find it handy. We'll gladly send you a copy without charge.

MATHIAS KLEIN & SONS
Canal Sta. 3 Chicago

The Latest On

House Wiring

By **THOMAS W. POPPE**
ELECTRICAL ENGINEER AND CONTRACTOR

Absolutely new and up to the minute, describing and illustrating all up-to-date methods of installing Electric Light Wiring according to the latest rulings of the National Board of Fire Underwriters. All systems of wiring are covered, including the three-wire system now so much in use. Practical diagrams and illustrations are given to show just how the work is done.

It Solves All Problems

FOR THE PRACTICAL WIREMAN OR AMATEUR and in fact contains all the essential information for the successful wiring of a building.

Among the subjects covered are—Planning and laying out the work—Locating the Meter—Meter Connections—Feed Wires—Switches—Plug Receptacles—Brackets—Ceiling Fixtures—Flexible Conduit System—Rigid Conduit System—Steel Armored Cable System—Knob and Tube System—Various Switching arrangements explained and diagrammed—The easiest method of testing Three and Four-way circuits explained and illustrated—Current carrying capacity of Wires—Etc.

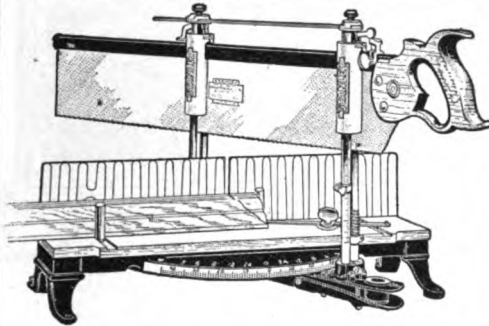
103 Pages, 74 Illus. Flexible Cloth Cover, Pocket Size

PRICE, FIFTY CENTS POSTPAID
Money refunded if not satisfactory

POPULAR ELECTRICITY BOOK DEPARTMENT
350 N. Clark St., Chicago, Ill.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Stanley Tools

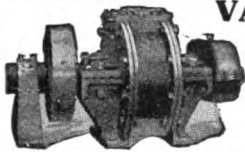


Stanley Mitre Box

These Boxes are compact, strong and durable; are quickly put together or taken apart for convenience in carrying; have the greatest strength with the least weight, and will do the widest range of work of any Mitre Box made.

Send for Catalogue No. 34L containing complete description Address

STANLEY RULE & LEVEL CO.
NEW BRITAIN, CONN. U.S.A.



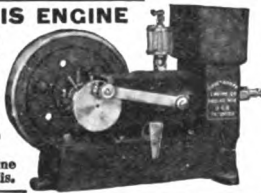
VACUUM PUMPS Tools, Hose and Parts

for cleaners, Electric or gasoline. For stationary house or wagon machines. Our pumps rugged, stand any wear. Assemble your own machine. Saves half. Dept. A.

VACUUM SUPPLY CO., Ann Arbor, Mich.

\$19.50 BUYS THIS ENGINE

Your boy wants this $\frac{1}{2}$ H.P. Gas Engine. Practical and reliable—operates with gas or gasoline. Will run small dynamo, lathe, drill, coaster wagon, cream separator or washing machine—useful and instructive. Price \$19.50 Write for circulars and prices on larger engines. Newkopp Engine Company, 1222 18th St. Racine, Wis.



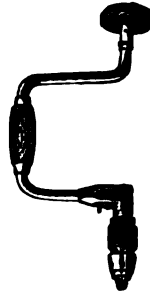
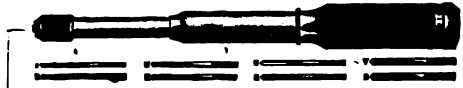
No. 1025

That Thin Nosed "RED DEVIL" still leads all slip joint pliers in popularity, practicability and durability. It's "RED DEVIL," No. 1025, 6 $\frac{1}{2}$ inches long, has a very thin nose and is a plier you will appreciate.

Ask your local dealer for it or any other "RED DEVIL" tool. We make over 3000 different tools for mechanics.

If you want to see a sample send us 50 cents and one pair only will be sent you postpaid.

SMITH & HEMENWAY CO., 105 Chambers St., New York, U.S.A.



Have you been dissatisfied with your tools? Have they failed to fulfill your expectations? Then why don't you try

Goodell-Pratt's

They are made for men who know and appreciate good tools. The mechanical principles are correct, and the materials are selected to give the longest wear. Sometimes they do cost a little more, but the extra value is there to more than repay you for the extra outlay.



Our Catalog shows 1500 tools. Write for it.



GOODELL-PRATT COMPANY

Toolsmiths

GREENFIELD, MASS., U. S. A.



NEW YORK OFFICE, 359 BROADWAY

FOR SIXTY-FIVE YEARS the firm of MUNN & CO. has conducted the largest patent practice in the country. We file thousands of applications for patents every year. Our system is so perfected that every case receives the best of attention and is prepared by experts who have had special training in handling every class of invention.

¶ **SEND SKETCH.** If you will send us a sketch, no matter how crude, we will give you a fair and candid opinion as to whether it is probable a patent can be obtained. All matters of this kind are strictly confidential and the description and sketches will be dated and placed in our secret archives for future reference. This service and our Hand Book on Patents are free if you will write us at once.

¶ **QUALITY.** The quality of our work has given us an unrivalled reputation among Patent attorneys and we are the recognized American attorneys for many leading Foreign Patent Solicitors. Our staff consists largely of examiners from the United States Patent Office, who are therefore familiar with the latest procedure and the best practice. Our draftsmen are all expert mechanical constructors who are able to show the invention in operative form.

¶ **FREE NOTICE.** All patents secured through our house receive a free notice in the *SCIENTIFIC AMERICAN*. No better or more economical method of introducing your invention to the attention of the public could be devised.

¶ **OUR OFFICES.** Our Washington office is located in our own building, near the Patent Office. This permits of our attorneys making special oral arguments with the Patent Office Examiners—an advantage not enjoyed by local attorneys.

¶ We are prepared to conduct Interference Proceedings, Infringement Suits, give Validity Opinions, draw up contracts and attend to all branches of legal work connected with patents, Trade Marks, etc.

¶ We do not offer prizes or other specious inducements, but rely upon our recognized reputation of over half a century. Our fees are as low as is consistent with good work.

WASHINGTON OFFICE
625 F Street, N. W.
Washington, D. C.

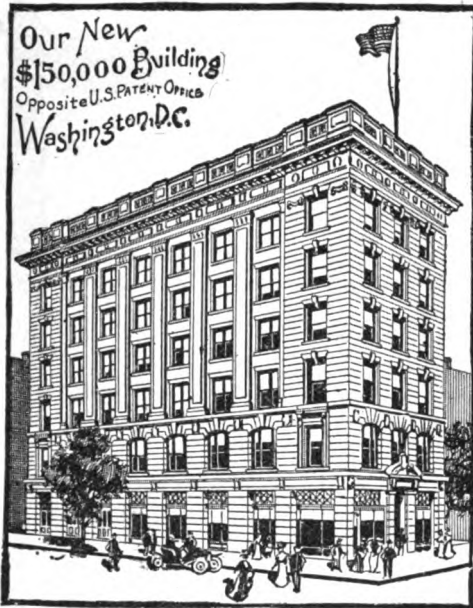
MUNN & CO., Attorneys
367 Broadway, New York, N. Y.



WASHINGTON OFFICE

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

PATENTS



TRADEMARKS AND COPYRIGHTS SECURED OR FEE RETURNED

Send model or sketch and description of your invention for free search of the U. S. Patent Office Record.

Our **FOUR BOOKS** mailed free to any address. Send for these books; the finest publications ever issued for free distribution.

HOW TO OBTAIN A PATENT. Our Illustrated 80 page Guide Book is an invaluable book of reference for inventors and 100 mechanical movements illustrated and described.

FORTUNES IN PATENTS. Tells how to invent for profit and gives history of successful inventions.

WHAT TO INVENT. Contains a valuable list of inventions wanted and suggestions concerning profitable fields of invention. Also information regarding prizes offered for inventions, among which is a Prize of One Million Dollars offered for one invention and \$10,000 for others.

PATENTS THAT PAY. Contains letters from our clients who have built up profitable enterprises founded upon patents procured by us.

LIST OF PATENT BUYERS. Personal requests and letters from manufacturers and promoters for patents secured by us and suggestions of new ideas they wish to purchase.

We advertise our clients' inventions free in a list of Sunday newspapers with two million circulation and in the World's Progress. Sample copy free.

Electrical Cases a Specialty. We have secured many important electrical patents.

VICTOR J. EVANS & CO.

Victor Bldg., 724 9th St. N. W., WASHINGTON, D. C.

PATENTS

NO ATTORNEY FEES UNTIL PATENT ALLOWED

Send Sketch for FREE REPORT. FREE BOOKS.

FRANK FULLER, Washington, D. C.

PATENTS

C. L. PARKER
Formerly Member Examining Corps, U. S. Patent Office.

PATENT LAWYERS
12 McGill Bldg., WASHINGTON, D. C.

Patents, Trade Marks, Copyrights, Patent Litigation Handbook for Inventors, "Protecting, Exploiting and Selling Inventions" sent free upon request.

PATENTS

THAT PROTECT AND PAY

BOOKS, ADVICE, SEARCH AND LIST OF INVENTIONS WANTED } FREE

Send sketch or model for search. Highest References. Best Results. Promptness Assured.

WATSON E. COLEMAN, Patent Lawyer
622 F Street, N. W. Washington, D. C.

WANTED-IDEAS

Manufacturers are constantly writing me for new ideas protected by OWEN PATENTS. Send for my free literature and read their wants.

FREE! Three finest patent books published! 72-page guide "Successful Patents"; "Stepping Stones" (containing list of over 200 inventions wanted; tells the plain truth about prizes, reward offers, etc.) and "Patent Promotion" (tells how to sell your rights; chief causes of failure, etc.) All sent free upon request.

Very highest references. I help my clients sell their patents or dispose of their applications. Advice free. No obligation incurred by writing me. Free manufacturing facilities. I secure patent or no fee. No charge for report as to patentability, practicability, etc.

RICHARD B. OWEN, 6 Owen Bldg., Washington, D. C.

Any Electrical Book on the Market

Can be obtained through our Book Department. Tell us your wants

POPULAR ELECTRICITY PUBLISHING CO.
350 N. Clark Street, Chicago, Illinois

100 Things To Make and 20 Electrical Experiments

Are Contained in Our New Book

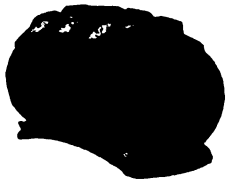
How to Make Things Electrical

Complete detailed directions with careful drawings for building Motors, Dynamos, Toasters, Coils, Transformers, High Frequency Apparatus, and a wide range of other devices.

200 Pages \$1.50 Postpaid. 184 Illustrations.

Popular Electricity Book Dept.
350 N. Clark St., Chicago, Ill.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



One Motorcycle Tire

**Holds Every World's Record
Dominates in Sales
And Equips ¾ of All the
New Machines**

It is built by Goodyear—built just the same as Goodyear automobile tires, which have won top place in Motordom. Consider that—one maker holds the leading place both in motor car and Motorcycle tires, despite tremendous rivalry. In three years Goodyears have gained topmost place in Tiredom. And the only reason lies in super-service proved by millions of these tires.

Why Take a Risky Chance?

Rival makers, of course, must say, "Our tires are as good as Goodyears." But look at the evidence.

How is it that Goodyears won all the world's records in speed and durability tests?

How is it that Goodyears, in the test of time, came to outsell all others?

Why is it that three-fourths of all the 1914 motorcycles come out with Goodyear equipment?

And look at automobiles. Those tires must also stand fearful strain and grind. And most users meter their mileage. Goodyears in that field have outruled all others. Now they have won in both fields by giving most of what you desire in a motorcycle tire.

GOOD YEAR
AKRON, OHIO
Motorcycle Tires

Then why take chances? No tire, in any way, offers more than Goodyears. You pay no more for Goodyears than for other standard makes. No good tire costs you less. And the verdict of users—the final verdict as shown by sales—is that Goodyears are best. Made with a double-thick anti-skid tread. Made by a patent method to prevent tread separation. Made to hold forever the place they hold today.

There is a Goodyear dealer in your town. Ask us for his address—also for our book which pictures and describes the making of Goodyear tires.

The Goodyear Tire & Rubber Co.
Akron, O.

Toronto, Canada London, England Mexico City, Mexico
Branches and Agencies in 108 Principal Cities
Dealers Everywhere

Write Us on Anything You Want in Rubber
(1535)

TULC

BALL BEARINGS

A company manufacturing ventilating machinery, using ball bearings, has adopted TULC as their standard lubricant for all machinery they put out. They found TULC superior to all other lubricants running under the same conditions and that it had a longer life. Another reason was that it will never harden or carbonize under any condition.

THE UNIVERSAL LUBRICATING CO.
SCHOFIELD BUILDING CLEVELAND, OHIO

NEVERLEAK

**Prevents
Tire Troubles**

Make your tires leak proof—cut out those expensive repairs, those hold-ups from flat tires. Inject into each tire a tube of NEVERLEAK Tire Fluid—the one reliable, time-tested preparation, used for eighteen years by thousands and thousands of riders.

Reduces Expense

NEVERLEAK saves you money. It heals punctures instantly while you are riding, doing away with costly plugs. It preserves the rubber, adding years of life to your tires. A 4-ounce tube protects a tire until it finally wears out. Easily injected by means of handy tubes, 25c each. Sold everywhere by dealers and repair men.

BUFFALO SPECIALTY CO.
Buffalo, N. Y.

The Truth About Two-Speeds

The riding season of a Two-Speed year has opened up with the roads alive with over 30,000

Indian TWO-SPEED MOTORCYCLES

MOTORCYCLING interest centers today in the Two-Speed gear. Old riders—new riders—engineers—manufacturers—all are giving their most extensive consideration to the Two-Speed device. It has suddenly acquired a universal acceptance as a true advancement in motorcycle construction.

But Two-Speeds are not new to the Indian—they are not a novelty—not a 1914 feature to be exploited.

The Indian advocated Two-Speeds long before other manufacturers had begun to realize their possibilities.

Our five years' experience in Two-Speed construction—season after season of road use and test—has made a practical piece of mechanism with all the mechanical fallacies eliminated.

Widespread demand has created quantity production, reducing manufacturing cost to a margin below average, and has made it possible for you to purchase a Two-Speed 7 H. P. Indian Twin for \$275.00, F. O. B. Factory.

The Indian Two-Speed is the supreme type of motorcycle. It conquers any road. Will start from a standstill on any rideable grade. Takes a hill like a bird. Increases wonderfully the flexibility and pull of the motor. Throttles down to a walking pace in congested traffic.

The Indian Two-Speed Gear is a certainty. You should be satisfied with nothing less than a known and proven mechanical achievement.

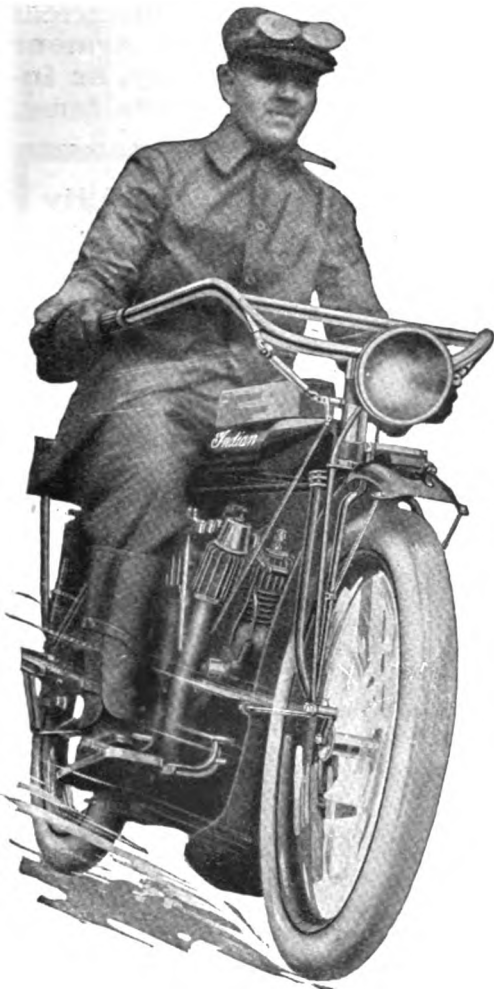
1914 Catalog Ready

HENDEE MANUFACTURING CO.
878 STATE ST., SPRINGFIELD, MASS.

(Largest Motorcycle Manufacturers in the World)

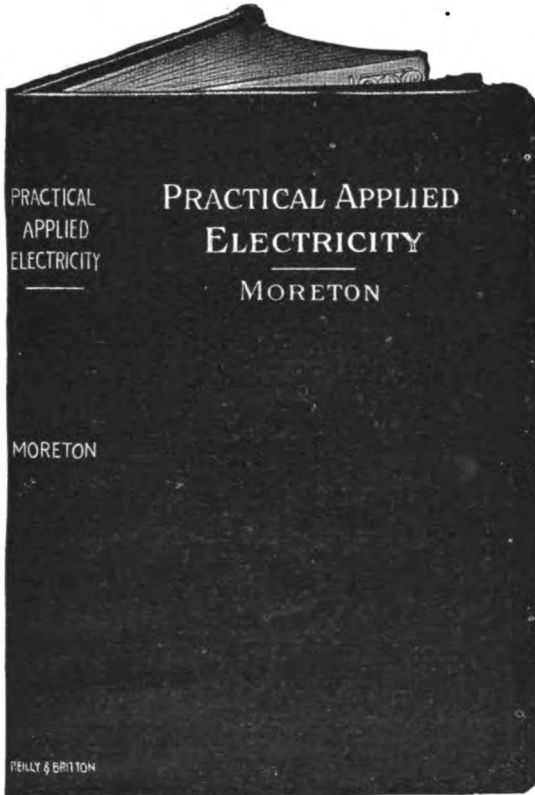
Branches and Service Stations:

Chicago Dallas Kansas City Minneapolis Denver
San Francisco Atlanta Toronto Melbourne London



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

Learn Practical Electricity From This Book



Practical Applied Electricity

By DAVID PENN MORETON, B. S. E. E.

A Complete Course In Applied Electricity

Covering every line of electrical work as taught in the Armour Institute of Technology, an institution of world wide fame.

Practical Applied Electricity is the outgrowth of actual work combined with classroom experience. The author is Associate Professor of Electrical Engineering at the Armour Institute of Technology. Most of the students taking the electrical

course attend the evening classes, being employed at electrical work through the day. The problems which confront these students are embodied in this book—one reason for its being so practical and up-to-date. To illustrate this valuable information, careful detailed drawings have been made under the personal supervision of the author. In plain words, this book contains the experience of a large number of ambitious electrical workers, gathered together by a recognized authority on the subject.

The language is so plain, and the mathematics so simple that no one can fail to understand. Questions and answers given at the end of each chapter, impress upon the mind of the reader the more important points to be remembered.

Subjects Covered:

The Electrical Circuit and Electrical Terms Explained by Means of the Water Analogy; Ohm's Law; Series and Divided Circuits Calculation of the Resistance of Various Circuits and Conductors; Primary Batteries; Dry and Wet Cells; Voltage; Internal Resistance and Polarization; How to Renew; Series and Parallel Connections; Tables of Data of Commercial Types of Cells; Magnetism; Permanent Magnets; Electromagnets. The Magnetic Circuit and Quantities Involved; Magnetic Properties of Various Materials; Magnetic Calculations; Instruments; Construction of Various Types of Ammeters, Voltmeters, Wattmeters, Galvanometers, etc.; Calibration of Instruments; The Dynamo; Fundamental Principle; The Magnetic Field; Commutation; Armature Reaction; Characteristics of the Series, Shunt and Compound Types of Generators; Motors, Fundamental Principle; Various Types and Their Application to Different Kinds of Work; Motor Speed Control; Variable Speed Motors; Railway Motors; Elevator Motors,

etc.; Storage Battery; Fundamental Principle; Commercial Types; Application; Care of; Systems of Power Distribution; Two and Three Wires; Balancers; Motor Generator Sets, etc.; Practical Operation of Electrical Machinery; Connections in Series and Parallel; Motor and Generator Troubles; How to Locate and Remedy Them; Electrical Lighting; Various Types of Incandescent and Arc Lamps; Application of Various Types; Photometry of Lamps; The Nernst Lamp; Moore Tube; Mercury Vapor Lamp; Electrical Wiring; Calculation of Conductors; How to do Exposed Moulding and Conduit Work; How to Install and Connect Heaters, Motors, Generators, Fixtures, Arc Lamps, etc.; Wiring Tables for Different Classes of Work; Alternating Current Circuit; Comparison of the Direct and Alternating Current Circuits; Quantities Involved; Series and Divided Circuits; Measurements of Power; Alternating Current Generators and Motors; Resuscitation; Numerous Miscellaneous Reference Tables

450 PAGES 323 ILLUSTRATIONS
BLACK FLEXIBLE LEATHER BINDING

Price \$2.00 Postpaid

Examination Offer—Send in your order today, and if after looking over this book you find that it is not what you desire, we will refund your money upon its return to us, within 10 days. All interested in electricity, old or young, artisan or amateur, expert or experimenter, should own this absolute authority.

POPULAR ELECTRICITY BOOK DEPT., 350 N. Clark St., Chicago, Ill.

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



They Started Equal

The Difference Is Training

These two men like thousands of others, started side by side at desks in a row — *equal*.

One stood still. Today he's just a little older, a little more discouraged — but right where he started.

The other, with just the same opportunity, has grown to a position of command and big pay.

The only difference is training.

Every one of the men who worked at his side had exactly the same opportunity; just as much spare time; just as much natural ability.

But he had the *pluck to start and determination to win.*

Go where you will, you will find thousands of such men who have risen from the ranks to positions as Superintendents, Managers, Engineers, Contractors, Owners, solely through the help of the International Correspondence Schools.

It is just the same with you. You too can increase your earning power just as fast and just as far as you have the courage to.

It makes no difference what you are doing; how old you are or where you live.

For the International Correspondence Schools will bring right into your own home all the help you need to train in a little spare time for whatever position you mark on the attached coupon.

Take the first step today!

Mail the Coupon! Now!

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 1102-P, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for a larger salary and advancement to the position, trade, or profession before which I have marked X.

Electrical Engineering
 Electric Lighting
 Electric Railways
 Electrician
 Electric Car Running
 Dynamo Foreman
 Wireman
 Mining Engineer
 Tel. and Tol. Engineer
 Surveyor
 Civil Engineer
 Automobile Running
 Agriculture

Mechanical Engineer
 Mechanical Draftsman
 R. R. Construction
 Concrete Construction
 Architect
 Contracting and Building
 Architectural Draftsman
 Plumbing and Heating
 Chemist
 Bookkeeper
 Advertising Man
 Civil Service Exams.
 Salesmanship

Name _____

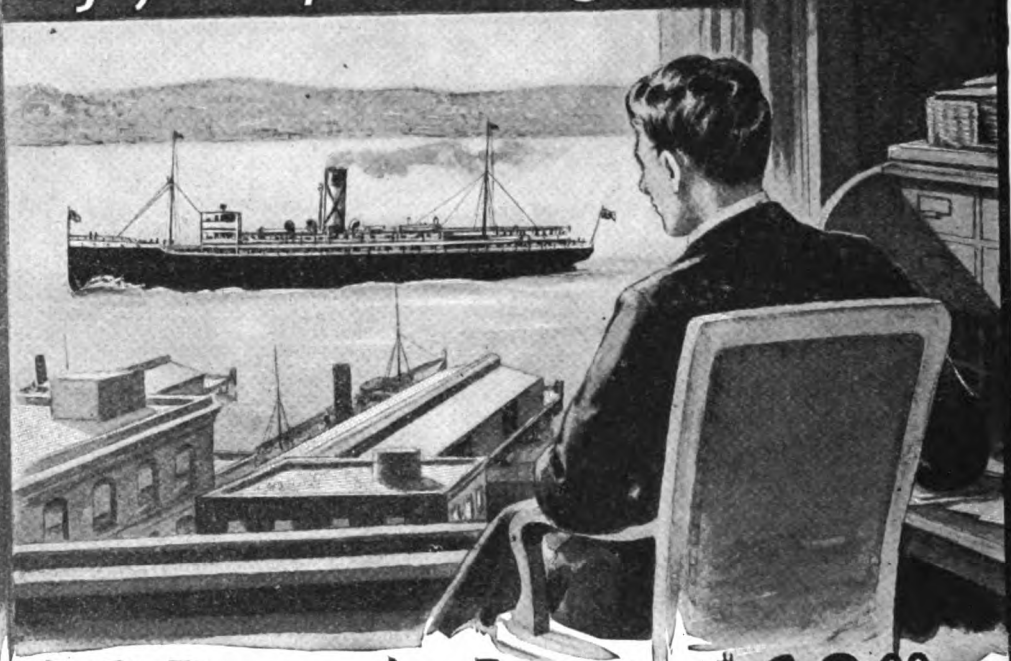
St. and No. _____

City _____ State _____

Present Occupation _____

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.

"Enjoy a trip to Foreign America"



12 DAY ALL EXPENSE \$60⁰⁰ UP
NORTHERN CRUISE

Seeing the Wonderful Northlands and Foreign America

including all essential expenses, visiting HALIFAX, NOVA SCOTIA, the land of Evangeline, and ST. JOHNS, NEW-FOUNDLAND, the Norway of America.

This cruise to these foreign lands on the new steamships "STEPHANO" and "FLORIZEL" of the

Red Cross Line

will prove the most novel, delightful and health-giving vacation you ever experienced. The foreign cities of Halifax and St. Johns, with the beautiful Nova Scotia and grand Newfoundland scenery, are sights never to be forgotten.

The ships are built especially for tourists; are fitted with every mod-

ern device to insure safety and comfort.

Splendid cuisine, orchestra and sea sports. You spend 7 days at sea and 5 days in port, giving ample time for sight-seeing. No hotel bills or transfers. You live on the ship. Send now for handsome booklet 64

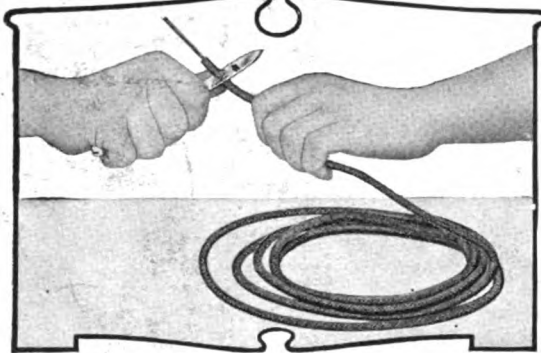
Reduced rates for superior accommodations in May and June.

BOWRING & CO., 17 Battery Place, New York

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Pocket Knife
No. K0478. 3 blades
Price \$1.00



An All Around Good Knife

You'll never use anything but a Keen Kutter pocket knife once you've tried one. For your pocket or your kit, you never did own a knife like a Keen Kutter. The edge it will take and hold, the snap in the springs, the stay-fast handles and the workmanlike appearance of a



Automatic Stropper
with Strap
No. K600. Price \$1.00



Pocket Knife
No. K618. 3 blades
Price \$1.00

KEEN KUTTER

pocket knife will tell you that it's the knife for you, every time. Keen Kutter pocket knives, like the Keen Kutter Junior Safety Razor, are sold with the express understanding that the dealer is authorized to refund the money if they fail to make good.

*"The Recollection of Quality Remains
Long After the Price is Forgotten."*

Trade Mark Registered.

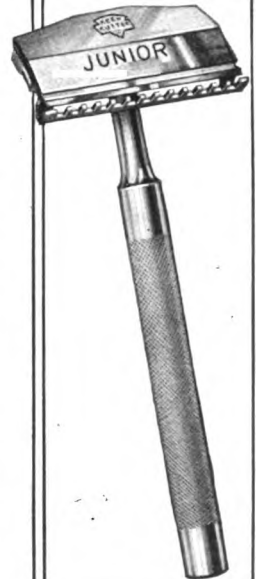
—E. C. SIMMONS.



If not at your dealer's, write us.

SIMMONS HARDWARE COMPANY

St. Louis New York Philadelphia Toledo
Minneapolis Sioux City Wichita



Keen Kutter Junior Safety
Razor No. KJ10 with
extra package of blades
and case. Price \$1.00

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



My Boy! Here's Your Chance

It's more than a chance—you can make it a certainty because it depends entirely upon yourself. It's your opportunity to rise to one of the countless positions open to the trained man and obtain a trained man's salary.

The man who sits in his private office and "hires and fires" and lays out your work, was no more qualified to fill that position a few years ago than you are to-day. He saw **his chance** and made the most of it. He obtained his training and knowledge by study. You can do the same—the American School will help you.

You don't want to remain in the "time-clock and dinner-pail" class all your life—don't be satisfied with just a common job at small pay. Show the boys at the shop that you have it in you to advance—you owe it to yourself and to your family.

Don't be afraid to mail the coupon, you won't be bothered by agents or collectors. Like all strictly educational institutions the American School depends, for growth, upon reputation and the success of its students.

Don't let a little thing like filling in and mailing a coupon stand between you and success, congenial work and more pay. **Accept your chance to-day.**

WE HELP MEN HELP THEMSELVES

American School
of Correspondence, Chicago, U.S.A.

Your Opportunity Coupon

Check the course you want and mail the coupon now

American School of Correspondence, Chicago, U.S.A.

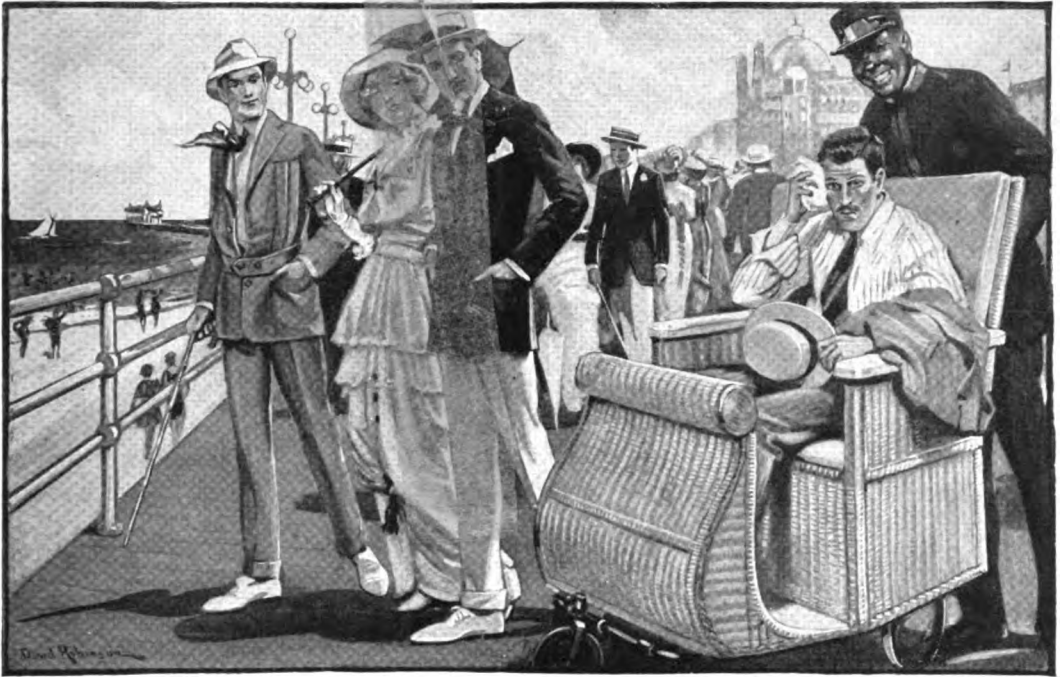
Without any obligation on my part please send me your Bulletin and advise me how I can qualify for the position marked "X." P. E. 6-14

- | | |
|-------------------------------|--------------------------|
|Electrical Engineer |Lawyer |
|Elec. Light & Power Supt. |Bookkeeper |
|Electrical Wireman |Stenographer |
|Telephone Expert |Private Secretary |
|Architect |Accountant |
|Building Contractor |Cost Accountant |
|Architectural Draftsman |Cert'fd Public Acc't |
|Structural Draftsman |Auditor |
|Structural Engineer |Business Manager |
|Concrete Engineer |Fire Ins. Inspector |
|Civil Engineer |Fire Ins. Adjuster |
|Surveyor |Fire Ins. Expert |
|Mechanical Engineer |Moving Picture Op'r |
|Mechanical Draftsman |Sanitary Engineer |
|Steam Engineer |Irrigation Engineer |
|Municipal Engineer |Textile Boss |
|Gas Engine Engineer |College Preparatory |
|Gas Tractor Engineer |Auto. Mechanician |

NAME

ADDRESS

For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



“Look, What a Grouch!” He Hasn’t B. V. D. On.

SUN aflame—coat on arm—handkerchief in hand—head drooping—brow dripping—spirits low—nerves “on hair-trigger”—how hot *he* is without easy-breezy B. V. D.—literally “rolling in discomfort.”

They swing along, unmindful of the heat, heads high, eyes bright, bodies cool, minds clear, muscles taut and faculties alert. *You*—on with B. V. D. and *feel and look* cool. Stop at the first store you come to and say, “I want B. V. D.”



For your own welfare, fix the B. V. D. Red Woven Label in your mind and make the salesman *show* it to you. If he can't or won't, *walk out!* On every B. V. D. Undergarment is sewed



(Trade Mark Reg. U. S. Pat. Off. and Foreign Countries)

B. V. D. Coat Cut Undershirts and Knee Length Drawers, 50c, 75c, \$1.00 and \$1.50 the Garment.

B. V. D. Union Suits (Pat. U. S. A. 4-30-07) \$1.00, \$1.50, \$2.00, \$3.00 and \$5.00 the Suit.

The B. V. D. Company,
New York.

London Selling Agency: 66 Aldermanbury, E. C.

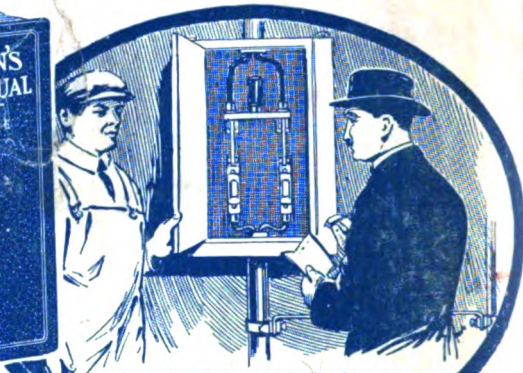
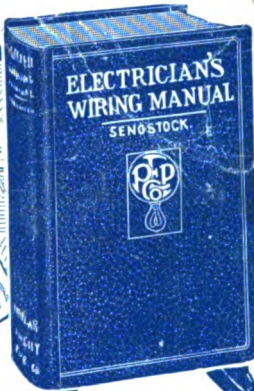
Copyright U.S.A. 1914 by The B. V. D. Company.



For our Mutual Advantage mention Popular Electricity when writing to Advertisers.



Excellent instruction for home study.
Prepares you to do any kind of
inside wiring



On the job it will help you.
Follow its instructions and your
work will pass inspection.

YOUR HELPER

When you're up against a stiff job, here's the book you want to tell you exactly what to do, and how to do it in strict accordance with the National Electrical Code. In a simple, compact form, it fully covers light and power installations.

Electrician's Wiring Manual

By F. F. SENGSTOCK, *Electrical Inspector Chicago Board of Underwriters*

The book that thousands of Wiremen, Contractors and Electricians have been waiting for. Not merely a discussion on Code rules. But straight talk by a man who knows the game from A to Z and gives you the benefit of his many years' experience. Shows you just how to proceed so that your work will pass the most exacting inspector. Every step explained in detail, made clear by 415 careful drawings. A chapter of practical kinks—tricks of the trade unknown to most wiremen—representing the experience of hundreds of practical workers, is all the worth the price of the book.

Twenty-Seven Chapters, 410 Pages, 415 Illustrations of Sound Practical Information, Flexible Leather Binding, Pocket Size

1—Tools and Symbols. 2—Preliminary Suggestions on Building Wiring. 3—Moulding. 4—Flexible Conduit. 5—Rigid Conduit. 6—Fixtures and their Installation. 7—Switches. 8—General Suggestions on House Wiring. 9—Installing Household Electric Utensils. 10—Wires and Cords. 11—Motors. 12—Transformers. 13—Switchboards and Panels. 14—Motion Picture Theatre. 15—Bell Circuits, Annunciator Circuits, Gas Lighters, Burglar Alarms, Bell Transformers, Door Lock. 16—Elevators. 17—Wiring in Damp Places. 18—Outside

Wiring. 19—Grounding and Ground Detectors. 20—Inspector's Report on a Defective Electrical Equipment. 21—Estimating and Specifications. 22—Tables and Formulas. 23—Electrical Circuits, Calculation of Wiring, Line Losses and National Electrical Code Discussed for the Beginner. 24—Alternating Currents Simply Explained. 25—Some Things the Electrician should know about Storage Batteries. 26—Underwriters' Requirements in the Installation of Wireless Telegraph Equipment. 27—Practical Kinks.

Price \$1.50 Postpaid

Just think of it—410 pages, 415 illustrations, bound in real flexible leather pocket size for only \$1.50. We know you will want a copy to have on the job with you at all times, giving you the latest methods and a certainty of having your work approved.

800 copies sold before publication, when announced as containing 22 chapters, 240 pages, 200 illustrations. Since increased to 27 chapters, 410 pages, 415 illustrations without raise in price.

Order Now—Use the "Money Back" Coupon Attached

Popular Electricity Book Dept., 350 N. Clark St., Chicago, Ill.

Coupon

POPULAR ELECTRICITY BOOK DEPT.

350 N. Clark St., Chicago, Ill.

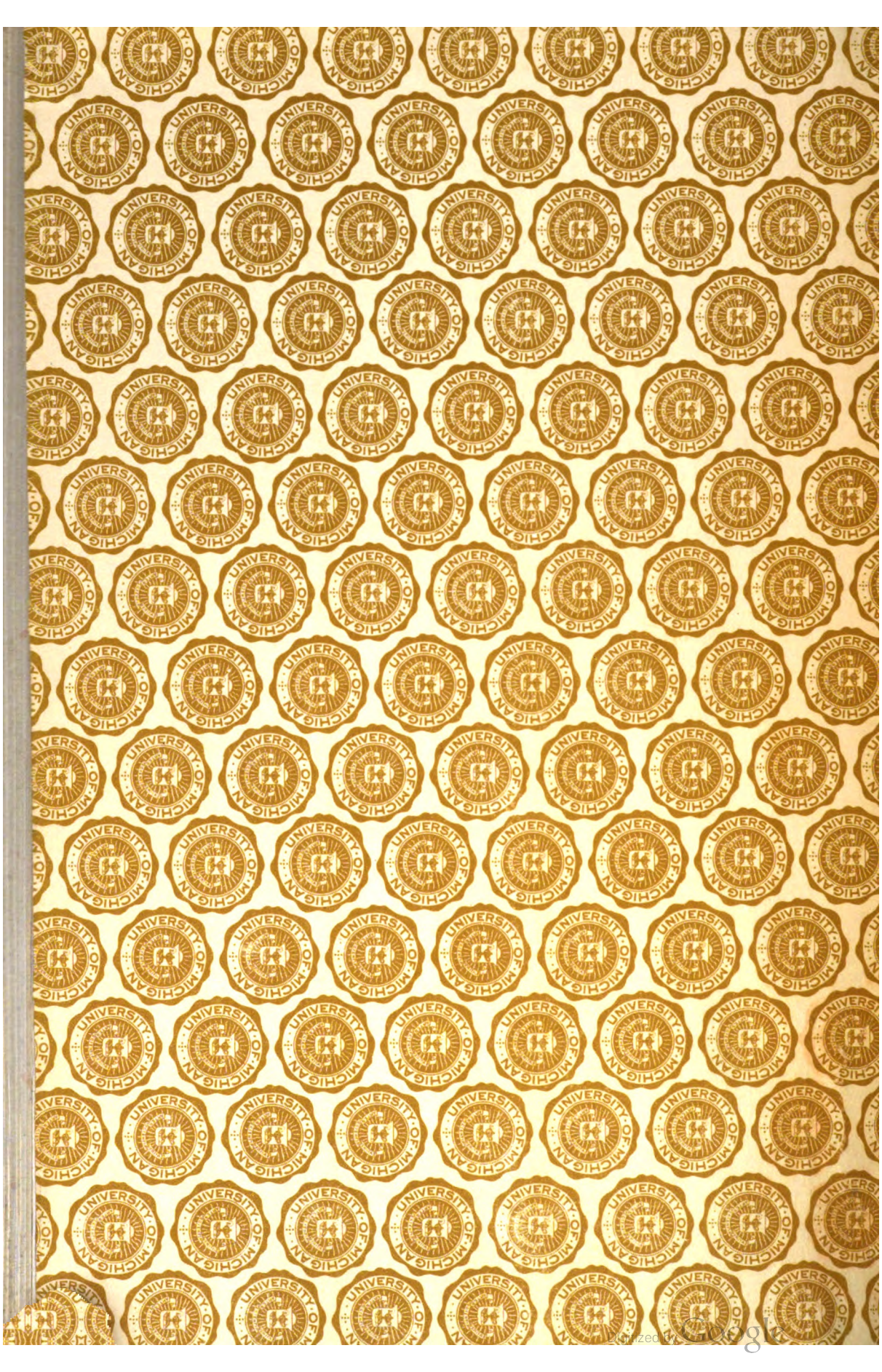
I enclose \$1.50 for which send me the "Electrician's Wiring Manual," as advertised.

It is understood that same may be returned within 10 days, if not satisfactory, and money will be refunded.

Name

St. and No.

City..... State.....



UNIVERSITY OF MICHIGAN



3 9015 07502 4417

