Practical Electrics

20 Cents

Over 100 Illustrations

February 1923

EDITED BY H. GERNSBACK

THE TALKING GLOVE

See Page 166

PARTS — ACCESSORIES — SETS

"FOR THE FAN" FOR EVERYONE FOR BUSY PEOPLE

QUALITY APPARATUS AT LOW PRICES

WE PAY THE EXPRESS OR POSTAGE IN UNITED STATES AND U. S. POSSESSIONS

Except Storage "A" Batteries

YOUR ORDER—SMALL OR LARGE—FILLED THE DAY RECEIVED

VACUUM TUBES

Genuine Cunningham Tubes made by the General Electric Co. Every tube guaranteed new and in original package. We do not sell "bootleg" tubes.

PC200—Detector. $4.40
PC201—Amplifier. ... 5.90

METAL AND BAKELITE SOCKETS

Bakelite brown finished socket for panel or base mounting. Double spring contacts held rigidly in place.

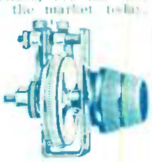
P1076—Bakelite socket $0.65
P1075—Nickeled Metal socket .... .45

VACUUM TUBE RHEOSTATS

This is a reasonably priced, smooth acting rheostat that will mount directly on back of panel. Bakelite arrow knob.

P1050—Rheostat 45c

Genuine Cutler Hammer rheostats, we believe, are the best rheostats on the market today. Arranged for panel mounting. The picture shows the vernier type. All metal parts nickeled.



P1061—Vernier type C. H. Rheostat.... $1.40
P1062—C. H. Rheostat without vernier. .95
P1064—Howard vernier rheostat operates from one knob.................. $1.40
P1065—Howard rheostat without vernier .90

VARIABLE GRID LEAK

Pencil mark type. Removable black enameled cap.

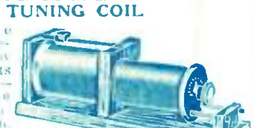
P50—Grid Leak 22c

GRID AND PHONE CONDENSERS

Mounting holes spaced to fit screws of above Grid Leak. Mica insulation, wrapped with varnished cambric tape. Capacity, .00025 Mfd.

P55—Grid Condenser. 18c
P59—Phone Condenser .001 Mfd....... 25c

LOOSE COUPLER AND TUNING COIL



This loose coupler is preferred by many because of its wide range — 200 to 3500 meters. Mahogany finish. All metal parts are brass, nickeled and highly buffed. Secondary has 12 point switch mounted on Bakelite coil head. Windings are green silk-covered wire.

P800—Size, 5½x6x18 inch.......... $6.50
P805—Two Slide Tuning Coil 2.60

CRYSTAL DETECTOR

A very high grade glass enclosed crystal detector including the crystal. All metal parts nickel plated. Adjustable to any point on the crystal.

P20—Enclosed crystal detector $1.30

A lower priced but nicely constructed detector. Crystal included.

P30—Detector. .... .88

TESTED CRYSTALS

Selected and tested galena or silicon. Each box contains enough for four to six ordinary crystals.

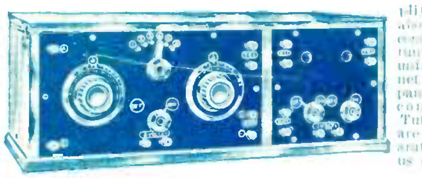
P12—Galena, per pkg.. $0.10
P13—Silicon, per pkg.. .10

FROST JACKS AND PLUGS

Jacks are polished nickel, nickel-silver springs, pure silver contacts. Nickel washers for mounting on any panel ⅛ to ⅝ inch thick. Spread terminals make soldering easy.

P133—One spring (open circuit). Each $0.46
P134—Two spring (closed circuit). Each .52
P131—Four spring (two closed circuits) Each .... .63
P135—Three spring (two open circuits, commonly called "single circuit filament control"). Each .... .70
P136—Five spring (two open and two closed circuits, commonly called "two circuit filament control"). Each..... .88
P132—Plug, telephone type with short knurled grip .... .35
P137—Plug (as shown), cord tips fit into plug 1.05
P139—Plug with threaded barrel instead of set screw. Takes cord tips........ .55

LICENSED REGENERATIVE RECEIVING SETS



Licensed under Armstrong Patents. Solid Mahogany case, hinged cover, shielded Bakelite panel and parts mounted on panel. Wide range, 150-800 meters.

The **PT225** is a complete receiving set with detecting unit—and two stages of amplification as pictured above. The **PT224** consists of complete tuning and detector unit in shorter cabinet (see division of panel). Ideal sets for concert reception. Tubes, batteries, etc., are always sold separately. Order them from us and save money.

PT225—Tuska Receiving Detector and two stage Amplifier Set.................... $59.50
PT224—Tuska Popular Receiver and Detector Set.................... 31.50
PT226—Tuska Two Stage Amplifier for **PT224**.................... 30.00

OUR GUARANTEE

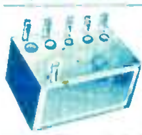
Your satisfaction guaranteed. If for any reason you do not feel satisfied with your purchase, you may return it and we will refund your money. We will pay return transportation charges.

PHONES

Genuine Frost and Brandes head sets complete with cords.

Frost **P162**—Double head sets, 2000 ohm $4.25
Frost **P163**—Double head sets, 3000 ohm 4.90
P168—Western Electric latest type double head set. List $12.00. Our price 10.50
Brandes Superior **P166**—Double head sets, 2000 ohm 7.20

"B" BATTERIES



Standard Eveready radio "B" batteries. Never over five days old.

P230—22½ volt Signal Corps type. Size 3⅛x2x2½ inch $1.08
P235—22½ volt U. S. Navy variable—5 positive taps. Size, 5x3x2½. Price......... $1.80
P240—22½ volt large variable—5 positive taps. Size 6½x4x3. Price..... 2.25
P245—45 volt large leads only. Size, 13x4x3. Price 4.00

INDUCTANCE COILS

Rigidly wound, nicely finished, low distributed capacity. All coils are equipped with standard mountings. We can supply any of these coils without mounting plugs, for 35c less than the prices shown. The wave lengths shown are range limits, based on a variable condenser of .001 Mfd. capacity.

	Number of Turns	Wave Lengths	Price Mtd.
P1725	25	125- 250	$0.95
P1726	35	175- 450	0.98
P1727	50	240- 720	1.05
P1728	75	390- 910	1.10
P1729	100	500- 1450	1.14
P1731	200	900- 2500	1.28
P1732	250	1200- 3500	1.36
P1733	300	1500- 4500	1.38
P1735	500	2800- 6100	1.65
P1737	750	5000-12000	1.95
P1738	1000	7900-15000	2.30
P1739	1250	9750-19500	2.55
P1740	1500	11500-26500	2.70

STORAGE "A" BATTERIES

Built of entirely new parts. With the proper care they should last several years. The De Luxe type has rubber case and cover for top as pictured, the Standard type has black wood case similar to ordinary automobile type. Guaranteed to give full rated capacity. All 6 volt batteries.

Number	Amp. Hour Rating	Shpg. Wgt.	Price
PD 60—De Luxe....	60	40	$15.50
PD 80—De Luxe....	80	50	17.50
PD100—De Luxe....	100	62	20.50
PS 60—Standard ...	60	35	12.25
PS 80—Standard ...	80	40	14.25
PS100—Standard ...	100	50	16.25
PS110—Standard ...	120	60	18.25

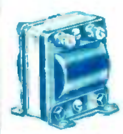
The above storage batteries are the only items on which we do not pay transportation charges. We will ship by Express.

THORDARSON AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

There is probably no better known transformer. Made by a company that specializes in transformers. Entirely encased in steel aluminum shield. Heavy connecting straps to binding posts.

P1504—Thordarson Transformers, 3½ to 1. $3.65
P1505—Thordarson Transformer, 5½ to 1 $4.20

AUDIO FREQUENCY AMPLIFYING TRANSFORMERS



Correctly designed for minimum distributed capacity and low core loss. Shielded, beautifully finished in nickel and black enamel. Ratio 5½ to 1.

P1506—Shielded Transformer $3.75

The unshielded types listed below have terminals mounted on Bakelite panel. Two ratios.

P1510—Transformer, 10 to 1 ratio.... $3.55
P1503—Transformer, 3 to 1 ratio.... 3.50

RADIO FREQUENCY AMPLIFYING TRANSFORMERS

Radio frequency transformer circuits help to eliminate static and interference, thus permitting easy, sharp tuning of long distance stations. Enclosed in metal case for shielding and can be mounted in tube socket if desired. Wiring diagrams furnished with each transformer.

P1500—Transformer. Each $3.47

INDUCTANCE COIL MOUNTINGS

For base or panel mounting. Connecting leads furnished, coil settings are adjustable by means of knobs. Made entirely of bakelite with nickeled brass metal parts. Coil position can be locked by knurled set screws.

P1603—Three coil mounting.......... $3.50
P1602—Two coil mounting.......... 2.75
P1601—Single coil mounting.......... .50

BINDING POSTS

Complete with screw and washer. All brass, finished in polished nickel or with black composition top as listed. Order by number.

	Each	Doz.
P110—Large size, all nickel	10c	95c
P122—Medium size, nickel, with hole for phone tip or wire.	4c	35c
P112—Medium size, black composition top	5c	48c
P120—Large size, composition top..	8c	85c

SWITCH POINTS AND STOPS

Brass, polished nickel finish. Screw size, 6-32x5-8 ins. long, two nuts with each contact point and one with the stops. Stops high enough for any type of lever and point.

	Each	Doz.	Hundred
P130—Switch Point, diam., ¼ inch; height 3-16 inch..........	3c	20c	$1.40
P150—Switch Stops .	3c	20c	1.40

SWITCH LEVERS

A high grade, polished nickel-plated lever with solid moulded black composition knob. Complete with panel bushing, spring and two nuts.

	Each	Doz.
P151—1-in Radius	20c	$2.25
P152—1¼-in Radius	20c	2.25
P155—1½-in Radius	20c	2.25

HOW TO ORDER

Order from this page. Please give number, description and price of the articles you order to help us avoid mistakes. Total the amount of your order and send Post Office money order, certified check or draft with your order. Be sure to give your name and street address on both letter and envelope. Do not include money for transportation. We pay it except on storage "A" batteries. See ads of previous months for other items.

VARIOMETERS

For efficiency, perfect inductive ratio, low capacity effect and neatness of design these variometers are unexcelled. All metal parts nickeled brass. Stator and ball mahogany finish. Furnished completely assembled and tested.

P1300—Variometer, No. 18 wire....... $2.75
P1200—Variometer, No. 20 wire...... 2.75

The following knocked-down variometers have the stator windings wound and cemented ready to put in place. Two sizes of wire as listed. Complete with wire and metal parts.

P1205—Knocked-down variometer with No. 20 wire........................ $1.85
P1305—Knocked-down variometer with No. 18 wire........................ 1.85

180 VARIOCOUPLER

The primary and secondary windings of this coupler are properly proportioned and spaced. The center of the secondary is always in the center of the primary field. Unlike most couplers, it aids in tuning. Black fibre base, brown formica tube, and nickeled metal parts. Panel or table mounting.

P1100—Coupler $2.95

VARIABLE CONDENSERS

Very best mechanical construction. Heavy, hard aluminum plates. The vernier types are furnished with moulded dial and small knob for adjusting vernier. Plain types have ¼ inch shaft.

P1443—43 plates .001 Mfd. without dial $2.35
P1423—23 plates .0005 Mfd. without dial 1.80
P1411—11 plates .00025 Mfd. without dial 1.35
P1403—3 plates .00005 Mfd. without dial 1.15
P1441—41 plates vernier .001 Mfd. with dial 4.95
P1442—21 plates vernier .0005 Mfd. with dial 4.25

THORDARSON VERNIER CONDENSERS

P1523—23 plate vernier .0005 Mfd. with knob and dial........................ $3.65
P1543—43 plate vernier .001 Mfd. with knob and dial........................ 4.55

DIALS

Bakelite — Composition

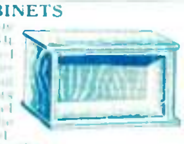
Genuine Bakelite Dial as pictured. Sharply engraved divisions and figures filled with a brilliant white. Three-inch diameter, with bushing for 3-16-inch or ¼-inch shaft. Set screws included.

	Each	Doz.
P500—Dial	60c	$7.00

Three-inch moulded composition dial as pictured. Has a luster that cannot be told from Bakelite. Set screws included.

	Each	Doz.
P550—Dial, 3-16 in. Shaft......	30c	$3.00
P555—Dial, ¼-in. Shaft	30c	3.00

CABINETS



These are reasonably priced but attractive built cabinets of weathered oak. The top is removable by loosening four screws. End posts are routed to take panel 3-16 inch thick. The panels are not included. See table for panel lengths.

P212—Can be used for detector and two steps. Panel space, 5½x12.............. $2.50
P214—Can be used for 2 variometers and 1 coupler. Panel space, 5½x14........ 2.75
P218—Can be used for 2 variometers, 1 coupler and detector. Panel space, 5½x18 3.00
P222—Can be used for 2 variometers, 1 coupler, detector and 2 step. Panel space, 5½x22 .... 3.25

PANELS

Genuine Formica. Panels to fit our cabinets.

P262—Panel, 5½x12-in. 3-16-in. thick $1.38
P264—Panel, 5½x14-in. 3-16-in. thick. 1.64
P268—Panel, 5½x18-in. 3-16-in. thick. 2.08
P272—Panel, 5½x22-in. 3-16-in. thick. 2.53

SPAGHETTI AND WIRE

For cabinet wiring. Yellow finish spaghetti.

P33—Per 4-ft. length.................. 27c
P32—Tinned Copper No. 16 Wire.... Ft. 2c
20 Ft. 30c
P33—Wire with insulation similar to spaghetti on it. Wire is tinned for soldering. Price, 10 feet........................ 37c

INSULATORS

These are very strong strain type insulators.

	Each	Doz.
P360—Moulded insulator shown	$ .10	$1.10
P365—Porcelain insulators.....	.09	.95

ANTENNA WIRE

The following are 100 foot coils of 7 strand cable of No. 22 wire, which makes the best Aerial. Use phosphor bronze, where the span is 100 feet or more. It is stronger.

P350—Stranded Phosphor Bronze, 100 ft. $1.47
P355—Stranded Copper, 100 ft......... .77
P356—Single No. 14 bare solid Copper Wire, 100 ft.............................. .42

LIGHTNING ARRESTER or PROTECTOR

Mounts indoors. Porcelain base, nickeled cover. Listed by the Underwriters' Laboratories under April, 1922, regulations.

P300—Protector $1.40

GREAT LAKES RADIO CO., 1124 JACKSON BOULEVARD CHICAGO, ILL.

Would you like to make $10 an hour?

Read! Think! Act!

Sounds like big pay, doesn't it?

But thousands of men, when they have climbed the ladder and figured back, have found that the time they spent in spare-hour reading and studying paid them bigger than any wages they ever earned.

Let's figure it. There are at least three evening hours a day that can be used in putting practical knowledge into your head. Suppose you used just a fair portion of these, putting in, say, 500 hours a year for two years—1000 hours in all.

The well-informed man in any business can expect to earn $2000 a year more than the uninformed one. In five years this difference amounts to $10,000, or $10 for every hour of your two years' spare-time employment.

We are putting it conservatively. Many men have found their use of spare time paid them as high as $25 to $50 an hour. Spare-time investment is the biggest thing you can undertake.

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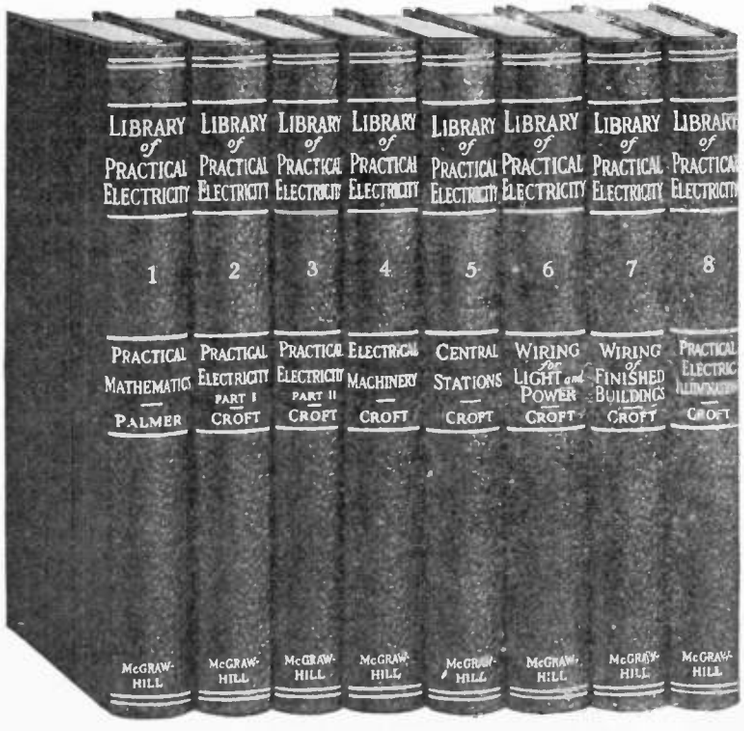

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2. The author's knowledge of electricity has been obtained through actual shirt-sleeve practice. Beginning as an apprentice lineman, he went through the various stages of wireman, draftsman, etc., until he attained the position of electrical engineer with one of the big electrical manufacturing companies. Now he heads his own consulting company.
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Gentlemen—Please send me the CROFT LIBRARY OF PRACTICAL ELECTRICITY (shipping charges prepaid), for 10 days' free examination. If satisfactory, I will send $1.50 in ten days and $2 per month until $19.50 has been paid. If not wanted, I will write you for return shipping instructions. (Write plainly and fill in all lines.)

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Occupation .....

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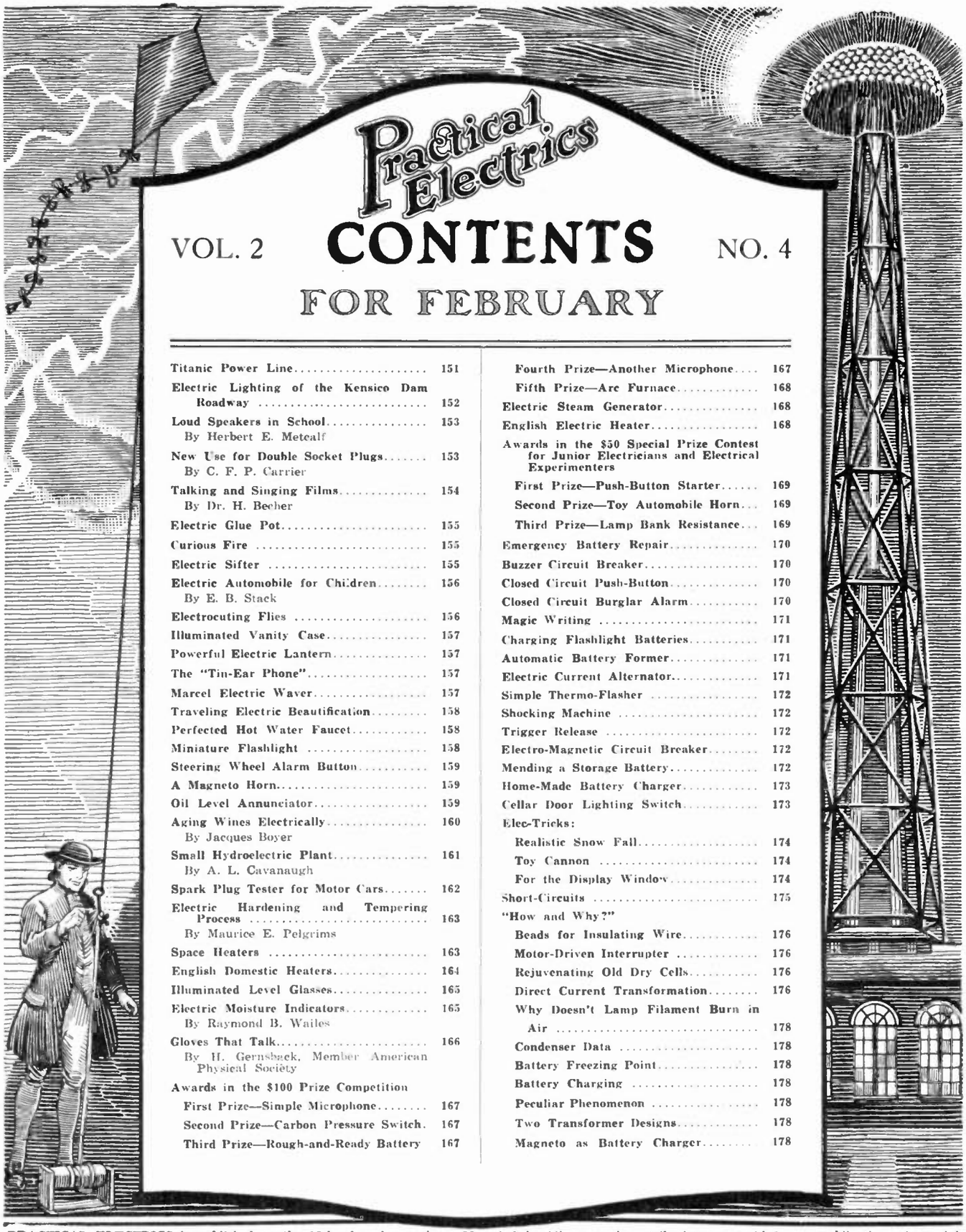

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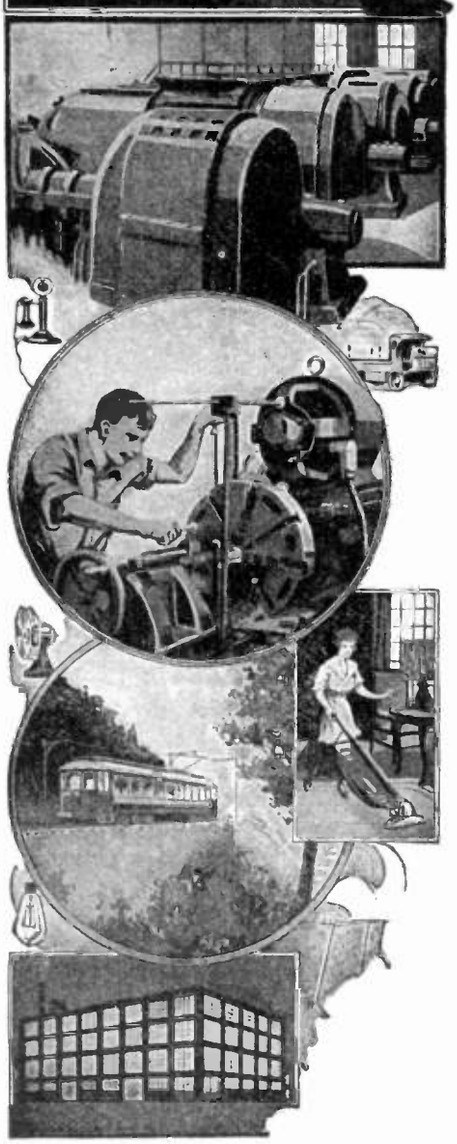

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31 West 17th Street, New York

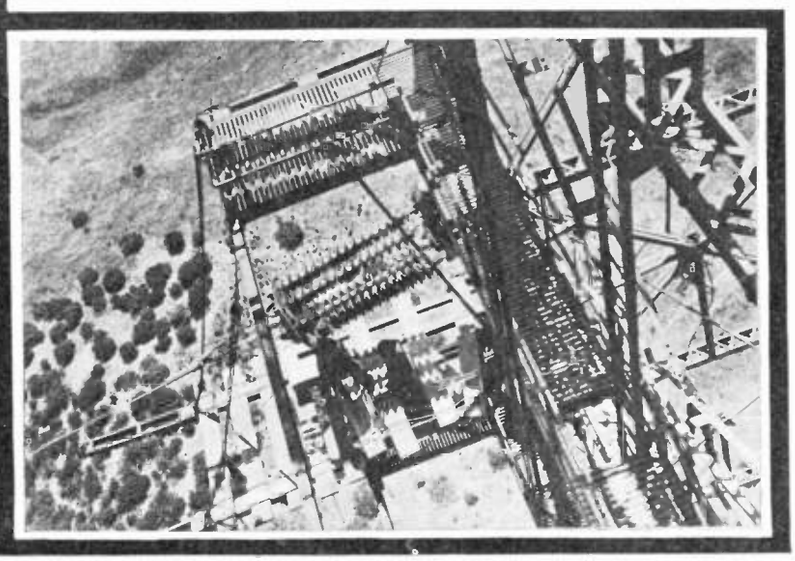
Volume 2
No. 4

Practical Electrics

February
1923

H. Gernsback, Editor and Publisher T. O'Conor Sloane, Ph.D., Associate Editor

Titanic Power Line



Two views of a Titanic power line in California. On the left is seen one of the Titans traversing a gulf 135 feet above the water, with wires fatal to the touch at his side. Below is shown a partial view of one of the towers, with the great insulators carrying lines whose potential runs as high as 165,000 volts.

IN the early days of the dynamo, which really fixes the date of the modern development of electrical power, the question came up of the possible utilization of distant water falls for supplying electric power.

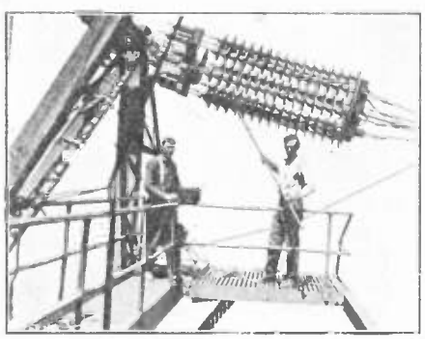
The problem to be solved in long distance power transmission hinges on the use of small conductors or wires. At high voltage such wires will transmit as much power as heavy ones at low voltage. In olden times, there was no realization of the possibility of reducing the size of the conduit by the employment of high voltage.

The unit of electric power is the product of the voltage by the amperage; the size of wire required depends entirely on the amperage, so by increasing the voltage, it is possible to obtain the same amount of power with less amperage, and thereby to reduce the size of conduit required.

When the famous Edison Station in Pearl Street was opened, 110 volts were produced by the famous Jumbo generator. By large increases, the voltage rose, until in 1922 we hear of the 220,000 volt power transmission.

We illustrate above a view of part of a tower on a 165,000 volt power line in California, whose lines run 135 feet above the water, about the height of the bridges over the East River in New York City. The great insulators are seen projecting from the tower; an aluminum cable made of 35 strands of No. 10 wire, with a core of steel wires, built to stand a strain of 32,000 pounds. is the main line. Recently a cable was burned out, a sailing vessel passing beneath it, touched it with one of her upper masts and started an arc.

Sometimes it becomes necessary to go out over the line to repair it. A species of trolley car is used for the purpose, which runs on one of the power lines, from which the power for the time being is shut off. The car runs on wooden wheels and is actuated by hand cranks in front. The man whose picture we show is a well-known operator, Pete Lindsay, by name. He is surrounded as he goes out on the single line 135 feet above the water, or has alongside of him, other lines with over 100,000 volts potential. The obvious danger would seem to be the fall into the water, but the real danger would be touching the lines alongside of him. It is said that the static effect of the electricity causes the car to vibrate as if in a high wind.



One of the giant insulators whose size can be estimated by the men standing on the platform below.

The voltage of 1880 is one two-thousandth of the voltage of 1922. In other words the voltage on power lines has risen at about the rate of 50 volts per annum. It is now at a point where the limit seems to have been reached, but a power line not over an inch or two in diameter carrying a load which it was supposed in the seventies would exact the use of a line a foot or more in diameter, makes a striking comparison.

The writer well remembers in old days at what was then called Columbia College, now called Columbia University, that the subject of transferring electric power over long lines, as from Niagara Falls to New York, was discussed by one of the professors and was pronounced impracticable by him for the above reason. Working on Ohm's law with the low voltages then in use, he determined that so huge a line would be required that the capitalization in copper would make it a commercial impossibility. But this was all before the days of high voltage, alternating current, with its step-up and step-down transformers and its marvelous capability of adjusting itself to all circumstances.

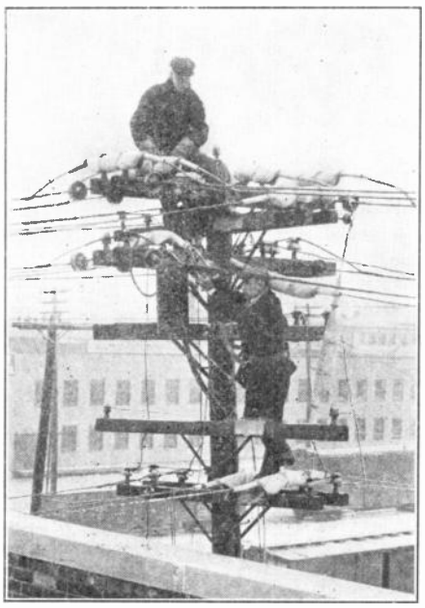
We illustrate also one of the giant insulators, whose size can be estimated by

the two workmen standing near it, with a conductor whose end is carried by a long pole. One of the men is connecting a measuring instrument in order to determine leakage or some other factor. It is a great contrast to the telegraph insulators not much bigger than bottle tops, with which we are all so familiar, on telegraph poles going across the country.

The hazard of touching such circuits naturally increases as their voltage is higher, and workmen who have to climb poles carrying high potential wires, and who have to work among such wires, are often exposed to considerable risk.

To protect operatives who have to do this class of work, shields of heavy canvas and insulating material are now made, which resemble somewhat in their build an automobile tire; they contain successive layers of canvas and rubber, which are clamped over the wires about which the operatives have to work, protecting them perfectly from shock.

Lock-strap attachments made of India-rubber fabric clamp the protector securely to the wire, so that the workman can bend over and lean upon it in perfect security. Without such protection he would be working in constant danger of shock,



Another view of workmen on a high potential system, protected by flexible shields from contact with the deadly wires.

which might cause him to lose his hold and fall to the ground, or inflict some severe burn or even kill him. Numerous accidents have occurred from this cause.

The illustration shows a couple of workmen engaged at work on top of a pole carrying a mass of wires, a number of which are protected by these shields. At each end of the shield there is a tubular extension of small diameter which has its own clamp, while around the center portions of the shield straps are secured as just described.

The conductivity of a metal wire increases as the temperature falls, and one of the early suggestions due to Elihu Thompson was that power conductors should be contained within a tube which should be filled with liquid air. This was certainly an attractive suggestion, although like many similar ones, charged with difficulties and troubles. The wire would instantly burn out if anything happened to interfere with the supply of liquid air and adequate insulation within a tube might be very difficult.

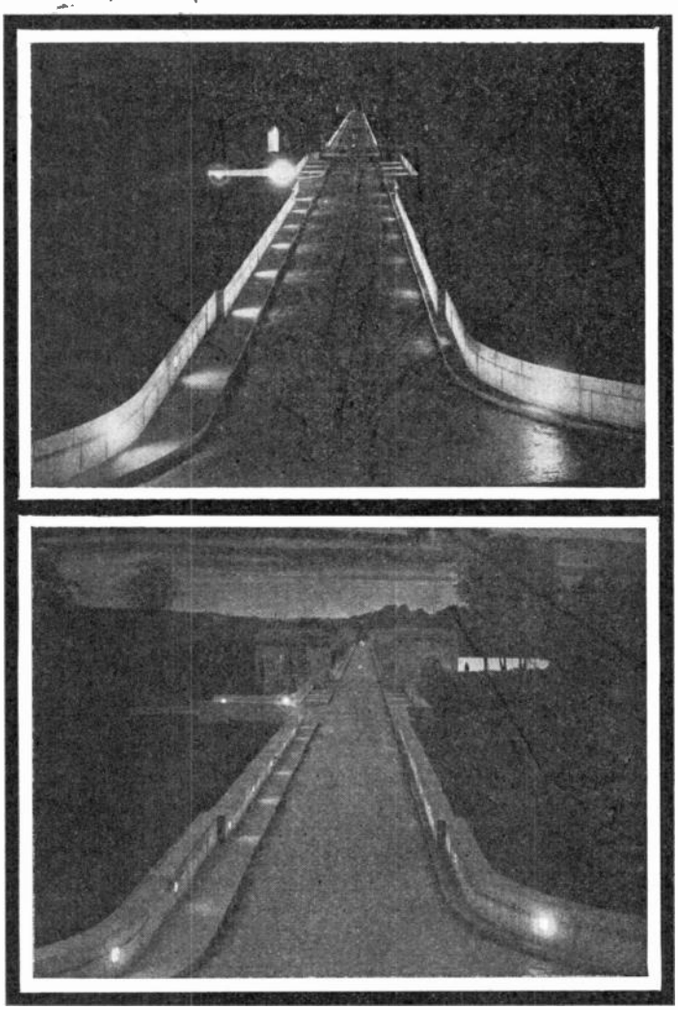
Electric Lighting of the Kensico Dam Roadway

THE Kensico Reservoir is an object of great interest from the engineering, architectural and landscape points of view. Between the Kensico Reservoir situated in Westchester County, not far from White Plains, to the Catskill Mountain source of water supply impounded in the beautiful Ashokan Dam Reservoir, there is a distance of about 75 miles of conduit.

The conduit is a remarkable piece of engineering, some of it deep-level work far underground, crossing the Hudson River by a great inverted siphon connecting with the pipes of New York.

Provision has been made for the care of these 75 miles of aqueduct. In old times the Croton Aqueduct was considered a great achievement in engineering. Both these lines, with the exception of the siphons, run on practically an even gradient, the one from the Croton Reservoir, the other from the Ashokan Dam to the city local reservoirs.

In constructing the original Croton Aqueduct, a devious course was pursued and determined by the contour of the surface. The Ashokan Dam Aqueduct was made almost straight for the greater part of its length, and varied in depth from surface structure to many feet below the surface. It is these 75 miles which the Kensico Reservoir takes care of. When it is to be cleaned or repaired, the Kensico Dam has enough water impounded back of it to take care of the water supply while the Aqueduct is being worked on.



The lighting of the Kensico Dam Roadway with low level electric lamps, in recesses in the parapets.

It is a great artificial lake, three and one-half square miles in area, with a shore line of no less than 40 miles in length. It has two dams, the maximum height of which is 307 feet, nearly half the height of the Woolworth Building, and the maximum depth of the reservoir is 155 feet. It impounds 38 billion gallons of water, about 6000 gallons per inhabitant of New York.

The reservoir is crossed at one point by a bridge which we illustrate here. This bridge with a 2200-foot roadway, 26 feet wide, with a 4-foot sidewalk on one side, is illuminated by a special type of light distribution. A great point is made on this reservoir and its appurtenances of the architectural features. Each dam is built with special regard to its effect and it was determined that this bridge with its 4-foot parapets would be impaired in architectural effect if poles were placed along the sides to carry the electric lights.

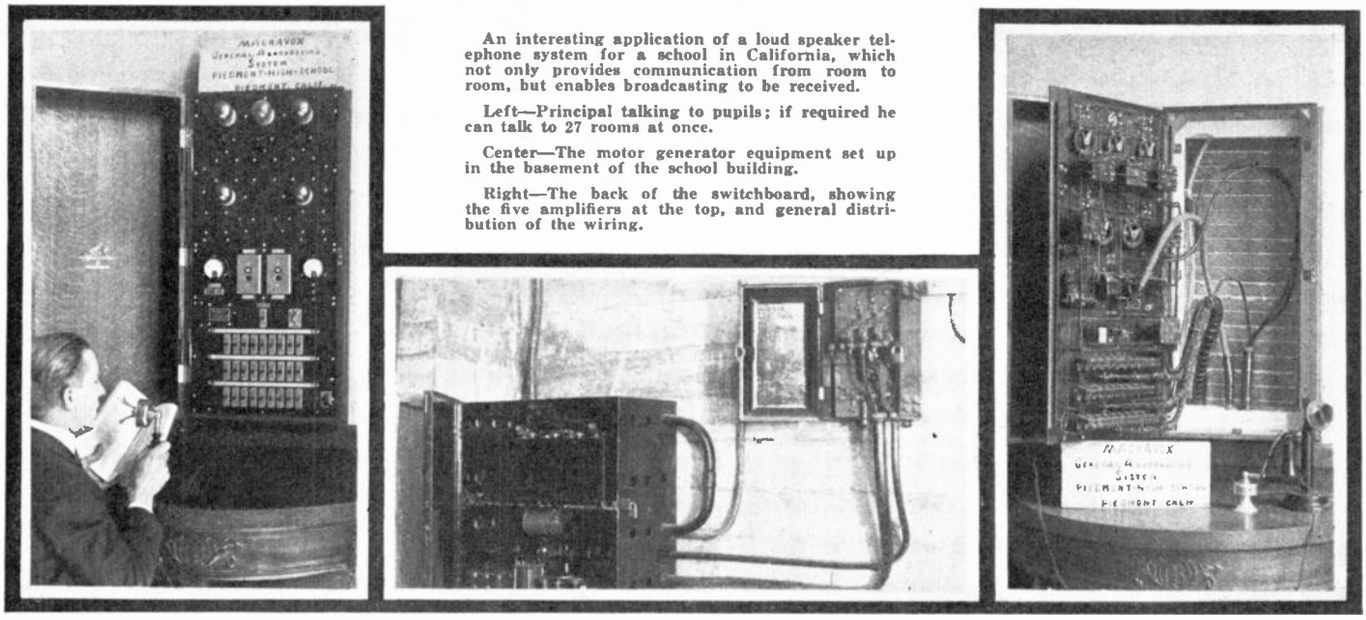
Accordingly, a novel system of lighting was developed. Recessed openings or ports 13½ inches square and 8 inches deep, with glass-filled doors, were constructed in the parapets. They are spaced 37½ feet apart. The ports on one side are staggered with respect to the others, that is to say, a port on one parapet is opposite the central point between two ports on the opposite one.

The centers of these openings are 26½ inches above the road. In each port there is established a 6-volt, 108-watt Mazda lamp, which is operated at 5½ volts to increase the durability, and the lamps give ample light with this reduction. The ports contain a metallic structure for carrying the lamp and its connections, and are closed in front by the doors with their prismatic glass filling, with the axes of the prisms vertical; the doors are locked. Back of each lamp there is a reflector.

The effect of this system has proved to be so good that it will undoubtedly be applicable to many other places. The light from each lamp streaming out, crosses the road and illuminates the wall opposite thereto as well as the surface of the roadway. The effect as brought about by the staggering of the lamp, conduces to an approximate uniform distribution of light, and avoids spottiness and contrast. The power required is about five watts to the running foot of roadway, a reasonable figure.

Loud Speakers in Schools

By Herbert E. Metcalf



An interesting application of a loud speaker telephone system for a school in California, which not only provides communication from room to room, but enables broadcasting to be received.

Left—Principal talking to pupils; if required he can talk to 27 rooms at once.

Center—The motor generator equipment set up in the basement of the school building.

Right—The back of the switchboard, showing the five amplifiers at the top, and general distribution of the wiring.

IN the little suburb of Oakland, Calif., known as Piedmont, across the bay from San Francisco, many hundreds of school children have the daily pleasure of listening for a period to the various radio programs as they are broadcasted from far and near, and the principal or any visitor to the school may speak to any or all of the pupils without the necessity of assembling them in a central hall—a result made possible by a built-in electrical announcing system.

There is a set of 27 loud-speaking reproducers, electrodynamic in construction. These operate directly from a super-power amplifier located in the principal's office and controlled by a selector panel in the same location. The power supply is located in the basement and entirely controlled by switches on the amplifier panel. All that is necessary to place the equipment in operation for the voice is to press the starting switch, throw the keys to whichever rooms are desired, and speak. If all the rooms are to be addressed, then a master key is pressed. A radio receiving station is located upstairs, and a radio connection may be used instead of the transmitter microphone. There is nothing complicated in its operation, it is used by the principal and his assistants daily, and with no need for special electricians.

The 27 reproducers, one for a room, are of the standard electrodynamic type, with no stepdown. Four wires are connected, two for the movable coil and two for the field, which is wound to consume about one-third ampere per instrument. The entire wiring from these instruments to the panel is in conduit and was installed during the erection of the building.

All wires lead to the principal's room, coming up in conduit to the main panel. This panel may be separated into three separate units, the selector, the motor generator control, and the power amplifier. The wiring from the rooms goes directly to the selectors which simply conduct the modulated output of the power amplifier to any or, if desired, to all of the reproducers. When this is done, the field is on all instruments, providing a constant load for the motor generator.

Just above on the panel is the motor generator control. One switch starts the motor generator and also puts the field on all reproducers by means of relays. Total current is shown on an ammeter, and a voltmeter shows plate voltage, or the storage battery voltage, as desired, by throwing a switch. Another main switch allows the motor generator to run, performing only the function of charging the storage battery.

At the top of the panel is the power amplifier. This consists of five 5-watt tubes arranged so as to give the full power output of three tubes on the last stage, each with its rheostat. A transmitter is provided and also a switch to change from voice reproduction to radio.

In the basement is a 350 8-volt motor generator. A 150-ampere-hour storage battery and wheel floats across the circuit to stabilize the generator and to take care of the field current supply, as well as to operate the remote control relays.

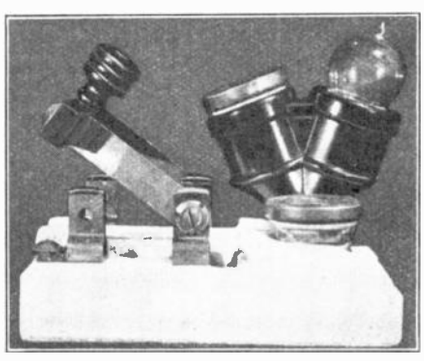
The system was designed and built to comply with the rigid specifications of the school architect. It was installed as part of the school's electrical equipment and was installed as work on erection progressed. Therefore, it may be considered a part of the school, not as an addition or an after-thought. Numerous other architects are drawing these installations into school plans, and as the cost is moderate, and the benefits large, undoubtedly many such plants will soon be in use.

New Use for Double Socket Plugs

OF the great number of manufacturers of double socket plugs, there are few who realize there is still another use for their product, one which would perhaps double their sales.

Nearly everyone at some time or other has been left in the dark when a fuse has blown at some most inopportune time. Groping in the dark to the meter box, with the aid of matches, vain guesses are made as to which fuses are good and which are bad. Dust and dirt on the mica window often prohibits the inspection of the fuse element. It is a case of try, and if you do not succeed, try again.

The double socket plug, however, provides a way out of this embarrassing difficulty. The disagreeable feature of fuse hunting is done away with by using a double socket plug and a small wattage lamp in combination with each fuse. The plug is substituted in the cut-out in place of the fuse plug; the fuse plug is replaced in one of the sockets while the lamp is inserted in the remaining socket. The lamp should be of five, ten, or fifteen watts and of the same voltage as the circuit.



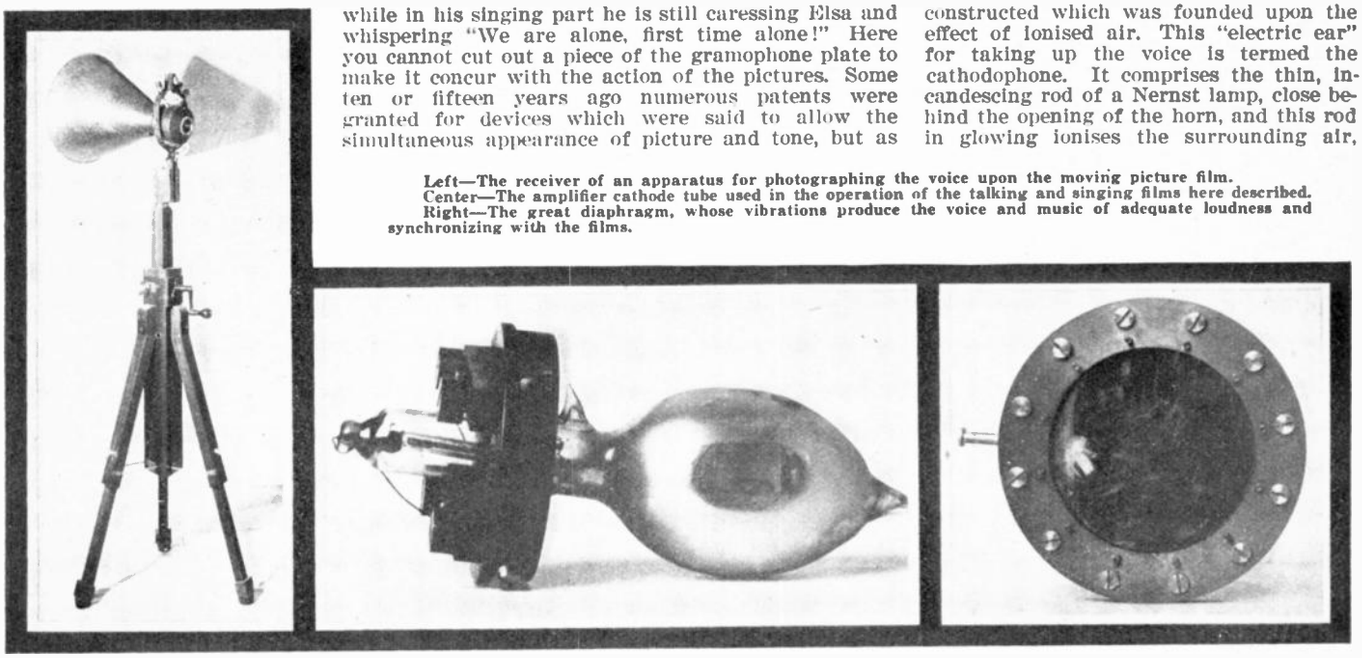
A double socket used to hold a plug fuse and a lamp; when the fuse blows, the lamp will be lighted, thus enabling one to instantly locate the trouble.

By this arrangement it is obvious that there is a test lamp permanently installed across each fuse. The lamp is shunted by the fuse, thus when the fuse blows the circuit is then through the lamp, which indicates which fuse is blown. The whole house may be in darkness, yet this pilot lamp will furnish enough illumination to change fuses, without unnecessary delay and hazard.

Contributed by C. F. P. Carrier.

Talking and Singing Films

By Dr. H. Becher



Left—The receiver of an apparatus for photographing the voice upon the moving picture film. Center—The amplifier cathode tube used in the operation of the talking and singing films here described. Right—The great diaphragm, whose vibrations produce the voice and music of adequate loudness and synchronizing with the films.

THE problem of the production of talking films is as old as the kinematograph itself. As silent scenes always convey an impression of incompleteness, many inventors have striven to enliven a film by reproducing simultaneously with it singing or spoken words. The first and most obvious attempt in this direction was to bring the gramophone into synchronism with the kinematograph, but the picture film having the shape of a ribbon, and the carrier of sound being a phonograph disc, perfect synchronism was unattainable. At the moment when the words "The Apple Has Fallen" were heard, William Tell may not even have started to bend his cross-bow.

In the endeavors to obtain synchronism

Four views of a face on a moving picture film, with the record of the voice enunciating the sound of "O" photographed on the left edge.

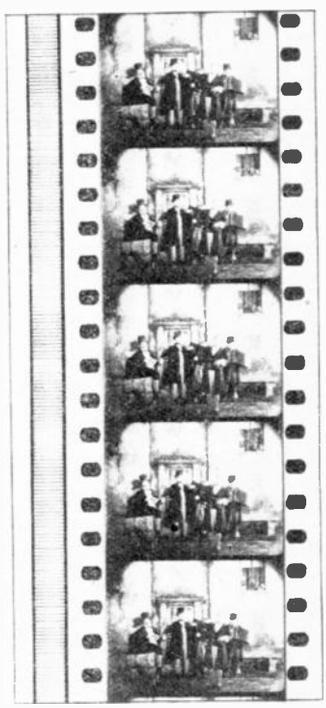
of pictures and dialogue, new difficulties constantly arose. Faulty parts of a film can easily be cut out, without disturbing the reproduction on the screen. But what would the public say when, for instance, Lohengrin already fights with Telramund while in his singing part he is still caressing Elsa and whispering "We are alone, first time alone!" Here you cannot cut out a piece of the gramophone plate to make it concur with the action of the pictures. Some ten or fifteen years ago numerous patents were granted for devices which were said to allow the simultaneous appearance of picture and tone, but as stated above, none of them could attain practical value.

Other inventors experimented with the idea of having the lines of speech imprinted upon the celluloid film, but in this case the receiving and manifolding were very difficult. The traces of speech being made mechanically by the needles, defects in the sounds of the gramophone inevitably accompanied the reproduction of pictures.

During a very recent period, a representation of talking films has taken place in Berlin which proved a true sensation. Speeches, songs, dances accompanied by an orchestra, scenes of plays and operas were produced with great effect. Even the shuffling steps of one actor were distinguishable in the rear seats of the large theatre. Violin, cello, cornet and xylophone each gave its own timbre, and the singing voices were quite clear in tone, especially in the medium range of voice. It is not claimed that there remains nothing to be improved upon, but no doubt there has been thus presented a thoroughly well-studied invention. The definite synchronism of picture and tone is apparent from the description.

The inventors are two engineers, Messrs. Vogt and Masolle, specialists in high frequency current, and the physicist, Dr. Engl. They have been working together for three years, taking out more than 160 German and about 300 foreign patents. Mr. Vogt worked on the basis that *the one film* must be the *carrier of picture and tone at the same time* and that the tone must *not be transferred mechanically* as by the oscillations of mirrors, because they are too slow to adapt themselves to the frequency of the tones. We must here consider that we have the sensation of a tone when of from 16 to 25,000 air waves per second.

The taking of a voice by means of photography. A horn receives the sound-waves. The smallest end of this funnel has the shape of a bee-hive. The transformation of sound,waves, thus received, into variations in light intensity, is done by electricity; carbon microphones are inapplicable and therefore a microphone was constructed which was founded upon the effect of ionised air. This "electric ear" for taking up the voice is termed the cathodophone. It comprises the thin, incandescing rod of a Nernst lamp, close behind the opening of the horn, and this rod in glowing ionises the surrounding air, that is, it makes the air conductive for electricity. A very small space separates the metal nozzle from the glowing Nernst-rod and this nozzle and rod form the terminals of an electric circuit, closed by the ionised air. If at this same time sound waves strike the mouth of the horn, the *ionisation and the current also are reduced in rhythmic accord with the sound.* This current is thus subjected to diminutive variations of but 0.000,001 ampere, but by means of a specially constructed amplifier (cathode tube), the electric variations are increased enormously. The sound waves are thus converted into electric currents, which fluctuate in accord



Scenes in a moving picture drama; on the left are shown the photographs of the voice to accompany the drama, perfectly synchronised therewith.

with the fluctuations of the voice. The currents are conducted to an "*ultra-frequency lamp*" in which the fluctuations of current are transformed into fluctuations of light.

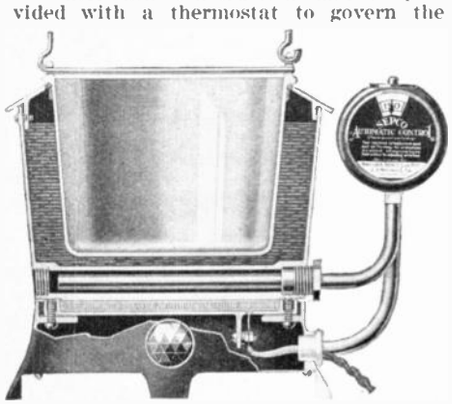
The violet ray radiation of this lamp, which is constructed upon the principle of the Geissler tube, has the property of converting electric waves into practically identical variations of light. Even a whisper in a distance of from 15 to 30 feet affects them. The fluctuations of light of this lamp are photographed through a narrow slit and reproduced upon the moving film; they appear as fine stripes side by side with the picture. This combined voice negative is developed and printed exactly as in the case of ordinary films.

The transformation of the voice photograph into sound waves is performed in the following manner: Through the part of the film carrying the sound photograph, a small shaft of light is passed, whose intensity is governed by the sound-photograph, as we have termed it. The light thus caused to vary in intensity, reaches a photoelectric organ, the "electric eye." The photoelectric cell depends on the action of a metal film in an atmosphere of neon; no selenium is used. This film possesses the property of emitting electrons in accord with the changes of light intensity affecting it, and thus of altering without lag the electric conductivity of the tube. These weak electric alternating currents are now strengthened by a reinforcer, and are capable of setting in action the reproducer called the statophone (electric mouth), with considerable intensity. So far it had not been possible by means of the ordinary telephone receiver to obtain a strength of sound sufficiently loud for large rooms without impairing the intelligibility of speech. This difficulty has been overcome by the invention of a new electrostatic telephone which most satisfactorily renders sound of the lowest as well as the highest frequencies in equal strength and intensity. The disc of the statophone has a diameter of sixteen inches.

The reader will already have recognized that we have here a series of inventions, the significance of which far surpasses their applicability to the kinematograph. Word and tone may now be preserved and transferred without picture in a manner thus far lacking. Politicians, scientists and clergymen may now speak to large assemblies. The reproduction of concerts, of good house music, may now be done by the films, which allow reproductions of unlimited length.

Electric Glue Pot

THE glue pot illustrated here is of water-bath construction and is provided with a thermostat to govern the current received by the heating element. Glue, it is claimed, possesses the greatest holding quality at a temperature of 150-175 degrees Fahrenheit, and if it falls to the neighborhood of 100 degrees or rises to 176 degrees Fahrenheit, it loses some of its adhesive qualities, or, rather, its tensile strength.



A glue pot of the double heater type, the water in the outside vessel being protected from evaporation by a cover, and provided with a liquid thermostat to regulate the electric current and thereby maintain a constant temperature.

Immediately above the heating element there is a tube which contains a volatile liquid which is made to operate the switch automatically, so as to turn the current on or off, according to the temperature. In this way the heat is increased or diminished for a few degrees' excess or a few degrees' fall of temperature. The operation is entirely automatic, so that the glue pot can be left unattended without any danger of boiling over or of heating the glue too hot.

The glue container is of cast aluminum; below the heating element there is an air space protecting the bench from heat. A straight bar extends across the center of the pot, on which the glue brush can be wiped off. The annular space surrounding the glue pot is closed with a metallic skirt or petticoat plate, which measurably restricts evaporation of water. There is a temperature gauge, and a peep hole with a faceted glass window in the base, permitting the workman to watch the operation.

Curious Fire

AN unusual place for a fire was located when the Consolidated Gas and Electric Company in Baltimore discovered a blaze on a high-tension transmission line.

Fumes from a fertilizer plant coated an insulator with a presumably organic deposit, which in wet weather served as a conductor, started a current leak and caused the current to set fire to the hickory pin supporting the insulator.

When this was discovered the 4000 volts of the circuit had forced a current through, which had almost burned the pin away.

Some Interesting Articles Appearing in the February Issue of "Radio News"

On the Transmission of Waves. By Sir Oliver Lodge.

Electrons, Electric Waves and Wireless Telephony. By Dr. J. A. Fleming.

Keeping the Public Sold. By Armstrong Perry.

Damping; Its Meaning, Causes and Effects in Radio. By Louis Frank.

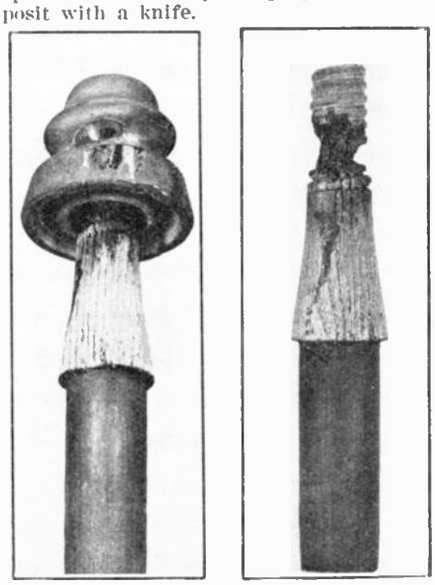
Alkali Vapor Detector Tubes. By H. A. Brown and C. T. Knipp.

Mr. and Mrs. Brownlee Hold Hands. By Ellis Parker Butler.

Super-Regenerative Amplication. By William M. Smith.

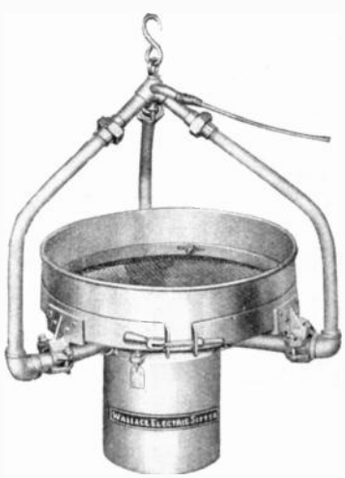
The Reflex Circuit. By J. L. Goldsman.

The dark spots on the insulator indicate the density of the coating, as these spots were made by scraping off the deposit with a knife.



Two views of an insulator pin on a high tension transmission line pole, where a fire was caused by a surface current leak.

Electric Sifter



A most ingenious electric sifter agitated by a motor purposely thrown out of dynamic balance.

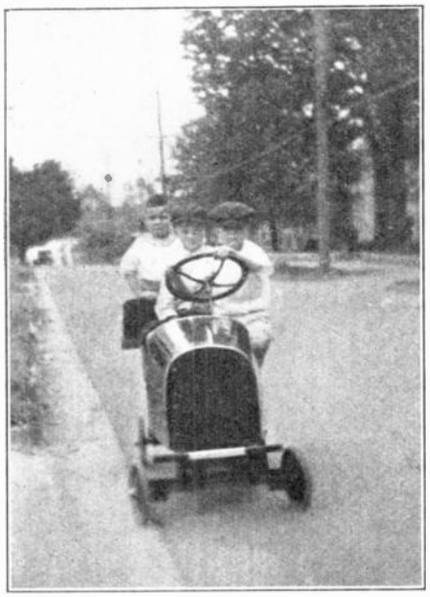
ONE of the great difficulties encountered in the operation of rapidly rotating machinery is to secure dynamic balance. A fly wheel may be in perfect static balance, so that when mounted in its bearings it will remain in any position in which placed, yet if rotated may shake the frame in which it is mounted so violently as to make the machine useless.

This very defect is utilized in the sifter illustrated. There is a sieve from whose center a case descends which contains the motor. It is a vertical motor with stationary armature whose field and housing rotate. The housing is purposely thrown out of balance by a counterweight, so as to produce a violent vibration when it rotates, exactly what strenuous efforts are made to avoid in most machinery.

To operate it, the machine is hung up at any desired place at a height which makes it easy for the workman to introduce material; current is taken to the apparatus by a flexible conductor, the motor starts into action, violently shaking the sieve over a small range of vibration and sifting any material most effectively. The motor is suspended by a block and fall or any adjustable arrangement, so that it can be set at such a height that the workman can easily shovel sand or other material into it.

The case of the motor is dust-proof and cooling air is drawn in at the top of one of the three arms, and after it is circulated about the motor, is blown out at the top of another arm. With an 18-inch sieve we are informed that such a sifter will keep two workmen shoveling at top speed, who will at that prove insufficient for keeping it at full efficiency. The claim is advanced that the work of twelve men can be accomplished by the electric sifter.

Electric Automobile for Children



Left—A front view of a miniature electric car for children's use, with disc wheels, rubber tires, and all modern improvements.
Right—A side view of the little car, which seems able to carry more than its allotted number, in this respect resembling its larger brethren.

THE miniature electric car described here is adapted for operation by children; it is not a toy, but a real car.

We believe the illustrations show that there is a real chauffeur at the wheel.

The body is made of white wood, has a stream line hood, and is carried on a steel chassis. There is a front and rear bumper covered with sheet aluminum. The car has four disk steel, roller-bearing wheels with large rubber tires. The speed controller, which is in a metal box under the car as shown, has four contacts immersed in oil and each contact is connected to four No. 14 nichrome resistance wires in parallel in porcelain tubes, giving a variable speed to the motor.

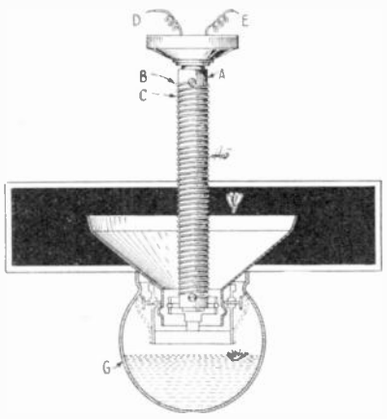
The regulation automobile brake design is used but with only one brake lining. This car has a strong 6-volt motor; bicycle sprockets and chains are used to make the speed about 12 miles per hour. Under the car is a 200-ampere switch with lock, so that the car may be locked when not in use or when repairs are to be made. Two 6-volt storage batteries are connected in parallel and rest on rubber mats under the hood. On the dash is a porcelain receptacle which is connected to the bat-

teries and a rectifier is plugged into this receptacle to charge the batteries from 110-volt alternating-current circuit. When the batteries are charged the car will run about five miles.

Contributed by E. B. STACK.

Electrocuting Flies

FLIES are dangerous; hygiene dictates a deadly war against them. But the ways of destroying them are relatively few, the best known being the several



1. Section of the electric fly-trap with its connections all designated and described, showing what becomes of the flies.

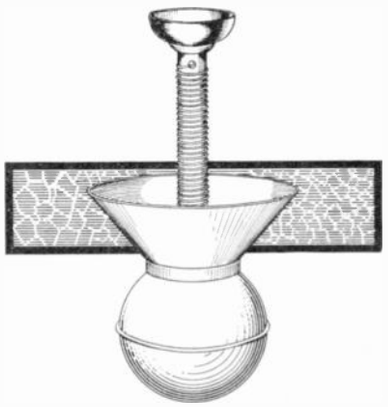
kinds of flypaper. These papers, however, whether poisonous or adhesive papers, always present a disagreeable appearance in proportion to their success.

We have here a new fly-killer, of a quite different principle; to the feature of high efficacy it joins that of cleanliness, and one might almost say of elegance. The principal original feature is that it electrocutes the victims.

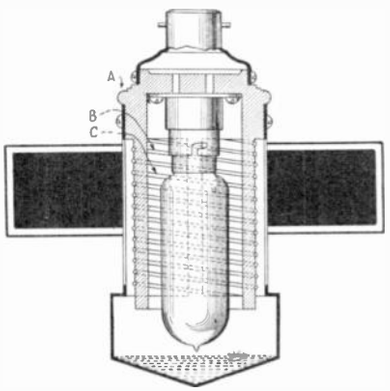
The device consists of a bar of insulating material (A), which may, for example, be wood, on which are wound two electric conductors (B) (C), perfectly insulated one from the other; each wire at one of its extremities is connected with one of the leads of an electric circuit, the other extremities being without connections, so that the circuit is opened. The apparatus shown in Fig. 1 is connected at (D) and (E) to the two leads of a house circuit.

If a fly alights upon the bar (A) it brings the two wires (B) (C) into communication through its body; a spark jumps across and the insect is lightning-struck. He falls into the funnel (F), then into the recipient (G), which is filled with water containing a few drops of kerosene. Here he is definitely asphyxiated. The funnel (F) and the recipient (G), locked to the bar of the electrocuter by means of springs or a bayonet joint, are easily detached, so that the apparatus may be quickly removed for cleaning whenever such may be necessary.

As a means of attracting the flies, an odoriferous liquid may be brushed over the bar (A). It is to be observed that the fly-killer consumes no current except for the brief instant of an electrocution. Figure 1 shows a view, partly in section,



2. A perspective view of an electric fly-trap; the flies, alighting on the stem or vertical shaft, are electrocuted and fall through the funnel into the globular receptacle below.



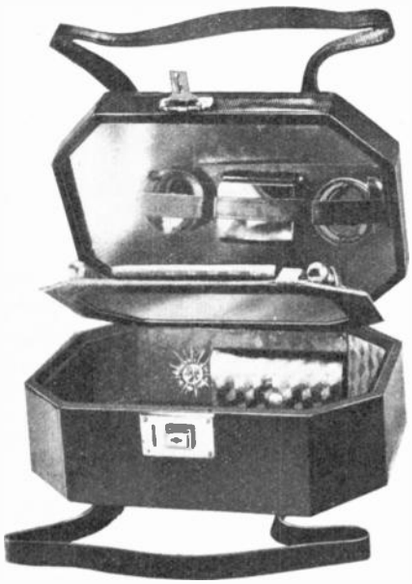
3. A section of a special construction of the electric fly-trap, whose functions are not so perceptible and which is of more desirable contour.

of the apparatus, and Figure 2 shows the exterior in elevation.

Figure 3 shows a model slightly different and particularly elegant, which will serve for living apartments. It has the appearance of a night light; it contains an electric lamp burning behind a screen, and within a translucent case, whose bottom is the recipient for the electrocuted flies; on an insulating cylinder (A) are wound the two conductors (B) and (C), whose action is the same as has just been described; during the evening the flies, attracted by the light, fly around the apparatus, try to walk upon the wires, and the contact kills them.

Illuminated Vanity Case

THE illustrations tell the story of this accessory to the lady's outfit. All of us have some idea of what a vanity case



A vanity case containing, in addition to its mysteries, an electric light and the usual mirror, so that the possessor can use it in a darkened place.

is, although not all of us have penetrated its dark mysteries. These mysteries will be dark no longer, for the electrician has now placed in the vanity case an electric lamp, which is lighted by touching a button. In the cover of the case there is a mirror, and the light when the button is pressed, illuminates the face of the user, so that she can see her reflection in the glass and guide her actions accordingly.

The lighting system is built into the case with a concealed battery, the battery and lamp both being of standard type so that they can be purchased anywhere, and this latest vanity case is made in several sizes and styles for different requirements. Some of us prejudiced males would even hope that the lady's face would appear so well under these conditions, that she would leave the contents of the case undisturbed, believing that the Creator knew what he was about when he endowed her with natural charms.

A view of the vanity case in use, showing also a different design of the same, of rectangular outline.

Powerful Electric Lantern

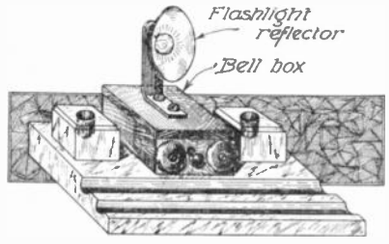
A hand electric lamp fitted with three dry cells or a storage battery, so as to constitute a thoroughly practical lantern, and one whose battery will last on account of its size and capacity.

THE illustration in itself is almost sufficient description of this magnified flashlight. Flashlights are not altogether satisfactory, being quite apt to give out in an emergency, and their batteries not being of large size, they give but little light as the size of the lamp is restricted naturally. The fact that they concentrate the light into a beam which spreads but little is the principal cause of their usefulness.

The lamp we illustrate has an aluminum case which contains two number 6 dry cell batteries. These are the same batteries that are used for operating bells and are able to take care of somewhat heavy service. The lamp is a three-volt bulb. It is placed in a center of a reflecting mirror and has a focusing adjustment, so that it can be pushed backward or forward to change the divergence or spread of the reflected shaft or beam of light. The reflector is enclosed by a glazed door of wire glass. It is obvious that this is considerably larger and a more serious proposition than the little flashlight with which we are so familiar. We are informed that this appliance was used extensively by the army overseas, and a military type is still manufactured which is intended for the regular army equipment.

An interesting variation on the dry battery lamp is one which is equipped with the Edison storage battery. Of course, the battery is heavier than the miniature flashlight battery, but the weight of the rest of the lamp is kept down as much as possible. It is put at four pounds without the battery.

The "Tin-Ear Phone"



An alarm for a deaf man, to be placed on his desk with his inkstand, to notify him when the telephone is calling.

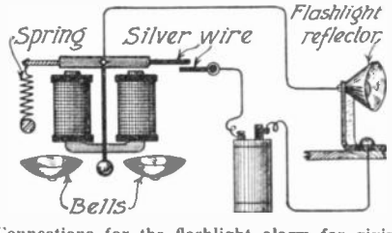
ONE of the executives in a large-sized office, being quite deaf, was unable to hear the telephone bell ringing under his desk. Bells of various tones were experimented with, to no avail.

Some success was obtained by removing the polarized ball from the regular box, placing it in a neat box forming a combination bell-box and inkstand for the desk, with the bells directly in front. The bell hammer was painted white, so as to be more readily discernible in case of doubt as to its ringing. A small flag fastened to the hammer fluttered when the bell rang.

These contrivances were helpful but not wholly efficient. Two short pieces of silver wire were fastened, one to the bell hammer and one to an insulated support, so that they touched when the bell rang and thereby closed the circuit to a small battery flashlight which flashed across the desk. The accompanying illustration shows the connections and the appearance of the finished combination.

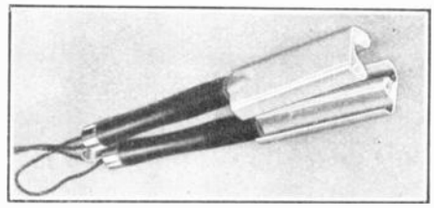
This apparatus, which served efficaciously for the deaf man, was promptly dubbed the "tin-ear phone."

Contributed by V. H. Todd.



Connections for the flashlight alarm for giving an ocular signal when the telephone is calling.

Marcel Electric Waver



A Marcel waver, the electric current being called upon to give the desired effect to the coiffure.

PRACTICAL ELECTRICS has frequently had the pleasure of illustrating articles which interest the fair sex and which are designed for their alleged improvement, although some of us think that nature made the members of that sex almost perfect.

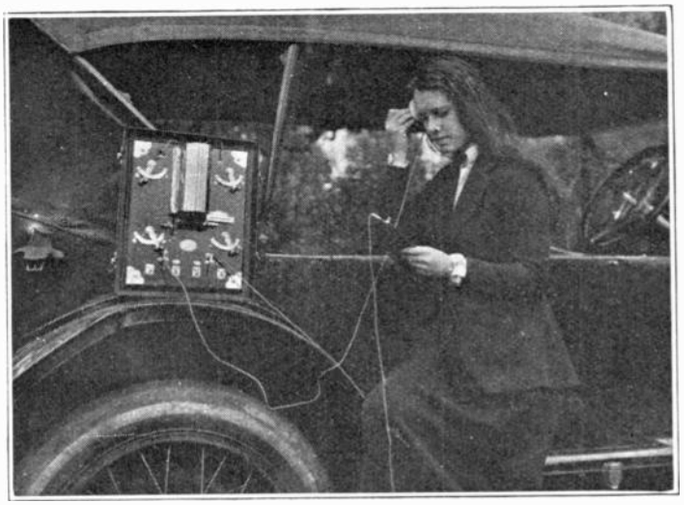
The illustration with this article shows correctly shaped tongs for marcel waving the hair. The reason for its shape is obvious; it clamps the hair between the two dies of the tongs, as the mechanic would call them, and these are warmed by heating coils, one within each piece.

It is claimed that the apparatus works successfully on hair of different qualities, that it uses the minimum of heat which will effect the purpose, and that the wave produced will last a number of days. It is built for 110 to 115 volts, which is the voltage of the everyday house circuit and uses one-half ampere, the power consumption representing about 55 watts.

Traveling Electric Beautification

OF late years automobiles have been used a great deal by campers. While this seems perfectly natural in the West and less settled parts of the country, here in the more settled East a great deal of open-air living is indulged in by automobilists. Trailers may be drawn along with an automobile to carry camping appliances, or if the family is not too large the automobile itself will carry everything needed, including tents, sleeping bags and cooking appliances. In a great many cities and towns, public parking places are provided, where automobilists can spend the night, so that the motor car is acquiring a new significance in our life.

As every car has its starting battery now, electricity is always available for minor uses, and the illustration shows a switchboard designed to further such uses as illustrated. The lady, who looks suspiciously neat for an automobilist, is using electricity for some of those mysterious performances in the line of beautifying the face, which members of her sex are so fond of indulging in.



The storage battery of an automobile connected to a special switchboard, so that a lady occupant can employ electrical toilet appliances for the purposes best known to herself.

It will be observed that there are two wires leading out from the switchboard, one connected to the appliance in the lady's right hand, and the other to the mirror-like object in the left hand. In this way an electrical massage or some similar process is carried on, right in the open, as well as if it were conducted in a professional establishment.

After the automobile has marked the complexion with the toil of travel, it is obliging enough to supply an electric treatment for restoring the face of the weary traveler to its pristine freshness.

A New Hot Water Faucet

THE arrangement which we describe here appears to be among the most practical because it is simple, hygienic and its adjustment cannot be disturbed.

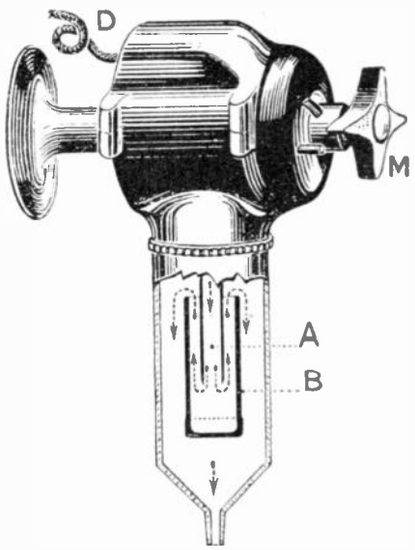
There are no interior metallic resistances requiring time to develop heat, and which oxidize. The water itself, traversed by the current, is at once heated thereby and sterilized, conducing to economy and hygiene.

The faucet again can supply cold water just like an ordinary one, and a simple turn of the handle starting the current gives warm water at any temperature up to that for which the apparatus is regulated.

The instant the handle is turned the water runs warm at a temperature determined at will by the position given to the handle. Whatever kind of electric current is employed, one can never be shocked, the connections being studied out for this result. If the water is cut off by any accident, the current is cut off also. No deterioration of the apparatus can result in such case, something which, when metallic resistances are used, or when gas heat is used, may readily ensue. The faucet is made in different models for all ordinary alternating currents used in our cities and elsewhere, and replaces without difficulty the ordinary water faucet.

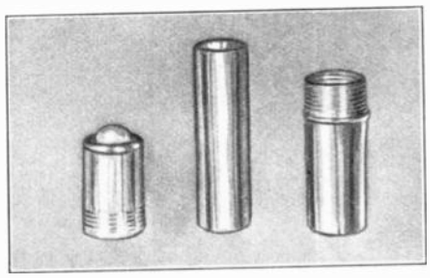
The illustration shows this faucet with a partial section for elucidating the principle of its action. The electric current from a wire (D) reaches a tubular electrode (A) made out of inoxidizable carbon, and passes through the water which circulates around it, heats it and goes to the second outer concentric electrode (B). After being heated between the two carbon electrodes, the water escapes at the bottom of the faucet, its course being indicated by the arrows. The water and electric current are both turned on by the one handle (M), which governs the rate of both currents.

The small model will supply a pint a minute of water at a temperature about 90 degrees Fahrenheit, with an expenditure of about half a kilowatt. A larger model can heat up to six times this amount, using a maximum of 5 kilowatts,



A very interesting hot water faucet, heating water as required by current passing between carbon electrodes.

while a still larger one can take care of 8 to 24 pints per minute, giving a temperature in excess of 120 degrees Fahrenheit, using from 12 to 22 kilowatts. The efficiency is nearly theoretical and reaches about 97 per cent.



Three views of probably the smallest flashlight made, which will fit in your pocket. It is made in Germany and occupies a little more room in the pocket than the German mark.

Miniature Flashlight

FROM Germany there comes the diminutive flashlight illustrated here, which to all intents and purposes consists of three pieces, although if we completely dissect it, there will be found several more.

The front part carries the lamp; unscrewing it, a cylindrical battery appears, stowed away inside the lower portion of the case, in which it rests loosely. For the purpose of our photographer, the little flashlight was unscrewed and the three elements put side by side. It certainly is the acme of simplicity. It is a little over two inches long, and perhaps five-eighths inch in diameter. To cause the lamp to light, the upper part is screwed home on the lower. This completes the battery circuit, so that the screwing action represents the closing of a switch. On unscrewing the upper part, the circuit is opened and the lamp ceases to give light.

Not only cheapness of construction, but convenience of operation is conduced to by the absence of any switch, for switches on flashlights have a way of behaving in a rather annoying manner, at least such is the experience of the writer. Here we have no switch.

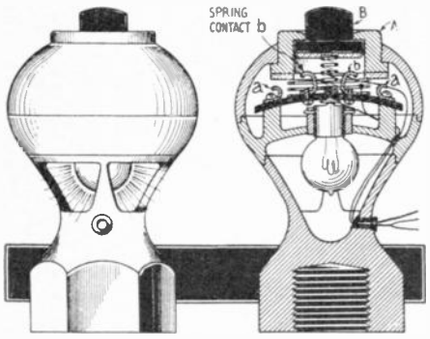
In ordinary flashlights, the switch often seems the defective part, not operating as smoothly as it should, but giving the feeling of uncertainty. Here the switch problem is absolutely abolished with the original switch. A simple turning of the two sections of the tube together closes the circuit and lights a lamp.

A frequent way of expressing the simplicity or complexity of machines, as the case may be, is to give the number of parts, and when in the most ordinary machine all the pieces are summed up, screws, nuts, bolts, etc., the number sometimes is astonishingly large. But here we have a structure in three main pieces, unless we wish to count the parts of the battery and the bulb as units. It is composed mainly of three parts, exactly as shown in the illustration. Simplicity certainly could not go much further or do better in the way of producing the ultimate flashlight which, small as it is, is not a toy, but lasts a reasonable time and gives a fairly good light.

Motor Electrics

Steering Wheel Alarm Button

THE illustration shows a very neat appliance to be screwed upon the top of



An ornamental and useful steering post alarm button, giving a light, as well as sounding the horn.

the steering bar of an automobile, in the center of the steering wheel.

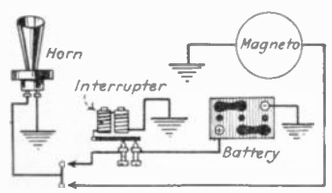
Within the shell there is a lamp, and four windows are cut through the bottom of the shell, so that when the lamp is lighted the line will shine out, producing a pleasing effect.

In the upper part of the shell there are four contacts, one pair marked (aa), the other pair marked (bb). There are two concentric push buttons, each pressed up by its own spring. One button is marked (A), and the other is marked (B). The driver presses down the buttons, both of which can be depressed by one motion, the button (B) first descends, bridges the space between the contacts (bb), thereby closing the circuit through the horn and sounding it as usual. If it continues to push, the springs (dd), yield to the pressure, and the outside concentric button (A), is forced down against the contacts (aa). This closes the circuit through the lamp, so that now the horn is sounding and rays of light emerge from the top of the steering column, giving a sort of visual alarm and producing a very attractive effect. The illustration shows the connections very clearly.

Contributed by FRANCIS J. LORENZ.

A Magneto Horn

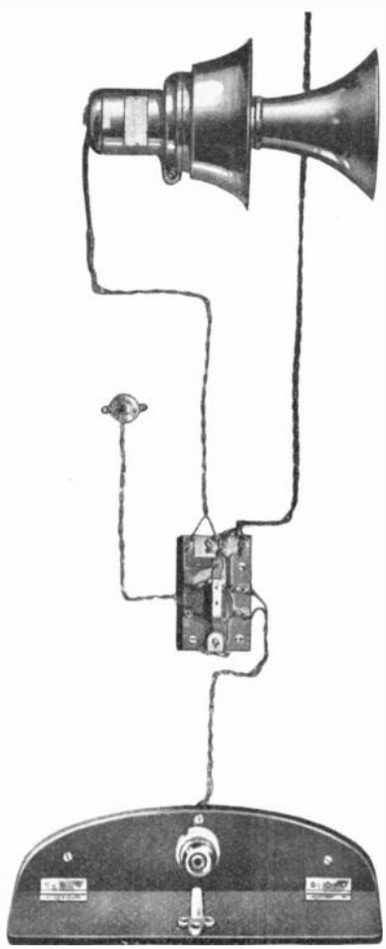
THE magneto horn is an instrument of the buzzer type, through which the requisite impulses of current for making sound are given by a hand alternating current generator. On turning the handle the rapid successions of impulses occur, acting on the magnet of the horn; the attraction repels the soft iron disc in front of the poles of the magnet, producing the characteristic sound.



Connections and wiring for sounding an alternating current horn on a direct current circuit.

The illustration shows how such an horn, which, if connected to a direct current, will give no sound whatever, can by mediation of a buzzer be made to act without the necessity of a generator. The buzzer is put in line between the battery and the horn, and in the case of an automobile, for which it is specially designed, the starting battery with grounded circuit actuates it.

A contact screw is placed at the upper end of the armature of the buzzer and is connected to ground. When the switch, which may be on the steering columns, is closed, the buzzer starts its armature in rapid vibration, the armature is in circuit with the coils of the buzzer and the horn proper, so that the vibrations of the buzzer



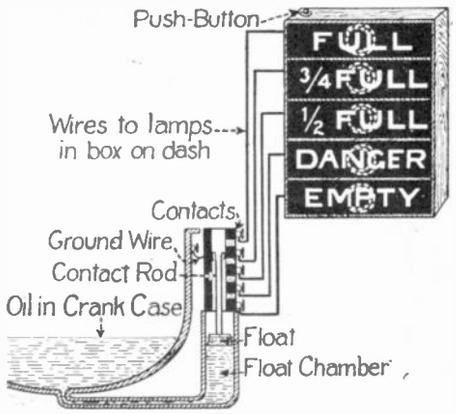
A view of the general lay-out and distribution of parts of the circuit for a magneto horn sounded by a buzzer.

armature are transmitted to the magnet of the horn and the sound is produced as long as the switch is left closed. This gives a sort of Klaxon effect.

Oil Level Annunciator

HAVING burnt out the bearings in my car several times during my long drives through the country, due to lack of oil, I devised a simple apparatus for determining the amount of oil in the crank-case without my leaving the driver's seat. The device serves to warn automatically and also stops the engine at the same time.

The apparatus works in the following manner: To determine the amount of oil in the case, press the button on top of a box mounted on the dashboard and the



A system for indicating the height of oil in the oil reservoir, applicable also to the gasoline tank.

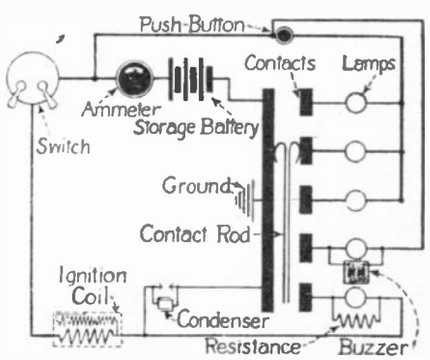
light will tell the amount. If while driving the oil falls to the danger point, both a light in the box and the buzzer will automatically give a warning of this. If the warning is disregarded and the oil falls below the "*Danger*" point, the ignition coil will be short-circuited automatically, the motor will stop, and a light will be lighted behind the transparency "Empty." The motor cannot run unless the oil is replenished.

The box, which is mounted on the dash, is made of metal or wood of any required size. In this box there are horizontal partitions, giving, with top and bottom, five compartments, with a lamp in each. The "Danger" compartment has a small buzzer included and the "Empty" compartment has a resistance unit—any standard 6-volt automobile resistance unit will do. This is shunted across the bulb in the danger compartment to insure a perfect circuit in case the bulb is burnt out.

The front of the box is made of glass which is painted with the necessary lettering as shown. From the box the wires run to the contact chamber as shown, and also the wires coming from the switch and the ammeter. The push-button controls the lamps in the "Full," "¾ Full" and "½ Full" compartments; the other lamps operate automatically.

The contact chamber is made out of fiber or other insulating material.

Contributed by FRANK P. O'NELL.



Details of the wiring and connection of signals and alarm for disclosing the condition of the oil supply.

Experimental Electrics

Ageing Wines Electrically

By Jacques Boyer

Paris Correspondent, PRACTICAL ELECTRICS

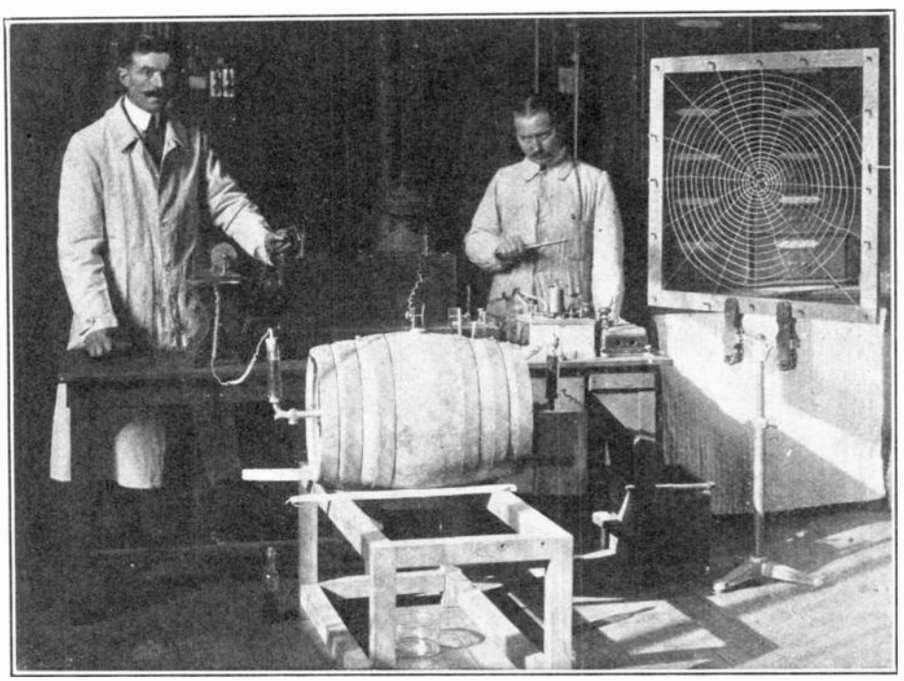
TO quickly impart to wine and alcohol the bouquet which a slow oxydation and constant care give it after a long sojourn in the vaults, is a problem which Professor Charles Henry, the eminent director of the Physiological Laboratory of the Sorbonne has taken up, after so many others have unsuccessfully attacked it.

Abandoning the chemical agents used in the experiments of his predecessors, he uses the magic of electricity to quickly remove rankness and impurities from the new juice of the grape, or the disagreeable taste from the products of the distillery.

Professor Henry's experimental arrangements are very simple. He places his tub or any other recipient full of the liquid to be treated, in an electrostatic field of 60,000 to 120,000 volts. This difference of potential he obtains by means of an induction coil placed in parallel in an alternating current. But in case there is only a direct current at his disposal it has to be transformed into the alternating current by means of a rotary converter.

This treatment can also be applied by coupling the transformer with an alternating current dynamo driven by an internal-combustion engine. Whatever is done the liquid is placed in contact with the two electrodes of the circuit by means of electrodes enclosed in glass tubes with cocks and which Professor Henry calls the "purgers," because under the influence of the electrostatic field the impurities collect there in the course of the operation. On the other hand, between each pole and each purger there is interpolated a point and a disc for affecting the current.

According to the reports from the noted investigator, the electrostatic field effects all the ageing of the wine in a most economical and efficient way by acting on the colloids, the diastases and the microbes, the three principal factors of the normal evolution of grape juice from the time of its flowing out of the press up to the final stabilization of its different constituents. The colloids play a most important rôle in this matter, although they are present only in a few one-thousandths, in the composition of the wine; considering the minuteness of their particles, sometimes only a twenty-five-millionth of an inch in diameter, and on account of their Brownian movements they multiply the surfaces of contact between two surfaces disseminated through the liquid mass: Their accelerating function in the wine-producing reaction is undoubtedly a catalytic phenomenon. In any case, the electrostatic field separates the traces of colloids into particles, neutral, positively electrified, or negatively electrified. As true and real an ionizer as heat, as ultra-violet rays, or as acids or alkalis, this process has the advantage over these physical agents of easier manipulation.



An electrostatic field of upwards of 60,000 volts is used to improve wines, producing the effect of natural "ageing," and decomposing the unpleasant impurities of new wine.

On the other hand, the diatases of the yeast, so important in the formation of the bouquet and the taste, decompose the constituents of the must into fragrant products by oxydation or reduction. (*Oxydases* or *catalases.*) Complex colloids lower the temperature of the reaction, and as a slight difference in potential excites their reaction, a strong electrostatic field destroys them. In the third place, the colonies of microbes which are found in wine are also characterized by their electric polarity. Thus, for example, the yeasts and the bacteria are negative. Other bacilli are positive. The first fly to the positive pole, the others to the negative pole.

These facts, experimentally determined, enable us to foretell the action of an electrostatic field on vinous fermentation; if feeble, it excites fermentation, but if strong, according to its intensity, it retards it, finally stopping it altogether, on account of the attraction of the microbes to the electrodes, and according to the disorganization of the diastases. We can then improve deteriorated wines and accelerate the ageing of good wines by subjecting the diastases to catalyzing action. In short, the good effects of Pasteurization are produced without the attending inconveniences, for it does not destroy the micro-organisms required for the normal evolution of grape juice.

Professor Henry has subjected different wines from Touraine (Chitenay et Vouvray) to a feeble electro-static field, and after a single treatment he compared them with samples taken from the same casks. According to his notebooks, which he opened before us, this system would advantageously replace filtering processes, so risky as regards the quality and bouquet of wines, as such processes introduce coagulating impurities and chill the liquid. This process will make unnecessary the usual purification by albumen or chemical treatments, always disadvantageous to the quality of the product, and often injurious to the health of the consumer.

According to the size of the hogshead, each operation lasts two to three hours and requires some kilowatt-hours, per kiloliter. When there is no difference to be detected between the liquid in the purgers, emptied from time to time, and that of the casks, whether tried by taste or bacteriological examination, or chemical analysis, the current is cut off.

In general, after this treatment, the percentage of alcohol in the wine in the barrel diminishes, as well as its total acidity. The aldehydes and ethers change considerably. In the purgers are found albumen, sugar, sulphur, iron and substances of disagreeable odor, without counting the more or less important agglomerations of "vinegar plant," *Mycoderma aceti or Saprophytes,* of other low forms of fungi, and of bacteria.

Finally, the difference between the original wines and the wine which has been treated increases with time, which the colloidal character of the constituents explains perfectly. It is easy to understand why the electrostatic field cures wine of bitterness and of its other troubles and stops secondary fermentation.

The new treatment of Professor Henry is so firmly based on scientific principles that its application is being tried in important wine making establishments and distilleries to see if the promises of the laboratory can be carried out on the industrial scale.

Small Hydroelectric Plant

By A. L. Cavanaugh

A PLANT of this design will be found to accomplish perfect work on the farm or for many other uses. It will operate as well, and in many cases better, than the expensive systems on the market. After you have figured up your needs and obtained prices for the commercial systems, then figured out what this one will cost, you will find it possible to save a substantial sum by constructing your own plant.

For purposes of reference, we will assume that you want a farm plant (the dimensions, etc., will be no different in any locality, except that the farm usually offers a better location for plant). Select your site—if possible a stream with rock

Fig. 1. View of a miniature power house and water wheel with the dam in the background; a farm hydro-electric power station.

bottom, as it offers a good foundation for the dam, which should preferably be of concrete, though stone and mortar will make a good one. For the plant here described the dam should be about seven feet high at its center or highest point.

Fig. 1 shows a front view of plant and dam. Fig. 2 shows a side view from the wheel side of the house, and a cross section of the dam near the center. A door is placed in the side opposite the wheel. The house itself may be built of ordinary lumber, 2-inch by 4-inch timbers forming the frame, covered with weather boarding or "shiplap," and the roof with shingles, or else whatever is most convenient. The cost of the house is a trifle, especially on the farm, where scrap lumber can be found around the place. Stones and creek sand or gravel from the stream will greatly reduce the cost of concrete.

Fig. 4 is a detailed drawing of the wheel. (A) is a side view and (B) is the full view of the wheel. Each rim is made of eight pieces of seasoned oak one inch thick, joined to the hub with eight 2-inch by 4-inch timbers. The hub is a circular piece of oak 20 inches in diameter. The

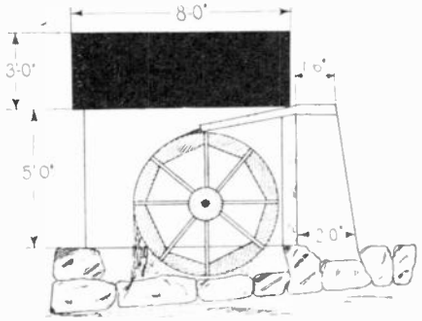


Fig. 2. Side view of the structure shown above in end view.

wheel is five feet in diameter and 22 inches wide.

Use a 2-inch pipe for shaft; it passes through the hub of the wheel and lies in a bearing outside the wheel, as well as on two bearings inside the house, the

Fig. 3. A general view of the mill and dam, with the overshot water wheel and some dimensions.

shaft extending all the way through the house.

Fig. 5 shows a bearing (B) which is formed of babbitt metal held in place by two blocks of wood, as shown. Pour the metal directly in the wooden blocks in two pieces—a top and a bottom. Set screws will hold the block in place, also providing a method of taking up wear in the bearings. Fig. 6 shows the way of making the buckets on the wheel. Boards one inch thick by 16 inches wide may be sawed lengthwise part way through on

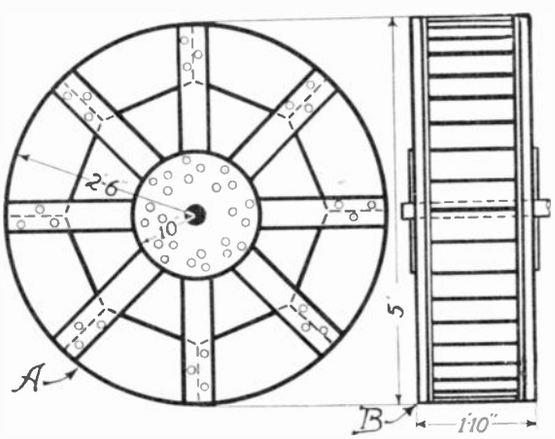


Fig. 4. Diagram with dimensions for the construction of the overshot water wheel.

one side and are four inches less in radius than the 5-foot circle of the wheel's periphery. This would be the bottom of the buckets, and should be nailed between the two sides of the wheel, four inches from the outside rim, giving the buckets a depth of four inches. Make 48 dividing boards of 1-inch stuff, placed at an angle of 30 degrees with the tangent to the rim of the wheel.

Inside the house place a belt wheel on the shaft with special made hub (the size of this wheel should be according to the speed of the water wheel, and would have to be computed by speed of water in the stream). This wheel is the driving wheel and is belted directly to the dynamo, as shown in Fig. 10, which shows the general layout and wiring of the exterior of

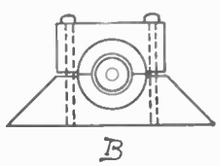


Fig. 5. One of the bearings of the main shaft of the water wheel illustrated above.

the plant. The voltmeter and ammeter used on the switchboard can be purchased from some local electric shop cheaper than they can be made. They are not absolutely necessary, but prove a convenience in showing just how much power the operator has, and whether he can add another machine of some sort to the list he has already running. This figure also shows the concrete block on which the dynamo is set to eliminate vibration.

Perhaps the most difficult "job" of the whole thing is the making of the dynamo, and yet it is not a formidable undertaking if directions are followed carefully. Of course, the usual way is to purchase this, but the one for the purpose can be made at less cost, and besides it is difficult

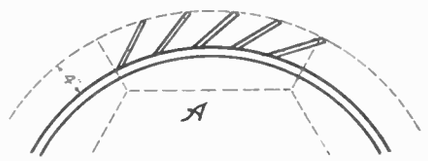


Fig. 6. A portion of the water wheel, showing the buckets and how they are placed to hold the water and produce the power.

to obtain a machine of the right kind—one that would work at as low a speed as the operator is likely to require.

The machine here described, and to be used on this plant, is a direct current generator, and should develop at least one-half kilowatt, nearly a horsepower, in good running condition. In order to be of the highest efficiency, it must have closely fitting parts, and for this reason should be carefully machined. There should be as little clearance as possible between the armature and the pole faces. A ¾-inch shaft of machine steel should be used for the core of the armature. Sheets of iron should be cut as in (A), Fig. 8, enough to make a thickness of 10 inches. An equal number of paper sheets (but mica is better) should be cut of exactly the same size and shape; the dimensions of these pieces are shown in the illustrations. Cut the notches by dividing the rim into 12 parts and cut every other section to a depth of three-quarter inch, dovetailing on each side to retain the wires. The hole in the center should be just big enough to press on the shaft, after which the entire bunch of metal is keyed on the shaft by drilling holes close to the outside sheets and inserting screws, making a compact cylinder of iron.

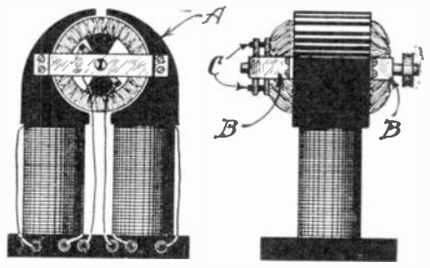


Fig. 7. Side and end view of the generator to be driven by the water wheel in the hydro-electric plant.

The entire armature is now insulated by giving it several coats of shellac, letting each coat dry before adding another (it may be covered with paper, but this involves considerable trouble and is not actually necessary), and is now ready for the winding. You should use the Siemens

winding. Number 18, double cotton-covered magnet wire is the best for the purpose, and it will take about four pounds. Begin at one end of the core and wind on lengthwise, bending aside at the shaft as shown at (B), Fig. 8, and placing the wire one layer deep, being careful to pack firmly. Each slot will hold about 16 turns per coil. When one coil is complete, do

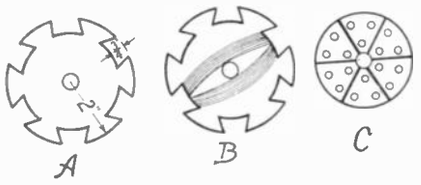


Fig. 8. The laminations of the armature and the windings illustrated, and the five part face commutator of the simplified dynamo.

not cut the wire, but leave a loop, as shown, and begin winding the next coil in the next slot, and continue around the armature in the same manner. After once around, a coat of shellac should be put on the coils, then another series is wound on top of the first in the same manner, leaving a loop in like manner.

Everything is now ready for the commutator. Make the backing of a disc-shaped piece of vulcanized hard rubber, three inches in diameter and one-quarter inch thick (hard wood boiled in paraffin wax is satisfactory, except for a tendency to warp). Now secure a piece of brass of the same shape, size and thickness as the backing, with 18 screw holes, as shown at (C), Fig. 8. After you have screwed this brass plate to the wooden backing, with a hacksaw cut the brass into six parts, as shown in diagram. You now have six pieces of brass separated by just enough space to insulate them from each other. They could be cut separately, but this is the easier method. Now bore a hole in the center just big enough for it to be placed on the armature shaft on the end where the loops of wire were left out, then key it. Cut all the loop ends bare for an inch. Solder the bared ends to the segments of the commutator, all the loops in one slot going to one segment, as there are as many segments as there are slots.

Fig. 11 shows the finished armature, with several turns of brass wire wrapped around near each end to hold the armature wires in a compact bundle.

Fig. 7 shows two views of the completed dynamo, with the dimensions. The pole pieces (A) are cast iron. They should not be made until the armature is wound, as they can be made to fit the armature much easier than the armature can be wound to fit the pole pieces. The field coils are wound with No. 18 wire on two 3-inch soft iron bars. This winding can best be done on a lathe, guiding the wire with the hands or with a stick bored at the end for the wire to pass through. Each layer of wire on the coils must be insulated from the other with a piece of

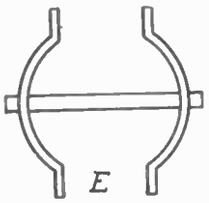


Fig. 9. Brackets for holding the armature; the cross lines indicate the armature shaft, the brackets spanning the ends of the armature bore.

paper. The ends of each coil should be brought to the base of the machine and attached to a binding post, as shown in the diagram.

The brackets for holding the armature in the machine should be made of brass, and are shown in detail at (E), Fig. 9. They should be screwed to the pole pieces.

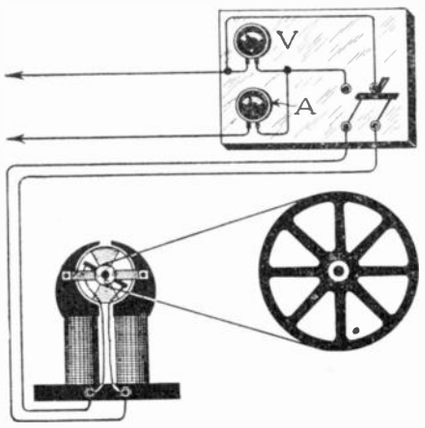


Fig. 10. The main switch, volt-meter and ammeter, and the belt drive of the dynamo. One of the brackets alluded to above is seen here, bolted to the pole-pieces.

The dimensions of the various parts of the machine are shown in the diagrams when such is necessary. The size of the field coils will vary with the amount of the wire, and should be between four and five inches in diameter.

The pulley on the shaft of the armature is the driving pulley, and is three inches in diameter. The brushes are thin strips (C) of copper held in place by a brass bar attached to the bracket, and should be carried to the bottom and terminate in two binding posts, as shown. The base of the machine should be a piece of soft iron 2 feet long, 18 inches wide and 3 inches thick. The entire machine is held together by the cores of the field coils

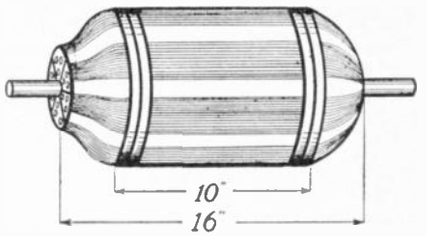


Fig. 11. The armature wound, the five part face commutator is seen on the left hand and the windings are seen lying in the grooves in the laminations.

which extend beyond the coils about two inches on either end, and screw into the pole pieces on one end and into the base on the other.

The binding posts should all be insulated from the base (or they may be on a wooden base attached to the metal base).

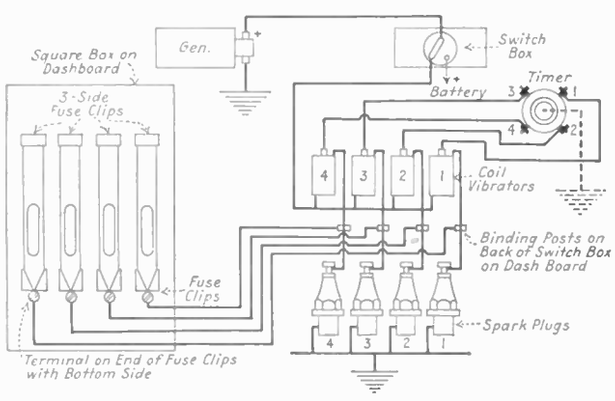
With the machine all set up, as shown in Fig. 10, with the wiring as shown, it is now ready to be hooked up to the wheel. Before any power can be obtained from the dynamo, the cores must be magnetized, which may be accomplished thus: Connect binding posts so you can run the current from two dry cell batteries through the field coils, then connect armature winding and field coil in series, which will be very obvious and clear. Now start up the machine at as high a rate of speed as possible. The current is now taken from the outside binding posts. The brushes may be adjusted so that the machine will operate successfully in either direction.

A power station may be installed in the house, where you can have a series of storage batteries which may be charged when the current is not being used. Thus there will always be plenty of "juice" to run lights, fans, and so on. A ½-kilowatt machine means that 500 watts, or five 100-watt lamps, can be used at one time, but by storing up current in the batteries the capacity of the work that can be done, or the number of machines run, is limited only by the number of batteries and the time the machine is run without being used. In other words, if there are batteries enough, almost an unlimited amount of power can be stored—sufficient to operate any and all sorts of time and labor-saving machinery.

Spark Plug Tester for Motor Cars

THE illustration gives a diagram showing how connections may be made for notifying the driver of an automobile by inspection, without leaving the driver's seat, of what work the plugs are doing.

Upon the dashboard a sort of shallow box is mounted, carrying four spark plug ignition testers. The one the writer used was the Westinghouse Spark C Tester; this resembles an Eversharp pencil in shape and gives a glow through a little window in the case, or is without glow, all of which reveals the condition of the plug. A faint glow shows a bad plug or bad wiring; if no glow appears the wire is broken or the plug is short-circuited. A bright glow means all is well.



An elaborate spark plug tester designed primarily for motor powers, but adaptable to any multi-cylinder, internal combustion engine.

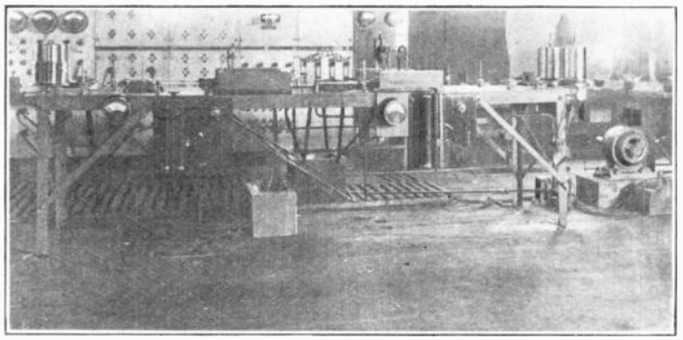
Accordingly, four of these testers are mounted on the dashboard between old fuse-clips. The lower ends are connected to the cylinders of the car, so that each tester corresponds to and is connected to its own cylinder. The diagram explains the connections perfectly.

With this arrangement on a car, a short-circuit, an oiled-up plug, a break in the wire, or a crack in the porcelain will at once be revealed to the driver, and not only that, it will disclose to which cylinder the defective plug or connection appertains.

By a slight modification in the connections, spark gaps could be used on the dashboard instead of the tester, but these would give very imperfect information.

Electric Hardening and Tempering Process

By Maurice E. Pelgrims
Belgian Correspondent, PRACTICAL ELECTRICS



An elaborate apparatus for hardening and tempering steel wire and strip. The heat is produced electrically so that the room gets comparatively little heat, making the process much more sanitary than it otherwise would be.

UNTIL recently the only methods available for hardening and tempering steel wire and strip were by solid fuel, gas or oil furnaces. While these have served a useful purpose in the past, modern conditions demand a more accurate method of heat treatment in order to successfully achieve results. With combustion furnaces there is considerable difficulty in maintaining accurate temperature control, due to variations in the number of potential heat units supplied, and the impossibility of obtaining perfect combustion.

A newly patented British continuous process for the electric hardening and tempering of steel wire and strip has been developed, after several years of research work, with the object of overcoming all these difficulties. With this process the temperature is under perfect control, and there are no products of combustion to be dealt with. The metal is heated in a non-oxidizing atmosphere, resulting in an entire absence of scaling or discoloration of the wire or strip after heat treatment. The plant may be operated by unskilled labor, another noteworthy advantage.

The usual method at present employed for heating steel wire or strip for hardening is to heat the metal by gas and quench in oil, or other suitable cooling bath. The loss of heat by radiation when heated by gas is very great, resulting in low thermal efficiency. In addition, the temperature of the room is raised to such a degree that fans have to be employed to ventilate the room and get rid of the fumes given off. Any variation in the pressure or quality of the gas supply affects the hardening and tempering of the metal, and although elaborate governors are employed in some cases to regulate the gas pressure, there is at present no system available to compensate for the varying calorific value of the gas supplied, and this involves difficulty in securing a uniform quality of hardness and temper in the metal under heat treatment.

To overcome these difficulties the new process in question has thus been developed. It is a well known fact that any conductor offering resistance to the flow of electrical current produces heat in the conductor and this is the principle used, with modifications and additions. The wire or strip under heat treatment is heated directly by the flow of current passing through it as it is fed through the apparatus, the electric resistance of the metal and the current flowing through same producing the desired temperatures. The current flowing through the steel wire or strip is regulated by suitable electrical control, in order to raise the temperature according to the requirements for hardening.

An alternating current supply is generally obtained from the secondary of a transformer, arranged with tappings to give low voltages, and allow economic working when dealing with different gauges. The alternating current is far preferable to the direct current for electric heating, as the former allows of more uniform and accurate control of temperature, and obviates the possibility of any electrolytic action which may be set up if the direct current were used. The plant illustrated operates on alternating current and special provision has been made in the design and construction to operate at very high power factor, the latter being under normal working conditions .93.

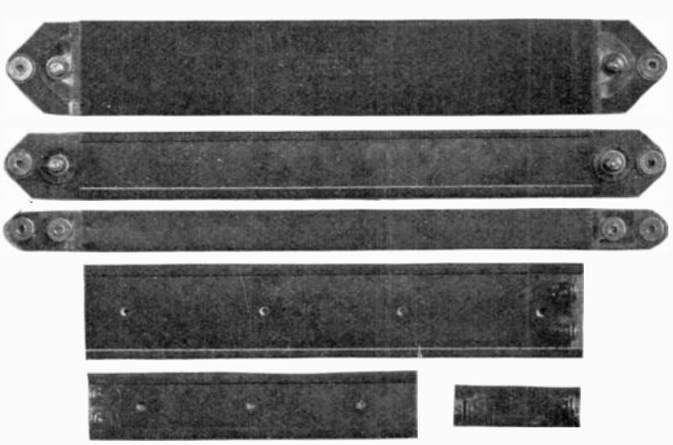
The actual operation is as follows: For hardening, the traveling steel wire or strip is heated directly by the flow of current through the wire or strip, electrical controls being provided so that the correct temperature required for hardening can be obtained with accuracy. The traveling wire or strip then passes into an oil trough, and is quenched, giving the preliminary hardening. The oil in the quenching tank is kept circulating so that the temperature is fairly constant. The wire or strip, after passing through the quenching tank, is electrically reheated by the current as before, to the required temperature for drawing the temper, as indicated by a special control indicator, and again passes into an oil trough and is again quenched, the wire thus attaining the desired temper. From the oil bath the wire passes round a tension pulley, and is wound upon revolving drums, the speed of the traveling wire or strip being adjustable by variation of the speed of the gears driving the drums. Special arrangements are provided to obtain non-oxidizing atmosphere in the heating chambers, both for hardening and tempering, so that all possibilities of scaling are eliminated. The actual saving by this electrical process as compared with the gas process is estimated at 50 per cent, in Great Britain.

A patented electro-magnetic detector for denoting the decalescence point of the steel prior to quenching for hardening, is also embodied as standard equipment in the plant. This detector is a very useful addition, as it enables the operator to obtain with accuracy the correct temperature the steel should be heated to prior to quenching. An indicator marked in gauges of wire and speed per minute is fixed on the machine. To operate the plant, all the operator has to do is to turn the control wheel until the pointer indicates the gauge of wire under heat treatment. An important feature in connection with this process is that if the wire or strip is not uniformly drawn the indicator above mentioned shows it, and the wire can be returned to the drawing department for further treatment. This prevents waste which at present occurs by the wire being hardened and tempered and then found to be not uniformly drawn.

Space Heaters

WHILE it is true that anyone with a bit of wire and perhaps some asbestos board or other similar material can construct an electric heater for himself, such appliances as are shown in the illustration, all made up in the best possible style and steel-jacketed so as to be absolutely permanent, present every feature of convenience and safety.

While there are various sizes, a typical one is 24 inches long, 1½ inches wide and 3/16 inch thick. The wire is encased in sheet mica, for this is one of the cases where nature supplies a better material than art can manufacture. After being encased in sheet mica, the heating coil and mica together are jacketed with steel, to which 25 tons' pressure is supplied by a hydraulic press.



Space heaters. These are resistance elements, steel jacketed and made in various sizes for use in different positions, as in ovens, for producing electric heat.

To cause an electric lamp to give light, its terminals are connected into an electric circuit, and the space heaters are treated much the same way, as if each were the filament of a lamp. If a number are to be mounted together, it is found that a distance from center to center of about 1½ inches is sufficient to secure circulation of heated air.

The insulation is designed for 250 volts maximum pressure, so that if they are connected in series for high voltages, the steel jacket must be treated as a live part, and must not be grounded, but should be insulated absolutely. A good plan as an additional

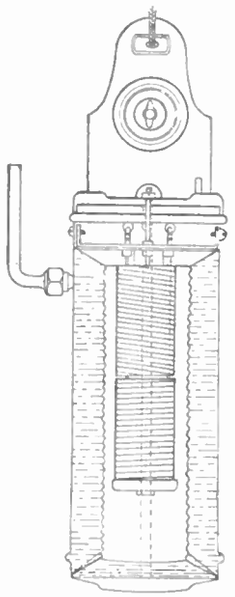
protection is to mount the entire heater, if such it is, on insulating feet. If it were perfectly insulated it would be an ineffective heater.

It often is an object to keep the temperature down, and this is accomplished by giving a smaller number of watts to a heater than is normally provided for. Thus a heater which at 250 volts could absorb 500 watts, if placed on 110-volt circuit, will absorb only 97, giving, of course, a very much lower temperature. A very convenient little table is given to elucidate this system of regulation.

Such heaters are used for the most diverse purposes, for japanning ovens, chicken raising, moving picture film drying, and many other technical purposes. For outside invalid sleeping cots the space heaters are sometimes placed beneath the bed. They are used to protect underground electrical machinery from accumulation of moisture on fields and armature. Coming down to smaller uses, they may be used in a garage to keep the radiator warm in winter, and for maintaining heat and regulating current for charging an automobile battery. The unit is sometimes called by the manufacturer "two feet of electrical heat," and this phrase certainly seems to describe it aptly from the strictly mechanical point of view, but not from the electrical.

English Domestic Heaters

WE give our readers here several examples of domestic heating appliances as made in England:

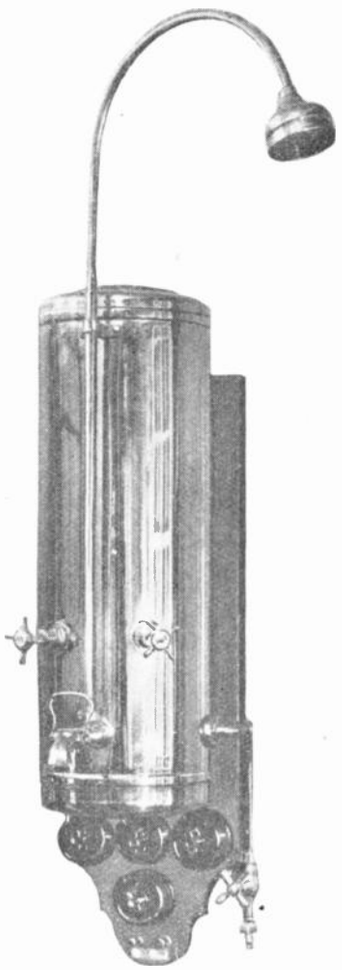


Section of an English heater to deliver hot water which is so compact that it can be hung upon a single nail against the wall.

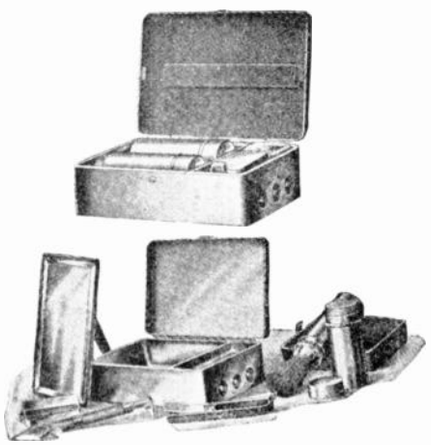
The first one we illustrate is the regular water heater, whose interior is shown in the diagram. It will be seen that the heating coil is contained within a chamber surrounded by the water, and this particular section illustrates the faucet heater and also what the manufacturer terms the "electric geyser," which is designed to supply a constant current of hot water. In the one illustrated on the right a shower bath is supplied.

The apparatus takes from 25 to 40 amperes; the lower part of the back board contains the switches, and the connections are all of the simplest possible description, requiring no plumber's work. The heater is hung up by a few hooks or is screwed to the wall, and is connected to the cold water tap by an India rubber pipe. The heating element is plugged into any lighting socket. Various sizes are made, requiring different current intensities.

The fair sex is also taken care of by a violet-ray apparatus with which there is combined a heater which will produce water vapor, so that the face can be exposed not only to the violet rays, but it will be immersed in a fine spray producing a mist-like atmosphere. We cannot be personally responsible for the benefits to be derived by the complexion.



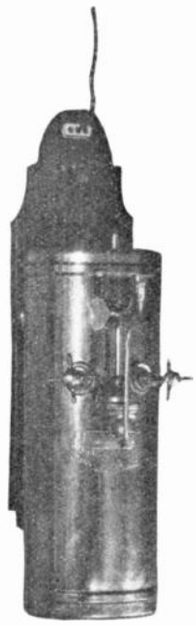
A very elaborate heater, giving a warm shower bath which can be made cold as desired, and also provided with a faucet for drawing water of any desired temperature.



A shaving outfit supplied with hot water by the electric attachment described above. The one box holds everything required.

Another very neat arrangement is a shaving set. This is made to include the different appliances required, along with a special heater for warming the water, the whole boxed up in a compact case, so that everything is in portable shape and carefully stowed away.

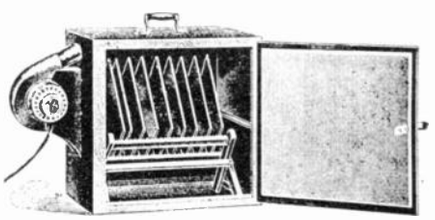
The photographer's needs are also taken care of. One of the most annoying things in photography is the length of time required to dry the plates. The same company supplies an electrically heated box with divisions to hold negatives, so that they can be rapidly dried, economizing time and enabling the photographer to get much quicker results than he would otherwise.



External view of the heater shown in the first column. Its compactness and convenience will be evident on inspection.

The following are some technical details of the heater:

There are three sizes regularly made, containing 1, 2 and 3 gallons of water, respectively. The capacity of the coil is such that each can be loaded to a maximum of 1,000 watts, and can be given three loads, 400, 600 and 1,000 watts. The heating element can readily be removed for replacement after being used up, which, of course, takes considerable time. The hot water is taken from near the top, so that there is no possibility of drawing all the water out, which in itself, is an element of safety. The smallest size will give a gallon of hot water in from eight to ten minutes, and the various temperatures which can be produced, as referred to above, are obtained by the use of a second tap marked cold, which when opened causes cold water to flow simultaneously with the hot water through the tap.

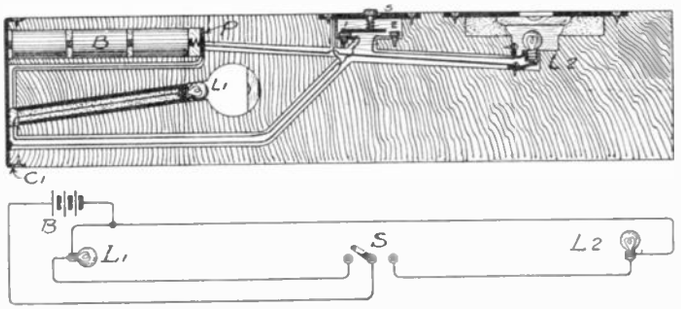


A little drying chamber for the use of the photographer, operated by electric heating so as to accelerate the drying of the negatives.

Illuminated Level Glasses

THE illustration presents a useful arrangement for illuminating a mechanic's level, when working in out-of-the-way places or in any location where the obscurity necessitates the use of matches to see the glasses. The use of matches or candles leaves only one hand free for leveling, hence any system by which both hands are unimpeded is a useful assistant in carpenter or mason work.

The layout submitted requires the following material: Three Ever-Ready unit cells, 2 flashlight bulbs, 1 three-point switch and some brass tubing of ½-inch diameter. Connections and circuits are entirely out of sight and the bulbs are out of the way and protected from breakage, being imbedded in the wood.



A builder's level, both of whose bubble glasses are illuminated by flashlight bulbs, so that it can be used in the dark or in obscure places.

The switch (S) has three grooves into which the contactor drops, due to a small spring which also maintains contact through a washer against the plate of the switch which is flush with the upper edge of the level, in no way interfering with its use.

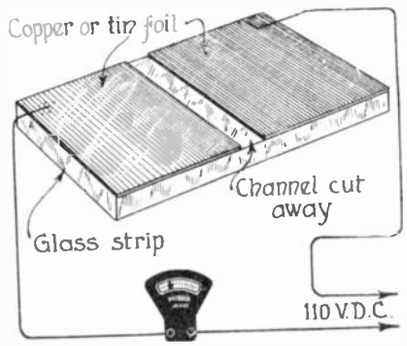
The layout is fairly simple and does not seriously weaken the level, provided the long holes are drilled with a three-sixteenths-inch bit or smaller. The necessary work pays for itself over and over again in time saved by dispensing with matches and candles, and the incident fire hazard.

Contributed by H. I. SHAKESHAFT.

Electrical Moisture Indicators

By Raymond B. Wailes

NUMEROUS industrial processes are carried to completion by the accurate adjustment of many variable factors. Temperatures are controlled by



Experiment in the indication of moisture in the air by its effect on electrical conductivity of a glass surface on which moisture collects.

base and noble metal thermo-couples which automatically keep the reaction-producing heat at the proper temperature. Air pressures are kept constant and even the moisture present in the reaction vessel is taken into account in many manufacturing processes. This article has to do with the determination of moisture in the atmosphere by electrical means. With a sensitive millivoltmeter or galvanometer, and a curve plotted with the aid of a home-made hygrometer of the slinging or whirling wet bulb type, the completed instrument will be an admirable addition to the shop or laboratory.

Glass is slightly hygroscopic, or, rather, glass will gather moisture, *i.e.*, will collect moisture upon its surface, the moisture not penetrating molecularly, as it were, into the body of the glass itself. This fact is utilized in an instrument showing the moisture in the air.

Fig. 1 shows the detail of the instrument. A glass plate or microscope slide is covered with metal such as tin or copper foil and a small channel cut away from the middle portion as shown. The channel should be cut completely around the slide on all sides, if the metal foil is carried around the glass, making the metal foils non-electrically conductive. On connecting the metal foils with a sensitive indicating instrument such as a galvanometer, and an electrical source such as 110 volts D. C., a deflection will be observed, the intensity being dependent upon the amount of moisture which has collected between the narrow channel on the glass slide, the moisture being deposited thereon from the atmosphere.

Instead of using glass as the active substance, a hygroscopic substance such as zinc chloride can be used. This can be made by allowing hydrochloric or muriatic acid to act upon scraps of zinc until the acid is entirely spent or "killed." The solution obtained should be concentrated slightly by gentle heating. It is used in the experimental moisture indicator below.

Electrical Articles Appearing in February "Science and Invention"

Giant Wind-Mill Plant to Develop Electric Power.

Radio Controlled Mystery Ship. By Graser Schornstheimer.

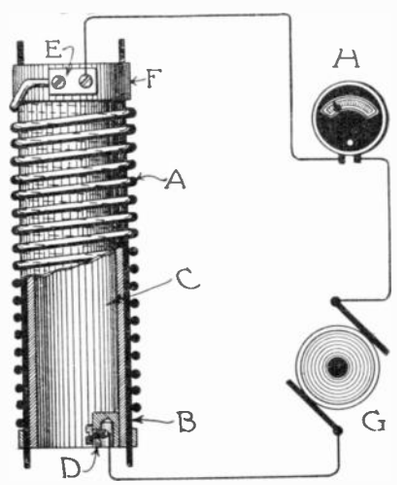
Electric Toe Dancer.

New Midget Telephone — Smallest in the World.

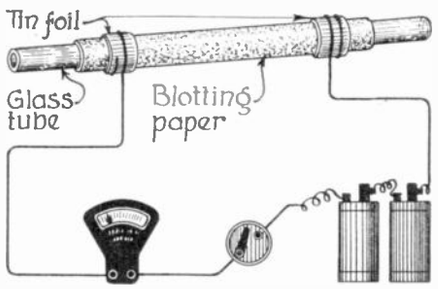
How, When and Why Does Electricity Kill. By M. McCabe.

Transmitting Pictures by Radio. By J. H. Kraus.

Descriptive Articles on How to Build Radio Receiving Sets.



A variation on the first method of indicating moisture electrically, using a coil instead of tin-foil sheets as electrode.



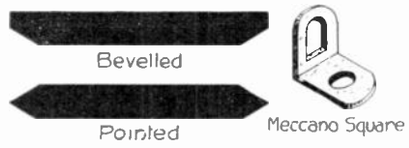
Dry blotting paper used as an indicator—a method applicable as a rain alarm, or even as a notifier of a dense fog.

A rod or tube of glass (Fig. 2) is covered with white unused blotting paper, and moistened with the zinc chloride solution obtained as above. Tinfoil electrodes should now be affixed as shown and held in place by means of bare copper wires twisted around them, this operation also making electrical connection with the foil and consequently the active zinc chloride surface upon the blotting paper, the zinc chloride being a conductor. A small E. M. F. obtained from several small flashlight batteries passing through the whole zinc chloride unit, will be impeded by the amount of water in the blotting paper and therefore in the air, the zinc chloride being hygroscopic. A sensitive indicating instrument serves to visualize this amount directly.

A British manufacturer is producing presspahn moisture indicators. These instruments are reliable and exceedingly simple in operation. They consist of a metal tube (C, Fig. 3), upon which is wound a layer of presspahn (B), or artificial leather, leatheroid, etc. A spiral of wire is wound upon the hygroscopic leather covering and a potential from a source such as a battery or dynamo (G) applied, together with an indicating instrument (H). Any variations of water content in the air and consequently in the leather will cause a deflection of the hand of the indicating instrument. The apparatus is exceedingly simple and capable of being duplicated by any experimenter.

Get "Meccano" squares and a little board of light wood on which the squares are screwed in two parallel ranges; the distance between the rows is to be slightly less than the length of the carbons.

Take two posts from the batteries and join each one to a range of the squares.



Two examples of the treatment of the dry battery carbon in the multiple contact microphone, showing also the little bracket which holds the end shaped to fit it.

Then introduce the ends of the carbons in the holes drilled in the squares. When they are all in place the microphone will be ready for use.

The many contacts go to make it sensitive. As a variation, carbon blocks can be cut out of battery carbons and substituted for the metal brackets, holes being drilled in them to receive the ends of the carbon rods.

Fifth Prize

Arc Furnace

By John N. Brahy

OUR contributor writes that he needed a small electric furnace, and not caring to buy one, constructed one along the lines shown, using for its construction material from a few worn-out dry cells. The illustration tells the story. The carbon terminals are taken from a dry battery. For a small furnace they may be of the flash-light battery size.

PRIZE WINNERS

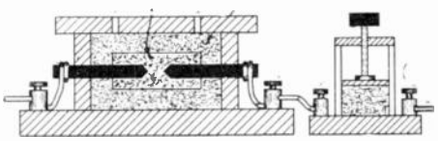
First Prize, $50.00
Roscoe Betts
Arcadia, Nebraska

Second Prize, $20.00
C. Q. Rice
Preston, Idaho

Third Prize, $15.00
N. P. Ball
Colton, California

Fourth Prize, $10.00
Jacques M. Bellaire
235 bis rue de Vaugirad
Paris, France

Fifth Prize, $5.00
John N. Brahy
283 Crescent St.
Long Island City, N. Y.

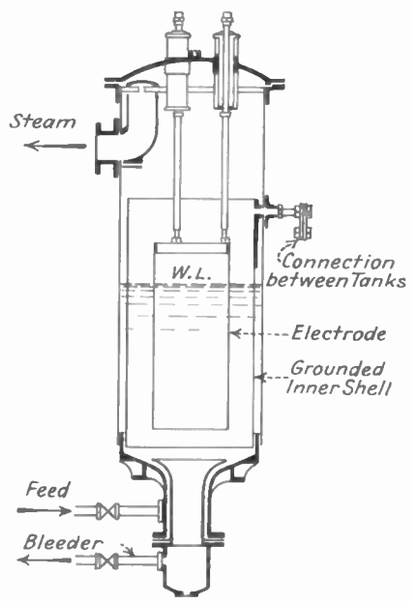


A small electric furnace made with battery carbons and regulated by a pressure rheostat for controlling the current, constructed of carbon fragments and granules made from battery carbons.

In order to control the current, a carbon grain rheostat was used. This will give very perfect regulation if the arc is watched, but it has the difficulty that its resistance does not increase when heated, so that it loses its ballasting effect, and it would seem better to use a ballasting coil of iron wire rather than the rheostat shown, or perhaps it would be better to say, in addition to the rheostat shown. The latter would then operate as a perfected switch rather than as a ballast.

Electric Steam Generator

A NUMBER of installations have been set up for generating steam by electricity. This process is applicable when the electric energy is generated by water power, or in some cases



A steam generator operated by an electric current and now being used to a considerable extent in Canada and the United States.

when there is a peak to be taken care of in the course of the daily supply of power.

By this is meant that in some cases so much power is drawn upon, in the evening hours for instance, that a peak is established, and it is an object, of course, to bring the rest of the supply period up somewhere near this peak. This can be done by generating steam in the daytime when there is less demand for light.

Under average conditions, a pound of coal will produce about 7½ pounds of steam, and a kilowatt-hour with an efficiency of 97½ per cent will produce a little over 3 pounds of steam. This leads to the equivalent of 4840 kilowatt-hours, as an equivalent of one ton of coal in heating value. These figures are abstracted from a very interesting paper by T. S. Gregory. If these calculations are extended it will be seen that electrical steam generation on its face at least is far from cheap, and the figure is rendered less favorable by the fact that 80 or 90 per cent of the steam energy may be regarded as wasted under ordinary circumstances.

The generator we illustrate is termed a "water resistance generator" and is now exploited in this country and in Canada. An electrode is immersed in water and a current at adequate potential being supplied, a current passes through the water from electrode to a shell; the shell is fixed concentrically with the outer walls of the boiler and is immersed in the water. Thus, if an electric arc is formed, no harm is done to the boiler, only the inner shell is affected.

There are two ways of controlling the operations: one is by causing the water level to vary, so as to change the resistance, thus affecting the rapidity of generation of heat. The other way is based on the fact that resistance of water varies with the temperature; the hotter it becomes, the less is its resistance, so that by maintaining an even level and a constant potential, the heat may be varied by drawing water off by what is known as a bleeder valve, thus regulating the temperature.

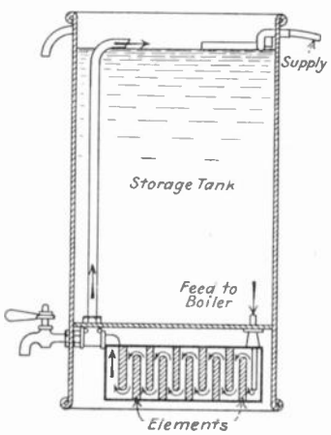
It is said that these generators are in use mostly in paper plants, and have been constructed to the aggregate of 150,000 kilowatts. The feed water enters at the bottom and is deflected by the funnel-shaped tube placed there, so as to give good circulation. One set of terminals pass through the top, and the other connection will be seen extending to the right from the inner cylinder.

Electric generation of steam is of great interest for countries like Sweden, Switzerland and Italy, which are comparatively poor in coal, and is being used in the paper industry.

English Electric Heater

THE heater described here is being exploited in England. It is designed to heat water in large quantities for household purposes, keeping in reserve an adequate supply of hot water, not merely relying on heating it as drawn through a faucet.

The illustration shows the apparatus in section; there is a 10-gallon storage tank fed by a ball-cock in the usual way, and the heating element is contained in the base. There are a series of baffle-plates in the heating chamber, which cause the water to take a devious course, and nichrome ribbon wound on



An English hot water heater arranged to keep in reserve a storage tank full of hot water, not merely warming it as it issues from the tap.

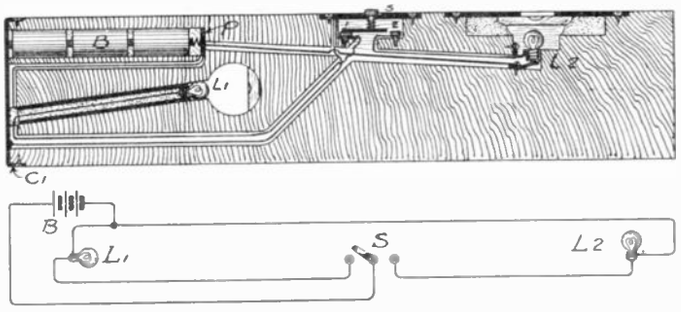
mica formers is contained within this chamber so that the water is brought into intimate contact therewith.

The water which has been heated in the heating chamber is delivered by natural circulation to the tank, rises through it, keeping in constant circulation, and remaining at a comparatively even temperature. There is a special arrangement by which a small quantity of water can be drawn directly from the heating chamber. This would supply a basin or other small quantity required, and when a larger quantity is needed, after a lapse of twenty minutes the entire ten gallons will be hot, if the start is made with cold water. When the complete heating element is working, it absorbs 3,750 watts, but when only a small quantity of moderately hot water is needed, the heating element can be cut down to a fraction of the whole, absorbing 200 watts only.—*The London Electrician.*

Illuminated Level Glasses

THE illustration presents a useful arrangement for illuminating a mechanic's level, when working in out-of-the-way places or in any location where the obscurity necessitates the use of matches to see the glasses. The use of matches or candles leaves only one hand free for leveling, hence any system by which both hands are unimpeded is a useful assistant in carpenter or mason work.

The layout submitted requires the following material: Three Ever-Ready unit cells, 2 flashlight bulbs, 1 three-point switch and some brass tubing of ½-inch diameter. Connections and circuits are entirely out of sight and the bulbs are out of the way and protected from breakage, being imbedded in the wood.



A builder's level, both of whose bubble glasses are illuminated by flashlight bulbs, so that it can be used in the dark or in obscure places.

The switch (S) has three grooves into which the contactor drops, due to a small spring which also maintains contact through a washer against the plate of the switch which is flush with the upper edge of the level, in no way interfering with its use.

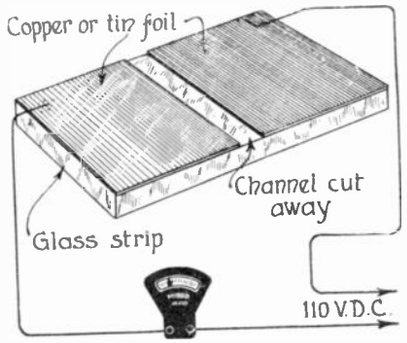
The layout is fairly simple and does not seriously weaken the level, provided the long holes are drilled with a three-sixteenths-inch bit or smaller. The necessary work pays for itself over and over again in time saved by dispensing with matches and candles, and the incident fire hazard.

Contributed by H. I. SHAKESHAFT.

Electrical Moisture Indicators

By Raymond B. Wailes

NUMEROUS industrial processes are carried to completion by the accurate adjustment of many variable factors. Temperatures are controlled by base and noble metal thermo-couples which automatically keep the reaction-producing heat at the proper temperature. Air pressures are kept constant and even the moisture present in the reaction vessel is taken into account in many manufacturing processes. This article has to do with the determination of moisture in the atmosphere by electrical means. With a sensitive millivoltmeter or galvanometer, and a curve plotted with the aid of a home-made hygrometer of the slinging or whirling wet bulb type, the completed instrument will be an admirable addition to the shop or laboratory.



Experiment in the indication of moisture in the air by its effect on electrical conductivity of a glass surface on which moisture collects.

Glass is slightly hygroscopic, or, rather, glass will gather moisture, *i.e.*, will collect moisture upon its surface, the moisture not penetrating molecularly, as it were, into the body of the glass itself. This fact is utilized in an instrument showing the moisture in the air.

Fig. 1 shows the detail of the instrument. A glass plate or microscope slide is covered with metal such as tin or copper foil and a small channel cut away from the middle portion as shown. The channel should be cut completely around the slide on all sides, if the metal foil is carried around the glass, making the metal foils non-electrically conductive. On connecting the metal foils with a sensitive indicating instrument such as a galvanometer, and an electrical source such as 110 volts D. C., a deflection will be observed, the intensity being dependent upon the amount of moisture which has collected between the narrow channel on the glass slide, the moisture being deposited thereon from the atmosphere.

Instead of using glass as the active substance, a hygroscopic substance such as zinc chloride can be used. This can be made by allowing hydrochloric or muriatic acid to act upon scraps of zinc until the acid is entirely spent or "killed." The solution obtained should be concentrated slightly by gentle heating. It is used in the experimental moisture indicator below.

Electrical Articles Appearing in February "Science and Invention"

Giant Wind-Mill Plant to Develop Electric Power.

Radio Controlled Mystery Ship. By Graser Schornstheimer.

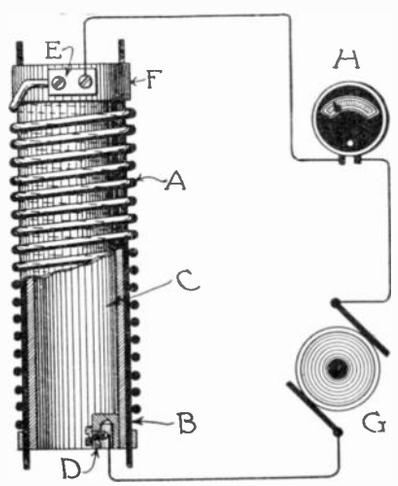
Electric Toe Dancer.

New Midget Telephone — Smallest in the World.

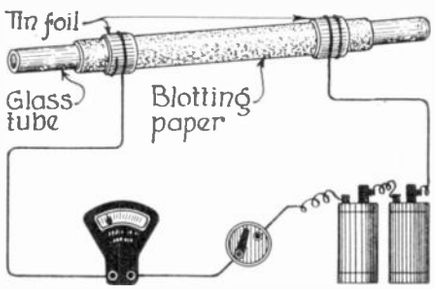
How, When and Why Does Electricity Kill. By M. McCabe.

Transmitting Pictures by Radio. By J. H. Kraus.

Descriptive Articles on How to Build Radio Receiving Sets.



A variation on the first method of indicating moisture electrically, using a coil instead of tinfoil sheets as electrode.



Dry blotting paper used as an indicator—a method applicable as a rain alarm, or even as a notifier of a dense fog.

A rod or tube of glass (Fig. 2) is covered with white unused blotting paper, and moistened with the zinc chloride solution obtained as above. Tinfoil electrodes should now be affixed as shown and held in place by means of bare copper wires twisted around them, this operation also making electrical connection with the foil and consequently the active zinc chloride surface upon the blotting paper, the zinc chloride being a conductor. A small E. M. F. obtained from several small flashlight batteries passing through the whole zinc chloride unit, will be impeded by the amount of water in the blotting paper and therefore in the air, the zinc chloride being hygroscopic. A sensitive indicating instrument serves to visualize this amount directly.

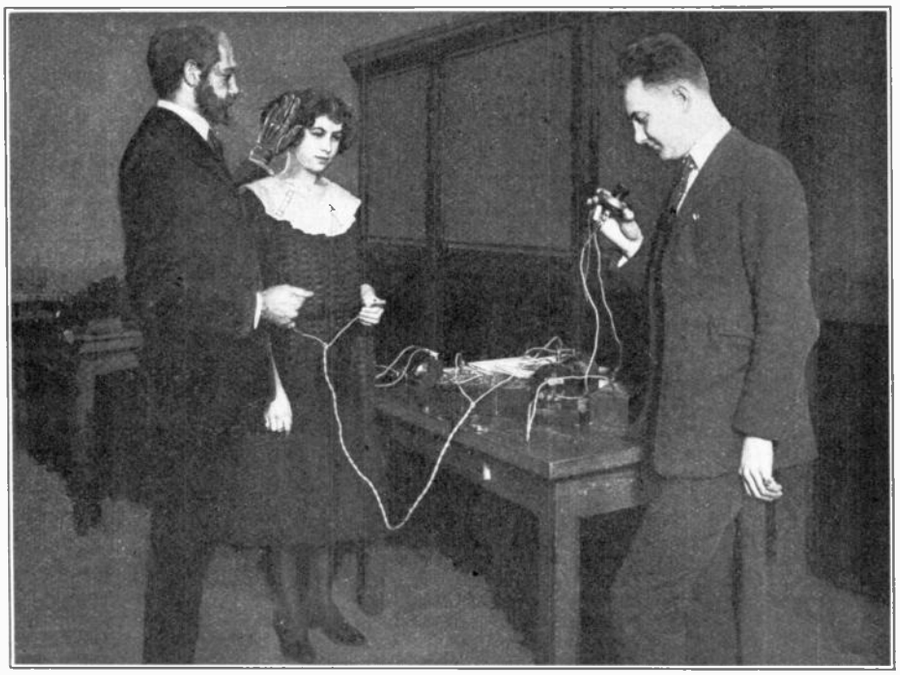
A British manufacturer is producing presspahn moisture indicators. These instruments are reliable and exceedingly simple in operation. They consist of a metal tube (C, Fig. 3), upon which is wound a layer of presspahn (B), or artificial leather, leatherold, etc. A spiral of wire is wound upon the hygroscopic leather covering and a potential from a source such as a battery or dynamo (G) applied, together with an indicating instrument (H). Any variations of water content in the air and consequently in the leather will cause a deflection of the hand of the indicating instrument. The apparatus is exceedingly simple and capable of being duplicated by any experimenter.

Gloves That Talk

By H. Gernsback
Member American Physical Society

THIS is an experiment which the writer performed some years ago, and is now brought back to life with some little variation. It is an interesting demonstration that can be produced by any one, and the appliances necessary are simple.

We first need a good microphone, which, however, can be home-made. Some one of the microphones described in the columns of this journal can be employed with good results. We also require a primary battery (A), which may consist of either a few dry cells or a 4 to 6-volt storage battery. Next we have a spark or induction coil (SC). This coil may be a spark coil set as is used on a Ford car, or otherwise a good telephone induction coil, without any vibrator. If a spark coil with a vibrator is used, it is necessary that the adjusting screw be screwed tightly against the spring, so that it will not move.



Showing graphically how the glove talks. The operator's left hand is gloved, which is pressed lightly against the cheek of the lady, while he, as well as she, takes hold of the handles supplying the high tension current. The face of the young lady, the stretched glove, and the hand inside, are the condenser which talks.

Next we have a high tension battery (B) which is the usual radio "B" battery, and may be bought at any radio store. A voltage of 24 will answer, as a rule. If good results are not obtained with 24 volts, another 24-volt battery may be added in series. It is advisable to get a "B" battery with connections brought out, so that voltage can be varied. In this experiment the voltage required is often quite important, and a variation of a few volts will make a great difference. We also require metallic handles, such as used on electric shocking apparatus (H and H¹). A metallic screw driver or even a piece of wood, covered with tinfoil, to which a flexible wire is connected will do very nicely.

If all the connections are made, an assistant now speaks into the microphone (M). While one person holds in one hand one metallic handle, the other hand, covered by a kid glove, is held against the ear of a second person, who holds the other terminal in one hand. The glove will then talk distinctly and quite loudly.

It is quite necessary that the glove in question be a *kid leather glove*. A cotton glove, or one of the soft leather variety, known as buckskin or chamois, will not work. The thinner the leather of the glove, the better the results. Note particularly that the glove must be perfectly dry. If it is moist or wet, a poor result will follow. Drying the glove over a stove or radiator before using it will improve the quality of the rendition.

There is a little trick in connection with this that is important. When holding the glove against the ear of the listening person, place the palm of the hand near the wrist against the cheek bone. This will bring the palm of the gloved hand over the ear. *Do not touch that part to the ear of the second person.* The idea is that the stretched glove over the palm will vibrate and the vibrations should not be impaired. You can easily demonstrate this to your own satisfaction by pressing the glove tightly to the ear of the listener. He or she will hardly be able to hear anything. But the instant the glove is removed, slightly, from the ear, the results will become astonishing. Always remember that the wrist of the gloved hand must actually make contact with the cheek bone of the face of the listener. If no contact is established, the device does not operate, for the following reasons:

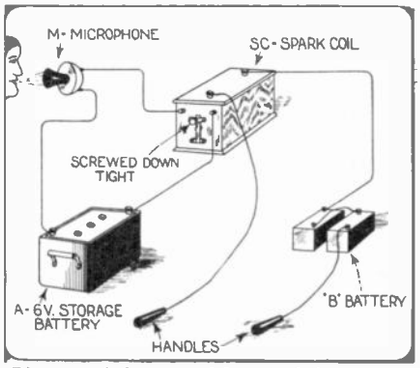


Diagram of the general layout of the apparatus for the talking glove, showing the different pieces and their connections.

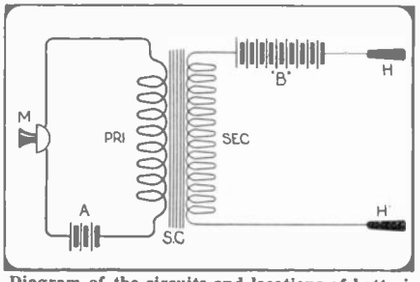


Diagram of the circuits and locations of batteries and spark coil for the talking glove experiment.

The Talking Glove is a variety of talking condenser. By studying the circuit it will be noted that the current from the high tension battery flows first through the secondary of the coil, then through the body of the operator, thence to the glove. The hand inside the glove is one plate of the condenser—the glove is the dielectric—the face, or cheek bone, of the listener is the other plate. The return circuit is completed through the listener's body into the "B" battery. It will be observed that the condenser is kept charged continuously through the high tension "B" battery, whether an operator speaks into the microphone (M) or not. Note also that the polarity of the "B" battery is important. It will work much better if the connections are made in one way than in another. The correct connection has to be found by actual experiment.

In our cover design we have shown how phonograph music can be transmitted through the Talking Glove. In this case a microphone button is attached to the tone arm of the phonograph, and the phonograph can then be closed so that little music issues from it. Or the phonograph may be in another room, only having two wires lead into the room where the experiment is made. This will mystify the listeners still more. A microphone for phonographs has been described by the writer on page 354 of the July, 1922, issue of PRACTICAL ELECTRICS.

A good stiff piece of writing paper will do equally well. In this case the writing paper is placed over the ear, while the operator cups his hand on top of the paper. After a few trials, in order to get the necessary tension and pressure, it will speak loudly and distinctly.

The experiment of the Talking Glove can be varied somewhat by using two operators, each with a glove in his hand. Each should take hold of the metallic handles (H and H¹). Then if the two operators place their two gloved hands over both ears of the listener the sounds will be plainly heard.

For parlor tricks or amusement purposes, another variation can be made by having the two operators step, each with one foot, upon a contact plate, the bottom of the shoe soles being pierced by nails, while the inside of the shoes is covered with tinfoil or other metallic plate. It is necessary that no socks be worn, or holes may be cut in them for the foot to connect with the plates. In this case there will then be no visible wire or connection to the two operators, to the mystification of the listener. The gloves may be handed about for examination and put on or taken off right in the presence of the audience.

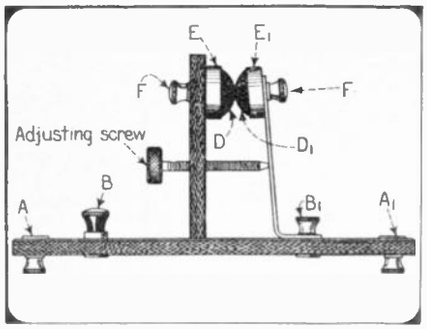
Awards in the $100 Dry Battery Competition

First Prize

Simple Microphone

By Roscoe Betts

THE microphone illustrated has as its essential elements two pieces of carbon dry cells. These are cut off short very near the caps and filed down to



A simple microphone, constructed with the capped ends of dry battery or flashlight battery carbons, smoothly rounded, for the speaking contacts.

semi-spherical shape (D, D_1). The binding posts (F) and caps (E, E_1), it will be seen, give a good basis for attachment.

The microphone is carried on a baseboard. Binding posts from the dry battery at the four corners of the board, two of which are shown at (A and A_1), serve as very neat feet for it to rest on. The left-hand carbon is carried by an upright strip of wood attached to the baseboard, and is secured by its own binding post with a wire attached beneath the cap and running down to the left-hand binding post (B). The other carbon is carried by a spring held in place by another binding post (B_1). The spring presses the two carbons together, and below will be seen an adjusting screw by which the pressure is regulated.

Second Prize

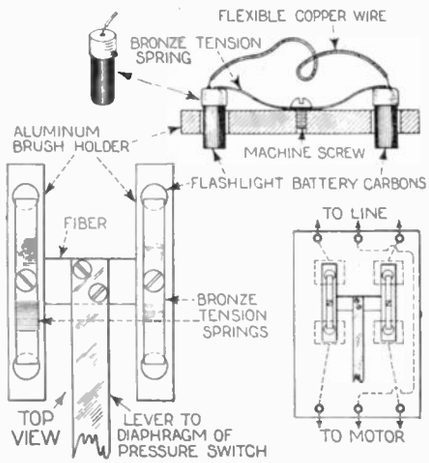
Carbon Pressure Switch

By C. O. Rice

AN automatic air pump, which furnished compressed air for various purposes around a canning factory, was operated by a 3-phase, 1-horsepower motor, regulated by a pressure switch of standard make. This switch developed the disagreeable habit of becoming hot, burning the contacts, making them stick together, and frequently blowing out the fuses on account of the diminished resistance due to these bubbles.

The writer conceived the idea of replacing the bronze spring of the pressure switch with carbon brushes, which it was manifest would not stick by fusion, as metal will, welding being naturally impossible.

The illustration is quite explanatory. To hold the brushes, an aluminum plate three-eighths inch thick was used. The carbon passed through holes at the ends of the plate, which holes were large enough to permit carbons taken from large sized dry batteries to move freely up and down. The metal caps were left upon the carbons and they were connected by soldering a copper wire from one to the other as shown in the illustration. The wire must be flexible so that the carbons will be free to move independently, and they should be adjusted so as to have equal tension. A small bronze flat spring was held down by a five-thirty-second machine screw in the center, the free ends of the spring pressing the carbon down against the contacts. This arrangement was intended as a temporary repair, but was found so efficient that it was kept in permanent use.



How the capped ends of flashlight carbons form admirable pressure contacts, with a suggestion implied of their utilization as brushes.

Third Prize

Rough-and-Ready Battery

By N. P. Ball

OLD dry batteries supply the carbon element. They are stripped of their zincs as much as possible, without taking too much trouble. If the cell is old and the zinc rotten, and the porous paper seems fairly good, they can be lightly pounded and much of the zinc broken up and removed in that way. Now if the porous pasteboard cell seems good and not clogged with salts, it can be used as it is, otherwise I prefer to carefully remove the paper and wrap the cylinder of carbon and manganese in a piece of stout cloth about 10 inches square, coming half an inch above the cylinder—the surplus of the bottom being folded over and brought tightly up to the side and all tied round and round with a string, as shown in the illustration.

You can fill up with water only, as I find that the old batteries furnish plenty of chemicals. If they are old and dried out it will take some little time before they will soak up and furnish current. A small handful of salt, salammoniac, or a little acid will assist in starting.

Do not allow two of these cans, while connected up, to touch, or a short will result.

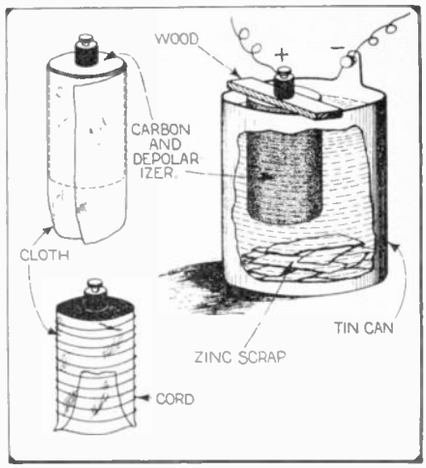
Save your old fluids. They are rich in chemicals, and can be diluted, if necessary, to start other batteries. I have not found it necessary to use any additional chemicals and my batteries improve all the time.

Where the porous cup is not removed it would be better to wrap with a string, as the paper sometimes soaks loose. Carbon cells and cans may be used over again, if desired. Of course new ones might be better, but the old ones act very well.

It will be surprising to find how long the "galvanized" cell lasts. I find it an excellent base for work, and there are quantities of them thrown away.

Tin cans are used for containers, according to fancy. The tall coffee cans and gallon cans are the best, for a long life battery. In choosing coffee cans, however, see that they do not leak water, as many of the kinds do. All these cans are deeper than necessary, but they can be cut off, or, better still, partly filled with scrap zinc. As rust is an insulator, the cans used should not be too rusty inside.

If you have a tin coffee can you can use two of the batteries, prepared as aforesaid, bending the can slightly to an oval shape at the top so as to get them both in. In the gallon can I generally use two, but three will be better. Of course



Utilizing an old dry battery; how to secure what is virtually a new lease of life for the abandoned or exhausted dry cells which have ceased to supply useful current.

the cell must have the carbons connected to make one element.

Scraps of zinc are now thrown into the bottom of the can; these are the positive element.

The zinc connection is soldered directly to the top edge of the can, or in a strip of the top, as shown above. Of course it will be best to have binding screws or clips for all connections, but a slit can be cut in this strip of top and the connecting wire, particularly if large, pulled into it for a hasty zinc connection.

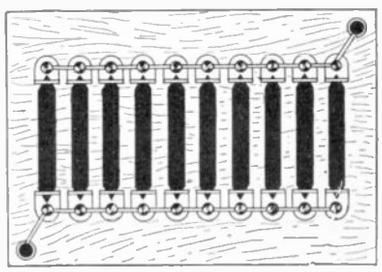
One of the advantages of this battery is that all kinds of scrap, zinc, zinc fruit jar tops, and particularly any kind of "galvanized" iron can be utilized. It is to be put into the can, under or around the batteries, and it, or part of it, must make contact with the can.

In the coffee can with two, or gallon can with three carbon elements, the zinc scraps or tops can be tightly wedged in, and good contact is sure to be obtained. However, all scrap, if merely dropped in, particularly if heavy, seems to make good contact. Pieces of "galvanized" iron and strips of same, if not too thick, can be bent round and sprung into the can.

Fourth Prize

Another Microphone

By Jacques M. Bellaire

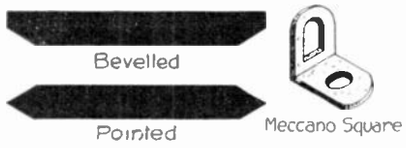


A multiple current microphone, the carbons from flashlight batteries being used to give great sensitiveness, there being 20 contacts in this instrument.

TAKE several old flashlight batteries, draw the carbons out, and bevel their ends to a sort of point as shown.

Get "Meccano" squares and a little board of light wood on which the squares are screwed in two parallel ranges; the distance between the rows is to be slightly less than the length of the carbons.

Take two posts from the batteries and join each one to a range of the squares.



Two examples of the treatment of the dry battery carbon in the multiple contact microphone, showing also the little bracket which holds the end shaped to fit it.

Then introduce the ends of the carbons in the holes drilled in the squares. When they are all in place the microphone will be ready for use.

The many contacts go to make it sensitive. As a variation, carbon blocks can be cut out of battery carbons and substituted for the metal brackets, holes being drilled in them to receive the ends of the carbon rods.

Fifth Prize

Arc Furnace

By John N. Brahy

OUR contributor writes that he needed a small electric furnace, and not caring to buy one, constructed one along the lines shown, using for its construction material from a few worn-out dry cells. The illustration tells the story. The carbon terminals are taken from a dry battery. For a small furnace they may be of the flash-light battery size.

PRIZE WINNERS

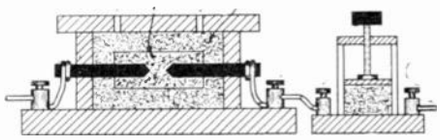
First Prize, $50.00
Roscoe Betts
Arcadia, Nebraska

Second Prize, $20.00
C. Q. Rice
Preston, Idaho

Third Prize, $15.00
N. P. Ball
Colton, California

Fourth Prize, $10.00
Jacques M. Bellaire
235 bis rue de Vaugirad
Paris, France

Fifth Prize, $5.00
John N. Brahy
283 Crescent St.
Long Island City, N. Y.

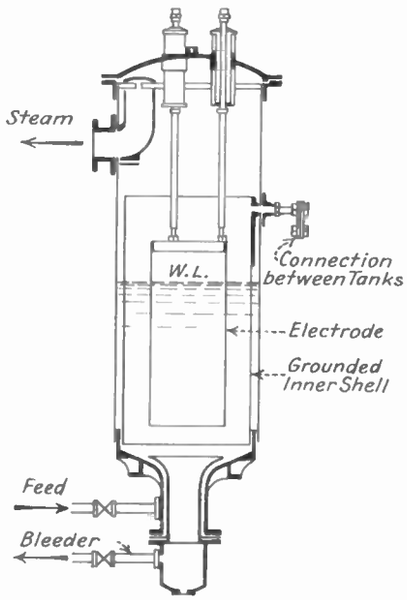


A small electric furnace made with battery carbons and regulated by a pressure rheostat for controlling the current, constructed of carbon fragments and granules made from battery carbons.

In order to control the current, a carbon grain rheostat was used. This will give very perfect regulation if the arc is watched, but it has the difficulty that its resistance does not increase when heated, so that it loses its ballasting effect, and it would seem better to use a ballasting coil of iron wire rather than the rheostat shown, or perhaps it would be better to say, in addition to the rheostat shown. The latter would then operate as a perfected switch rather than as a ballast.

Electric Steam Generator

A NUMBER of installations have been set up for generating steam by electricity. This process is applicable when the electric energy is generated by water power, or in some cases



A steam generator operated by an electric current and now being used to a considerable extent in Canada and the United States.

when there is a peak to be taken care of in the course of the daily supply of power.

By this is meant that in some cases so much power is drawn upon, in the evening hours for instance, that a peak is established, and it is an object, of course, to bring the rest of the supply period up somewhere near this peak. This can be done by generating steam in the daytime when there is less demand for light.

Under average conditions, a pound of coal will produce about 7½ pounds of steam, and a kilowatt-hour with an efficiency of 97½ per cent will produce a little over 3 pounds of steam. This leads to the equivalent of 4840 kilowatt-hours, as an equivalent of one ton of coal in heating value. These figures are abstracted from a very interesting paper by T. S. Gregory. If these calculations are extended it will be seen that electrical steam generation on its face at least is far from cheap, and the figure is rendered less favorable by the fact that 80 or 90 per cent of the steam energy may be regarded as wasted under ordinary circumstances.

The generator we illustrate is termed a "water resistance generator" and is now exploited in this country and in Canada. An electrode is immersed in water and a current at adequate potential being supplied, a current passes through the water from electrode to a shell; the shell is fixed concentrically with the outer walls of the boiler and is immersed in the water. Thus, if an electric arc is formed, no harm is done to the boiler, only the inner shell is affected.

There are two ways of controlling the operations; one is by causing the water level to vary, so as to change the resistance, thus affecting the rapidity of generation of heat. The other way is based on the fact that resistance of water varies with the temperature; the hotter it becomes, the less is its resistance, so that by maintaining an even level and a constant potential, the heat may be varied by drawing water off by what is known as a bleeder valve, thus regulating the temperature.

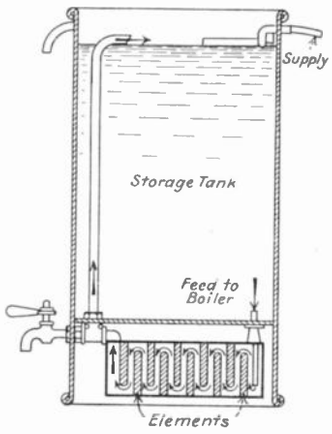
It is said that these generators are in use mostly in paper plants, and have been constructed to the aggregate of 150,000 kilowatts. The feed water enters at the bottom and is deflected by the funnel-shaped tube placed there, so as to give good circulation. One set of terminals pass through the top, and the other connection will be seen extending to the right from the inner cylinder.

Electric generation of steam is of great interest for countries like Sweden, Switzerland and Italy, which are comparatively poor in coal, and is being used in the paper industry.

English Electric Heater

THE heater described here is being exploited in England. It is designed to heat water in large quantities for household purposes, keeping in reserve an adequate supply of hot water, not merely relying on heating it as drawn through a faucet.

The illustration shows the apparatus in section; there is a 10-gallon storage tank fed by a ball-cock in the usual way, and the heating element is contained in the base. There are a series of baffle-plates in the heating chamber, which cause the water to take a devious course, and nichrome ribbon wound on



An English hot water heater arranged to keep in reserve a storage tank full of hot water, not merely warming it as it issues from the tap.

mica formers is contained within this chamber so that the water is brought into intimate contact therewith.

The water which has been heated in the heating chamber is delivered by natural circulation to the tank, rises through it, keeping in constant circulation, and remaining at a comparatively even temperature. There is a special arrangement by which a small quantity of water can be drawn directly from the heating chamber. This would supply a basin or other small quantity required, and when a larger quantity is needed, after a lapse of twenty minutes the entire ten gallons will be hot, if the start is made with cold water. When the complete heating element is working, it absorbs 3,750 watts, but when only a small quantity of moderately hot water is needed, the heating element can be cut down to a fraction of the whole, absorbing 200 watts only.—*The London Electrician.*

Awards in the $50 Special Prize Contest

For Junior Electricians and Electrical Experimenters

First Prize, $25	Second Prize, $15	Third Prize, $10
Mr. Amedeo Giolitto	Mr. Cecil Plass	Mr. Alva Stevenson
836 Illinois Avenue	131 South 13th Street	Leitchfield,
Rockford, Illinois	Vincennes, Indiana	Kentucky

First Prize

Push Button Starter

By Amedeo Giolitto

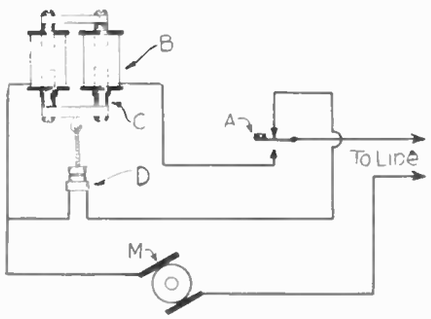
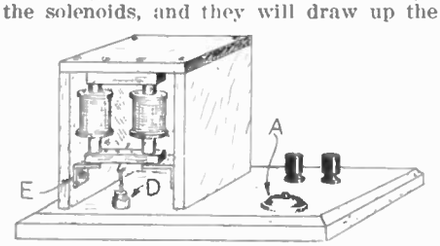


Diagram of a starter for a motor, using an electro-magnetic switch, and whose inductance operates to prevent a too great sudden draught upon the circuit.

WHEN starting a motor which is connected to a lighting circuit, the lights are always dimmed for an instant, although the motor may be a small one. The dimming of the lights is annoying, when the motor is to be started frequently, but by using the starting device as shown in the accompanying drawings, the effect upon the lights can be prevented or greatly diminished.

The device will be useful when the experimenter wishes to start motors at night without causing the lights to drop. It is entirely automatic in operation and is very simple, for it is only necessary to press the button (A) to start the motor, while to stop it the same button is again pressed. This button is of the double-contact type and is connected as shown above.

By studying the diagram it will be evident that when the button is pressed, the starting current for the motor (M) will have to pass through the solenoids (B); their inductance will prevent an inrush of current from flowing through the motor, thus protecting the lamp circuit, and at the same time they will draw up the plunger (C), which pulls the chain switch (D) and therefore closes the circuit (that is, if it was open in the first place). Now when the button is released, the circuit through the chain switch will be completed and the motor will be connected directly across the line; and as the solenoid circuit has been opened the solenoids will release the plunger, which will return to its former position. Pressing the button again will send a current through the solenoids, and they will draw up the plunger again, this time opening the chain switch, and the motor will stop when the button is released.



The general layout of the electro-magnetic switch, showing the location of solenoids, switch-chain and push-button.

Below the solenoids and the chain switch (D) are shown mounted inside a wooden box. Two brass pieces (E) screwed to the side of the wooden box prevent the plunger from falling out of the solenoids.

EXPERIMENTERS and amateurs, we want your ideas. Tell us about that new electrical stunt you have meant to write up right along, but never got to. Perhaps you have a new idea, perhaps you have seen some new electrically arranged "do-funny"—we want these ideas, all of them. For all such contributed articles that are accepted, we will pay one cent a word upon publication. The shorter the article, and the better the illustration—whether it is a sketch or photograph—the better we like it. Why not get busy at once? Use one side of the paper only.

EDITOR.

Second Prize

Toy Automobile Horn

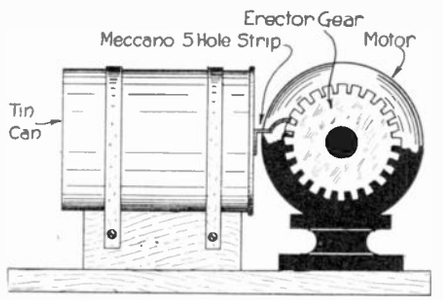
By Cecil Plass

MY younger brother's automobile, which he played with most of the time, was provided with everything but a horn. This deficiency was soon corrected by constructing the electric horn shown in the accompanying drawing.

The materials required are: One large tomato can, one battery motor, one gear from an Erector construction set, one 5-hole strip from a Meccano set, two pieces of tin, and one block of wood.

The illustration shows clearly how to put the horn together. It is best to fasten the 5-hole strip to the end of the tomato can with two screws.

When the gear wheel turns, a true Klaxon effect is produced.



A home-made Klaxon, using a tin can for the horn and an Erector gear for producing the vibrations of the diaphragm.

Third Prize

Lamp Bank Resistance

By Alva Stevenson

WHILE making repairs upon some small motors, I found it necessary to use a lamp bank resistance. The illustration herewith shows the result of my efforts.

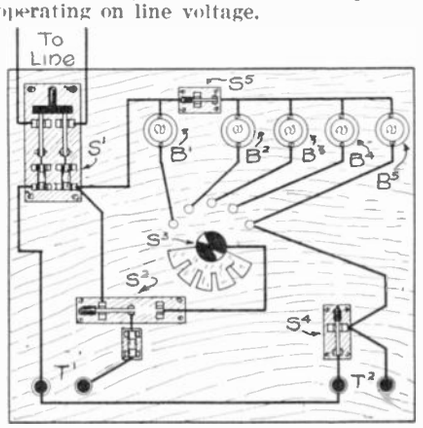
(S^1) is an ordinary double pole, single throw switch with fuse clips. (S^2) is a single-pole, double-throw switch with a fuse clip fastened to the center terminal. (S^3) is more complicated, yet simple in construction.

As many contacts are to be added as bulbs; I used five. Drill the holes in a semi-circle and insert the contacts, which may be silver or copper, tapped to receive a screw which secures them. Dress them down evenly. Cut a piece of sheet brass or copper in a semi-circular shape and drill a hole for its support as shown. Cut a finger on the edge for each contact point. At the center place a knob to turn the contact maker back and forth. The reader will note that the connections (S^4) and (S^5) are ordinary single pole, single throw switches.

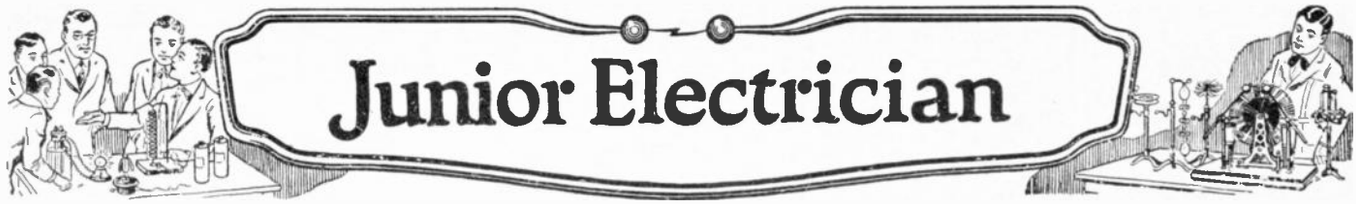
With (S^1) closed, (S^2) thrown to the right, (S^3) connecting contacts (1) and (2), (S^4) and (S^5) open, one has bulbs (B^1), (B^2) and (B^5) in series at (T^2). By turning (S^3) and connecting more bulbs in parallel with (B^2), (B^1) and (B^5) will be in series. By connecting contact (1) with contact (5), (B^1) only will be in series. By turning (S^3) to the extreme right and closing (S^5) and then turning (S^3) back to the left, one can have from one to five in parallel at (T^2).

With (S^4) closed, one has (B^5) burning to work by, while he has the following combinations: With (S^2) to the right he has from one to four lamps in parallel at (T^1); after the motor or other instrument is well under way he can throw (S^2) to the left and have full line voltage at (T^1).

If the worker wishes more light at any moment he can connect as many contact points as he desires with contact (S^5) and close (S^4) and immediately his wish is fulfilled. If the fuse at (S^2) is smaller than those at (S^1), the room will not be left in the dark, which might happen if he is depending on (B^5) for light, should the load at (T^1) become too heavy while operating on line voltage.

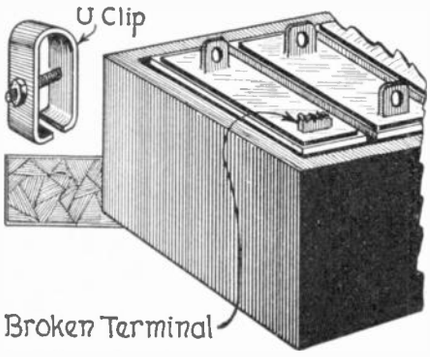


A lamp bank resistance, an interesting characteristic of which is the fact that no wires cross, and thereby a definite possibility of trouble is avoided.



Emergency Battery Repair

A STORAGE battery repair was made in the following manner. The battery was nearly worn out, having given ser-



Quick repair for a storage battery, where one of the terminal lugs has been broken off.

vice for several years in an individual home, being of 32-volt potential. However, it seemed to take and hold a charge fairly well and the owner deemed it unwise to part with the necessary wherewithal for a new one until it was absolutely unavoidable.

The sudden breaking of one of the lead terminals was an unlooked-for mishap. By jumping the damaged cell, the voltage would be lowered two volts, but this made the lights within the home rather dim.

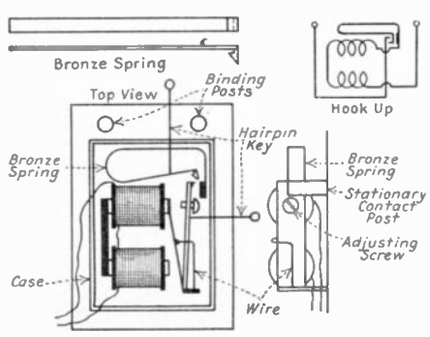
The repair was made by bending a piece of medium weight strap iron into a "U" with the ends turned over. A hole was then drilled through both sides, and through them a bolt was inserted and turned up. As the nut was tightened, the ends were drawn together. Since a portion of the broken terminal still showed above the sealing compound of the cell, it was not a difficult matter to make the connection by setting the "U" over this broken terminal, rendering the connection current-tight.

This repair lasted very well for nearly a year, when the battery was discarded for a new one.

The permanent repair of a battery with a broken lug would be to fasten on a new one by the lead burning method (autogenous soldering). But this could not be done without emptying the cell, which the present method does not require.

Contributed by DALE R. VAN HORN.

Buzzer Circuit Breaker



A circuit breaker constructed from a buzzer, and reset by a bit of wire or a metal hairpin, when it has been opened by too much current.

THE circuit breaker switch shown here is made with a buzzer.

The vibrator contact spring is soldered fast to the vibrating member. The end of the spring is bent at right angles to the armature, and projects about one thirty-second of an inch, as shown. A hole is drilled through the armature opposite the magnet hole, and tapped for an 8-32 iron screw, which serves as an adjustment for current. This screw should fit firmly, so that it will not work loose. A piece of wire is soldered to any stationary part of the buzzer, and shaped so as to keep the armature from touching the stationary contact.

A strip of phosphor bronze spring is bent into a U-shape and soldered to the stationary contact holder.

The case is then lined with paper to prevent short-circuiting, and two holes are drilled through it for the hairpin key. This key serves to set and unset the breaker while the cover is on.

In operation, an excess of current attracts the armature toward the magnet. This releases the bronze spring, which flies back and breaks the circuit. The breaker is set by pushing the spring into place with the hairpin key through the top opening, and unset by pushing the armature toward the magnet through the side opening.

The breaker is fairly sensitive to fractions of an ampere, and may be adjusted freely. The distance of the screw from the pole piece will influence the breaking point considerably. The windings may be connected in series or parallel, or replaced altogether with different wire. Thus, a fairly wide range of capacity may be obtained.

As the hairpin key operates through two small, vent-like holes, few casual observers would suspect its mode of operation without having made an investigation. Therefore, unless the binding posts are shorted, it makes a secret switch, proof to a certain degree against being tampered with.

Contributed by F. B. ANDERSON.

Closed Circuit Push Button

A COMMON door bell push button built up on a wooden base closes a circuit only when the button is pressed inward. To apply this for use in a dark room it is necessary to so arrange it that the circuit can be closed for as long a period as desired without pressing the button, and then can be opened and kept so.

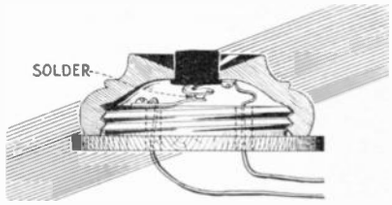
This can be done by placing a large drop of solder upon the contact spring. If, then, the button in the outer section of the base is screwed home, the projecting lump of solder will come in contact with the upper contact, close the circuit and keep it so. But if it is desired to open the circuit, a turn or two of the upper section of the wooden base will draw the upper contact away from the drop of solder as the base is unscrewed, and the circuit will be opened. If a momentary light is wanted, a touch on the button will now give it.

The writer has used this modified switch with great satisfaction for making prints.

Contributed by W. A. SCHRODER.

Closed Circuit Burglar Alarm

NEARLY all closed circuit alarm systems employ the open circuit type of bell, the bell being oper-



A push-button modified so that it can be used as a switch and kept closed or used as a button and be normally open.

ated in connection with a relay. Although the relay is generally used, it is not absolutely necessary, as the ordinary bell can be so arranged that it will be adapted for a closed circuit system.

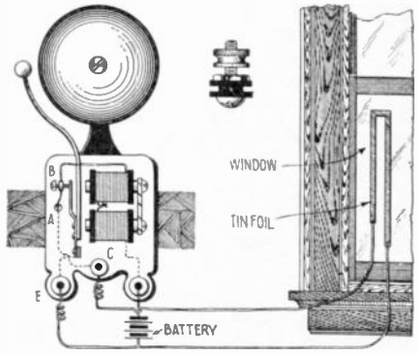
The accompanying illustration shows how this is done. A small hole (A) is drilled in the frame of the bell, near the insulated contact (B). A wire is soldered to the contact (B), and passes through the hole (A). The other end of the wire is connected to the binding post (C). Dotted lines show the wires under the frame of the bell. The middle binding post (C) is insulated from the frame, and is shown in detail at one side.

The illustration also shows how the bell is connected up to the circuit. Gravity cells should be used, as dry cells would not last very long on such a circuit. The tinfoil strip which is pasted around the edge of the window as usual is connected to the binding posts (C) and (E). This short-circuits the make and break contacts on the bell, and the magnet will hold the armature down; but if a burglar should break the window, the circuit through the tin-foil would be broken, the armature will fly back closing the ringing circuit, and the bell will ring continuously.

If the bell is to be used with window or door contacts, the contacts must be connected in series and then to the binding posts (C) and (E). The closed circuit type of contacts must be used; that is, they should open the circuit when a window is raised or a door opened.

The main advantage of a closed circuit alarm system is that it is burglar-proof; even if anyone should cut the wires the bell will ring.

Contributed by AMEDEO GIOLITTO.



A burglar alarm operating on a closed circuit, so that breakage of the window pane will cause the alarm to be given.

Magic Writing

WITH the method here detailed you can inscribe your name on your knife blade or any other article that is made of a metal attacked by the acid of

A simple way of writing one's name indelibly upon a surface of iron or steel by the use of the galvanic battery.

the salt employed. This sort of writing can be done on copper, brass, or German silver. To make the process clear, a sheet of metal is shown in the drawing, laid on a flat board.

The metal plate was covered with ordinary soap, rubbed on dry, and the name was written in with something sharp—a pin, needle, or even a dry pen. If a pen is used, there will be difficulty in using the same pen again for writing with ink. The letters of whatever you write should be connected, though if the liquid that is poured over the letters flows over so that all the letters are under the same "puddle," there will be no difficulty in obtaining good results just as though the letters were connected. It will be noted that the words PRACTICAL ELECTRICS in the picture are connected as well as all the letters.

One of the wires from the battery is solidly connected to the metal plate and the other just dips slightly into the liquid that covers the letters. This second wire does not touch the metal.

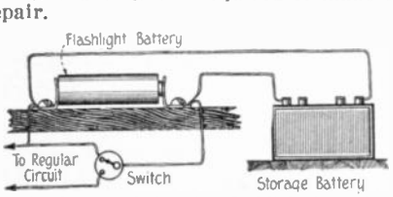
To make the liquid, take one-fourth of a glass of water and dissolve a tablespoonful of blue vitriol (copper sulfate) in it; then with a silver spoon dip the solution out of the glass and carefully put it over the letters. The liquid should not be allowed to run over the edges of the metal anywhere, because it will not stand up in as deep a puddle again and will not be quite as efficient when shallow.

If one cell is employed, the current should operate on the metal a minute or two, but if you are provided with as many cells as illustrated, current need remain on but fifteen or twenty seconds.

After washing the soap off, a tiny gold thread will be left on the metal where the scratched-in-soap letters were previously. This line soon turns black and you find that it has eaten into the metal a tiny way and that "magic writing" has become a permanent reality.

Charging Flashlight Batteries

IT happens frequently when one is driving a car at night that something goes wrong and a light is required to make the repair.



A simple way of charging flashlight batteries, so as to obtain increased service from them, and to avoid throwing them away when they show weakness.

Upon taking your flashlight out of the tool box you may find that the battery is dead, either from a short circuit from touching metal of the car or a tool or because of plenty of use. Now, with this simple device mounted on the car you can take out the battery and place one cell at a time in circuit.

Place the cell in the clamp and leave it there till it becomes hot, but do not let it remain there long enough for the sealing wax to melt. When the seal begins to soften, remove the cell, then treat the other cell in similar manner.

After all the cells have been treated in this way, place them in the flashlight, and it is a certainty that you will have a light as good as that from a new battery.

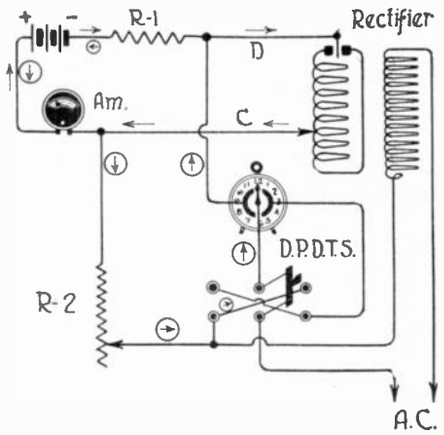
Contributed by THEODORE R. JOHNSON.

Automatic Battery Former

ON page 458 of PRACTICAL ELECTRICS for September there is a description of an automatic switch for forming storage battery plates. The writer of the present contribution constructed the apparatus and is having good success with it, but employs a magnetic rectifier with the circuits indicated in the accompanying illustration. The special object of this hook-up is to disconnect the 110-volt A. C. while the battery is discharging.

The operation of the time switch is as follows: Referring to the diagram, A. C. are the high voltage leads that feed the rectifier primary. One of these runs through the DPDT switch to one of the semi-circular contacts of the automatic charging device. When the clock hand connects with the right-hand contact plates the rectifier starts; and current flows from the secondary to the battery along (D, C), as indicated by the plain arrows. A resistance (R-1) is inserted to govern the amperage of the charging current. When the clock hand moves over to the left, the battery discharges as shown by the encircled arrows. A second resistance (R-2) (variable is best), is included in this circuit, because the battery must be discharged slower than it is charged. The ammeter (Am.) indicates the strength of the current charging or discharging at all times.

The DPDT switch allows the automatic charger to be thrown out of circuit



An automatic battery former which charges and discharges a storage battery in regulated periodicity without any supervision, the operation being regulated by a clock.

entirely and permits the rectifier to be operated continuously, if desired.

A caution to be observed in constructing the automatic switch is that firm contact must be made by the clock hand, and a quick, snappy break secured when the high voltage current is cut into and out of circuit. Connect the grounded side of the A. C. line to the automatic charger and mount the contacts on fiber or some other good insulating substance. A little care must be taken to adjust the carbon electrodes of the rectifier so that the vibrating tongue will not make contact after the primary current is stopped. The author will gladly give more detailed information to anyone interested.

Contributed by REV. BENEDICT BABB.
St. Benedict's Abbey, Mt. Angel, Ore.

$50 IN PRIZES

A special prize contest for Junior Electricians and Electrical Experimenters will be held each month. There will be three monthly prizes as follows:

First Prize	**$25.00 in gold**
Second Prize	**$15.00 in gold**
Third Prize	**$10.00 in gold**
Total	**$50.00 in gold**

This department desires particularly to publish new and original ideas on how to make things electrical, new electrical wrinkles and ideas that are of benefit to the user of electricity, be he a householder, business man, or in a factory.

There are dozens of valuable little stunts and ideas that we young men run across every month, and we mean to publish these for the benefit of all electrical experimenters.

If in any way possible, a clear photograph should be sent with the idea; but if that is not possible, a good sketch will do.

This prize contest is open to everyone. All prizes will be paid upon publication. If two contestants submit the same idea, both will receive the same prize.

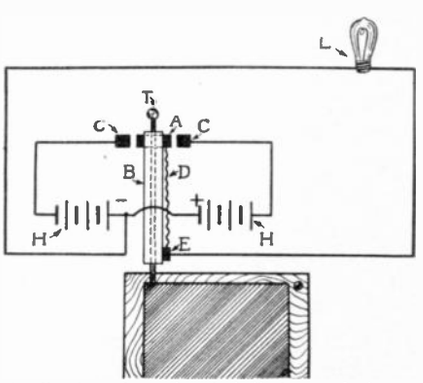
Address all manuscripts, photos, models, etc., to *Editor, Electrical Wrinkle Contest*, in care of this publication.

Electric Current Alternator

THIS simple appliance causes a battery to give an alternating current. The gong is removed from an electric bell and on the clapper there is riveted a strip of fiber (B), to which are attached two contact pieces (A) and (E), electrically connected by a spring or wire (D).

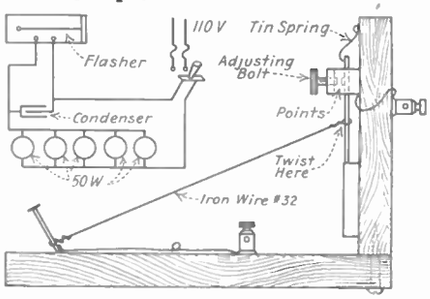
The battery is of double the required voltage, and from its center point a wire is carried to the circuit as shown. If the bell clapper swings to the right, the contact between (A) and (C) will be closed, and a current will go through the circuit in one direction from one-half of the battery. Then, if the clapper swings over to the contact (C), again a current will go through the circuit, this time in the opposite direction. The frequency of the current will be determined, of course, by the number of vibrations given by the operation of the bell.

Contributed by FRED D. VERCELLINO.



Application of an electric bell, for producing an alternating current from a pair of primary batteries.

Simple Thermo-Flasher



An electric flasher, operating by the change in length of a wire heated by the current passing through it to the lamps.

A BASEBOARD about two inches wide by six inches long is required. Another board about three inches long and two inches wide is fastened upright to the end of the long board by two screws. A spark coil interrupter is mounted in the usual way on the short upright board. A piece of iron wire (about size 32) is fastened to the vibrator as shown in the sketch; the other end of the wire is fastened to the base by a nail.

A spring, made of a piece of tin, is bent and fixed as shown in the illustration. No. 32 iron wire passing the current will, by expanding and contracting, if the vibrator points are properly adjusted, flash a bank of five 50-watt, 110-volt lamps. For flashing a smaller or larger bank, corresponding sizes of iron wire must be used. A condenser should shunt the points. As described the apparatus will flash a 6-volt, 2.5-ampere bulb.

Contributed by J. HAYWARD.

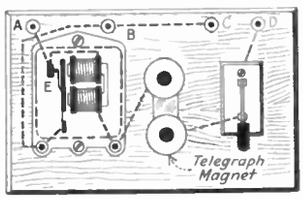
Shocking Machine

AN inexpensive shocking machine can be constructed by utilizing an electric buzzer.

The cover of the buzzer is first removed and a piece of wire is soldered to the stationary contact (E); the buzzer is then mounted on a wooden base with a pair of telegraph magnets and a switch, these different parts being connected together as shown. It will be noted that the magnets are connected in series with the buzzer. This increases the self-induction of the circuit, and since the voltage developed between the binding posts (A) and (B) is due to the self-induction of the circuit, the voltage is therefore increased. The shocking handles are connected to the binding posts (A) and (B).

The batteries are connected across the binding posts (C) and (D) and the device is turned on and off by means of the switch. Two battery carbons can be employed for the handles. The dotted lines show the connections under the base board.

Contributed by AMEDEO GIOLITTO.



A buzzer or electric bell used as a shocking machine, with the shocks reinforced by an old telegraph magnet placed in the circuit.

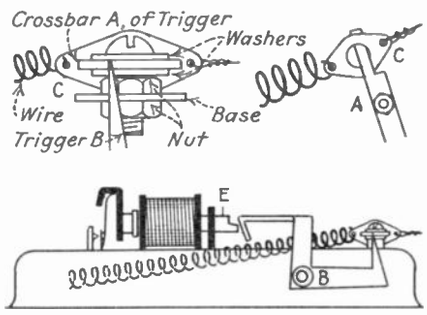
Trigger Release

A DIRECT acting bell, in the apparatus illustrated, is used to release a spring-actuated trigger, which may discharge a gun, snap a camera, pull open a switch rapidly, or do other similar things.

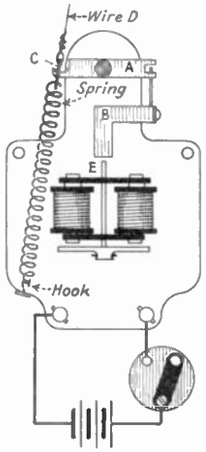
A horizontal swiveling bar is riveted on the little support on the right of the base, and one end of it is caught by the right hand end of the trigger (B) where the end of the trigger projects upward. This trigger is actuated by the bell magnet (E), as shown, whose armature when attracted and when its end (E) is drawn forward to the right, depresses the right end of the trigger and releases the swiveled bar.

The distant end of the same bar passes through a hole in a little oblong plate (C); one end of this plate is attached by a string or wire to the piece to be tripped; and to the other end of the same piece a string is connected. Thus when the end of the trigger (B) is depressed, the swiveled bar (A) is released, the spring contracts and jerks open the switch, pulls the trigger or does whatever else it is arranged for.

Contributed by LEROY COX.



Details of a trigger release which can be used for distant snap-shots and other similar purposes, where a mechanical release at a distance is required.

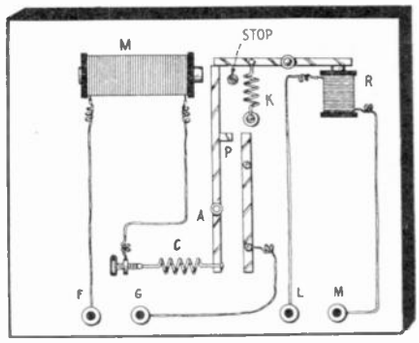


A general view of the trigger release, using the mechanism of a direct acting bell, and embodying the details shown above.

Electro-Magnetic Circuit Breaker

THIS circuit breaker is provided with two magnets whose axes are at right angles to each other. Referring to our illustration, the horizontal magnet on the left passes the current of the circuit through its coils. In front of it is an armature pivoted at the point (A), and with a spring at the bottom which tends to draw the upper end away from the magnet pole. At (P) there is a contact which is opened when the magnet attracts the armature to its pole, and closed when the armature is held to the right by the spring at its lower end. The lines on the drawing show the circuit. The current enters at the binding post (F), goes through the coil of the magnet, through the spring at the bottom of the pivoted armature, through the contact (P), and out at the binding post (G).

If now, the current is too strong, the magnet will acquire power enough to attract its armature, against the force of the spring, opening the contact (P) and cutting off the current. This refers to the horizontal magnet shown on the left of the illustration. The vertical magnet also



A circuit breaker whose action depends on two electro-magnets placed at right angles to each other, whose armatures interlock at the ends.

has its armature (A), pivoted in the center, and drawn away from the pole by a spring. When the main circuit magnet attracts its armature, the left-hand end of the armature (A), is drawn down by the spring against the stop, and holds the armature (K) close against the pole of the magnet (M), thus opening the contact (P). The circuit is now open, and the magnet (M) is dead. But the electro-magnet (R) has its own circuit, and on closing this circuit, the magnet (R) attracts its armature, the left-hand end swings upward as the right-hand end swings down, the lower end of the armature (K) is drawn by the spring towards the left, the contact (P) is closed, and all is again in order. By this arrangement, the circuit breaker can be set from a distance and there are no fuses to burn out.

Contributed by FRED HALL.

Mending a Storage Battery

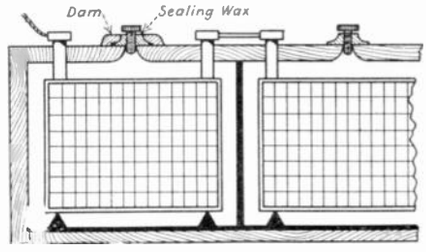
THE writer once had the misfortune to break the threads holding the cap to one cell of a new storage battery.

Taking the battery out of its case I made a dam of damp loam, about two inches in diameter and concentric with the broken cap holder. Care was taken with the earth to keep it all out of the battery.

Next I put a little lard on the screw cap plug and by wiping with my fingers I left just enough lard to prevent sticking. Holding the cap tight upon the hole, so as to completely close it, I melted common sealing wax and let it fill in the space between the dam and the plug until the desired height was reached. Just before the wax became solid I turned the cap gently to and fro to prevent it becoming too tight.

The battery is still in use and the remade cap holder looks as though it would last as long as the battery itself.

Contributed by G. E. CROSS.



Making a new neck for a storage battery out of sealing wax, to receive the screw plug with which it is closed. A simple operation which was used with success.

Home-Made Battery Charger

By Harold Nowell Whitmore

THIS article describes and illustrates the construction of a simple and inexpensive rectifier for charging a 6-volt battery from 110-volt alternating

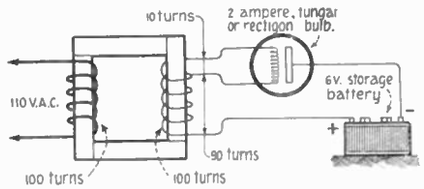


Fig. 1

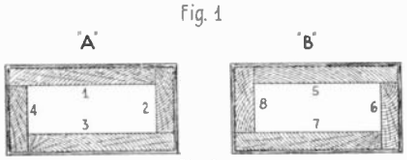


Fig. 2

Layout and general diagrams of an apparatus for charging a battery from an alternating current house circuit.

current. A charger built on these specifications has been in use several months and has proved entirely satisfactory.

The type of charger using a rectifying tube was chosen as the most practical one to be built at home, as it is recognized to be the most simple and trouble-proof apparatus; there are no moving parts and no adjustments, and it may be allowed to run unattended for any length of time. Should the A. C. power supply fail at any time the storage battery will not discharge back through the transformer coil. Very few tools are required to assemble the apparatus and an examination of the following bill of material will show that the cost of parts is low.

Bill of Material

175 pieces 16-gauge silicon steel 6¾ inch by 1¼ inch.
175 pieces 16-gauge silicon steel 3¾ inch by 1¼ inch.
¾ lb. No. 14 double cotton-covered copper wire.
1½ lb. No. 18 double cotton-covered copper wire.
1 porcelain cleat receptacle, standard Edison base.
1 2-ampere Tungar or Rectigon bulb.

Figure 1 is the wiring diagram. (A) is the primary coil made up of 400 turns of No. 18 wire. The leads from this coil attach to the lighting circuit, 110 volts A. C., and may be provided with an attachment plug to go into any lamp socket. (B) is the secondary coil and consists of 100 turns of No. 14 wire. A tap is taken off at the tenth turn and leads to the filament of the tube, together with the first ten turns. The last or hundredth turn connects to the positive (+) terminal of the battery being charged, and the plate connection on the top of the rectifying tube goes to the negative (—) terminal. Battery clips provide the necessary connections.

The assembling of the frame is best accomplished by first constructing a shallow box (sides about 2 inches high), whose inside dimensions are slightly larger than 5 inches by 8 inches. The finished frame is to be 5 inches by 8 inches. Starting at corner (A) of the box (Fig. 2), lay in the steel strips 1, 2, 3 and 4 as shown. On the second layer start at corner (B) of the box and lay in strips 5, 6, 7, and 8. On the third layer start again at corner (A). In this way build up the transformer frame until its height, when compressed, is equal to the width of the strips, or about 1¼ inches. This will require about 175 long strips and the same number of short strips. The frame should now be carefully removed from the box and placed in clamps. The method of clamping and mounting is left to the builder, although a practical suggestion is shown in the general assembly Fig. 3. The method shown also provides for the mounting of the frame to a board, which in turn may be used to attach the complete apparatus to the wall.

The next operation is to tape the side members of the frame preparatory to winding the coils. The primary coil is then wound with 400 turns of No. 18 wire. In winding the secondary coil take a tap off at the tenth turn and continue for 90 more turns, making a total of 100 turns of No. 14 wire. When the coils have been wound, tape them well and apply shellac.

This charger will be found to impart a slow charge and will therefore be easy on the battery. The charging operation is started by first attaching the battery clips to the proper terminals on the 6-volt storage battery and then turning on the 110-volt circuit.

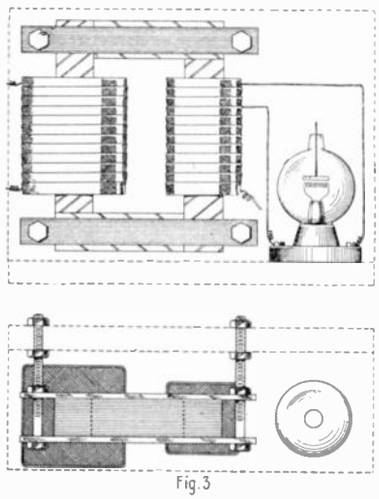


Fig. 3

Further details of the apparatus and of its mount for charging a storage battery from an alternating current circuit.

Cellar Door Lighting Switch

THREE binding posts (two with bolts on the bottom and one with a wood screw on the bottom), six rubber washers which will fit on the binding posts, some tin, a piece of an old clock spring, and a piece of wood two inches by three and a half and about a quarter of an inch thick, comprise all the materials necessary to construct this simple little device for shutting off cellar lights. The cost will not be over 35 cents.

Mount the two binding posts, with bolts

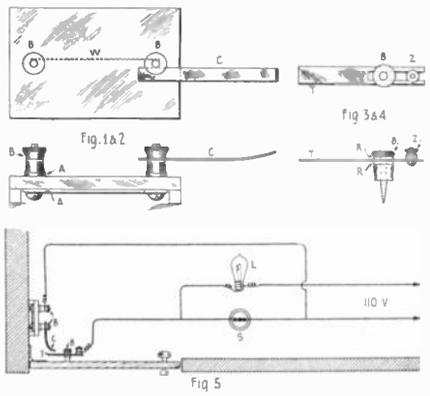


Fig. 5

A very simple switch for attachment to a door, so that when the door is opened a lamp will be lighted, which is extinguished when the door is closed.

on the bottom, on the piece of wood, one on each end. Connect them with a piece of wire and insulate them from the wood with four of the rubber washers as shown in Figures 1 and 2. From an old clock spring cut a piece about two and a half inches long, and fasten this to one of the binding posts.

Screw the piece of wood into the wall about one inch away from the door and near the top of the door, with a piece of clock spring toward the door. Then screw the remaining binding post into the door, parallel to the other two, and about two and a half inches from the door. Fasten to this a piece of tin so that it faces toward the other two posts. Then bend the clock spring so that it will touch the piece of tin when the door is about one foot open. A clock spring should be used because it springs back into place no matter how much it is bent back. Hook this device in parallel with the switch as shown in Figure 5.

When you open the door the lamp lights; when you close it the lamp goes out. If it is desired to have the door shut and the lights on at the same time, all that is necessary is to turn on the switch in the regular way.

Contributed by Julian M. Sturtevant.

What I Would Like to See Published in "Practical Electrics"

It has always been the Editor's desire to publish what the readers want, not "what strikes the Editor's fancy." As a rule we believe that we publish such material as is of greatest interest to our readers. Occasionally, however, it is necessary to check up to see whether our guess is right, for, after all, in publishing a magazine such as this there is some guess-work connected with the selection of articles for publication. For this reason we shall put it up to our readers from time to time, to make certain that we publish just what they desire.

In the blank space below, please list your preferences for certain articles, or classes of articles, which you would like to see printed in this magazine. The Editors will try their utmost to comply with the wishes of the majority. The results of this work will be published from time to time:

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NAME .....

STREET ADDRESS .....

CITY OR TOWN.....STATE.....

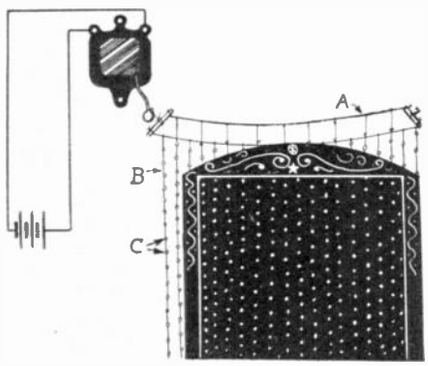
IN this department are published various tricks that can be performed by means of the electrical current. Such tricks may be used for entertaining, for window displays, or for any other purpose. This department will pay monthly a first prize of $3.00 for the best electrical trick, and the Editor invites manuscripts from contributors.

To win the first prize, the trick must necessarily be new and original. All other Elec-Tricks published are paid for at regular space rates.

Realistic Snow Fall

IT is questionable whether the principal merit of this effective display inheres in its simplicity or in the realism of the effect produced.

A buzzer is mounted out of sight of the prospective audience, and from a wire extension attached to its armature, a string



A very pretty deception, producing the effect of a snowfall in a toy theater, with a dark background to carry out the illusion.

is carried right across the scene, which may, of course, be a store window or even a box representing the little theater.

From this string, which is stretched rather tightly, hang a number of the finest possible threads. It is advisable to have a dark background and the threads black. At frequent intervals on the threads are strung little tufts of pure white cotton, and to enhance the appearance, a number of the horizontal strings may be placed parallel with each other, each with its own lot of threads hanging down. When the buzzer is set in action, the horizontal strings, which should be out of sight, are started into motion, the threads are jerked up and down, and the exact effect of a snowstorm is produced.

A nice little snowy landscape can be made in the bottom of the box by the judicious use of salt and Christmas-tree decorations, so as to give a true winter landscape.

Contributed by FRED D. VERCELLINO.

Toy Cannon

WE usually think of cannon in terms of gunpowder and fuses. The one shown here employs neither, yet is as certain and effective a noise-maker as the other and is much cheaper. Instead of using powder and a fuse, the explosive material is a mixture of gasoline and air and the means for discharging it consist of a spark-plug, still in working order.

The barrel is made from a piece of gas-pipe and the carriage consists of two two-inch pieces of plank, cut to shape, with a pair of coaster wagon wheels to move it on. A wad of paper or some other substance is rammed in the front of the barrel before the gasoline is ignited, and the force required to push this charge or wad out creates the noise. Or, if desired, loose-fitting wooden plugs about one foot long and weighted at one end may be used for ammunition with equally interesting results.

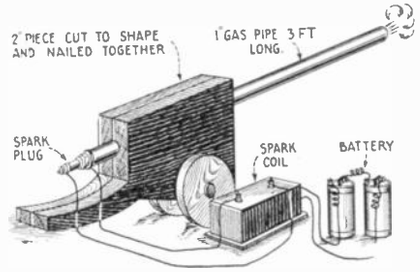
Get a piece of one-inch gas-pipe, three feet long, and one inch in inside diameter. One end must be threaded and a cap for this end provided. The cap is drilled and the resulting hole is threaded to take the threaded end of the spark-plug, which is then screwed tightly in place. The cap, however, is left loose, and is unscrewed before each shot. Then the gasoline, a sufficient quantity, is poured into the cap, care being taken to see that the points of the spark-plug are wet with the liquid and the cap is screwed back on again.

As a pattern, take the drawing by which to cut the two-inch pieces of wood. These should be eight inches wide and two and a half or three feet long. A narrow-bladed saw will cut the irregular pattern well, providing the saw is sharp. After the two pieces have been cut to shape, each piece is gouged out to take the rear end of the barrel. When this is in place and the two pieces of the carriage are nailed or bolted together, the barrel will be tightly gripped. The wheels may be any suitable pair of a diameter of five or six inches, and are held in place by a bolt running through them and the carriage as well.

In connecting the cannon with the spark-coil and the batteries it will be well to use several cells. The spark-coil should be powerful enough to emit a good spark at all times. Connected in the circuit there should also be a switch by which the circuit can be closed and opened. This switch is left open until the cannon is ready for firing. When properly assembled the closing of this switch will cause the spark to pass between the points of the spark-plug, igniting the gasoline. It will be noticed that one wire from the spark-coil is connected to the end of the plug and the other fastened to the barrel in some convenient manner. This is the ground-wire and will serve the purpose as long as the connection is tight.

The amount of gasoline required may be determined after a few trials, but it will not be large. Usually one-half of one teaspoonful will be plenty. Too much is worse than too little.

The wad rammed into the front of the barrel should not be too tight. It will be



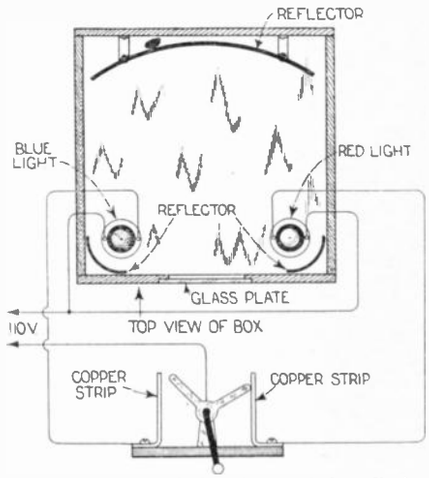
A toy cannon discharged electrically, using gasoline in the breach cap, to produce the explosion when mixing with air and ignited by an electric spark.

well to experiment with this also, first using a small and loose wad and then increasing the size and tightness until it is tight enough to produce a loud report when the gun is fired.

One interesting use of this cannon is for salutes and signals in a camp, as for Boy Scouts. Once made, new uses will present themselves from time to time.

Contributed by DALE R. VAN HORN.

For the Display Window



Application of a flasher for a window display, utilizing colored light for the mystification of the spectators.

UNDOUBTEDLY many experimenters have observed that red writing cannot be read in a red light, while blue writing cannot be read in a blue light, nor green in a green light, etc. The fact is that red writing becomes invisible in a red light, and blue in a blue light. The reason is at once apparent since the red light colors the paper red and the writing becomes lost in the red background, the same holding true for the other colors. By making use of this principle an interesting device can be constructed which can be used for window displays.

Two electric lamps are mounted in a wooden box as shown in the diagram, the lamps being different in color, one of them red and the other blue. An opening is cut in the front of the box and is fitted with a glass plate, while a reflector is arranged in the back of the box so it will reflect the light rays from either one of the lamps to the glass plate. On the glass plate two different pictures are painted; one being painted in red and the other in blue. Next the lamps are connected to a hand switching or flasher arrangement which will light them alternately; turning one of them off and at the same time turning the other on.

In explaining how the device works let us assume that the red light is burning; then the red picture on the glass plate will disappear, while the blue picture can be plainly seen; but when the blue light is burning, the red picture will appear, while the blue picture will disappear, thus it seems as if one picture has turned into the other.

Contributed by AMEDEO GIOLITTO.

Short-Circuits

THE idea of this department is to present to the layman the dangers of the electrical current in a manner that can be understood by everyone, and that will be instructive too. There is a monthly prize of $3.00 for the best idea on "short-circuits." Look at the illustrations and then send us your own particular "Short-Circuit." It is understood that the idea must be possible or probable. If it shows something that occurs as a regular thing, such an idea will have a good chance to win the prize. It is not necessary to make an elaborate sketch, or to write the verses. We will attend to that. Now, let's see what you can do!

Mag's dead, please don't roast her;
(She came from old Cork),
Though into a toaster
She poked with a fork.

By EDWARD L. FRIEDMAN.

This grave, friend, is revealing,
But for an outlet,
And a near metal ceiling,
Poor Pat would live yet.

By ROBERT F. KOPP.

Down here, cold and damp,
Lies Jake, 'neath the grass;
He handled a lamp
When he'd broken the glass.

By W. A. SCHROEDER.

Tiny Mouse Ties Traffic

GENEVA, Oct. 28.—Traffic on the electric railway at Cenere, in Italian Switzerland, was held up for some hours this week as the result of a short circuit, which investigation showed had been caused by a mouse in jumping from one wire to another.

The animal was found on the rails completely carbonized.

Look! In this small hole
(It's a grave of a sort)
Is a mite of a mouse
Who a railway did short.

By G. CLEAR.

Handle Touches Wire Man Is Electrocuted

Battle Creek, Nov. 7.—The steel handle of an air brush coming into contact with a wire carrying 5,000 volts of electricity caused the immediate death of Steve Gogoff, 19 a worker in the Grand Trunk shops here this morning.

Conductor Shocked to Death As He Lifts Phone Receiver

OLEAN, N. Y., Oct. 14.—Electrocution was the fate that met Leon T. Gooden of this city today at Vanda, near here, when he lifted the receiver from a telephone.

Gooden, a conductor for the Local Transit Company, had left his car to telephone for moving orders, using a service phone attached to a telephone pole. It is believed a high-tension wire fell across the telephone line leading to the phone.

Electric Cleaner Kills

KALAMAZOO, Sept. 8.—Frances Marian Underwood, three-year-old daughter of Mr. and Mrs Hugh G. Underwood, was electrocuted at 2 o'clock Thursday afternoon when she touched an electric vacuum cleaner while standing on a register. Death was instantaneous.

Si's here in his slippers
(He'd no shoes to wear),
'Twas electric hair clippers
And a short through the chair.

By O. E. BRICKER.

THIS department is conducted for the benefit of everyone interested in electricity in all its phases. We are glad to answer questions for the benefit of all, but necessarily can only publish such matter as interests the majority of readers.

1. Not more than three questions can be answered for each correspondent.
2. Write on only one side of the paper; all matter should be typewritten, or else written in ink. No attention can be paid to penciled letters.
3. Sketches, diagrams, etc., must always be on separate sheets.
4. This department does not answer questions by mail free of charge. The editor will, however, be glad to answer special questions at the rate of 25 cents for each. On questions entailing research work, intricate calculations, patent research work, etc., a special charge will be made. Correspondents will be informed as to such charge.

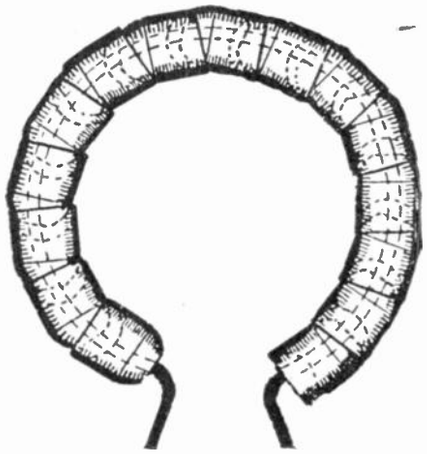
Kindly oblige us by making your letter as short as possible.

Beads for Insulating Wire

(230)—Joseph Billings, Broad Brook, Vt., inquires:

Q. 1.—Why cannot common beads be used to insulate a wire with as great advantage, as special ones made for the purpose and illustrated in your November issue?

A. 1.—Common beads can be used to great advantage for this purpose, but they are distinctly inferior to the specially made and shaped ones. The special ones are stronger than the glass and by a sort of ball and socket construction the presence of the gaps between the beads is completely avoided in some of them. This feature was brought out in the article in our last issue, and the diagram given with this query shows very clearly the ball and socket construction of insulating beads to which we have alluded, and makes it clear how the gaps between them can be avoided. It is perfectly obvious that this ball and socket construction is superior to plain, round beads used for the same purpose.



Regular insulating beads with ball and socket joints between the respective beads, enabling the bending in any kind of a curve without exposing the wire.

Motor-Driven Interrupter

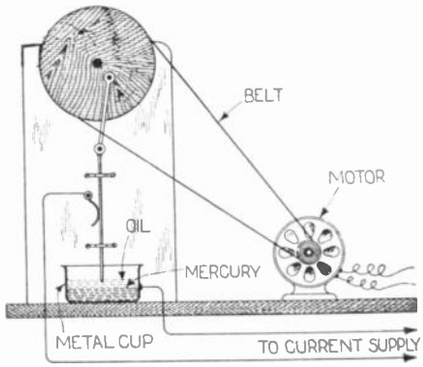
(231)—P. O. Spears, Bronx, N. Y., asks:

Q. 1.—Please describe the construction of a simple motor-driven interrupter.

A. 1.—A very good form of interrupter for your particular purpose is one in which a rod is mounted with an eccentric on the shaft of an electric motor. The rod dips in and out of the mercury, the top of which is covered by a layer of oil.

Q. 2.—Explain the construction of a mercury lamp, similar to the one used in photographic galleries.

A. 2.—The procedure is to merely seal the two electrodes into a long tube of glass, making sure that one of these electrodes enters from what will subsequently be the bottom of the tube. A small quantity of mercury, about one ounce, is placed into the end of the tube, and two of the lamps are connected in series with each other, and then connected across the 110-volt direct current circuits. The tube is then exhausted and sealed.



A motor driven interrupter, using a mercury cup as one element of the make and break, the mercury being covered with oil to prevent oxidizing.

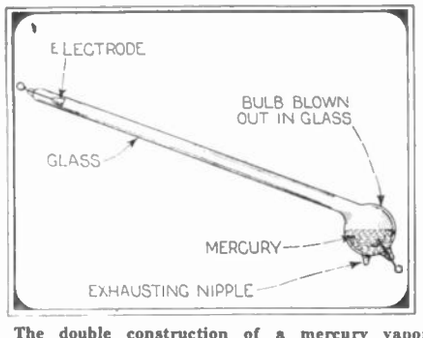
We Pay One Cent a Word

WE want good electrical articles on various subjects, and here is your chance to make some easy money. We will pay one cent a word upon publication for all accepted articles. If you have performed any novel experiments, if you see anything new electrical, if you know of some new electrical stunt, be sure to let us hear from you. Articles with good photographs are particularly desirable. Use one side of the paper only. EDITOR.

Q. 3.—Is a voltmeter necessary in experimenting with Tesla high frequency currents, and if so, can a D. C. voltmeter be employed?

A. 3.—No voltmeter will be necessary in experimenting with Oudin or Tesla apparatus; neither can a D. C. voltmeter be employed on the high frequency alternating current.

Q. 4.—In making Leyden jars I have no difficulty in making the tinfoil adhere to the inside of the glass, but find that I cannot get the outside very smooth. Please advise.



The double construction of a mercury vapor arc, showing the principles employed in the construction of the regular article.

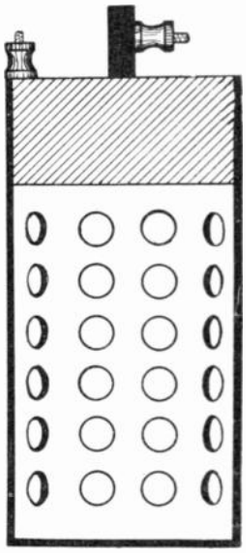
A. 4.—The shellac is first applied to the bottle, and allowed to dry slightly till it becomes tacky. Then tinfoil is placed thereon, and the same rubbed over with a smooth stick to make it adhere firmly. It is subsequently set aside to dry.

Rejuvenating Old Dry Cells

(232)—Henry Mallins, Ridgewood, Va., writes:

Q. 1.—There seems to be some point involved in the treatment of the zinc container of a dry cell when it is to have its life prolonged by being perforated by numerous holes and soaked in sal-ammoniac solution. Some direct the zinc to be punched full of holes, while others say it should be drilled. What is the point involved?

A. 1.—Drilling is far preferable to the use of the punch, for, by cautiously drilling, it is quite possible to avoid perforating the paper or material which lies next



How a dry battery is to be drilled, in order to get more use out of it after becoming exhausted as regards the original exciting electrolyte.

to the zinc. The purpose of this material is to prevent contact of the zinc with the depolarizer and to cut out local action. The zinc can be drilled for holes as shown in the illustration, with a special drill; this can be filed up or ground without much trouble, so as to have a rounded point; zinc is so soft that almost any drill can be used for it. A rounded end is desirable to prevent the perforation of the paper or cloth.

Direct Current Transformation

(233)—George Barker, Hoboken, N. J., wants to know:

Q. 1.—Can I step up direct current at 8 volts to 32 volts, without changing it to alternating current first.

A. 1.—No, it is impossible to transform direct current by simple stepping up.

Why Doesn't Lamp Filament Burn in Air

(234)—Kenneth Tyler, Carroll County, Ill., asks this department:

Q. 1.—Why will the filament of a Mazda bulb not glow if the tip of the lamp has been broken off, permitting air to take the place of the vacuum?

A. 1.—The filament of a Mazda lamp if intact, will glow in spite of the fact that the tip of the lamp has been broken off, but the instant that the wire is heated to cherry redness, even in a spot, rapid oxidation takes place, destroying the wire, and consequently cutting off the current. If the current is regulated to prevent heating to redness, the filament will not burn out. If nitrogen or some other inert gas were pumped into the bulb, taking the place of the oxygen of the air, the lamp would burn as before, provided, of course, that the filament is not broken during the process.

Condenser Data

(235)—Leonard Schultz, Mauston, Wis., asks:

Q. 1.—Please give me data for a condenser (primary) for a ½-inch spark coil.

A. 1.—The condenser to which you refer, namely, for a ½-inch spark coil, comprises 65 tinfoil sheets, size 2 inches by 6 inches, placed between paraffined paper sheets.

Battery Freezing Point

(236)—J. W. Shannon, Bridgeport, Nebraska, asks:

Q. 1.—Will ordinary freezing weather injure the power battery described a few months ago?

A. 1.—Ordinary freezing weather will not injure the power battery, but will delay its action somewhat. Its freezing point is about 10 degrees below zero Centigrade (14 degrees F.).

Battery Charging

(237)—D. V. Baker, Central America, wants to know:

Q. 1.—Does it make any difference whether I use one or more lamps in a lamp-bank resistance for charging a storage battery? My generator cannot furnish enough current at times (when other apparatus is in operation) to charge at higher rates.

A. 1.—It does not make any difference in charging storage batteries whether one or several lamps are used in the circuit. Of course, the greater the number of lamps in a lamp-bank the quicker the battery will be charged, but a small trickle charge suffices to keep the battery in good condition after it has once been fully charged, and current drawn from the same only to a corresponding extent.

Q. 2.—Can a Ford spark coil be employed to operate an Oudin transformer?

A. 2.—A Ford spark coil cannot be successfully used to excite an Oudin coil, because the amount of current from the same is very slight. If a miniature Oudin coil is constructed, some result would be obtained, but a spark from the secondary of the Oudin would in all probability not exceed in length the spark of the Ford coil itself.

Q. 3.—Where are the two secondary leads of a Ford coil?

A. 3.—The binding post that connects to the ground is also one of the secondary leads of a Ford coil. In other words, one secondary and one primary are connected together.

Q. 4.—Please give data for a two-inch spark coil.

A. 4.—For a two-inch induction coil we would suggest the following, which will be found very efficient: A core 11 inches long and 1⅛ inches in diameter, made of soft iron wire, is covered with an insulating tube three-sixteenths inch thick. Upon this two layers of No. 14 double cotton-covered wire are wound. Four pounds of wire, size No. 33, silk or double cotton-covered, is now wound in eight pies, with one-half pound of wire to each pie. This forms the secondary. The pies are then connected in series. One hundred and twenty sheets of tinfoil, size 9 inches by 7 inches, are then placed between layers of paraffined paper for the condenser, which should be connected in the regular manner across the vibrator contact points. The coil, of course, must be fitted with a vibrator.

Peculiar Phenomenon

(238)—M. R. Beymer, New Haven, Conn., is worried because two parallel wires laid on the floor picked up current. In the flat below him an X-ray machine is operating. He asks:

Q. 1.—Is there any danger from the X-ray machine?

A. 1.—There may be danger from the X-ray machine which is operated on the floor below you, but the probabilities are against it. The user can be made to shield it with lead. The phenomena of induction are familiar to all who have had experience with electrical apparatus, particularly with induction coils. The reason the current was found in the two wires lying along the floor and parallel to the wires of the machine in the room downstairs was because of the inductive effect.

Two Transformer Designs

(239)—J. H. Bullard, Utica, N. Y., asks:

Q. 1.—Please give data for step-up transformer from 115 volts to 230 volts and 15 amperes.

A. 1.—The core is made of laminated iron strips, 2¾ inches wide, in the form of a rectangle 18 inches long by 9¾ inches wide. This core is built up to a thickness of 2¾ inches. The primary consists of 166 turns of No. 5 D.C.C. wire wound in three layers. In place of No. 5 wire, two No. 8 wires may be used in parallel. The secondary consists of 332 turns of No. 8 D.C.C. wire.

Q. 2.—Also give data on a 2-watt transformer stepping up from 6 to 8 volts.

A. 2.—A 2-watt step-down transformer giving 6 and 8 volts on the secondary is made thus: The core is built up of laminated iron strips, ¾ inch wide, in the shape of a rectangle 3¼ inches long by 2½ inches wide, outside dimensions. This core is to be ½ inch thick. The primary consists of 2200 turns of No. 34 S.C.C. wire, wound in 22 layers. The secondary consists of 300 turns of No. 25 S.C.C. wire, tapped at the 240th turn. This tap will give approximately 6 volts, and the end of the winding will give approximately 8 volts.

Magneto as Battery Charger

(240)—John R. Adkins, Branchland, W. Va., asks if a telephone magneto can be used to charge storage batteries without changing it in any way, but just adding a one-cell electrolytic rectifier to convert the current to direct.

A. 1.—The frequency of the alterations of current delivered by a telephone magneto is so high, and the amperage is so low, that by the time the current is rectified, it would be impossible to charge a storage battery with the same. The amperage would be entirely insufficient to be practical for the work.

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Name Plates
Crystals
Bornite
Silicon
Radiocite
Condensers
Ground Clamps
Plugs
Contact Arms
Aerial Connectors
Bus Bar Wire
Enameled Wire
Transformer Coils
Copper Strip
Flexible Cord
Knobs
Panel Knobs
Key Knobs
Binding Posts
Lock Posts
Machine Screws
Switch Stops
Telegraph Key Knobs
Hard Rubber Binding Posts
Nickel-plated Switch Points
Zinc Spark Gap Ends
Panel Switches
Mounted Crystals
Tin Foil
Rheostat Windings
Spring Clips
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Lock Fork
Spacing Washers
Carbon Grains
Blow Torches
Minerals
Copper Pyrites
Iron Pyrites
Soft Metal (Hugonium)
Threaded Brass Rod
Cord Tip Jacks
Vacuum Tube Sockets
Mica Diaphragms
Radio Cement
Choke Coils
Magnet Wire
Brass Rod
Grid Leak Condensers
Phone Cords
Metal Dials
Universal Panel Bearing Handles
Switch Knobs
Potentiometer Windings
Binding Post Name Plates
Spaghetti-Insulating Tubing
Radio Frequency Transformers
Instrument Posts
Hexagon Nuts
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Cap Nuts
Brass Lugs
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Dials
Lubricated Switches
Panel Switch Levers
Mica
Vario-Coupler Rotor
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Switch Blades
Selenium
Diaphragms
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Transformer Stampings
Solderall
Galena
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If you were to buy a book containing all of these 75 Hook-ups you would have to spend from $3.00 to $7.00 to secure the same information.

High Frequency Questions

(241)—D. V. Baker, Rep., of Honduras, C. A., writes:

I built an Oudin coil as described in the July issue of PRACTICAL ELECTRICS, using No. 25 S. C. C. wire (taken from the resistance coil of an arc light). I would like to know how to make a spark coil that can be used with this Oudin coil.

A. 1.—We do not believe that you will get very good results from the Oudin coil which you built, because of the fact that it is wound with iron wire. A good 5-inch spark coil will answer your purposes admirably. A coil of this size can be made by winding two layers of No. 12 double cotton covered wire on an iron core 16 inches long, and 1⅝ inches in diameter, over which an insulating tube is placed five-sixteenths inch in thickness of side. About 16 pounds of No. 32 double cotton covered wire will be required for the secondary, which is made up in pies or sections. 32 pies being necessary.

Q. 2.—How can I make the primary condenser for the same?

A. 2.—The tinfoil, 9 inches by 9 inches, is placed between pieces of paraffine paper, measuring 13 inches by 13 inches, and 220 sheets of tinfoil of this size will be required. If your tinfoil is smaller in size, the area when the entire condenser is put together must be equivalent to 17,820 square inches. This is the primary condenser.

Q. 3.—What should the secondary condenser be; I can't obtain mica here, so don't advise mica condensers?

A. 3.—The secondary condenser for a spark coil of this nature could take the form of Leyden jars. Four 1-quart jars of relatively thin glass are coated on the inside and the outside with tinfoil to within three inches of the top. They are all connected in parallel; that is, all the outside coatings are connected together, and rods, terminating in chains, connecting to the inside of the jars, are likewise connected together.

Operating Spark Coil on D. C.

(242)—E. D. Bacon, Kansas City, Mo., wants to know:

Q. 1.—Can a 5-inch spark coil be used on 120-volt direct current circuits?

A. 1.—An ordinary 5-inch spark coil cannot be used on 120 volts direct current circuits, unless an adequate potentiometer is employed with the same. The primary voltage of the coil described in a previous question, where the data are given, is 16 volts.

Q. 2.—What is the best method of fixing fiber or hard rubber ends to an iron core?

A. 2.—Shellac is the best method of cementing hard rubber or fiber to the iron core. Make it a very tight fit.

Q. 3.—How can I make a tinfoil condenser simply?

A. 3.—In making the condenser it is merely necessary to pile the paraffined paper, and the tinfoil strips, one on top of the other, as shown. Put the entire group into a press or tie tightly with twine between two boards and boil in paraffine. The group of lugs already brought out are bunched together. A hole is then drilled through the same, and each group bolted together.

Correction Notice

In our October, 1922, issue we mentioned that W. Mansfield & Co., of Liverpool, England, manufacturers of the Mansfield automatic oil and water locater, were no longer in business. This is not correct. The statement in question really referred to Edwin A. Mansfield & Co., of New Brighton, England, which firm indeed is no longer in business.

Steinmetz Predictions

DR. CHARLES P. STEINMETZ says that our present use of coal is absurd and the time is not far distant when all the coal will be burned at the mouth of the mine, and instead of transporting the heavy coal we will simply transport the energy in the shape of electricity.

VERY probably our children's children will see the last of railway locomotives carrying their own coal. All that power will be brought to them by electric wiring.

He reminds us that we have also hardly begun yet to use our hydro-electric power.

Indeed, an entire transformation of our material life is very close at hand.

"When everything is electrified," he says, "and central stations are automatically coaled, smoke can be eliminated. No dirt, dust or smoke will be permitted by the government. There will be no fires of any kind within the city limits. Hence there will be no conflagrations and the air will not be full of gases."

THE streets will be clean. There will be no animals used for traction, and hence no street dirt. The atmosphere will be clear, and you can always see the sky. With pure air, the yards in the city can be improved, and parks beautified.

There will also be radical changes in our domestic life. The heating and cooling of houses will be done by simple thermostats controlled by electricity.

The same apparatus that heats the house on a cold day will cool the air and keep humidity normal on a hot day.

VENTILATION at present is accomplished by windows and electric fans. When electricity is developed we shall have an apparatus to bring fresh air into the house and destroy the bad air and remove it.

In a word, all of the power which we now get by dirty and wasteful processes will be manufactured at waterfalls, coal mines and oil and gas wells, and the three great essentials, heat, light and power, for human activity will be attended to by the genie which Ben Franklin invited from the skies.

How to Use Electric Fans in Winter

THE Emerson Electric Manufacturing Company, a prominent company of electric fan manufacturers, gives about a dozen winter uses of fans.

Among the uses for the winter months are the following:

"A fan in the kitchen will blow out smoke and odors if it is set on the window sill. A fan in any closed-up room will do away with that 'stuffy' feeling.

"Directed against the steam radiator on a cold morning, the fan will bring up the room temperature in a surprisingly short time. It will help distribute the heat from a hot-air register in the same manner.

"If the furnace is sluggish, a fan in the cold-air duct, or blowing into it, will send heat to distant rooms which are ordinarily heatless. The same fan in the cellar will dry clothes on a rainy wash day in half the time otherwise required; put the fan on the floor and let it blow up between the lines of clothes to get this result.

"Turn the breeze of the fan into a closet and you will take out that musty smell, and perhaps reach a few moths at the same time."

Electricity at the North Pole

THE wonders and enjoyment of "listening-in" may be brought to the Esquimaux by Captain Amundsen, who sailed

on June 1 from Seattle for the Frozen North, where he will make an aerial survey of the North Pole. For this purpose a storage battery of 56 cells has been included among his equipment on the "Maude." This battery is to be used also for radio communication with Washington, and is to furnish electric light during the three years that Captain Amundsen expects to sojourn in the polar regions.

While it will not be possible to get any of the regularly broadcasted concerts for the benefit of his Esquimaux neighbors, Captain Amundsen will be able to put them in touch with the nearest point, which will probably be Nome, Alaska. It is also probable that he may "broadcast" specimens of Esquimaux music which may be picked up by those within 2000 miles, the radius of his transmitting apparatus.

In addition, Captain Amundsen will keep in touch with Washington four times a day. His radio messages will be sent and received by relay from Nome to St. Paul station on the Bering Sea and thence to Washington.

The electric lights which Captain Amundsen will install upon his arrival at his destination will, however, no longer be a novelty for the Esquimaux, who already have been made acquainted with this mode of illumination. In 1914, the Crocker Land Expedition, headed by Captain Donald MacMillan, took a number of storage batteries, and for the first time in the history of the world the Aurora Borealis had a rival in the form of electric illumination. A few months ago Captain MacMillan returned to the North, and again took an electric lighting system with him.

Captain Amundsen will use aeroplanes upon arriving at the farthest point. From these aeroplanes will be flashed reports to the "Maude," whose powerful transmitting apparatus will relay them back to civilization.

Electricity an Infrequent Cause of Fire

JOHN F. HEALY, veteran chief of the Denver Fire Department, recently made some interesting statements in regard to electricity as a cause of fire. "Contrary to popular opinion," said Chief Healy, "electricity is seldom the cause of fire. In all my years of experience in fire work, during which time I have investigated the cause of over a thousand fires, I cannot say I have found electricity, properly used, has been the cause of a single fire. I say properly used because I have known careless interior wiring and leaving a red-hot electric iron on an ironing board to be the cause of fire. The real cause of fire in such cases, however, should be attributed to the user rather than to electricity."—*Electrical Co-operative League Bulletin.*

What a Dime Will Do

SOME one with a penchant for statistics has figured that a dime's worth of electricity, based on a price of 10 cents per kilowatt-hour, will perform the following services in the household:

Operate a 16-candlepower lamp for about 40 hours. Operate a 6-bulb flatiron for 1½ months. Do a washing equivalent to 20 sheets each week for about 2½ months. Operate a vacuum cleaner long enough to clean about one-tenth of an acre of carpet. Operate a sewing machine for 20 consecutive hours. Drive an electric fan four hours a day for nearly a week. Brew 2½ gallons of coffee in an electric percolator. Operate a heating pad for from one-half to one week, depending upon the heat used. Operate a foot warmer five consecutive hours. Operate a water pump long enough to raise 100 gallons 1,100 feet. Make 100 slices of toast.

What Electrons Do

THE facts upon which all physicists are now agreed have been summed up under nine heads, by a recent author, the recapitulation of which is worth reproducing:

1.—All electrons have the same mass, and this mass is very small compared with the mass of any atom.

2.—All electrons carry equal negative charges numerically equal to the charge carried by a monovalent ion in electrolysis.

3.—In gases electrons move from a region of low electric potential to a region of high potential, with a speed depending upon the potential gradient and upon the pressure of gas.

4.—A gas is rendered conducting by the passage of a stream of rapidly moving electrons.

5.—The impact of rapidly moving electrons on matter develops heat, light and mechanical force.

6.—Electrons are repelled by other electrons and by all negatively-charged bodies.

7.—Electrons are attracted by positively-charged bodies.

8.—Electrons in motion are accompanied by a magnetic field, which is in circles having their planes normal to the line of motion.

9.—Electrons are emitted by bodies at a sufficiently high temperature and by bodies at a sufficiently low potential. They are emitted spontaneously by a few substances at ordinary temperatures even when uncharged. They are emitted during some chemical reactions and also by some substances when exposed to X-rays or to light waves of short wave-length.

Electric Railways in Mountainous Districts

A CONTRIBUTION to the *General Electric Review* (U. S. A.) by Mr. Frank Rusch gives an interesting account of the advantages arising from the use of electric traction on railways in various mountainous districts, with a total of about 660 route miles. Maximum gradients of 2 to 2.2 per cent are recorded; on such gradients 2,200 to 2,500 tons can be hauled, while on a 1 per cent gradient as much as 3,500 tons can be dealt with.

These results compare very favorably with the performances of steam locomotives. Thus on a 2 per cent gradient over the Saddle mountains in Washington two electric locomotives are hauling 2,200 tons at a speed of 15 miles per hour, whereas two steam locomotives could only deal with 1,600 tons at 8 to 10 miles per hour. One point that always strikes the steam man in first operating electric locomotives is the great advantage of not having to stop for fuel and water. As a large part of these mountain railways run through dry territory the elimination of pumping plants to supply water on route is a real economy. Again, while electric locomotives weigh more on drivers than steam engines they are easier on their drivers, especially on curved track such as is usual in mountain regions.

On the goods service the running time has been decreased 40 per cent, and the tonnage increased by a similar amount since electric driving was introduced. Goods trains can be handled over mountain grades without stopping, and owing to the use of regenerative braking may be handled without applying the air brake to the whole train, unless for some reason it is necessary to come to a dead stop.

It is found to be very easy to judge train weights, proper ratings, etc. Every locomotive is equipped with its own instruments and acts as a dynamometer, and the engineer can at once detect any symptoms of overloading. Another feature is the uniformity of results obtainable from engines. There is no argument as to whether one man can get more out of an engine than another—all are placed on an even basis. The personal element is much less in evidence than in the case of steam railways.

Twelve Good Uses for Electric Fans

THE following are twelve good uses for an electric fan:

1. Dry frosting on a cake.

2. Hasten the drying of varnish or paint.

3. Hurry along the dehydration of fruit or vegetables.

4. Dry quickly delicate garment suspended on a hanger so as to prevent running of colors.

5. Remove dampness from clothes after ironing.

6. Drive stagnant air from a closet or closed room, thus compelling live air to enter.

7. Vitalize air by the process of stirring it up at times when windows cannot be opened.

8. Establish a draft in furnace when fire is slow.

9. Cause radiation of heat from register or steam coil in the winter.

10. Woo sleep for baby on hot days, or for baby's mother and father on hot nights.

11. Make the temperature of kitchens, laundries or other workrooms endurable to houseworkers.

12. Give to offices the coolness necessary to serene nerves and efficient work.

Ten "Don'ts" in Using Electric Equipment

TO minimize the possibility of accidents or fires from electrical causes, City Electrician Israel Lovett of Omaha, Neb., has published the following precautions against careless handling of electrical equipment:

Don't fail to insist that your electrical contractor secures permit and inspection for any new electrical wiring. You help to pay the salaries of the inspectors; why not have something to show for your money?

Don't use pennies for fuses. There used to be a practice of hanging a monkey wrench on the safety valve. This has become unfashionable.

Don't use or handle electrical appliances such as vibrators, heaters, etc., while sitting or standing in the bath-tub.

Don't leave the electric flatiron connected to the circuit and go to use the telephone, visit with the neighbors or call at the grocery. It costs $100 for the fire department to make a "run" even for a smoking ironing board.

Don't use paper shades or other inflammable materials or decorations about electric lamps.

Don't use lamp cord wiring in your homes. It is unsightly and unsafe. The underwriters' committee which recently made a survey of Omaha stated that 40 per cent of the so-called electric fires originated from defective cords.

Don't permit "the handy man" nor the incompetent workman to do your wiring. There are numerous licensed electrical contractors in all of our cities.

Don't forget that there are 365 days in every year in which to see that your electric wiring is in first-class shape. Fire prevention week is past, but there are 51 other weeks yearly when the same precautions can properly be taken.

Don't forget at any time that good, competent workmanship and first-class materials used in the installation of electric wiring make the best and safest job of work.

Don't overlook the fact that the electrical department is anxious to furnish service and will be glad to offer suggestions for your wiring job. Some of them may prove useful.

Switzerland's Electric Power

THE total energy available in 1914 in the whole of Switzerland was, according to a report of the Swiss Water Board, estimated at 4,000,000 horsepower, based upon an average of 15 hours' working time at the power stations. Of this energy there was in use on January 1, 1914, 500,000 horsepower. The new power stations erected and in course of construction from January 1, 1914, up to December 31, 1920, furnish about 300,000 horsepower, so that on January 1, 1921, about 3,200,000 horsepower, four-fifths of the energy available, was still to be exploited. On January 1, 1914, the total number of water-power stations was 6,860, of which 6,025, with an average total net capacity of 39,000 horsepower, had a minimum constant capacity of less than 20 horsepower; 835, with an average total net capacity of 487,000 horsepower, a minimum constant capacity of 20 horsepower and more, and only six a minimum constant capacity of 10,000 horsepower and more.

The Swiss Electrotechnical Association has collected some figures regarding the situation at the end of the year 1919. The number of enterprises increased only from 1,185 to 1,285, nor has the number of places using electrical energy grown to any extent. This is due to the fact that there are scarcely any villages in Switzer-

land into which electricity had not already penetrated. With the exception of the population living in mountainous districts away from the road, it may be said that today electricity is at the disposal of all the inhabitants. In fact, Switzerland is declared to be the most completely electrified country in the world at the present time. The possible capacity of the hydro-electric power stations amounted in 1919 to 504,500 kilowatts, with steam reserves of 66,500 kilowatts. The electrical energy delivered in 1919 was 1,846,000,000 kilowatt-hours, of which steam plants produced 2,235,000 kilowatt-hours. These figures exclude the production of the Swiss Federal Railways and other producers which consume their own energy.

During the year 1921 the exports of electrical energy were as follows: To Germany, 36,610 kilowatt-hours, to France, 24,296 kilowatt-hours, and to Italy, 46,859 kilowatt-hours, or a total of 107,765 kilowatt-hours. The total number of kilowatt-hours exported amounted in the year 1920 to 378,000,000, of which 221,000,000 were exported in the six-month period between April 1 and September 30. —HENRY L. GEISSEL in *Electrical World.*

Electric Heating Increases Oil Output

PRODUCTION from low-gravity oil wells can be increased 100 per cent through the application of electric heat. A recent test at one of the California oil fields in the case of a low-gravity or "head" well demonstrated the feasibility of the scheme. A 5-kilowatt heater consisting of four sections was placed around the well casing before the pumping commenced. Actual measurement showed an increased production of from 50 to 75 per cent. In the case of a 10-kilowatt heater production was increased 100 per cent. It was determined that the cost of operating such a heater averaged $20 per month per well. Low-gravity or "head" wells can only be pumped approximately eight hours out of twenty-four. The application of the electric heater greatly increased the pumping period. It is believed that there are unlimited possibilities in the application of electric heat to oil production in low-gravity districts, not only in pumping from the wells, but also in transporting the oil from the field to the refinery or to the shipping point.—*Journal of Electricity and Western Industry.*

Electric Iron Starts Blaze

AN electric iron caused more than $1,000 damage by fire recently to the home of Louis Kandel, 47 Washington Street, Harrison.

The blaze was discovered by Sal Kandel, 14, who was almost overcome by smoke while making his way from the attic, where the fire started. Mrs. Kandel said she was ironing last night and probably neglected to shut off the current when she finished.—*Newark Star-Eagle.*

Electrical Resistivities of Granular and Molded Resistors

ELECTRICAL resistivities of different resistor materials are being determined under different conditions of temperature, pressure, purity, etc., at the Northwest Experiment Station of the Bureau of Mines at Seattle, Wash., by Prof. G. R. Shuck of the University of Washington. It is hoped that these data will be of value in designing furnaces which use a resistor as the heating element or which make use of carbon as a reducing element and also in the manufacture of electrodes.

Sweden's Electrification

SWEDEN is fairly well supplied with raw materials for its manufacturing industries, but is entirely without a domestic supply of coal and oil, a Department of Commerce report states. Its water-power resources, however, make up for this deficiency, and necessity has done much to develop these resources in such a way as to make Sweden perhaps the most electrified country in the world.

The post-war period of depression and resultant cheaper labor and material, in conjunction with the keen competition in foreign markets, have caused Sweden to recommence her interrupted program of electrification in order to be placed in a more advantageous position in the world's markets.

Sweden's total supply of water power, estimated at approximately 7,000,000 horsepower, is available during about nine months of the year, and is exceeded, among European countries, only by Norway, which has an estimated available supply of 7,500,000 horsepower. Of the Swedish power available, only about 3,500,000 are worth developing at the present time; of this amount, 2,800,000 horsepower are privately owned and 700,000 are owned by the state.

The consumption of electric-energy is distributed as follows:

	Kilowatts
For electrolysis	585,600,000
For household uses	167,400,000
For traction	43,600,000
For industrial power	1,347,100,000
Total	2,143,700,000

Since 1917 the total power used has increased by nearly 2,000,000 kilowatts, practically all of which falls upon industry.

Electric Needle Removes Cancers

MANY cancers so situated that they cannot be cut out are now being removed successfully by electricity, a process called endothermy.

The method has been developed by Dr. William L. Clark of Philadelphia. It has two forms, desiccation and coagulation. In the former an ordinary sewing needle held in a suitable handle is used with a monopolar electric current of high voltage and low amperage from the Oudin resonator of a high frequency machine. This is passed around a small tumor such as is found on the eyelid or the vocal cords. The intense heat thus concentrated at the point of the needle dries up the tissues around the tumor, thus separating or isolating it so that it may be removed without bleeding or leaving a scar. Local anaesthesia is all that is necessary.

The second form, coagulation, calls for total anaesthesia. In it a more powerful bipolar current of low voltage and high amperage is applied to larger and more deeply seated cancers. One pole of the machine is connected to a wet electrode below the patient, the other pole is attached to a darning needle in a suitable handle. This is inserted at the edge of the lesion, the current is turned on and heat is immediately produced. The needle is moved around the cancer till this is separated.

The endothermic method, according to Dr. Wyeth, is especially useful in cases of cancers in the mouth or on the tongue, when they can generally be removed entirely at one operation.

"Endothermy neither burns nor chars. It can be executed through a piece of paper, but I would take this opportunity to warn against its indiscriminate use. Irreparable harm may result from lack of technic."

Electrical Inventions are Still Needed

AN immense field for the woman of a mechanical turn of mind is the development of the labor-saving devices for the use and relief of the woman of the house. There are many electric devices of the household that need slight improvement to make them absolutely indispensable to the houseworker. An attachment to silence the noise of the useful electric cleaner, a device for window cleaning, one for papering walls and ceilings, an electrical machine for the English housewife to use in cleaning her chimneys, are some of the needed inventions named by Mrs. Mary Gynne-Howell in a lecture before the Woman's Engineering Society, London, that will add to the labor-saving management of the home.

Push-Button on Bed Lights Lamp Before Clock

ONE often wakes early and wonders what time it is. If he gets out of bed, finds the light button, he is pretty well awakened, and oftentimes only to find that several hours will elapse before time for dressing. With some persons this means from a half hour to an hour of getting back to sleep again.

By means of a push-button on the side of the bed, and auxiliary wires running to a small light attached to a convenient part of the dresser, one can tell the time of night without rising, and the satisfaction of dropping immediately off to sleep again will be worth the cost of the arrangement.

The light may be connected to the regular wiring circuit of the house, and should be so placed that it will light up the face of the clock.

Contributed by DALE R. VAN HORN.

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You can place your ad in these columns for only 2c a word. It will pay you to read and investigate the offerings made from month to month in these columns, by reliable firms, dealers and individuals from all over the country. You are reading them now—others will read yours. Ad-lets for the April issue must reach us not later than February 20th.

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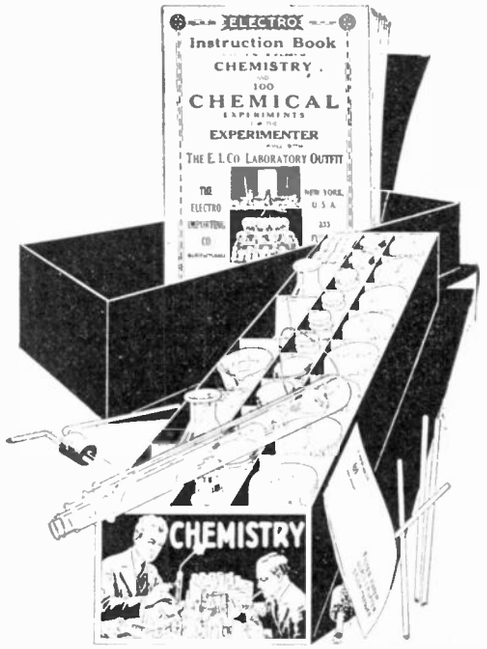

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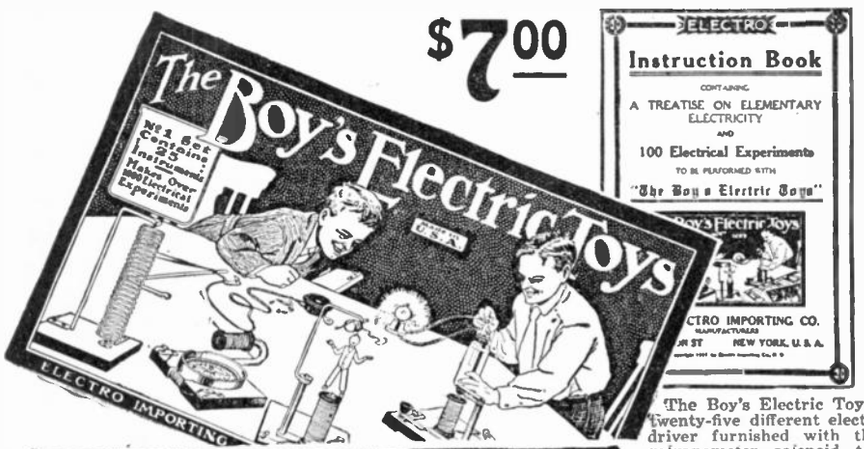

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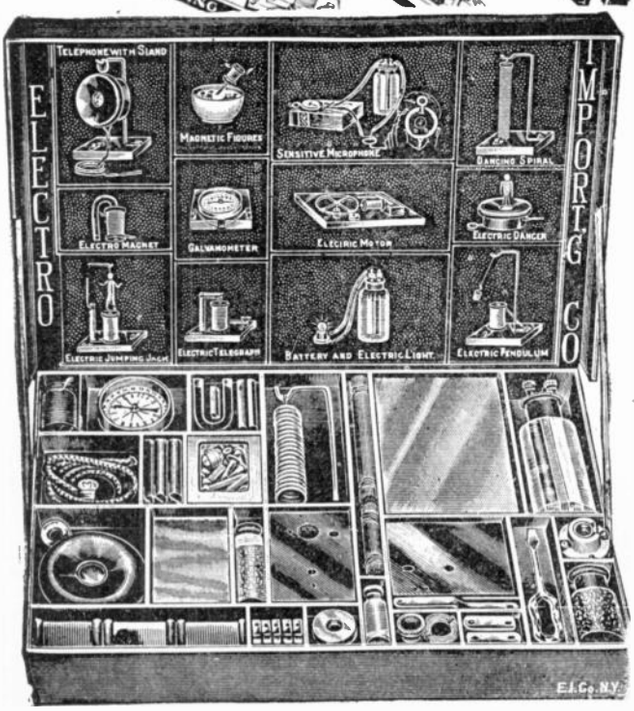

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Occupation.....

Employed by.....

Home Address.....

Reference.....

P.E., Feb.

See How Easily You Can Learn to Dance This New Way

If you can do the step illustrated in the chart on the right, there is no reason why you cannot easily and quickly master all of the latest steps through Arthur Murray's method of teaching dancing right in your own home.

NO matter how skeptical you may be about being able to learn to dance by mail, this new course will quickly prove to you that you can easily learn without a teacher on the ground to direct your steps—and without music or partner—right at home.

Even if you don't know one dance step from another, these new diagrams and simple instructions will enable you to learn any of the newest dances in an amazingly short time. You don't need to leave your own room—it isn't necessary to go into a dancing class—or to pay large fees for private instruction. All you need to do is to follow the instructions as shown on the diagrams, practice the steps a few times to fix them in your memory and there is no reason why you should not be able to dance on any floor, to either band or phonograph music and to lead, follow, and balance correctly no matter how expert your partner may be.

Learn Any Dance in a Few Hours

Whether you want to learn the Fox Trot, One Step, College Rock, Conversation Walk, Waltz, or any of the newer steps you won't have the slightest difficulty in doing so through this new method. Then, the very next time dancing starts, you can surprise your friends by choosing a partner and stepping right out with perfect confidence that every step you make and every movement is absolutely correct. Arthur Murray guarantees to teach you or your lessons won't cost you one cent.

More than 90,000 people have learned to become perfect dancers by mail, and there is no reason why 90,000 more cannot learn just as easily. In fact, about five thousand people a month are becoming wonderful dancers through Arthur Murray's amazing new method.

Why Good Dancers Are Popular

Good dancers are always the most popular people in their set—they never lack partners and are invited to every social event because dancing is the most popular form of recreation, and good dancers are always in demand. But beside this, good dancers always have perfect mental and physical control, ease of manner, poise, are never embarrassed, shy or timid. Very often they meet influential people in this social way who are very helpful to them in business.

How to Prove That Arthur Murray Can Teach You to Dance in an Evening

Arthur Murray has consented, for a limited time only, to send a special 16-lesson course to everyone who signs and returns the coupon attached to this page.

You may keep this course for five days and test it for yourself. It must prove to you that you can quickly learn to dance in your own home without music or partner through Arthur Murray's methods or the test will cost you nothing.

Arthur Murray is America's foremost authority on social dancing. The Vanderbilts, Ex-Governor Locke Craig of North Carolina, and scores of other socially prominent people chose Mr. Murray as their dancing instructor. In fact, dancing teachers the world over have been instructed by him.

Through his new, improved method of dancing by mail, Mr. Murray will give you the same high-class instruction in your own home that you would receive if you took private lessons in his studio and paid his regular fee of $10.00 per lesson.

Satisfied Students Praise the Course

Let me say that your chart system explains many things to me which other teachers could not make clear.
Wm. S. Meyerfield
Ann Harbor, Mich.

I practiced yesterday and learned the Fox Trot through the night. Tonight I danced a number of times with a good dancer to the music of a phonograph and had no trouble in leading or balance.
J. N. Mealy
Flatwood, W. Va.

I am getting along very nicely with the instructions. I have so many pupils I have to have a larger place.
Albert J. Delaney
Bay City, Mich.

Before I got your lessons I couldn't dance a step, but now I go to dances and have a good time, like the rest of them. I'll always be thankful that I have taken your course.
Beggi Thorgerison,
Ethridge, Mont.

Many other enthusiastic letters have been received. If interested send for special leaflet reprinting them.

Do You Know

- The Correct Dancing Position
- How To Gain Confidence
- How To Follow Successfully
- How To Avoid Embarrassing Mistakes
- The Art of Making Your Feet Look Attractive
- The Correct Walk in The Fox Trot
- The Basic Principles in Waltzing
- How To Waltz Backward
- The Secret of Leading
- The Chasse in the Fox Trot
- The Forward Waltz Step
- How to Leave One Partner to Dance with Another
- How to Learn and Also Teach Your Child to Dance
- What the Advanced Dancer Should Know
- How to Develop Your Sense of Rhythm
- Etiquette of the Ballroom

Send No Money — Not One Cent

Mr. Murray is eager to prove to you that he can quickly teach you to become a good dancer in your own home. Just fill in and mail the coupon—or a letter or postcard will do—and the special course will be promptly mailed to you. When your postman hands the special sixteen-lesson course to you, simply deposit only $1.00 with him, plus a few cents postage, in full payment. Keep the course for five days. Practice all of the steps, learn everything these sixteen lessons can teach you and prove to your full satisfaction that you have found the quickest, easiest, and most delightful way to learn to dance. Then, within five days, if you desire, you may return the course and your dollar will be promptly returned to you. But if you decide to keep the course—as you surely will—it becomes your personal property without further payments of any kind.

To take advantage of this offer you must send the coupon today—offer may be withdrawn without notice. So mail coupon NOW.

Arthur Murray, Studio 614, 801 Madison Ave., N. Y

Arthur Murray, Studio 614, 801 Madison Ave., New York

To prove that I can learn to dance at home in one evening, you may send the sixteen-lesson course, and when my postman hands it to me I will deposit with him only $1.00, plus the few cents postage, in full payment. If, within five days, I decide to do so I may return the course and you will refund my money without question.

Name .....

Address .....

City ..... State .....

If apt to be out when the postman calls you may send one dollar with coupon and we will pay postage.
(Price outside U. S. $1.10 cash with order.)