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EFFICIENT RADIO SETS

HOW TO MAKE
AND OPERATE
RECEIVING SETS.



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No. 9105. FIELD GLASSES. Price Postpaid... **\$1.00**

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You See All of The Action

SIX POWER

Keep up with the action! Follow every move without the jerky irregular motion of ordinary glasses. A front row seat to any game, fight or sport. Sit back in your seat and enjoy every moment. Captains of boats use them, aviators use them, sport broadcasters use them, and YOU can, too at this new low price. We have never seen these sold for less before, yet you get the same high quality 6 power lens with screw type adjustment. Fit snugly and stay put. Slip them on when you begin and take them off when you've finished—no thing more to think or worry about. Postpaid.

No. 6732. Temple Field Glasses. Price... **\$1.00**

Astronomical & Terrestrial TELESCOPE

Over 10 Power
5 Drawer
\$2.50



Fig. 3
Power, 5 10 power telescope. Ideal for solar observations, long distance, nature study, star gazing. Examine the Milky Way and many of the brilliant stars. Look at sun spots, examine the flames which shoot off the sun over 250,000 miles! Study the craters and valleys of the moon, red seas, etc., etc. Finely ground and finished. Nickel-plated draw tubes, length 26 1/2".
No. 6725. Astronomical Telescope, 10 Power \$2 50
No. 6726. 14 Power, 3 1/2" Telescope \$3 50
No. 6727. 20 Power Achromatic, 3 1/2" \$4 50

Marine Spy Glass

A beautifully finished solar and terrestrial telescope. One drawer with brass tube body, black crystalline finish. 16 inches in length. 26 power. Postpaid.

No. 6728. Marine Spy Glass. Price **\$2.00**

FIELD GLASSES 25c

SIX POWER

WOW! What a bargain! Real, genuine Field Glasses with six power magnification. Center piece, quick, one-finger focusing. Permits full, unhampered, two-eyed vision that gives you remarkable scope and clarity. Swell for nature study, sports, outdoor work and a thousand other things. Each set is complete with cord and packed in box, black leatherette finish. Postpaid.

No. 6730. 6 Power Field Glasses. Price... **25c**



POCKET TELESCOPE

Eagle Eye Vision
See Sun Spots
Six Power

25c



Fig. 3
power telescope for only 25c! Swell for outdoors, nature study, sports, looking at the moon. Converted into a SOLAR TELESCOPE by using smoked glass so you can see sun spots, etc. 5 in. long.

No. 6731. POCKET TELESCOPE. Price... **25c**

Fountain Pen Telescope



Few telescopes can claim the mechanical perfection and convenience that are incorporated in this Fountain Pen Telescope. Slips into the pocket, and appears to be an ordinary fountain pen. Yet the cover may be instantly removed and you have a powerful, five lens telescope. Made of hard rubber. With cover and nickel clip. 6 1/2 inches in length. Postpaid.

No. 6729. Fountain Pen Telescope. **\$1.00**



THINGS FAR AWAY
SEEM VERY NEAR



Always A
Front Seat

JOHNSON SMITH & CO., DETROIT, MICHIGAN

HOW TO BUILD
EFFICIENT RADIO SETS

by F.S.Winger.

Before beginning the details of construction, I wish you to clearly understand that from a purely scientific standpoint it is not a whit more marvelous to "listen in" on a radio set, than it is to be able to see thru a pane of glass.

The fact that glass is transparent seems to have satisfied us ever since we flattened our stubby little baby noses against the window pane. If we have been reasonably thoughtful during later boyhood or adult life, the term "transparent" should require further explanation, as in order to affect the sense of sight, these ether or light vibrations have to get through this solid pane of glass.

Electro-magnetic waves of radio frequency, and light waves, are both of the same nature—that is, they are both vibrations of the ether, the chief difference being in their wave lengths and frequency. Radio wave lengths are many thousands of times longer than those of light, but they both travel at the rate of 186,000 a second.

You will naturally say,—"then why does every one you meet marvel at radio waves if they are so much like light waves?" Well it is simply this,—nature has provided us all with the sense of sight with which sense we can interpret directly and without the necessity of any mechanism, while with electro-magnetic

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waves of radio frequency we have no sense by which we can detect them, so we have to build a radio set in order to take note of their very existence.

At the present time the most convenient sense to use is that of hearing. In the near future other senses will be made to respond when the proper instrumentalities will have been devised.

Without going into details at this time, I will merely state that electro-magnetic waves of radio frequency must be changed from their alternating nature to pulsating direct currents of audio frequency, in order to be heard in the phones, and this involves the use of a detector which is merely a form of rectifier.

Radio frequency is a term applied to those ether vibrations or frequencies which are more than 10,000 per second: frequencies slower than 10,000 to as low as 16, come within the range of hearing. To illustrate this:-

In the mountains of Switzerland at high altitudes, where absolute silence generally prevails, there is a species of cricket whose chirp or note is pitched so high as to be extremely annoying to some of the tourists who annually visit there, while others are absolutely incredulous that the crickets are making any sound at all: in other words some can hear it while others cannot, for the range of hearing varies greatly with different people.

The higher limit of vibrations as I have already stated is 10,000 per second, hence 10,000 and slower to as low as 16 per second are audible:-i.e., audio frequent.

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SET I

This is a crystal set (mineral detector) capable of hearing the broadcasting stations within a radius of 25 to 50 miles on from 200 to 600 meter wave length.

DETAILS OF CONSTRUCTION OF THE INDUCTANCE

FIG. I

With a pair of dividers and a straight edge, mark out Fig. I on a heavy piece of card board about $1/16$ " in thickness. After you have done this, cut out the $4 \frac{3}{8}$ " disc with a pair of scissors, and then the slots also.

Using the one so made as a pattern, mark out another one, and when done give them both a heavy coat of shellac and allow to dry before doing anything else with them. The coating of shellac will help to stiffen the form on which you will do your spiral winding and will also prevent them from absorbing moisture.

When thoroughly dry, make two little holes at A.B. which may be adjacent to any one of the eleven sections which you may happen to select.

Thread your insulated wire (size 24 B&S Double Cotton Covered wire) down through hole B and then up through hole A. You now have your starting end securely fastened. (Leave about 8" sticking out of A for connection).

Now proceed with the weaving of your spiral as follows:- After unreeling enough wire from the spool to allow you freedom of movement, hold the disc with your left hand braced against the body, and pass the wire down through the slot C.

You will notice that this causes the wire to run back of the flange D.



FIG. NO. 2
THE HOOKUP.

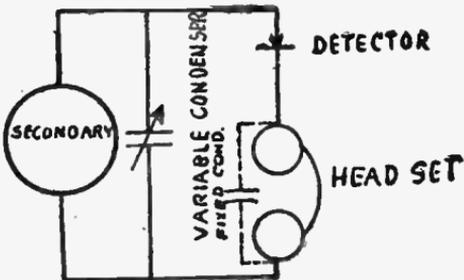
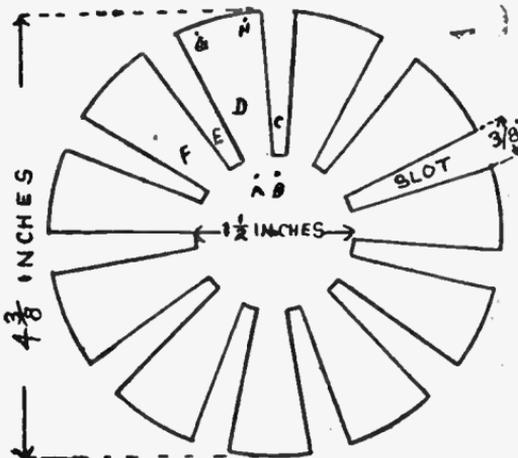


FIG. NO. 1



THE INDUCTANCE.
MAKE TWO OF THEM; ONE
IS THE PRIMARY, AND
THE MOVABLE ONE IS
THE SECONDARY.

CUT IS ONE HALF
ACTUAL SIZE.

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Now bring the wire up through the slot E, and then across flange F, and so on.

When you will have made one complete turn in weaving in and out, you will notice that when you come around to flange D again, that the wire comes up through slot C, and crosses on top of flange D. This alternation should be preserved throughout the entire winding until you will have wound disc full to within about $1/8$ " of the outer edge. This outside or last turn should be fastened at its end at holes G and H in a manner similar to the start at A and B. Leave at least 8" of spare end sticking out of hole G for connections which are to be made later.

When completely wound, you should have approximately 50 or more turns in your woven spiral.

Now, wind the other disc in exactly the same manner. These two discs will require approximately $1/4$ pounds of your #24 D.C.D. wire.

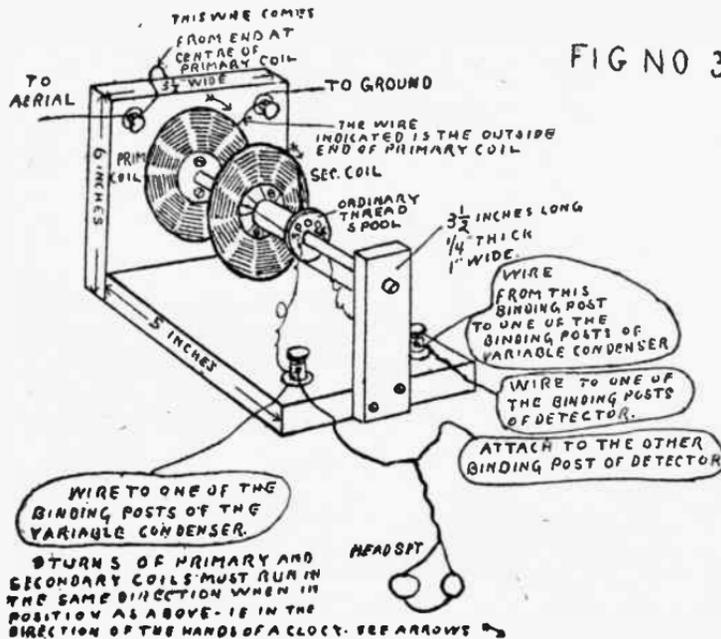
During the winding, care should be taken to keep the wire free from kinks, and also to see that they are evenly spaced on both sides.

It is immaterial which of these two discs or coils you use as a primary, as they are exactly alike, only when placing them in their final positions, you must see that the turns of woven spirals are running in the same direction.

A good pair of phones is a necessity. You should procure phones of at least 1,000 ohms resistance (2,000 total), and do not waste your time with cheap ordinary 75-ohm receivers.

Your galena detector should also be of a design which can be quickly and accurately adjusted. While it is possible for you to make one, you had better pay the nominal

FIG NO 3



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price asked for same by the Radio dealers.

A 23 plate or .0005 microfarad air-spaced variable condenser should also be purchased, as you will find almost unsurmountable difficulties in the making, or even the assembling, of a variable condenser.

The variable condenser is your sole tuning device, and its place in the secondary circuit will be described later (Fig.3) as well as the other instruments just described.

Your aerial should be a single wire about 80 or 100 feet in length, supported between two insulators at either end. The size should be #14 bare copper wire.

Ordinary porcelain cleats will serve very well as aerial insulators.

Any convenient object will serve to support your cleat insulators, but it is advisable that your aerial wire be free from adjacent obstacles and run in a direction as nearly at right angles to any near-by high tension or telephone lines as it is possible to do. The end where you will bring your lead wire down to your receiving set should be slightly lower than the other end: at least it should not be any higher, alightly lower is preferred.

An ordinary 6"-8" or 10" porcelain tube (depending upon the thickness of wall or material through which you have your lead-in wire enter building) will do nicely. In boring the hold into which this porcelain tube is to be inserted, have it slant slightly downward, so rain will not run into it, but rather drain off of it.

If your lead-in wire is unusually long, then have your aerial proportionately shorter as the lead-in wire figures in the wave length.

Your ground connection should be made to a cold water pipe, but if this is not feasible

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a gas or steam pipe will do.

Figure #2 is the hook-up, and need not be referred to, since I have made Figure 3 in perspective, and I think in such a clear manner as to be easily understood.

It is possible that you may get slightly better results if you shunt your phones about a small fixed phone condenser, as shown by dotted lines in Fig. 2 but do this only as a last resort.

In making this design for your reception of broadcasting signals, I have taken into consideration features which will be adaptable to the use of vacuum tubes later on should you care to extend your experimentation to that extent.



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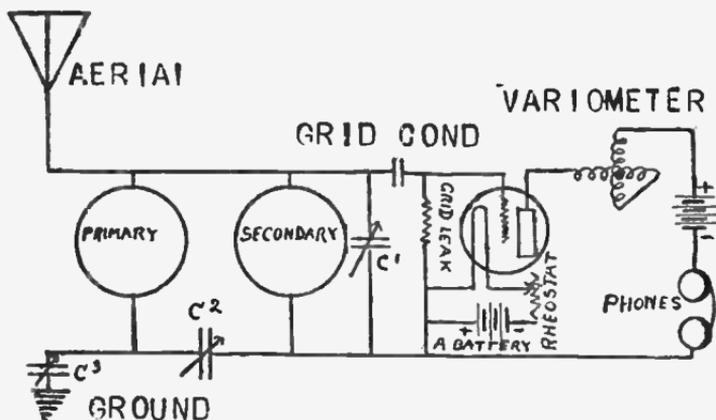
SET 2 FOUR CIRCUIT REGENERATIVE SET

In this set I am going to ask you to use the same Primary and Secondary coils which you have already constructed for Set #1.

In addition to what you have already either constructed or bought, you will require the following:-

- 2 more Variable Condensers .0005 mfd. each.
- 1 Grid Condenser .00025 mfd. capacity.
- 1 Grid Leak-experiment for proper capacity.
- 1 Vacuum Detector Tube.
- 1 Tube Socket.
- 1 Variometer.
- 1 Rheostat- for regulating filament.
- 1 B. Battery — 22½ volts.
- 1 A. Battery (Storage) 6 volts.

SET NO. 2 FOUR CIRCUIT REGENERATIVE SET.



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You will notice from this diagram that the primary and secondary are capacitively instead of inductively coupled. The primary and secondary should, in fact, be separated fully five or six inches, and be in the same plane, so as to be entirely free from any inductive relation.

The signal strength of this set is very good and the tuning remarkably selective.

The two extra variable condensers should have the same capacity as the one described in Set #1: i.e., .0005 mfd. each, though should you have condensers of larger capacities, they can be used to good advantage.

As before stated, if you have constructed Set #1, you already have the primary and secondary coils, only I am going to ask you to take off ten turns and then reverse the position of the secondary coil: i.e., put the spool between the two coils, and then back the Secondary as far away from the primary as the wooden rod upon which it slides, will permit. Further than this would be still better.

Referring more particularly to the hook-up for this Set #2:-

C3-secondary tuning condenser

C2-coupling condenser

C1-antenna tuning condenser

The Grid Condenser you may have to experiment with, as to capacity, but roughly speaking, it should be approximately .00025 mfd. You will also have to experiment a little with the Grid Leak, before you find it entirely satisfactory.

The Variometer in the plate circuit is used to secure both oscillations and regenerations. For sharp tuning, small capacities should be used, and for broad tuning proportionately larger condenser values.

If you have made Set #1 as I am now assum-

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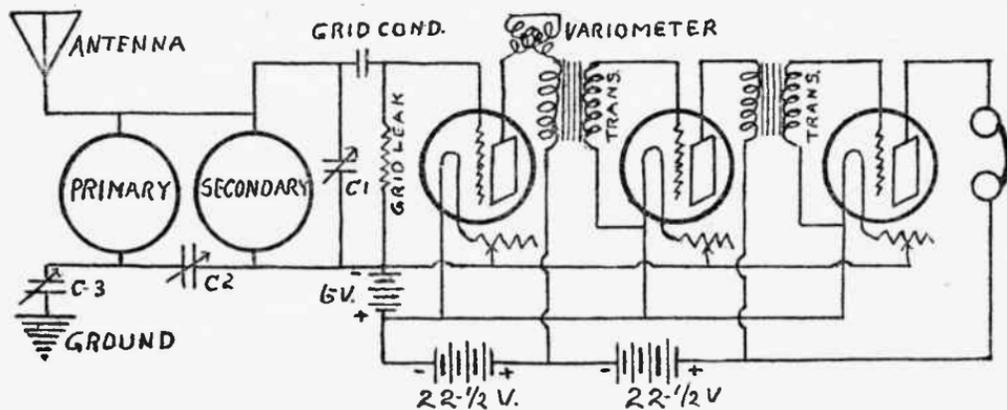
ing you have done, your experience thus acquired, will enable you to connect up the apparatus in Set #2 without the aid of a graphic or perspective drawing.

I am not describing the Variometer, as I think you had better spend a few dollars for one rather than to construct it yourself.

I am not telling you just at present how to arrange Set #2 in a cabinet, but will do so along with description of Set #3, which will be descriptive of two stages of amplification, but will use the same regenerative receiver just described.



SET NO.3- DETECTOR & 2 STAGE AMPLIFIER.



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SET 3

You will notice up to the point where the first Transformer is placed, that all to the left is practically the same as I have shown in Set #2. A few changes in the location of the Batteries are necessary in order to carry Set #2 on through two stages of amplification as shown in Set #3.

Of course you have not constructed Set #2, for I have not as yet furnished you with sufficient details to do so. You are now ready to make a choice between Set #2 and Set #3, and I hope you will decide in favor of #3, for with it your results will be much more satisfactory though of course slightly more expensive.

With the making of the first or experimental set #1, there practically ends your ability to construct portions of the apparatus used, and from now on your efforts should be confined to the proper housing of apparatus which it is really necessary for you to buy. The detail of necessary apparatus and parts is as follows:-

- 1-Primary-you have already constructed--use it.
- 2-Secondary-you have already constructed--use it.
- 3-3 Variable Condensers-43 Plate (.001mfd.) preferred-Panel type.
- 4-1 Grid Condenser.
- 5-1 Grid Leak.
- 6-1 Detector Tube-Cunningham #300 is a good one.
- 7-2 Amplifying Tubes-Cunningham #301 recommended.

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- 8-1 Variometer-Any standard make such as "Chi-Rad", Remler, Amrad, etc.
- 9-2 Audio Frequency Transformers--1 of Ten to One ratio and the other Three to One.
- 10-1 pair high resistance phones. (You now have if you constructed Set #1.)
- 11-3 Filament Rheostats.
- 12-3 Tube Sockets.
- 13-1 Six-Volt Storage Battery (used for lighting filament).
- 14-2-22½ volt "B" Batteries-preferably variable voltage type.
- 15-4-3" Dials--1 each for Condensers C1, C2 and C3-also 1 for Variometer.
- 16-8 Binding posts.
- 17-2-7"x14"x3/16"Formica or Bakelite Panels.
- 18-2 Bottom boards 7"x13"x3/8".
- 19-2 Wood Cabinets 7"x13"x6" inside measurement-make of ½" stock.
- 20-2 Double circuit phone jacks.
- 21-1 Open circuit phone jack.
- 22-Connector wire, Tinned Copper-"Spaghetti" tubing, etc.

This seems like a formidable array of materials and apparatus, but really is not, and can be obtained from any Radio dealer. Your real job is to do the assembling in the two cabinets-one to contain the Primary and Secondary coils together with the three Variable Condensers, and the other cabinet to contain the Detector and the Amplifying Tubes Transformers, Rheostats, etc.

At the extreme left of the cabinet intended for the reception of the capacity coils and condensers, bore two holes in panel about an inch apart one directly over the other. These are to fasten the aerial and ground binding posts--the top one being for the aerial and the other for ground connection.

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The Primary and Secondary coils may be mounted at the extreme ends of this cabinet, their planes being perpendicular to the plane of the panel. In between at equal distances from each other mount your variable condensers. Bore holes through your panel to allow the shafts of your condensers to pass through and then fasten three of your dials to same.

At the extreme right of your panel in the same relative position, provide holes for two binding posts for connecting or bridging to grid and filament binding posts of the cabinet still to be constructed.

The wiring diagram will explain how the connections are to be made on the interior of cabinet. Care should be taken to have connector wires cross each other as little as possible and in all cases have them as far apart as space will permit. This arrangement is left to the individual taste of the designer, and is a detail which I cannot go into in the space allotted here.

The other cabinet or the one to contain the Detector and amplifying units, starts out in the matter of binding posts just as the other cabinet: i.e., two binding posts in the same position. In this panel, the Variometer dial and the three rheostat knobs appear on the exterior, and should be placed equidistant from each other, the Variometer being to the extreme left, and the three tubes and two transformers to fill the balance of the space.

About 2" below each of your rheostat knobs the two circuit jacks should be placed. Directly above, and at proper height, three small holes about 1/4" diameter should be bored. These are for purpose of observing the lighting of your filaments.

The binding posts necessary for plate and battery connections should be at the extreme right of the panel, and their number and use you can work out by studying the diagram.

RADIO SYMBOLS

Varicoupler  Battery - 

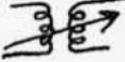
Antenna  or  Buzzer 

Condenser(Radio Frequency) 

Condenser(Audio Frequency) 

Condenser(Variable)  Tube 

Coupler Inductance 

Coupler Inductance(Variable) 

Detector  Connection 

Ground  No Connection 

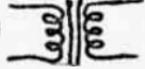
Inductance 

Inductance(Iron Core) 

Receivers(Telephone) 

Resistance 

Resistance(variable) 

Transformer(Iron Core) 

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SET 4

A SHORT-WAVE RECEIVER-ADAPTER

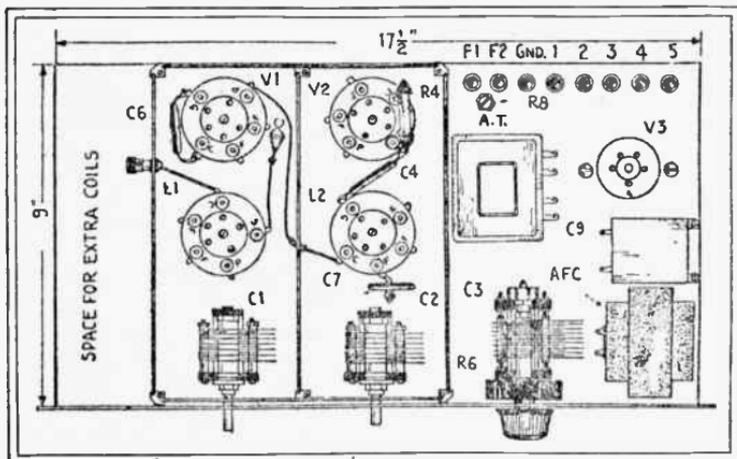
FOR INDEPENDENT USE OR AS A PERMANENT
ADDITION TO A BROADCAST RECEIVER

I am now going to tell you how to build a Short-Wave Receiver-Adapter. Your ordinary Receiver will be all right for the domestic programs, but a new thrill awaits you if you have a ShortWave Receiver. You will be able to tune in on short-wave stations from many different parts of the world. You can listen in direct to London, Paris, Berlin, Buenos Aires, Melbourne and other foreign stations. You can tune in on your local police calls.

The material for this article is taken from a recent issue of "Radio-Craft" and is given by special permission of my friend the editor, Mr. Hugo Gernsback.

Unlike other short-wave adapters, this one becomes an integral part of the broadcast receiver, giving instant choice of short or long waves, by operation of its built-in switch. It may, however, be attached or removed in but a few minutes. Aside from its use as an adapter, it is not, as might be supposed, practically useless. Without changes of any sort, it serves as a complete receiver, using either an elim-

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Above, the layout of the tuner of the Short-Wave Adapter-Receiver, as it was built by the author; the filament transformer is placed elsewhere. Attaching the shield covers to the cabinet's lid makes changing coils easier. The unit may be connected to the broadcast set by a plug, as shown, or by a built-in switch.

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inator or "B" batteries for the plate voltage. By getting the "B" potential from the last R. F. stage of the broadcast received (which has a tendency to throw the latter into oscillation) and tuning the broadcast receiver to some broadcast station on the lower portion of the dial, harmonics may be easily picked up down to 10 meters or lower. This method is invaluable in calibrating wavemeters and oscillators.

Because it was designed for use with the dynamic speaker, the tuner is followed by three audio stages, when used with most sets. Although this is unsatisfactory (and entirely unnecessary), with head phones it has been found that it enables the most distant stations to be clearly received on the speaker. And, when the tuner is attached to even a fair receiver, hum and mechanical noises are almost completely wanting. In addition, the use of three stages permits the filtering out of the high-frequency static by use of a suitable tone control; thus providing more enjoyable reception without seriously cutting down on the volume of the signals. A 250,000 - ohm variable resistor and an .006-mf. condenser, shunted in series across the secondary of the set's first audio transformer, make a very satisfactory combination for this purpose.

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Although the tuner is shown as used with a modern A. C. broadcast receiver having two audio stages, the constructor must realize that its usefulness is by no means so limited. It may be used with any receiver, by increasing insufficient "B" voltages with one or two "B" batteries, or cutting down anything over 180 volts with a suitable resistor. In districts where A. C. supply is not available, the three filaments may be wired in series, omitting the center-tap resistor, and used in conjunction with a suitable battery. The new tubes available give a wider choice of amplifiers than hitherto available.

CONSTRUCTION OF THE TUNER

The layout diagrammed (see page 22) was chosen because it permits more direct leads; which is of utmost importance in an instrument of this kind. The R.F. and detector stages being side by side, the shortness of the lead between the two eliminates both the need of a shielded wire at this point, and the capacity between the wire and its metal covering. The condensers and resistors not shown are mounted beneath the subpanel, taking great

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care to have them as near their associated coils or tubes as possible.

The separate filament transformer used here is placed several feet away, to lessen any chance of inductive hum and simplify one of the problems of A.C. operation. An individual switch for this transformer allows the tubes to warm up while the broadcast receiver is operating; this may be of any type satisfactory to the constructor. All filament leads and wiring are of shielded cable and grounded.

To facilitate changing coils, the constructor may find it a good plan to mount the lids of the aluminum shields on the underside of the cabinet's lid. The subpanel should be raised enough to assure that the lid rests firmly on the shield; if this is unhandy, the metal lid may be lowered by a thickness of wood.

Because it is difficult to specify definite components which are readily obtainable in any locality, the details of the socket-plug needed are left to the constructor; the only requirement being to separate the plate prong of the detector tube from the plate of its socket, and to bring out a lead from each. For this purpose an old tube base and a socket (UX or UY as needed) may be bolted together, connecting the other prongs to the socket with short lengths of wire.

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OPERATION

To attach the tuner to the broadcast receiver, only a few simple connections are required. The two leads from the socket-plug are soldered to two of the wires of a four-wire cable. The socket-plug is then placed in the detector tube socket of the broadcast set, and the tube is replaced in the socket of the adapter plug. On the end of another of the wires a small loop, which will fit tightly over a tube prong, is made and soldered. This is the tap to the plate of the audio tube. The remaining cable lead goes to the ground of the set; if quick changing is desired, a small test clip may be fastened to this lead.

The cable is then connected to the proper binding posts of the tuner; the antenna is connected; the filament supply is switched on; and the builder sits down to enjoy some of the true marvels of short-wave reception.

If the tuner is placed on top of the broadcast receiver, it may sometimes set up a very objectionable hum, due to interaction with the power transformer of the set. In this case it is necessary to turn the tuner at right angles, or remove it a few feet away.

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For best results with any short-wave receiver, it should be placed as close to the antenna lead-in as possible, for the losses incident to long, straggling leads mount up rather terrifyingly when dealing with the higher frequencies. It is not at all necessary to provide another aerial for this tuner, if the broadcast antenna is of first class construction with as few turns or sharp angles and as far from detracting influences as the location permits. If but one aerial is used, the operator may mount a small S.P.D.T. switch on the back of the tuner's cabinet. The same ground is used, providing it is satisfactory for use on the short waves.

PARTS USED

- C1, C2 - 2 National S. W. condensers, "Type S.E." 125 mmf.;
- C3 - National equicycle condenser, 250 mmf.;
- C4 - Polymet molded fixed condenser, 150 mmf.;
- C5, C6, C7, C10, C11 - Polymet molded fixed condensers, .01 mf.;
- C8 - 1-mf. by-pass condenser;
- C9 - 2-mf. by-pass condenser;
- C12 - X-L Varico-Denser, "Type N";
- R1 - 2000-ohm fixed resistor;
- R2 - 2-meg. grid leak;
- R3 - 500-ohm fixed resistor;

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- R4 - 3-meg. grid leak;
- R5 - Clarostat volume control;
- R6 - Centralab Radiohm, 500,000 ohms;
- R7 - 1800-ohm resistor, preferably variable;
- R8 - Clarostat "Hum-Dinger" hum balancer, 20 ohms;
- AT - Silver-Marshall audio transformer, "Type 225" or "255";
- AFC - Audio filter choke, 80-henry;
- FT - Filament transformer, $2\frac{1}{2}$ volts, 6 amperes;
- JS - Yaxley jack switch, "Type 45";
- RFC - Hammarlund shielded, polarized S. W. choke;
- L1, L2 - 6 Pilot or Silver - Marshall UY coil forms;
- Four Pilot UY sockets; one Eby UY wafer socket;
- One aluminum double can, $8\frac{3}{4}$ x $7\frac{3}{4}$ x $5\frac{3}{4}$ inches;
- 7 x 18-inch metal panel; 9 x $17\frac{1}{2}$ -inch metal subpanel;
- Four-wire cable, hook-up wire, hardware etc.

A very effective resistor, for R3, may be one of the windings from a discarded pair of head phones. If the ends of the coil are carefully soldered, an absolutely silent and permanent resistance will result.

The layout of the front panel is left

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somewhat to the choice of the builder. Two vernier dials may be used for the tuning controls; a more balanced appearance will result, however, if a very small vernier condenser is placed above C1 (in the respective positions of C3 and R6) and plain knobs are used. This construction will also make for quicker tuning, it being difficult to turn a high - ratio vernier with the left hand as quickly as with the right. The jack switch may go beneath the dial of C2.

It has been found best to use a filament transformer which comprises an electro-static shield.

The coils are wound on standard UY coil forms, $1\frac{1}{2}$ inches in diameter, with No.24 D.S.C. wire. The grid winding is at the top in each case, with the tickler $1/8$ inch or the primary $1/2$ -inch below. Beginning at the top of the form, leads are taken off as follows: Grid, "F" (Gnd.); F (to "B" supply) Plate; and, for the primary of L1, "F" (Gnd.), "C" (Ant.).

	TURNS L1	TURNS L2	
METERS	(GRID.) (PRI.)	(GRID.) (TICK.)	
18.5-32	$6\frac{1}{2}$ 5	$4\frac{3}{4}$ $5\frac{1}{2}$	
31.5-52	$9\frac{1}{2}$ 6	$6\frac{3}{4}$ $6\frac{3}{4}$	
50.0-85	$18\frac{1}{2}$ 7	$17\frac{1}{2}$ $8\frac{1}{2}$	

Practical Television

What It Is and What It Does

The Photo-Electric Cell

Before the invention of the telephone, May, a telegraph operator at Valentia, Ireland, discovered a peculiarity of selenium. He discovered that if selenium was heated and allowed to cool slowly so as to crystalize, it would offer great resistance to electricity. However, when a bright beam of light was allowed to fall upon it, the selenium conducted electricity in small currents. May made other experiments and found that the resistance was from two to five times as great in the dark.

Unfortunately one great difficulty arose. Selenium was slow to respond to the impulse of light. The reaction was found to be speeded up considerably when the selenium cell was made in thin films.

Recently a more satisfactory relation between light and electricity has been discovered. This is based upon the fact that electrons, or negative particles of electricity, are expelled from the surface of a metal when a beam of light falls on it. Virtually every metal behaves in this manner, but the effect is most pronounced in potassium and sodium, the soft metals obtained by electrolysis of caustic potash and caustic soda.

For a current of electricity to flow across a photo-electric cell, two electrodes are necessary. The layer of potassium acts as the cathode or negative electrode, and the anode usually is a circular wire grid of nickel. During use the anode is given a high potential by connecting it to the positive terminal of a battery. The flow of electrons is increased by applying a large voltage, but if this is made too great a glow discharge appears in the tube, and the practical limit varies from 120 to 300 volts.

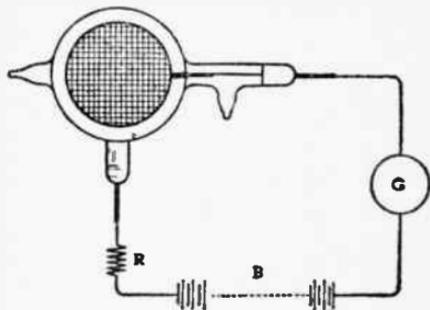
An area of glass is left clear, and it is through this that the light is allowed to act on the potassium, the cell usually being enclosed in a light tight box through which the "window" only is visible. The passage through the "window" of a beam of light causes the electrons to be discharged from the surface of the potassium. As they are negative charges they are attracted to the positive electrode, and thus a stream of electrons passes across the cell—in other words, a current of electricity passes through it and along an outside wire connecting the two electrodes.

The action will be made clear if we compare it with what happens inside an ordinary radio tube. In this the lighted filament throws off electrons, and these are immediately attracted to

the anode, which is connected to the positive of a high tension battery. Thus a current flows along the tube in one direction only, and it is because of this that the tube is used for rectifying and amplifying purposes.

Before we try to understand how the photo-electric cell is used in television let us see how by means of it a single beam of light may be reproduced at a point many miles distant. Suppose we allow the beam to fall upon a photo-electric cell in New York. Through the cell a current will then flow and be amplified by means of radio tubes and transmitted by cable or radio to London or almost any point on earth. In receivers at these points small currents will then flow that vary in sympathy with those passing through the photo-electric cell in New York. They will change as the intensity of the beam of light changes—being strong when an intense beam of light falls on the cell, and becoming proportionally weaker as the intensity of the beam fades.

It only remains to change this varying current back into the light, which may easily be done by means of a special electrical lamp containing neon under low pressure. This glows with a brilliant red light when a current of electricity is forced through it under high voltage. Tubes of this kind have become familiar through their use in illuminated advertising signs.



The currents in the receivers of our light transmitting apparatus are impulses that occur at frequencies of many thousands per second. An ordinary lamp would be useless for recording their passage but the neon glow lamp can be lighted and extinguished at the rate of more than a million times per second and responds almost instantaneously.

As an electric eye a photo-electric cell of this kind is more promising

RADIO AND TELEVISION BOOK

than a selenium cell because it responds to a beam of light almost instantaneously. The electrons shoot out from the metal at speeds that are very close to the speed of light.

Unfortunately the new cell has a serious drawback in that the current which passes through it is very small; that produced by an electric lamp placed only a few inches from the cell is only a few hundred thousands of a milliamperere. In this respect a selenium cell is much better, and some have been constructed that allow a current of an ampere to pass through the circuit containing it.

Summing up, we see that there are two electric eyes that may be used for television and that one of them is very slow while the other gives feeble results. The slowness of the selenium cell prevents its use for this purpose and practically all experimenters now make use of a photo-electric cell along with apparatus for magnifying the current that the cell gives. This may be easily accomplished by means of the ordinary radio tube, and the impulses passed on to a radio transmitter.

Unfortunately this is not all that is required of television, and there are many practical difficulties to be overcome. One of these is that although the electric eye can relay the intensity of a single beam of light, it is unable to take in an entire scene at once.

The electric eye corresponds to one of the microscopic cells of the retina, and in order to imitate the action of the human eye completely we should need millions of photo-electric cells! For each of these cells a wire would be necessary over which the electrical impulse could be transmitted, and at the receiver a corresponding number of amplifiers and neon lamps would be required. Such apparatus no doubt could be constructed, but the cost and labor of building it would be too much, for it has been calculated that, in order to produce a receiving screen for a picture that is not too coarse, no fewer than 90,000 cells would be required.

The Scanning Disc

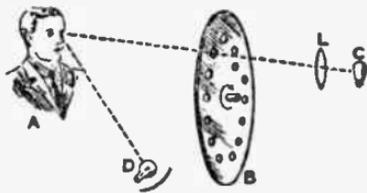
The scanning disc consists of a thin sheet of metal, or some similar substance, around which are drilled a series of holes. Each hole is placed the width of a hole nearer the center of the disc than the preceding hole until one complete set of holes once around the disc is completed. When vertical scanning is used, the radial distance between the first and last holes of the spiral governs the width of the area which can be scanned, which the circumferential distance between successive holes governs the height of the scanned area.

The illustration shows that a beam of

light from the lamp is focused on the edge of the disc so that it can only pass through one of the holes at a time. If the beam is allowed to fall on a white sheet after passing through the hole, only one white spot will be seen. If the disc is rotated slowly the light spot will move slowly in a vertical direction. Just as the spot leaves the screen a second spot will appear at the opposite edge, and, because of the spiral arrangement of the holes in the disc, a little to one side of the path of first spot. As this second spot leaves the screen a third one will appear, and it will continue in the same manner. When one complete revolution of the disc has been made the screen will have been covered by the light spot.

If the screen is rotated faster, the spot travels more quickly and finally it becomes a streak moving slowly from one side to the other. If the disc is revolved still faster the whole screen will be covered before the first dot has vanished due to the persistence of vision. When the disc is revolving very fast the light seems to become dimmer. This is because the impression upon the eye is fading (the impression fades completely in about 1-8th of a second; this is called persistence of vision) and makes the picture seem a little dimmer.

Now we can readily understand that if we substitute for the screen a human face or picture, the light spot will travel over the object. If a photo-electric cell is kept present, at any given



instant the light will fall on some part of the object. If it is dark, the reflection of the light will be poor and the cell will not record the impulse; if it is white, the impulse will be great. And so a series of impulses are transmitted rapidly. The photo-electric cell works so rapidly that the former spot has disappeared by the time the second one appears, which is not the case in the eye. Various shades will reflect differently and the impulses will vary accordingly. At the receiving end, the process is reversed and kept synchronized with the first machine. The picture is reproduced in black and white similar in appearance to a camera picture. Each piece is reproduced just as quickly as the picture is scanned.

The first true complete television set—sending and receiving—for prac-

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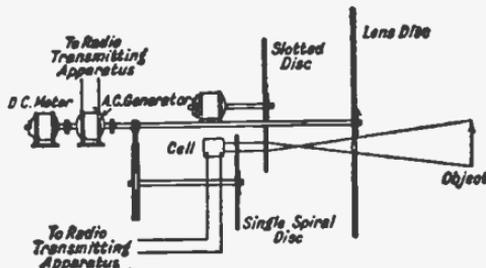
tical operation was an apparatus invented by J. L. Baird, a Scotchman.

The principle employed in this machine has been copied and is used in almost all modern forms of television including the latest cathode ray sets. The object is transmitted and produced in a series of strips close together. This is made possible by the scanning disc as described on earlier pages. The alteration of the intensity of the light rays are focused on a light sensitive cell (similar to the photo-electric cell) causing the current variations or impulses. The variations are transmitted to the receiving apparatus which, in turn, reproduces them in a similar manner.

The apparatus used by Baird consisted of the transmitting end of several discs as shown in the figure. The first was a lens disc with 32 lenses mounted in staggered formation. The second was a slotted disc. The third was a single spiral disc. The cell was located directly behind these discs. All of the discs were revolved by means of the motor at speeds of between 800 and 1000 r.p.m.

The receiving end was very similar to the sending, differing only essentially in that it substituted a neon lamp for the cell. The figure shows clearly the set up for the receiving apparatus. The two discs—both revolved by a motor which is synchronized with the sending motor.

While this apparatus was the first true television set, there have been a few distinctive changes made since that time. The scanning discs are now only made of holes instead of enclosing



a lens, the lens being either in front or behind the disc. The largest improvement is the new cathode ray tube which gives us an exploring device without mechanical limits of any sort. This method will be described later.

During the time that Baird was making his experiments, an American, C. Francis Jenkins, was also developing television. Jenkins' receiver, however, employed prisms and mirrors rather than just magnifying glasses and scanning discs. The light rays were bent to cast their reflections upon some convenient screen. It was not a true television apparatus, however, inasmuch

as it only reproduced "shadow photos" or silhouettes. The design was original and very interesting. The special advantage claimed by Jenkins was the drum scanner (a small cylinder in place of a series of revolving discs) which was much more compact and required less power to operate. The 7 inch drum which gives a picture 2 inches square corresponds to the Baird 48 hole disc, which was 36 inches in diameter. Recently Jenkins has adopted this apparatus to send and receive true television pictures.

The Cathode Ray Tube

The cathode ray tube is one of the latest and most important developments in television. It is becoming more and more practical and promises to replace the familiar revolving disc and motor that has been discussed in previous paragraphs. The cathode ray tube has several notable advantages over the mechanical scanners; one of these is that it eliminates all rotating or other moving mechanical parts.

Although the idea of transmitting pictures in this way is over a quarter of a century old, it was not until the last few years that these ideas have materialized. This is because of the many improvements in the cathode ray tube. Recently Dr. V. K. Zworykin, inventor of one of the variations of the photo-electric cell, who has been spending much time with cathode ray tubes, developed a better tube and improved upon a system employed by Campbell Swinton, one of the originators of the use of the cathode ray tube.

The illustration clearly shows the cross sectional drawing of the tube with the fluorescent screen. The stream of electrons, which are emitted by the Electron Gun part of the tube, constitute the cathode ray, and can be bent or moved in any direction by either an electromagnetic or electrostatic field. The cathode ray can be caused to oscillate or scan at any desired speed, even up to a million times or more per second.

The two fields mentioned above are acting at right angles to each other and can, therefore, control the rays. It must be remembered that cathode rays are highly magnetic and can be deflected easily by any sort of magnetic or electric charge.

The scanning is similar to the scanning of the screen by the disc described above. The cathode rays are guided across the screen in parallel lines until the entire screen is traversed.

The receiving end of a cathode ray system is illustrated here. This shows the general hook-up of the circuit. The sending part of this type of television is very complicated, and is being revised almost daily. The transmission is not as yet perfected to such a large

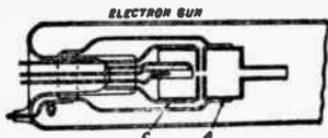
RADIO AND TELEVISION BOOK

degree, but in both America and foreign countries pictures have been successfully transmitted in this manner.

There are several advantages in this system. First, there is no necessity to amplify the incoming signal since it can be applied directly to the cathode stream, provided the signal is not below a certain minimum value. Second, the synchronization of the sender and receiver is much more simple. The only serious drawback is in the expense of the tubes which only last from 200 to 300 hours. There has been difficulty in focusing the rays on the screen, but this is being rapidly overcome by current experimentation.

Color Television

A small change can be made in both receiving and sending apparatus to change it from an ordinary set to a color television set. The exploring or scanning disc is made with a separate set of holes for the three colors red, green and blue. After the operator has the sending apparatus set in motion,



the red, green and blue colors that filter through the scanning disc is synchronized with the first, and the corresponding colors are reproduced in rapid succession so as to appear as a complete color picture. However, in the receiver three lamps are necessary: a neon filled lamp, a helium filled lamp, and a mercury vapor lamp. These give off red, blue and green colors respectively. The proper color effect is obtained, in the receiver, by having a commutator associated with the driving motor. This allows only the neon lamp to be lighted when the red spiral holes are present, the helium filled lamp when the blue spirals are present,

and the mercury vapor lamp when the green spirals are present.

Although the three colors are produced in succession, the rapidity of motion is such that these three color images blend into one complete colored picture. The combination of various parts of the three colors will produce many other colors.

The color filters unfortunately absorb a considerable quantity of the light passing through them. This difficulty has been partially overcome by placing a mirror behind them and reflecting additional light. This system cannot be applied to the cathode ray tube type of television and it remains for some person to invent a practical system of colored cathode ray television.

Stereoscope Television

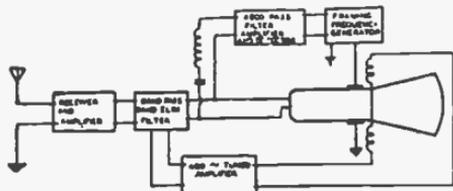
Just as we have two eyes to give our eye-sight depth and size in respect to distances, so have there been similar applications to television. The effect of television as it is today is like a picture in the theater or like having one eye closed. By an application of a similar principle as used in stereoscope photography, we can give depth to television pictures. The scanning disc has two sets of holes, one inside of the other. The impulses are sent along first as seen by the left eye and then as seen by the right eye. The speed of the disc blends the two together in a finished picture so as to give it the proper quality.

Perhaps the latest development in television is the combination of the stereoscopic television and the color television. This is a vast improvement over the original Baird system of television, although the fundamental principles of both the original set and this modern one are identical. It should be stated that Baird was one of the inventors of both of these last two improvements. Many men all over the world are working continuously on more improvements. The most outstanding men in America have been Jenkins and Alexander. Both have spent considerable time in the development of modern television. Each has his own system. Jenkins is working on a system which employs a drum; Alexander is working on the Cathode ray system.

Building a Television Set

Most people are not so much interested in the sending of the picture as with the receiving of the picture and how it can be brought into their home. The preceding paragraphs have served only as a background for more detailed and experimental work in television. However, it is not the purpose of this chapter to make any specific diagrams or plans for the construction of a receiver since the fast changing details would make such construction useless. Furthermore, different sending stations use different size discs, motors, etc. which make it even more difficult to designate one set that would meet all the requirements. The advancement of the cathode ray tube television set is proving to be a competitor of the scanning disc type and may even replace it in the course of the next few months.

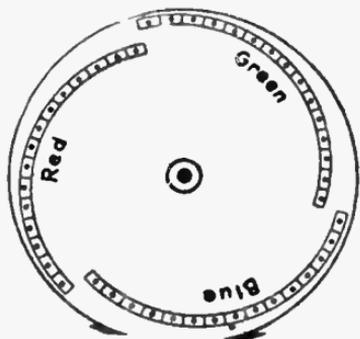
The aim in this chapter is rather to



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acquaint the reader with a general plan of the scanning disc receiver and its parts to make understandable such plans as may be printed in radio and television magazines.

In the receiving end there is no need



for a photo-electric cell or any lighting system. The most essential parts consist of the neon lamp and the scanning disc. Of course a radio amplifier is necessary to amplify the feeble signals which come in. A lens and synchronous motor makes up the rest of the receiver. The parts are:

1. Scanning disc.
2. Neon lamp.
3. Synchronous motor.
4. Amplifier.
5. Lens.

The cabinet and the framework to mount the materials can be adjusted to

suit individual needs. Please remember that this list of materials is for a television receiver that employs a scanning disc. It must be stated, however, that this type of set is out-of-date. Recent developments have made the sets employing cathode ray tubes very much more convenient. It would be well for you to obtain plans for this type of set if you intend to build one.

The amplifiers differ little from the type used in radio work. A simple three tube amplifier similar to those used in radio (three tube L. F. amplifier) will sometimes serve the purpose. Variations of all sorts from the usual amplifier have been tried with different degrees of success.

The purpose of the amplifier must always be kept in mind. The currents are amplified at the sending end and sent to the receiving end at a very low frequency. Therefore a low frequency amplifier will be necessary. To light the neon lamp, two or more stages of L.F. amplification is necessary. In building an amplifier for television purposes there are a few things that should be kept in mind. Everything that tends to distort the image or current must be eliminated. The eye can quickly notice the smallest change. There must be no L. F. oscillation. This is generally due to inefficient wiring or weak batteries.

The lens will vary with the type of outfit that you are building and instructions for this piece are usually given with the diagram.

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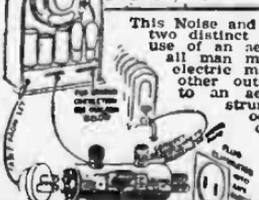
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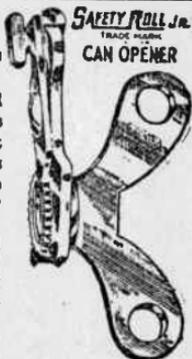
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for building a
MODEL STEAM ENGINE**

No. 3 issue of the Mechanical Package Magazine contains a complete kit of parts for building a miniature steam engine. With these parts anyone possessing rudimentary knowledge of tools plus a little common sense can build himself a workable steam engine—one that will run at the speed of an electric fan on the energy furnished by canned heat or a gas flame. You will thoroughly enjoy putting this together and get a big kick seeing it run after you have finished. In addition there are plans for building a midget seaplane, the first plans ever published for a biplane-seaplane—easy to build, too. Dozens of surprising new how-to-build-its for workshop fans, models, toys, practical experiments. How to build a one man racer from old car parts, how to build your own photo-electric cells for 50c., fun with dry ice, electrifying the lawn mower, chemical experiments, building a static glider flyer, elements of physics, a laminated 3-pole motor, measuring power of small engines, a mechanical album, a spark coil for midget engines, original and instructive articles on shop methods, experimental work and use of tools, etc., all for 25c postpaid.

No. 1993. MECHANICAL PACKAGE MAGAZINE No. 3. Price complete, postpaid.... **25c**

MECHANICAL PACKAGE MAGAZINE NO. 1

**An Interesting Magazine, together with all parts necessary for building a complete
ELECTRIC MOTOR**



This is a most interesting magazine that not only contains 84 pages crammed full of ideas for home, workshop and farm, but there is also included all the parts necessary for building a tri-polar, self-starting electric motor. By following the very simple directions given, any boy can build this motor with an ordinary pair of pliers in fifteen minutes. It runs on any No. 6 dry battery, obtainable anywhere. The magazine itself is full of dozens of home workshop construction ideas, handikinks that save money, tells how to build an aero ice sled that goes 60 miles per hour, how to make drawings the Misonne way, modernistic den for bachelors, machining the "mighty Atom," a Movie Star's home workshop, building "handybully" trailer, a 40 mile an hour hydroplane, lights for home workshop, secrets of successful soldering, concrete bird houses, electric launch built of cardboard, etc., etc. Sent postpaid for **ONLY 25c.**



No. 1991. MECHANICAL PACKAGE MAGAZINE No. 1. Price complete, postpaid **25c**

MECHANICAL PACKAGE MAGAZINE NO. 2

**This issue contains a complete Magazine also
all parts necessary for building an
ELECTRIC TELEGRAPH SET**

No. 2 issue of the Mechanical Package Magazine contains complete materials for building one combination telegraph key and sounder, together with full directions, step by step, so plainly written that any boy can assemble them. Learn telegraphy! It is amazingly easy. Get a friend to build a line with you and switch in on some real sport! The magazine itself contains numerous interesting features of interest to all, notes on shop methods, kinks, wrinkles and the use of tools, the inside story of television, a specially interesting article on model hydroplane construction, making stereoscope pictures, instructions and blue prints for building "Ratusha", an inexpensive big little cruising boat, building a 2-pole dynamo, secrets of successful kite flying, building an

exceptionally clever portable cabin, modernistic bedroom suite for men, backyard bird bath, etc. etc. Sent postpaid for **ONLY 25c.**

No. 1992. MECHANICAL PACKAGE MAGAZINE No. 2. Price complete, postpaid.... **25c**



1/2 FORMER PRICE
INKOGRAPH
PENCIL POINTED PEN
NOW REDUCED TO \$1.00



Combines the best features of fountain pen and lead pencil minus the weak points of both, plus improvements not found in either. Capable of doing anything possible and many things impossible with a fountain pen.

The Inkograph writes in ink with the same speed and ease of the softest pencil and is a joy to use. It feeds as fast as you can make your brain think or your hand move, and writes as even and uniform on the last page as it did on the first.

Makes 3 to 4 carbon copies at one time, while the original is in ink, bearing down on the point as hard as you like without injury.

Draws lines to a ruler without smudging. Writing point is shaped like a fine lead pencil point. Anyone can use YOUR pen because no style of writing can spoil its smooth point. Ideal for rough usage.

REQUIRES NO BLOTTER. The ink dries as fast as you write because the flow is fine, even and uniform.

CANNOT LEAK or soil the hands or clothing. Not the tiniest drop of ink will spill. An Inkograph will actually improve your handwriting 100 percent. Has 14 kt. solid gold feed.

Your choice of Black, Jade, Black and Gold, Onyx, Black and White, Marine Green and Black, unbreakable Piroxalin. Every pen guaranteed.

AUTOMATIC FEED that instantly removes any obstruction from the writing point. This feed works freely up and down within the point, effectively removing any sediment and insures a perfect ink flow.

NO COMPLICATED PARTS to worry over—no mechanism to clean or set out of order. **PRICE \$1.00 postpaid.**

PUT PHOTOS ON SILK, CLOTH, WOOD, PAPER, LINEN, ETC. 25c



It is now easy to print your snapshots and other photos on any cloth or other fabric surface—cushions, pillows, handkerchiefs, scarfs, ties, hosiery, underwear, paper, wood, linen, etc. The photos are washable. Will not fade or rub off—long lasting. Easy to do—just follow a few simple directions. One bottle is good for about 50 prints in RICH TONES. Thoroughly practical. **PRICE FOR COMPLETE OUT-FIT ONLY 25 CENTS SENT BY MAIL POSTPAID.**

Exploding Matches

More fun than fighting with your wife. They look just like ordinary matches, but explode with a loud bang when lit. 12 matches to a box. **PRICE 10c per box, 3 boxes 25c, or 75c per doz. boxes.** Not available. Shipped by express only. **10c**



BIG HUNTING KNIFE

With Genuine Leather Sheath
ONLY \$1.00 POSTPAID



This is the ideal outdoor knife—an indispensable part of the equipment of every sportsman, tourist, Boy Scout and camper. Its utility far exceeds its modest cost. As a protective implement, it is always ready for any emergency.

ALWAYS DEPENDABLE ALWAYS EFFECTIVE

It's an all-purpose knife for hunting, fishing or canoeing. Thousands of Boy Scouts own these knives. Whether you are cutting your way through underbrush, sharpening tent stakes, slicing bacon, dressing game, or doing one of the innumerable other jobs a sportsman asks a knife to do, you will find it indispensable. Blade is about 5 inches long with mirror-like finish—strong, big, sturdy. Finely ground blade makes cutting easy. Note guard at bottom of handle to help grip and keep knife from slipping. Knife comes complete with genuine leather sheath, slotted so you can carry it on your belt.

Also has strap to hold knife firmly in sheath while carrying it. **PRICE \$1.00 POSTPAID**

KEYLESS LOCK



This is a 5-number lock—requires no key to open it. The secret combination is furnished with each lock, without which it is next to impossible for anyone to open it. The tumblers must be placed in their correct order before the lock will open. **EACH LOCK HAS A DIFFERENT COMBINATION.** No two alike. No keys to lose. Whether it is for securing your locker, your motorcycle, your boat, tool chest, bicycle, mail box or any other of a thousand uses, it will be found practical and effective. Very substantial construction, being made entirely of brass, nickel plated all over. The 5-number combination renders it practically thief-proof. **PRICE 20 Cents.**

CREAM EXTRACTOR

This is a most useful household device, for it automatically extracts the pure, thick cream from bottled milk. Simply place it in the bottle and the cream flow will start automatically at once, a automatically stopping when the cream is drawn. Pays for itself in one week's use. Can also be used for syphoning other liquids—gasoline from your car, for instance. Made of pure aluminum in one piece only; will last a lifetime.



PRICE 25 CENTS POSTPAID.

Address all orders for goods described herein to
JOHNSON SMITH & CO., 6615 E. Jefferson Ave., DETROIT, MICH.

MAGIC MONEY MAKER

ONE OF THE BEST NOVELTIES OUT

INSERT A PIECE OF BLANK PAPER, AND OUT COMES A DOLLAR BILL



Demonstrate this machine to your friends and they will think that you have discovered something better than a gold mine. You simply insert a piece of white paper, turn the key and out comes a nice new dollar bill, you insert another paper, give another turn and out comes bill number two. You can repeat as often as you like. This isn't a counterfeiting scheme, but you can have a lot of fun in making your

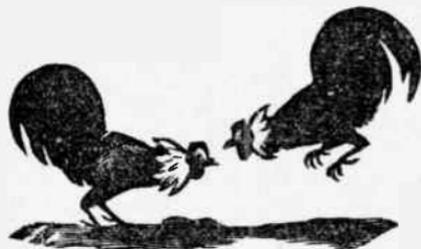
friends believe that you are printing real money.

No. S3198. THE MONEY MAKER. Price Postpaid.....

50c

The Fighting Roosters

A full blooded pair of fighting game cocks
These lilliputian fighters have real feathers
yellow legs and fiery red combs, their movements



when fighting, are perfectly natural and life-like, and the secret of their movements is known only to the operator who can cause them to battle with each other as often and as long as desired. Independent of their fighting proclivities they make very pretty mantel ornaments

No. 3425. Fighting Roosters. Per Pair..... **10c**
3 for 25c., or 75c per dozen postpaid

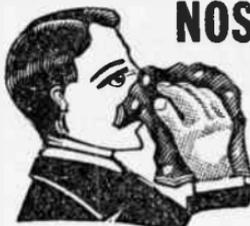
MAGIC FLUTE

The Magic Flute, or HUMANATONE, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it, which when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is charming, as it is surprising.



No. S3478. Magic Flute **10c**

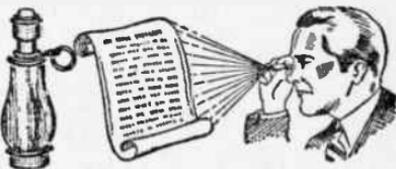
NOSE BLOWER



When some men blow their noses it sounds like a trombone. We have all got accustomed to those queer noises, but now the Nose Blower has come to torment us. It is ingeniously concealed in a handkerchief. On meeting your friends or at a party, after chatting awhile you carelessly take out this handkerchief and proceed to blow your nose. It's like a sudden clap of thunder. The ladies scream, and your male friends will think they hear the whistle of a steam engine. Everybody will put their fingers in their ears when they see you going to blow your nose again. You can blame the hideous noise to your having a very bad cold, and keep up the fun as long as you like.

No. S2192. NOSE BLOWER..... **10c**
3 for 25c., or 75c. per doz. postpaid

Telescope Watch Charms



An imported French telescope watch charm, made of white bone, that contains the Lord's Prayer, the Ten Commandments, Bathing Beauties, etc. Equipped with a microscopic lens so that the Prayer, Commandments, or picture, as the case may be, can be easily read although almost invisible to the naked eye.

No. 8147. Lord's Prayer **15c**
No. 8148. Ten Commandments **15c**
No. 8149. Bathing Beauties..... **15c**
Any 3 for 40c, or \$1.35 per doz. postpaid.

CIGARETTES



You can now order your favorite brand of Cigarettes by mail and have them shipped to you by parcel post, free from observation no matter where you are located. All Cigarettes come twenty cigarettes in a package, ten packages to a carton. Thus each carton, which is the minimum quantity we sell, contains 200 cigarettes. Prices shown below do not include postage. Average shipping weight of each is one pound. Please add sufficient to cover postage. Send remittance in any convenient form. We accept postage stamps in payment of all orders, large or small.

PRICES (NOT PREPAID)

- No. 9147. TWENTY GRAND, carton \$1.10
- No. 9148. WINGS, per carton..... 1.10
- No. 9149. MARVEL, per carton.... 1.10
- No. 9154. CAMEL, per carton..... 1.50
- No. 9155. LUCKY STRIKE, carton. 1.50
- No. 9156. CHESTERFIELD, carton. 1.50
- No. 9157. OLD GOLD, per carton... 1.50
- No. 9165. KENTUCKY WINNER, ctn.1.75
- No. 9166. KOOL, per carton..... 1.75
- No. 9167. SPUD, per carton..... 1.75
- No. 9146. HERB'T TAREYTON, ctn. 1.75
- No. 9144. RALEIGH, per carton.... 1.75
- No. 9162. PHILIP MORRIS, carton. 1.75

Please Add Enough for Shipping Charges

Auto Distributor Intensifier



The "Sparkmaster" is a distributor intensifier that will give you more speed and power with less gas. Will make the motor run smoother and better. Just try this intensifier on your car and see for yourself the difference it makes. Can be slipped onto the distributor in thirty seconds without tools. Do not confuse this with the jump spark intensifiers that do little or no good. This is patented and cannot be copied. Has bakelite case. Only one intensifier needed for 4, 6 or 8 cylinder car.

No. 4934. Distributor Intensifier... **25c**



Made up just like the small books of matches given away at cigar stores. The back row has the regular matches; the front row are the exploding kind. You take a match from the back row which gives

a light in the regular way and hand it to your fellow smoker, who gets a big surprise as the match which he takes from the front row explodes as soon as he lights it.

No. 2770. Price Each Book..... UNMAILABLE. SENT BY EXPRESS COLLECT

FLEXIBLE STEEL RULES

Indispensable for Every Handy Man and Mechanic



These Flexible Steel Rules are practically indestructible and are needed by every mechanic and in every home. The rules have very clear markings and can be twisted and turned without damage; they always return to original shape.

- No. 4227. 39 in. Flexible Steel Rule in metal case. Each..... **20c**
- No. 4228. 78 in. Flexible Steel Rule in Bakelite Case. Each... **35c**



20c

SWISS WARBLER & NIGHTINGALE WHISTLE OR THE DOUBLE THROAT



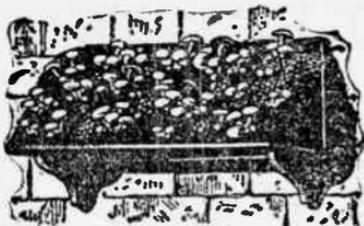
This is the genuine Swiss Warbler or Nightingale Whistle, the original Prairie Whistle and Bird Call. It is a little instrument that fits in your mouth easily and without discomfort. With it you can imitate bird calls and the sounds of various animals by following the very simple directions. It is also sometimes called THE DOUBLE THROAT and as such it is of great aid to ventriloquists. It is used by



professional ventriloquists, vaudeville entertainers, whistlers, and others.
No. 2858. SWISS WARBLER. 1 Sample for 5c, 5 for 10c, or \$1.00 per 100 postpaid

JOHNSON SMITH & CO., DETROIT, MICHIGAN

Mushroom Spawn



Mushrooms are very easily raised from our spawn. All you need is a cellar, basement, closet, or spare room that you can close the light out, as they grow better in the dark. Our illustration shows a small shelf utilized for the purpose in the cellar. You can have shelves all round the closet or cellar and you will be astonished at the large quantity you can raise in a very small amount of space. All the little mushrooms you see on this shelf came out in one night. As an article of food there is nothing more delicious or inviting than mushrooms, and they may be cooked in an almost endless variety of ways. By selling them to your neighbors and storekeepers you can make several dollars a week, and several of our customers have informed us that they have made quite a profitable industry from a small investment.

No. 5241. Price per Brick (weight about 1 1/4 lb.)...50c

Automatic Dime Bank



ENCOURAGE THE YOUNGSTERS TO SAVE.

NO EXTRA CHARGE FOR POSTAGE.

Another good and useful Automatic Savings Bank. All on the one principle. This one holds 50 Dimes (\$5), and opens of its own accord when the last Coin has been deposited. Registered scale at the side with holes enabling you to see at a glance how much money the Bank contains at any time.

No. S2586. Dime Bank.....15c

CHANGE PURSE



Pocket size, nickel plated, and will hold \$2.50 in pennies, nickels, dimes and quarters. Four strong springs hold the coins in place, and a slight pressure with the thumb instantly brings the coin wanted into your hand. No more fumbling in your pocket or pocketbook.

to get a certain coin wanted.

No. S2587. Change Purse.....25c

DANCING SKELETON

A jointed figure of a skeleton fourteen inches in height, will dance to music slow or fast, keeping exact time, and performs various gyrations and movements while the operator may be at some distance from it.



When handed to the operator, it is simply placed in position, when it will seemingly become endowed with life, and begins to move. At the command of the operator (who may be in any part of the room) it will lie down, stand up, dance, etc. For exhibition in the parlor, before social gatherings, etc. it never fails to create fun and amusement. We send full and explicit directions with each Skeleton, by the aid of which anyone can readily make it perform, to the astonishment of their friends or the public.

No. S3433. Dancing Skeleton.....10c
3 for 25 cents, 1 doz. for 75c.

Back Seat Driver's Card



There is a neat cardboard folder, with the wording "INSTRUCTIONS FOR BACK-SEAT DRIVERS" on the outside. What it contains on the inside when opened we prefer not to mention here. It isn't confined

to many words, but what it does say is certainly brief and to the point. Have a few of these cards on hand; you'll need 'em.

No. S2856. Back Seat Driver Cards. Each.....5c
3 for 10c., 25c. per doz., \$1.50 per 100.

THE RIBBON FACTORY FROM THE MOUTH TRICK



If you want to have some fun, send for this Ribbon Factory Trick and draw your after yard of various colored ribbons from an apparently inexhaustible supply. After filling a basket or covering the floor with ribbons, you can state that you feel much relieved after getting rid of your load.

No. S3202. Ribbon Factory Trick...10c
3 for 25 cents, 1 doz. for 75c

PEA-MATIC

REPEATER-12 SHOT

HARMLESS
ACCURATE

25c
Post-
paid.



Here it is, boys. You can have an immense amount of fun with this new pistol. It shoots 12 to 15 ordinary peas without reloading. All you need do is to load the gun with peas, pull the trigger and keep on firing until the barrel is empty. Then reload and fire again. It is absolutely harmless and safe. Nothing to explode. These pistols sell like hot cakes, so get yours AT ONCE. Be the first boy in your town to own one of these automatic repeating pistols and be the envy of all the other kids in the neighborhood. Remember, unlike most other guns, it costs practically nothing for ammunition.

No. 7481. PEA-MATIC 12-SHOT REPEATER. Price Postpaid.... 25c

AUTO TIRE BANG!

Sounds Exactly Like a Blowout
"IT STOPS THEM ALL"

10c

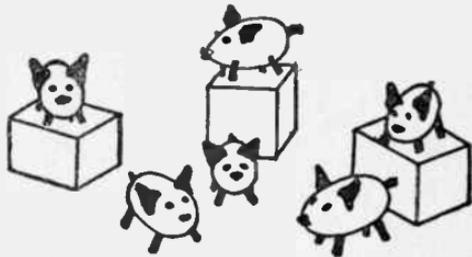


The Auto Tire Bang is attached to a small cardboard disc and a spring wire by means of which it is quickly attached to the tire. If placed underneath the fender it is out of sight. On the first revolution of the wheel, it explodes with a loud bang as soon as the wheel rolls over it. The driver gets out in a hurry to change tires, thinking he has a blowout, and even the victim is pleased when he finds he has merely been the victim of a practical joke. Not available. Shipped by Express only. Not prepaid.

No. 6536. Auto Tire Bang. Each... 10c
3 for 25c. or 75c per dozen.

THE MYSTERY MOVIE PIG

What Makes It Move?



S-S-S-H! Don't tell. It's a secret! | | Every one baffled as to how it works or why the little pig winks its eyes, wiggles its ears and nose, or wags its tail. But YOU know, for all you have to do is to catch a good lively fly or bug and put him inside, and then the fun begins. Put in two or three—the more the merrier. Let them out at night to have their dinner and exercises and get more lively ones in the morning. But don't tell the secret. Keep them guessing. For there is no machinery inside and it is NOT electricity NOT air, NOT radio, NOT water.

No. 2899. Mystery Movie Pig.... 25c

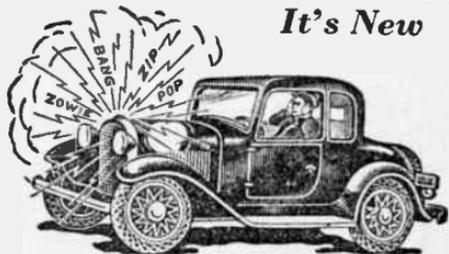
AUTO SCARE BOMB

The Auto Bomb is attached to the motor of your car, fastening one wire to the spark plug terminal and the other wire to any part of the motor to serve as a ground. The instant your "victim" steps on the starter, there is a shrill whistle, followed by a loud bang. The driver thinks his car has exploded. Can be attached in a few seconds. Does not harm the car. Gives you more protection than an insurance policy—catches the thief in the act. Not available. Sent by Express only. Not Prepaid No. 6534. Auto Scare Bomb. Price 15c
3 for 40c or \$1.35 per dozen



The Auto Skunk

It's New



Attach to the motor of an automobile in accordance with the directions, then "STAND BY" and watch the fun. The driver gets out of the car, presses the starter and the contact sets off the Auto Skunk. A dense cloud of smoke immediately envelops the front of the automobile, causing the driver to get out of the car and lift the hood. Upon lifting the hood, the driver receives the full force of the violent odor that has accumulated from the "Skunk." Not available. Shipped by Express only.

No. 6535. AUTO SKUNK. Each... 12c

JOHNSON SMITH & CO., DETROIT, MICHIGAN

10c ELECTRIC MOTOR

6,000 Revolutions per Minute

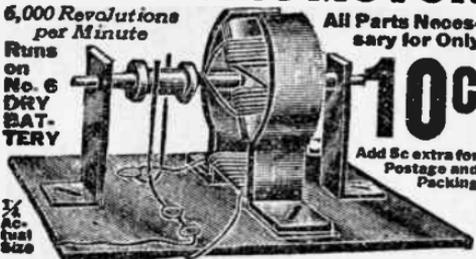
Runs on No. 6 DRY BATTERY

All Parts Necessary for Only

10c

Add 5c extra for Postage and Packing

1/2 Actual Size



An Electric Motor for 10c. Sounds almost unbelievable but it is perfectly true. We send all the parts packed in a neat box, with full directions for assembling. No trouble at all putting it together—it is FUN. Takes but a few minutes. And OH BOY! Isn't it speedy! Runs on a No. 6 or similar dry battery. You can learn more about a motor in 30 minutes than by hours of study. Perform many novel and interesting experiments with it. PRICE 10c with 5c extra for postage and packing. No charge for postage if 3 or more are ordered.

No. 4920. ELECTRIC MOTOR. Price 10c

Explosion Fillers

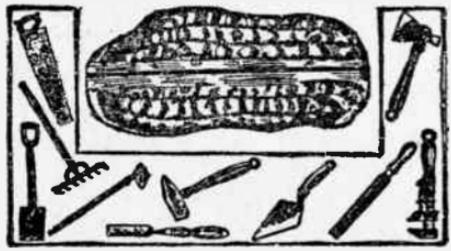


These are small pieces of wood, like the end of a toothpick, that you can insert in cigars and cigarettes to make them explosive. They are chemically treated and after the cigar or

cigarette is alight for a short time, it goes off with a loud bang to the profound astonishment of the smoker. There are 10 pieces in each package.

No. S2741. Explosion Fillers. Pkg. 10c

COMPLETE Tool Set in a Nutshell



The Smallest 10-piece Tool Set in the World, made of white metal, silver finish. Set consists of 1 hatchet, 1 saw, 1 trowel, 1 chisel, 1 file, 1 hammer, 1 wrench, 1 hoe, 1 rake and 1 spade, enclosed in an imitation jumbo peanut 8 inches long.

No. S5778. Tool Set in Nutshell. 15c
3 for 40c., or \$1.35 per doz. postpaid.

JOY BUZZER

(Hand Shaker and Tickler)

FUNNIEST JOKER'S NOVELTY EVER INVENTED!



Use the ring as a key to wind it.



Wear it as a ring—the Buzzer in the palm.



It "shocks" them when they shake hands.



It makes them jump if they are ticklish.



They will hit the ceiling if they sit on it.



Under a sheet it feels like a mouse.

Attached to one end of the Joy Buzzer is a brass ring that slips over the second finger, allowing the Buzzer itself to be concealed unobserved in the palm of the hand. Inside the Buzzer is a clock-work mechanism that is wound up. Projecting from the center of the Buzzer is a brass point, and a little pressure upon this point releases the mechanism. Shake hands with some one and see the shock the person receives when he unconsciously releases the mechanism of the Buzzer. If he is ticklish, watch him jump. Place it on a chair and watch the commotion when some one sits upon it. Place it under a pillow—under a sheet it feels like a mouse. You can use it as an ordinary "tic-tac" on a door or window—use it to awaken a sleeper by holding it on the sole of the foot or just behind the ear—try it on the window of an automobile just as the gears are shifted; they will think the engine is "busted." Dozens of other uses will suggest themselves to you. Made entirely of metal; you will get more than your money's worth of fun out of this little contraption.

No. S2935. JOY BUZZER. Price..... 28c

THREE SHELL GAME



The old shell game. An old one that is always new. You can make the pea appear underneath any shell you wish, and no matter what shell is picked by a spectator he is shown to be always wrong. Watch them sit up and take notice when the little pea moves mysteriously from one shell to the other. NOTE. This trick is sold for entertainment purposes only. Complete with directions.

No. S2936. Three Shell Game... 25c
JOHNSON SMITH & CO.

Solar Telescope



The new Excelsior Solar Telescope is a large and serviceable instrument, nicely made and accurately fitted. When extended it is almost three feet in length, and when closed measures not quite twelve inches in length. Telescopes of this size usually sell for many times this price, but by importing them direct from a large European manufacturer, we are enabled to offer them to our customers for ONLY \$1.25 each, at which price they ought to sell readily. The lenses are well made, the sides are brass bound, and the four sections are perfectly fitted. Here is your chance to obtain a Telescope for a nominal sum. It will be sent postpaid to any address upon receipt of amount in any convenient form. Postage stamps accepted if more convenient.

No. S9110. EXCELSIOR SOLAR TELESCOPE. Price Postpaid.... **\$1.25**

Novelty French Ring with View A VERY GREAT CURIOSITY



Here is a very great novelty in Rings, that is selling in thousands. It is a nicely made ring, finished in imitation platinum, and set with a large imitation diamond. It looks just like an ordinary ring, but in the shank of the ring is a small microscopic picture almost invisible to the naked eye, yet is magnified to an almost incredible degree and with astonishing clearness. There is quite an assortment of pictures that should suit all tastes. Some are pictures of bathing girl beauties, pretty French Actresses, etc., others are views of places of interest in



France, Panama Canal and elsewhere; others show the Lord's Prayer in type, every word of which can be read by persons with normal eyesight. They are interesting without being in any way objectionable.

No. 8322. NOVELTY FRENCH RING. Price Postpaid **25c**
Three for 65 cents, or a dozen for \$2.25 by mail postpaid

Silent Defender or Aluminum Gloves



These aluminum Gloves are used by Police Officers, Detectives, Sheriffs, Night Watchmen, and others, as a means of self protection, and they are certainly effective. They easily fit the hand, the fingers being placed in the four holes, thus tightly grasping the Glove. Very useful in an emergency. Made of aluminum, highly polished, they are very light, weighing less than 2 ounces. They are 3 1/4 inches long and 2 3/4 inches across and will fit compactly in the pocket, always available ready for instant use. You should buy one for each hand.

No. 89095. Silent Defender. Each, **25c**
Or Two for 45c postpaid anywhere.

Elec-Trick Push Button

Did you ever see a youngster pass by a push-button without trying it? Never—it can't be done. That's the psychology back of this Elec-trick Push Button. Place this little contrivance anywhere it will be noticed—in the lapel of your coat or vest if you choose. Upon pressing it the victim naturally expects to hear it ring. The result can be better imagined than described. As soon as he touches it, you will see some of the liveliest dancing you ever witnessed in your life. It gives a smart "shock" as soon as the Button is pressed. Never known to fail. Attach it to your house—WOW! What a shock they get when they press what they think is your door bell. **15c**



No. 2062. Elec-Trick Push Button. **15c**
3 for 40c. or \$1.35 per dozen

Protect Your HOME and Earnings



with this
25 Calibre
regulation
blue steel

AUTOMATIC

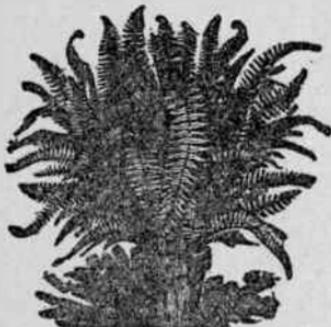
\$9.75

Keep one of these safety brand new automatics in your home and be fully protected against burglars, thieves and holdup men. It's a terrible fright to wake up in the night—hear noises down stairs or in the next room—and realize your neglect has left you wholly UNPROTECTED.

Buy one of these automatics and be always fully protected. Handsome blue steel, gun-metal finish. HAS DOUBLE SAFETY and is practically "fool-proof." Accurate aim, rifled barrel, hard rubber, comfortable checkered grips, safety lever, 7 cartridges. Small, lies flat in pocket. Can be shipped by express only.

- *No. S9045 is 25-calibre, 7-shot, as illustrated. Big Bargain **\$9.75**
 - *No. S9048 is larger size, 32 calibre, military model, automatic 7-shot. **\$11.00**
- Big Value, only.....

FERNS GROWN FROM SEED



Ferns can be grown easily from seed. Fill a clean pot with fine earth. Put the pot in a saucer and immerse with boiling hot water to kill all weed, seeds or insects in the soil. After the soil has cooled, strew the fern seed over the top of the soil but do not cover it. Put a piece of glass on top of the pot, and keep the saucer full of water. Never put water on top of soil. In a short time the soil will be covered with a green moss-like growth, and in a few weeks the little fern leaves will appear.

No. S5060. Per Package..... **10c**

RUBBER TYPE SET



This printer is larger than our No. 21, and contains five fonts of large type, with punctuation marks, three sets of figures from 1 to 10, three \$ marks, pallet with enamelled handle for holding type, ink pad in metal box with cover, and type tweezers for setting type, making a very complete outfit, with which a great variety of printing can be done. With these Printing outfits of ours a boy can combine pleasure and business printing cards, envelopes or small handbills and circulars for his companions or business associates at a profit, and at the same time learn the art of setting type and printing, which in later life may be of great value to him.

No. S2362. No. 22 Type Set.....**30c**

No. 23 Rubber Type Set

This is a still larger outfit as it has both capitals as well as small letters. This outfit contains no less than 266 letters, figures, punctuation marks, ornaments, spaces, etc., and comes complete in box with holder for setting 3 lines of type, tweezers and self-inking stamp pad. Size and style of type is

as follows: **AAAAaaaaaaBB**

This is an excellent set for business or personal use.

No. 2363. Box of Rubber Type..... **50c**

Junior Rubber Type Set

Complete with over 67 letters (capitals only), stops, 2-line type holder, tweezers and self-inking stamp pad. You can mark linen, books, papers, envelopes, cards, etc. As a card printer you can set up name, etc., and print 500 cards an hour. It will thus be found not only a source of profit, but also of great amusement and instruction. Size of type 3-16 inch.

No. 2361. Junior Rubber Type Outfit. **15c**

SURPRISE SOAP



The fellow who unwittingly uses this soap has a very big surprise coming to him. It is an exact duplicate of an ordinary piece of soap; BUT it contains a chemical that acts like a dye as soon as it comes into contact with water. The result can be better imagined than described.

No. S2198 Surprise Soap **15c**

AMERICA AND COMPLETE OUTFIT

(Add 10c for postage and packing)

Make and make your own lectures

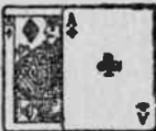
1/2 Photo
1 1/4 in.

Although this apparatus is so MARVELOUSLY CHEAP, it is quite the best, and will take SPLENDID PICTURES. Just the thing for beginners in photography. It takes pictures not quite 2 x 3 1/4 inches with clearness, sharpness and distinctness. Loads in daylight. Has VERY GOOD LENS; BRILLIANT VIEW FINDER, a simple yet effective SHUTTER, time and instantaneous, leatherette handle, comes complete with 4 FILMS, 1 package of PRINTING PAPER, a neat little PRINTING FRAME with glass top, and a SUPPLY OF CHEMICALS for developing, fixing and turning out the finished picture. Full printed instructions so plainly written that a child cannot fail to understand. Never before has such an inexpensive opportunity been offered of indulging in the fascinating art of photography. With this outfit you can take portraits of your friends, views of places of interest you may visit, and snapshots of curious events and quaint characters. THE CAMERA AND COMPLETE OUTFIT FOR ONLY 35c (Canada and foreign 50c) With 10c extra for postage and packing. EXTRA FILM 10c per package of 5 films. EXTRA PRINTING PAPER 10c per package.

Fortune Telling by Cards

Dice, Dominoes, Crystal, etc.

Book shows how to tell fortunes with cards, dice, dominoes, crystal, etc. Tells the meaning and significance of every card. Several different methods explained and fully illustrated. Crammed full from cover to cover with complete information on fortune-telling. PRICE 10c postpaid. Stamps accepted.



Electric Telegraph Set 15c

BOYS!

A private Electric Telegraph Set of your own for 15c. Lots of fun sending messages to your friends. Better still get two sets, hook them up as shown in the directions, for TWO-WAY messages (sending and receiving).

No trouble at all to operate with the simple instructions that accompany each set. Operates on any standard dry battery obtainable everywhere. With this outfit you can learn to transmit and receive messages by the Morse International Code, and in a very short time become an expert operator. Mounted on a wooden base measuring 4 x 3 in. fine glass construction throughout, with key, sounder, magnet, miniature Western Union blank, pocket size case box with full illustrated instructions. ALL FOR 15c without postage. (Canada and Foreign 20c.)



Add 10c for postage book "BOY ELECTRICIAN" Tells how to make batteries, dynamos, motors, radios, bells, engines, alarms, coils, etc. Written specially for boys so anyone can understand it. 100 illustrations. ONLY 10c.

Novelty Catalog 10c.

Send 10c extra for our MAMMOTH CATALOG of novelties, jokes, (Globe, puzzles) books, etc., etc. Only catalog of its kind in existence. JOHNSON SMITH & CO.

35c Blank Cartridge Pistol

REVOLVER STYLE

22 CAL.

MADE IN 3 SIZES

Three new models now out 25c, 50c and \$1.00. Well made and effective. Modeled on pattern of latest type of Revolver. Appearance alone enough to scare a burglar. Takes 22 Cal. Blank Cartridges obtainable everywhere. Great protection against burglars, tramps, dogs. Have it lying around without the danger attached to other revolvers. Fine for 4th July. New Year, for stage work, starting pistol, etc. SMALL SIZE 1 in. long 25c. MEDIUM SIZE 5 in. long 50c. LARGE SIZE 6 in. long \$1.00. BLANK CARTRIDGES 50c per 100. HOLSTER (Cowboy type) 80c. Shipped by Express only not prepaid.

25c
50c
\$1.00



BIG STEAM ENGINE

NEW POWERFUL MODEL JUST OUT

25c Add 10c for postage and packing

The world's biggest value in mechanical toys. A great big steam engine, measuring 7 inches in height by 2 1/4 inches in diameter (7 1/4 inches in circumference) for ONLY 25 cents. You should see it run, too. It's a revelation to see the fly wheel spin around at a great rate as soon as you "get steam up." Just light up, fill the boiler with water, and in a few minutes the engine is running at top speed. New model just out, runs on alcohol or canned heat—MORE POWER. Has fly wheel for running small mechanical toys.

Fully Tested—Guaranteed to Run

It is foolproof, harmless, fully tested and guaranteed to run. A scientific toy that illustrates the principle of the steam turbine. Runs for hours on one filling of water. Every boy should have one. Wonderfully well made—splendid value for the money. Sells for ONLY 25c, with 10c extra for postage and packing. Easily worth double. Electric Model of same Engine also available. Price 50c, postage 10c extra.



CRYSTAL RADIO RECEIVER \$1.00



Say what you will about Electrical and Battery Sets, a CRYSTAL set has them all beat for simplicity and clearness of tone. There is absolutely no noise and no distortion—no batteries to buy—no tubes to wear out—no maintenance expense whatsoever. Cost nothing to operate and will last indefinitely. Reception is loud and clear. This Receiver is guaranteed to work equal to the most expensive Crystal set you can buy. Has a receiving range of over 25 miles, or under favorable conditions up to 100 miles. Construction of the finest materials throughout, including super-sensitive crystal, accurate tuning fork, and all complete—nothing more to buy. \$2.95 postpaid. Johnson Smith & Co., Dept.

SINGLE AND 100-SHOT AIR PISTOLS

Just what you've always wanted. A powerful high grade Air Pistol, shaped like an Automatic, peck size. Fires B. B. shot obtainable anywhere. Very powerful yet perfectly safe for boys to handle. Two styles—Single Shot Pistol or Repeater. The Repeater fires 100 shots in one loading. The Single Shot Pistol shoots Air Rifle Darts in addition to B. B. shot. Well made and durable; all metal parts (metal plating) and barrel grain wood stocks. Front and rear sights. Weighs about 10 ounces. Better than an air rifle. Shipped by Express. Not Prepaid. \$2.50. PRICES: Single Shot Pistol . . . \$2.50 100-Shot Repeating Pistol . . . \$5.00



Shoots B. B. Shots

LIBERTY AUTOMATIC REVOLVER

HIGH QUALITY • RIFLED BARREL • GOOD VALUE

With Shell.
Ejecting
Device
PRICE
\$9.50

.22 Cal.
.32 Cal.
.38 Cal.



One of the most powerful and effective weapons made. The shots can be fired rapidly and in succession, as fast as you can count. The ideal weapon for Express Men, Bank Agents, Pay Roll Clerks, Automobileists, and all others where quick action is absolutely essential. Accidents and discharge impossible. Another feature is the Automatic Shell Ejector, that throws the empty shells out when the barrel is tipped down. The Revolver is exceptionally well made of the very finest of materials and scientifically tested for accuracy. Fitted with Cartridges for above Revolvers - by express only. .22 cal. \$1.00 per 100; .32 cal., \$2.50 per 100; .38 cal., \$3.50 per 100.

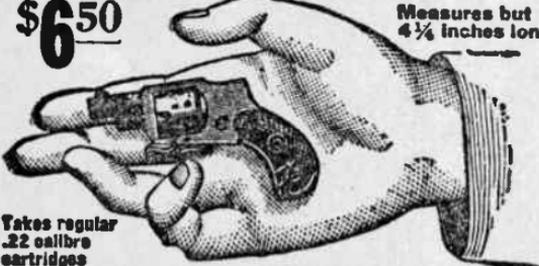
*No. S9022, Liberty Automatic Revolver.... \$9.50 (Revolvers and Cartridges unobtainable)

"The Baby" Double Action Hammerless Revolver

A HANDSOME AND MOST EFFECTIVE WEAPON

\$6.50

Measures but 4 1/4 inches long



Takes regular .22 calibre cartridges

The new Baby Double Action Hammerless Revolver has been produced to meet the ever increasing demand for a revolver that would combine small size and light weight with the essential features of Efficiency and Practicality. It is small in size, yet is just as effective and serviceable as the most expensive weapon you can buy. Every lady should have a revolver and should know how to use it, and there is no safer or better one made than this. A great feature is its safety action that guards against accidental discharge, making it quite safe for young men and ladies. The illustration gives an idea of its appearance, but it must be seen and used to be thoroughly appreciated. The ammunition used is the standard .22-calibre (short) cartridge obtainable anywhere, or you may obtain the cartridges from us (cartridges can be shipped only by express). The revolver fires six shots in one loading. The operation of the charging mechanism is extremely rapid and absolutely reliable; six well aimed shots can be fired in as many seconds. The revolver is very well constructed, with finest nickel plated fluted barrel of cylinder, and it weighs only 4 1/4 ounces. The Price of the Baby Revolver is only \$6.50.

*No. S9025, Baby Hammerless Revolver... \$6.50 (Revolvers and Cartridges unobtainable)

"Young America" REVOLVER

.22 & .32 Cal.

A Good Pocket Gun



A double-action revolver made in two sizes—.22 and .32 calibre. The .22 calibre revolver takes the .22 calibre rim fire cartridges - firing 7 shots at one loading. The .32 calibre gun takes S. & W. center fire cartridges - weights approximately 9 ounces, at one loading. The "Young America" is the most popular Fourth of July revolver. Octagon Barrel accurately rifled, made of best steel—very highly nickel plated and polished. The handle fancy hardened rubber. *No. S9008, Young America Revolver..... \$7.50



Aerial Balloon

A brightly colored balloon that measures sixteen inches long is blown up in the usual way, and, when released, the air pressure sends the balloon soaring upward. The effect is startling. Price 10c each. 3 for 25c.

SOARING UPWARD, the 16-inch propeller SPINNING AROUND AT A LIVELY RATE, the effect is startling. Price 10c each. 3 for 25c.



THE BUDDY PHONE

A Real Telephone. Works Indoors or Outdoors. Though this is merely a very clever toy, it is quite as serviceable for short distances as the most elaborate apparatus made and it is much less liable to get out of order or to need adjustment. In fact it cannot be rendered ineffectual unless roughly handled. No troublesome battery, no intricate "hook-up." Can be set in place in use from one room to another, up or down stairs, around corners, etc. The patented sounding discs transmit and receive the voice perfectly, making it a really practical talking telephone. Set consists of two phones, transmission cord and full instructions. Price only 65c per set postpaid.

WONDERFUL X-RAY TUBE



A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. Price 10c, 3 for 25c.



Exploding Matches

More fun than fighting with your wife. They look just like ordinary matches but explode with a loud bang when lit. 12 matches to a box. PRICE 10c per box, 3 boxes 25c, 75c per doz. boxes. Not available. Shipped by Express only.

10c



ITCHING Powder

This is another good practical joke. The intense discomfort of your victim is everyone's but themselves is thoroughly enjoyable. All that is necessary to start the ball rolling is to deposit a little of the powder on a person's hand and the powder can be rubbed upon to do the rest. The result is a vigorous scratch, then some more scratch, and still some more. 10c box, 3 boxes for 25c or 75c per dozen. Shipped by Express.

ANARCHIST BOMBS

One of these gross vials dropped in a room full of people will cause more consternation than a hamburger cheese. The small entirely harmless illustration in a short time. 10c per box, 3 boxes for 25c., 75c per doz. boxes, or \$7.50 per gross. Shipped only by Express.

SNEEZING POWDER

Place a very small amount of this powder on the back of your hand and blow it into the air and watch them sneeze without knowing the reason why. It is most amusing to hear their remarks, as they never suspect the real source, but think they have caught it one from another. Between the laughing and sneezing you yourself will be having the time of your life. For parties, political meetings, car rides, or any place at which there is a gathering of people, it is the greatest joke out.

PRICE 10c, 3 for 25c, 75c per dozen. Shipped by Express.

COMICAL MOTTO RINGS

Lots of harmless fun and amusement wearing these rings. Made in platinum finish (resemble platinum), with various comical mottoes, as illustrated. Price 25c. ea. Postpaid.

MAGIC MADE EASY 250 MAGIC TRICKS

An excellent little book containing 250 Parlor Tricks, illustrated with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Practically illus. Sent postpaid. Price 10c. 3 copies for 25c postpaid.



WHOOPEE CUSHION

Whoopee Cushion is made of rubber, inflated like a balloon, and then placed on a chair, couch, seat, etc. When the victim unsuspectingly sits upon the cushion, it gives forth noises that can be better imagined than described. Price 25c.



LEARN TO VAMP



Would you like to play the piano or organ without going through the drudgery of learning the scales and keys and without tedious practice? The Vamping Tute is a greatly simplified method, which, after a little practice, enables you to play the accompaniment to any tune or song written in any "time" or in any "key." No knowledge of music necessary. Once you have mastered the system, you will be able to play the accompaniment to songs, ballads, waltzes, the latest hits, etc., entirely by ear without any music. Price 12 cents postpaid.

FRENCH PHOTO RING 25c

A handsome ring, finished in imitation platinum, and set with a large imitation diamond in the shape of the ring is a very microscopic picture almost invisible to the naked eye, yet magnifiable to an almost incredible degree. Pictures of bathing girl beauties, French actresses, views of France, Panama Canal, others show the hard's Prayer, every word legible. Only 25c postpaid.



HOME BREWED WINES & BEERS

Over 100 simple recipes for making all kinds of good, wholesome wines, ports, champagnes, brandies, gin, rum, cordials and simple liquors, fruit syrups, etc. Only 10 cents postpaid.



SNAPPY JOKES

A big collection of rich and rare jokes by a jolly bartender for stag parties, smokers, etc. Good clean humor—not a bit vulgar in the whole book. Don't be a clam in company. Get a copy before your friend does. Costs but a dime, but contains a dollar's worth of fun. Hundreds of jokes in one book. Price 10 cents postpaid. RED HOT JOKE BOOK, 10c postpaid. Catalog 10c.



250 Magic Tricks

An excellent little book containing 250 Parlor Tricks, tricks with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illustrated. Entertain and amuse everybody. Price postpaid 10c.



MERRY WIDOW HANKY

A perfect model of the most necessary lingerie garment worn by ladies, which, when folded and worn in the pocket, has the appearance of being a gentleman's handkerchief. A clever, funny joke. Price 15 cents postpaid.

DANCING SKELETON

A jointed figure of a skeleton 14 in. in height, will dance to music and perform various gyrations and movements, while the operator may be some distance from it. It will lie down, stand up, dance, etc. We send full and complete instructions. Price 10 cents. 3 for 25 cents postpaid.

TOY MAKER 10c

Greatest boys' book written. How to make Camera, Canoe, model Railroad, Telephone, Hooversong, Telephone, Telephone, etc. Also, Water Wheel, Paddle Boat, Skis, Dog sled, etc. 150 illustrations. Price 10c.

JOHNSON SMITH

125 TRICKS WITH CARDS



Containing all the tricks and deceptions with cards ever invented, including the latest Trick of the most celebrated Conjurers, Magician and Prestidigitators popularly explained, simplified and adapted for home amusement and social entertainments. The whole so explained that any one can, with a little practice, perform the most difficult feat, to his own satisfaction and to the wonder and admiration of his friends. There is also added a Complete Exposure of all the Card Tricks made use of by Professional Card Players and Gamblers. Shows how "skin" Gamblers cheat and win money by their infernal "palm fling," and other tricks. These features make it the best work ever published on Card Tricks.

No. 1174. 125 TRICKS WITH CARDS... 25c

TRICKS AND SOCIAL ENTERTAINER

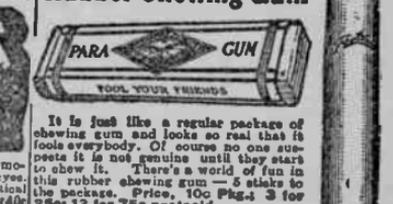


Cleverly performed feats of conjuring, sleight-of-hand and illusion interest everybody, and ability of the kind always makes one a welcome guest. This is a book of 96 pages, with nearly 100 illustrations. The instructions for parties are so plainly given that even a child, with a little practice, can do them, as they only require SIMPLE APPARATUS. The book gives full and clear explanation of an unusually large number of clever tricks of all kinds, and a glance at the partial contents given below will give you a very good idea as to the comprehensive nature of this book. In addition there is a chapter on "SECOND SIGHT," a combination of five different methods which baffles the most astute investigators. The book is well worth the while even for those who merely wish to know how the tricks are done, while for the amateur magician it is a perfect treasury of golden opportunities.

No. 1163. Tricks and Social Entertainer... 25c

INVISIBLE INK / Rubber Chewing Gum

The most confidential message can be written with this ink, for the writing makes no mark. Cannot be seen unless you know the secret. Invaluable for many reasons. Keep your postal and other private memorandums away from prying eyes. Great fun for playing practical jokes. Only 15c a bottle; 3 for 40c.



Rubber Tacks, Box 10c Rubber Cigarettes. Price per Box. 20c
Rubber Cigars, Price Ea. 10c Rubber Matches. Price per Pkg. 10c

Microphone Transmitter Button



current and is extremely sensitive. Amplifies radio signals. Countless wireless cases will suspect themselves. Experimenters find the Button useful for hundreds of experiments along the lines of telephony, auto radio, etc. Many fascinating stunts may be devised, such as holding the button against the throat or cheek to reproduce speech without sound waves. \$5.00 is given to anyone who sends in a new suggestion for the use of the Button provided the manufacturers find it suitable for use in their literature. PRICE \$1.00 POSTPAID ANYWHERE.

You can easily make a highly sensitive detetophonos by using this Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can connect up different rooms of a hotel. This outfit was used by secret service operatives during the war. It is being used by the military in hundreds of places and is the greatest invention in micro-phones. You can mount the button almost anywhere—card board boxes, stove pipes, and on the wall behind a picture frame, etc. The Button is so light and small it cannot be detected. Person can be overheard without suspecting it. You can listen in on conversations in another room. A deaf person in the audience can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be heard in hundreds of feet away. Button may be used to renew telephone transmitters; often makes an old line "talk-up" when nothing else will. Ideal for the radio user; carries other stunts.

No. 2472. Microphone Transmitter Button \$1.00

JOHNSON SMITH & CO., DETROIT, MICHIGAN
World Radio History

PHOTOGRAPHY For Beginners

No other hobby presents so much permanent pleasure as photography. Quite apart from the stimulating pastime in itself this many-sided art offers undreamed of possibilities of application. Whatever aims or objects you have in view, you will always be able to obtain full gratification. Do you want snapshots to remind you of your travels and excursions? If so, let the camera be your companion, and your pictures will be a constant source of pleasant reminiscences to a much greater degree than bought pictures ever could be. Photography is not a very difficult art. It is a simple matter to produce good pictures, and if you will adhere to the methods recommended in this book, you will have no reason to fear that your photographs will be spoiled by failures. Here is a brief summary of the book: How a photograph is made—How a camera works—Making an exposure—Work in the dark room—Developing the negative—Printing the positive—Photography indoors—Outdoor photography—Instantaneous action picture—Home portraiture. Numerous illustrations.



No. 1651. Photography for Beginners 10c

PHOTOGRAPHY Self-Taught

One of the best books for a amateur photographers published. Contains over 150 pages—16 chapters, with numerous illustrations. A complete handbook on photography from start to finish for the amateur and beginner. Everything is written in plain, simple language, and each subject is exhaustively dealt with from start to finish. Every division of this most fascinating art treated in a most thorough and pleasing manner.



No. 1650. Photography Self-taught 35c

HOW TO WRESTLE



This book will put you wise to all the tricks and wrinkles of attack and defense, which, if studied and practiced, will make you a first-class wrestler. With the knowledge contained in this book, a skilled but comparatively weak man can easily establish superiority over a far stronger but less scientific opponent. The book is written by an expert and contains the full instructions of a former champion wrestler. It tells how to trap a man immediately following your initial hold, explains various Holds, Throws, Swing-Overs, Grips, etc., including the Half Nelson, Grape Vine Hold, Head and Crotch Throw, Chancery and Swing Over, Waist Hold, Arm Hold and Back Heel, Crotch Hold, the "Hatch" or Head Throw, the Double Bridge, Cradle Hold, the Buttock and Counter, Foot, Head, Ground and Shoulder Holds, Escapes, Clever Counters, Jiu Jitsu Throw, Various Grips, etc. The book is complete in every respect, contains nearly fifty illustrations, and is written in plain, everyday language that anyone can easily understand. The information given in this book is easily worth ten times the small sum asked.

No. 1267. How to Wrestle. Price 25c

Our Book Of FORBIDDEN KNOWLEDGE

At last here is a book freely revealing many of the Hidden Secrets of the Ancients. This book has been compiled from various rare and secret books, and contains much valuable information. Here is a brief description of the contents: **BLACK MAGIC REVEALED**—Secret method of mesmerism and hypnotism—How to make others think of you and love you—How to charm those whom you meet and love—Electrical psychology—How to perform the Davenport Brothers Spirit Mystery—How to be a spirit medium. **SUPERSTITIONS**—Color superstitions—Lucky and unlucky days—List of fortunate hours—Lucky dreams, etc. **CHARMS, SIGNS AND OMENS**—Talismans, charms, spells and incantations to overcome evil influence—The black cat—Metagrammatism or how to tell fortunes by the transposition of names—The silent language—How to write love letters secretly—How to get rich and live happily married, and much additional information.



No. 1643. Forbidden Knowledge.. 10c

GUIDE TO HORSE OWNERS

This book contains just about everything about a horse worth knowing. Written by a noted veterinary surgeon of great experience. Tells the kind of horse to buy; how to manage horses; break and train horses; shoe a horse; cure all kinds of horse diseases. The very best advice on buying, breeding, rearing, training, shoeing, taming, feeding, breaking and doctoring horses. Tells how to make a horse lie down; how to catch a wild horse; teach a horse to pace; to make a horse stand, sit on his haunches, come down to mount, follow you, make him stand still without hitching, to prevent him from running away; how to tell age of a horse, etc.

No. 1355 Guide to Horse Owners 25c

MONEY MAKING SECRETS

Contains dozens of plans, ideas and money-making opportunities for everybody. Enterprising, ambitious men and women, boys and girls will find scores of dollar-making ideas that can be turned into cash right in your own home in your spare time. Every plan thoroughly practical and has actually been successfully worked. Little or no capital required with many; with a little effort, can be made to yield big profits. Tells how to raise pigeons for profit. Many formulas and trade recipes given and instructions to make many useful household articles, etc. Also tells how to build a practical radio, materials for which can be bought for a few cents.



No. 1253. Star Money Maker..... 10c

10c CHEAP AND POPULAR BOOKS 10c

EACH BOOK CONTAINS 64 PAGES
COVER IN THREE OR MORE COLORS



FORTUNE TELLING BY CARDS
Simple methods for telling fortunes by means of playing cards, past, present and future. No. 1936. PRICE 10c



FORD JOKES
A choice collection of automobile jokes, witty sayings, etc. No. 1940. PRICE 10c



COON JOKES
A select collection of coon jokes and witty sayings, comic stories, speeches. No. 1944. PRICE 10c



Smart Set Jokes
A selection of original classical jokes, laughable stories, witty sayings, etc. No. 1948. PRICE 10c



Complete Letter Writer
A complete essay on letter writing, also a course of interesting letters on business, love, courtship and marriage. No. 1937. PRICE 10c



Sparring and Boxing
The science of self-defense easily learned without a master by a professional boxer. No. 1941. PRICE 10c



Good Time Jokes
Containing all the latest and most popular jokes, funny stories, etc. No. 1945. PRICE 10c



YOU-TELL-EM FUNNY SAYINGS
A collection of "You-tell-Em" funny sayings that were all the craze in America. No. 1950. PRICE 10c



LOVE LETTER WRITER
Original letters of friendship, courtship, marriage, etc., with instructions how to write with elegance and ease. No. 1938. PRICE 10c



How to Play Checkers
This up-to-date work contains full instructions for students as well as valuable information for experienced players. Illustrated. No. 1942. PRICE 10c



PRIZE JOKES
Containing a selection of all prize jokes, collected from all sources. No. 1946. PRICE 10c



Speeches & Toasts
A good selection of speeches and toasts for all occasions, and how to prepare and deliver them. No. 1954. PRICE 10c



Business Letter Writer
Commercial correspondence, letters of credit agreements, drafts, laws and maxims for business men, etc. No. 1939. PRICE 10c



HOW TO PLAY CHESS
A complete guide to the game of chess, containing valuable information for students and professionals alike. No. 1943. PRICE 10c



SNAPPY JOKES
A collection of rich and rare jokes, compiled by a jolly bartender for stag parties, smokers, etc. No. 1947. PRICE 10c



Riddles, Jokes & Stories
A splendid collection of the latest riddles and conundrums, new jokes and excruciatingly funny stories. No. 1955. PRICE 10c

TAP DANCING



Learn To Beat Out A Tune With Your Feet It's Easy

Why envy the easy rhythm and fascinating grace of Step'n Fetch-it and others. Now you can learn to tap dance in ONLY 6 HOURS by a new, simplified course of lessons by Prof. Hawley Wilson. No special ability needed.

Be smart! Learn tap dancing. Everybody's tapping. The whole town is tapping. Learn to beat out a tune with your feet. Hostesses love it. Friends adore it. It's fun and you'll thoroughly enjoy the lessons. Besides, tap dancing is not only an invigorating and entertaining accomplishment, but it is also an invigorating and health-giving exercise for making the limbs supple and giving a "springy" feeling of fitness to the whole body. It promotes slimmness—nature's way, without pills, drugs or dieting.

25c
Postpaid

Here is what some of our customers say: "... wonderful benefit. Thank you for adding tap dancing to my accomplishments." And another: "My friends were amazed. I dare not recommend your course for fear of competition."

No. 1304. Tap Dancing. Price... **25c**

Art Of Dancing

LEARN THE CARLO, CONTINENTAL, RHUMBA, KISS DANCE, ETC.

LEARN TO DANCE THE LATEST STEPS. Be popular this season. Really good dancers are always admired—always popular guests. Partners welcome them eagerly. With the aid of this book you can learn the newest, smartest steps without a teacher and become a dancer who is sought after.

After following the instructions in this new book you won't need to make excuses when the dance music starts. Besides, you'll get lots of fun out of parties and dances. If you want to become a perfect dancer, learn to dance at home this new, easy way.

WHAT THE BOOK TELLS:

How to develop poise and control, how to improve your dance steps, the art of holding, how to walk to music, how to lead, how to do the latest Fox Trot Steps, Natural and Reverse Turns, the Reverse Wave and Change of Direction Steps, the Quickstep, awaying to music, how to Waltz, Backward Changes, how to do the Continental, the famous Kiss dance, the Manhattan Dance, the College Rhumba, the Carlo, the Charleston, etc., etc. 16 chapters, nearly 100 illustrations are given; everything is made so plain that you'll be dancing before you know it.

100 ILLUSTRATIONS
16 CHAPTERS



No. 1301. Art of Dancing. Price **25c**

HOW TO DANCE

This book is intended to teach the art of dancing to those unable to avail themselves of the services of a professional teacher. The author has made this book so simple and plain that any person of ordinary intelligence can understand it and learn how to become a first-rate dancer without the aid of a teacher.

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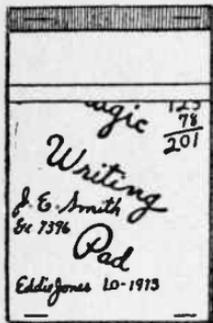
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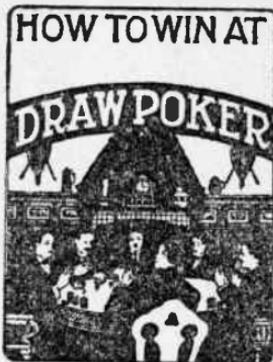
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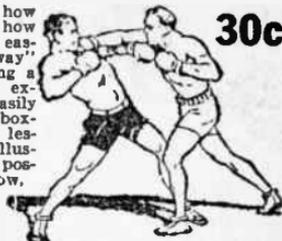
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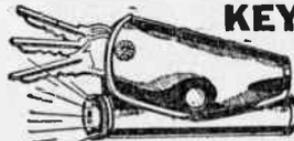
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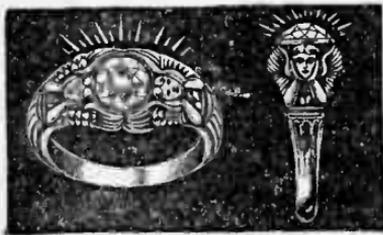
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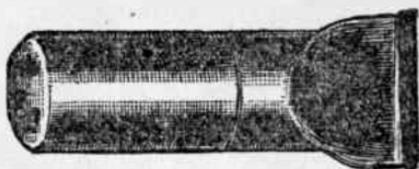


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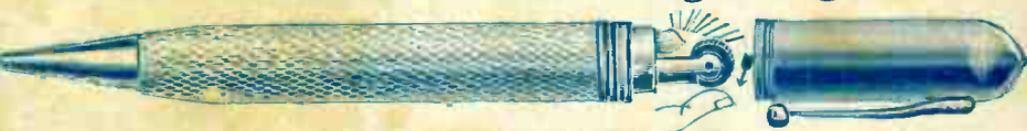


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Combination Pencil and Cigar Lighter



A Combination Cigar Lighter and Mechanical Pencil. The cap conceals a lighter, located in the space usually set aside for the eraser. To light, turn the wheel with the thumb. Made entirely of metal, with highly polished finish. A very popular and useful article.

No. 9325. Combination Cigar Lighter and Pencil. Price, Postpaid 15c
No. 9317. Extra Flints for Above Cigar Lighter. Price, 3 for 10c

Listen to Music, News, Sports, With A Crystal Radio Receiving Set

**No Batteries! No Tubes! No Distortion!
No Noise! No Expense to Maintain!**

The world's best entertainment and educational features are to be had for the listening in. The very low prices asked for these really good and practical sets puts them within the reach of every man, woman, boy and girl. "If you really wish to learn all about radio," advises the editor of Radio News, "start with a good crystal set." A crystal set has many advantages, but the main ones are simplicity and absolute clearness. There is no distortion and no noise. There are no batteries to buy. No tubes to wear out, in fact there is no maintenance expense whatsoever. They cost absolutely nothing to operate and they will give you constant service for an indefinite period of time. The reception is loud and clear. **Prices below do not include aerial or ear phones.**

Little Wonder Crystal Radio Price \$1.00



Compact in size but big in results. This set will receive broadcasting within 25 miles of a station or even greater distances when conditions are favorable. The open type detector permits adjustments to be made

to the finest degree. The set includes the Philmore supersensitive crystal which assures quick results when "looking" for a station, because the entire surface of the crystal is sensitive.

No. 6581. Little Wonder Crystal Radio. Price Postpaid. **\$1.00**

BLACKBIRD CRYSTAL RADIO

The "Blackbird" is a most efficient crystal radio receiving set. Will receive broadcasting from stations up to 25 miles (greater distances under favorable conditions) loud and clear that will bring joy and happiness to the listener. This radio is equipped with a super-sensitive crystal enclosed in a glass housing, thus effectually keeping out dust, etc. No tubes or batteries required. Price does not include Aerial Kit or Phones. **SHIPPED POST-PAID.**



No. 6583. Blackbird Crystal Radio **\$2.50**



SUPERTONE CRYSTAL RADIO

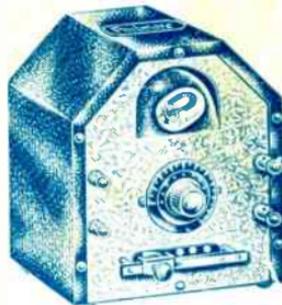
\$1.50

A rigidly constructed radio receiving set which will give everlasting service. Has a range of 200 to 600 meters with a receiving radius of over 25 miles. Under favorable climatic conditions, reception may be had within 100 miles from a broadcasting station. Reception is loud and clear without distortion of any kind.

No. 6582. Supertone Crystal Set **\$1.50**

SELECTIVE CRYSTAL RADIO

Our best crystal set. Possesses unusual selectivity and designed to give most efficient results. Built with a tapped coil matched with a .00035 Mfd. variable condenser. On the panel is a dial for tuning and logging stations, two double posts to take two pairs of headphones, and a dust-proof glass enclosed crystal detector which includes a super-sensitive crystal. With it you can hear messages broadcast anywhere within 25 miles, or even up to 100 miles under favorable conditions.



No. 6584. Selective Crystal Radio **\$3.95**