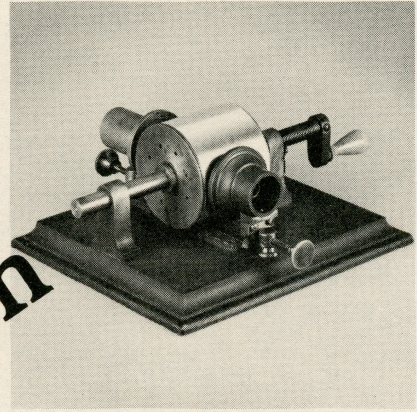


# making edison's phonograph



by DONALD W. MATTESON

If you would like a thrilling experience, a bit of the excitement that comes to an inventor, try re-inventing the phonograph by building your own tinfoil working model. You will gain an insight into some of the problems that faced Thomas Edison 100 years ago. You will find that there is still a challenge to the invention, even though we have the benefit of all the knowledge and technology since those horse and buggy and oil lamp days.

When Edison gave John Kruesi, his experienced machinist and craftsman, instructions to build the phonograph, he (Edison) had already done much preliminary experimenting. He knew the principle was right. Kruesi, using the finest materials and a complete workshop, turned out a well-made machine. His precision was needed to test Edison's concept fairly.

We want to make the replica's construction possible (with commonly available materials and without the support of a machine shop) for anyone who has the basic skills and a strong desire to build. We recommend wood for the base, the bearing supports, the reproducer support and slide and the cylinder, or drum. On Edison's original, these components were made from iron and brass, requiring much machining. With the possible

exception of a lathe to round the cylinder, the only tools necessary for your model are those found around an average household or home workshop.

The non-wood components can be purchased at a local hardware store. The shaft is 1/2" threaded rod; the nuts are the bearings. A smaller 1/4" threaded rod is used for fine adjustment of the recorder-reproducer.

The original drum or cylinder was grooved in a spiral pattern. This gave the tinfoil the depth or cushion it needed to receive the voice pattern indentations from the diaphragm. The model's wooden cylinder is not grooved, since this would require a screw-cutting lathe and a skilled machinist. We cemented a thin layer of felt to the cylinder surface to provide the same cushioning function.

The secrets for a successful tinfoil recording machine are careful workmanship, critical adjustment and lots of patience with trial and error. You will not only gain experience in these areas, but you will feel some of the anxiety and sense of accomplishment that Thomas Edison no doubt felt 100 years ago. I know, because I was excited myself when the replica I made "talked back"

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after many refinements and hours of work. Good luck!

## ASSEMBLY INSTRUCTIONS

**\*[Read all directions first; refer to diagrams for further aid. Supply list on page 12.]**

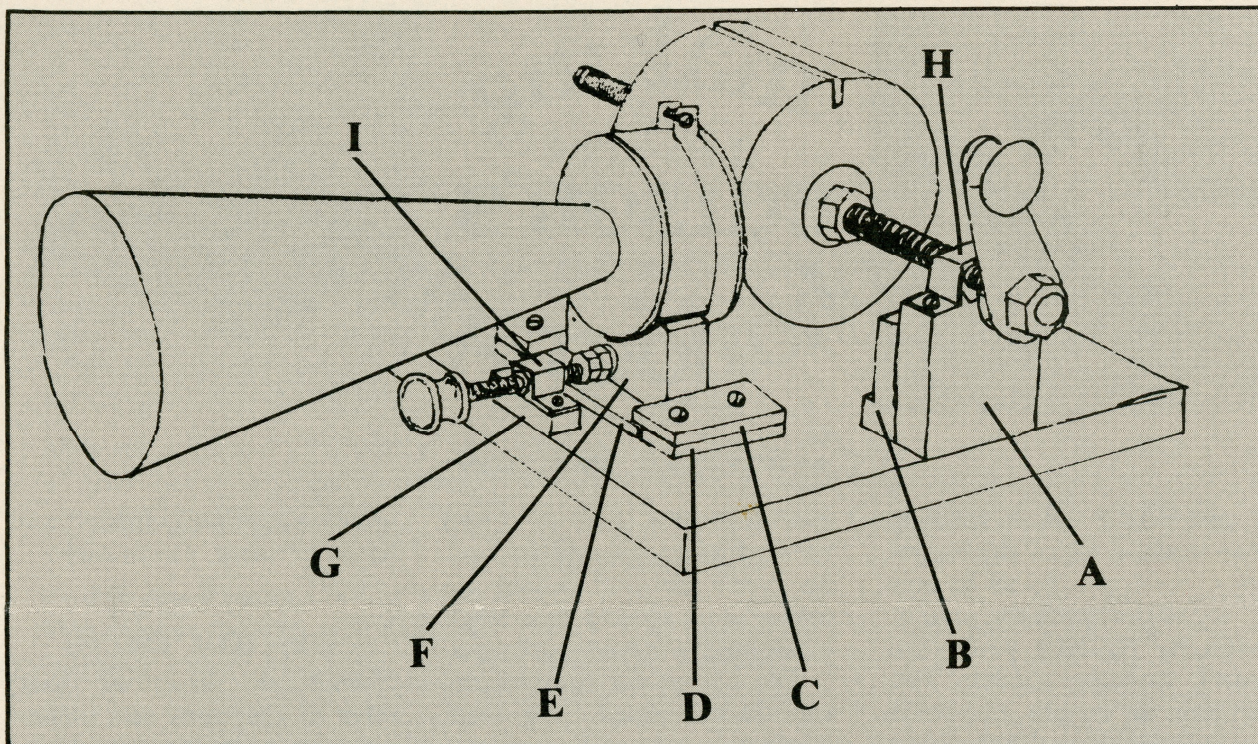
### CYLINDER

Take each of the squares, draw a 4" circle with center marked. Cut out circles and bore 1/2" hole in center of each. Glue together to form cylinder, keeping inner hole free of glue. Set overnight. To approximate size of Edison original, cut 3/8" from one end of cylinder (cylinder should then be about 3-3/8" long). Take shaft and place washer and nut 3-3/4" from one end. Slip cylinder on from other end. Lock firmly in place with second washer and nut. Make sure cylinder surface is perfectly round (a lathe is a useful tool here). Cut a slot lengthwise on cylinder as indicated in diagram, 1/8" deep and 3/32" wide. Set cylinder aside.

### RECORDER/REPRODUCER [R/R]

Take can, remove top and bottom lids and cut to depth of about 1-1/2". Cut mica/plastic to fit diameter of can, marking center with compass. Attach to one end of cut-down can with epoxy. Enlarge compass hole with ice pick and

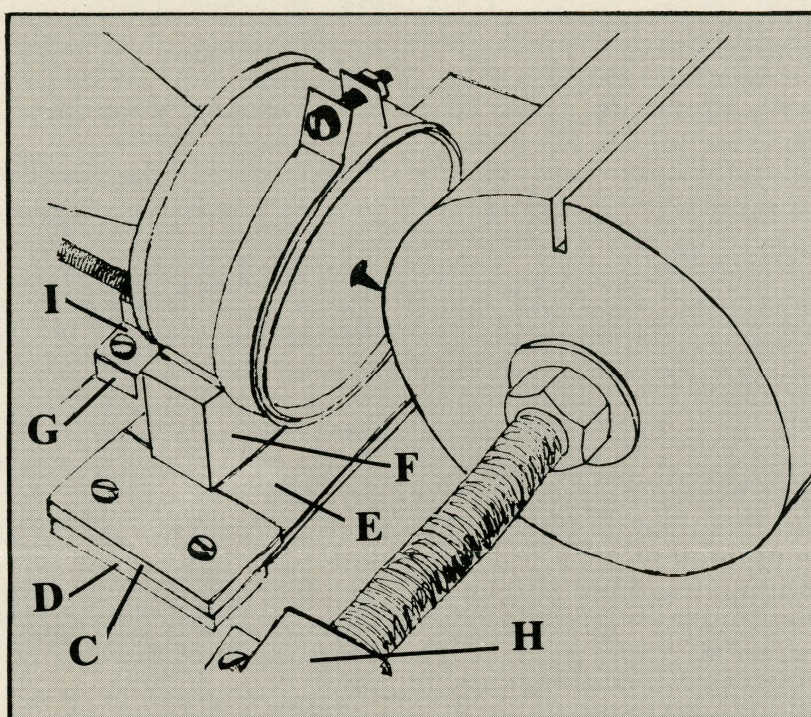




screw in #4 screw to act as needle. Cut out circle of cardboard to fit other end of can. Cut  $\frac{3}{4}$ " diameter hole in center of cardboard. Epoxy (or silicate glue) cardboard to can. Make paper horn from manila folder; 8" long;  $\frac{3}{4}$ " diameter small end; 4" diameter large end. Trim ends and glue small end to opening in cardboard. Set R/R aside.

## MOUNTING

Glue one A block to base, flush with one side of base and  $4\frac{1}{8}$ " from front (2" side of A should rest on base). Glue one B block (be sure indicated cut has been made) to base and inside wall of A (2" side of B should rest on base). Repeat procedure on opposite side of base with remaining A and B blocks so that distance between outer wall of two A blocks is  $8\frac{11}{16}$ " (note: second set of A and B will *not* be flush with edge of base) and all four blocks are  $4\frac{1}{8}$ " from front. R/R will be mounted on EF blocks. Lay E on base. Lay F on E— $9\frac{1}{16}$ " from front of E, centered on sides. Hold can rim of R/R on the front side of

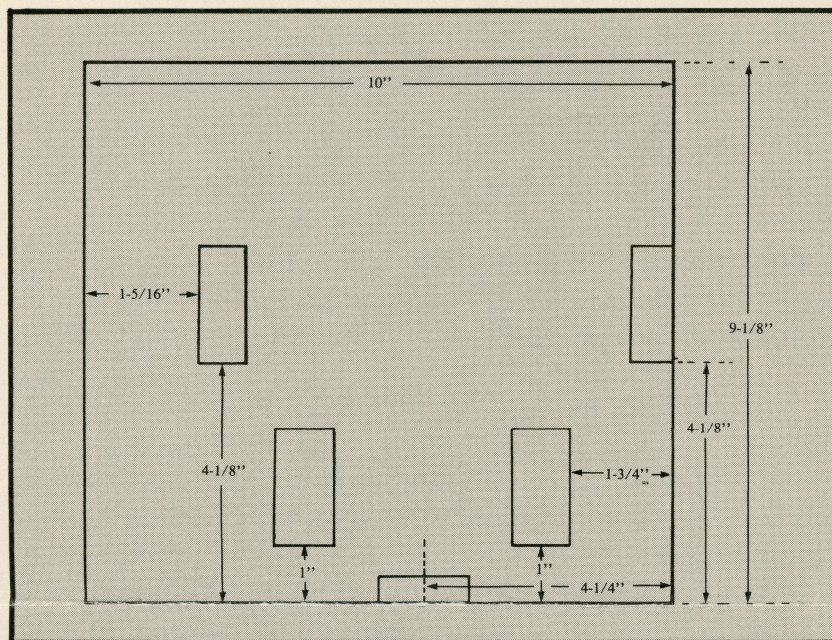


F, raising or lowering it until "needle" is  $2\frac{1}{2}$ " above base. Trace around can rim on F and cut along semi-circular line marked. Discard convex cut area of F. Can of R/R should now cradle in F, with the "needle"  $2\frac{1}{2}$ " above base. Remove R/R and glue F onto E, leaving  $\frac{1}{4}$ " on each side and  $9\frac{1}{16}$ " in front. Clamp and let dry.

## SLIDER-GUIDES

Place one D block 1" from front of base,  $1\frac{3}{4}$ " from flush-support side of base. Place EF immediately to left of D (touching) and set other D block snugly against and to immediate left of EF, 1" from front of base. Both D blocks should be parallel. Glue both D blocks into position. Add one C block to top of D, flush





with outside, overlapping R/R base. Repeat procedure on other side. Drill two holes in C,  $3/8''$  in from outer edges and  $3/8''$  from each end. Screw in #6 screws. Glue G to front edge of base, centered in front of guide block EF. Take  $1/4''$  shaft; slide on washer and screw three nuts halfway down shaft. Rest final nut on G. Locate and drill  $1/4''$  hole into F so that threaded shaft, when screwed through the hole, is parallel to the base and perpendicular to EF. Place shaft through F and place washer and two nuts on the end of the shaft protruding through F. Outermost nut should be flush with end of shaft. Tighten inner two nuts and washers on either side of F against F firmly, but not so tightly that threaded stock will not rotate. Tighten outer nuts against inner.

### FINAL STAGE

Place one nut on each end of  $1/2''$  shaft. Place cylinder and shaft on A blocks so that nuts rest on top of A blocks. Take H, bend and drill as per drawing, securing each nut under bracket to act as guide for shaft. Nut should not move. Screw both H strips into A blocks. Attach I to G in

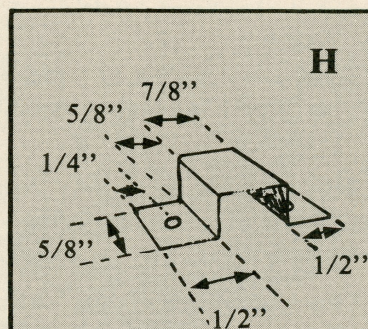
same manner, placing bracket over  $1/4''$  nut resting on G. Add a drawer knob to end of shaft. Assemble hand crank with sheet metal and nuts according to your own design, adding a drawer knob. Mounting of R/R to EF can be accomplished by using epoxy or by creating a bracket of your own design out of sheet metal. Cut felt to fit cylinder, leaving slot open. Glue.

### RECORD

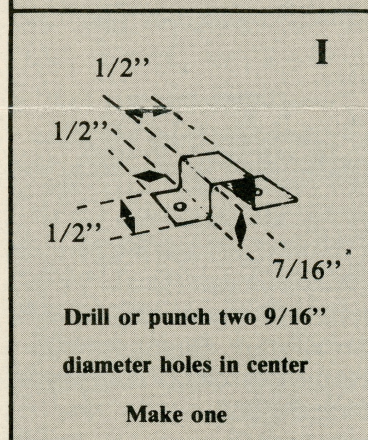
Cut a sheet of tinfoil 3 to  $3-1/4''$  wide by 13'' long. Place one end in the slot of the cylinder and wrap around, smoothing as you go. Secure by inserting loose end in slot and adding wire hanger or cardboard piece as wedge. You'll find a little practice will produce a tight wrap and a smooth surface for recording.

Turn the crank to move cylinder to one end as far as it will travel. Advance the R/R with adjustment knob until needle just contacts the surface of the foil. Turn the crank and adjust further until the needle begins to form a slight groove on the surface of the foil.

Prepare to turn the crank at a uniform speed (65-70 rpm is ideal, moving the cylinder the length of the shaft in about 30



Drill or punch two  $9/16''$   
diameter holes in center  
Make two



Drill or punch two  $9/16''$   
diameter holes in center  
Make one

seconds). You will want to practice so that you can record and play back at the same speed. Seat yourself with the phonograph on a sturdy table so you can speak directly into the horn. With a VERY LOUD and CLEAR voice make a test recording, speaking into the horn as you turn the crank.

### PLAYBACK

After you have made a recording, back up the R/R before rewinding. If you don't, you may erase what you just recorded. Rewind cylinder to original position. Advance the R/R very carefully to a point not quite so deep as for the recording and turn the crank as before. You should hear your voice through the horn. Note: The adjustments are critical, since it is possible to tear the foil or erase the recording very easily. Trial and error will lead you to an expertise with your device.



# SUPPLY LIST

(One 1/4" x 2" x 12" piece of plywood and one 3/4" x 10" x 36" piece of clear white pine will supply wood for pieces listed below.)

## CYLINDER

Five pine blocks 4-1/8" square x 3/4" thick; one 12"-long 1/2" pre-threaded stock shaft; two 1/2" nuts and washers; glue.

## RECORDER/REPRODUCER

One can (juice, tuna, cat food, etc.) 2-3" diameter; 3-1/2" square mica or stiff plastic for diaphragm; one #4, 1/4" self-tapping screw for "needle"; one 3-1/2" square cardboard; one manila file folder for paper horn.

## MOUNTS

Two pine blocks 2" x 2-1/8" x 3/4" (A); two pine blocks 2" x 1-3/4" x 3/4" (B) with 1/2" cut 1/4" from bottom to allow more movement of cylinder (see main diagram); one pine block 10" x 9" x 3/4" (base); one pine block 2" x 3" x 3/4" (F); one piece plywood 2" x 3-1/2" x 1/4" (E).

## SLIDER-GUIDES

Two pieces plywood 1/4" x 2" x 3/4" (D); two pieces plywood 1/4" x 2" x 1" (C); one pine block 3/8" x 1/2" x 1-1/2" (G); four 3/8" or 1/2" #6 self-tapping screws; one 4" segment of 1/4" pre-threaded stock shaft; five 1/4" nuts; two 1/4" washers.

## FINAL STAGE

Two 3-5/8" x 5/8" strips of 20g. sheet metal or tin can (H); one 3-1/2" x 1/2" strip of 20g. sheet metal or tin can (I); six #6 self-tapping or wood screws; four 1/2" nuts; one 1/4" screw; two drawer knobs; 4" square 20g. sheet metal or tin can for hand crank and bracket; 3-1/4" x 13" sheet tinfoil (Heavy duty aluminum foil will work, but is much more delicate and tears easily. Tinfoil can be obtained at scientific supply companies.); 3-3/8" x 13" felt; 3" segment of wire coat hanger or strip of cardboard.

