

Recording Equipment and Its Operation

A review of types of commercial apparatus designed for "instantaneous" recording of sound on discs

By GEORGE J. SALIBA, S.B.

WHENEVER a new art, still in its embryonic stage, is introduced to the public, the development and perfection of that art lies with the amateur who is willing to spend without stint both time and money to satisfy his desire to achieve results in a field which is considered very technical. But he is, usually, handicapped at the outset of his quest by inability to find and procure the proper apparatus with which to conduct his experiments.

And home (or, as it is now known in the trade, "instantaneous") recording, a comparatively new development in the associated fields of acoustics and electronics, seems to be passing through just this dark stage; since the writer finds that, judging by the letters elicited by previously published articles*, enthusiasts of this art are experiencing inability to obtain the necessary materials with which to carry on their work.

Today the handicap is due largely to the fact that manufacturers of home recording equipment are averse to advertise extensively; not yet realizing the magnitude of this relatively new and interesting field or the interest that has been aroused by previously published material, and the repercussion—its application.

Since this equipment is usually a side-line, it is the amateur—the one who should be

* The author refers to his articles, "Instantaneous Recording of Sound on Discs," in the June, 1931, issue of RADIO-CRAFT, and "How to Improve the Quality of Radio and Personal Recording," in the succeeding July issue. See also the article, "Home Recording of Radio Programs and Speech," in the December, 1930, issue.—Tech. Ed.

given every possible aid—who is made to suffer. To sweep away this curtain of secrecy, it is the purpose of this article to describe in considerable detail, and with an eye to their practicability, some of the equipment now available on the market.

A Modern Recording Machine

A particularly interesting recording machine (Fig. A) is manufactured by G. J. Badgley & Co. While intended for use with blank ungrooved records, such as aluminum,

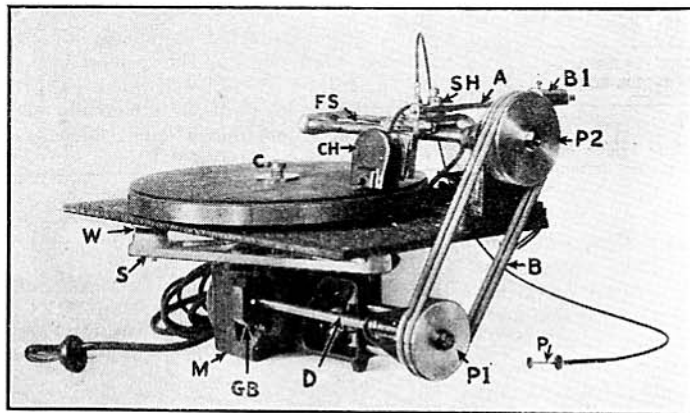


Fig. A

Detail of the recording unit shown in Fig. B; it will operate on plain or grooved discs. A special recording head must be used for the latter. The plunger P is used to give great accuracy in raising and lowering the head. The components and their functions are described in the text.

it can be used also for blank pregrooved records simply by adding an ordinary phonograph pick-up equipped with the proper weights. The turntable motor M is of the commercial phonograph type; slightly modified in order to drive the cutting head CH across the face of the record.

The gear box GB contains two helical

which is mounted on the feed screw FS. This feed screw has 64 threads to the inch; but the feed screw-turntable gear ratio is such that 96 lines to the inch are cut on the record.

To give rigidity to the motor, the spider S upon which the motor is mounted is made very long; and it is separated from the mounting plate by means of rubber cushions or washers W, to prevent motor vibration being transmitted to the turntable.

A threaded clamp C is used to prevent slippage of the record during recording. This clamp is purposely made with a left-hand thread to offset any tendency of the turntable, driven in the right-hand direction by the motor, to loosen it.

The weight on the recording head can be varied by sliding along the weight-rod A, the weight B1. The rod also is movable, so that the weight can be made to hang directly over the cutting head if necessary. This head is guided across the face of the disc, by means of a half-threaded coupling which is kept in mesh with the feed-screw which is kept in mesh with the feed-screw by means of a spring contained in the spring housing SH. A very unique feature of the apparatus is the plunger P.

The motor, although it has enough torque to make a twelve-inch record, has a difficult time starting with the cutting head on the disc. Now, by the use of the plunger P

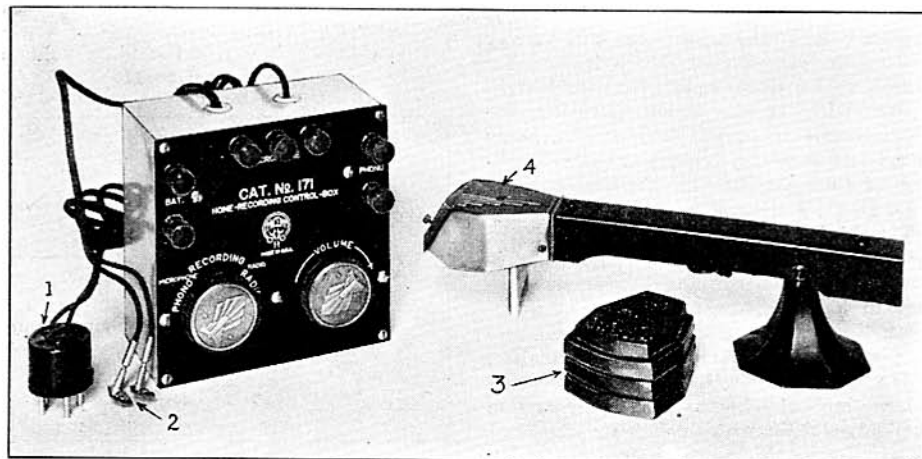


Fig. C

This apparatus, with a microphone and its battery added, is designed for permanent attachment to a receiver, for recording and reproduction. Adapter 1 and lugs 2 connect, respectively, at the detector and power stages. The pick-up-recorder 4 is loaded with the weights 3, as required.

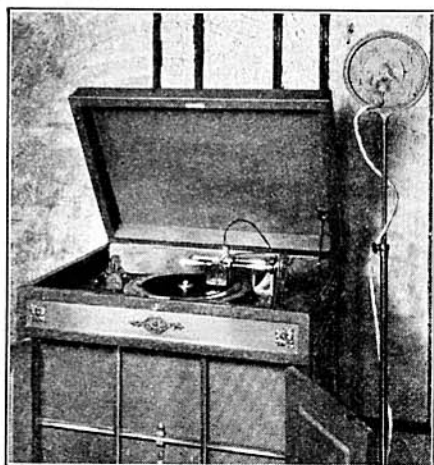


Fig. B

A studio-model recorder; the reproducing pick-up is at the left of turntable.

the following procedure is carried out: While the motor is at rest, the cutting head is placed at the "start to record" point on the blank record. The plunger is then pushed, and the cutting head now may be raised from the record by pushing in plunger P; after which the motor may be started. When it has reached normal recording speed, the plunger is released, thus replacing the recorder on the record.

This machine cuts a good, even groove with no apparent "line periodicity" (uneven spacing—not uncommon in some makes); and it is especially adaptable for studio work.

Fig. B shows the complete studio recording apparatus utilizing this machine. It must be remembered that excellent results are obtainable only when a good two-button microphone and a good three-stage transformer-

must be isolated in another room of the studio suite. (The design of this assembly is in accord with the specifications which appeared in the previous article, in which, particular attention should be given to Fig. 4, pg. 29.—Tech. Ed.)

The Recordovox

The Pacent Model 171 "Recordovox," shown in Fig. C, is made especially for home recording, to use only pre-grooved records; this instrument does not record on non-grooved metal records. Besides making the records, it reproduces them as well; and, once this apparatus is connected to the radio receiver, it need never be removed.

In order to use the "Recordovox," a radio set, turntable and microphone are needed. To use a single-button microphone, only two connections are made, to the center post

The recording head is connected to the terminals marked "Phono." The five-prong adapter 1 (connected by a cord to the control box), is inserted in the detector socket of the radio set, and the detector tube is placed in the adapter. The single-prong adapters 2 (furnished with the instrument), are placed on the plate prongs of the two output tubes; which then are replaced in their sockets. The remaining cord from the control box plugs into the receptacles incorporated in these adapters. This completes the installation. For radio reception only, the selector switch is turned to "Radio," and the set tuned in the regular way; and to record a radio program the selector switch is set at the "Recording Radio" position.

The turntable motor is turned on, a home-recording needle is inserted into the recording head, and the latter is weighted with one or more of the weights, 3, (supplied with the kit.) The radio set is then tuned to the station whose program is desired for recording, making sure that the volume control is at a fairly high level. Best results, of course, will be obtained with all three of the weights; but, very often, the phonograph motors available do not have sufficient torque to pull the turntable around when the head is thus weighted, and a lesser number must be used.

When it is desired to make microphone recordings, the volume control of the radio set is turned to the position for minimum volume. (If a signal still is heard, the receiver must be detuned.) The selector switch on the control box is turned to "microphone recording," and (after the cutting head is set as described above), the apparatus is ready for the recording.

The microphone, if of the single-button type, should be held in a true vertical position and about one inch from the lips of the speaker, who should use a tone slightly louder than ordinary conversation. If squealing is noticed, the microphone should be kept away from the loud speaker. In

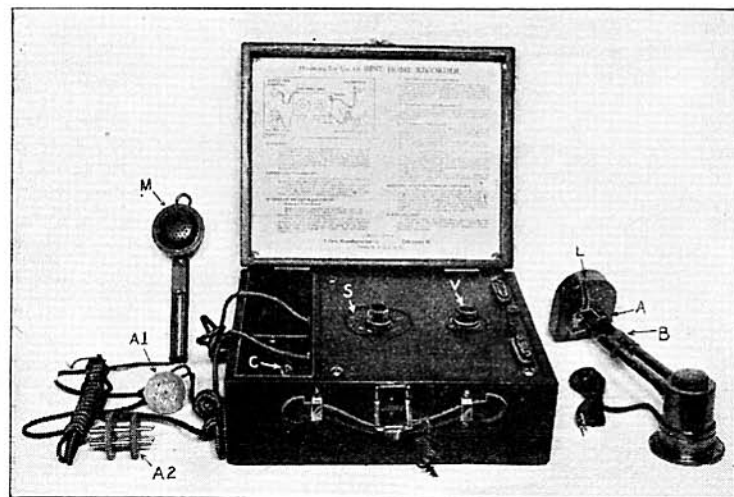


Fig. D

The Best Home Recorder; left, microphone M, with adapters A1 for connection to the input, and A2 (two plugs) for the output of set; C is a cap for use with a screen-grid detector; S, switch; V, volume control. The pick-up, at right, is described on page 118.

or resistance-coupled A. F. amplifier are used. The standard impedance of the cutting head is in the neighborhood of 4000 ohms; however, it is obtainable with a unit of any standard impedance.

The cabinet contains, for recording and playback, a complete amplifier and current-supply system, consisting of two stages of A. F. using type '27 tubes, and a power third stage using push-pull '45's; the rectifier is an '80. An indication of the sound level at which the recorder is working is given by a dynamic reproducer contained in the cabinet. The microphone, of course,

and either one of the outside posts marked "microphone"; and a $4\frac{1}{2}$ -volt "C" battery is connected to the posts marked "Batt." If a two-button microphone is used, connections are made to the three microphone binding posts; and a 6-volt battery is required.

Fig. E

Set-up of the new Presto home recording kit; shown in recording position.

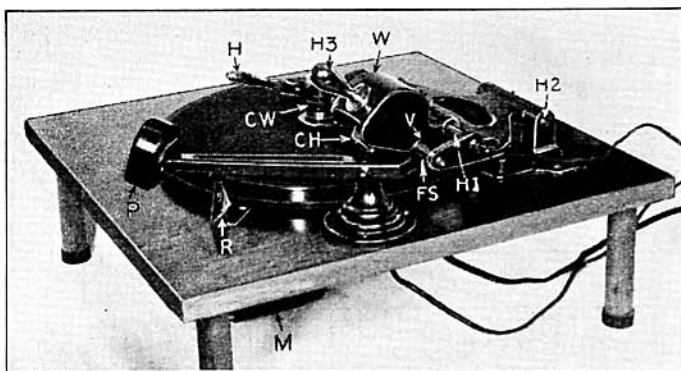
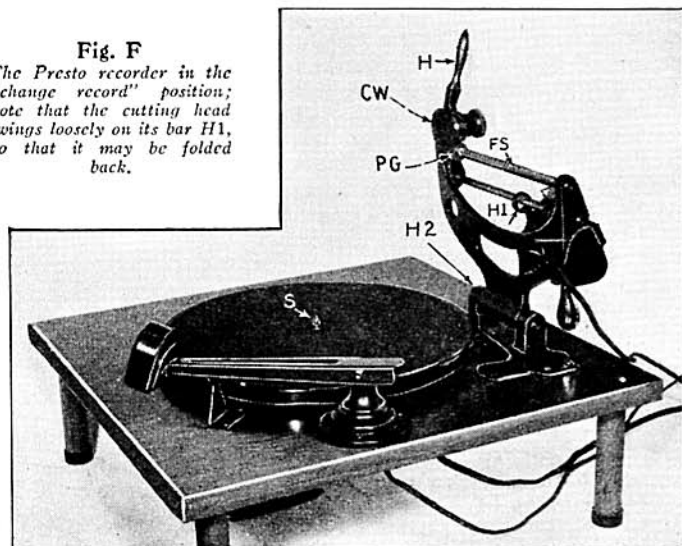


Fig. F

The Presto recorder in the "change record" position; note that the cutting head swings loosely on its bar H1, so that it may be folded back.



fact, for best results, the microphone should be in a room separate from the radio set and with the intervening door closed.


On playback, the previous instructions for detuning the radio receiver and setting the volume control at minimum volume are followed; and the selector switch is set to the "Phono" position. The volume of the record reproduction is regulated by means of a knob on the control box.

(Continued on page 118)

To reproduce, with the equipment shown, the cutting head is turned back on H1, and the pick-up P, here shown in its rest R, is placed on the record. CW is clamped to the motor's spindle S and drives the feed-screw FS.

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more expensive (though some manufacturers sell it for less than the "H") and, also, the "H" type can be constructed from ordinary potentiometers, the former is not as common as the latter.

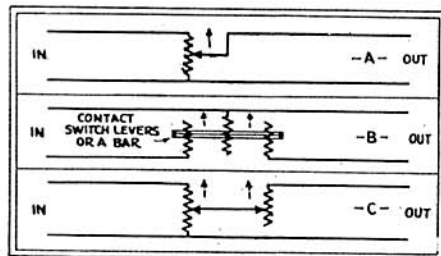


Fig. 13

The simplest attenuator, the "L" type, is shown at A; the "T" type at B; and the "H" type, which is more common at C.

Recording Equipment

(Continued from page 81)

New Best Apparatus

The Best Manufacturing Co.'s recording apparatus, shown in Fig. D, is very similar to the "Recordvox" except for the method of weighting the recording head, which is very ingenious. No external weights are added to the recording head. When the unit is to be used for recording, the lever L is pushed over to the side marked "R," locking the recording head and preventing it from swinging about a joint A. For reproduction, the lever is moved to position "P," and motion takes place at joints A and B. The balance of the recording head is such that, when its weight is fully applied to the record, it exerts enough pressure to make a good recording. This novel method of increasing the effective weight of the head possesses an advantage in that no weights are required; at the same time, it has the disadvantage that, should the turntable motor develop insufficient torque to pull the record at a constant speed, because of the great weight of the head, a poor recording will result. Under this condition, the lever is dispensed with, and weights are substituted to mount on top of the recording head. The method of installation and operation are the same as described for the Pacent unit.

Late Model Ungrooved-Disc Recorder

In Fig. E is shown the newest development in the way of home recording equipment, of Presto Machine Products, Inc. In this one kit are contained all the mechanical units (cutting head, feed-screw, worm, worm gear, etc.) necessary for recording on blank ungrooved discs. This entire mechanism is so constructed that it can easily be lifted from the turntable, for changing records, by simply pulling upward a handle, H.

Installation is very simple. The only requirement is to fasten the plate to the motor-board, first making sure that the clamp-worm CW will couple easily to the spindle of the turntable when the handle H is brought down. The clamp comprises a double-thread worm that is driven by the spindle of the turntable. This worm meshes with a pinion gear (PG, Fig. F) mounted at one end of the feed-screw shaft FS. This screw has 12 threads to the inch;

the threads being of the "butterfly" type. Since the ratio between the worm and pinion gears is 8:1, and the feed-screw has 12 threads to the inch, the number of lines per inch that will be cut into the record will be 96.

The cutting head is weighted with a 3-pound weight, W, the bottom of which is recessed and lined with leather at V, so that it will mesh in noiseless and proper manner with the butterfly thread of the feed-screw.

The Presto recorder is supplied in kit form; and contains, besides the cutting unit, a control box, microphone, microphone pre-amplifier, using a type '27 tube, pick-up and turntable. The operation of the control box (not shown here, but illustrated in the June issue) is similar to the above-mentioned control boxes, except that when the knob is turned to "Phono," the phonograph pick-up is cut into the circuit.

The cutting mechanism can be used with either the Pacent "Recordovox" or the Best control box, by simply inserting the recording head leads into the receptacles marked "Phono." It must be borne in mind that this unit is not suitable for the playback; and, when the latter connection is desired, it is necessary to remove the recorder leads and substitute pick-up leads.

This about completes the description of the home recording equipment now on the market. There are many other phases, of this fascinating and rapidly growing offspring of the radio and phonograph arts, which so far have not received the attention of any books or magazines. In due time, the writer will consider each of them in their proper sequence. Meanwhile, if there are any questions in the minds of readers of this department (A huge stack of mail attests that there are—varied and numerous.—Tech. Ed.), answers to them may be obtained by writing, enclosing a stamped return envelope, to the attention of the Sound Recording Department of RADIO-CRAFT.

Fifty-Watt Amplifier

(Continued from page 97)

former PT2 for the plate supply, and also makes it possible to use much smaller condensers without danger of breakdown due to voltage surges. This design is desirable when mercury-vapor rectifiers are used.

Operating Data

The operation of the amplifier is not different from that of the usual low-power push-pull stage; but it is necessary that the tubes be balanced, if long life is to be expected. The split secondary of the input transformer T3 contains a 400-ohm potentiometer R13 for this purpose; it should be so adjusted that the plate-current swing during operation is the same in each tube. Loss of emission in one tube or softening of the tube may be readily indicated by use of the two meters M1 and M2 in the jacks J1-J2, J3-J4, which should be mounted on the panel.

It is essential that the full filament voltage be applied to the rectifier tubes V7, V8 if they are to have long life; lowering the filament voltage increases the internal

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