

THE recorded wax is numbered and carefully packed by the recorder. It is then sent away to the record factory, where it is given an electrical conducting face, being metallised with finely powdered graphite applied with a soft brush. This process requires extraordinary care and skill. The wax is then polished, all traces of surplus powder are removed, and it is left with a very highly finished surface. It is then placed in a suitable holder so that it can be lowered conveniently into an electro-plating bath, where copper is deposited upon the metallised surface of the wax. This thin deposited copper shell is then stripped off the original wax and becomes a "negative," having the recorded music grooves standing up above the surface of the copper shell.

This "master" negative shell is next filmed by a secret process for a second electro-plating bath where copper is grown on to the side bearing the recorded lines. This second deposited shell is stripped off the first and is a "positive" or "mother" shell, having the sound grooves as in the original wax. The "mother" shell is then prepared in the same way as the "master" shell, placed in another electro depositing bath, and the process repeated so as to obtain a working matrix shell which is a "negative" and has the recorded grooves standing out from the face of the shell. From the "mother" shell a number of matrix shells may be grown so that they can be sent to different parts of the world for record-pressing purposes.

A matrix shell, after nickel plating, is very carefully polished and then mounted on a heavy metal disc, and a central hole is accurately bored to ensure concentricity of the records which will be pressed from it. It is then screwed up into the dies of an hydraulic record-press. (see Fig. 2).

A few sample hard records are obtained from the three or four shells, of different performances of the same musical item, and these are submitted to the most searching musical and technical tests so as to ensure that the commercial records shall be as perfect as possible from the artistic, surface noise, and wearing quality points of view. Specially trained girls are engaged constantly upon the wear and surface testing of these sample records. One sample is settled upon as being satisfactory for wear and musical technique, and this shell, after passing the copyright investigation, is approved for the manufacture of records, for listing in the catalogue, and for advertising.

Commercial Manufacture of Records.

NOW let us consider the actual processes in the manufacture of the "hard" records as sold to the public.

The crushing load of the needle point on the groove at the commencement of playing is of the order of 20 tons per square inch, rapidly decreasing, as the needle wears, to about 2 tons per square inch at the end of the record. It will be realised that the record material

must be sufficiently tough to withstand these crushing forces.

The record ingredients consist of shellac, carbon black, flock, slate powder, copal and resin.

Many tons of raw shellac are obtained every week from the Tacchardia lacca insect in India, and are shipped to Hayes to be made into records.

The various materials are all ground up into extremely fine powders, which

culits" ready for the record-pressing operations.

The hydraulic record press consists of a pair of heavy steel jaws in which the two working matrices for forming both sides of the record are fixed. These two dies can be alternately heated and cooled rapidly. A pin projects through the centre hole of the lower matrix in order to form the central hole in the pressed record.

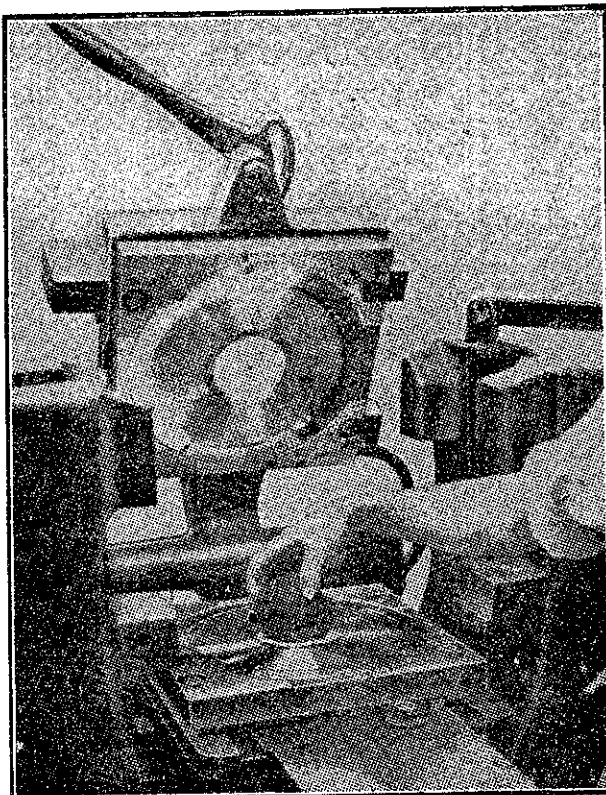


Fig. 2—Hydraulic record press, showing top and bottom shells screwed to the dies, and a lump of plastic material being placed on the lower label prior to closing the press.

are carefully screened, all traces of foreign matter being removed, and they are then mixed together in large rotating mixing machinery in exact proportions according to a secret formula which has been developed after years of experience by the record experts.

The mixture is heated up and worked up into the form of dough, which is transferred, in thick sticky slabs, to a water cooled calender, which feeds it out in wide plastic strips. These strips look rather like thick black blankets. The "blankets" are then further cooled, and are finally rolled out in thin brittle sheets, which are cut into small slabs of the size of large "bis-

The general sequence of operations performed by the pressman is as follows:—

The dies of the press are first warmed up, while the cooled "biscuit" is placed on to a hot table and is softened to the desired plasticity. The record labels are next put into position on the top and bottom matrices, the "biscuit" material is rolled up into a lump like Plasticine, and is placed in position over the centre pin of the bottom die (see Fig. 2).

The press is then closed, hydraulic pressure applied, and cold water is turned on to the hollow dies. When the dies are sufficiently cooled the press is opened and the record removed and

placed under a flattening weight to be dealt with when the press has been re-loaded for the next cycle.

In this condition the record is fit to be played, but it has to be examined for blemishes and the rough edge has to be polished to a smooth finish. The records now have to be placed in their envelopes, and are passed along to the copyright stamping section, where the necessary stamps are affixed. The records are then boxed up in batches, transferred to a huge store, from which they can be distributed rapidly to motor lorries or railway vans and so reach your local dealer. Over half a million records leave the factory every week.

This, then is the story of your shining record, and now, when you enjoy its music, you will appreciate, perhaps, the tremendous amount of research, experiment and organisation which have been put into the making of it.

Tone Arm Balance

HOW often is it stated that one of the advantages of grammo-radio or of electrical gramophone reproduction is the fact that record wear is reduced.

The reason put forward for this is that a pick-up does not require such a great point pressure of the needle upon the record, that with most pick-up arms this pressure can be easily regulated, and that the actual grinding of the surface is reduced.

This sounds as though it might gladden the heart of grammo-radioites, for the cost of records is the biggest item of upkeep; but it is only a half-truth.

Record wear can be reduced; the important thing to remember is that sometimes the reduction in wear is so slight as to be not worth the trouble, and that sometimes the reduction in wear can be obtained only at the expense of quality.

The pressure upon the record surface in an ordinary mechanical-reproduction gramophone is in the nature of several pounds per square inch. It should be constant, but with most records it is nothing like constant; and this is often the cause of jarring on very high, very low, or very loud passages.

Obviously, then, there is a certain minimum pressure beyond which one cannot safely go. Below that minimum, very bad results will be experienced, with generally lower voltage swings delivered in the case of a pick-up, and in bad cases the needle may jump the groove. Beware of this, then, when adjusting a counterbalanced arm.

The tendency is all towards electrical recordings of greater brilliancy, and with most of the new records a pressure upon the record, in the case of a pick-up, not much less than that with an ordinary soundbox will be needed; so there is no saving in record wear.

With adjustable tone-arms the pressure can be reduced for the more valuable records.—N. Bell, in "Wireless Magazine."

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