聽寫倒英文

趙元任

TRANSCRIBING REVERSED ENGLISH

Y. R. CHAO

In a special record of Basic English, No. CC. 17596-2 of His Master's Voice Company, made under the direction of C. K. Ogden and read by Sir Richard Paget in imitation of George Bernard Shaw's voice, there is a strange, unintelligible passage occupying the last 72 seconds of the record, which I was told was ordinary English which had been recorded backwards.

To find out what the real English was, the obvious thing to do would be to contrive to run the gramophone backwards, so that the direct English would come out again. But it occurred to me that a much more interesting thing to do would be to try to transcribe the reversed English as it sounded, and if the transcription was correct, it ought to be English again if I read the transcription backwards. So I refrained from trying to get the original by turning the record backwards, and started to transcribe the passage as it was.

There were a few words which could be easily deciphered at once. Towards the beginning (phrase V in the "D. of R." transcription below) there were words which sounded like [ɦ͡ɔːʃ˧˥mæʃ˦˧], which reversed would be [ʃæm˥˧ʃɦ͡ɔː˧˩], and as the previous (direct) part of the record was talking about "false Shaws", this must be "sham Shaws" (with the *s* inaudible). Then there was a phrase which ended in a syllable [lɔː˥˩] (T), which reversed would be *all* [ɔːɪ˩˥]. Finally, there is an isolated word [l̃ːɜw˥˩] (K), which is obviously the interjection *well*.

But the transcription of most of the sounds proved to be a much harder task than I had anticipated. As the usual phonemes of English could not be recognized simply, the transcription had to be done entirely in terms of particular phones. In addition, the intonation was given, only approximately, in musical notation, from which it was hoped that the expression of the original could be reconstructed. As the syllabication sounded all mixed up, the letters were all spelt together except for pauses,

and the musical notes were set opposite the vowels or syllabic [n̩], [l̩], etc. The time values of the musical notes were even less accurate than their pitch, and voiceless consonants were not given rest values except when very long.

When the direct transcription was finished, the whole thing was copied backwards, and great was my disappointment when it began to say: "pɒjøˑmɹɑʻp, sɪɡʃɪɡylɵwɣdspesəɣ̃nɣnn̩, (?) ɔt-ʃfuxəɣ̃nɪiɲʃt-ʃ", which was no nearer King's English than the "horsh mash" business for "sham Shaws". The two minus's failed to make a plus. The only additional words I recognized from the twice reversed English in addition to *sham, Shaws, all,* and *well,* were *recognise,* which I had down as [ɹExɣɡŋʌɪn], and *a rather,* given as [ɒʁ(ɡ)ɑːɣ̃ɜː]. But I did not have to reflect long to realize that more could not very well be expected. In the course of transcription, it was felt and confirmed by later statistics, that the vowels could be more easily gotten than the consonants, and for the consonants, the manner of articulation could be more easily gotten than the place of articulation. Unfortunately, it is precisely the place of articulations of consonants that is most important, so it was no wonder that most of the transcription was unintelligible.

The next step I took was to learn the reversed transcription, or the would-be English, rhythm, intonation and all, until I could say it without a hitch. Then I dictated the whole thing onto a dictaphone record, and listened to the result at some distance. The idea was that if the wrong consonants were made indistinct by being reproduced thru a dictaphone and heard at a distance, the vowels, the rhythm, and the intonation would be given a chance to suggest to the imagination English words which would make sense. The result of this was that the previous guesses were confirmed, and a few more words and phrases were heard. Of the latter, however, a good deal was heard wrongly. Thus, *give you a warning* (D) was heard as *if you all want it, until you recognize the voice you remember* (I) as *can't you recognize......voice were of men* (construction unintelligible), *if you have never heard me* (J) as *if you have never heard of it, I can give you* (L) as *I think if you,* (li)*stening to an aim*(*iable*) (Q) as *since your name,* and *with a rather* (R) as *but a rather.*

At this point I gave up the phonetic method of deciphering as a total failure, or at least a failure of the total, and proceeded with mechani-

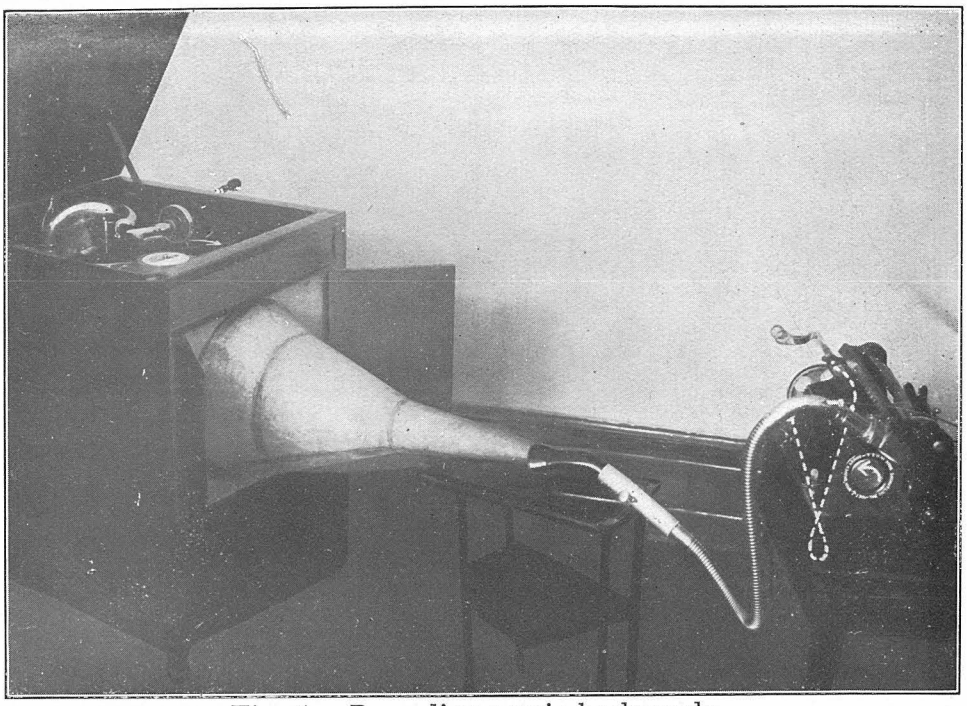


Fig. 1. Recording music backwards.

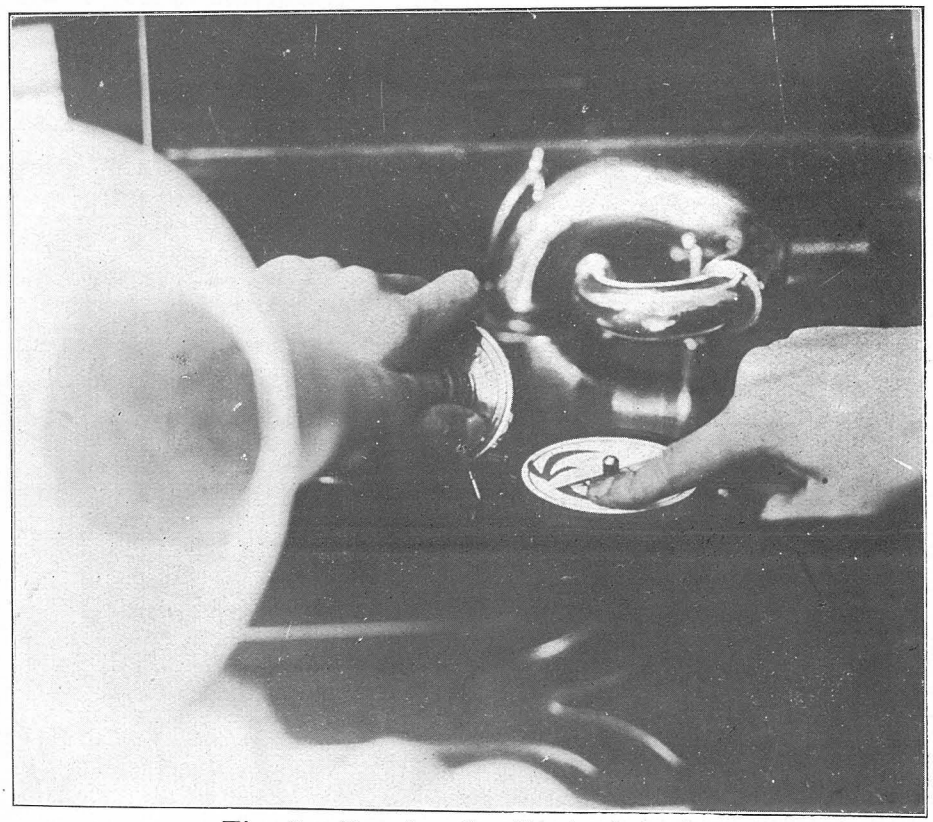


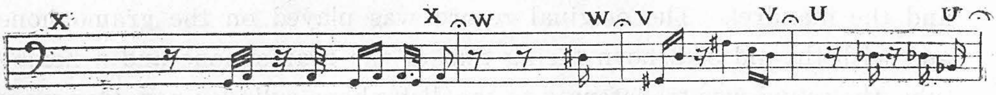
Fig. 2. Turning the disc backwards.

cal methods. As it was no simple matter to run a gramophone backwards and have the needle in the right direction, an indirect method was tried first. The dictaphone was run backwards by substituting a cord with one X-twist in place of the simple O-loop belt which connected the motor and the mandrel. The original record was played on the gramophone, and with the aid of a horn facing that of the gramophone and a flexible tube, the sound was transferred to the dictaphone cylinder now turning in the reverse direction. (See Fig. 1.) When this was finished, the usual O-loop belt was replaced and the direct English was reproduced. From this mechanically twice-reversed record, I succeeded in deciphering almost all of the original text.

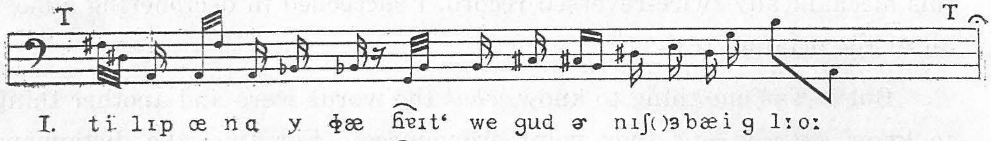
But it was one thing to know *what* the words were and another thing to know exactly *how* they were pronounced. For this, the dictaphone record was not clear enough. So I took up the original record again and tried to play it on the gramophone. To do this, I had the machine run down as far as it would go. The sound box was taken down and held by the left hand to the small end of a small horn over the record in such a way (see Fig. 2) as to make the needle rest lightly on the record pointing counterclockwise. The record was then turned in the reverse (counter-clock-wise) direction with one finger of the right hand, which could be continued until the spring became too tight (reversing having the effect of winding), when it had to be run down again. The speed could not of course be kept constant. But after a little practice, I could keep it much more nearly constant than I had expected.

The text of the whole passage is given below in two forms, the first in the reverse order, and the second in the English order. In each form, the first line is the first transcription made with the machine running normally, the second line is the transcription made with the machine running backwards, that is, when the English is heard. In the second form, the English orthography is also given. To avoid confusion about the meaning of "reverse", the passage as it sounds when the gramophone runs normally is said to be in the D. of R. (direct of reverse) order while the other order will be known as the R. of R. (reverse of reverse) order.

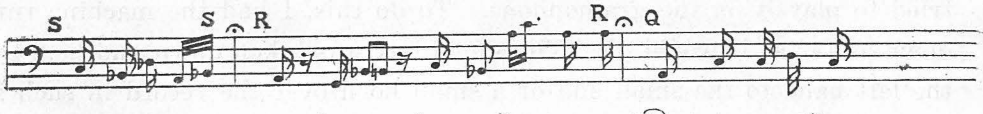
D. of R. Text



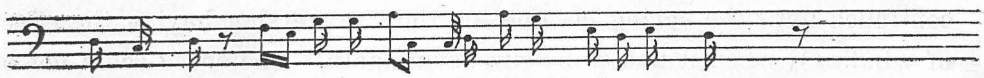
I. D. of R. hearing. ɪ t(ʔ)ɪ(z)orʌbemmu m̥əsm̥əs(h)æʃ ĥɔːʃ m̩ːæ ʃ (h)ɔkmiɐɒ
II. R. of R. hearing. d̥ɪtsɪ zgɪ ɾʌvɛnːuʍ z̥m̥ət n̥æ f z̥ĥɔːʃ mːæ ʃ z̥ət̩s ɔʻpɯɪ ɑ



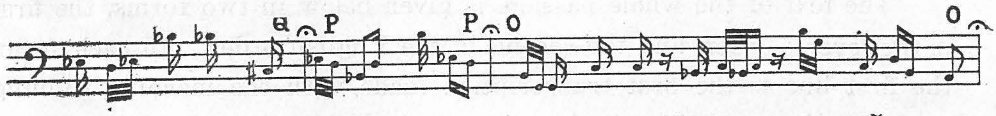
I. tï lɪp œ nɑ y ɸæ ĥɐɪtʻ we gud ɚ nɪʃ()ɜbæig lːoː
II. z̥d̥iː psɜ ðɐ ið tæ ĥɐɪ hᵢuj muʍ l̩ piʻpɜðɐið lːoː



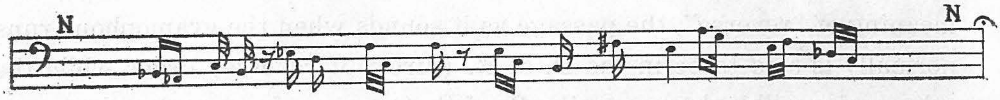
I. ɪnnihɛtndɪs ɔʊkʃỹwiɐk ðɪsb ɜːðɑː(g)ɐɒt u ĥãvdwi(ʒ)n ɪtðɪ
II. imzɪtɛðnːeð sɪ̥ov ʃɪriɐtn̥zɛl̥p ɜːðɑːɹ ɑðɪw nĥew ɪ t n̩vɛsvə



I. nəmbəʃ nes tuwʊruθe njɪnnoʊʃ n̩nɪ stɪnɔwɪ(h) æ(k)
II. nəm l̩ʻtnɛʒd dluo̩ l̩bəɪmiennəuʻtŋːɪns ɪlɑuj ʃtæ ð



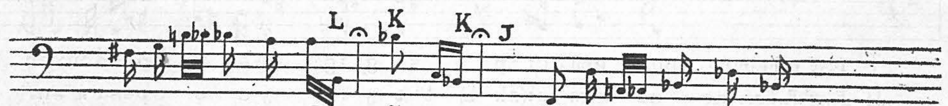
I. l̩liːtʻuɪlɪs nɑ(t) (ŋ)gɹʌ(ʒ)tiwʊns ɑɔgudɪsnɟɪ ðɩno ʊʃ (ʔ)iɐ p ɪðienwuj
II. lː iː fujlɪʻtnɐ n ʊ e dtɪuo̩ls ŋ̊ɔːɹː zɪdiː psəðɔ ʊʃ tɪʌʍkibiem uj



I. (k)ĥændɪlɒh ɔjĭ (ɸ)ɒm (ɸ)æs tiẽngɤʃ nɪ sniliɪskguʃ nær
II. n̥ h ĥæmdiɾɒh ʌ ib sɑm tæð ɪɩlvɪtknɪtsnɪliɪf ʻuʒdnæ

I. ɪtɲi ɔ·(?)pɤȶɪsi lɪptɪ ʌɹʌɩ(ʒ)tuwɪʃ hɒɸɸɪ ʃplɛtliʉkəd

II. ŋɪtnɪ ɔ ʻpəsɪdɪ ɾevzɪ ʌː ɪ hᵢu jʃtɒʍfɪ ʃplɛhlɪwtəð

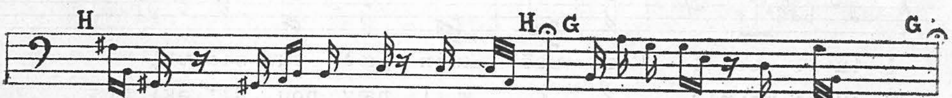


I. nɪsɪgwɪpidmɪs ɪʌ(?) ɪ̥̃ lɜw tɪ̥mdĥɜ̥ː əbən ðɑ t wɪʃdɪ

II. tnɪhə ujvignɪʻkɪʌ lː ɛ·w ɪ̥m̥dĥɜ̥ː əvɛn væḥujfɪ

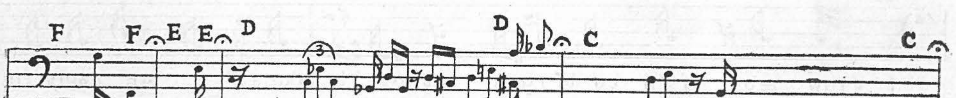
I. wuuʃduʃbujðhaoxs· tɔ(?) n̥nɛmbərwispiɔpʊdnɪʌŋgɤx ɛɹu ɪsnɑ(?)

II. uʊʻduʻtuɹɑtɒʍ ʻtɐb ə̥b̥m ɛm ərujs̥ ɪɔvəðzɪʌngəʻkɛɹujlɪʻtnɐ



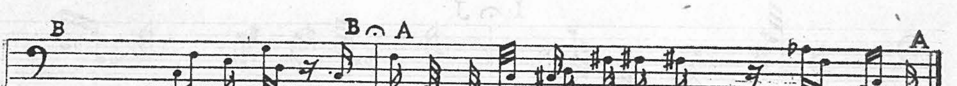
I. ti lɪp tə̥ ɣ̃ŋgɪʃtʊtpʻɘʃ bærwʊɪk ɪ̥tɤdɪswʊʊ ðætniuk

II. diː ps əðʒnieʃtʊt sɐʒd̥væh uj ɪ̥tḷkəfɪduọn væhlɪw



I. ə̃eʊ tɪ(?) tɪ̥nʊʊ wɔuipɪgᵻ ɪstɪd pʃ tʃʌɹ pʃtʌp

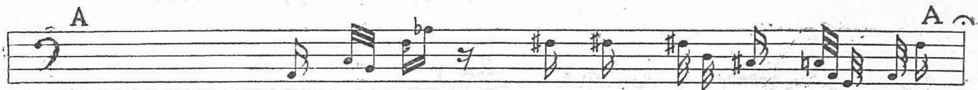
II. ? ? ŋ̥ɪ̥nɔː wʌujvɪgᵻ imtel tsʌɹ fʻtʌb



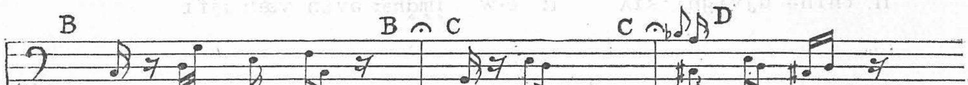
I. ʃtʃ ɲiɪnðəx ʊ fʃt ɔ(?) n̥nʌnðəsęp̥sdɤwelygɪʃgi̥s pʻɑːɹmərɹɒp̥

II. ʃɪ̥l̥gŋ ɪ n əʻkʊopsfɔ n̥ː ə m ɪseps· ə u jvɪ gɪʻt(tks) ɑː mə i ɑ

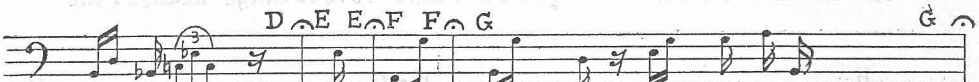
R. of R. Text



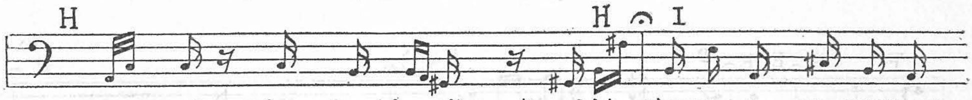
I. D. of R. hearing. pɒj øᵊmɹɑː ʻp sɪ gʃ ɪg ylɐw ɤd spęsəðnɤnn̩
II. R. of R. hearing. ɑi əm ɑː(sk t) tʻ ɩ g ɪv ju ə spesɪm̩ ən̩ː
III. English. I am a!sked t o give you a spesi men



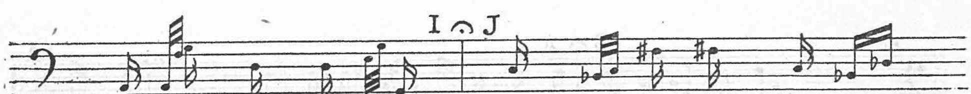
I. (ʔ)ɔt ʃfʊ xəðn ɪiŋ ʃ tʃ pʌt-ʃpʌɹ ʃ t ʃp dɪt sɪ gɾ ɪp
II. ɔf spoʊkʻ ən ɪ ŋglɪʃ bʌtʻ fʌɹ s t let mi gɾ ɪv
III. of spo k en English ; But fi rs t, let me g ive



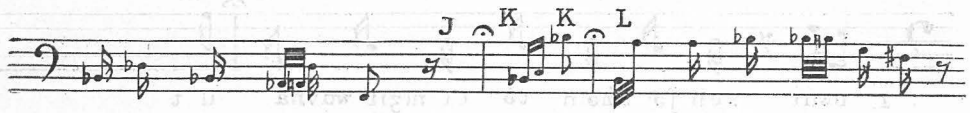
I. iu ɔ wuʊnɪt (ʔ)ɪt ʊeə̃ kuin tæð ʊuw sɪd ɤt-ḷ
II. ju ʌ wɔːnɪŋ ? ? w ɪl hæv noʊ dɪf əkḷ tɪ̥
III. you a warning. ? (well(?)) w ill have no difficulty.



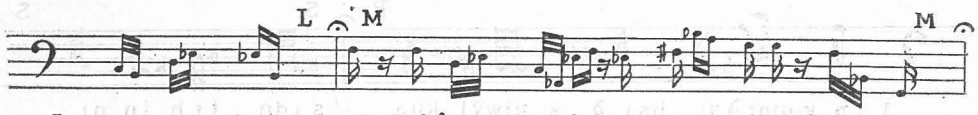
I. kɪuw ræb ʃɐʻp tʊ t-ʃ ɪgŋɤ̃ ət pɪlit (ʔ)ansɪ u ɹɛ xɤgŋʌɪn
II. ju hæv dʒɐs tʊ tʃeinʒ ðə spiː d ɐntʻɪl ju ɹɛkʻ əgnʌɪz
III. You have j ust to cha nge the spee d, until you rec ogni ze



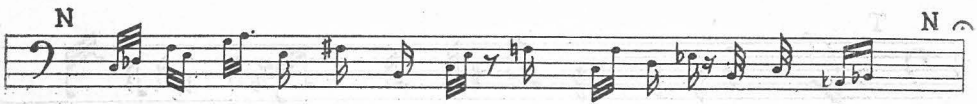
I. d ʊ pɔips ɪw rəbmenn̩ (ʔ)ɔt-sɪ xoah õ ju bʃu dʃuuw
II. ð ə vɔɪ s ju rə mem bə betʻ ʍɒt ɑ ju tʻu dʻʊu
III. the voi ce you re mem ber. But what are you t o d o



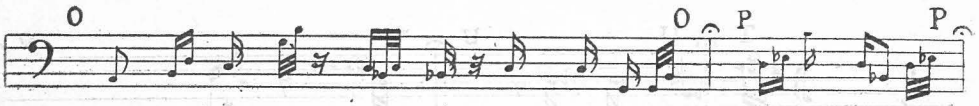
I. ɪdʃiw tɑð nəbɜ fiɜː d̥ m̥ɪt wɜĩ ĩ (ʔ)Aɪ sɪm dip ɪwg ɪ sɪn
II. ɪf ju hæv nɛvə fiɜː d̥ m̥ɪ wɛ l Aɪ kʻɪn gɪv ju ə hɪn(t)
III. if you have never heard me?' We ll, I c an give you a hin t



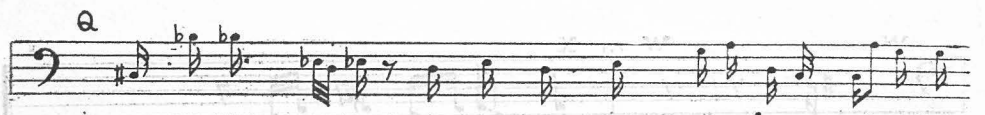
I. dək ɯil tɛlp ʃ ɪɸ ɸɒhʃɪwut (ʒ)ɪʌ ʌɹ ɪt pɪli sɪtɤp(ʔ)ɔ ɪntɪ
II. ðət wɪl hɛlp ʃ ɪf ʍɒtʃju hɨɪʌː ɪz vɛrɪ dɪsəpʻ ɔ ɪntɪŋ
III. that will help (sh). If what you hea r is very disap p o. inting,



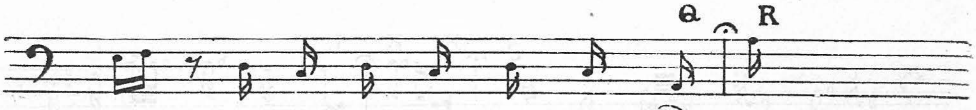
I. tæn ʃʊgksɪɪl ins ɪn ʃɤg nẽit sæ(ɸ) mɒ(ɸ) ĭj ɔ hɒl ɪd nfiæ(k)
II. ændʒu fɪɪl ɪnstɪŋktɪv lɪɪ ðæ t mas bi ʌ hɒr ɪd mfiæ h n̥
III. andyou feel instinctively, tha t must be a horrid m a n,



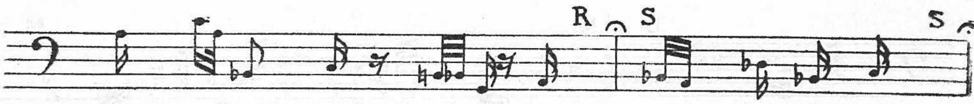
I. juw nei ðɪ p ɐi(ʔ) ʃʊo nɪð ɪɟn sɪd ugɔɑ snʊw ɪt (ʒ)ʌɹg(ŋ)
II. ju mei bi kʍAɪ t ʃʊo ðə spiː d iz ɹː ɔ ŋ̥ slo̥u ɪt dɐʊ n
III. you may be qui te sure the speed is wro ng. Slow it dow n,



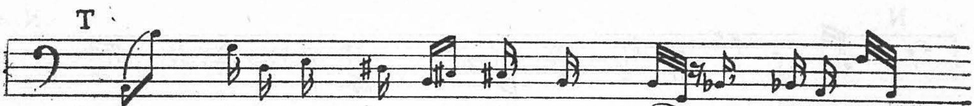
I. (t)ɑn sɪl ɪu ʻtiː lɻ (k)æ(h)ɪw ɔ nɪts ɪnn̥ ʃʊ on nɪjne θur
II. ɐntʻɪl jɻu ʻf iːlː ð æ tʃju ɑ lɪ s nɪŋːtʻu ən neimɪəbɻ
III. ʻunt il you f eel th a t you are li stening t o an a miable



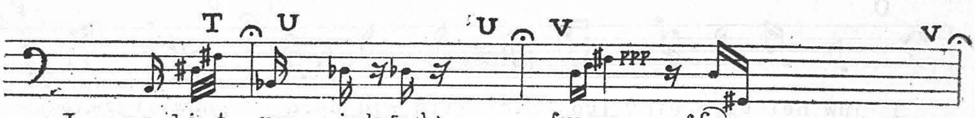
I. ʊwut sen ʃɚ bmən ɩð tɩ n(ʒ)i wdvĥa͡ u t
II. ọuld dʒɛnt‘ ḷ mən əv sɛvṇt ɪ wĥen wɪð
III. o ld gent le man of seventy - o ne, with



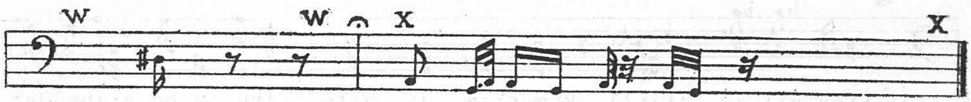
I. ɒ ʁ(g)ɑ: ðɜ: bsɪ ð k ɐiwỹʃ kʊɔ sɪdn tɛh in nɪ
II. ɑ ɹ ɑ:ðɜ: pḷɛ z ṇt ɐirɪʃ vɔis ðen: ðɛt ɪz mi
III. a r ather pleasant I rish voice, then that is me



I. ɔ: l: g i æ bɜ ()ʃɪ nɚ d u g ew ‘tĥiɐ æɸ y ɑnœ
II. ɔ: l: ð i ɐ ðɜ p‘ i pḷ ʌ u m ju hĥiɐ æt ð i ɐ ðɜ
III. A ll the other p eople whom you hear at the other



I pɪ li t ʊʁ imk ˜ɔ(h) ʃæ m: ʃĥɔ:
II. spi: dẓ ɑ imp‘ ɔ s tẹẓ ʃæ m: ʃĥɔ: ẓ
III. spee ds are imp o sters, sha m Sh aws,



I. ʃæ(h)səṃsəṃ ummɛbʌr o(z) ɪ(?)t
II. fæṇtəṃẓ ʌ u n: ɛvʌr ɩgzɪstɪḍ
III. phantoms, whon ever ex isted.

This turns out to be a paraphrase of a part of the preceding direct record, the corresponding part reading as follows:

"I am requested to give you an example of simple English. But as a first step, let me make a suggestion.....will not be difficult. You will get it [the right rate] *by simply changing the rate of the record to the point when you seem to be hearing the voice that is in your memory. But what are you to do if you have no knowledge of my voice? Here is a suggestion which will be of value to you. If what you are hearing does not come up to your hopes, and your feeling is, there is no attraction about that man, you may be quite certain that the rate is wrong. Make it slower. And when you seem to be hearing a kind old man of seventy-one, with a not unpleasing Irish voice, that is me. All the others talking at the other rates are not me at all, false Shaws, shades and fiction, who will have no existence."*

Before going into general discussions, a few peculiar places in the record may be noted. In phrase D there is a tone B^{b} A like the ringing part of a piano note. Phrase F is unintelligible. It contains a tapping sound at the beginning (in the R. of R. order). Phrase F, also containing a tap, sounds like a very under-articulated *well.* Phrase G says *will have no difficulty,* and as this construction is incomplete, there must have been some hitch in the original process of taking the record. The word *speed(s)* occurs three times. In phrases H and U, where it is long, the transcription from the D. of R. hearing is [tilɪp] which reversed is [pɪlit]. The [l] is very distinct, and yet when the machine is reversed, no [l] can be heard. In phrase L, there is an extraneous sound [ʃ] after *help,* which is clearly audible in both directions. In the middle of phrase Q, in the combination *an (n)amiable,* two *n*'s instead of one can be heard in both directions.

In comparing the two transcriptions, it is the wrong ones rather than the right ones that are most interesting. "But first, let me give you a warning." The right ones are also merely attempted transcriptions of a gramophone record, and it would seem that there is no reason why a series of sounds when heard in one order should be transcribed more correctly than when heard in the other order. Here, the knowledge of

what the English words are will have two kinds of influence. It would of course certainly not do to look up the words in a phonetic dictionary and copy down the public school pronunciation of each word. Still, a knowledge of the word will enable one to concentrate one's attention to a limited number of possible pronunciations, and in this way, sounds or aspects of sounds could be noticed or discerned which otherwise might escape one's attention. On the other hand, the same knowledge may induce one to put down the ordinary phonetic transcription for a word where nothing of the sort or sometimes nothing at all is really sounded in the record. On the whole, however, I think the first kind of influence is greater than the second if one is on one's guard against it, as I have tried to be. Hence I tentatively take the transcription from the R. of R. hearing to be the "correct" one and use it as a standard of comparison, with the proviso, however, that there may perhaps be a few cases when imagination runs away with me, where what seems to be wrong may be really correct, while the "correct" transcription may be really wrong.

In the following tables, the columns marked correct give the "correct" sounds as heard in the R. of R. order. The opposite parallel columns give the transcription from the D. of R. order of hearing. The figures give the number of times the sound in question occurs in the text. A square □ indicates the absence of any sound and parentheses () indicate doubtful judgment. A hyphen such as in [t-s] indicates that the original sound heard was [st] and there is no reason to conclude that the reversed sound should form a very close combination. A ligature ‿ indicates that the letters under the sign represent one sound, so that the letters do not reverse when the whole passage is reversed. (In scoring the correctness of the transcription, however, [ɦ] and a following vowel are counted as two sounds.)

Vowels

"correct"	D. of R. hearing	"correct"	D. of R. hearing
iː	ɪli$_2$ (speech H,U)	iː ɪɟ	ɑː ɑː$_2$
ɪi	ɪi	ɑ	ɒ$_3$ ɒ̈ ɔ
ui	ẽi (instinctively, N)	ɔː	ɔː$_2$ ɔɑ ʊɒ
i	ɪ$_4$ i ĭj y	ɔ	ɔ$_2$

"correct"	D. of R. hearing
u	u_4 ʊ ʊgk
ʊn	uʊw
ɜː	$ɜ_{ɪ_2}$
ɜ	ɜ œ
ɪ	$ɪ_{19}$ i_7 ɪi ə ɣ
$ɪ_o$	$□_3$ $ɪ_2$
e	$ɪ_3$ e_o
E	E_4 $ɪ_2$ e ə
E⊣	ɜ
æ	$æ_9$ ɑ
ɐ	$ɑ_3$ ɐ ã æ ɔ
ʌ	$ʌ_2$ $ɔ_2$
ʌɹ	ʌɹ
ɒ	$ɒ_2$ oɑ
ʊ	ʊ
ɛi	ei ɪj ɪg
oʊ	ʊ
o̤u	ʊw_2 ʊuw

"correct"	D. of R. hearing
Aɪ	$Aɪ_2$ ɐi
ɐi	ɐi
ɑi	ɒj
ɐʊ	ʌɹg
ɔɪ	ɔɪ ɔ(i
$ɔɪ_o$	ɔ
ə	$ɛ_5$ $ɣ_5$ $ø_2$ l_2 $ɪ_2$ $ə_o$ o ʊ
$ə_o$	$□_3$ $ə_o$
ɩ	$ɪ_3$ ỹ (Irish, R)
ɪə	ə
ɪɐ	ɪɐ
ɪʌː	ɩʌʌɹ
uɔ	ʊo
ju	ɪw_3 ju juw iu ɪu ɪwg
	ɪwut kɪuw ew u ylɵw
wɪ	ʉi kui u
□	o $ə_o$

Consonants

"correct"	D. of R. hearing
p	ɾ$_4$ b f n □
p‘	p-(?)ʃ k
b	p ð θ □
b_o	(?) □
t	t_6 $□_5$ k_2 h_2 s ʃ (ʒ) (Φ) (?)
t‘	s_3 $ʃ_2$ t-ʃ t-s⊣ b-ʃ
d	t_2 s_2 d n (ʒ)
d‘	d-ʃ
d_o	$□_2$ d_o t
k	t □ (instinctively, N)
k‘	x_2 s
ĸᴍ‘	p

"correct"	D. of R. hearing
g	g gʃ d (?)
g⊢	g⊢ □ □ (English, B)
m	m_3 n_3 bm mb ɕn g s
mː	m_oː
m_o	m_{o_2}
n	n_{13} $□_3$ ðn m ɲ (ŋ) ŋ n_o
nː	n_on d-n mm
n_o	$□_2$ h
ŋ	ɲ n □
ŋː	n_on
$ŋ_o$	t □
l	l_4 n_4 d u □

"correct"	D. of R. hearing	"correct"	D. of R. hearing
-lː	lː l̩ː l̃l̃	ɹ	ɹ ʁ (ʒ)
l̩	ɚ$_2$ l̩ ur	ɹː	uʒ
l̩̊	ʃ s	r	r$_2$ w
f	Φ p s ʃ d-ʃ d t ʻt	ɾ	l r
v	p$_4$ ð$_3$ b$_3$ ʒ kʊ □	h	t$_3$ h k s r
ð	d$_2$ t$_2$ n$_2$ s$_2$ ð b Φ ʒ p	hi	(ʒ) ʻt
	(k) □	ɦ	ɦ$_4$
s	s$_7$ □ ʃ (Φ) t h ʻp d̥	tʃ	t-ʃ hʃ (h)
z	n$_2$ t$_2$ ð (z) d	dʒ	ʃ$_2$ s
z̥	□$_3$ s	w	w$_2$ wdv
ʃ	ʃ$_5$ t-ʃ	ʍ	x Φ d □
ʒ	ɣ̃ (chang ɔ)	□	t$_7$ (ʔ)$_3$ p$_2$ d s ɹ ʁ (z) ʃp m̥

Glancing over the table of vowels, it will be seen that the transcription is on the whole rather good. The unexplainable [iː] as ɪli has already been noted. Short [ɑ] is given too close values. [æ] is correct in nine cases out of ten. [ə] is heard as ɵ and ɤ with equal frequency. The quasi-diphthong [ju(ː)] is transcribed in all manners of ways and the [j] is mostly frequently heard as an [ɪ]. The reason for this I think is that the reversed [uj] does not seem so natural as [uɪ] or [wɪ] for which it is therefore mistaken.

The consonants are much worse "off". A very interesting phenomenon is the striking difference between [t] and [tʻ]. [tʻ] is heard as a fricative or a stop plus a fricative. The fricative part is given four times as [s] (or sɬ) and four times as [ʃ]. As a matter of fact, it was a loose kind of [ʂɬ] that was heard, and it was my knowledge of English phonemes that made me fall into the familiar grooves of [s] and [ʃ]. Similarly, [kʻ] is heard as [x] twice. When a [-nː] or [-lː] with a changing pitch is heard reversely, it gives the impression of forming a separate syllable plus a separate detonation, thus, *well* [wɛlː] is heard as [l̩-lɘw]. [f] occurs eight times and is not heard correctly a single time. It is heard once as [Φ] (M). As the *f*'s in the preceding parts of the record, which can be heard more satisfactory when the machine is spring-driven, sound rather more [Φ]-ish than *f*-ishy, the transcription [Φ] is perhaps right after all. [s] is heard correctly

seven out of fourteen times, which is better than expected, in view of the difficulty for *s* to be correctly heard over the radio. [ʃ] is nearly always heard correctly. [ɦ] occurs four times and is always correctly heard. It is interesting to note that [ɦɜ] for instance, is heard still as [ɦɜ] when reversed, which shows that [ɦ] is really a qualifying element in that the next written vowels has a breathy quality, and not a neutral [ɦ] in the position of say [ə], followed by a non-breathy vowel of the quality in question.

Of the extraneous sounds given where none existed, several occur at the beginning of breath groups before a short vowel, that is, at the end of breath groups after a short vowel in the D. of R. Thus, while *If what* [ɪfʍɒt:tɒʍfɪ] is rendered as [hɒΦΦɪ] which is correct so far as the vowel in *if* is concerned, yet *and you* [ændz̥u:uz̥dnæ] is rendered as [kʲuʃnæt] with an illusory [t]. In the former case, the will to be empirical succeeded. In the latter, the knowledge or habit of not ending a very short clearly articulated vowel without some sort of consonantal ending (or in terms of Chinese phonology, a *ruhsheng* ending) had its way. The [p] in [pɑj] for *I*[ɑi] in phrase A, has the same bad *raison d'être*.

To get a rough idea of the accuracy of transcription, a method of scoring is adopted as follows: The transcription from the R. of R. hearing being taken as the standard, the sound units in D. of R. transcription are marked as correct only when written exactly as in the second line. Thus, phrase J might be scored thus:

ɪ d ʃ ɪw t ɑ ð n ə b ɜ ɦ͡ɜː d̥ m̥ ! t
ɪ f ju h æ v nɛ v ə ɦɜː d̥ m̥ !
+ − − − − − − − + − − − + + + + + −

As this scoring is obviously too strict, a fractional "credit" is also given to the "wrong" letters. For the vowels, the wrongs are given half credit as a rough average between the very wrong ones and those which are practically correct. For the consonants, the place of articulation counts a half. The elements in the manner of articulation are divided into two groups: (A) regarding plosive, affricate, fricative, nasal, flapped or trilled, and (B) regarding voicing and aspiration, each of these two

groups counting as one quarter. (Silence □ is considered a voiceless stop, and fricatives (except h) are considered unaspirated except that [ʃ] for [t'], [x] for [k'] etc. are scored as wrong under (A), but as right under (B).) In this way, phrase J may be rescored thus:

I.	ɪ	d	ʃ	ɪw	t	ɑ	ð	n	ə	b	ɜ	ɦ	ɜː	d̥	m̥	ɪ̥	t
II.	ɪ		f	ju	h	æ	v	n	ɛ	v	ə	ɦ	ɜː	d̥	m̥	ɪ̥	
Vowel	1			.5		.5			.5		.5		1			1	
Cons. place		0	0		0		0	.5		.5		.5		.5	.5		0
Cons. man. A		.25	.25		0		.25	.25		0		.25		.25	.25		.25
Cons. man. B		0	.25		0		.25	.25		.25		.25		.25	.25		.25
Total cons.		.25	.5		0		.5	1		.75		1		1	1		.5

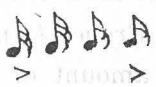
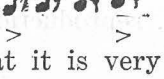
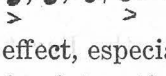
	Totals	per cent correct
Vowels	5	71%
Cons. place	2.5	50%
Cons. man. A	2.0	80%
Cons. man. B	2.0	80%
Total Cons.	6.5	65%
Total Sounds correct	11.5	67%

Similarly, the score for the whole transcription is computed, with the following results:

		count as	Total correct	Total sounds	per cent correct
Vowels correct:	84	84			
Vowels wrong:	111	55.5			
			139.5	195	71%
Consonants correct					
Place:	144	72			
Manner A:	153	38+			
Manner B:	189	47+			
			157.5	261	60%
		Totals	297	456	65%

Seeing that the only words which were correctly deciphered the first time were *Sham, Shaws; all, well* [ʃæm, ʃɔːz, ɔːl, wɛl] which contain only 12 out of 456 sounds, or about 2.6%, it can be seen that the intelligibility of language is not at all in the same proportion (altho more less proportional to it) as the audibility of its sounds. For some sounds or aspects of sounds are much more important than others, and when the places of articulation go wrong, the intelligibility is greatly affected.

In making the D. of R. transcription, the marking of stress accent was overlooked. But after the English or R. of R. was heard, one thing was noticed, namely the illusion of a strong stress in clearly articulated short vowels at the beginning of an English phrase when heard in the D. of R. order. Thus *of* (B), *un*(*til*) (I), *If* (L), all seem to be stressed when heard in the D. of R. order although they do not seem so when heard in the R. of R. order. Both this illusion and the illusion of a final consonant is to be explained by the habitual association of clearly articulated short vowels with the attributes in question.

Finally, I made some experiments on the dictaphone with artificially reversed reading. I learned the corrected text and dictated it into the machine running backwards, and then played it in the normal direction. The results of the first attempts were illuminating as well as highly amusing. For, on the whole, the reproduction was very good, intonation and all, but here and there it would contain mistakes such as one would not naturally make in slips of the tongue, and even contain sounds not usually found in well known languages. The rhythm in the word *seventy-one,* for instance, has about the value of  The reversed rhythm  (for [nɐwɪtnves]) is so unnatural in music or in speech that it is very easily misread as  and the resulting rhythm for *seventy-one* has a most amusing effect, especially as the preceding words were said with that very expressive intonation of the original. The pronunciation of reversed aspiration is also a very difficult thing. As noted obove, its character changes with the sound aspirated as well with the contiguous vowel. Besides, the length required, the degree of friction, if any is required, is a very difficult matter to adjust. To produce the reversed [t] in [t'u], one would have to do something like the Chinese way of blowing a glowing *jyymeitz* (紙煤子[1]) into flame: a

(1) a kind of paper roll to smoke the water pipe with.

quick *hoot* with an abrupt stop. Any slight difference in the length or amount of friction will change the R. of R. sound into an affricate or an aspirated affricative. Needless to say, when an aspirate is carelessly pronounced still as an aspirate, the result is of course nothing of the sort. Thus, when *until* is wrongly reversed as [lɪtʻ-nɐ] the result is a sort of *unstil* or *unshtil.* Another thing is that one's habit about the pronunciation of ascending and descending diphthongs will have to be entirely changed. Thus, while the transcription for reversed *you* and *I* has [uj] and [ɪʌ] respectively, the tendency is to say [uɪ] and [jʌ], and the result is a sort of affected *you* and a Frenchman's English *I.* In the justaposition of sounds, care has also to be taken not to make extraneous audible glides, while glides in the original English, such as the aspirations already noted, have to be given consciously. The habit of assimilation of consonants to vowel will also have to be reversed, especially as regards *h.* In the words *you have* [juhæv] the matter of syllabication is not so important if the *h* has the right value. In ordinary speech, it assimilates to the following vowel, in this case[æ]. But when reversed as [væhuj] the usual tendency to starting the rounding simultaneously with [h], and if this is done, as I did in similar cases, the result is a sort of *you whave.*

All in all, the sounds of reversed English are more outlandish than any of the known outlandic languages, and the exact shades of some of the sounds, such as a reversed strongly articulated voicelss unaspirated plosive (e.g. the French *t*) probably can not be physically produced. Still, with a certain amount of practice, one can probably learn to say the reverse of any thing well enough for the R. of R. reproduction to sound acceptable as well as intelligible.

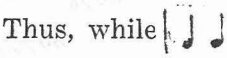
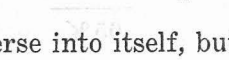
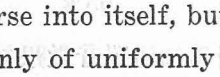
In addition to the Paget as Shaw record, I made some experiments with synthetically reversed Chinese words and with music. The ten numerals in Mandarin may fairly be transcribed as

一	二	三	四	五	六	七	八	九	十
iː˥	ɚ˥˩	san˥	sɿ˥˩	u˨˩˦	lɪoʊ˥˩	tɕʻiː˥	pɑː	tɕɪoʊ˨˩˦	ʂʅ˧˥

But the results of first attempts had to be heard before I could know what changes had to be made to make it more natural. Thus, the intended fourth tone or falling-tone falls too fast, which shows that

what was felt to be a rising tone had risen too slowly. The number 二 [ɚ] sounded unnatural until I started with a slightly high vowel and slightly lower it towards the end, which shows that the real 二 is a descending diphthong of a very narrow range, perhaps a retroflexed [ɜə] or a [ɐɜ]. The number 六 reversed is [uəĭlːˎ] for which the tendency to say [wəɪlːˎ] had to be corrected to make it "go". The aspiration in 七 [tʂʻiː˥] has to be given as a very long [ʂ] while the frictional part of 九 [tʂɪoʊˎ] has to be made as short and yet as sharp-sounding as possible. The high-low-medium circumflex tone reverses beautifully into a good thire tone, which is a medium-low-high circumflex tone. For the vowels in 四 [sɭˋ] and 十 [ʂɭˎ], the frictionless [ɿ] and [ɻ] gave more plausible results than [ɻ̩] and [ɻ̩], which fact incidentally justifies the use of two new vowel-letters [ɿ] and [ɻ], as proposed by Bernhard Karlgren.

Another experiment was also made with reversed music. In the matter of pitch, nothing very striking is noticable. The melodies, apart from their rhythm, are mostly quite plausible as musical melodies. As to harmony, the succession of chords also sounds fairly good, at least in the middle of a slow phrase. For, most of the rules of good chord succession, at least in major keys, are reversible, the most important exceptions being that the common successions VI-IV, IV-II and IV-V, at least in fundamental positions, sound somewhat strange when reversed. But the ends of a phrase do not usually sound very good, especially as it is generally not likely for the first chords of a phrase to reverse into a good cadence.

The most peculiar effect of reversed music, however, is in its rhythm. It gives a syncopated effect all the way through. I have tried singing the same tune first *legatissimo*, then *staccato*, then with carelessly timed endings of notes. While this only gives the impression of the same tune rendered in different styles, the reversed version gives quite different tunes. Thus, while  reverses into itself, so far as the rhythm is concerned, the same thing when rendered as  (i.e., ) does not reverse into itself, but into the very peculiar rhythm . This is true only of uniformly sustained notes such as those of an organ. An experiment with a record of orchestra bells transferred from a gramo-

phone onto the reversing dictaphone had a very peculiar result. While the indefinite endings of the notes of undamped bells have a rather rich effect of blending, the rhythm and melody being well defined by the very strong ictus at the beginning of each note, the reversed record sounded very confused and all the notes seen to some from nowhere and begin since nowhen, which shows how much the total effect in hearing a sound depends on the sounds immediately preceding. Playing and listening to music backwards is like sailing a ship astern: everything of the ship, to be sure, is going exactly backwards, but the wake is now at the bow and not at the stern. Only if one could create a gradually appearing wake in front of the advancing stern can it be said that everything, things *about*, as well as *of* the ship is reversed.

中 文 摘 要

有一個英文留聲機片末段是機器倒開的時候灌音的。 這段假倒英文放在普通機器裏開起來所發的聲音的時間次序完全是倒的，聽起來非常古怪。 作者曾經細聽這倒英文，用語音符號把他全部的音記下來，並且用音樂符號把語調也記下來。 假如這些音記得十分準，要是把記下來的倒文再倒着讀就應該把原文讀出來。 試驗過後竟大不然。 除了少數幾個字以外，大部分都不成話。 後來又用一個臘筒蓄音機，設法叫他倒轉，同時把這普通留聲機的倒英文灌到臘筒上。 灌好了，再叫蓄音機正轉，這樣才把原來的英文全部聽出來。 但蓄音機的聲音不夠清楚，於是再把原來的片子放在普通留聲機上用手指硬推着他倒轉，這樣原來的英文也可以很清楚的聽見了。照這樣聽的英文再用音標跟音樂符號寫下來作爲標準，跟第一次的記音比較，結果是：

	寫對的	音總數	準確度
元音	139.5	195	71%
輔音	157.5	261	60%
發音部位	144	261	55%
發音方法	171	261	65%
總 計	297	456	65%

但第一次聽得出的英文字數遠不及65%。 這一半是因爲知道單音數跟知道字數本不一定成同樣的比例。 還有一個原因是語音成素當中于了解上最要緊的是輔音發音部

位，其次是輔音發音方法，再次是元音，而事實上這三者聽寫的準確度的次序恰恰相反，所以更不容易懂了。

從音的錯聽上可以看出許多有趣的點來。 比方 l 跟 u，ɣ 跟 v，m 跟 mb 等等都是在歷史的音變上有過的。 英文的吐氣音跟不吐氣音的分別，這上也聽得出來。 比方吐氣的 tʻ，倒過來是先有吐氣而後舌尖再頂起來（跟吹紙煤子似的），在片子聽起來都聽成了 ʃ，ʂ 那類的音了。 還有些沒有音的地方，聽出多餘的音來了。 大概正文裏有清楚的短元音起頭的，倒轉過來就容易聽得像有一個入聲韻尾 p，t，k，ʔ 等音煞尾。 這是因爲很短而又清楚的元音，無論在中國語或外國語不能沒有音尾，所以雖然倒文實在沒有，習慣的影響使耳朵誤聽爲有了。 這個片子裏有幾個帶音的吐氣〔ɦ〕，如上海匣母字讀音。 照平常的寫法是先寫一個輔音再寫一個元音。 如〔ɦæ〕，但是倒過來聽的還是像〔ɦæ〕，並不是一個普通元音〔æ〕加一個中性的〔ɦ〕，可見這〔ɦ〕是元音的一種形容性而不是一個元音前的聲母。

用了倒開的臘筒蓄音機，又做了些人工的倒話的試驗。 法子是把那一篇倒英文照改正的寫法，依所記的音跟語調讀熟了，收在倒開的蓄音機，然後再正過來開。 結果是大部分都好，並且很好，可是有的部分就很怪。 因爲說倒音的錯誤不是普通說錯話會有的錯誤，因此會有很可笑的聲音出來。 例如 tʻu 倒錯了作爲 utʻ，結果是先吐氣，後頂舌而成了一種 uʈt。

最後又做了些中國字音倒讀試驗跟倒灌音樂的試驗。 用這法子往往可以幫助着對證記音的準不準。 比方北平二像是單純元音，但倒過來覺得有點古怪（除調值不論），細聽覺得起頭太關，後來太開，因此知道正說的二是起頭有點開，後來有點關的。 這個跟試驗直線尺直不直一樣的法子： 正畫一條，倒畫一條，要是尺不直，差別就顯得雙倍大了。

倒音樂試驗的結果是在單音調沒有什末特別，在和絃相承的次序上有些古怪的地方，變動最利害的是節奏，因爲平常音樂只注重起音點的拍子，對於止音點可以麻呼一點，所以同是一個調，各音的止點不同一點，雖然正聽的時候沒有大分別，倒聽起來，他的節奏就完全不同了。 例如 |1 0 2 3| 是勻拍，倒過來成 |3.2 0 1| 就變成了跳拍了。