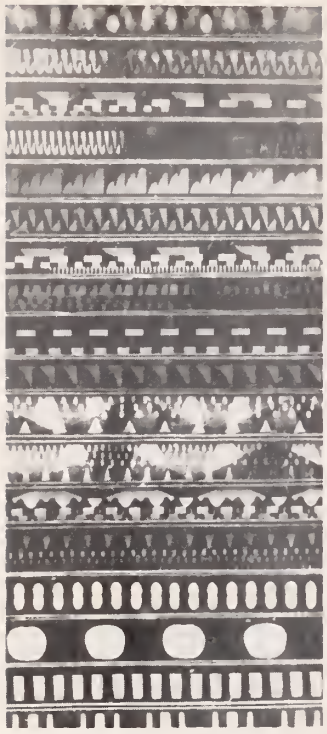
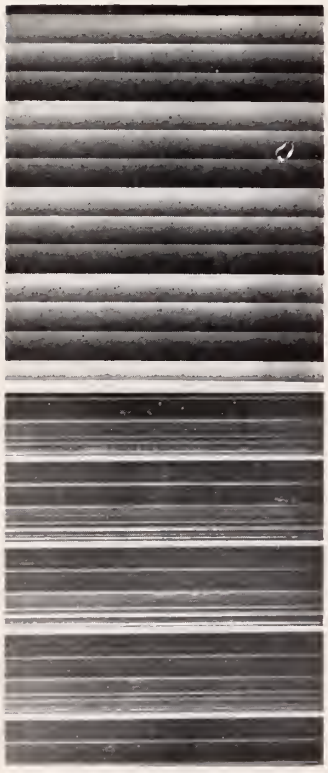




Top: By means of his discs, Sholpo obtains on the photograph ornaments with various "teeth" giving various timbres, strength and pitch. (From Sholpo's earlier works.)

Bottom: Specimen of the ordinary "intensive" shadow recording, on which Yankovsky is working, obtaining the transverse bars by sliding copying paper.

Absolute

THE recording of sound upon the sound path of a moving picture film (a narrow ribbon alongside the picture), is usually done in the following way: a musical instrument is played in front of the microphone, the vibrations of the microphone membrane are transferred electrically to the lamp amplifier, and further to the sound recording apparatus where different parts of the sound ribbon are exposed to different intensities of light by means of an oscillograph or some other device. This method involves a good deal of time, and encounters considerable mechanical and electrical hindrances.

From the very beginning of the sound picture epoch, A. Avraamov, the Soviet musical theoretician, together with Pfeniger, the German, and Sholpo and Voinoff, former co-workers of Avraamov, have wondered whether it would not be possible to throw light and shade upon the sound ribbon in a direct manner, by photographing upon the sound ribbon certain ornamental figures — drawings or cardboard or paper designs.

At first, the sounds obtained were mostly of the flute timbre type. Later, a three minute "Hurdy-gurdy" item was tried, and, the timbre of the street organ, being of simple construction, turned out most successful.

Then Voinoff made his "piano," all of which can be fitted into a necktie box. Each of its keys, i. e. each half-tone is represented by a long "comb," which is a schematicized record of the real piano. This schematization did not harm the achievement of the purpose. Voinoff complains only about the extreme bass notes, which, he says, having lost some of the overtones, do not sound as rich. Voinoff has not been able to add the necessary little "teeth" to the large basic ones.

Voinoff fits his "keys" or "combs" on to the regular appliance for multiplication photographing in such a way as to have the "key" exactly on the sound ribbon during the photographing process.

In this manner he has succeeded in photographing two three-minute items: a Prelude by Rachmaninoff, and a fox-trot, "The White Monkey." The Prelude showed especially interesting results. The "designed music," (to be more exact, it was music cut out of paper), came out as an abstract design of diverging circles and prisms. Voinoff has also recorded a multiplication film, "The Thief," in which he has preserved very exactly the rhythms of the whole thing.

Artificial sound seems most suitable for accompanying multiplication films. Its notes have no reverberation whatsoever, they do not create an acoustic "atmosphere" (i. e a sound perspective for the picture to which they are attached).

Generally speaking, music sounds especially agreeable in two cases. One case, for instance, occurs when, on putting on head phone and hearing an orchestral broadcast with the sound perspective of the concert hall fully preserved, one feels as if one were actually present in the concert hall. Or it may happen that the loud speaker in a room creates the complete illusion of music being performed in that very room. This is the case when the acoustics of the radio studio and of the room with the loud speaker somehow correspond to each other.

Radio utilizes this absence of reverberations in "designed" sound very willingly. By broadcasting records of "designed sound," radio, in reality, broadcasts music without reverberation, while the listener hears it with the reverberations of his own room where the listening process takes place. "The designed music of the radio" cannot fail to harmonize with any premises. Any one who has heard the "whispering" of radio heroes in some large halls (a thing frequently encountered, for instance, in radio plays), knows well how falsely such acoustic absurdities sound.

E. Sholpo, of Leningrad, has introduced methods somewhat different from those of Voinoff, and still more refined. He makes his teeth not in the form of a comb, but in the form of a round see-saw with teeth of different size according to the pitch of the octave which the "see-saw" must transmit. The higher the pitch, the closer together must the teeth be. Within the octave, Sholpo regulates the quantity of the teeth by means of a more or less frequent circulation of the disk, in dependence upon which the combs are photographed on the moving picture film with more or less frequency. Recently, Sholpo has substituted slots for teeth; this adds to his disks greater exactness and practicability. Together with Rimsky-Korsakoff (the composer grandson of the famous Rimsky-Korsakoff), he has recorded on a film a number of items by Rimsky-Korsakoff, and a few new works. Anyone who has heard the "March-Trot"—a short jazz piece played on . . . birds' voices will

Music by Designed Sound

by
V. Solev (Moscow)

never forget it. "March-Trot" is a serious contribution to the wealth of world music.

Timbrograms—Music of the Future.

All those engaged in work on "artificial sound," have until very recently recorded it by means of lines (transverse recording). At Potilikha, in Moscow, there is a man called Tager, who has discovered unexpected opportunities in shadow recording ("intensive," nuance recording).

Tager's strips of shadow carrespond to Shorin's "teeth."

By photographing them on a different scale, Yankovsky has obtained a different pitch of sound but in the same timbre as the design taken as the basis. Naturally, he chooses, for the starting point, the most richly sounding note of each instrument.

The fact that Yankovsky's "timbrograms" promise to furnish sound of any pitch with the timbre of the best note of the instrument is of tremendous importance in principle. It is known that the higher the pitch, the poorer is the timbre of any musical instrument. (The extreme upper notes of the piano, for instance, are quite "dry). This phenomenon takes place because the material used in the making of the instrument (wood, copper, etc.) reflects differently in each case sounds of different pitch. Various instruments made of various materials and of various forms possess greater or lesser quantities of fully sounding octaves. The piano sounds well within a big range; other instruments are considerably poorer in good octaves. All depends upon the instrument.

One might say that Yankavsky creates "multiplication instruments" which are not dependent upon any acoustic whims, simply because, once and for all, the best saund is taken as the basis.

This possibility is far more interesting than abstract research for "new sounds," in which up to now the workers in the field of the "designed sound" have been engaged. Regardless of whether it has been a lang or a short process, whether it has came easily or has invalved a tremendous amount of time, labor, and patience of audiences, the fact remains that during the centuries of its existence, our orchestral practice has chosen the timbres most acceptable to our ears, (just as Oriental practice has chosen its own timbres).

The modern symphony orchestra is very rich in sounds, and it is impossible to discover immediately something utterly different in this line. The point is, that by no means every instrument of the orchestra is in harmonious relations with its neighbors. Orchestra instruments do not represent a finished system; especially important is the fact that the range of possibilities is different in all instruments. These are the gaps that Yankovsky promises to remedy.

Sholpo of Leningrad also is seriously thinking of changing aver ta the field of Yankovsky's "timbrograms." For they can be utilized on the multiplication film apparatus, as well as far the recording of the paper designs in motion, as has been done by Sholpo.

Musical Horizons.

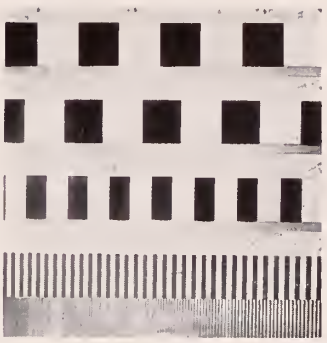
What does "designed sound" sound like?

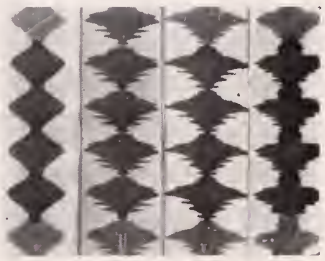
It would be wrong to suppose that the very first steps open up possibilities for altogether new timbres. These have not been obtained. Until recently, instrumental technique was groping its way towards new sounds. Nevertheless, experience in the field is colossal.

During the nineteenth century alone there were twelve thousand patents dealing with musical technique. The choosing ot new sounds, new timbres, and improvement of the already existing ones has, therefore, been a cease'ess process. If it were possible to get altogether fantastic timbres, they would fail to stir the listeners aesthetically.

But it would be an altogether different matter if we should succeed in getting series of intermediary timbres, for in-

Continued on next page





Top: Early attempts to produce "designed sounds." These designs gave a timbre of the "hurdy-gurdy" type—simple and bare.

Center: How the sound of a French Horn arises and continues. The periods appear almost instantaneously and die away with a singing note.

A piano gives a much shorter period.

Bottom: Multiplication film for television ("the March of the Chess Figures") to be broadcast with "artificial sound".

E. Sholpo of Leningrad, sketching the slot-teeth on his discs. These figures are then photographed on the sound path of a moving picture film. It would be truer to speak of "photographic sound" than "designed sound."

stance timbres between those of wood and brass winds, with different sordines. In this case, "designed sound" has justified itself from the very first steps of its existence. Even a few years ago, saunds of the type of different wood wind instruments were obtained. Such intermediary timbres are today often obtained by Voinoff, to say nothing of Sholpo of Leningrad, who has been working by a more subtle method.

The dream of the symphony orchestra reformers, who have in vain struggled for some degree of smoothness of transition between different instrumental groups, may be realized by means of synthetic music, particularly by the music of Yankavsky and Sholpo. The simplicity of the photo-copy method used by Yankovsky, together with the rapidity of Sholpo's methods promise to do very much in this direction.

The dearest dreams of the "automatisators" of music may become a reality. The violin will walk across the viola and the cello directly beyond the double bass. The lowest sounding brass wind instrument, the tuba, will rise above the highest brass wind—the trumpet. Triangles will sing, not ring. The piano, preserving the crystal clearness of its sound, will sound as prolonged as the harmonium, with its sound rising from the most tender pianissimo to colossal force. The flute will go down beyond the bass clarinet. The bassoon piccolo will go up beyond the flute piccolo. There will be smooth modulations from the violin to the clarinet, to the horns, to the percussion. The gaps between the violins, the wood and the brass wind instruments, between the bow, the percussion, and the plucked instruments, and even choruses will be dane away with. These groups af instruments are not so far apart in regard to timbres. The "multiplication" orchestra of the future can be clearly foreseen even now, in the form of an unbroken continuation of timbres, from the tenderest flute to the double bass, without any parasitical soundings.

At present there does not exist an instrument which apart from musical sounds, (i. e. those with regular wavelike vibrations) does not produce also sounds of a disorderly, noise like character. The whistling of the winds, the rustling of the violins . . . Violing noises for instance form a relatively large percentage of violin sound.

Analysis of phonograms will allow us to overcome this, also. The noise "teeth" might be removed from the phonogram of the given instrument. Later, one might use the phonogram cleared of them.

We will get rid of the negative aspects of the sordines which have introduced new noises into the brass instruments since their appearance.

We shall know what it is that distorts to shrieking point the sounds of the cornet-a-pistons and the English horn in its higher registers. These instruments might be introduced into the regular symphony orchestras.

The lower notes of the bass tuba, for instance, have a very poor sound. It has been known for a long time that they are very poor in overtones but nothing could be done about it. Yankovsky has looked at the phonogram of the tuba;—yes,-in the lower notes there are only large and infrequent "teeth" and very few little ones. But isn't it possible to draw them or to photograph on a larger scale the picture of the richer middle register notes? Yes, that is what Yankovsky is doing now. The new member of the orchestral polyphony is ready.

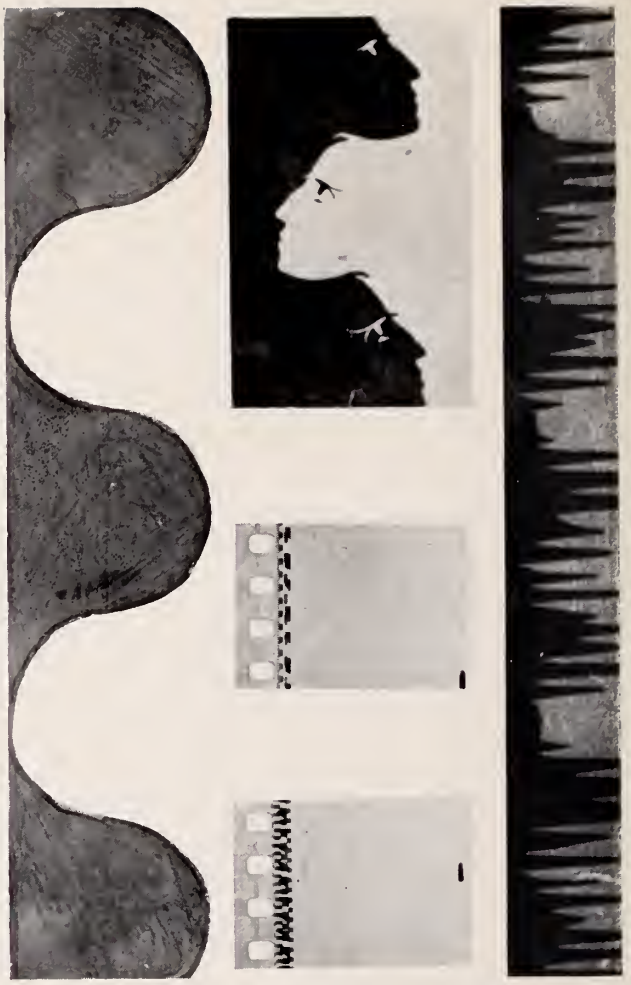
A problem of this sort would probably alarm even Prof. Sarnett, the French transformer of musical instrtuments for the radio. It seems as if he does not go beyond the improvement of the transmission of thot which the orchestra already possesses. Basic change in the acoustics of the instruments themselves lies beyond his purpose.

The fullfreedom of the technique of interpretation promised by "designed sound," might bring to life a number of instruments, such as harps, which are beginning to become obsolete. Trumpets will play without stops for breath. A fairy like occumulation of "orchestra" tempo might become possible.

By building a chord out of tones of any pitch, it will be possible to create altogether new harmonies, outside the reach of present day instruments.

"Designed sound" also makes it possible to give melody and harmony "glissando" fashion (i. e. sliding up and down, like the howling of the wind). This sliding of the vocal tone is frequently used in singing, especially in Gypsy and Persian singing. The Hawaiian guitar has something of the kind. "Designed sound" offers the possibility of such a sound to any other instrument. (This has been done, by

Continued on page 154



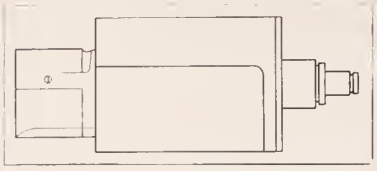
Left: It is difficult to analyze a curve of this type into a series of others. It was thought that it would give a complicated sound, but practice did not bear this out. Everything, depends, it seems, on the presence of small "teeth."

Top center: Experiments made by Avraamov and Yankovsky showed that a profile usually sounds like a violincello. The profile is taken in such a way that the black silhouette corresponds to the white one, in accordance with the law of sound recording which says that phases must follow each other alternately.

Lower center: Two sound tracks obtained by photographing Sholpo's discs (each track gives a different timbre of sound).

Right: Natural sound track of a piano on a cinema film. It can clearly be seen how the same group of "teeth" repeat itself at definite intervals (the film moves so rapidly that every sound has time to be recorded in the form of several "periods," making it easier to distinguish its boundaries from those of neighboring sounds.)

High Fidelity
RECORDING
GALVANOMETER



Model "E" Mount

(Variable Area System)

A Berndt-Maurer High Fidelity Recording Galvanometer provides the advantages of the Variable Areo type of sound trock . . . Several models are available giving o chaice of physical dimensians which permit a neat and convenient instollatian af any recarder ar single system camero.

Literature and thorough technical description will be sent on request

The BERNDT-MAURER Corp

117 East 24th Street New York

1515 Cohuengo Blvd.,
Hollywood, Colif.
Phane: GLodstone 2404

Recording Machinery
Hollywood Motion Picture Equipment Co.
645 Martel Ave. Cable Artreeves
Hollywood, California

ries dealing with Problems of Controlling Correct Photographic Reproduction.

REFERENCES

1. Crabtree, I. I., Parker, H., and Russell, H. D.: Some Properties of Two-Bath Developers for Motion Picture Film, J. Sc. Mot. Pict. Eng. XXI: 21, July 1933.
2. "Tropical Development," published by Service Dept., Eastman Kodak Co., Rochester, N. Y.
3. Gage, H. P.: Heat Absorbing Glass, Trans. Soc. Mot. Pict. Eng. 12: 1063, Sept. 1928.
4. Coblentz, W. W.: Radiometric Investigation of Water of Crystallization, Light Filters, and Standard Absorption Bands, Bull. of Bur. of Standards 7: 655, May 1911.
5. Gordon, N. T.: Water Cooling of Incandescent Lamps, J.. Soc. Mot. Pict. Eng. 14: 332, March 1930.

See also—Farnham, R. E.: The Water Cooled Lamp, pamphlet from the Nela Park Engineering Department, General Electric Co.

Absolute Music by Designed Sound

Continued from page 148

the way, in the "March-Trot" of Rimsky-Korsakoff and Sholpo).

All the passibilities of quorter tone music, of the performonce of music of any nationality in its originol form, etc., af course remoin open.

Music ocquires unheard-of force of oction.

Furthermore, o chord of more thon ten sounds per second can be heord distinctly only by very few musicions possessing on obsolute eor. Very well, then! Let us turn it into o new timbre. The regular timbre complex (the bosic tone plus the over-tones) reproduces in the minioture the full chord, not only stoticolly but olso dynomicolly. (At each of its notes, the over-tones repeat a certoin musical phrose). Here is, therefore, o new path towords purely orgonic experimentotian in search of new timbres.

One more thing. Music con be determined in regord to five relotionships: pitch, loudness, technique of performonce, timbre ond polyphony. In regord to the lost relationship, "designed sound" will apporently be greotly helped by constontly improving the technique of the "re-recording" of sounds. By meons of special apparotus far "re-recordings," done purely electricolly without ony acoustic hindronces, all the sounds ore re-recorded upon one phonogrom of normal width.

Some doy perhops, by meons of re-recording, "designed sound" will enter into the regulor symphony orchestra. It might enter the orchestro either as on unusuol "soloist," or os o modest incognito, instead of some instrument which in its normal state can not fulfill the desires of the composer (see the use of harps in Wogner's music).

"Designed sound" permits combinations of any timbre with ony method of producing the sound. The piono will be able to sing; the flute will ring like the plucked instruments. . . . Mr. Disney, can you imogine mewing in the voice of the

Back Issues of American Cinematographer

•

We can furnish certain issues of practically every volume published far the past 17 years, except 1935.

•

We da nat however, have full volumes for any year.

•

The American Cinematagrapher is the aldest poper in the warld devated to the matian picture cameraman.

•

Its magazines are full of valuable infarmotion and experiences of the world's leoding comeramen.

•

All back issues are priced at 30c in single copies.

•

American Cinematographer
6331 Hollywood Blvd.
Hallywaad, Calif.

dog, or barking in the voice of the cat? Can you imagine the tune of a French chansonette sung in the timbre of a roaring lion? "Synthetic" singing (without words) is not far off.

As far as speech imitation is concerned, its realizatian will involve probobly more time. Even in regular sound recording, music, thus far, gives better results than speech. The choirs of the angels need not fear unemployment as yet. For the multiplication film, however, there is a possibility of smooth, unnoticeable transition from the timbre of the human voice into a melady af musically fixed tones, from musical tanes into noise-like sounds and vice versa, as a cambination of music and noise. Finally some voices, such as the natural barking of the dog, will be reproduced in the near future. The dog's voice vibrates an octave that makes the "bark."

It is curious that work on the analysis of the phonogram has originated in the Soviet Union not only in the fields of cinema ar the radio (where a small group af people has also been working on "designed sound") but in purely musical circles. The State Music Publishing Hause has recently brought out in book form a posthumous work by Prof. Rabotnov—"A Treatise on the Investigation of Phonograms," dealing with vocal parts in particular. The work is devoted to the analysis of the disk records for the phonograph. Prof. Rabotnov analyzes the forms and conditions of the origin of the little furrows characteristic of the vocal parts. Prof. Rabotnov has accomplished that, of which once upan a time, Mogali-Nagi, the photo-innovator, dreamt.

From the literature on the subject, it is known that researches dealing with vocal parts were carried on in England a few years ago by Mr. Humphreys for the practical purpose of adding saund to films. Unfortunately, however, results of his wark, have not as yet been published.

Mast difficult to reproduce is the human voice with its sounds passing from ane into anather, and the singing quality of the violin. The striking of the bow upon the strings calls forth such a number of overtones as is impossible to produce in some other mechanical fashion.

Where can "designed sound" be heard? It is included occasionally into the braadcasts of the Leningrad radiostations. Special little films with "designed sound" have just been made for Soviet television. The experimental radio-station in Moscow, which after midnight (Moscow time) transmits occasional television programs, is soon to include in its programs smoll multiplication films accomponied by "designed sound". The first number is the "March of the Chess Figures" with music from Carmen.

Everything for
CAMERAMEN
and
STUDIOS

Right here in our Display Rooms!

New and Used Cameras, Accessaries, Lighting Equipment, immediately available. Phone, write or wire.

Everything is thoroughly guaranteed

Eastern Representatives
MITCHELL CAMERA CORPORATION
HARRISON FILTERS—FEARLESS PRODUCTS
MOVIOLA FILM EDITING EQUIPMENT

We now have a modern, completely equipped repair and service department—specializing on Mitchell, Bell & Howell, Akeley and De Brie Cameras

FRANK C. ZUCKER ••• J. BURGI CONTNER

MOTION PICTURE CAMERA SUPPLY, Inc.

723 Seventh Ave. New York City
Telephone BRyant 9-7755 Cable Address: Cinecamera

FEARLESS PANORAM DOLLY

FEARLESS:
BLIMPS
•
DOLLIES
•
MOTORS
•
FREE-HEADS
•
GEARED TILT-HEADS
•
LAMPS
•
SOUND RECORDING EQUIPMENT
•
DEVELOPING MACHINES

FEARLESS PRODUCTS IN USE THRU-OUT THE WORLD

M-G-M	Fox Movietonews, N. Y.	General Service Studios
20th Cent. Fox	Associated Screen News	Republic Pictures
Paramount	Technicolor	Eastern Serice Studios
United Artists	Clasa, Mexico City	Chesterfield
Warner Bros.	Sonofilm, Kolhapur	Darmour
Columbia Pictures	Gaumont British	Samuel Goldwyn
Universal	London Film Productions	Quality Films, Calcutta
Jam Handy, Detroit	British Lion	Jorge Stahl, Mexico City
Wilding Pictures, Detroit	RKO-Pathe	Multifilm, Holland
	Hal Roach	

FEARLESS CAMERA COMPANY
Cable Fearcamco
8572 Santa Monica Boulevard HOLLYWOOD, CALIFORNIA