

T H E S I S

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A STUDY OF THE POSSIBILITIES
OF THE USE OF FILM STRIPS AND MOTION PICTURES AS AN
INTEGRAL PART OF THE TEACHING OF VOCATIONAL AGRICULTURE
IN COLORADO HIGH SCHOOLS

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Submitted by

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In partial fulfillment of the requirements
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CHAPTER I

GENERAL INTRODUCTION

The introduction of film strips and motion pictures into the classroom, although a comparatively new venture in educational work, is no longer an experiment. When first tried, its enthusiastic supporters prophesied that the use of these visual aids would revolution-¹ize classroom procedure. Repeated experimental work has shown, however, that they should be used to supplement rather than supplant other teaching devices.

The use of film strips and motion pictures in connection with the classroom teaching has had a slow growth. One reason for this has been the absence of a well-tested teaching procedure involving the use of such material. A second reason has been the scarcity of film subject material suitable for, and adaptable to, classroom use. The third reason has been the considerable cost of equipping the classroom for such use and the cost of operation. School boards have not made appropriations for such cost items unless convinced that classroom efficiency would thereby be definitely improved.

It is to be expected that many high-school subjects might be benefited by the use of such visual aids. Vocational agriculture

1. Freeman, "Commonwealth Studies," Visual Education Magazine,
Feb., 1933

seems to offer wider opportunities for the use of such teaching devices and to promise a greater direct return from their use than do most high school subjects. In a practical way, however, opportunities for visual instruction in vocational agriculture, as in other subjects, would be greatly limited if the subject content represented by the available film strips and motion pictures were meager in amount or unadapted to state and local conditions. An attempt to survey the general situation as to film availability and adequacy should, therefore, precede the elaborated development of any program for classroom instruction, based upon the use of visual aids of this character. The present study represents such a survey as related to the teaching needs of a particular state.

The Problem - The problem of this study has been to determine whether the film strips and motion pictures that are available in agriculture are (1) sufficiently desirable for classroom use and adaptable to classroom conditions; and (2) adequate in content both as to major divisions of agriculture and the different farm enterprises, to justify their inclusion as an integral part of the teaching of vocational agriculture in Colorado high schools.

It would be manifestly impossible in a study of this kind to investigate the possibility of every film strip or motion picture that might be presumed to have value in class work in vocational agriculture. Some limitation has therefore been placed upon the specific visual aids investigated. This limitation has been set by the term "available" as used in the problem.

Film strips and motion pictures considered as "available", first, were those that could be secured on a rental or a transporta-

tion cost basis. No picture was considered which could be handled only by purchasing, as that would defeat the experimental basis of the investigation. Second, only those motion pictures were considered as available which were of the non-inflammable 16 mm. size. The larger size (35mm.) being inflammable and purely commercial in nature would seem too little adapted to school conditions to justify their consideration. Third, no film strip or motion picture was considered available which originated at such a distance that the cost of transportation was relatively excessive.

CHAPTER II

METHOD AND PROCEDURE

Section I. Evaluating Factors.

In attempting to carry out the investigation represented by the present study, an effort was first made to secure the cooperation of all teachers of vocational agriculture in Colorado high schools who were using visual aids in classroom teaching. Of the 56 departments of agriculture in the state, only 25 were equipped with facilities for handling motion picture projection, and but 15 were quipped¹ for presenting film strips under classroom conditions.

Because of the limited budgets under which certain of the departments that possessed visual aid facilities were forced to operate, it was found impossible to have many schools that could fully cooperate in this investigation. It was planned, therefore, that the main investigation would be carried on by the department of agriculture of the Fort Collins High School, with such contributory cooperation as would be possible on the part of the other departments.

The aid of twenty teachers of vocational agriculture who had used and were expecting to use such visual aids in their classroom work was secured for the selecting of evaluating factors, the weighing of such factors, and the evaluation of such motion pictures and film strips as would be presented in their classes.

In the period of six years covered by the present study, a total of 306 different motion pictures and film strips were presented

1. Personal communication, Akin and Bagshaw-Denver. June 1936

in this way as a part of classroom procedure to determine their applicability to such work.

As will be shown in detail in the following chapter, no motion picture or film strip was presented to less than two classes in a single school. Some were presented each year for the entire period of the study and in as many as fifteen schools.

METHODS USED IN SELECTION, PLANNING FOR, AND PRESENTING VISUAL MATERIAL

A selection of the motion pictures and film strips to be used in connection with the investigation was made from titles listed in the releases of film strips and motion pictures that seemed to relate to agriculture. In the six-year period from 1931 to 1936 inclusive, at one time or another, a test under classroom conditions was made of the entire list of such material as met the requirements of "availability".

Upon being received, each film strip and motion picture was given a pre-view to permit its classification under one of the three major divisions of Animal Husbandry, Crop Production and Marketing, and Farm Mechanics. It was further classified as to the enterprise into which it would best fit, according to the following list:

ANIMAL HUSBANDRY

- | | |
|-----------------------|---------------------|
| 1. Beef Production | 5. Sheep Production |
| 2. Dairy Production | 6. Swine Production |
| 3. Horse Raising | 7. Miscellaneous |
| 4. Poultry Production | |

CROP PRODUCTION AND MARKETING

- | | |
|--------------------------------------|---------------------------------------|
| 1. Alfalfa Production | 8. Soils |
| 2. Corn Production | 9. Marketing Farm Crops |
| 3. Sugar Beet Production | 10. Forage Crops |
| 4. Irrigation Practice | 11. Forestry |
| 5. Plants and Plant Breeding | 12. Miscellaneous Crops |
| 6. Pest Control | 13. General Agriculture |
| 7. Soil Fertility and
Fertilizers | 14. Crops not grown in N.
Colorado |

FARM MECHANICS

- | | |
|-----------------------|----------------------|
| 1. General | 10. Metals |
| 2. Abrasives | 11. Motors |
| 3. Farm Blacksmithing | 12. Paints |
| 4. Concrete Work | 13. Rope and Twine |
| 5. Farm Electricity | 14. Rubber |
| 6. Explosives | 15. Tools |
| 7. Fuel | 16. Tractors |
| 8. Glass | 17. Valves |
| 9. Farm Machinery | 18. Farm Engineering |

Before being used in the classroom procedure, a lesson plan was prepared for each visual aid, examples of which are given in the Appendix. An attempt was made in each case to make the showing of the motion picture or film strip an integral part of the classroom discussion and no pseudo situation was set up merely to permit the material to be shown. In the case of the film strips, only such frames were used as could be fitted into the lesson plans.

In the course of the investigation, covering as it did the period of six years, certain changes in physical equipment relating to the projection of pictures occurred. In the Fort Collins High School these included the use of an improved form of screen and better methods of darkening the room. It is not felt, however, that any changes of this nature affected, other than in a minor way, the evaluation given to any particular visual aid material.

In no school was the lesson plan selected for a particular visual aid used without modification during the six-year period; nor was the same lesson plan used in all schools. It was felt, however, that such variations in teaching procedure as occurred would not affect the validity of the findings of the investigation, as it was not intended that the study would test the effectiveness of a particular plan but would determine the effectiveness of the visual aid material under actual teaching conditions.

Selection of Evaluating Factors - To determine what factors should be considered in the evaluation of motion pictures and film strips for classroom purposes, the opinions of twenty teachers of vocational agriculture cooperating in the study were secured. This was done by means of a conference and there was a general agreement on the following evaluating factors:

1. Condition of motion pictures and film strips.
2. Adaptability to the job.
3. Applicability to Classroom Procedure.
4. Adequacy as to Content and Form of Presentation.

To clarify the interpretation that should be given each factor, the following statements were arrived at after a consultation with the cooperating teachers:

Condition of the Motion Pictures or Film Strips - If the material gives evidence of lack of clearness in projection it should definitely be listed as not desirable. If the motion picture film shows worn sprocket holes and is dry and easily broken, it should be listed as not desirable, although consideration would be given to the possibility that new prints put out by the producer might remedy this difficulty.

Adaptability to the Job - Motion pictures or film strips should be considered not desirable which are too general in nature, thereby not contributing specifically to the unit being studied.

Applicability to Classroom Procedure - Visual material should be considered not desirable which did not definitely supplement the classroom work.

Adequacy as to Content and Form of Presentation - Such material should be considered not desirable which does not bring out the main points of the lesson being presented.

Weighting of Evaluating Factors - The four evaluating factors were submitted to the 20 cooperating teachers to determine the cooperative weighting that should be given to the various factors. Figure I shows graphically the results secured:

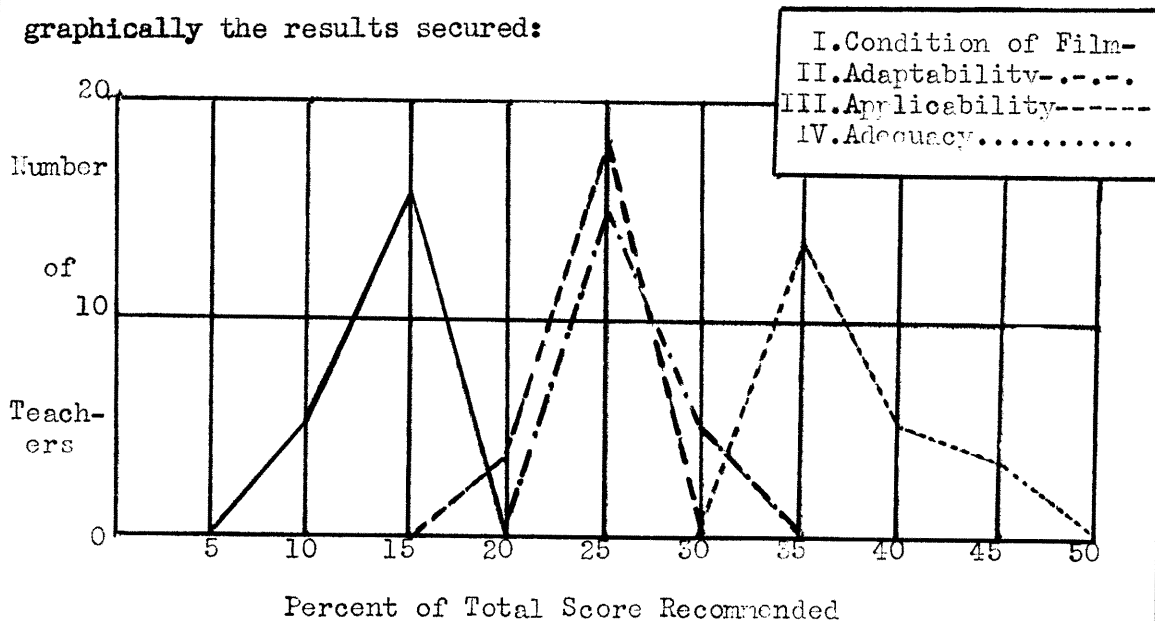


Figure I - Percent of Total Score recommended for each Particular Evaluating Factor as Related to Number of Teachers Involved.

The close agreement among the teachers as to weighting to be given to the factors is indicated by the following data:

Factor I - Condition of the Film - 16 teachers out of the 20 rated this evaluating factor at 15% of the total evaluation.

Factor II - Adaptability to the Job - 15 teachers rated this factor at 25%.

Factor III - Applicability to Classroom Procedure - 17 teachers rated this factor at 25%.

Factor IV - Adequacy as to Content and Form of Presentation - 14 teachers out of the 20 teachers rated this factor at 35%.

The weightings given to the factors in the present investigation were those indicated on the data as the choice of the majority of the teachers.

Application of the General Problem of Evaluation to the Classroom Procedure.

A decision was reached that each motion picture and film strip was to be given a rating for each of the four evaluating factors at the time of the classroom presentation, the scoring being expressed in terms of "good", "fair", and "poor". This was to be done by each instructor and for each time the material was used.

In those cases where student teachers were present at the time that visual material was used in the classroom work, they were to be asked to score the material. In the course of the investigation it was not possible to obtain an evaluation scoring for each motion picture and film strip by student teachers. It was found to be possible, however, to secure such a rating for a fair proportion of the visual aids, either from an audit angle or from a teaching angle.

After considerable discussion it was decided that the stu-

dents of the classes in which the different films and film strips were used for classroom purposes would also be asked to give an evaluation rating. To make this evaluation as effective as possible, it was urged that the instructor in charge of the class at a time previous to the actual showing of the picture, present a brief discussion as to the points to look for in the picture and an explanation of the evaluating factors to be used. After the showing, they were urged to discuss with the class the relation of the picture to the job being studied but they were also asked to use care so as not to influence the students in their scoring. Student score cards were to be collected at the close of the presentation period and the results summarized upon a single score form.

It was further decided that where a student teacher was auditing a class, he was to be considered merely as a member of the class in connection with the scoring.

Section II - Criteria of Acceptance and Rejection.

In connection with the evaluation procedure, a score card was printed that carried spaces for the placing of information about the particular visual aid, date of use, and scoring given. A place at the bottom was left for remarks or general criticism. (A copy of this score card may be found in the Appendix.)

These score cards were used throughout the investigation. For each class showing of a particular film or film strip there would be filed at least two cards, one for the instructor, another for the class as a whole. Where the class work was in charge of a student teacher, an additional card was filled out and filed which gave the reactions of the student teacher.

These score cards became a cumulative record that could be referred to at any time by teachers or administrators desiring information about particular films or other visual material.

As the investigation proceeded the file material was allocated to one of three classifications:

1. Rejected visual material.
2. Probationary visual material.
3. Acceptable visual material.

A consistent rating of "poor" in connection with a majority of the evaluating factors on the part of the instructors, student teachers and students was considered ample cause for rejection.

Where a considerable spread of scoring was indicated, and yet many ratings of "poor" were given, the particular film or film strip was placed in the probation file. In this connection the weighting as given to each evaluating factor was taken into consideration in reaching a final decision.

A film or film strip placed in the list of rejections would not be re-ordered in any following year; one in the probation list would be re-ordered where funds permitted. In later showings such material would either retain its probational standing or become a rejection due to the inclusion in the program of newer and better aids covering the same general ground.

All films and film strips not in either of the preceding files were included in the file of acceptable visual aids. As has been indicated before, new films or film strips might have an effect on the standing of older material, in this case causing previously accepted material to become reduced to a probational or rejected standing.

Section III - Analysis of Data.

A major purpose of the investigation had been to determine whether the quantity of acceptable material was adequate for the classroom inclusion of visual aid material in vocational agriculture. An analysis of the file material was made to determine the situation both as to range of content and the distribution of the acceptable material in **relation** to units and enterprises. The results of this are given in the main body of the present study.

Since those visual materials included in the accepted and probationary files were not to be considered static, an analysis was also made of the rejected material to determine causes of rejection, thereby indicating any particular features that would tend to operate against the classroom use of visual aids.

A further analysis of the acceptable visual material was carried out to determine the relative adequacy of such films and film strips as to general and specific applications in the different fields of vocational agriculture and in the different specific enterprises. As an outcome of the various analyses it was to be expected that a conclusion could be reached as to whether the range and adequacy of the visual aid material would be such as to justify their incorporation into the curriculum of vocational agriculture.

CHAPTER III

PRELIMINARY RESULTS OF INVESTIGATION

The present chapter gives a general survey of the number of films and film strips investigated in the six-year period, the number considered acceptable or related to those rejected, and an analysis of the factors causing rejection. The succeeding chapter will present an analysis of the acceptable material in terms of desirability, adequacy and adaptability to classroom procedures.

Sources of Available Material - An adequate supply of film strips and motion pictures for the use of agriculture work in Colorado might be expected to include material divided among the following classifications:

(1) Pictures general in nature or with wide agricultural applications that would be suitable for background or related information.

(2) Pictures specifically applicable to Colorado conditions that might be made an integral part of the classroom procedure.

(3) Pictures featuring local conditions, projects or activities that would be highly important to a particular department but might have little general value to other departments of the state.

Pictures included under the first classification are being developed by commercial producers of pictures, manufacturing firms for their own advertising purposes, educational institutional institutions, and government agencies. Only a small proportion of the

total have been designed for classroom use.

In the third classification group would be placed the pictures made by an individual instructor or the member of his classes for such purposes as a permanent record of projects carried out or a presentation of local conditions needing classroom discussion.

It is with the second classification that the present investigation largely deals. Most of the pictures included in the group were not intended primarily for classes in vocational agriculture. Some were planned for county agents and groups interested in agricultural topics. State and government agencies have, therefore, in considerable measure, been responsible for the production of such pictures, as the financial returns have not been sufficiently great to induce many commercial concerns to enter the field.

At first, the various producers did not operate cooperatively, but more recently considerable duplication of material has been avoided by the beginning of cooperative efforts, and the distribution facilitated by a tendency to centralize such material with state distributing centers.

Table I, lists the sources of visual material for vocational agriculture classes, and the type of visual material handled by each producer, as well as the visual aids reviewed over the period of six years, and the number accepted for classroom use.

Table I - Sources of Visual Material for
Colorado Vocational Agriculture Classes
as Related to Visual Aids Investigated.

Distributors	Motion Pictures		Film Strips	
	Number Reviewed	Number Accepted	Number Reviewed	Number Accepted
1. University of Colorado Visual Education Department	68	53	28	20
2. Akin and Bagshaw	52	42		
3. U.S. Dept. of Agriculture	39	24		
4. Goodyear Tire Company	6	3		
5. U.S. Bureau of Mines	15	9		
6. Ray Bell Film Company	2	1		
7. Swift Packing Company	1	1		
8. Y.M.C.A. Motion Pictures	18	10		
9. Colo. Vocational Visual Library			77	63
	—	—	—	—
Totals	201	143	105	83

As indicated by the table, a total of 306 different motion pictures and film strips were tried out under classroom conditions, with a total of 226 of these included in those listed as acceptable at the termination of the investigation.

As to the distributors who furnished such visual material, it is to be noted that the film strips were obtained solely from two sources: The Colorado Vocational Visual Library, and the Bureau of Visual Instruction at the University of Colorado which offers a com-

bined service for the University of Colorado and the University of Kansas. The Colorado Vocational Visual Library, connected with the State Board for Vocational Education has built up its supply of film strips from several sources including in their list those made by the agricultural teachers.

In the motion picture field, the Bureau of Visual Instruction of the University of Colorado supplied the largest number. These films were largely of an industrial nature and well suited to the Mechanics enterprise. Akin and Bagshaw proved the best source for pictures in the Animal Husbandry and Crop Production and Marketing fields. The motion picture films of the U. S. Department of Agriculture covered all three enterprises almost equally. The commercial concerns mentioned in the table had relatively few pictures available although the number is increasing and by being deposited in the libraries of the state distributing agencies are becoming available for agriculture teachers.

An itemized list of film strips and motion pictures is given in the Appendix.

Visual Aids Investigated in Six-Year Period - The following table (Table II) gives data as to the number of film strips and motion pictures tried out each year, with the number of evaluations made, and the total number rated as acceptable, probational, or rejected. This is done for each major enterprise.

Table II - Data Relating to Film Strips and
Motion Pictures Investigated in the six-
Year Period.

A. ANIMAL HUSBANDRY - FILM STRIPS

Year of Survey	<u>Number of Evaluations</u>			Instruc- tors	<u>Summarized Rating</u>		
	Total Number Shown	Students as (Classes)	Student Teachers		Number Accept- able	Number Proba- tional	Number Re- jected
1	40	80	10	80	35	3	2
2	45	82	9	82	40	4	1
3	52	80	10	80	42	7	3
4	50	82	8	82	43	6	1
5	48	75	9	75	45	2	1
6	50	78	10	78	45	4	1
Totals	285	477	56	477	250	20	9

ANIMAL HUSBANDRY MOTION PICTURES

1	20	40	8	40	18	1	1
2	25	46	9	46	20	4	1
3	27	44	10	44	22	4	1
4	30	48	9	48	23	6	1
5	32	50	10	50	25	7	0
6	32	48	8	48	25	7	0
Totals	166	276	54	276	133	29	4

B. CROP PRODUCTION AND MARKETING-FILM STRIPS

1	30	46	9	46	18	8	4
2	34	48	8	48	19	10	5
3	35	46	10	46	22	8	3
4	35	44	9	44	23	9	3
5	38	42	10	42	25	3	5
6	38	46	8	46	25	9	5
Totals	210	272	54	272	132	52	25

CROP PRODUCTION AND MARKETING - MOTION PICTURES

Year of Survey	<u>Number of Evaluations</u>			Instruc- tors	<u>Summarized Rating</u>		
	Number Shown	Students as (Classes)	Student Teachers		Number Accept- able	Number Proba- tional	Number Re- jected
1	51	35	8	35	45	4	2
2	54	40	7	40	46	6	2
3	51	36	8	36	48	2	1
4	55	42	10	42	51	1	3
5	56	46	9	46	53	2	1
6	56	45	10	45	53	2	1
Totals	323	244	52	244	296	17	10

C. FARM MECHANICS - FILM STRIPS

1	15	30	8	30	3	5	7
2	10	20	7	20	3	4	3
3	8	15	9	15	3	2	3
4	7	12	10	12	4	1	2
5	6	12	9	12	4	1	1
6	7	11	7	11	4	1	2
Totals	53	100	50	100	21	14	18

FARM MECHANICS - MOTION PICTURES

1	52	40	8	40	45	4	3
2	56	42	9	42	50	3	3
3	60	46	10	46	55	2	3
4	65	45	10	45	60	3	2
5	71	50	9	50	68	2	1
6	79	52	10	52	75	2	2
Totals	413	275	56	275	353	16	14

D. GRAND TOTALS FOR FILM STRIPS - ALL MAJOR ENTERPRISES

1.	85	156	27	156	56	16	13
2.	89	150	24	150	62	18	9
3.	95	141	29	141	67	17	9
4.	92	138	27	138	70	16	6
5.	92	129	28	129	74	11	7
6.	95	135	25	135	74	14	8
Total	548	849	160	849	403	92	52

E. GRAND TOTALS FOR MOTION PICTURES-ALL MAJOR ENTERPRISES

Year of Survey	<u>Number of Evaluations</u>				<u>Summarized Rating</u>		
	Number Shown	Student (as Classes)	Student Teachers	Instruc- tors	Number Accept- able	Number Proba- tional	Number Re- jected
1.	123	115	24	115	108	9	6
2.	135	122	24	122	114	10	6
3.	138	126	28	126	125	8	5
4.	150	135	29	135	134	10	6
5.	159	146	28	146	146	11	2
6.	167	145	28	145	153	11	3
Totals	872	789	161	789	780	59	28

F. GRAND TOTALS FOR FILM STRIPS AND MOTION PICTURES

1.	208	271	51	271	164	25	19
2.	224	272	48	272	176	28	15
3.	233	267	57	267	192	25	14
4.	242	273	56	273	204	26	12
5.	251	275	56	275	220	22	9
6.	262	280	53	280	227	25	11
Totals	1420	1638	321	1638	1183	151	30

For the 306 individual pictures reviewed, the grand totals show that 1420 showings of the motion pictures and film strips were individually reviewed critically during the six-year period. This involved the ratings on the four evaluating points for 1638 classes with an average of approximately twenty students to the class, in addition to 321 student teacher ratings and 1638 instructor ratings. Of the total number 1183 received a weighted rating of acceptable, with 151 considered as probationary, and 80 rejected.

As shown by Table II, 80 film strips and motion pictures were rejected in all major enterprises. The heaviest rejections oc-

curring in the film strips in the Crop Production and Marketing division. Most of these film strips were too technical for classroom use and were not in line with the jobs being studied. The least rejections, four in number, occurred in the motion pictures in the Animal Husbandry division, most of the films shown proving very satisfactory for background for the jobs being studied.

Some of the pictures were put on a probationary list for as long as four years before being listed as acceptable or rejected. As previously mentioned, a specific film strip or motion picture given a probationary rating in one year would not necessarily retain such a rating in a succeeding year. The same would apply to a picture given a rating of acceptable. The column totals for the acceptable material, therefore, do not necessarily agree with the corresponding totals in Table I.

Analysis of Rejected Visual Material - At the close of the investigation, 80 of the individual film strips and motion pictures remained with a rating of "rejected". The specific factors contributing most largely to such ratings are indicated by Figure 2.

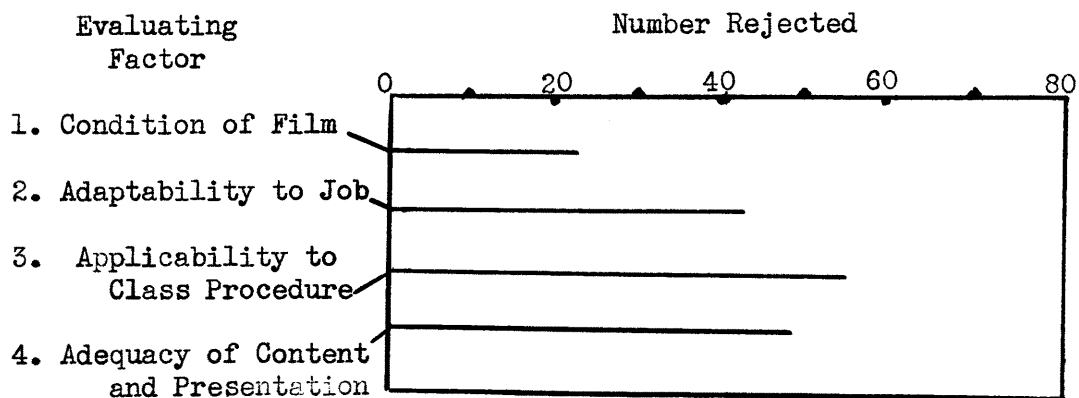


Figure 2. Specific Factors Related to Rejection of Visual Aid Material. The figures indicate only those cases among the 80 rejected film materials in which three-fourths or more of all the evaluating group rated that factor as "poor".

As shown in the figure, 22 of the film strips or motion pictures or one-fourth of the total number, were given a "poor" rating because they were not in condition to be shown properly. Torn sprocket holes, poor photography, or a general dry condition which resulted in numerous breakdowns, were the conditions usually noted.

In 41 cases, the pictures were considered not to be adapted to the job. Too much background, which detracted rather than assisted in bringing out the main points of the lesson, was the usual situation.

Lack of applicability to class procedure was indicated in 53 cases, some other type of supplementary aid being considered preferable. For example, where action was required to show processes, the film strip would not be considered as desirable as the motion picture. It might be noted in this connection that the release of some new films might, by contrast, have the effect of giving a lower rating to earlier material.

In 47 cases, the material was given a "poor" rating as to adequacy of content and form of presentation where the main points of the lesson were not supplemented or the method used did not make the situation clear to the students.

It is evident from the total of the number involved, that many of the films were undesirable on the basis of more than a single evaluating factor.

Discussion of Results - While there were 80 visual aids that were rejected as the result of classroom presentations, this does not necessarily mean that these particular motion pictures or film strips were without merit. Some were intended for entertainment

purposes that did not fit into the program of work of agriculture classes. Some were too technical for the purpose, being intended for sales groups or scientific workers.

It is recognized that material considered undesirable solely because of poor mechanical condition could be remedied by the reprinting of such material.

CHAPTER IV

AN ANALYSIS OF ACCEPTABLE VISUAL MATERIAL

The preceding chapter although pointing out that a total of 226 film strips and motion pictures had been rated as acceptable for classroom work in vocational agriculture did not give other than a partial answer to the question:

Are the motion pictures and film strips now available of sufficient range, desirability, and adequacy, and so adaptable to classroom conditions as to justify their incorporation into the curriculum of vocational agriculture for Colorado?

The present chapter gives a more detailed analysis of the relation of such visual materials to general and specific fields of vocational agriculture. This is followed by a discussion of the adequacy of the available material in treating problems (1) of wide application, (2) of the Mountain States area, (3) of limited or more local application.

Distribution of Available Visual Material - In the following table (Table III) the number of available films and film strips are listed for each of the major divisions of vocational agriculture under the various enterprises.

Table III. Distribution of Visual Material
Available for Colorado Classes in Vocational
Agriculture (1936)

A. ANIMAL HUSBANDRY

Enterprise	Film Strips	Motion Picture
1. Beef Production	3	3
2. Dairy Production	12	3
3. Horse Raising	5	2
4. Poultry Production	10	7
5. Sheep Production	9	5
6. Swine Production	6	5
Total	45	25

B. CROP PRODUCTION AND MARKETING

Enterprise	Film Strips	Motion Pictures
1. Alfalfa Production	2	1
2. Corn Production	1	7
3. Sugar Beet Production	0	2
4. Irrigation Practice	1	5
5. Plants and Plant Pathology	2	3
6. Pest Control	3	7
7. Soil Fertility and Fertilizers	3	0
8. Soils	4	2
9. Marketing Farm Crops	1	1
10. Forage Plants	4	1
11. Forestry	2	10
12. Miscellaneous Crops	0	6
13. General Agriculture	1	8
Total	24	53

C. FARM MECHANICS

Enterprise	Film Strips	Motion Pictures
1. General	2	4
2. Abrasives	0	1
3. Farm Blacksmithing	0	7
4. Concrete Work	0	4
5. Farm Electricity	0	7
6. Explosives	0	3
7. Fuel	0	7
8. Glass	0	4
9. Farm Machinery	0	4
10. Metals	0	7
11. Motors	0	7
12. Paints	0	4
13. Rope and Twine	0	2
14. Rubber	0	7
15. Tools	0	3
16. Tractors	0	3
17. Valves	0	1
18. Farm Engineering	2	0
Total	4	75
GRAND TOTALS	73	153

As shown by the table, film strips predominate in the Animal Husbandry division, 45 out of a total of 70 being of that type. Each enterprise, however, is represented by at least two film strips and two motion pictures.

In the Crop Production and Marketing division, motion pictures predominate in connection with such enterprises as corn production, irrigation practice, pest control, forestry, miscellaneous crops, and general agriculture. Yet, with two exceptions, each enterprise is represented by at least one film strip or motion picture.

In the Farm Mechanics division, of the total of 79 visual aids, all but four are motion pictures.

For the benefit of the teacher of agriculture wishing to make a study of the more desirable visual aids that have been investigated in the present study, the individual film strips and motion pictures are listed by title in the Appendix. Comments as to distribution cost and features are also included.

Distribution of Visual Aids in Terms of General and Specific Application - All acceptable visual aids were related in either a general or specific manner to the three main divisions of agriculture presented in vocational agriculture classes: Animal Husbandry, Crop Production, and Farm Mechanics. As used in this connection, those considered as having general application would cover the entire enterprise, while those with a specific application would deal with a definite unit of work being studied.

Table IV shows the distribution, for the 226 motion pictures and film strips, of those having general application as compared with those having specific application:

Table IV. Distribution of Visual Aids in Terms of General and Specific Application.

	Motion Pictures	Film Strips
A. ANIMAL HUSBANDRY		
General	13	6
Specific	12	39
B. CROP PRODUCTION AND MARKETING		
General	26	3
Specific	27	21
C. FARM MECHANICS		
General	32	2
Specific	43	2

That there was an almost even division, in the case of motion pictures, between those with general application and those with specific application is evident from the table. The first type of picture has its greatest value in background study and for building up student interest; the second for enlarging the classroom study in connection with some phase of the entire enterprise. As examples, "Farm Poultry Raising" represented the first type; "Selecting the Laying Hen" and "Marketing Live Poultry", the second.

As to film strips, those with specific application far outnumbered those with general application both in Animal Husbandry and in Crop Production and Marketing. In Farm Mechanics the visual aids were almost entirely limited to the numerous motion pictures available as but four acceptable film strips were listed, two of specific application and two general.

Distribution of Visual Aids in Relation to the Enterprises of Animal Husbandry.— To indicate whether the distribution of motion pictures and film strips with general and specific application covered, in an adequate manner, the various enterprises of Animal Husbandry, Crop Production and Marketing, and Farm Mechanics, the following tables (V, Vi, and VII) have been prepared. Table V relates to Animal Husbandry:

Table V. Distribution of Visual Aids for Animal Husbandry by Enterprises.

Enterprise	Motion Pictures		Film Strips	
	General	Specific	General	Specific
1. Beef Production	2	1	0	3
2. Dairy Production	0	3	0	10
3. Horse Raising	1	1	0	5
4. Poultry Production	3	3	1	7
5. Sheep Production	1	4	1	8
6. Swine Production	2	3	1	4
7. Miscellaneous	1	0	2	3
Total	10	15	5	40

It is evident from Table V, that the total number of acceptable strips outnumber those of motion pictures in the major enterprises of Animal Husbandry. This is partly because film strips treat all phases of the livestock enterprises.

In the Beef enterprise, the motion picture film, "The Cow Business" well illustrates the general character of the three motion pictures listed in the table. "Types and Breeds of Dual Purpose Animals" likewise illustrates the specific type of film strip, of which three are listed.

In the Dairy Production enterprise there were few motion pictures considered acceptable and of those, none were general. (Incidentally it may be stated that several dairy associations have breed study pictures that are available only in 35 mm. form and so are not included in the present study.) Every one of the twelve film strips in this enterprise are of the specific type.

Material acceptable for teaching the Horse Raising enter-

prise is very limited with most of the visual material of the film strip type, being specific in nature. The one general motion picture, "Horse and Man" is a background study.

The motion pictures available in the Poultry Production enterprise are not limited to background study; they also present phases of production and marketing of poultry and the raising of turkeys. The film strips are largely specific; such as, "Selecting the Laying Hen", and "Standard Breeds of Poultry."

Only one motion picture in the Sheep Production enterprise is general, the four others treating such subjects as production and handling of wool and the handling of lamb and mutton. Among the film strips having a specific application are, "Breeds of Sheep" and "Judging Sheep". These particular strips are typical examples of similar film strips found in all enterprises that are particularly related to breed study.

The motion pictures available in the Swine enterprise cover the range from hog production and sanitation to packing house products. Of the six film strips, five are largely specific, dealing with diseases and breed study.

The Miscellaneous division is devoted to the enterprises such as Rabbits and Bees which are not covered in the regular program of agriculture work. The six visual aids listed in this division are evenly divided between general and specific, five of the six being film strips.

Table VI. Distribution of Visual Aids for Crop Production and Marketing by Enterprise.

Enterprise	Motion Pictures		Film Strips	
	General	Specific	General	Specific
1. Alfalfa	0	1	0	2
2. Corn	1	6	0	1
3. Sugar Beets	2	0	0	0
4. Irrigation	3	2	0	1
5. Plants and Plant Pathology	0	3	1	1
6. Pest Control	2	5	0	3
7. Fertility and Fertilizers	0	0	0	3
8. Soils	2	0	0	4
9. Marketing	1	0	1	1
10. Forage Plants	0	1	0	4
11. Forestry	4	5	0	2
12. Miscellaneous Crops	5	0	0	0
13. General Agriculture	2	7	0	0
Total	23	30	2	22

In contrast to the Animal Husbandry division, the Crop Production and Marketing unit has a much larger number of motion pictures than of film strips. These motion pictures are both general and specific and in most cases are of particular importance in showing situations which are hard to explain in words. In this particular unit, the motion picture offers unusual opportunities for classroom work, as in the case of the life cycles of pests and the development of flower parts through the use of diagrammatic and slow-motion pictures. Action, as provided by the motion picture, enables the students to see the proper control measures for forest fires and soil erosion.

A relatively small number of film strips are available for the Crop Production and Marketing unit. The 24, shown in the table,

deal for the large part with the specific jobs in each enterprise.

In the Alfalfa enterprise there are three visual aids available and these are about evenly distributed between motion pictures and film strips.

"Selection and Care of Seed Corn" is the only film strip available in the Corn enterprise but this was considered as being very good as indicated by comments made upon the rating cards. All of the motion pictures except one deal with specific jobs in Corn Production, particularly with seed selection and pests.

The two motion pictures in the Sugar Beet enterprise are general in nature and are desirable for showing students the entire industry.

Five out of a total of six visual aids in the Irrigation enterprise are motion pictures and these five are almost equally divided between those of general nature and those which have a specific application. Methods of applying irrigation water is handled in these motion picture films. The one film strip, "Measuring Irrigation Water", represents an introduction to the job of water measurements.

By means of slow-motion photography, such motion pictures as "How Seeds Germinate" and "Seeds and Seed Dispersal" are of importance in the enterprise of Plant Pathology. Equally important are the microscopic views of diseased plants shown in the film strip "Nature of Plant Diseases".

Seven motion pictures and three film strips are represented in the enterprise of Pests and Pest Control. The film, "Halting

"Plant Foes", is a good illustration of the general type of motion picture, while "The Japanese Beetle", represents the specific type. "Structure of Insects" is a good illustration of the three film strips which deal specifically with pest control work.

In the combined enterprises of Fertilizers and Fertility and Soils, two motion pictures and seven film strips are available. Several of the film strips have been made by extension specialists in Colorado, such as the film strip, "Colorado Soils". The work in soil conservation is portrayed in this enterprise by the motion picture, "Anchored Areas".

Although phases of marketing are woven into many pictures and film strips, only one motion picture and one film strip in the available list are devoted to marketing.

The enterprise of Forage Plants has available four film strips of a specific nature "Important Cultivated Grasses" is such an example. The single motion picture available is the "Four Men and the Soy", where a complete story of the soy bean is woven into the plot.

The Forestry division has available nine motion pictures, with the general and specific types being about evenly divided. Methods of fire prevention and reforestation are portrayed. The two film strips available give a treatment of range management and transplanting operations.

In the enterprise of Miscellaneous Crops, the six motion pictures available are devoted to crops which are foreign to our state. No film strips appear in this enterprise.

For the enterprise of General Agriculture there are available nine motion pictures, largely of the specific type. "Yoke of the Past" is an example of the type of picture with general application, while "Analyze Your Business" is an example of the type with specific application.

Table VII. Distribution of Visual Aids for Farm Mechanics by Enterprises.

Enterprise	Motion Pictures		Film Strips	
	General	Specific	General	Specific
1. General	3	3	2	0
2. Abrasives	1	0	0	0
3. Farm Blacksmithing	3	4	0	0
4. Concrete making	4	0	0	0
5. Electricity	5	5	0	0
6. Fuel	2	4	0	0
7. Glass	1	0	0	0
8. Leather	1	2	0	0
9. Machinery	1	3	0	0
10. Metals	2	5	0	0
11. Motors	3	4	0	0
12. Paint	0	3	0	0
13. Rope and Twine	0	2	0	0
14. Rubber	5	2	0	0
15. Tools	0	3	0	0
16. Tractors	3	0	0	0
17. Valves	1	0	0	0
18. Farm Engineering	0	0	0	2
Total	35	40	2	2

For the Farm Mechanics unit, the visual aids available are almost exclusively in the form of motion pictures, as 77 out of the total of 81 are of this form. One of the most important uses for the motion picture in this field is that pertaining to the portrayal of manufacturing processes. For example, in connection with Blacksmithing work, the instructor is able to show the students the manu-

facture of iron from the ore to the finished product.

Film strips are relatively uncommon in the farm mechanics field, but four being included. As noted in the previous Chapter, several film strips are produced by the General Electric Company, but most of them are too technical to be of much use to a farm mechanics student.

In the General enterprise, motion pictures and film strips are equally divided between general and specific. Safety is taught very effectively by the use of the motion picture.

As noted in the table, there is available in the case of each of the eighteen enterprises listed in this unit at least one motion picture. In most cases, each of these enterprises has available pictures both of general nature and specific application.

In the following enterprises the visual material is limited to that of a single motion picture: Abrasives, Glass, and Valves. Rope and Twine is represented by two such pictures. Other enterprises have available a larger number of visual aids.

The various enterprises dealing with Farm Blacksmithing, Metals and Tools, have a total of 17 motion pictures available, of which "Iron Ore to Pig Iron", "Heat Treatment of Steel", "Pigs of Lead", and "Story of Copper" are typical.

The enterprises of electricity represented by 10 motion pictures show the function of such electrical devices as the spark plug, battery, blasting cap, or present the uses of electricity on the farm.

Motor and Tractor enterprises are represented by a total of

10 motion pictures. "The Four-Cycle Gas Engine", shown along with the actual demonstration of the engine represents a desirable approach to the discussion of the gasoline engine. Animated drawings shown in "The Busy Body" show the construction of a small gasoline motor. These are typical motor films. Those in the Tractor enterprise are of general application and show the value of tractors on the farm.

The Fuel enterprise is represented by seven motion pictures that show the production and refining of petroleum and the handling of coal. For the Rubber enterprise, a similar number of pictures deal with the production of rubber and its fabrication into rubber products.

Other enterprises are represented by a smaller number of pictures: Concrete Making with four films; Leather with three films; Farm Machinery with four films; Paint with four films.

In the enterprise of Farm Engineering, no motion pictures are available. However, the film strips, "Farm Sanitation" and "Farm Water Supply" cover the general situation.

Distribution of Visual Material in Relation to Agricultural Applications - Motion pictures and film strips have been grouped in the following two tables (VIII, IX) according to their application to agriculture in all states, to that of the Mountain States, and to more limited or local situations. Table VIII shows the number of motion pictures classified according to these three groupings for each main division:

Table VIII. Distribution of Motion Pictures
in Relation to Agricultural Applications.

Division	Of Wide Application	Of Mt. States Application	Of Limited Application
Animal Husbandry	20	4	1
Crop Production and Marketing	35	10	8
Farm Mechanics	75	0	0

For the Animal Husbandry enterprises the large proportion of the twenty-five motion pictures are grouped under the heading of wide application, as problems concerning livestock production are of general interest throughout the country. Four films, however, were designed for the Mountain States area and one film particularly for Colorado. For example, "Breeds of Livestock" and "Livestock Diseases" are motion pictures intended for all sections of the country, while "Range Management" is a motion picture of interest to the Mountain States area.

In the Crop Production and Marketing enterprises the greatest number of motion pictures are listed as being of wide application. These films treat of such subjects as the standard crops which are raised in all states. "Seed Corn Secrets" and "Halting Foreign Plant Foes" are two examples in this classification. Irrigation practice films, such as "Measuring Irrigation Water" and "Irrigating Field Crops", are of interest to agriculture teachers in the Mountain

States but would be of little interest to sections where irrigation is not practiced. The film, "Colorado Soils" is typical of the few films in this enterprise which primarily are of classroom interest only to Colorado teachers.

In the Farm Mechanics division the visual aids are of wide application only since the enterprises of farm mechanics are common to all states.

Table IX. Distribution of Film Strips in Relation to Agricultural Applications.

Division	Of Wide Application	Of Mt. States Application	Of Limited Application
Animal Husbandry	39	5	1
Crop Production and Marketing	21	2	1
Farm Mechanics	4	0	0

Table IX gives the data for the corresponding distribution of film strips in the various divisions. In the Animal Husbandry field the largest number of film strips are listed under the heading of "wide application" as these film strips are suitable for teaching agriculture in any state. Such strips as "Breeds of Livestock" and "Farm Poultry Raising" are examples of visual aids which have no boundary lines. Several film strips, such as "Lamb Feeding" and "Woolen Yarn", are of application only to the Mountain States area, while "Hampshire Ewes at Colorado State College" is an example of a strip which would interest largely Colorado Teachers.

In the Crop Production and Marketing enterprises the greatest number of film strips are also found under the heading of "wide application". "High grade Hay from Producer to Consumer" is an example of such a strip, since it would be of value to agriculture teachers in any state. "Forest Management" is a strip which illustrates the Mountain States application in that it would be of chief interest only to teachers in this region. "Colorado Soils" is a typical example of a strip which would be of interest only to teachers of agriculture in Colorado.

Very few film strips are available in the Farm Mechanics division. The four that are listed are placed under the wide application classification since they should be of interest to the agriculture teachers in any state. An example of such a strip would be "Mechanics" which gives a brief description of all types of mechanical appliances.

General or Extra-Curricular Uses for Acceptable Visual Material - While the present study has been an investigation of available material in relation to classroom presentation, as an incidental part of the investigation the usefulness of the accepted material for other types of work associated with vocational agriculture has been determined. As might be expected, the vocational agriculture teacher, having in his possession visual material may find a use in motion pictures and film strips for such extra-curricular activities as entertainment, F.F.A. programs, promotional activities, and evening and part-time classes.

Table X gives a summation of the particular visual aids of the present study that have been used in connection with one or more

extra-curricular activities.

Table X. General or Extra-Curricular Uses for Acceptable Visual Material.

Type of work	Motion Pictures	Film Strips
1. Field Practice	5	3
2. Supervised Project Work	6	1
3. Promotional Activities	5	1
4. Entertainment	5	3
5. F.F.A.	2	0
6. Evening and Part-Time Work	2	3
Totals	25	11

Well-chosen film strips and motion pictures are admirably suited to extra-curricular work. Those listed presented an approach to local situations brought into part-time and evening classes for discussion, or were used in F.F.A. programs to represent desirable activities or outstanding projects. It is evident that the visual aids represented in the table could not be considered as adequately indicating the extent to which visual aids can be used in extra-curricular activities by the vocational agriculture teacher.

Summarization of Results - The purpose of the present investigation as represented by the present chapter has been to determine the range, desirability, and adequacy of the motion pictures and film strips in relation to classroom work in vocational agriculture in Colorado.

All three major fields are almost equally covered by the visual aids. The 226 motion pictures and film strips found acceptable for classroom conditions were shown to be almost evenly distributed over the three major fields, there being a total of 70 such visual

aids in the Animal Husbandry division, 77 in the Crop Production and Marketing division, and 79 in that of Farm Mechanics.

Such visual aids not only covered the three major fields but were well distributed both as to general and specific applications. This is shown for the motion pictures by the fact that those with general application numbered 13, 25, and 31 for the three divisions, while those involving a specific application numbered 11, 26, and 43. The film strips more largely presented material of specific application, especially in the divisions of Animal Husbandry and Crop Production and Marketing, as shown by the fact that those with general application numbered 5, 2 and 2 for the three divisions as compared with 40, 22, and 2 for those with specific application.

Not only were the visual aids well distributed which dealt with general and specific applications for the three major divisions as a whole, but the same was true for the various enterprises under each major division.

For each of the seven enterprises in the Animal Husbandry division, at least one motion picture and at least three film strips were listed, the average for a single enterprise being 3.6 motion pictures and 6.4 film strips. With the single exception of the Dairy Production enterprise, both general and specific applications were represented by the visual aids available.

In the Crop Production and Marketing division, each of the thirteen major enterprises was represented by at least one motion picture and at least one film strip, the average for each enterprise being 4.1 motion pictures and 1.8 film strips. For eight enterprises

the visual aids represented both general and specific applications. For the enterprises of Fertility and Fertilizers, and Forage Plants, the nine visual aids available were limited to specific applications. For the enterprise of Sugar Beets and Miscellaneous Crops, the seven visual aids available, all of which were motion pictures, dealt with general applications.

In the Farm Mechanics division, of the eighteen major enterprises, all were represented by at least one motion picture or film strip, the average of all visual aids per enterprise being 4.4. Half of the eighteen enterprises were represented both by visual aids that had a general application and those that had a specific application. Although the Concrete enterprise had four motion pictures of general application, there were no visual aids of specific application. In a similar manner, the three motion pictures assigned to the Tractor enterprise were general in application. On the other hand, the Paint, Rope and Twine and Tools enterprises were represented solely by motion pictures of specific application.

That the visual aids that were available placed some emphasis upon agricultural conditions that were of Mountain States application was shown for the division of Animal Husbandry by the fact that 20 motion pictures and 39 film strips were of wide application, while 4 motion pictures and 5 film strips were primarily of Mountain States application. For Crop Production and Marketing, 35 motion pictures and 21 film strips were of wide application as compared with 10 motion pictures and 2 film strips of Mountain States application. In the division of Farm Mechanics, the emphasis of the 79 visual aids was solely upon wide applications.

More local or limited agricultural applications were represented by one motion picture and one film strip in the Animal Husbandry division; and by eight motion pictures and one film strip in the division of Crop Production and Marketing. No visual aids of local applications were listed in the division of Farm Mechanics.

General Discussion of Results - In connection with the summarized results, certain points need to be made.

As to whether the costs involved in the use of visual material would be commensurate with the classroom returns for the use of such material is not a part of the present study, though abundant evidence of a subjective nature would imply that the gains from such visual presentation amply repaid the costs involved.

As a result of the investigation, numerous requests have reached the writer for lists of the visual aids found acceptable and for comments on the best ways of fitting the specific visual aids into the vocational agriculture program. When it is considered that many schools would not desire to use more than a limited number of the visual aids studied in the investigation, it is evident that further work should be done leading to more accurate evaluation of present and future material and the preparation of syllabi for classroom use.

An evident need for an increase in the amount of visual material emphasizing Mountain State and local applications has been shown. It is possible that this need can be met in part through cooperation with state extension agencies. Film strips are becoming quite common in extension as a means of bringing actual conditions to the farmers, and local situations are frequently brought out which are worth the attention of the students in agriculture classes. Most of

the pictures originating with extension work are of state-wide application but the specific problems of certain communities may also be portarayed by actual conditions.

As noted at an earlier point, agriculture teachers are also making their own film strips and these are being placed in the Colorado Vocational Visual Library where they are available to all teachers of the State.

CHAPTER VI

SUMMARY AND CONCLUSION

The problem of this study has been to determine whether the film strips and motion pictures that are available in agriculture are (1) sufficiently desirable for classroom use and adaptable to classroom conditions; and (2) adequate in content both as to major divisions of agriculture and the different farm enterprises, to justify their inclusion as an integral part of the teaching of vocational agriculture in Colorado High Schools.

"Availability" of films has been defined as those film strips and motion pictures which were in case of the film strips, the single frame type, and for the motion pictures, the 16 mm. type. The study was further limited to include only films which could be handled on a rental or transportation-cost basis. Only those pictures applicable to the three main divisions: Animal Husbandry; Crop Production and Marketing; and Farm Mechanics were considered. In addition, only those pictures were included in the study which could be obtained at a reasonable cost by the vocational agriculture teacher.

A general survey of 306 film strips and motion pictures was made during the six-year period with final acceptance of 226 and rejection of 80. Nine sources of this material are listed, eight furnishing motion pictures and two the film strips.

The evaluating factors considered in relation to the rating of the visual aids as "Acceptable", "Probationary", or "Rejected" were condition of film, adaptability to the job, applicability to class

procedure, and adequacy of content and presentation.

For the 306 individual pictures reviewed, the grand totals show that 1420 showings of the motion pictures and film strips were individually reviewed critically during the six-year period. This involved the ratings on the four evaluating points for 1638 classes with an average of approximately twenty students to the class, in addition to 321 student teacher ratings and 1638 instructor ratings. Of the total number, 1185 received a weighted rating of acceptable, with 151 considered as probationary, and 80 rejected. Some of the pictures were put on a probationary list for as long as four years before being listed as acceptable or rejected.

The contributing factors leading to a final rejection of a picture show that 22 of the film strips or motion pictures or one-fourth of the total number were rejected because they were not in condition to be shown properly due to worn sprocket holes, poor photography, or a general dry condition resulting in poor care of the films. Too much background and not enough specific content resulted in 41 rejections as not being adapted to the job. In 53 cases, rejections resulted because of lack of applicability to class procedure, other types of supplementary aids being more suitable for classroom procedure. Lack of adequacy of content or the form of presentation resulted in 47 rejections. Many of the films were rejected on the basis of more than one evaluating factor.

As to the range, desirability, and adequacy of the motion pictures and film strips in relation to classroom work in vocational agriculture in Colorado the following results were indicated.

The 226 motion pictures and film strips found acceptable for classroom conditions were shown to be almost evenly distributed over the three major fields, there being a total of 70 such visual aids in the Animal Husbandry division, 77 in the Crop Production and Marketing division, and 79 in that of Farm Mechanics.

Such visual aids not only covered the three major fields but were well distributed both as to general and specific applications. This is shown for the motion pictures by the fact that those with general application numbered 13, 25, and 31 for the three divisions, while those involving a specific application numbered 11, 26, and 43. The film strips more largely presented material of specific application.

For each of the seven enterprises in the Animal Husbandry division, at least one motion picture and at least three film strips were listed, the average for a single enterprise being 3.6 motion pictures and 6.4 film strips. With the single exception of the Dairy Production enterprise, both general and specific applications were represented by the visual aids available.

In the Crop Production and Marketing division, each of the thirteen major enterprises was represented by at least one motion picture and at least one film strip, the average for each enterprise being 4.1 motion pictures and 1.8 film strips. For eight enterprises the visual aids represented both general and specific applications. For the enterprises of Fertility and Fertilizers, and Forage Plants the nine visual aids available were limited to specific applications. For the enterprise of Sugar Beets and Miscellaneous Crops, the seven visual aids available, all of which were motion pictures, dealt with

general applications only.

In the Farm Mechanics division, of the eighteen major enterprises, all were represented by at least one motion picture or film strip, the average of all visual aids per enterprise being 4.4. Half of the eighteen enterprises were represented both by visual aids that had a general application and those that had a specific application. Although the Concrete enterprise had four motion pictures of general application there were no visual aids of specific application. In a similar manner, the three motion pictures assigned to the Tractor enterprise were general in application. On the other hand, the Paint, Rope and Twine, and Tools enterprises were represented solely by motion pictures of specific application.

That the visual aids that were available placed some emphasis upon agricultural conditions that were of Mountain States application was shown for the division of Animal Husbandry by the fact that 20 motion pictures and 39 film strips were of wide application while 4 motion pictures and 5 film strips were primarily of Mountain State application. For Crop Production and Marketing, 35 motion pictures and 21 film strips were of wide application as compared with 10 motion pictures and 2 film strips of Mountain States application. In the division of Farm Mechanics, the emphasis of the 79 visual aids was solely upon wide application.

More local or limited agricultural applications were represented by one motion picture and one film strip in the division of Crop Production and Marketing. No visual aids of local applications were listed in the division of Farm Mechanics.

Conclusion - The facts given represent an answer to the problem as to whether the accepted visual aids are of sufficient range and adequacy for classroom use in vocational agriculture. Since only those visual aids have been considered in this connection which had previously been selected on the basis of being desirable for classroom use and adaptable to classroom conditions, it is evident that the investigation leads to the following conclusion:

The visual aids available to teachers of vocational agriculture in Colorado are of sufficient range and adequacy and sufficiently desirable and adaptable to classroom conditions as to justify their incorporation into the curriculum of vocational agriculture in Colorado.

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APPENDIX

	Pages
I. Distributor Lists of Available Motion Pictures and Film Strips and the Distributors.....	1 to 21
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UNIVERSITY OF COLORADO

Motion Picture Title	No. of	Rental
	Reels	Cost
1. From Rags to Roofs.	2	\$.50
2. Story of Gasoline	2	.50
3. Story of a Storage Battery	2	.50
4. Making a Fixed Flavor Star Ham	1	
5. Island of Sugar	1	
6. Land of Cotton	1	
7. Anchored Acres	1	1.00
8. Brooding and Rearing Chicks	1½	1.50
9. The Cow Business	2	2.00
11. Hidden Foes in Seed Potatoes	1	1.00
12. Lamb and Mutton for Home Use	1	1.00
13. Turkey Business	1	1.00
14. Work of Underground Water	1	1.50
15. Better Seeds--Better Crops	1	
16. Conquering the Jungle (Rubber)	1	
17. Evolution of the Oil Industry	3	
18. The Gypsy Moth	2	
19. The Internal Combustion Engine	3	
20. Irrigating Field Crops	2	
21. Magic of Modern Shoe-making	3	
22. Making an All-steel Automobile Body	2	
23. Making Iron and Steel Sheets	4	

UNIVERSITY OF COLORADO Films.- Continued

Motion Picture Title	No. of Reels	Rental Cost
24. Man Against Microbe	1	
25. Miracle of Corn	1	
26. Orchard Irrigation	2	
27. Pigs of Lead	1	
28. Running Water	2	
29. Story of White Lead	2	
30. Swine Production	2	
31. Valves, Their Manufacture and Uses	3	
32. Waterways and Agriculture	1	
33. Alfalfa Weevil Control	1	
34. Civilization's Fabric	2	
35. Fighting Forest Fires From the Skies	2	
36. Halting Foreign Plant Foes	1	
37. Health for Hogs	1	
38. The Land of Cotton	2	
39. The Laying Flock Project	$\frac{1}{2}$	
40. Our Daily Bread	1	
41. Selecting the Laying Hen	1	
42. The Sheep Group Project	$\frac{1}{2}$	
43. The Sugar Trail	1	
44. Swiss Cheese Made in America	1	
45. Ten Pounds to the Bushel	1	

UNIVERSITY OF COLORADO Films.- Continued

Motion Picture Title	No. of Reels	Rental Cost
46. A Woolen Yarn	1	
47. A Year with the Flock	1	
48. The Yoke of the Past	3	
49. Cotton from Seed to Cloth	2	
50. Food Distribution	2	
51. From Pod to Palate	2	
52. Along the Firing Line	2	
53. Automobile Lubrication	1	
54. Bituminous	1	
55. The Busy Body		
56. Citrous Fruit and Fruit Drops		
57. Concrete and Its Uses	1	
58. Conquest of the Forest	1	
59. Dependability	1	
60. From Mountain to Cement Sack	1	
61. Luther Burbank	$\frac{1}{2}$	\$1.00
62. Meat Packing	1	1.50
63. Market Gardening	1	1.50
64. Preparing for a Garden	1	1.50
65. Some Fruits We Like	1	1.50
66. Do You Know Beans	1	1.50
67. Flowers	$\frac{1}{2}$	1.00
68. Fruit and Flowers	1	1.50

AKIN AND BAGSHAW

Motion Picture Title	No. of Rental Reels Cost
1. Arteries of Industry	6
2. Ball of Twine	1
3. The Benefactor (Edison)	2
4. Combine Harvesters	1
5. Conquering the Desert	2
6. Conquering the Jungle	1
7. Fire Prevention in Forests	$\frac{1}{2}$
8. Fisher Body Industries	1
9. Hercules Blasting Caps	1
10. Miracle of Corn	1
11. The Orange	1
12. Our Daily Bread	1
13. Romance of Shoemaking	2
14. Rubbing the New Aladdin's Lamp (blasting caps)	1
15. Snow Removal (tractors)	1
16. Tractors in Agriculture	1
17. Trip Through a Motor Factory	2
18. Walls Without Welds	3
19. Western Logging	1
20. Banana Land	1
21. Dates--America's New Fruit Crop	1 \$.50

AKIN AND BAGSHAW Films.- Continued

Motion Picture Title	No. of Reels	Rental Cost
22. Meat Packing	1	\$.50
23. Reforestration	1	.50
24. Story of Sugar Beet in Colorado	2	.50
25. Winter Breadline in Wyoming	$\frac{1}{4}$.50
26. Four Hundred Million Chickens	1	.50
27. Potatoes--Early and Late	1	.50
28. Peanuts	1	.50
29. Cranberries	1	.50
30. Milk for You and Me	1	.50
31. The Agricultural Crisis	1	.50
32. A.B.C. of Forestry	1	.50
33. Too Much Wheat	1	.50
34. Better Quality of Vegetables	2	
35. Grain Profits	1	
36. Farm Profits	1	
37. Luther Burbank	$\frac{3}{4}$.50
38. From Fruit to Flower	1	.50
39. Seeds and Seed Dispersal	1	.50
40. The Automobile	1	.50
41. The Horse and Man	1	.50
42. Story of a Spark Plug	2	
43. Coffee	1	.50

AKIN AND BAGSHAW Films.- Continued

Motion Picture Title	No. of Reels	Rental Cost
44. Behind the Breakfast Plate (Bacon)	1	\$.50
45. Leather	1	.50
46. Refrigeration	1	.50
47. Cotton--Dixie's Great Crop	1	.50
48. Wool--Marketing and Manufacturing	3	.50
49. Bituminous Coal	1	.50
50. Iron Ore to Pig Iron	1	.50
51. Producing Crude Oil	1	.50
52. Rubber	1	.50

Miscellaneous Films

GOODYEAR

1. Conquering the Jungle	1
2. Conquering the Desert	2
3. The Island of Yesterday(rubber)	1
4. Story of Goodyear	2
5. The Story of the Tire	1
6. The Inner Tube	1

U.S. BUREAU OF MINES

1. Story of Gasoline Motor	3
2. Story of Gasoline	2
3. Story of a Storage Battery	2
4. Heat Treatment of Steel	2

Miscellaneous Films

U.S. BUREAU OF MINES.- Continued

Motion Picture Title	No. of Reels
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5. Story of a Spark Plug	2
6. Story of Lubricating Oil	2
7. The Explosives Engineer, Forerunner of Progress	1
8. The Power Within	3
9. Making it Tough	3
10. Refining the Crude	4
11. Open and Shut (Valves)	3
12. From Mountain to Cement Sack	1
13. Construction that Endures	1
14. Automobile Lubrication	1
15. Making an All-steel Automobile Body	2

U.S. DEPARTMENT OF AGRICULTURE

1. The Cow Business (beef)	2
2. The Tale of Two Bulls (dairy)	1
3. Behind the Breakfast Plate	1
4. Better Seed--Better Crops	1
5. Wheat or Weeds	1
6. Rust (black stem)	2
7. The Corn Borer	2
8. Four Men and a Boy (soybeans)	2

Miscellaneous Films

U.S. DEPARTMENT OF AGRICULTURE.- Continued

Motion Picture Title	No. of Reels
9. How Seeds Germinate	1
10. Testing Seeds in Soil	2
11. The Master Farmer	2
12. Home is What You Make It	3
13. Anchored Acres	1
14. Fighting the European Corn Borer with Machinery	1
15. Cooperative Marketing (livestock)	2
16. Back of the Weather Forecast	2
17. Horses and Bots.	
18. Green Pastures.	
19. Preparation and Marketing of Dressed Poultry	
20. Marketing Live Poultry	
21. Approved Management on National Forests	
22. Fighting the European Corn Borer with Machinery	
23. Conveying and Measuring Irrigation Water	2
24. Preparing to Irrigate	1

Miscellaneous Films

U.S. DEPARTMENT OF AGRICULTURE.- Continued

Motion Picture Title	No. of Reels
25. Japanese Beetle Control	2
26. Japanese Beetle--Life History	2
27. Million Dollar Pockets (Gophers)	2
28. Pop Goes the Weevil	3
29. Routing Rodent Robbers	2
30. Save the Soil	2
31. Forest and Streams	1
32. The Forest and Health	1
33. The Forest and Wealth	1
34. The Forest and Waters	1
35. Forest Fire	1
36. Forest Fires--or Game	1
37. Forest or Wasteland	3
38. Friends of Man	5
39. Future Forest Giants	1
40. It Might Have Been You	1
41. Marking Timber	2
42. New Woods for Old	1
43. That Brush Fire	$\frac{1}{2}$
44. Unburned Woodlands	1
45. What Price Fire?	2
46. Wood Wisdom	1
47. Rabbit Farming	2

U.S. DEPARTMENT OF AGRICULTURE

Film Strips (Not included in Colorado Vocational Visual Library)

Film Strip Title	Frames
1. Preparing Beef Cattle for Show or Sale	42
2. Cooperative Bull Associations	36
3. Some Principles of Breeding Demonstrated with the Herediscopes	40
4. Cattle Grubs and Heel Flies	24
5. Methods of Estimating Milk Quality by Bact- erial Count	49
6. Farm Horseshoeing	72
7. Selecting the Laying Hen	36
8. Inspection of Dressed Poultry	41
9. Wholesale and Retail Marketing of Live Poultry in N.Y.C.	44
10. Farm Sheep Raising	60
11. Cooperative Feeder Cattle and Lamb Pools	94
12. Wool Shearing and Preparation of Fleece	54
13. Preparation of Wool for Market	50
14. Swine Management	38
15. High Grade Hay from Producer to Consumer	54
16. Equipment and Practices Reduce Costs in Hay Making	68
17. Protect Small Grain Crops from Black Stem Rust	28

PROJECTION OF FILM STRIPS AND MOTION PICTURES,

AND ACCESSORIES

A. Film Strips

The Projection of Film Strips.- The film strip represents essentially a reduced or cheapened form of lantern slide. The strip consists of a series of frames printed on standard 35 mm. motion picture non-inflammable film with each frame $3/4 \times 1$ inch in size. A film strip usually consists of from 20 to 50 frames or different pictures.

The pictures on a film strip are usually projected by projectors designed for this purpose. By simply turning a knob a new picture is thrown on the screen. Such a picture may be shown for a considerable time without danger of heat causing the film to buckle. There are, at the present time, at least three types of such projectors on the market. They weigh from 5 to $7\frac{1}{4}$ pounds and range in price from \$20 to \$45, depending upon the size and make. They may be connected with the ordinary light socket, and, although connected with only a 200-watt Mazda lamp, are capable of throwing an excellent illuminated picture on the screen. The picture on the screen ranges from a few inches to several feet in size, according to the distance of the projector from the screen. A 3- x 4-foot image is usually considered the best size of projection for

the classroom. The operation of these projectors is very simple and can be manipulated by students successfully.¹

For a school already owning a stereopticon lantern for glass slides, it is possible to purchase a special film strip attachment that can easily be fastened to the lantern.

Advantages of Film Strips Over Glass Slides.-

Prior to the introduction of film strips certain vocational agriculture teachers were using glass slides to supplement their classroom instruction. This material was limited in scope and often unsuited to local conditions and the slides were easily broken.

Film strips are unusually economical as compared to glass slides. A strip of 25 to 75 pictures may be purchased at an average cost of from 1 to 5 cents per picture, while a single glass slide frequently costs as much as \$1.50. Furthermore, many kinds of film strips can be rented at very little expense, and with a very low transportation cost. Such a strip is shipped in a small tin container and the postage cost rarely exceeds 5 cents, whereas shipping costs for glass slides would be markedly higher, due to the greater weight and care necessary to avoid breakage.

1. Sources and makes of strip film projectors are given on pages in the Appendix.

The greater portability of the film strip machine is another advantage of the film strip as compared to the glass slide.

Making the Film Strip.- The cheapest film strip is made from negatives of a strip film camera. One can be made from a collection of pictures or photographs. Any camera can be used for making film strips.

The Ansco Memo Camera, made by the Agfa Ansco Corporation, is specially designed for the making of film strips. It is a miniature camera priced at \$12.50 and takes 50 pictures with a 50-cent roll of film. Its weight is only 12 ounces and the body measures 2 x 2½ x 4 inches. An F 6.3 lens is used with an equivalent focus of 1 15/16 inches. It has a fixed focus with full range of shutter speeds and stops, an automatic dial which counts exposures as made, and a direct-vision spyglass finder. Its construction permits easy daylight loading and rapid winding. It uses E.K. Background, Super Sensitive Pancromatic 35 mm. film specially cartridged for this camera.

Loading and unloading is simpler and easier than with a regular roll film and winding is done by pressing a lever instead of turning a key. There are no peephole numbers to watch, a dial on the front automatically registering the number of the exposure as the shutter is released. Setting the shutter is the same as with other hand cameras, and no focusing is required. Quickness in arranging the view is gained by the direct-vision spyglass

finder which enables one to see the subject right-side-up from the eye level up to the instant of exposure.

The film and the individual negatives made by this camera are of standard size. The cartridges are loaded with Agfa motion-picture negative film, and each individual negative is the size of a standard 35 mm. motion picture "frame". From the individual negatives arranged in any desired order, the positive motion picture film is printed in the usual way. The cost of such printing is 2 cents a frame.

The Memo camera is particularly well adapted to teaching vocational agriculture because of its simplicity and ease of operation. It may be used by the students for taking pictures of their projects at different stages. With certain students to serve as department photographers, many timely pictures of farm mechanics projects and other activities may be obtained. The camera is also capable of taking interior views and clear close-up pictures. This enables the instructor to get good pictures of detailed work which can be used in class projection.¹

B. Motion Pictures

The motion picture, by its rapidly changing series of pictures thrown on a screen, gives an illusion of motion. In this respect it is quite unlike the film strip.

1. Sources and makes of strip film cameras are given on pages in the Appendix.

There are two sizes of motion picture films: the standard theatrical film that is 35 mm. wide (or 1 5/8 inches); and the special 16 mm. film which is an inch narrower.

The 16 mm. film is projected by means of a special projector. This projection apparatus is much less complicated and correspondingly easier to operate than the 35 mm. projector. All of the 16 mm. film is printed on safety or non-inflammable stock. Because of the safety, economy and ease of operation, the 16 mm. silent motion pictures have become the films most extensively used for educational purposes. In the present study only the 16 mm. motion picture film is discussed.

C. Miscellaneous Equipment

In addition to projectors for both the film strip and the motion picture, consideration must be given to other forms of equipment which make proper projection possible. Rooms, curtains and screens all play a part in making visual instruction a success in the school.

Rooms.- Film strips and motion pictures should be projected in the agricultural room if a normal situation is to be maintained. For best projection results this room should be long and narrow since those students who are at wide angles from the screen do not get a clear impression of the picture produced. The room should be darkened as much as possible since any light detracts from the picture itself. Proper ventilation should be supplied

as the health of the students is endangered in a close, stuffy room.

Where it is impracticable to use the agricultural room for projection purposes, due to difficulties in darkening or to the size and shape of the room, the next best thing is a room in the building devoted to projection purposes only. The class can be taken to this room for the picture presentation but since the normal teaching situation has been upset, the teacher must guard against a "picture show" attitude among the students. The ideal situation is to have a properly darkened agricultural room and in addition, a special projection room where special types of instruction can be given without interfering with the regular classroom instruction.

The writer feels that he has such an ideal set-up in his own school. Using the laboratory room, which adjoins the classroom, as a projection booth, the pictures are thrown on a screen in the front of the room, making it unnecessary for the students to change their positions at their desks. Since film strips and motion pictures are used as supplementary aids to the regular classroom instruction, the normal teaching situation is not disturbed by this method of projection. When the pictures portraying the unit of work studied have been given, the regular teaching procedure can be resumed. A special projection room is also maintained where pictures not so related to the subject being studied may be shown. These presenta-

tions usually take up the full hour to avoid the passing of the class during the period.

Curtains.- The proper curtaining of the projection room is necessary if the best results are to be obtained. Although some of the projectors can be used in rooms light enough to allow the students to take notes, there is apt to be a strain on the eyes of the students watching the picture and it is probable that the picture itself will not be as distinct as should be required.

The writer has found opaque curtains very satisfactory in keeping out the light. These curtains, with the regular tan color on the outside and black on the inside, have a cost varying from \$3 to \$6 per window. In order to keep any light from coming in along the edges of the curtains, binding strips are used. These may be made in the shop and consist of two strips of wood hinged together with spring hinges. When the curtains are drawn down, the strips clamp over the edges of the curtain thus preventing any side light from coming in.

If it is not possible to buy opaque curtains, strips of wall board may be hung over the windows. It is necessary, however, that there be no cross light and that no light falls on the screen.

Screens.- Satisfactory projection of pictures requires a screen with a suitable reflecting surface. There are two types of screens according to the nature of the surface: (1) the reflecting screen; and (2) the trans-

lucent screen. The first reflects the light, the other transmits it. Of the two, the reflecting screen is the most widely used.

Three types of reflecting screens using different surface construction are referred to as the beaded, silver, and mat-white. The writer has had very satisfactory experience with a Da-Lite beaded screen. This screen, developed within the last few years, is covered with small glass beads and has the highest direct reflective qualities of the three general types. However, projection at various angles in the room is not altogether satisfactory.

The silver screen is a canvas screen covered with a metallic coating which is flexible, thereby allowing the screen to be rolled without damage to the surface. This screen gives a wider angle of reflection than the glass bead screen but does not have as high a reflective quality.

The mat-white screen is usually made up of a white silk surface which may be cleaned easily. This screen allows projection at wide angles from the line of projection, and is especially good in giving a true reproduction of colors.

The writer recommends a commercial type screen in preference to any "home-made" type. A poor screen reflects only a small part of the light, while a good screen reflects nearly all the light thrown on it. This is the main reason why "home-made" screens give dull, gray images

and are generally unsatisfactory.¹

For emergency use, a screen can be made from wall board, 4 feet by 6 feet, painted with aluminum paint. For film strip projection, a piece of white card board, 22 inches by 28 inches, may be used in such a case or projection made on a white painted wall. One must remember, however, that there is an eyestrain developed in the use of these inferior types of screens, and, if possible, an inexpensive commercial screen of a portable type should be a part of the visual equipment.

One of the leading screen companies in the country, has for sale, 15 distinct and separate commercial models, made in 50 standard sizes. The "New Deal" model is one of the smallest of these and is made to set on a table. The beaded screen fabric is mounted in a light, compact, fabric leather-covered case of neat design and rugged construction. The single support assures positive and easy control.

The "Challenger" sits on a tripod with a picture surface approximately 45 inches off the floor. The screen folds into a neat, compact unit for storage or transportation. For this model, sizes range from 40 inches up to 70 inches by 94 inches, the corresponding prices ranging from \$20 to \$75.

The screen should be set in the darkest part of

2. Sources and makes of screens are given in the Appendix on pages

the room and so placed that all the students can see clearly without any distortion. A long room is more desirable than a wide room as it gives the students a chance to get away from the screen. No one should be allowed to sit closer than 6 feet or at an angle to the screen since distortion is undesirable. It is desirable that the largest picture possible be shown on the screen providing that the picture still remains clear-cut. With the film strip it is usually necessary to move the projector closer to the screen than in the case of motion pictures.

Other Physical Equipment.- All the extra equipment which is necessary to the projection of both film strips and motion pictures should be kept handy and in good condition. The writer has found it advisable to have an emergency box handy whenever pictures are being shown. This contains an extra lamp, a splicing outfit, oil, belts, spare plugs, and brushes. Duplicate extension cords should always accompany the projector when taken to a new place for projection.

While lamps are guaranteed from 25 to 50 hours of service, defective lamps are occasionally encountered. It is a good policy to keep several spare lamps on hand for both the film strip and the motion picture projectors.

At least one extra reel should be kept on hand in case of emergency needs.

TYPES OF WORK TO WHICH MOTION PICTURES
AND FILM STRIPS ARE ADAPTED

Considerable interest has been shown by research workers in the field of visual instruction, especially in connection with the use of motion pictures in history, geography, and science classes. While much of the experimental work was done only with grade-school boys and girls, the following conclusions seem to have been demonstrated:¹

(1) Film strips and motion pictures should be especially designed for the teaching work, and should be accompanied by carefully prepared syllabi.

(2) Such visual aids should be used to supplement other teaching devices, not to substitute for them.

(3) The motion picture should be used only when it is necessary to show action.

(4) The extra expense involved can be justified by greater effectiveness of the learning.

The experience of many teachers has shown that visual instruction has a wide-spread application in the field of vocational agriculture. The writer feels that film strips and motion pictures are adapted to practically

1. Dorris, Anna V., Visual Instruction in the Public Schools, Chs. I, II, III.

every phase of instruction. In one form or another, they serve as valuable supplementary aids in putting the job across to the students. In the following discussion the various types of vocational agriculture work are given along with the special adaptations to them of the film strip and motion picture.

A. General Background

A clear picture of the subject being studied is necessary for the student in order that he may clearly interpret the subject. Vocational agriculture has the advantage over most subjects in the curriculum in having a natural background to draw from. Unlike other subjects, vocational agriculture treats of types of work with which the farm boy is already more or less familiar. The teaching is based on "mastering the boy's home environment" and deals largely with local farming conditions. The boy knows what the various animals and crops look like, knows some crops' cultural methods, and above all, usually has an interest in this environment.

Types of farming not common to the community are more clearly and easily presented through the medium of the motion picture than by descriptions presented by the instructor or by printed material. General and related information which may be considered with each job is made more interesting and instructive to the students by means of the film strip or the motion picture.

B. Classroom Procedures

The chief use of film strips and motion pictures would seem to be in connection with regular classroom procedures. In the Preparation Step they may be used in forming backgrounds and developing interest in the job to be considered. In the Presentation Step they may be used in helping "spot the problems" so necessary in a complete analysis of the job. In the Supervised Study Step they may be used as aids to individual students working on special reports. In the Class Discussion Step they may be used with the reports given by the students as a help in drawing out the desired information. In the Conclusion Step they may contribute to a faster grasp of the important things in the job and furnish a good review before the concluding statements are copied in the note books. They may also be used in the Testing Step, questions being based upon material presented in the picture.

In the Related Information part of the job, they may be used to bring a clearer conception of the supplementary material.

C. Laboratory Practice

Film strips and motion pictures may be considered valuable in the laboratory, even though a great share of laboratory work is with actual materials and demonstrations. They may be made to serve as a check on the work at hand by showing what has been done in similar fields. Specially

developed films may, through diagrammatic drawings, show the many minute details being studied by the students.

D. Field Practice

Film strips and motion pictures may be used in field practice to serve as an introduction to the trip to be taken, by showing what to look for if it be an inspection trip, or by picturing methods of performance if it be an operative job. The use of such pictures, following the trip, may serve to check on the things seen or done.

E. Supervised Project Work

There are many ways in which film strips and motion pictures may be used in supervised project work. It is possible to present in this way a clear conception of worthwhile projects carried by local boys in former years, or by boys in other communities. Pictures are also valuable in showing the right and wrong ways of cultural methods for crops or management of livestock carried as projects.

F. Farm Mechanics

Theory work in Farm Mechanics is, at most, a hard thing to put across to students. With the assistance of film strips and motion pictures boys are able to grasp details more clearly than where a verbal discussion is the only presentation method used. The motion picture, by its combined diagram and motion, represents the action in a realistic and easily understood way that is superior either to the use of the engine itself or to still diagrams.

G. Promotional Work

With vocational agriculture frequently on the defense no better way of protecting the department would seem to present itself than that of showing to the patrons the many activities which are involved in that department. By means of film strips and motion pictures such activities may be clearly and concisely presented to the public. For increasing enrollment in the department the presentation of these activities to prospective students is to be considered a highly satisfactory method. Promoting special types of work by showing similar work as carried out in other schools is a most important part of the service that may be rendered by film strips and motion pictures.

H. Entertainment

Even though the time given to instructing the vocational agriculture students is short enough, the entertainment angle should apparently not be overlooked. As a special reward for good work an occasional showing of an entertainment film would seem to justify the time and expense. Such entertainment is good psychology in putting on evening and part-time schools.

I. Future Farmers of America

Film strips and motion pictures fit well into the F.F.A. program since the starting point of all extra curricular activities is the F.F.A. Contests, exhibits, and conventions can be shown to the students, thereby in-

creasing the desire on the part of the members to improve their own program. A yearly record of F.F.A. activities can well be kept by either film strips or motion pictures.

J. Evening and Part-time Work

This important feature of the vocational agriculture program can be assisted by the use of the film strip and the motion picture. Local pictures are of more interest to the adults than pictures taken in some other part of the country. Methods of culture of farm crops and general management of livestock can be shown most effectively by means of these aids. It is much easier to conduct a program if a film strip or motion picture is on hand to centralize the discussion. Improvements of past years in housing conditions, etc., can be shown most clearly by using a film strip or a motion picture.

Lesson Planning for Use of Visual Material

No matter how adequate the visual aid materials may be in connection with the various enterprises of the vocational agriculture program, the fact must be recognized that the adaptation of the material to classroom procedure is, in itself, a task requiring considerable experience for its best accomplishment. Few of the film strips or motion pictures are accompanied by syllabi that indicate how these classroom aids may best be used, and how the classroom work may be stimulated rather than disturbed by their use.

In the use of a film strip, only those frames of a strip needed to supplement a lesson should be used. A film strip should be used to supplement the teaching of a job not to substitute for the teaching. Not only should the film strip be used in group discussion but an effort should be made by the teacher to encourage the students to use it for individual study. Carefully prepared syllabi should accompany the home-made film strips. These, in some cases, offer excellent projects for the advanced students when checked carefully by the teacher.

Motion pictures are particularly well adapted to teaching general and related information. They should be used only where it is necessary to show action. The teacher should remember that motion pictures are not entertainment devices and should use just those pictures which

fit into the teaching plan. The "padding" of other pictures of no allied nature are detrimental to a good teaching job. Were teachers to feel that they should use these other pictures merely to fill the hour, the effect would be to make the students feel that all visual aids are primarily not teaching devices but methods of keeping them busy or entertained.

In order to properly teach the job, the teacher must prepare an analysis and teaching layout of the job. This enables him to clearly see what points in the lesson are to be stressed and to clarify the various factors and decisions which must be made by the students. The proper placing of the visual aids in the teaching layout will serve to remind the teacher when such aids should be used.

To indicate what he considers a desirable use of these visual aids in lesson planning, the writer has selected three typical jobs as illustrations. The first of these will be the managerial job of "Selecting a Good Breed of Dairy Cattle," in which the classroom procedure is supplemented by the following film strip (listed in Table II, B): "Breeds of Dairy Cattle"-47 frames.

This is followed with a lesson taught from a purely informational basis, namely, "Producing Clean Milk." The film strip and motion picture (listed in Table II, B) used to supplement this lesson are: "Milk for You and Me"-1 reel of motion picture; and "Production of Clean Milk"-1 film strip of 45 frames.

The third lesson involves the development of the operative skill of "Butchering Hogs." The film strip and motion picture (listed in Table II, F) used are: "Making a Fixed Flavor Star Ham"-1 reel of motion picture; and "Dressing and Curing Pork on the Farm"-1 film strip of 30 frames.

(Teaching Layout of a Managerial Job)

DAYS

MONTH

2

Sept.

ENTERPRISE: DAIRY PRODUCTION

JOB: SELECTING A GOOD BREED OF DAIRY CATTLE.

Situations to be dealt with:

1. The farmers in the community have different breeds of dairy and no one breed predominates.

Objectives:

1. An understanding of the characteristics of the major breeds of dairy cattle.
2. An understanding and appreciation of the factors that should be considered in selecting a breed of dairy cattle.

PROCEDURE TO BE USED

(First Day)

I. Preparation Step:

1. Clearly explain the job, bringing out community situations and the importance of the job.
2. Show the film strip, "Breeds of Dairy Cattle." Have the boys draw on their own knowledge as to names and characteristics of breeds. (Do no teaching in this step.)

II. Presentation Step:

1. Draw the boys into the analysis of the job, getting them to state (a) the decisions; (b) the important factors; (c) kind of facts needed.
2. Have boys copy analysis in their note books.

III. Development and Assignment of Additional Problems:

1. Develop additional problems with boys through suggestive questioning.

2. Develop problems arising from general and related information.
3. Have boys copy problems in their note book.

IV. Supervised Study:

1. Boys get facts needed to evaluate factors.
2. Boys study additional problems.

(Second Day)

V. Discussion:

1. Show the film strip, "Breeds of Dairy Cattle." Call on boys to describe characteristics of animals. Use syllabus to guide discussion.
2. Bring out more important functioning facts.
3. Evaluate factors, solve problems, and come to conclusions.
4. Discuss additional problems.

VI. Follow-up Work:

1. Project workers make plans for job.
2. Other boys write conclusions reached in class.

VII. Testing:

1. Check plans of project workers.
2. Observe what project workers and other boys do with the job.
3. Show film strip and have boys write down name of each breed shown.

REFERENCES: Breeds of Dairy Animals-F.B. 1443
Judging Livestock-C.S.C. Bul. 265A.

(Teaching Layout of an Informational Job)	<u>DAYS</u>	<u>MONTH</u>
	2	Dec.

ENTERPRISE: DAIRY PRODUCTION

JOB: PRODUCING CLEAN MILK.

Situations to be dealt with:

1. Quality of milk from different farms varies.
2. Many farmers do not put forth their best efforts to produce the highest quality of milk.

Objectives:

1. An appreciation of the value of high quality of milk.
2. An understanding of the factors entering into the production of clean milk.
3. A desire to produce the best grade of milk.

(First Day)

I. Preparation Step:

1. Clearly explain job, bringing out community situations and the importance of the job.
2. Show motion picture film, "Milk for You and Me."

II. Presentation Step:

1. Develop problems for study and discussion with the boys.
2. Add additional problems by suggestive questioning.
3. Boys copy these in note books.
4. References: U.S.D.A. bulletins; C.S.C. Bulletin, given to boys.

III. Supervised Study:

1. Boys find solutions to the problems.

(Second Day)

IV. Class Discussion:

1. Show the film strip, "Production of Clean Milk." Have discussion from boys on each picture. Use syllabus as guide. Discuss problems.

V. Follow-up Work:

1. Boys write plan for jobs or the conclusions reached in their note books.
2. Boys execute plans.

VI. Testing:

1. Teacher examines job plans.
2. Show parts of films and have boys mention the good and bad practices.

- REFERENCES:
1. "Producing Clean Milk in Colorado."- Bul. 245A, C.S.C.
 2. "Producing Clean Milk"-F.B. 602.

(Teaching Layout of an Operative Job)	<u>DAYS</u>	<u>MONTH</u>
	2	Jan.

ENTERPRISE: SWINE PRODUCTION.

JOB: BUTCHERING HOGS.

Situations to be dealt with:

1. Many more farmers could profitably butcher their own hogs.
2. Many farm boys have assisted in butchering but have not taken the responsibility of doing the job.

Objectives:

1. An appreciation of the correct procedure in butchering a hog.
2. Operative skill in accord with the standard practice in butchering hogs.

PROCEDURE TO BE USED

(First Day)

I. Preparation Step:

1. Clearly explain the job bringing out community situations and importance of the job.
2. Show film strip, "Dressing and Cutting Pork on the Farm." Use only the pictures pertaining to butchering.

II. Demonstration by Teacher:

1. Mimeographed analysis sheets are passed out to the boys.
2. Teacher demonstrates the butchering of a hog.
3. Teacher clearly demonstrates each operation and gives reasons.

4. Discussion of problems arising from pupils questioning.
5. Discussion of problems arising from related and general information through suggestive questioning.

(Second Day)

III. Supervised Field Practice:

1. Boys practice doing job under supervision of teacher.
2. Teacher assists boys.

IV. Follow-up Work:

1. Show motion picture, "Making a Fixed Flavor Star Ham."
2. Project workers write plan in note book.
3. Others write conclusions reached in class.

V. Testing:

1. Teacher checks boys' plans.
2. Teacher observes work boys do.
3. Show film strip and have boys write operations as indicated in pictures.

REFERENCES: Butchering Hogs-C.S.C., Bul. 283A
Home Butchering of Pork-F.B. 1186

Budgeting in Connection With Film Material

The financing of a visual program is an important factor to be considered. Most school boards are adverse to spending much money for supplementary aids in teaching and with visual work in its infancy there is a natural antagonism toward "something new."

The teacher who is interested in building up a long-time program of visual instruction in his department should carefully consider all material before purchasing it. The initial cost is the greatest cost to be considered in setting up a department. Careful selection of projectors and miscellaneous equipment should be the teacher's aim. Where finances are limited for visual aid equipment, a small program can be well administered which will result in a gradual expansion in succeeding years. Education of the school administrators as to the effectiveness of visual instruction will go a long ways toward making it possible to extend visual work not only in the agricultural department but in the entire school system as well.

The following suggestions may be of assistance to teachers who are planning on starting a program of visual instruction in their department. In buying equipment, the teacher will find the distributors of visual aids only too glad to demonstrate their projectors and

in many cases to give generous trade-in value to old glass slide or other types of projectors already in the school system. Graduating class funds, P.T.A. funds, and benefits are always effective means in getting the school board to help finance visual equipment.

In the film strip field, the purchasing of a special film strip projector is usually superior to the purchasing of a special attachment for a glass slide machine. Film strips may be rented from the Colorado Vocational Visual Library at a very nominal cost but it is suggested that a few strips be bought each year and added to the visual library. For promotion purposes, the making of a home-made strip each year is an excellent project.

In the motion picture field, it is more economical in the long run to purchase a good projector which will stand up over a period of several years. The 16 mm. projector is far superior to the 35 mm. projector. Its easy portability and ease of projection by students as well as teachers make it the ideal type to purchase for educational purposes. Films of the 35 mm. form are rapidly being changed over to the 16 mm. type. It is the best policy to rent one's films rather than buy them. This is due to the cost of the film and to the infrequency of use of each film.

One good commercial type screen should be included in the visual budget although it is possible to make a fairly acceptable home-made screen for emergency

purposes. Opaque curtains should also be requisitioned for the agricultural room or some room adapted to the projection of pictures. A well-equipped emergency box containing an extra lamp, extension cord, etc. should also be included in the budget.

The teacher of agriculture should include the visual aids needed in with his yearly budget. Since they are teaching devices, they should have as much recognition as books, laboratory material, etc.

For an agriculture instructor who wishes to initiate a visual program on a small scale, the following suggestions are given as to the equipment and supplies necessary for the first year.

Film Strips.- In the film strip field it is necessary to have a good projector. Although a film strip attachment may be used on glass slide and opaque projectors, it is the belief of the writer that better results will be obtained by buying a projector especially adapted to film strips. This is because the special film strip projector has a better optical system than an attachment and allows the use of film strips when some other department in the school may be using the glass slide or opaque projector. Such a film strip projector may be purchased for \$38.50, complete with carrying case. It is an extremely compact machine, very durable, and gives a much greater definition to the picture than the older makes. Cheaper projectors may be purchased but

these are not as durable as the projector recommended. It must be remembered that in such a projector, the teacher has a machine which will last for years, the only upkeep necessary being that of a new lamp at irregular intervals.

To the teacher just starting a program, it is much more practical and economical to rent film strips than to buy them outright. This is partly due to the saving involved and to the desirability of acquainting one's self with the various film strips available before buying them. Some of the strips may not be found adaptable to the type of teaching being done and their buying would be undesirable. The Colorado Vocational Visual Library has 65 film strips on agriculture available. Most of these are U.S.D.A. strips although there are several that are produced by extension workers and agriculture teachers. These may be secured from the library at a group service cost of \$5 a year. To this cost must be added the cost of transportation back to the library which will be approximately 2 cents a strip or altogether about \$1.30. These 65 film strips will meet the needs of the first year of the visual program.

Motion Pictures.- In the motion picture field, it is more economical in the long-run to purchase one of the more expensive projectors. This is because the more expensive projectors will stand up better under hard usage than one of the cheaper makes. The projector

recommended by the writer sells for \$135.00. It is compact, easy to operate by teacher or student and is easily transported from place to place. It has a 500-watt lamp which gives an excellent illumination on the screen. Such a projector will last for years with the only upkeep being that of a factory overhaul about every 2 years and a new lamp about every 50 hours of service.

Film rental for the motion picture is more complicated than in the case of the film strip. A group service plan has been placed in effect by one of the leading distributors in the state at a cost of \$12.50. This group service plan includes 24 agricultural films and, in addition, the use of approximately 50 industrial films. In this plan, the distributor pays the postage one way. Such transportation cost to the teacher will amount to approximately 6 cents a reel or a total of \$4.44 for the 74 reels available. This number of films should be extensive enough for the first year.

Screens.- Although several home-made types of screens may be used, it is recommended that a good type of glass bead screen be purchased. Such commercial screens reflect the light to a greater degree than the home-made screens and are much easier on the students' eyes. The writer recommends the portable tripod type, 30 inches by 40 inches in size, which costs \$15. This type has an adjustment in height from 1 to 18 inches allowing ample height to permit throwing the picture over the heads of

the audience.

Lamps.- Replacement of lamps for the film strip and motion picture projectors are a necessary expense. Film-strip projector lamps are designed for 100 hours of service while motion-picture projector lamps last for 50 hours of service. A film strip projector lamp, 200 watt, costs \$3.25 while a motion picture projector lamp, 500 watt, costs \$5.25. It is recommended that the teacher keep on hand at all times at least one spare lamp for each machine. This precaution saves embarrassment and delay in case of a break-down while showing pictures.

Miscellaneous Equipment.- In addition to the above-mentioned equipment and materials, it is recommended that each teacher have on hand an emergency box. This box should contain the following articles: Film splicing outfit; spare lamps; light plugs; brushes for cleaning lens; special lens for throwing picture long distances; temporary patching material; double socket; lubricating oil; extra extension cord; triple socket; and an extra reel.

The splicing outfit is very handy in case of break-downs and can be purchased for \$1.50. Several small brushes should be kept on hand to clean the lenses. A special lens for long-distance projection is not absolutely necessary but very desirable at times.

A rubber covered extension cord is preferable and should be about 15 feet long. Such cord may be

bought in any desired length and can be made up very easily at a cost of 5 cents a foot plus the cost of socket and plug. The lubricating oil used should be that recommended for the type of projector that is being used, however, any high-grade penetrating oil similar to that used on sewing machines will be satisfactory. A 25 cent can will last for a long time. Spare plugs and sockets are always handy, particularly when the machine is taken to some room which is not adapted for projection purposes. A spare reel is very necessary should a break in the film occur in the showing of motion pictures. For temporary patching, cellulose tape is very useful; such a roll costs about \$1.50.

Budget Summary.- In summing up the budget feature of this study, the following table represents the probable costs of the first year of a visual program:

Film Strips:

1. Projector	\$ 38.50
2. Film Strip Rental	5.00
3. Postage (one way)	1.30
	<hr/>
	\$ 44.80

Motion Pictures:

1. Projector	\$135.00
2. Film Rental	12.50
3. Postage (one way)	4.44
	<hr/>
	\$151.94

Screen:

1. Glass Bead (tripod type) . .	\$ 15.00
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Miscellaneous Equipment and Supplies:

1.	Spare lamp for film strip projector	\$ 3.25
2.	Spare lamp for motion picture projector.	5.25
3.	Film-splicing Outfit	1.50
4.	Extension Cords (1-6 ft.; 1-15ft)	1.50
5.	Cleaning brushes25
6.	Lubricating Oil.25
7.	Double Socket.15
8.	Extra Plugs.10
9.	Extra Reel50
10.	Cellulose tape for temporary patching	1.50
		<hr/>
		\$ 14.25

Total cost for first year. . . . \$225.99

Value of permanent equipment . . \$187.50

It is possible to cut down the total cost as given above by buying guaranteed reconditioned projectors; substituting cheaper equipment; reducing number of film strips and films shown; or by using only one of the types of visual aids mentioned. It must be remembered, however, that the teacher who is starting a visual program for the first year should have a large enough program to show effective results. Administrators will be much more prone to extend a visual program to other departments in the school if they can see a well-rounded program in the agriculture department. It must also be remembered that the initial cost is the largest, and that the cash outlay need not be as great the second year.

Table II.- Visual Aids in Relation to Animal Husbandry.

A. ENTERPRISE: Beef Production

Job	Title and comment	Film strip frames	Motion picture reels	Distributor number	Cost
General	"The Cow Business" Background study of beef cattle in western U.S. Best to use before Beef Jobs are presented. Good		2	7	Transportation
	"Winter Breadline in Wyoming" Introduction to job of feeding range cattle. A little too much scenery. Interesting.		$\frac{1}{4}$	1	50¢
	"Green Pastures" Effects of over-grazing. Stresses distribution of cattle. Good in Grazing Job.		1	7	Transportation
Breeds	"Types and Breeds of Beef and Dual-purpose Animals" Presentation of all breeds of beef and dual-purpose animals. Very good.	34		3	Group Service
Judging	"Judging Beef Cattle" Judging common beef types. Supplement with other material.	43		3	Group Service
Fitting	"Preparing Beef Cattle for Show or Sale" Steps in preparation of animals for exhibit. Supplements operative job of Fitting for Show. Use at beginning of Job.	42		7	35¢

B. ENTERPRISE: Dairy Production					
Job	Title and comment	Film strip frames	Motion picture reels	Distributor number	Cost
General	"The Tale of Two Bulls" Comparison of pure-bred and grade bulls. Very good in introducing breeding work.		2	7	Transportation
Breeds	"Cooperative Bull Associations" Value of cooperative bull associations. Made interesting by narrative woven in.	36		7	28¢
	"Breeds of Dairy Cattle" Fundamental breed study. Especially good in judging work. Can be used in class discussion.	47		3	Group Service
Selecting	"Judging Dairy Cattle" Standard practices in judging. Supplement to special judging work. Good.	40		3	Group Service
	"Judging Holstein Cows" Judging of six classes of cows. New type of strip, especially for dairy judging (advanced). Very good.	12		2	Group Service
Housing	"Farm Dairy Houses" Good and bad types of dairy houses. Used to introduce Dairy House Job. Very good.	63		3	Group Service
Feeding	"Marketing Feeds Through Dairy Cows" Value of corn and silage as dairy feeds. Used to introduce Feeding Job.	28		3	Group Service
Breeding	"Some Principles of Breeding as Demonstrated with the Herediscope" Demonstration of the herediscope as a simple method of teaching breeding fundamentals. Good	40		7	28¢
	"Raising the Dairy Calf" Steps in raising the dairy calf. Should be supplemented by more recent material.	44		3	Group Service
Pests and Diseases	"Cattle Grubs and Heel Flies" How grubs and flies bother cattle. Very good for showing life cycles.	24		7	28¢
	"Eradicating T.B. from Livestock" Prescription of government methods of eradicating T.B. Very good to introduce job.	59		3	Group Service
Producing Clean Milk	"Production of Clean Milk" Steps necessary in producing clean milk. Unusually complete strip.	45		3	Group Service
	"Methods of Estimating Milk Quality by Bacterial Count"	49		7	35¢
	"Milk for You and Me" Microscope slides with corresponding bacterial count. Little advanced; interesting Importance of Quality in milk. Good.		1	1	50¢
Other Products	"Swiss Cheese Made in America" Depiction of the manufacture of Swiss cheese. General; interesting.		1	1	50¢

C. ENTERPRISE: Horse Raising

Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number	Cost
General	"The Horse and Man" Evolution of horse and relation to man's progress. Very good to introduce Enterprise.		1	1	50¢
	"Breaking the Farm Colt" Steps in breaking a colt. Very good in introducing the job.	41		3	Group Ser- vice
	"Care of Horse's Feet" Construction of horse's foot, its care, good and bad hooves. Very good.	41		3	Group Ser- vice
	"Farm Horseshoeing" Steps in shoeing horses. Excellent in introducing job.	72		7	42¢
Breeds	"Breeds of Horses" Common breeds of horses. Good in judging work. Needs supplementing.	59		3	Group Ser- vice
Selecting	"Judging Draft Horses" Fundamentals of judging draft horses. Good in starting the Selecting Job.	59		3	Group Ser- vice
Pests	"Horses and Bots" Preventative treatment for bots, eradication, types. Very good.		2	7	Trans- porta- tion

D. ENTERPRISE: Poultry Production					
Job	Title and comment	Film strip frames	Motion picture reels	Distributor number	Cost
General	"Laying Flock Project" Factors in building up a good flock project. Fine for getting interest.		1	5	Group Service
	"4 Hundred Million Chicks" Chick production based largely on big poultry plants. Not particularly adapted to farm. Interesting.		1	1	50¢
	"Farm Poultry Raising" Phases of poultry industry. Good to introduce Enterprise.	42		3	Group Service
Selecting	"Selecting the Laying Hen" Operations involved in culling the flock. Very good to supplement Culling Job.		1	5	Group Service
	"Selecting the Laying Hen" Operations in selecting laying hen. Good in class discussion of Culling Job.	36		7	28¢
Breeds	"Standard Breeds of Poultry" Main poultry breeds. Very good in Breed Study. Could treat main breeds more fully.	48		3	Group Service
Production	"Growing Healthy Pullets" General care and feeding of pullets. Adapted to Pullet Production Job. Very good.	33		3	Group Service
	"Brooding and Rearing Chicks" Up-to-date methods of rearing chicks in brooder houses. Good to introduce Brooding Job.		1½	5	\$1.50
	"Care of Laying Flock" Care of flock starting in November. Related to Pullet Production Job. Very good.	25		3	Group Service
Marketing	"Marketing Eggs in United States" Marketing, from farm and commercial angles. Good in Marketing Job.	46		3	Group Service
	"Inspection of Dressed Poultry" Price differences in grades of poultry. Preparation steps well shown.	41		7	28¢
	"Preparation and Marketing of Dressed Poultry" Modern methods on the farm and in cold storage warehouses. Very good.		2	7	Transportation
	"Marketing Live Poultry" Culling, shipping, and marketing. Excellent for Marketing Job.		2	7	Transportation
	"Wholesale and Retail Marketing of Live Poultry in New York City" Methods used in wholesale houses. Good.	44		7	28¢
Pests	"Chicken Lice and Mites" Differences between lice and mites. Control measures clearly shown. Good.	40		3	Group Service
Turkeys	"Turkey Production" All phases of turkey production. Very good in Turkey Job.	38		3	Group Service.
	"Turkey Business" Principles of turkey production. General. Very good.		1	5	\$1.00

E. ENTERPRISE: Sheep Production

Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number	Cost
General	"The Sheep Group Project" Steps in the development of a sheep project. Largely inspirational.		2	5	Group Service
	"Approved Management on National Forests" Pasturing and range control measures. Very good in Pasture Job.		2	7	Trans- porta- tion
	"Range Management on National Forests" Overpasturing effects and need for control measures. Good for Pasture Job.	35		3	Group Service
	"Farm Sheep Raising" Steps in sheep production. Good to introduce Sheep Unit.	60		7	44¢
Breeds	"Breeds of Sheep" Presentation of breeds of sheep. Too much stress on minor breeds. Good in Selecting Job.	35		3	Group Service
Select- ing	"Judging Sheep" Fundamentals of judging. Should be a good supplement to other instruc- tion.	34		3	Group Service
	"Judging Hampshire Ewes" A showing of six classes of ewes - 3 views of each ewe. Good for supplementing actual classes.	6		3	Group Service
Feeding	"Lamb Feeding Methods and Equipment" Common feeding practices and equipment. Good for preceding Feed- ing Job.	52		3	Group Service
	"Cooperative Feeder Cattle and Lamb Pools" The operation of pools, a little too long. Interesting, but very good.	94		7	48¢
Products	"Wool-Marketing and Manufacture" Steps in manufacture of wool. Fine in Preparation Step of Wool Job.		3	1	50¢
	"A Woolen Yarn" Steps in wool industry from shear- ing to manufacture of cloth. General picture, interesting.		1	5	Group Service
	"Wool Shearing and Preparation of Fleece" Hand and power shearing. Good for showing steps in preparing fleece.	54		7	44¢
	"Preparation of Wool for Market" Cleaning processes and differ- ences in grades, very good.	50		7	35¢
Meats	"Lamb and Mutton for Home Use" Operations involved in butchering and preparing lamb. Very good in Meats Job.		1	5	\$1.00

F. ENTERPRISE: Swine Production					
Job	Title and comment	Film strip frames	Motion picture reels	Distributor number	Cost
General	"Swine Production" Illustration of the best methods of raising swine. Good general picture to show at beginning of jobs.		2	5	Group Service
	"Health for Hogs" Values of houses and self-feeders for health for hogs. Fine for Feeding Job.		1	5	Group Service
	"Swine Management" All steps in general management. Very good in management and to introduce Enterprise.	38		7	28¢
Breeds	"Breeds of Swine" All major and minor breeds. Stresses minor breeds too much. Very good in general	31		3	Group Service
Selecting	"Judging Hogs" Comparison of lard and bacon types. Does not go into much detail in regard to judging principles.	27		3	Group Service
Housing	"Hog Houses and Equipment" Various types of hog houses and equipment. Too much stress on eastern types. Good.	30		3	Group Service
Meats	"Making a Fixed Star Ham" Very interesting picture on butchering and curing pork. Good in Meats Job as introduction.		1	5	Group Service
	"Behind the Breakfast Plate" Particularly good in showing stock yards phases of butchering. Very good in Meats Job.		1	7	Transportation
	"Meat Packing" Various steps in meat packing industry. Very good in Meats Job as introduction		1	1	50¢
	"Dressing and Curing Pork on the Farm" Steps in butchering hogs. Good portrayal of carcass cuts.	30		3	21¢
Pests and Diseases	"Round Worms and Swine Sanitation" Life history of round worms and relation to swine sanitation. General but good.	36		3	28¢

G. ENTERPRISE: Livestock, Miscellaneous

Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number	Cost
Rabbits	"Raising Domestic Rabbits" A detailed study of all phases of rabbit raising. Good in Related Information.	32		3	Group Ser- vice
	"The U.S. Rabbit Experimental Station" Results of breeding demonstrations. Very good supplement to project work.	34		3	Group Ser- vice
	"Rabbit Farming" A general picture dealing with prob- lems of raising. Very good.		2	7	Group Ser- vice
Bees	"The Anatomy of the Honey Bee" Detailed study of morphology of honey bee. Very good in Bee Pro- duction work.	31		3	Group Ser- vice
	"Handling Bees for Successful Bee Keep- ing" Complete treatment of Bee Production. Of general interest. Very good.	38		3	Group Ser- vice
	"Transferring Bees" Detailed operations of transferring bees; Very good in Apiary work.	54		3	Group Ser- vice

Table III. Visual Aids in Relation to Crop Production and Marketing.

A. ENTERPRISE: Alfalfa Production

Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number	Cost
General	"High Grade Hay from Producer to Consumer" Preparation of high grade hay: Stresses quality, very good.	54		7	55¢
	"Equipment and Practices that Reduce Costs in Hay Making" Various types of hay equipment; shows saving of man labor; very good in Job.	68		7	42¢
Pests	"Alfalfa Weevil Control" Life history of alfalfa weevil and steps in its control. Excellent in Insect Control.		1	5	Group Service

B. ENTERPRISE: Corn Production

Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number	Cost
General	"Miracle of Corn" General picture, advertising corn flakes; shows some points in growing corn; fair.		1	5	Group Service

Select- ing	"Selection and Care of Seed Corn" Factors concerning seed corn care shown in very good manner. Useful in Selecting Job.	16	3	Group Service
	"Better Seed - Better Crops" Illustrating in good narrative form the efforts of a crop improvement association; general in character.	5		Group Service
	"Seed Corn Secrets" General portrayal of important things to consider in growing corn. Good introductory film.	1	9	Transportation
	"First Aid to Agriculture - Better Seeds" Comparison of differences in poor and high grade seeds. Good Germination Job.	2	9	Transportation
Treat- ing	"Greater Corn Profits by Controlling Diseases Through Seed Disinfection." Illustration of use of Semesan. Very good.	1	10	Transportation
Pests	"The Corn Borer" Life history of borer. Not particularly adaptable to Colorado, but of general interest. Good in Insect Work.	2	5	Group Service

"Fighting the European Corn Borer
with Machinery"

1

7

Trans-
porta-
tion

Similar to "The Corn Borer"
but stresses more the control
measures, interesting.

C. ENTERPRISE: Sugar Beet Production

Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number	Cost
General	"Beets from Seed to Sugar Bowl" Culture of beets from pre- planting to delivery at factory. Good to show factory operations.		1	1	50¢
	"Beet Sugar in Colorado" Harvesting of beets and manufacturing of sugar. Good.		2	1	50¢

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D. ENTERPRISE: Irrigation Practice

Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number	Cost
General	"Work of Underground Water" Caves, sink holes and natural bridges formed by water. General picture, interesting.		1	5	\$1.50
	"Irrigating Field Crops" Illustration of common methods of irrigating. Very good for in- troducing Job.		2	5	Group Service

"Orchard Irrigation"	2	5	Group Service
Up-to-date practices in orchard irrigation. Very good in Irrigation Job.			
"Running Water"	2	5	Group Service
Importance of running water on the farm. Carries interesting story, interesting.			
"Conquering the Desert"	2	5	Transportation
Man's control of the desert by irrigation. Good related information in Irrigation Job.			
"Measuring Irrigation Water"	30	3	Group Service
Various methods of measuring water. Standard measures used. Very good.			

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E. ENTERPRISE: Plants and Plant Pathology

Job	Title and comment	Film strip frames	Motion picture reels	Distributor number	Cost
Seeds	"Seeds and Seed Dispersal"		1	1	50¢
	Unusually good picture showing germination and seed dispersal. Good in Seed Study.				
	"How Seeds Germinate"		1	1	Transportation
	Slow-motion picture of seed germination. Film very valuable in seed study.				

	"Testing Seeds in Soil" Method of testing seed in soil plats. Very good in seed study.	2	1	Trans- porta- tion
	"Plant Propagation" Methods of propagating plants. Good supplement to Plant Work.	49	3	Group Service
Diseases	"Nature of Plant Diseases" Microscopic views of common diseases of plants. Good intro- duction to Disease Study.	44	5	Group Service
F. ENTERPRISE: Pest Control, Miscellaneous				
Job	Title and comment	Film strip frames	Motion pic- ture reels	Distributor number Cost
General	"Halting Foreign Plant Foes" Shows administration of Plant Quarantine Act. General in nature. Interesting.		1	5 Group Service
	"Man Against Microbe" Historical picture of man's fight against disease. Good for introducing Disease Study; inter- esting.		1	5 Group Service
	"The Gypsy Moth" Method of control in U. S. of Gypsy Moth. Very good in Forestry Enterprise also.		2	5 Group Service

General	"The Japanese Beetle" Life history of Japanese beetle and control measures; Good in Insect Study.	2	7	Transportation
	"Japanese Beetle-Life History" Life history of beetle which stresses the stages most injurious; Very good.	2	7	Transportation
	"Structure of Insects" Detailed description of insect morphology; Good introduction to Insect Study.	21	7	21¢
	"Embryonical Development of Insects" Detailed study of insect development; Good in Insect Study.	27	7	21¢
	"Million Dollar Pockets" Clear portrayal of damage done by gophers and control measures used; Good supplement in Pest Work.	2	7	Transportation
	"Routing Rodent Robbers" Control methods used in U.S.D.A. war on rodents; Very good supplement in Pest Control Study.	2	7	Transportation
	"How to Get Ride of Rats" Poison methods used for rats; Stresses sanitation as a control measure. Very good in Pest Work.	30	3	Group Service

G. ENTERPRISE: Fertility and Fertilizers

Job	Title and comment	Film strip Frames	Motion Picture Reels	Distributor Number	Cost
General	"Green Manuring" Use of different crops as green manures; Excellent to introduce Unit.	51		3	Group Service
	"Farm Manures" Good to illustrate care and spreading of manure; Very good for class discussion.	52		3	Group Service
	"Lime and Limestone" Very clear presentation of use of limestone for soil; Good for Related Information.	48		7	Group Service

H. ENTERPRISE: Soils

Job	Title and comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
General	"Anchored Acres" Approved engineering practices of preventing soil erosion; Excellent in Erosion Study.		1	7	Transpor- tation

General	"Soil Erosion" Clear examples of soil erosion; Rather long but good in spots; Interesting.	95	3	Group Service	
	" Control of Gullies" Shows control of gullies by proper growing of crops and terracing; Very good.	30	3	Group Service	
	"Colorado Soils" Types of soils and their proper care; Made by Colorado Extension Service; Very good.	30	3	Group Service	
	"Save the Soil" General presentation of problems of soil conservation; Good for intro- duction to Erosion Work.		2	7	Transpor- tation
	"Plows and Plowing" A presentation of various types of plows and plowing methods; Excellent in plow study.	30	3	Group Service	

I. ENTERPRISE: Marketing

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
General	"Cooperative Marketing" Benefits of marketing livestock through an associa- tion; Good introduction to Mar- keting Job.		2	7	Transportation
	"Cooperative Marketing in U. S. " A compilation of all types of cooperative marketing; Too long, but can be used in part; Good.	108		3	Group Service

J. ENTERPRISE: Forage Plants

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
General	"Important Cultivated Grasses" Very clear pictures of common cultivated grasses; Good supplement to actual material.	30		3	Group Service

General	"Quack Grass" Characteristics of grass; Shows methods of control; Good in Weed Study.	26		7	21¢
	"Clover Production" Deals with cultural practices of clover; Excellent in Legume Study.	27		7	21¢
	"Legume Inoculation" More suitable for eastern conditions but is good related information material.	39		7	28¢
	"Four Men and the Soy" Fictionized story of the soy bean; Complete and interesting; Good in Legume Job.		2	7	Transportation
K. ENTERPRISE: Forestry					
Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
General	"Fighting Forest Fires from the Skies" Use of airplanes in fighting forest fires; General picture; Interesting.		2	5	Group Service

General	"Fire Prevention in Forests" Specific methods of combating forest fires; Good for Fire Prevention program.	$\frac{1}{2}$	1	Transportation
	"Reforestration" Comparison of soil erosion with conservation; Fits in well with Conservation program.	1	1	50¢
	"A. B. C. of Forest" Fundamentals of tree growth and forestry practice; Good for Introduction to Forestry Unit.	1	1	50¢
	"Range Management on the National Forests" 50 Fundamental steps in managing forest ranges; Very good.		3	Group Service
	"Transplanting Trees and Shrubs" 57 Shows correct and incorrect methods of transplanting; Too long; but forestry parts are good.		3	Group Service
	"Conquest of the Forest" Man's progress in making the forest supply lumber; Very good.	1	5	Group Service
	"Forests and Streams" Graphic presentation of relation of stream conservation to forests; Good in Forestry work.	1	7	Transportation

General	"The Forest and Waters" Proper planting of trees and water conservation clearly shown; General; Interesting.	1	7	Group Service
	"Marking Timber" Methods of marking timber; Very good in Range and Forest Management.	2	7	Transpor- tation
	"Wood Wisdom" Unusually good to show structure of various kinds of woods; Good in wood funda- mental study.	1	7	Transpor- tation
L. ENTERPRISE: Crops, Miscellaneous				
Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number Cost
Cotton	"The Land of Cotton" Cotton industry shown in detail; Very good as Related Information.		2	5 Group Service
	"Civilization's Fabric" Detailed cotton manufacture, clearly shown; Related Information picture.		2	5 Group Service
	"Cotton from Seed to Cloth" Interesting; Similar to "Land of Cotton"; Good Related Information picture.		2	5 Group Service

Coffee	"Coffee" Complete story of coffee culture; Good.	1	1	50¢
Peanuts	"Peanuts"	1	1	50¢
Cranber- ries	"Cranberries" Cultural methods of cranberries and use in home; Good as Related Information to show one type of irrigation.	1	1	50¢
M. ENTERPRISE: General Agriculture				
Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number Cost
General	"Yoke of the Past" Excellent comparison of the old and new in agriculture; Good in Farm Equipment study.		3	5 Group Service
	"Waterways and Agriculture" General picture showing mar- keting of agricultural products by water; Good for Related Information.		1	5 Group Service
	"Food Distribution" Clear conception of distribution of foods from farm to city; Good general picture.		2	5 Group Service

General	"Agricultural Crisis" Summary of factors leading up to 1932 crisis; Excellent in Farm Management Unit.	1	1	50¢
	"Farm Profits" Good presentation of need for careful bookkeeping on farm; Good in Farm Management.	1	1	Transportation
	"The Master Farmer" Improved practices in farming shown by book of a Master Farmer; General; Interesting.	2	7	Transportation
	"Home Is What You Make It" Transformation of an old farm by repairing and repainting; Good in Farm Housing.	3	7	Transportation
	"Back of the Weather Forecast" Graphic presentation of how the Weather Bureau is operated; General interest.	2	7	Transportation
	"Analyze Your Business" 58 Farm Management problems clearly explained; Good as supplement to Farm Management.		7	35¢

TABLE IV.--Visual Aids In Relation To Farm Mechanics.

A. ENTERPRISE: General.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
	"CO--The Unseen Danger" How carbon monoxide works; Very good in Safety First cam- paign; Interesting.		1	6	Transpor- tation
	"Learn and Live" Good picture to show value of safety; Useful at beginning of course.		1	6	Transpor- tation
	"Safety and First Aid" How to treat accidents in shop; Very good in Safety First campaign.		1	6	Transpor- tation
	"Mechanics" Brief Description of all types of mechanical appliances; Very good to supplement unit.	38		3	Group Service
	"Thomas Alva Edison" Steps in Edison's life and his inventions; Interesting; Fairly good.	53		3	Group Service

"The Benefactor"

Story of Edison which stresses results of his inventions; Interesting in general way; Good.

2

1

Transportation

B. ENTERPRISE: Abrasives.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
	"Manufacture of Abrasives" Very good picture to show different kinds of abrasives and their applications.		3	6	Transportation

C. ENTERPRISE: Farm Blacksmithing.

"Heat Treatment of Steel"

Heat treatment in modern furnaces; Very good.

2

6

Transportation

"Iron Ore to Pig Iron"

From mining of ore to making of pigs; Very complete; Useful also for Metal Unit.

1

1

50¢

"Arteries of Industry" Complete story of manufacture of steel pipe; Useful also as introduction to Metal Unit.	6	1	Transportation
"Making Iron and Steel Sheets" Good picture to show manufacture of iron and steel sheets; Interesting.	4	5	Transportation
"Making It Tough" Complete story of alloy-steel manufacture; General; Very interesting.	3	6	Transportation
"Story of Steel" Basic processes from ore to ingot; Very good general picture.	2	6	Transportation
"Walls without Welds" Story of seamless steel tubes; Very good to show manufacturing processes.	3	1	Transportation

D. ENTERPRISE: Concrete.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
	"Concrete and Its Uses" Excellent picture on make-up of cement and its manufacture; Good for intro- ducing Unit.		1	5	Transpor- tation
	"Construction that Endures" Many illustrations of uses of concrete; Good as introduction to Unit.		1	6	Transpor- tation
	"From Mountain to Cement Sack" Good idea of manufacture of cement.		1	6	Transpor- tation
	"A Concrete Example" Use of cement in building large structures; Very good general picture.		2	11	Transpor- tation

E. ENTERPRISE: Electricity.

	"Story of the Spark Plug" Action of spark plug and its proper care; Very good.		2	6	Transpor- tation
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"Story of the Storage Battery" Complete process of making a storage battery; Somewhat tech- nical but interesting.	2	5	Transpor- tation
"Along the Firing Line" Very complete story of the spark plug; Shows many uses; Very good.	2	5	Transpor- tation
"The Power Within" Various types of electrical work; General picture but very interesting.	3	6	Transpor- tation
"Story of Power" Early development of steam engine and modern uses of electri- city; Animated; Good.	3	6	Transpor- tation
"Electric Ship" General picture showing an all-electric ship; Very interesting for Related Information.	1	5	Group Service
"From Coal to Electricity" Power development by use of modern machines; Complete; Interest- ing.	2	11	Group Service

F. ENTERPRISE: Explosives.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
	"Rubbing the new Aladdin's Lamp" Manufacture of blasting caps; Very good in teaching Explosives Unit.		1	1	Transportation
	"Hercules Blasting Caps" Good explanation of blasting cap manufacture and uses; Interesting.		1	1	Transportation
	"The Explosive Engineer" Good general picture on duties of an explosive engineer; Good in Guidance work.		1	6	Transportation

G. ENTERPRISE: Fuel.

	"Evolution of the Oil Industry" Deals with the historical development of oil; Shows uses; Good.		3	5	Group Service
	"Story of Gasoline" Animated drawings of refining processes; Good to show different kinds of gasoline.		2	5	Group Service

"Bituminous"	1	5	Group Service
Portrayal of different types of mining; General; Interesting.			
"Producing Crude Oil"	1	5	50¢
Methods of drilling oil and oil transportation; Interesting.			
"Story of Lubricating Oil"	2	6	Transportation
Drilling operations and transportation methods; General; Interesting.			
"Refining the Crude"	4	6	Transportation
Manufacture and use of lubricants; Interesting.			
"Wonders of Anthracite"	2	11	Group Service
General picture of anthracite coal, showing geology, history, and mining; Very good.			

H. ENTERPRISE: Glass.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
	"Romance of Glass"		1	5	Transportation
	Shows steps in manufacture of glass; Interesting.				

I. ENTERPRISE: Leather.					
Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
	"Magic of Modern Shoe-Making" Shows all steps in manufacture of a shoe; Good Related Information in Lea- ther Work.		3	5	Transpor- tation
	"Romance of Shoe-Making" Deals with preparation of leather and shoe manufac- ture; Very good.		2	1	Transpor- tation
	"Leather" Shows tanning methods and various sources of leather; Good introduction to Leather Unit.		1	1	50¢
J. ENTERPRISE: Machinery.					
	"Romance of the Reaper" Good to show early dev- elopment of reaper; General; Interesting.		5	11	Transpor- tation
	"McCormick-Deering Industrial Power" Shows general uses of indus- trial tractor and machinery; Very Good.		2	11	Transpor- tation

	"Building Quality into Cream Separators" Good picture to show manufacture of cream separator; Interesting.	2	11	Transportation	
	"Combine Harvesters" General picture showing types of harvesters and uses; Very good.	1	1	Transportation	
K. ENTERPRISE: Metals.					
Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Dis-tributor Number	Cost
	"Pigs of Lead" Views of lead fields and manufacturing processes form ore to "pigs"; Very good.		1	5	Group Service
	"Story of Copper" Shows complete process of making copper; General; Very good.		1	6	Transportation
	"Story of Fabrication of Copper" Shows rolling and drawing copper and also testing strength of copper; Very good.		2	6	Transportation
	"Story of Lead Smelting" Shows drilling, blasting, and loading of lead ore and also mill operations; Good.		2	6	Transportation

"Making an All-Steel Auto Body" Shows machinery for manufacturing auto body; General; Good.	2	5	Transportation
"Long Drawn-Out" Journey through a copper wire mill; General; Very interesting.	1	11	Transportation
"Metals of a Motor Car" Uses of metals and alloys in construction and operation of parts of a car; Very good.	2	6	Transportation

L. ENTERPRISE: Motors.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distributor Number	Cost
	"Internal Combustion Engine" Shows principles of a combustion engine; Very good in gas engine study.		3	5	Group Service
	"The Busy Body" Animated drawings that show the construction of a small motor; Excellent.		1	5	Group Service
	"Story of Transportation" Early development of transportation methods; Shows electric railroads. Good.		2	5	Group Service

"Trip thru a Motor Factory" Shows all processes in building White Trucks and buses; General picture; Good.	2	1	Transportation
"The Automobile" Shows interdependence of industries in automobile manufacture; Related Information; Good.	1	1	50¢
"Story of Gasoline Motor" Animation shows entire function of gasoline motor; Very good.	3	6	Transportation
"Four-stroke Cycle Gas Engine" Very excellent picture showing principles of gas engine; Diagrammatic presentation.	1	1	50¢

M. ENTERPRISE: Paints.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distrib- utor Number	Cost
	"Story of White Lead" Shows manufacture of "Old Dutch process of making white lead; Very good.		2	5	Group Service
	"From Pigs to Paint" Story of Dutch Boy white lead; General, but interesting.		2	11	Transportation

"Doings of Turp and Tine"
Paint brush comedy, showing
production of wood turpentine; Very
good.

1

11

Transportation

"From Rags to Roofs"
Story of asphalt shingles;
Shows all steps in manufacture;
General; Interesting.

2

5

Group
Service

N. ENTERPRISE: Rope and Twine.

Job

Title and Comment

Film
Strip
Frames

Motion
Picture
Reels

Distrib-
utor
Number

Cost

"Ball of Twine"
Shows complete manufacture
of twine; Applicable to Rope Unit
as Introduction; Good.

1

1

Transportation

"Making of Twine"
Shows processes in making a
ball of twine; Very good as intro-
ducing Rope Unit.

1

11

Transportation

O. ENTERPRISE: Rubber.

"Conquering the Jungle"
Shows rubber plantation scenes,
gathering the latex and preparing
rubber; Good.

1

5

Group
Service

"Rubber" Complete steps in manufacture of rubber; General; Good, also in Auto Unit as Introduction.	1	1	50¢
"Island of Yesterday" Scenes showing rubber plantation and growing of rubber; General; Very good.	1	4	Transportation
"Story of Goodyear" Industrial picture showing manu- facturing processes of rubber; General; Interesting.	2	4	Transportation
"Story of the Tire" Shows rubber and cotton planta- tions and processes in building a tire; Excellent.	1	4	Transportation
"The Inner Tube" Complete on building of an inner tube; Very interesting.	1	4	Transportation
"Romance of Rubber" Shows production of rubber on largest plantation in the world; Very Interesting.	2	5	Group Service

P. ENTERPRISE: Tools

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distrib- utor Number	Cost
	"The Serpent's Tooth" Excellent film on manufac- ture and operation of hand saws; Story woven in.		1	12	Transpor- tation
	"The Meteor" Early history of saws and their uses; Story woven in; Very interesting.		1	12	Transpor- tation
	"Use and Disuse of Twist Drills" Technical picture showing parts of twist drills and common errors in using; Very good.		1	13	Transpor- tation

Q. ENTERPRISE: Tractors.

	"Tractors in Agriculture" Very good picture to show the many uses of tractors on the farm; Complete.		1	1	Transpor- tation
	"The Horseless Farm" Shows a farm operated entirely by tractors; General; Interesting.		2	11	Group Service

"Caterpillar Tractors in Agriculture"
Demonstrates general capabilities
of tractor for all types of farm work;
Good.

1

5

Group
Service

R. ENTERPRISE: Valves.

Job	Title and Comment	Film Strip Frames	Motion Picture Reels	Distri- butor Number	Cost
	"Valves, their Manufacture and Uses" Shows different types of valves and their importance in the home and on the farm; Good.		3	5	Group Service

S. ENTERPRISE: Farm Engineering.

"Farm Sanitation"
Shows ways of creating sanitary
conditions about the home; Very good.

30

3

Group
Service

"Farm Water Supply"
Shows methods of putting in a
farm water supply; Complete; Very
good.

30

3

Group
Service