

T H E S I S

DIPS AND THEIR USES

by

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upon graduation from the

K A N S A S S T A T E A G R I C U L T U R A L C O L L E G E

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DIPS AND THEIR USES.

Every successful breeder realized the importance of keeping his live stock free from disease. Whether a breeder is a success or a failure depends largely upon whether he is giving his stock constant care, thus keeping them in a healthy condition and ever on the gain; or whether he is allowing some disease to gain a hold upon them, thus destroying his gain, or causing him some actual losses. One of the leading problems that is confronting the breeder of today is to keep his live stock in a perfectly healthy condition.

It is a well established fact that the most economical way of fighting disease is by prevention. If this method is practiced there is no loss; while if the breeder allows a disease to get a hold upon the flock or herd, there is very apt to be some loss before the disease can be checked. If there is no loss in numbers, there will surely be some check in growth, which amounts to a direct loss. It is simpler, wiser and cheaper to prevent a disease than to cure it.

It is a well established fact also, that at least four fifths of the diseases of live stock are either contagious or infectious; that is they are caused by some micro-organism, or else by some minute insect. The simplest way of fighting the disease therefore would be to fight the organism, and it is the use of dips in their relation to the organism

to this work that I propose to discuss.

The use of dips may be divided into two general heads. First, their uses as antiseptics and disinfectants, and second their use as parasiticides.

In considering their disinfecting power we have referred to their power to destroy micro-organisms and which are the direct cause of many diseases. Among these might be mentioned, Bacillus hog cholera, Bacillus swine plague, Bacillus Coli, Bacillus Subtilis, Bacillus Tuberculosis, and Bacillus Anthracis.

The value of dips in this connection is inestimable, but it is certainly very great. Experiments have been carried on by some of the various State Experiment Stations which have proven that several of the common commercial dips are very effective for this purpose, and there is no doubt but that their careful use will prevent the spreading of many, probably all, of the contagious and infectious diseases.

The Oklahoma Experiment Station has recently carried out some very thorough experiments which show the disinfecting power of coal-tar dips. The test was conducted as follows: "5 cc of 48 hour bouillon culture of the germ were added to 94 cc of sterile water and thoroughly mixed by shaking. One drop of this mixture was added to 5 cc of sterile water and 3 and 5 loops respectively were added to two auger tubes and plates poured." These were used as check plates. After this 1 cc of the dip to be tested was added to the mixture of dip and water, making 100 cc in the flask or a one per cent solution. Auger plates inoculated the same as the

above 'check plates' were immediately poured from the mixture containing the dip. The process was repeated at the end of 30 seconds and at the end of 1, 3, 5, 8, 12, 15, and 30 minutes. The check plates showed an average of about 130 organisms per plate. By comparing this with the number on the plates containing the dips, a close comparison was made and the effectiveness of the dip was determined quite closely.

Each dip was tested upon *Bacillus Cholera*, *Bacillus swine plague*, *M. Aureus*, *B. Coli*, *B. Subtilis*, and *B. Anthracis*; and with all of these varieties they proved very effective. It was found that Zeneloum, Car-Sul, Cremolin, Chloro-Napththoleum, Moore's Hog Remedy, and Carbolic acid killed all but the last two of the above mentioned organisms in less than a minute and in most cases in less than thirty seconds, killing a large percentage of them almost instantly. Zeneloum proved to be the most effective against *B. Subtilis* and *B. Anthracis* proving fatal to all in less than two minutes. The other above mentioned dips were quite effective with these organisms, but in most cases a few were yet alive at the end of thirty minutes. In no case were there more than 19 colonies on a plate at the end of thirty minutes and this is less than 1.5 per cent of the average number on the check plates, so it will be seen that all of the dips are quite effective.

A test with *Bacillus typhoidus* showed that Zenoleum, Car-Sul, Cremoline, Chloro-Napththaleum, and Moore's Hog Remedy

all proved fatal to this organism in less than thirty seconds, while carbolic acid required one minute and Mortipest Sheep Dip and Lincoln Sheep Dip were not effective in two minutes which was the extent of time in the test.

Kerosene emulsion (Gov't. formula) and Mortipest Sheep Dip were both thoroughly tested and it was found that neither of these dips have any disinfecting power. Throughout these tests (1%) one per cent solution of the dips were used. It is probable that a stronger solution would have given more effective results. It is certain that for disinfecting buildings, etc., a two or three per cent solution should be used in order to insure perfect disinfection. This test shows a superiority of coal-tar dips over other dips for disinfecting purposes, which would give them a preference over other dips in keeping stock free from disease, and insect pests.

Uses of Dips as Parasiticide.

By the term "parasiticide" we mean the power of destroying parasitic insects such as sheep ticks, (*Malophagus Ovinus*), sheep mites, (*Psoraptis communis*) which produce scab in sheep, cattle, horses, and hogs; and hog lice (*Haematopinus suis*), the hog itch mite, (*Sarcoptes scabiei*), and other parasites of this nature.

This is the greatest work of the dips, for these parasites are doing a great deal of damage to the live stock

breeders. The sheep mite alone is probably causing more losses than any other disease which may infest sheep. Scabs in cattle is one of the greatest diseases which confronts the western breeders. Diseases of this kind are causing immense losses and yet they are easy to check and eradicate if properly treated; and dipping is probably the only effective treatment.

There are numerous dips which are very effective in this connection. The Bureau of Animal Industry publishes formulas for dips which are very effective. Perhaps the most effective dips used are:

(A) For scabs in sheep:

1. Tobacco and Sulfur dip;

Tobacco leaves, 1 lb

Flowers of sulfur, 1 lb.

Water, one gallon.

The advantage of this dip is that both of the constituents are fatal to the scab mite and further that the sulfur will remain in the wool for some time, and thus prevent re-infection. One of the principal disadvantages is that it does not penetrate the scab well unless it is hot.

2. Lime & Sulfur dips;

The Department of ~~Agriculture~~ Animal Industry recognizes several combinations of lime and sulfur. The one which the Department uses in its dipping is as follows:

Flowers of sulfur, 24 lbs.

Unslaked lime, 8 lbs.

Water, 100 gallons.

In very severe and long standing case of scabes, a stronger solution or else a higher proportion of lime, might be used.

3. Coal-Tar preparations;

The Dept. of Animal Industry has recently recognized coal-tar preparations which come up to the following requirements. "The dip should contain, when diluted ready for use, not less than one per cent by weight of coal-tar oils and cresylic acid. In no case should the dips contain more than four tenths of one per cent or less than one tenth of one per cent of cresylic acid, but when the cresylic acid falls below two tenths per cent, the coal-tar should be increased enough to bring the total of tar-oil and cresylic acid in the dip, up to 1.2 per cent by weight."

For cattle the Department recommends spraying with Beaumont Crude-Oil of not less than 25 per cent solution in water. Similar crude oils are sanctioned.

Dips for Hogs.

(A) Kerosene Emulsion:

Hard soap 1-2 pound

Kerosene, two gallons

Water, one gallon

"Boil the water and soap until the soap is dissolved, remove from the fire, add the kerosene and churn or agitate vigorously until an emulsion is formed. This emulsion, if thoroughly mixed, will form a gelatinous mass upon cooling;

It keeps indefinitely and may be used at any time by diluting to 20 gallons with warm water. If used after cooling, the mixture should be heated again (great care must be taken in heating because of the inflammable thersasine present) and then thoroughly mixed a second time."

(B) :--

Soft soap, one quart
 Hard soap, 1-4 pound
 Kerosine, one pint
 Water two quarts.

"Mix as in the preceding formula and dilute with one gallon warm water". Reheat as in formula (A).

(C) :--

Sour milk, four gallons
 Kerosene, two gallons.

"Mix the milk and kerosene and dilute with warm water to twenty gallons".

(D) :--

Hard soap, one-half pound
 Pyoethrum , 3 1-2 pounds
 Kerosene, two gallons
 Water, one gallon.

"Boil the water and soap until latter is dissolved. Extract the pyrethrum with the kerosene by mixing together and allowing to mixture to stand 24 hours. Then pour off the liquid. The kerosene extract is then mixed with the soap as in formula (A). For use, dilute to 20 gallong with

water. Reheat as in formula (A)."

(E) Benzine Emulsion;

Soft soap, four quarts

Water, ten to fifteen parts

Benzine, one part

Boil water and soap until latter is dissolved. Remove from fire; then add benzine and agitate until emulsion is formed.

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For cattle the same dips are recommended as are given above for sheep.

These government dips are very effective and have many good qualities but there are some objections to their use. The sheep dips made according to the government are very harmful to the wool and if they are not carefully made, they are very apt to kill the sheep. The lime in the "lime and sulfur" dip is especially harmful to the wool and also to the skin as it destroys the natural oil and also stops up the pores of the skin. The same is true when this dip is used upon cattle; the skin and hair become harsh and of poor quality.

The kerosene emulsion dips which are used upon hogs and sometimes upon other animals, are not excelled by any dip as an insecticide but as before shown, in this paper it is not a disinfectant and it also has the objection of harming the coat and of being very irritating to the skin, especially upon tender skinned animals. Another objection to this dip

is that it cannot be safely used upon pregnant sows. Many authentic cases can be sighted when kerosene has caused abortion. This makes it very objectionable and unsatisfactory as a dip.

Taking all of these facts into consideration, it seems that it would be desirable to secure a dip which would be effective without having these objections. There are many commercial dips on the market most of which are made from coal-tar and crude oils. Some of these are very effective as parasiticides and have an advantage over the government dips in that they are not dangerous, to the life of the animals treated and are beneficial rather than harmful to the hair and skin.

Many of the Experiment Stations of the various states have tested these dips and have recommended some of them very highly.

In connection with this article, I have made some tests upon sheep ticks (*Malaphagus Avinus*) and hog lice (*Hematopinus Suis*) using five of the leading commercial coal-tar dips, namely: Zeneloum, Car-sul, Cremolin, Chlro-Naptholeum, and Kreso dips. I tested different per centages and different temperatures, determining as nearly as possible, the length of time required to kill the insects and which dips seemed to be the most effective.

The following table shows the results of the tests made upon sheep ticks:

Name of dips used.	Temp. F. °	Time in seconds required to kill.					Average
		Test numbers					
		1st.	2nd.	3rd.	4th	5th.	
Car-Sul 3% solution	108	13	13	14	14	13	13.4
3	90	20	18	18	19	18	18.6
1	86	22	26	22	24	23	23.4
1	110	16	13	16	17	12	14.8
Zenoleum, 3% solution	108	15	19	14	13	18	15.8
3	90	29	24	21	25	24	24.6
1	86	23	24	26	22	25	24
1	110	18	20	18	16	14	17.2
Kerosene Dip, 3% solution	108	14	18	17	15	15	15.8
3	90	17	17	22	21	220	19.4
1	90	29	21	26	27	--	25.7
1	86	25	22	26	21	28	24.4
1	110	15	14	17	16	18	16
Chloro-Naph., 3% solution	108	13	12	16	17	15	14.6
3	90	23	21	26	17	26	22.6
1	86	26	25	28	26	24	25.8
1	110	20	16	23	17	17	18.6
1	73	30	34	45	36	41	37.2
Cremolin, 3% solution	108	19	17	15	17	16	16.8
3	90	19	21	26	21	22	21.8
1	86	22	26	22	24	23	23.4
1	10	17	18	18	18	16	17.4

The method of securing this data was somewhat as follows: I first picked the sheep ticks by hand. Then the dips were carefully measured and mixed and then heated to the proper temperature. The ticks were then taken one at a time and covered with the dipping solution and carefully watched until dead. The ticks were then laid in the sun and allowed to dry to be sure they were dead.

This data gives a comparison of different percentages temperatures, and also of different kinds of dips. It will be noticed that an increased temperature added to the efficiency of the dip. While some of the temperatures used are not practical to use, yet it is shown that it is practi-

cal, though not essential, to heat the dips to about body heat. It will also be noticed that, while one per cent solution proved quite effective, the results are not quite so constant as with the three per cent solution and that a longer time was required for it to be effective. I would conclude from this, that a three per cent solution would be effective and profitable. If the dip could not be heated at all, a stronger solution would probably be profitable.

The data also shows that Car-Sul ranks higher than any of the other dips; the test running more uniform and requiring a shorter time than in any of the other dips, which were tested. All of the dips used proved to be very effective.

The following table gives the results similar to that in the use of dips for sheep ticks:

Experiments with hog lice.

Kind of dip.	Temp. in F. °	No. of lice used.	Time sus- pended.	No. of lice killed.
Car-Sul, 3% solution	110	10	2 min	10
5	98	10	2 "	8
25	85	10	30 sec.	10
25	85	10	15 "	8
10	108	5	15 "	3
Zenoleum, 3% solution	110	10	2 min	4
5	98	10	2 min	4
25	85	10	30 sec.	10
25	85	10	15 sec.	9
10	108	10	15 sec.	8
Cremolin, 3% solution	110	10	2 min.	8
5	98	10	2 min.	9
25	70	10	20 sec.	5
25	78	10	20 sec.	7
25	85	10	30 sec.	8
25	85	10	15 sec.	6
10	108	10	15 sec.	10
Kreso Dip, 3% solution	110	10	2 min.	10
5	98	10	2 min.	8
25	85	10	30 sec.	10
25	85	10	15 sec.	8
10	108	10	15 sec.	10
Chloro-Nap. 3% solution	110	10	2 min	5
5	98	9	2 min	5
25	85	10	30 sec	10
25	85	10	15 sec	10
10	108	10	15 sec	4
Kerosene Emulsion,	98	10	10 min.	10
" "	98	10	10 sec.	10

The method of securing this data was similar to that pursued on the last test with sheep ticks. The lice were picked off the hogs by hand. After the dip has been carefully measured, mixed and heated to the temperature denoted, ten lice were placed in a beaker and the dips poured over

them. When they had been in the dip for the time specified, in the different tests, the dip was poured through a strainer which collected the lice. The lice were then laid out in the sun for ten minutes to see if any showed signs of recovery before the count was made. The number of dead lice was then counted and recorded. Some of the tests in this experiment would not be practical to any one who is dipping on a large scale because of the high percentages used, but they are practical to anyone who is trying to eradicate hog lice by spraying or hand dipping. Especially is this true of spraying for this method requires something which will act quickly, and a strong solution is needed for this purpose.

This test shows the advantage of having the dips at or a little above body heat, and also shows the time required to do effective work in ordinary dipping. An interesting comparison may be made between different kinds of dips. Kerosene emulsion is shown to be more effective than any of the coal-tar dips. Another test made, not shown in the table, showed that as an average of several tests, fourteen seconds were required by kerosene emulsion, made by formula (A) to kill hog lice. Car-Sul and Kreso dips are the most effective of the commercial dips at three and five per cent. Kreso stands first and Car-Sul second in the high per centage tests.

In all of these tests the lice and ticks used were killed on the same day that they were picked from the animal and

only the most vigorous and healthy ones were used in the tests.

From these tests it would be seen to be a reasonable conclusion to say that these coal-tar dips are effective and practical, at least in as far as these two parasites are concerned and it is reasonable to conclude that they would prove effective against all other parasites. The scab mite is the only one which might escape these dips and there seems to be no data upon this point.

These dips are very penetrating and seem to have a softening effect upon the skin and it seems reasonable to suppose that they would prove effective against the scabies. It is certain that they are more easily prepared for use than the government dips and also that they are of more value as disinfectants and for these reasons they would be the best dips for ordinary farm use.

Methods of Dipping.

There are several methods of applying dips to infected animals. Where only a few animals are to be treated, some form of hand dipping is used. The dip may be applied with a stiff brush or with a small hand sprayer, care being taken that the entire body of the animal is saturated. In this case the dip should be made into a stronger solution than for ordinary dipping, and it is thus quite effective if applied two or three times in the course of ten days.

Another method of dipping where only a small number of hogs or sheep are to be treated is to make a small tank

large enough to allow one animal to be immersed at a time by hand. A small platform is also provided upon which the animal is allowed to stand and drip before turned loose, thus saving the dip. This method is as good as any for a small flock because it is inexpensive and also because the animal can be retained in the dip as long as is necessary to accomplish the purpose. It is not economical, however, in the treatment of large flocks or droves.

For treating cattle on a small scale, the most common method is by means of a dipping cage and derrick. A combination which is commonly known as the elevator tank. It consists of a pit about eight feet deep in which is built a tank four feet eight inches by nine feet by eight feet deep which will admit a cage that is large enough to hold any cow or brute. Over this tank is built a derrick for raising and lowering the cage. From this derrick the cage is suspended by a block and tackle with which the cage may be quite easily handled. In most cases the block and tackle is so arranged that a horse or a team cannot be used for raising and lowering the cage. A chute is provided through which the animals may be forced into the cage. Care must be taken that the chute is constructed narrow enough that the animal cannot turn round. The cage should not be over 36 inches wide, or perhaps less. A dripping pen into which the animals are turned after they have been dipped, is also provided. The number of other pens necessary depends entirely

upon the number of cattle to be dipped. If any small number are to be dipped, one pen connected with the chute is sufficient. The principal advantage in this kind of a dipping plant is that it is not very expensive and does not require much room, and because the length of time it is desired to keep the animal in the dip can be more easily regulated than in case of the swimming dip vat, and also because the temperature of the dip can be kept more nearly at a constant temperature by means of a small inexpensive furnace.

At the present time the most common method of dipping large flocks or herds is by means of the swimming vat. This consists of a long, narrow tank deep enough so that when an animal gets into it he has to swim to get out. It may be constructed of concrete, brick, galvanized iron or wood. For cattle, the vat should be about seven and a half feet deep and eighteen inches wide at the bottom and thirty six inches wide at the top. If a retaining gate is to be used to retain the animal in the dip, a vat twenty feet long is sufficient. If a retaining gate is not used, the vat should be forty feet in length including the ascent out of the vat.

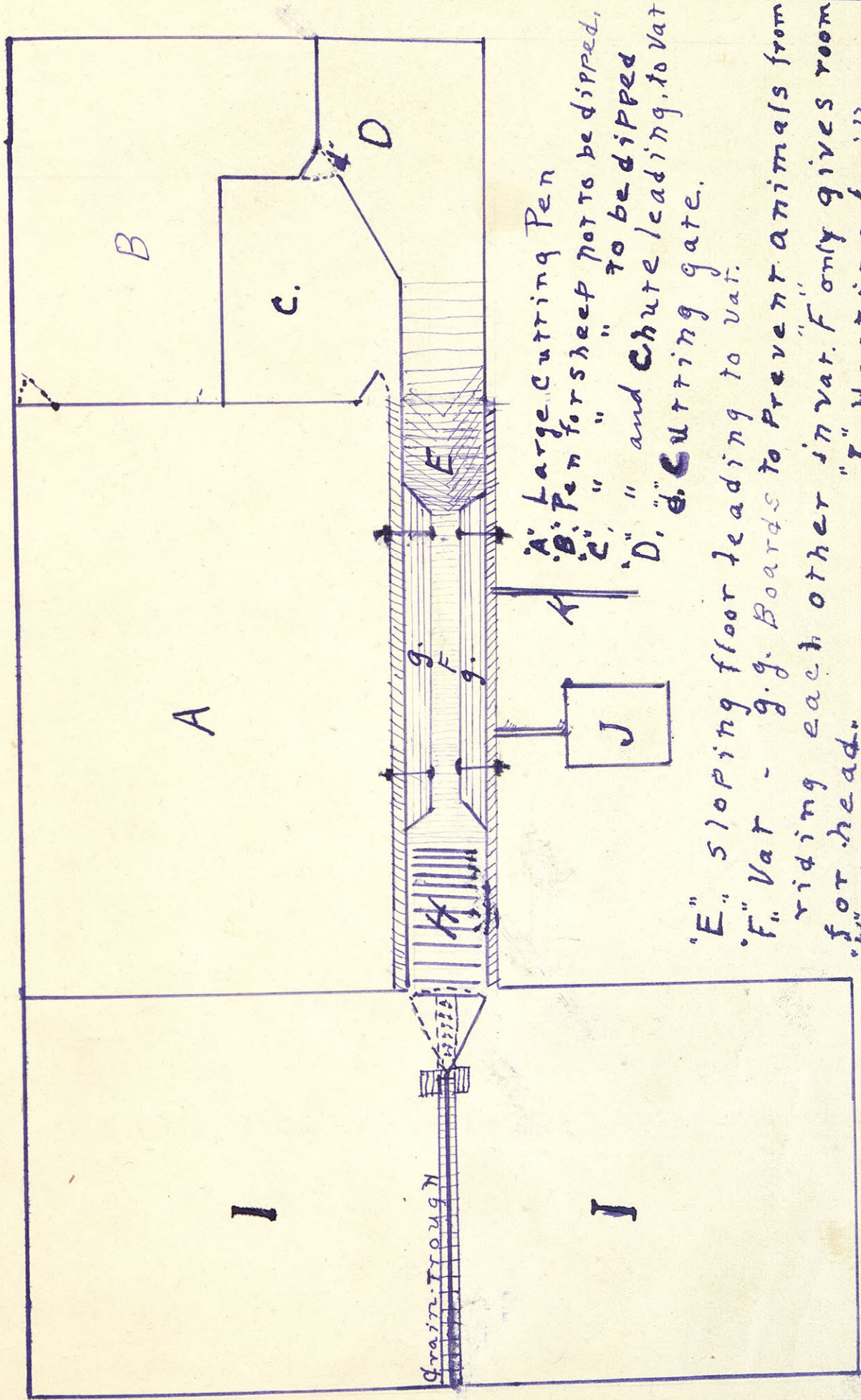
For sheep, a vat five feet six inches deep and six inches wide at the bottom and about twenty to twenty-four inches wide at the top, is sufficient. If no retaining gate is used, the vat should be at least forty feet long at the top and twenty-eight feet long at the bottom. If a retaining gate is used or the sheep are retained in the dip by hand for a

sufficient length of time, a vat fifteen to eighteen feet long is sufficient.

The ascent from the vat should lead into a dipping pen with a tight floor which slopes toward the vat so the dip which drips from the animals may be passed through a strainer and back into the vat; thus avoiding any waste of dipping material.

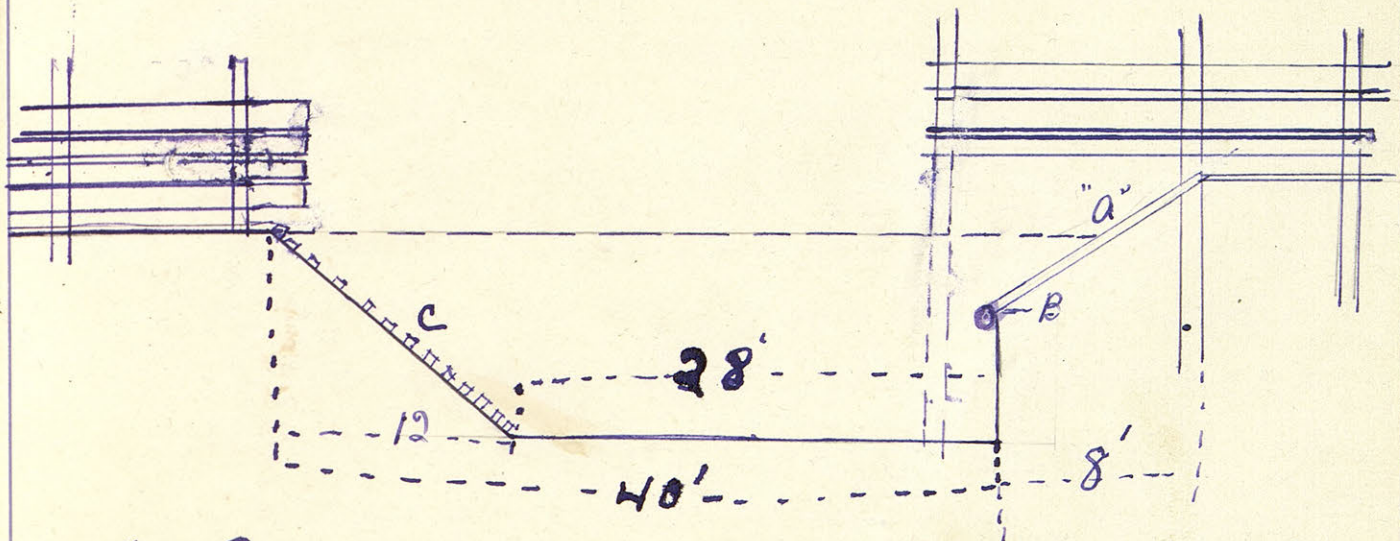
The size and arrangement of the pens which are connected with the plant depends largely upon the size of the flocks to be handled and upon available room. All that is absolutely necessary is one large pen and a narrow chute connecting it with the vat. The connecting chute to a cattle vat often terminates in a trap door which drops the animal into the dip. In all sheep plants and in some cattle plants the chute leads to a sloping floor covered with zinc or tin down which the animal slides into the dip. At the bottom of this sloping floor, it is well to put a large wooden roller so that the animal will not scrape his belly on the edge of the tank. The ascent from the vat should be a gradual slope and provided with heavy cleats so that the animal will have no trouble climbing out.

The following diagrams show diagrams for a sheep dipping plant which gives a nicely arranged set of pens and is not spread over a very large area. It is convenient and handy in arrangement and combines the good qualities of many different plans.

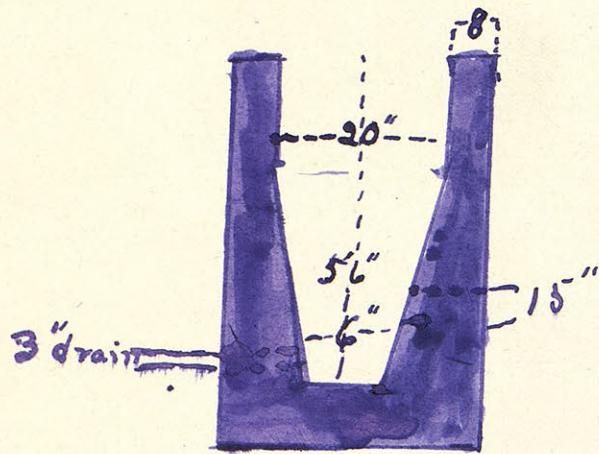


A. Large Cutting Pen
 B. Pen for sheep not to be dipped,
 C. " " " " to be dipped
 D. " " and Chute leading to Vat
 E. Cutting gate.

F. Sloping floor leading to vat.
 G. Vat - g.g. Boards to prevent animals from
 riding each other in vat. F only gives room
 for head.
 H. Ascending chute
 I-I. Drifting Pens.
 J. Heating boiler
 K. Drain Pipe



- "a" Sloping floor leading into vat
 "b" - a "bumping roller"
 c. ascent into dripping pens



A cross section of a concrete sheep dipping vat.

Another method of applying dips which is receiving a great deal of attention recently is the "Seabury Live Stock Spraying Machine". This method bids fair to take the place of dipping in a few years as it has already received the sanction of the "Bureau of Animal Industry".

The machine consists of an elongated chamber which is placed at the mouth of an ordinary branding chute. The animals are driven through the chute and as they enter the chamber they are showered or sprayed from every possible angle, with a solution of crude oil and water under a pressure of thirty or forty pounds. They are so arranged that the dip strikes the animal from the rear, thus digging under the hair and penetrating the skin, thereby reaching all parasites.

The process is said to be very rapid. Records have been reported as authentic, of 501 animals in thirty minutes, and 4000 in seven hours.

Beaumont oil is probably the best parasiticide and disinfectant of any of the non-poisonous dips. It is difficult to use, however, in the form of a dip, because of the difficulty in making it form an emulsion with water. If the pure oil is used or if it is mixed with water and allowed to separate as it does in dipping, it will gum the hair together and stop up the pores of the skin, thus proving fatal to the animal.

The Seabury sprayer seems to have overcome this difficulty and thus made the use of pure crude-oil and water

possible and practical. The oil and water are mixed in the proper proportions of 25 per cent oil and 75 per cent of water, under a high pressure and temperature, and are kept agitated until they are forced on the the animal. Forced on in this way the oil enters the skin, killing all parasites and softening the skin and hair without any harmful effect upon the animal.

Another advantage of this spray is that the soil is so effective as a parasiticide that the Government inspectors only require one treatment in compliance with the law, while with their dips, they require two treatments ten days apart. Another advantage is that the oil stays on the animal for several weeks, preventing reinfection and also keeping off the insect pests as flies, etc.

This spraying process is more expensive than dipping, largely because of the monopoly on the oil and also because unreasonable charges of the railroad companies for shipping the oil in, but even with this added cost the spraying process is not much more expensive in the long run, because there is much less danger connected with spraying than with dipping.

The rapidity and thoroughness with which the Seabury sprayer does the work of the dipping vat, will probably drive the latter out of existence in the course of a few years if the cost of operating the former can be kept within reasonable bounds.

General practice and also experimental work have both shown that coal-tar products and crude oils are the best dips and recent experiments seem to prove that spraying is the ideal method of applying these dips.

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