

DIPPING AND
TICK - DESTROYING AGENTS.

PART I.

BY

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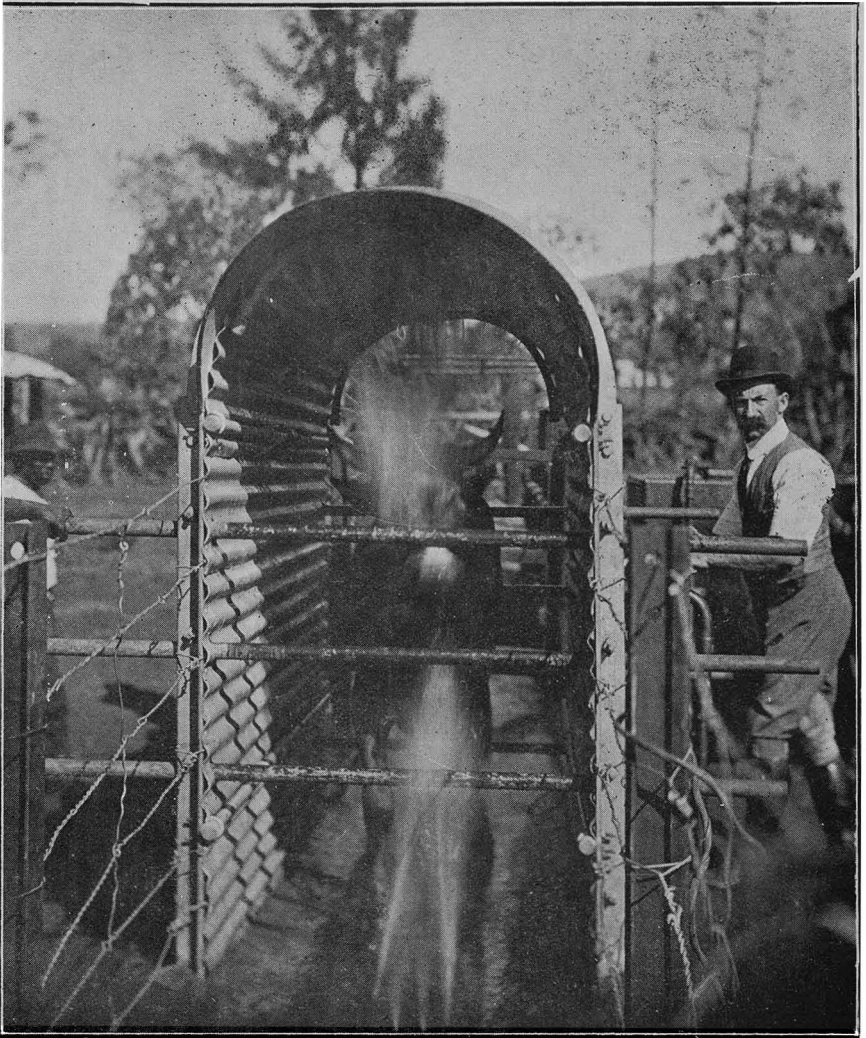
NATAL.

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LT-COL .WATKINS-PITCHFORD'S SPRAYING DEVICE.



With hood and side guide-rails removed to show system of piping. Head and floor sprays open, sprays at sides closed. These sprays are being operated, as shown, at side of pen by levers, and can be opened singly or together, as desired.

Dipping and Tick-destroying Agents.

THIS report is intended to show the efficacy of certain preparations supplied for the dipping and spraying of cattle. The main object with which this enquiry was instituted was the ascertainment of the frequency with which such dipping agents could be used without risk or disability to the animals concerned.

Such safety in use, however, was deemed of importance only when conjoined with the ability of the agent under observation to destroy the tick.

The conclusions arrived at, therefore, must be clearly understood to be based, not only upon the reliability of an agent as a dip for general use at usual intervals, but chiefly upon its ability to permit re-application at a short interval without incurring damage to the animal system.

Most of the current cattle dips have come under review in this manner, and an endeavour has been made to compare the properties of these preparations under conditions as similar as possible.

Precise similarity of conditions of test has not been possible, inasmuch as the observations undertaken have extended over some period, during which the conditions of weather, intensity of tick infestation, etc., have varied, but such slight variations have not in my opinion influenced final results in any great degree.

The agents coming under observation have been as follows:—

- | | |
|---------------------------------|-----------------------------|
| 1. Cooper's "Tixol"; | 8. Holmes' Paste Dip; |
| 2. McDougall's Dip; | 9. "Ialine" Sheep Dip; |
| 3. Quibell's Dip; | 10. Electrolysed Sea-water; |
| 4. Cooper's Powder Dip; | 11. Arsenite of Soda; |
| 5. Demuth's Dip; | 12. Erkenbrach's Paste Dip; |
| 6. Newton Chambers' "Izo-Izal"; | 13. Alderson's Dip; |
| 7. Thomas' Dip; | 14. "Laboratory Dip." |

It will be seen from the attached schedules that most of these preparations were efficient tick killers, some of them acting efficiently in this respect when used in much higher dilutions than those recommended in the directions recommended accompanying the sample.

In view of the number of dipping agents to be enquired into at one time it was found impossible to construct for every such preparation a dip or receptacle in which complete submersion could be effected, especi-

ally as each preparation was examined in three separate dilutions, full strength (as recommended by the proprietors), three-quarters strength, and half-strength, as it was hoped that some of the dips under enquiry—even if too strong to bear frequent repetition in full strength—might give good results when used at less than the strength prescribed for ordinary long interval dipping. This arrangement, as will be seen, necessitated the use of a large number of different solutions for which tank accommodation was out of the question.

It was, therefore, decided to base the enquiry primarily upon each preparation when used in the form of a spray, as such spray solution could be freshly mixed in the quantity required, and so effect a saving of both time and material.

It was recognised, however, that the results derived from the use of a solution in spray form were not strictly comparable to the results given by a dip or bath in which complete submersion took place.

As, however, it has been frequently observed that the effect of a spraying fluid is increased or intensified when used in the form of a dip, no objection to the preliminary use of the spray—on the ground of severity of effect—could be brought forward. A preparation, therefore, which was found too strong to bear repeated application in the form of a spray was considered to be unsuitable for use when used at the same intervals of time in the form of a dip or bath.

This observation as to the difference of effect between the same fluid in the form of a spray and a dip has, I believe, been the experience of others who have conducted investigations upon the effect of such preparations in other parts of South Africa. In carrying out an exhaustive examination of the matter much difficulty has been experienced by reason of:—

- (a) The restriction of grazing on account of existing East Coast Fever quarantine regulations; and
- (b) The difficulty of obtaining and transporting to the Laboratory paddocks a number of cattle sufficient for the purpose of the enquiry, which difficulty arose also upon the same ground.

The maintaining of an adequate degree of tick infestation—in order to judge of the effect of the various preparations upon tick-infested cattle—was only effected with much difficulty by reason of the restrictions of the animals to small paddocks, which later rapidly became both eaten down and denuded of ticks by the frequent dippings to which the contained cattle were subjected. In order to meet this difficulty the Corporation of Pietermaritzburg was approached and was good enough to at once place at disposal some acres of the Town Lands contiguous to the Laboratory paddocks. Even with this advantage the difficulty has been

considerable of re-infecting the test animals with a sufficient number of ticks to judge of the action of the various dipping preparations. The artificial hatching of ticks has, therefore, been resorted to, but such expedient—by reason of the delay and trouble involved—has not given the satisfactory results which would have attended the natural infestation of cattle grazing in an unrestricted area. In spite of this difficulty, the results obtained were sufficiently conclusive in each case as to the tick-killing properties or otherwise of the preparations concerned.

Observations as to the safety of an application and the interval at which it could be repeated without danger presented no difficulty, but much time has been spent in making such observations and in recapitulating such results as seemed unusual or unexpected.

In the first instance six head of cattle were set aside for the investigation of each preparation (although in some instances of repetition of results as many as twenty or more animals have been required for a single dip), and these six were apportioned as shown in the tabular statements, *viz.*, two beasts for the full strength, two for the three-quarter, and two for the half strength solutions. In this way it has been possible to note the tick-killing properties of a dip and also the safety with which a certain dilution could be repeated at a short interval.

This question of interval between dippings has been considered of much importance in view of the life history of the tick, especially of the Brown tick (*Rhipicephalus appendiculatus*), so frequently responsible in one of its developmental stages for the transmission of East Coast Fever.

The interval, therefore, between application of the various solutions was made as short as possible in order to prevent the tick in question surviving and thus leaving the body of an infected host and further propagating the disease.

A dip which could be applied so frequently as to ensure the destruction upon a beast of all forms of tick life would obviously do much to limit the spread of the disease by reducing the number of pathogenic or disease-producing ticks and thus decreasing the chances of infection.

The problem of killing all parasites upon a beast every few days without involving the beast itself in danger by direct or cumulative effect of the repeated applications proved a somewhat difficult question, and it was upon this point of the interval at which applications could be repeated with safety that most of the preparations under review were found wanting.

Arsenic—the chief constituent upon which most of the dips depend for their killing or insecticide properties—is a strong irritant to the skin, and in addition is capable of occasionally storing up or accumulating

its poisonous properties and suddenly exerting such in the form of acute arsenical poisoning.

Too frequent application of such a fluid gives rise to an inflammation of the skin, showing itself by a "staring" of the coat, and a heat and soreness of the skin itself, which latter frequently becomes wrinkled in lines or cracked so deeply as to permit the oozing of blood and fluid from the fissures.

As the skin at back the of the knee-joint and front of the hock is generally involved great reluctance to move is noticed, and the pain and discomfort are frequently so great that the beast will lie down and die without making an effort in extreme cases to help itself. Wherever a note exists in the following schedules as to "cracking" or "peeling" it will be understood that the effect has been due chiefly or solely to the dip in question containing too high a percentage of arsenic, or to the form in which the arsenic has been combined with the other component parts of the dip. At the foot of each schedule will be found a brief resume of its contents, and, in looking through these, it will be noticed that, while some preparations are shown as being inefficient as regards their tick-killing properties, the majority are found to be so severe as to necessitate the discontinuance of the test by reason of the effect upon the system of the animal.

The necessity mentioned above for frequent cleansing of animals at short intervals led to the interval of four clear days, *i.e.*, every fifth day, being determined upon as the shortest practicable time to which such interval could be brought with due regard to the safety of the beast and the destruction of ticks. This minimum time—four clear days—was found to be too severe a test for the majority of the preparations under examination to conform to, which preparations—though they proved quite efficient in tick-killing power—produced such grave local and constitutional disturbances as to necessitate their discontinuance after a few applications.

The difficulty of finding on the market a composition capable of wholly satisfying the above requirements led to the attempt to produce one, and as an outcome the dip referred to as "Laboratory Dip" in the schedule has received an extensive trial, and its composition will be found attached in the form of an Appendix, "A." After the component parts of this latter of Laboratory preparation has been successfully adjusted so as to give the desired result when used as a spray (see Schedule 15), it was found to be too strong used in 2,000 gallon bulk as a dip in which animals were completely immersed (see Schedule 19).

Further adjustments were therefore made (chiefly by alteration of the arsenical contents) and the final result is that shown on Schedule 21, in which it will be noticed that cattle have been put through this mixture

for sixty days at regular intervals of four clear days, and, while the cattle maintain their usual health, the ticks are destroyed.

The same fluid after two months' use when applied to grossly infested cattle in the form of a spray cleans them satisfactorily. It will, therefore, be seen that it is possible to dip cattle at such short intervals as once every fifth day without detriment to the beasts so dipped, and they can in this manner be kept practically free from tick infestation such as occurs in the short intervals between dippings. Even during such interval the dip has been noticed to exert to some extent a deterrent effect upon re-infestation (although on this point the difficulty mentioned above of securing thorough infestation by ticks under the conditions existing must be considered).

As far as I have been able to judge, cattle can be worked with safety directly after dipping in this "Laboratory Dip" when applied every fifth day. My opportunities of observing this point have been limited, but with a span of six oxen which have been repeatedly yoked as soon as dry after dipping and used for ploughing in heavy ground, no unfavourable results have ensued although such work has been continued day by day throughout the intervals from one dipping to another.

The question of ability to work after such frequent dippings is an important one to the owner of transport cattle or working oxen, and when the difficulties of safe and efficient dipping at short intervals have been met there remains the above difficulty of ensuring that no effects are produced preventing the animals so dipped from performing ordinary labour.

In one of the preparations shown amongst the annexed schedules a satisfactory result was given by the dip in question for many weeks, but when the oxen came to be worked it was found necessary to greatly increase the interval between dipping in order to avoid the risk of collapse and even death ensuing.

The only dip besides the Laboratory Dip which has been brought to my notice as being capable of frequent, safe, and satisfactory application even to working oxen is that in use at present upon the Nel's Rust Estate. Immersion in this dip takes place every seven days with cows and working oxen alike, and I am informed the cattle are kept virtually free from ticks and are capable of performing their usual work without distress.

This Nel's Rust dipping fluid is a modification of the Queensland dipping formula, and a copy of the formula used at Nel's Rust, which was given to me through the kindness of Mr. Alexander, is shown in Appendix "B" for the use of those who consider a weekly immersion a sufficiently short interval between dippings. Another practice in use at Nel's Rust is the separate dressing of the ears of all beasts either when emerging from the dip or in the yoke. It has frequently been observed

in the course of this enquiry that cattle will become divested of all their ticks with the exception of a few (generally Brown ticks) which persist in the ears, usually upon its edge or fringe. The practice, therefore, of applying a special dressing to the ear by means of a swab gives good results in those cases where the dip fails to kill all ticks, and the same procedure holds good in those cases where ticks are found to survive under the root of the tail. I am informed that at Nel's Rust where this procedure is systematically adopted the results leave nothing to be desired, while the trouble involved in this extra manipulation is only slight even where a large number of cattle is concerned.

It will be found, however, in the majority of cases where the Laboratory formula is employed that this separate treatment will not be found necessary, a fact probably owing to the higher percentage of arsenic present.

Following will be found appended the various schedules showing the manner in which the different dipping agents have comported themselves in their various strengths at an interval between applications of four clear days in each case.

It will be seen that no attempt has been made to compare the cost of the various preparations or to judge of the same from any preferential standpoint. All that has been attempted has been to ascertain the tick-killing properties of the preparation in question and the safety with which applications of the same could be made.

No critical observations have been made as to the species of tick concerned in the foregoing tests, although the Brown tick has been the subject of special notice in computing the tick-killing properties of any dipping fluid.

Where actual numbers of ticks are mentioned as surviving, it will be understood that an approximation only is meant. Much time, however, has been spent at each inspection in order to make this number as correct as possible.

At the foot of each schedule will be found a summary of its results in application.

It will be seen that all animals do not become equally affected by equal exposure to the spray or dip, and several instances can be noticed in which it was found necessary to cast one of the animals from a test on account of the severe skin reaction, while the companion animal remained unaffected.

Such constitutional differences are, of course, to be expected. Another point of interest to be observed is the frequency with which a

tolerance became established in beasts which threatened to develop inflammation of the skin after the third or fourth spraying or dipping, but which became habituated to the process by further repetition.

A slight amount of skin-irritation amongst a few animals after commencing the use of a fresh dip would not, therefore, appear to necessitate the immediate discontinuance of the use of a dipping fluid, but it is, of course, necessary to observe all such cases narrowly and to disuse any dip which threatens to exert its irritating effect to any serious extent.

The details given in Schedules 14 to 21 show the manner in which final results have been arrived at and the effect of the addition of various agents to the arsenical base, which latter, in the present state of our knowledge, must be looked upon as an essential constituent of all efficient dips for tick destruction.

The results given by the use of Arsenite of Soda alone will be found upon reference to Schedule 11, and the proportions shown there were taken as a rough index as to the arsenical content necessary in the preparation of a dip such as that shown in Schedules 14 to 21 ("Laboratory Dip"). According to the full strength of one pound of arsenite of soda (containing about 80 per cent. of arsenic) to twenty gallons of a diluting fluid was used, and this diluting fluid was arranged to contain Soap (in order to emulsify the other constituents and to produce a more lasting effect upon the skin), Paraffin (to act as a penetrating and tick-destroying agent which might assist also by its odour in reducing liability to tick attack), and Glycerine (as an emollient tending to counteract the roughening and irritating effect both of the arsenic and paraffin and to maintain sleekness of coat).

The results obtained from this mixture will be found on reference to Schedule 14, from which it will be seen that, while the animals are efficiently cleaned from their ticks, constitutional symptoms begin to set in after from four to six applications of the spray (every five days), which necessitates the casting of the animals from the series. Accordingly on Schedule 15 it will be noticed that the arsenite of soda is reduced to three-quarters of the above quantity; only 12 ozs. to 20 galls. of other fluid being used. This appears efficacious and safe, and after twelve sprayings an attempt is made to reduce the interval to two clear days instead of four, which is continued at this reduced interval for three sprayings, when symptoms of slight skin trouble necessitate return to the four clear days' interval, which is repeated with safety up to 23 operations before being discontinued as final. This experiment is repeated under letter "B" (Schedule 15) at a constant interval of four clear days with practically the same result up to 19 sprayings, covering a period from 28th August to 26th November. A recapitulation under letter "C" gives the same results up to 10 sprayings.

As will be seen from inspection of Schedule 15, a spraying fluid composed of the above constituents and containing in every 20 gallons 12 ounces of arsenite is both efficient and safe for use as a *spraying fluid* for an indefinite period.

An attempt was made to further reduce this amount of arsenite, keeping the other proportions as before, but the results were not so uniform although the cattle in the series were maintained practically free from ticks. (This schedule has not, from considerations of space, been put up.)

In view of the above results an endeavour was made to simplify the composition of the dip by omitting both the paraffin and glycerine, the soap emulsion remaining as before. Schedule 16 shows that the effect of the arsenic was too irritant even in the three-quarter strength, and that the animals had to be cast after the application of three sprayings. The addition of the glycerine to the composition used in Schedule 16 gives much the same result (as Schedule 17 shows), whereas the addition of the paraffin and the omission of the glycerine (Schedule 18) permits of the application of 11 sprayings before it is necessary to cast the animals. These results may, therefore, be summarised as follows:—

Arsenite (alone) 12 ounces to 20 gals. permits	...	3 sprayings
Arsenite, Soap emulsion ,, ,,	...	3 sprayings
Arsenite, Soap and Glycerine ,, ,,	...	3 sprayings
Arsenite, Soap and Paraffin ,, ,,	...	11 sprayings
Arsenite, Soap, Glycerine and Paraffin ,, ,,	...	23 sprayings

Arsenite of soda, therefore, in proportions as shown combined with the materials given above is a safe and efficient agent for use as a spraying fluid repeated at intervals of four clear days.

An endeavour was then made to observe the effects of the above fluid in the form of a dip in which cattle could be completely submerged, and accordingly a dip of the ordinary pattern (about 3,000 gallons capacity) was filled with the composition as above, with the exception of the glycerine. (See Appendix A.) Through this dip eight beasts were passed, as shown in Schedule 19, from which it will be seen they rapidly became unfit for further experiment.

As it was thought that this disappointing result might possibly have been due to the presence of un-emulsified paraffin which floated upon the top of the tank this oil was removed by skimming and water was added to the dip in order to bring the strength down to one pound of arsenite to forty gallons of fluid. The effect of this mixture is shown on Schedule 20, and eight beasts were passed through this fluid for four dippings before signs of skin-irritation began to manifest themselves. This difference of behaviour in the dipping fluid—even when less arsenite was present—seems strange, and I am not able to offer any satisfactory

explanation of the fact, which, however, has been noted by other observers.

A further dilution of the whole dip was therefore decided upon, and sufficient water was added to bring the strength down to one pound of arsenite to forty-six gallons, and the results of this final adjustment are seen in Schedule 21. It will there be seen that 40 beasts have been passed through this solution without any sign of skin irritation and that they have been cleaned from their ticks and maintained in a condition of comparative freedom from tick-infestation. During this period—dating from 21st December to the end of February—they have been continuously exposed to such re-infestation by ticks as the somewhat denuded paddocks have afforded, and such ticks as have attached themselves to the cattle have been regularly destroyed. Numerous Brown ticks have existed during this time, and separate experiments have been made upon the ears by bagging, etc., in order to observe the effect of the immersion upon these ticks in particular; the question of survival after dipping being in this way differentiated from re-infestation.

The strength of the dipping fluid has been ascertained from time to time, both by estimation of the quantity of arsenic by analysis, and by the cleansing effect produced upon the small number of grossly-infested beasts kept apart from the general herd.

It will, therefore, be seen that the fluid which, for want of a better term, I have called the "Laboratory Dip," is capable of continued application at intervals of four clear days for an indefinite period, and that it has proved as far as could be judged an efficient tick-killing preparation.

As I have said before, however, the work has been conducted with several limitations which may possibly give rise to results somewhat divergent from the foregoing results when an extended use of the dip in various localities is made. Simple adjustment of detail without alteration of any important point will, however, suffice in any such cases to ensure good results.

Another point upon which further observation is desirable is the safety with which working cattle subjected to this dip can be used for draught purposes. This point can be decided only by further trials which I am now arranging to have carried out in different parts of the Province. It appears to me, however, that there is good reason to believe that cattle can be worked with impunity while undergoing regular dipping, and I trust it may be found that the work undertaken in this direction will prove not only of use in retarding the spread of East Coast Fever but will prove of assistance in the general eradication of the tick itself.

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Govt. Bacteriologist.

The following are the schedules referred to in the foregoing report:—

Schedule No. 1.

COOPER'S "TIXOL."

FULL STRENGTH.

(As directed to be used by the
Manufacturers.)

First spraying, June 13th, 1938.—Both beasts moderately infested with ticks.

Second spraying, June 18th.—(1) 30 adults, also many young alive; (2) few young ticks present.

Third spraying, June 23rd.—No adult, large number of young dead.

Fourth spraying, June 28th.—Clean.

Fifth spraying, July 3rd.—(1) Few small ticks in ears, beasts purging; (2) clean, skin cracked.

Sixth spraying, July 8th.—(1) Accidental death; (2) clean, skin cracked.

Seventh spraying, July 13th.—(2) Few young ticks, badly cracked. Cast.

THREE-QUARTER STRENGTH.

First spraying, June 14th.—Moderately infested.

Second spraying, June 19th.—Two adult forms alive, also few young.

Third spraying, June 24th.—(1) Few small forms present, belly swollen; (2) clean.

Fourth spraying, June 29th.—(1)

THREE-QUARTER STRENGTH.—

Continued.

Clean, grinding teeth; (2) clean, legs peeling.

Fifth spraying, July 4th.—(1) Clean, stiff hind legs; (2) clean, legs cracked.

Sixth spraying, July 9th.—(1) Stiff and lame, cast; (2) badly cracked, cast.

HALF STRENGTH.

First spraying, June 15th.—Moderately infested with ticks.

Second spraying, June 20th.—(1) Several adult, also young ticks alive; (2) few fresh crawling forms young ticks.

Third spraying, June 25th.—(1) Many adult and young ticks present; (2) practically clean.

Fourth spraying, June 30th.—(1) Few adult and young alive, many dead; (2) practically clean.

Fifth spraying, July 5th.—(1) Practically clean; (2) clean.

Sixth spraying, July 10th.—(1) Clean, slightly cracked; (2) clean.

Seventh spraying, July 15th.—Cracked and peeling, cast. Died on July 13th from the effects of spraying.

SUMMARY.

It is evident from the above schedule that this preparation is too severe in its effects when used every fifth day in its full strength. The effects begin to be pronounced after the application of the fourth spraying, and when the strength of the spray is reduced by one-quarter no great difference is observed. Even when used at half strength directed effects begin to be produced on the skin after the fourth spraying. It is obvious, therefore, that this preparation—while quite efficient as a tick-destroyer—is not capable of use even when diluted to half strength. The directions upon the tin state that this preparation should not be used in the strength directed more often than once in 14 days, and the three-quarter and half-strength tests show that it is not capable of repetition at short intervals even at the much reduced strengths shown above.

Schedule No. 2.

McDOUGALL'S DIP.

FULL STRENGTH.

(As directed to be used by the
Manufacturers.)

First spraying, June 13th, 1908.—
Moderately infested with ticks.

Second spraying, June 18th, 1908.—
Several adult, also large number young
ticks.

Third spraying, June 23rd, 1908.—(1)
9 adult and many young ticks alive;
(2) 13 adult and many young ticks
alive.

Fourth spraying, June 28th, 1908.—
Practically clean; (2) 14 adult and
many young ticks alive.

Fifth spraying, July 3rd, 1908.—(1) 5
adult and large number young ticks;
(2) 20 adult and large number young
ticks.

Sixth spraying, July 8th, 1908.—(1) 3
adult alive, practically clean; (2) 15
adult and many young ticks alive.

July 8th, 1908.—Infested by hand on
body, ears, etc.

Seventh spraying, July 13th, 1908.—
(1) 4 adult and few young ticks present;
(2) 3 adult and many young
ticks alive.

THREE-QUARTER STRENGTH.

First spraying, June 14th, 1908.—
Many adult and young ticks present.

THREE-QUARTER STRENGTH.—

Continued.

Second spraying, June 19th, 1908.—
(1) 10 adult and large number young
ticks; (2) 30 adult and large number
young ticks.

Third spraying, June 24th, 1908.—(1)
150 adult and large number young
ticks; (2) 80 adult and large number
young ticks.

Fourth spraying, June 29th, 1908.—
(1) 80 adult and large number young
ticks; (2) 50 adult and large number
young ticks.

Fifth spraying, July 4th, 1908.—(1)
30 adult and large number young ticks;
(2) 10 adult and large number young
ticks.

Sixth spraying, July 9th, 1908.—(1)
10 adult and large number young ticks;
(2) 12 adult and few young ticks present.

Seventh spraying, July 14th, 1908.—
(1) 40 adult and large number young
ticks; (2) 30 adult and large number
young ticks.

HALF STRENGTH.

First to seventh spraying, from June
15th to July 15th, 1908.—In this dilu-
tion no appreciable effect upon the tick
seemed to be exerted.

SUMMARY.

It will be observed from the above table that this dip has been found capable of answering to the requirements of application every fifth day, without producing any skin trouble or constitutional derangement. It will be noted, however, that its tick-killing properties are not well marked and that many adult ticks appear to survive the reapplication of the fluid.

It is probable that the use of this dip in greater strength than that recommended by the manufacturers would give a greater efficiency as regards tick destruction, but whether such stronger solution could be applied every fifth day without producing any derangement is conjectural, the pressure of time and the number of other necessary observations prevented the ascertaining of this point.

Schedule No. 3.

QUIBELL'S PASTE DIP.

FULL STRENGTH.

*(As directed to be used by the
Manufacturers.)*

First spraying, June 13th.—Large number adult and young ticks.

Second spraying, June 18th.—Majority adult and few young forms dead.

Fourth spraying, June 23rd to July 3rd.—Practically clean.

Sixth spraying, July 8th.—(1) Clean, skin cracked slightly; (2) clean.

Eighth spraying, July 13th to July 23rd.—Reinfection with large number young ticks.

Tenth to seventeenth spraying, July 28th to September 1st.—Practically clean.

Eighteenth to twenty-first spraying, September 6th to September 21st.—Practically clean, with occasional slight reinfestment. A few brown ticks appeared to survive.

Twenty-second to twenty-fifth spraying, September 26th to October 11th.—Practically clean, with occasional slight reinfestment. A few brown ticks appeared to survive.

THREE-QUARTER STRENGTH.

First spraying, June 14th.—Moderately infested.

Second spraying, June 19th.—(1) Large number young ticks present; (2) many young ticks dead and many present.

Third spraying, June 24th.—Practically clean.

Fourth to eighth spraying, June 29th to July 19th.—Practically clean.

Ninth to nineteenth spraying, July 24th to September 12th.—Clean.

Twenty-first to twenty-fifth spraying, September 17th to October 12th.—(1) Clean; (2) few brown ticks persisting.

HALF STRENGTH.

First to twenty-fifth spraying, June 15th to October 13th.—Throughout this period, from June 15th to October 13th, these beasts remained fairly clean, the spray destroying the majority of forms of the blue tick. A few, however, seemed to be resistant and appeared to mature; many brown ticks remained unaffected by the solution in this strength.

August 2nd, salivating; August 4th, died.

SUMMARY.

As will be seen from the above table, this preparation was capable of repeated (25) applications at intervals of four clear days in three-quarter and half strengths. In full strengths it approached nearly to the desired result, but a certain amount of skin irritation was noticed after the fourth or fifth spraying, whilst the constant reapplication proved fatal to one beast after ten sprayings. The other animal of the series survived to the twenty-fifth time of spraying, when observations were discontinued. While, therefore, this dip is too strong for repeated use in its full strength it permits many ticks to survive when used in three-quarter strength, and it is possible that an adjustment between these two dilutions might give satisfactory results. It is understood that the above results have not taken into consideration the question of the safety of working animals after application of the dip, and more than one instance has been brought to my notice of unfortunate results occurring in the case of working oxen after having been dipped at intervals of seven days. The safety, therefore, of a dip for repeated application does not imply necessarily its safety for general use in the case of working animals.

Schedule No. 4.

COOPER'S POWDER.

FULL STRENGTH.

(As directed to be used by the
Manufacturers.)

First spraying, June 13th, 1908.—Moderately infested.

Second spraying, June 18th.—Five adult and small number young ticks.

Third spraying, June 23rd.—Young Ticks all dead, practically clean.

Fifth and sixth spraying, June 28th to July 8th.—Clean; (1) skin peeling.

Seventh spraying, July 13th.—(1) Clean, badly cracked, cast; (2) clean badly cracked, cast.

THREE-QUARTER STRENGTH.

First spraying, June 14th, 1908.—Moderately infested.

Second spraying, June 19th.—(1) Few young ticks; (2) 18 adult and few young ticks.

Third spraying, June 24th.—(1) Practically clean; (2) 25 adult live, many adult dead.

THREE-QUARTER STRENGTH.—

Continued.

Fourth spraying, June 29th.—Clean.

Fifth spraying, July 4th.—Clean.

Sixth spraying, July 9th.—Clean.

Seventh spraying, July 14th.—(1) Skin cracked, cast; (2) skin cracked, cast, lachrymation.

HALF STRENGTH.

First spraying, June 15th, 1908.—Moderately infested.

Second spraying, June 20th.—(1) Adult dead, large number young ticks; (2) 17 adult, large number young ticks.

Third spraying, June 25th.—(1) Adult dead, large number young alive; (2) body clean, large number young alive.

Fourth spraying, June 30th.—Clean.

Fifth spraying, July 5th.—Clean.

Sixth spraying, July 10th.—Small number young ticks.

Seventh spraying, July 15th.—Clean, skin roughened, cast.

SUMMARY.

The above table shows that this preparation is not capable of satisfying the demands of the enquiry in hand, inasmuch as the skin commences to be affected after the fourth spraying at ordinary strength, while when reduced to half strength only seven sprayings are tolerated before skin irritation is set up. It is probable, therefore, that in a form of a dip rather than as a spray the skin of these animals would have become affected at an even shorter interval.

This preparation appears to be highly efficient as a tick destroyer, but the interval at which it could be applied safely is probably a somewhat lengthy one.

Schedule No. 5.

DEMUTH DIP.

FULL STRENGTH.

(As directed to be used by the
Manufacturers.)

First spraying, July 8th, 1908.—Moderately infested.

Second spraying, July 13th.—(1) Large number young ticks; (2) small number young ticks.

Third spraying, July 18th.—Majority of ticks dead.

Fourth spraying, July 23rd.—Practically clean, legs peeling.

Fifth spraying, July 28th.—Clean, skin cracked, cast.

THREE-QUARTER STRENGTH.

First spraying, July 9th.—(1) Fair number of ticks present; (2) large number of ticks of all ages.

Second spraying, July 4th.—(1) Few young ticks; (2) 12 adult alive; majority of ticks dead.

Third spraying, July 19th.—Clean, badly cracked, cast.

HALF STRENGTH.

First spraying, July 10th.—Moderately infested.

Second spraying, July 15th.—Practically clean.

Third spraying, July 20th.—Clean.

Fourth spraying, July 25th.—Re-infested with moderate number of ticks.

Fifth spraying, July 30th.—(1) Clean, skin cracked, cast; (2) clean.

Sixth spraying, August 4th.—(2) Clean.

Seventh to tenth spraying, August 9th to August 24th.—(2) Re-infested large number of young ticks.

Eleventh to twelfth spraying, August 29th to September 3rd.—Large number of adults present.

Thirteenth to sixteenth spraying, September 8th to September 23rd.—Practically clean.

SUMMARY.

It will be seen from the above that this dip is not able to withstand repeated application. It will be noticed that the skin commences to become affected after three sprayings at full strength, and even in three-quarter strength this dip is not tolerated any better. Reference to the schedule will show that at the dilution recommended by the proprietors the legs became affected when the beasts were brought up for their fourth spraying, and it became necessary to cast them from the series after the fourth spraying.

The same results attended the use of the three-quarter strength solution, while in half strength it was found necessary to cast one beast at the fourth spraying, although the companionesse No. 2, as will be seen, goes on to the sixteenth spraying, having apparently acquired a considerable degree of tolerance.

This dip—though an excellent tick-killer—is obviously unsuited for repeated application.

Schedule No. 6.

IZO-IZAL SHEEP DIP.

FULL STRENGTH.

(As directed to be used by the
Manufacturers.)

First spraying, October 2nd, 1908.—Moderately infested.

Second spraying, October 7th.—Moderately infested, none dead.

Third spraying, October 12th.—Moderately infested, none dead.

Fourth spraying, October 17th.—Moderately infested, none dead.

Fifth spraying, October 22nd.—Moderately infested, none dead.

Sixth spraying, October 27th.—Moderately infested, none dead.

Seventh spraying, November 1st.—Large number larval and nymphal forms.

THREE-QUARTER STRENGTH.

First spraying, October 2nd, 1908.—Moderately infested.

Second spraying, October 7th.—Moderately infested, none dead.

Third spraying, October 12th.—Moderately infested, none dead.

Fourth spraying, October 17th.—Moderately infested, none dead.

Fifth spraying, October 22nd.—Moderately infested, none dead.

Sixth spraying, October 27th.—Large number of young ticks present.

Seventh spraying, November 1st.—Large number adult and young ticks.

SUMMARY.

As will be seen from the above schedule, this preparation fails to destroy ticks upon cattle when used in the dilution as suggested by the manufacturers, 1 part to 100 parts of water. No irritating effects were observed after seven sprayings, when, as the tick-killing property of the dip seemed to be insufficient, the observations were discontinued.

Schedule No. 7.

THOMAS'S DIP.

FULL STRENGTH.

(As directed to be used by the
Manufacturers.)

First spraying, September 28th, 1908.—Fair number of adult ticks.

Second spraying, October 3rd.—Clean.

Third spraying, October 8th.—Clean.

Fourth spraying, October 13th.—Clean, skin cracked, cast.

THREE-QUARTER STRENGTH.

First spraying, September 28th, 1908.—Fairly infested.

Second spraying, October 3rd.—Practically clean.

Third spraying, October 8th.—Clean.

Fourth spraying, October 13th.—Clean.

Fifth spraying, October 18th.—Clean, skin cracked, cast.

SUMMARY.

The above schedule clearly shows the unsuitability of this preparation for repeated use at short intervals. Its tick-killing properties are, however, obvious.

Schedule No. 8.

HOLMES' DIP.

FULL STRENGTH.	
(As directed to be used by the Manufacturers.)	number brown ticks.
First spraying, February 8th, 1909.— Moderately infested with brown ticks.	Third spraying, February 18th.—Ma- jority brown forms dead.
Second spraying, February 13th.— Many dead brown ticks, reinfested large	Fourth spraying, February 23rd.— Clean.
	Fifth spraying, February 28th.— Clean.

SUMMARY.

Owing to this preparation not coming under review until such time as observations upon other dips were almost complete it has not been found possible to give it the same extensive trial as that given to other preparations. It will be seen, however, from the short schedule above that this preparation appears to be efficient as regards its tick-killing property and capable of repetition for at least five sprayings; though it should be stated in this latter connection that the only cattle available for this test have been repeatedly dipped in Laboratory Dip, and may on this account have possessed a certain amount of tolerance to further skin-applications containing arsenic. Its efficacy as a tick-destroyer appears to be well established.

Schedule No. 9.

"IALINE SHEEP DIP."

FULL STRENGTH.	THREEQUARTER STRENGTH.
(As directed.)	
First spraying, January 25th, 1909.— Numerous adult and young ticks present.	First spraying, January 25th, 1909.— Large number of adult and young ticks present.
Second spraying, January 30th, 1909.— Numerous adult and young ticks present; none dead.	Second spraying, January 30th, 1909.— Large number of adult and young ticks present, none dead.
Third spraying, February 4th, 1909.— Numerous adult and young ticks present; none dead.	Third spraying, February 4th, 1909.— Large number of adult and young ticks present, none dead.

SUMMARY.

This preparation did not appear to exert any poisonous influence upon the ticks when used at the strength recommended as no dead ticks were observed, and as the test cattle remained thickly infested after three sprayings, observations on this dip were discontinued.

Schedule No. 10.

HYPO-CHLORITE OR ELECTROLYSED SEA WATER.

FULL STRENGTH.

First spraying, January 25th, 1909.—
Moderate number of ticks present.

Second spraying, January 30th, 1909.
—Large number of adults present, none
dead.

Third spraying, February 4th, 1909.—
Large number of adults present, none
dead.

THREE-QUARTER STRENGTH.

First spraying, January 25th, 1909.—
Large number of adult forms present.

Second spraying, January 30th, 1909:
—Large number of adult forms present,
none dead.

Third spraying, February 4th, 1909.—
Large number of adult forms present,
none dead.

SUMMARY.

This preparation proved, as will be seen from the above schedule, to be apparently unable to kill any ticks when used in the proportions directed, *viz.*, 1 part to 49 parts of water. The observations were discontinued after the third spraying.

Schedule No 11.

ARSENITE OF SODA.

1 lb. to 20 gallons.

FULL STRENGTH.

First spraying, July 3rd, 1908.—
Beasts moderately infested.

Second spraying, July 8th, 1908.—(1)
No adult live, large number young
alive; (2) seven adult dead and adher-
ing, few young alive.

Third spraying, July 13th, 1909.—
Practically clean.

Fourth and fifth spraying, July 18th
and 23rd.—Practically clean, skin crack-
ed, cast.

THREE-QUARTER STRENGTH.

First spraying, July 4th, 1908.—Mod-
erately infested.

Second spraying, July 9th, 1908.—
Practically clean.

Third spraying, July 14th, 1908.—
Practically clean.

Fourth spraying, July 19th, 1908.—
Clean, skin cracked, cast.

HALF STRENGTH.

First spraying, July 15th, 1908.—Mod-
erately infested.

Second spraying, July 10th, 1908.—
Practically clean, many lice present.

Third spraying, July 15th, 1908.—
Practically clean, many lice present,
lice still alive.

Fourth spraying, July 25th, 1908.—
(1) Clean, legs cracked, cast; (2) clean.

Sixth spraying, July 30th, 1908.—(2)
Clean.

Seventh spraying, August 4th.—(2)
Skin cracked, cast.

SUMMARY.

Inspection of the above schedule shows that this preparation is too irritant when used in the strength often prescribed, *viz.*, one pound to

20 gallons of water. As will be seen, the skin commences to become affected after the third spraying at full strength, while when used in the proportion of only one half-pound to 20 gallons, one of the test animals was cast after the fourth spraying and the remaining one after the sixth spraying.

This schedule is of interest as showing the influence of the arsenite of soda used alone in an un-combined state. Comparison between this table and Schedules Nos. 14 and 15 of "Laboratory Dip" will show the result of combining other agents with this arsenite of soda, which result in the reduction of its irritating properties without taking away from its efficacy as a tick-killer.

It is obvious that arsenite of soda by itself is not suitable either in the form of a spray or a dip, if application at short intervals is to be practised.

Schedule No. 12.

ERKENBRACH'S CATTLE DIP.

(All the observations below are made upon "Full Strength.")

FIRST OBSERVATIONS.

First spraying, June 15th, 1908.—Cattle well infested.

Second spraying, June 20th.—Moderately infested.

Third spraying, June 25th.—(1) Practically clean, coughing; (2) practically clean; trembling, sick.

Fourth spraying, June 30th.—(1) Clean, coughing; (2) clean, legs peeling.

Fifth spraying, June 5th.—(1) Clean, legs peeling; (2) clean, skin cracked, cast.

Sixth spraying, July 10th.—(1) Clean, badly cracked, cast.

SECOND OBSERVATIONS.

First spraying, January 25th, 1909.—Moderately infested.

Second spraying, January 30th.—Moderately infested; many dead.

Third spraying, February 4th.—Moderately infested; skin peeling, cast.

THIRD OBSERVATIONS.

Four Beasts.

First spraying, February 15th, 1909.—All beasts moderately infested with ticks.

Second spraying, February 20th.—Clean.

Third spraying, February 25th.—Nos. 1 and 2 clean; skin cracked, cast. Nos. 3 and 4 clean.

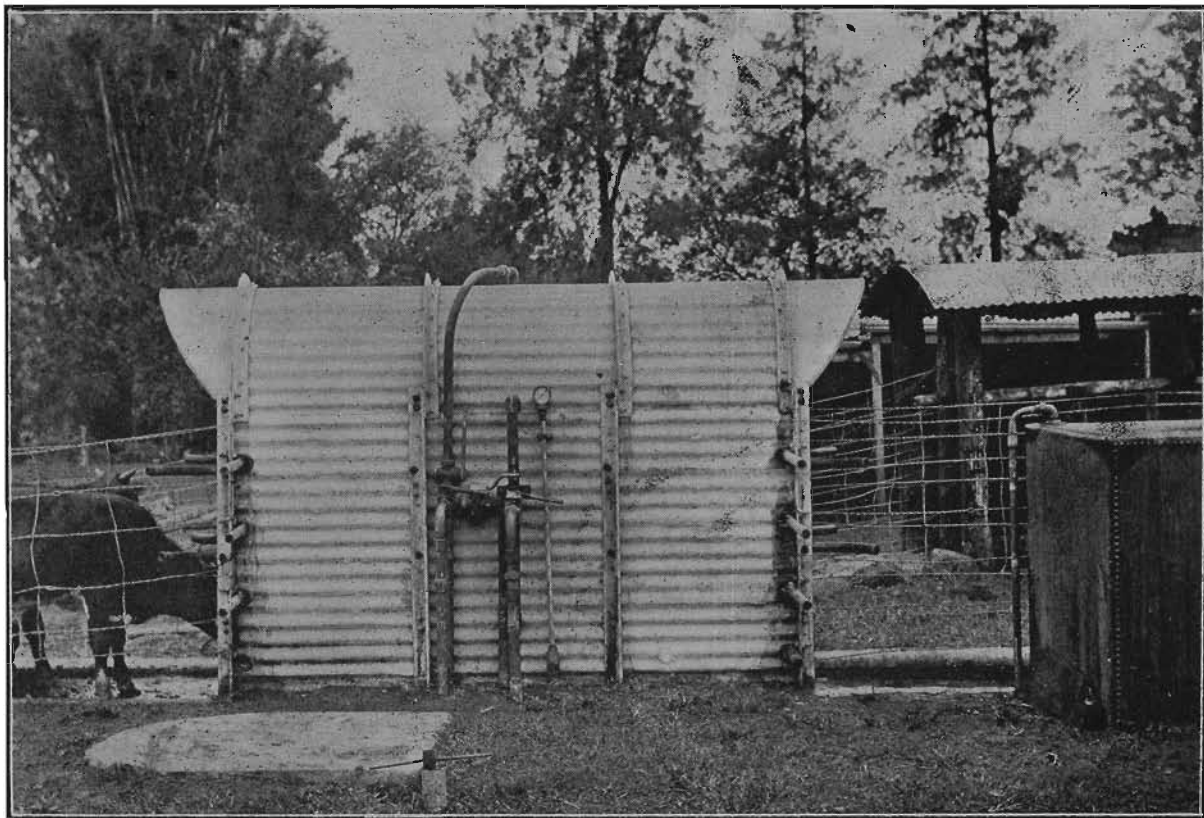
Fourth spraying, March 2nd.—No. 2 clean; skin peeling, cast.

SUMMARY.

The above schedule shows the repeated effect of spraying at intervals of five days. It will be observed that three separate observations have been attempted in the months of June, January and February, and in each case the result will be found the same, with the exception that the spraying fluid is apparently tolerated better during the dry weather. The results in every case have been severe, and in a number of cases not shown in the schedule in which the proprietor's instructions were

SPRAYING DEVICE.

Fig. 2.



General view of Pen, showing actuating levers, and pressure gauge, etc. The concrete block in foreground enclosed the pressure chamber. The controlling handle, shown projecting from the ground near this block, serves to direct the fluid from the pump either into the pressure chamber, or, at conclusion of operations, to return it into the 400 gallon storage tank, shown on right.

misunderstood, a slight increase in the strength of the spraying solution resulted in the deaths of several animals after the fourth or fifth spraying. Responsibility for this result, of course, does not rest with the dip itself, but it serves to show the result which may be brought about if this preparation is used in greater strength than that recommended.

It will be noticed that three-quarter strengths or half-strengths are not shown in the above schedule, which is due to above mistake, which, unfortunately, tended to confuse the results. Such results, therefore, have not been included in the schedule.

Judging from the behaviour of this preparation (in its full or manufacturers' strength) and also in its dilutions in comparisons with other preparations of a somewhat arsenical content, I am of the opinion that this dip would be found too severe in its three-quarter strength, and it is doubtful whether repeated dippings in half-strength would be tolerated.

Its efficacy as a tick-killer is undoubted.

Schedule No. 13.

ALDERSON'S CATTLE DIP.

This preparation appears to be somewhat similar to Erkenbrach's dip, while the arsenical content appears to be much the same. The remarks, therefore, in Schedule No. 12 apply equally to this preparation.

Six head of cattle were used for this test, as in other instances.

Schedule No. 14.

"LABORATORY" SPRAYING FLUID.

(Containing Arsenite of Soda, Glycerine, Paraffin and Soap.)

FULL STRENGTH.

(1lb. As. o to 20 gals. Water.)

First spraying, August 3rd, 1908.—
Cattle moderately infested.

Second to fourth spraying, 8th to
18th August, 1908.—Practically clean.

Fifth spraying, August 23rd.—(1)
Clean, skin rough; (2) clean, skin
cracked, cast.

Sixth spraying, August 28th.—(1)
Clean, skin cracked, cast.

SECOND TEST, FULL STRENGTH.

First spraying, September 11th.—
Beasts well infested.

Second spraying, September 16th.—
Practically clean.

Third to fifth spraying, September
21st to October 1st.—Clean.

Sixth to eighth spraying, October 6th
to 16th.—Clean, skin peeling.

Ninth spraying, October 21st.—Clean.
skin cracked, cast.

Schedule No. 15.

"LABORATORY" SPRAYING FLUID.

(A.)

First spraying, August 3rd, 1908.—Beasts moderately infested.

Second spraying, August 8th.—Beasts moderately infested.

Third to sixth spraying, August 13th to 28th.—Practically clean.

Seventh to eighth spraying, September 2nd to 7th.—Clean.

Ninth to thirteenth spraying, September 12th to 30th.—Slight reinfestation, cleaned by each recurring application of the spraying fluid.

Fourteenth spraying, October 3rd.—Clean.

Fifteenth to sixteenth spraying, October 6th to 11th.—Clean, skin peeling.

Seventeenth spraying, October 16th.—Clean, skin improving.

Eighteenth spraying, October 21st.—Clean, skin normal.

Nineteenth to twenty-third spraying, October 26th to November 5th.—Clean, skin normal.

(B.)

First spraying, August 28th, 1908.—Beasts moderately infested.

Second to fourth spraying, September 21st.—Approximately half ticks present dead.

Fifth spraying, September 17th.—Clean.

Sixth to nineteenth spraying, September 22nd to November 26th.—Clean.

(C.)

(Third test of the three-quarter strength.)

First spraying, October 12th.—Moderately infested.

Second to tenth spraying, October 17th to November 26th.—Clean.

Schedule No. 16.

"LABORATORY" SPRAYING FLUID.

(Containing Arsenite of Soda and Soap Solution Only.)

FULL STRENGTH.

(7½ lb. Ar. So. to 20 gals. Water.)

Moderately infested.

Second spraying, October 7th.—Three adult dead adhering.

Third spraying, October 12th.—Few brown ticks, skin cracking.

Fourth spraying, October 17th.—Clean, skin cracked, cast.

THREE-QUARTER STRENGTH.

First spraying, October 2nd.—Moderately infested.

Second spraying, October 7th.—Skin practically clean.

Third spraying, October 12th.—Clean, skin peeling.

Fourth spraying, October 17th.—Skin cracked, cast.

Schedule No. 17.

"LABORATORY" SPRAYING FLUID.

(Containing Arsenite of Soda, Glycerine and Soap.)

FULL STRENGTH.

First spraying, October 2nd.—Moderately infested.

Second spraying, October 7th.—Clean.

Third spraying, October 12th.—Clean, skin peeling.

Fourth spraying, October 17th.—Clean, skin cracked, cast.

THREE-QUARTER STRENGTH.

First spraying, October 2nd.—Slightly infested with ticks.

Second and third spraying, October 7th and 12th.—Clean.

Fourth spraying, October 17th.—Skin badly cracked, cast. (Died on the 18th of October.)

Schedule No. 18.

“LABORATORY” SPRAYING FLUID.*(Containing Arsenite of Soda, Paraffin and Soap.)*

THREE-QUARTER STRENGTH (ONLY).	Re-infested with many brown ticks; (2) clean.
First spraying, October 28th.—Well infested with ticks.	Seventh spraying, November 27th.— (1) Clean; (2) clean.
Second spraying, November 2nd.— Practically clean.	Eighth to tenth spraying, December 2nd to 12th.—Clean.
Third to fifth spraying, November 7th to 17th.—Clean.	Eleventh spraying, December 17th.— Clean, skin peeling.
Sixth spraying, November 22nd.—(1)	Twelfth spraying, December 22nd.— Skin cracked, cast.

Schedule No. 19.

“LABORATORY” DIPPING FLUID.*(Containing Arsenite of Soda, Paraffin and Soap; 2,000 gallons; the proportion of Arsenite being 1 lb. to 33 gallons.)*

First dipping, November 22nd, 1908.	Third dipping, December 22nd, 1908.— Skin cracking, cast.
—Eight beasts, all well infested.	Compare this result with that ob- tained by similar fluid used as spray.
Second dipping, November 27th, 1908.	
—Clean.	

Schedule No. 20.

“LABORATORY” DIPPING FLUID.*(Composition as above with 400 gallons Water added.)*

First dipping, December 3rd, 1908.— Beasts (8) moderately infested.	Fourth dipping, December 13th, 1908. —Clean.
Second dipping, December 8th, 1908.— Clean.	Fifth dipping, December 23rd, 1908.— Five beasts cast for skin irritation; the remaining three were turned out.
Third dipping, December 13th, 1908.— Clean.	

Schedule No. 21.

“LABORATORY” DIPPING FLUID.*(Composition as above with a further 400 gallons Water.)*

First dipping, December 21st, 1908.— Beasts (8) well infested.	Sixth dipping of original eight, Janu- ary 15th.—Clean.
Second dipping, December 26th, 1908. —Practically clean.	Seventh dipping of original eight, January 20th.—Clean; remainder showed ticks dead to about 50 per cent.
Third dipping, December 31st, 1908.— Re-infested with small and brown ticks.	Eighth dipping of original eight, Janu- ary 25th.—Clean.
Fourth dipping, January 5th, 1909.— Many dead forms attached, and some fresh re-infestation.	Ninth dipping on January 30th to fifteenth dipping on March 1st.—This herd has remained practically clean. Slight re-infestation has been observed on several occasions, but the cattle have remained tick-free during the last five or six dippings.
Fifth dipping, January 10th, 1909.— Clean.	
At this point thirty-one head of cattle were added to the test; all beasts well infested.	

APPENDIX (A).

LABORATORY DIPPING AND SPRAYING FLUID.

To mix 400 gallons:—

Eight pounds Arsenite of Soda.*

Five and a half pounds Soft Soap.

Two gallons Paraffin.

The details for preparation are as follows:—Dissolve the soap in about 5 gallons of hot water; while still hot add this soap solution in small quantities at a time to the paraffin and beat or stir to a creamy lather. This makes the soap emulsion. Dissolve eight pounds of arsenite of soda in a sufficient quantity (about a gallon) of hot water, and when completely dissolved add cold water up to 50 gallons. This mixture can be made in the tank. The soap solution may then be gradually added, stirring thoroughly the while.

Water should then be added till the 400 gal. tank is full. When it is desired to fill the dipping tank the above procedure can be adopted for as many times as is found necessary, or one mixing may be made sufficient for the purpose. Four hundred gallons, however, is a sufficient quantity to handle at one time. If a film of oil floats to the top of the dip in the tank the dip should be stirred with a stick, or board, before commencing to dip, or the oil may easily be removed by skimming, the proportion of alkali present in the soft soap (a proportion varying with different samples) determining to some extent the degree of emulsification of the oil.

It is of great importance that arsenite of soda containing 80 per cent. arsenic should be used, as it has been found in the past that several failures have been experienced in the application of this dip by the use of unreliable arsenical preparations. Hard water should not be used in the mixing of the dip. The above instructions should be strictly adhered to when mixing.

In the case of cattle not habituated to an arsenical dip, slight excoriation of the skin of the thighs and neck, etc., may be produced after the first dippings, but should this difficulty arise a dressing of the affected parts with oil or lard before dipping will permit of the animals being dipped at the five-day interval. It will be found that this intolerance rapidly disappears.

The approximate cost of the preparation for 400 gallons, at the wholesale rate as ascertained from a leading Maritzburg merchant, is as follows:—

Soft Soap, 5½ lbs., say at 4d.	1	10
Paraffin, 2 gallons, say at	2	2
Arsenite of Soda, 8 lbs., say at 5d.	3	4

7 4

*Arsenate of Soda, which is a different chemical compound, shall not be used.

APPENDIX (B).

COMPOSITION OF DIP

USED ONCE IN EVERY SEVEN DAYS ON NEL'S RUST ESTATE.

(By courtesy of G. D. Alexander, Esq.)

Composition of dipping fluid:—

- 5 lbs. arsenic;
- 15 lb. soda;
- 2 gallons of tar;
- 24 lbs. soap (soft);
- 400 gallons water.

The above is mixed in the usual way and cows and working oxen are dipped with impunity. It will be noticed that the arsenic itself instead of arsenite of soda is used and that the soda upon which the solubility of the arsenic depends is given as a separate item, the result being the same. The total quantity of arsenic present is, however, smaller in this dip than in the "Laboratory Dip," while the quantity of soap is considerably increased.

This dip has not been tried oftener than once a week as far as I am aware, but I see no reason why it should not safely be applied at less intervals than seven days.

PREPARATION FOR DRESSING EARS.

1 part "Ketrol" or "Cyllin";

9 parts grease (composed of 6 lbs. wagon oil and 3 lbs. lard oil).

This is applied with a swab to cattle while standing in the yoke or upon emerging from the dip in order to reinforce the action of the dip, and to ensure the destruction of all ticks present. It is probable that the low arsenical percentage contained in this dip makes this procedure advisable. It is, however, one which ensures the cleanliness of the ears of beasts and appears to be a useful procedure where the absolute cleansing of the cattle from ticks is desired.

APPENDIX (C).

OBSERVATION ON A SPRAYING APPLIANCE DEvised BY
LT.-COL. WATKINS-PITCHFORD.

The difference of opinion which has so long existed between the advocates of "dipping" *versus* "spraying" as systems for the cleansing of animals from ticks and other parasites will be familiar to every dweller in South Africa. Close examination of these rival systems will show that each can claim its own advantages and must admit its own peculiar deficiencies and drawbacks. Hitherto the greatest of these drawbacks to the system of "spraying" has been the difficulty of ensuring the complete saturation of an animal without the expenditure of much time and trouble. Appliances for spraying have been primitive and slow, and in the past the time taken in completely spraying a single beast has sufficed to put a whole troop of cattle through a dipping trough. If this admittedly grave disadvantage were removed the great drawback to the system of spraying disappears, and this difficulty has now been overcome by the devising of a mechanical spraying machine capable of rapidly and thoroughly saturating any animal with any fluid.

The advantages of an efficient spraying apparatus are obvious. Complete saturation can be effected in a few seconds without hustling an animal off its feet into a deep tank and forcing it to swim out or drown. Owners of stock will see the advantage of the point when dealing with valuable or pregnant animals. The dipping fluid also which is used in the spray-pen is not subjected to deteriorating influences (such as take place through evaporation, access of storm water, etc., etc.), but remains at a constant strength by being mechanically strained and returned into a closed tank at the conclusion of every spraying operation. This constant quality of the spray-fluid is a point of no little importance, and much of the difficulty (such as failing to cleanse on the one hand, and poisoning effects on the other) experienced in the use of dipping tanks arises from the inability to prevent the causes of deterioration mentioned above.

The system of spraying with the appliance shown in the accompanying illustrations is briefly as follows:—The horse is harnessed into the usual horse-gear (which turns the mealie-sheller, bark-chopper, etc.), and the pump of the spray-pen is set in action. One or two revolutions of the horse suffice to thoroughly churn up the contents of the tank in which

the spraying fluid is stored. This thorough mixing of the fluid each time a spraying operation is undertaken is a point of much advantage. The tap of the storage tank is then allowed to run until the lower part of the floor of the pen is under water, so to speak (as by this means all animals leaving the pen and walking up the draining slope must pass through some three or four inches of the fluid, and thereby thoroughly wash the under surface of the feet and hoofs). This tap is then shut off, which action allows the pump to throw the fluid into a strongly-formed steel drum or chamber holding about 40 gallons, which is reinforced, or strengthened, by being buried in concrete. Here the fluid is compressed, and as it reaches a pressure of 60 lbs. to the inch a simple valve lifts and allows all further fluid to flow out into the floor of the pen.

A beast is then driven into the pen and the bars are closed behind it. In the improved pattern, a light iron gate, or grille, hinged at the top, and counterbalanced by a lever, is used to close the entrance and exit pen—instead of the bars, as shown—thereby saving time and trouble.

The levers shown in the illustration are then opened in turn, and held open for about five seconds each. These levers control a system of perforated pipes running along (*a*) the roof, (*b*) the sides, and (*c*) the floor of the pen, and from these different directions the fluid is alternately forced in a heavy spray at a pressure of 60 lbs., with the result that complete saturation of the beast rapidly ensues. The bars of the pen in front are then drawn, and the process is completed by the animal washing its feet as it walks up the draining slope, down which all fluid drips, finding its way back to the floor of the pen, from which it is drawn through a fine sieve, by the pump, and so is returned again to the spray pen. The horse meanwhile continues his round, and the pressure of 60 lbs. is ready again before another beast can be driven into the pen. When all animals have been sprayed, the tap is turned over, and the fluid is drawn from the floor of the pen, automatically strained, and thrown back into the storage tank for the next spraying operation.

The appliance is very simple. No gear exists to become easily deranged, nor can any blocking of the spray holes exist, as not only is all fluid strained before it reaches the pipes, but the ends of these pipes are all closed with easily-detached screw-caps which allow any possible obstruction to be rapidly removed.

In cases where a spray pen is erected for common use by several cattle-owners, each owner may, if he so desires, have his own storage tank, and so spray his herd with any particular brand of dipping fluid he favours, and of any strength his experience may dictate.

As very little excavation, if any, is necessary, the advantage where stony ground is encountered at the site selected is greatly in favour of the spray pen.

Many other points will occur which give the above system, in certain circumstances, great advantages over the old system of dipping, but as these remarks are intended as a brief description of the appliance itself, and not a treatise on Spraying *v.* Dipping, these points are left to the discernment of the reader

The writer will be pleased to answer any questions which may be addressed to him with reference to the construction and approximate cost of an appliance as shown.



SPRAYING DEVICE.

Fig. 3.



Front view, showing pump and horse gear, at moment of shutting off head spray and opening floor spray. The guide rails, of which the curved ends can be seen projecting, serve to keep the animal in the centre of the pen. In the foreground on left, is the drive from catching kraal, up which cattle are being driven. The draining slope beyond cannot be seen by reason of the cloud of spray in the pen itself.