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MEASURING WATER CONSUMPTION BY STOCK
Burgess Spring Experimental Range

PRESENT METHODS

Amount of water consumed

Stock water at trough in corral (photo 1). Water is kept at a base level by a float valve. The base level is marked roughly by the point of a wire hook attached to the tank frame.

The water trough is fed from a small auxiliary tank (on the right in photo 2). The amount of water in the auxiliary tank can be read to the nearest gallon in glass gauge (photo 3).

Procedure:

1. Adjust water in trough to base-level if not already there.
2. Fill small auxiliary tank from large storage tank.
3. Record water level in glass gauge.

Next day —

4. See if water level in trough is at base-level, adjust if necessary.
5. Read glass gauge. Difference in readings represents number of gallons lost from trough.

The amount of water lost by evaporation is measured in a check trough protected from cattle (photo 4). Hook gauge in still-well records changes of .01 inch in water level.

Time of water consumption

This is measured by recording the time when the water level in auxiliary tank drops as trough is being filled. The home-made apparatus used to measure this drop is shown in photo 3. As the float (beer cans) drops, an arm from it makes contact with the horizontal wires on inside of

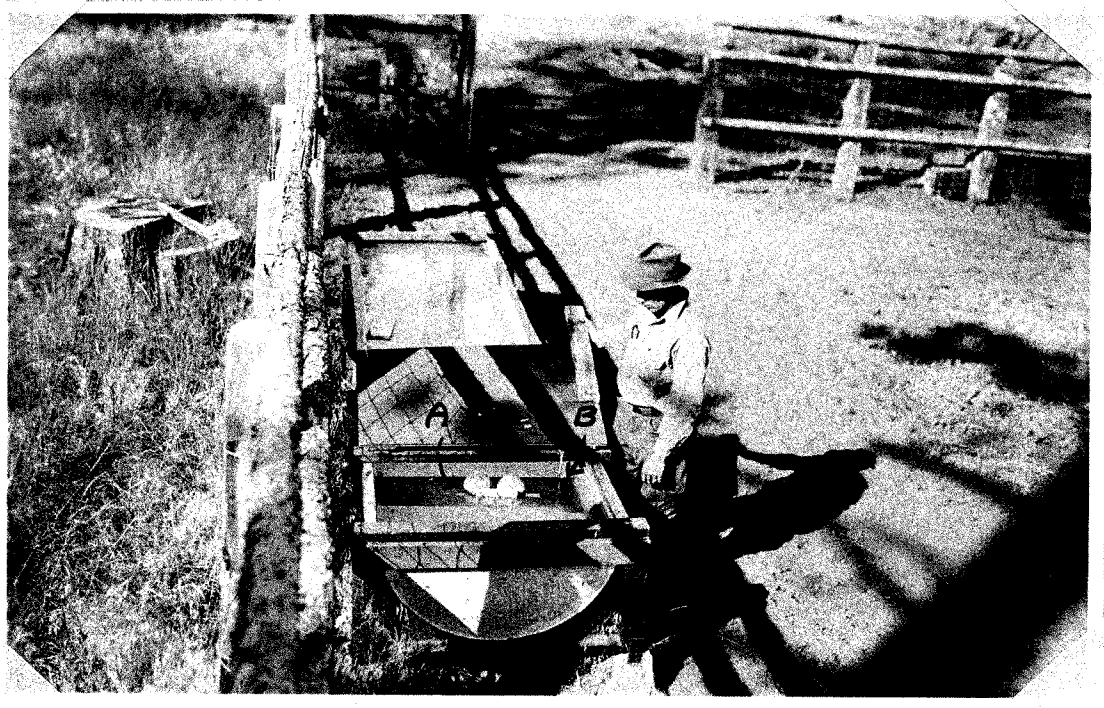


Photo 1

Stock watering trough in corral. Cover over float valve is raised. Valve not visible, only floats (A). Note wire "base-level" hook (B) in front of Short.

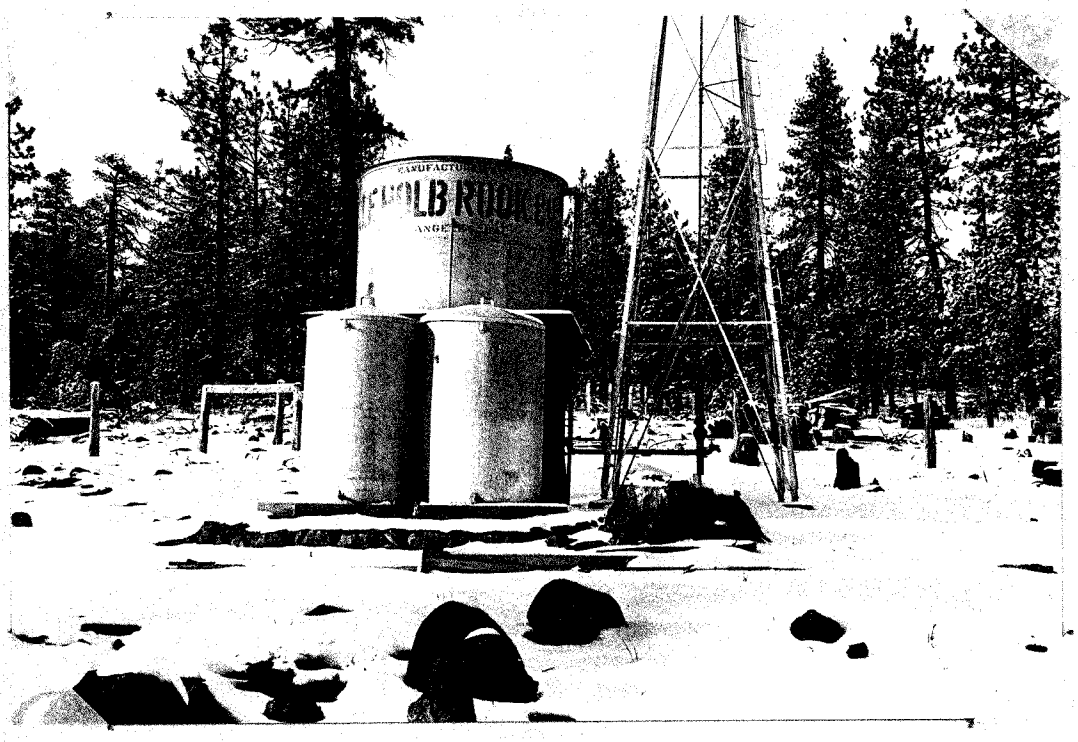


Photo 2

Two auxiliary tanks below storage tank. Small tanks filled by 1 1/2" shut-off valves which are not visible. Glass gauge is fitted between "elbow" and "tee" on front of small tanks (see photo 3).

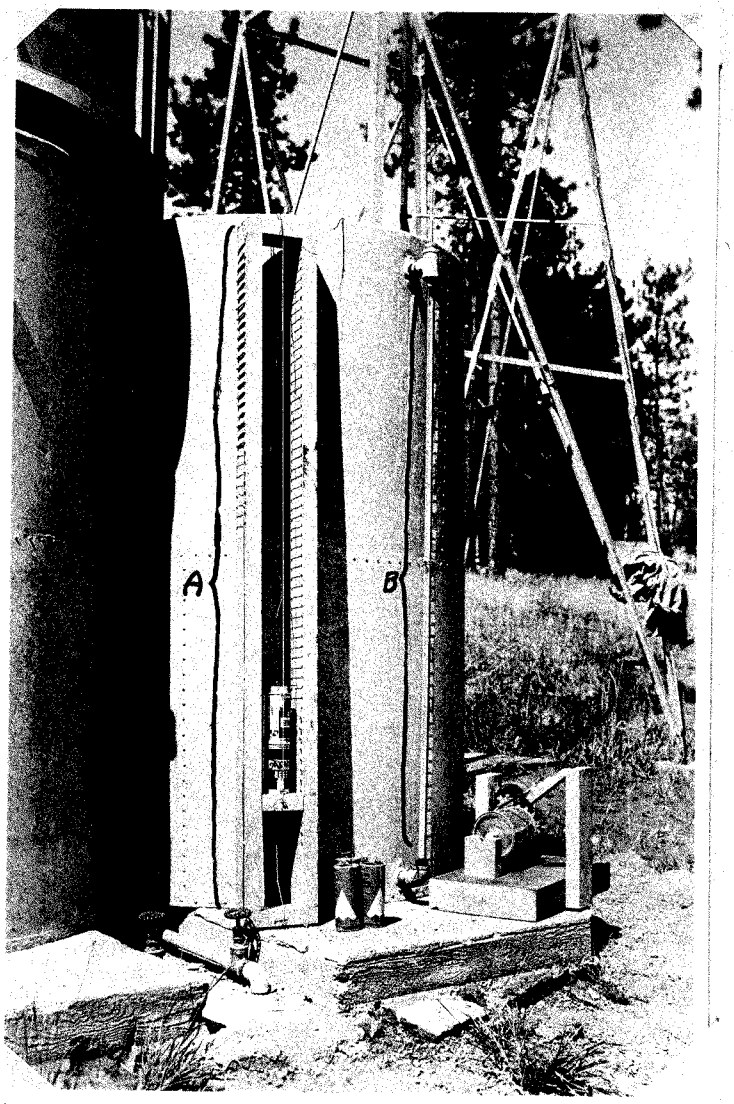


Photo 3

"Gadget" for recording time of water drop in auxiliary tank. Wooden frame (A) housing the float which is free to move up and down, fits inside the tank when in use; here shown removed for photographing.

Note glass gauge (B) calibrated from 0 to 450 gallons, providing a direct reading of quantity of water in tank at any time.

Photo 4

Trough for measuring evaporation. Note hook gauge in still-well.

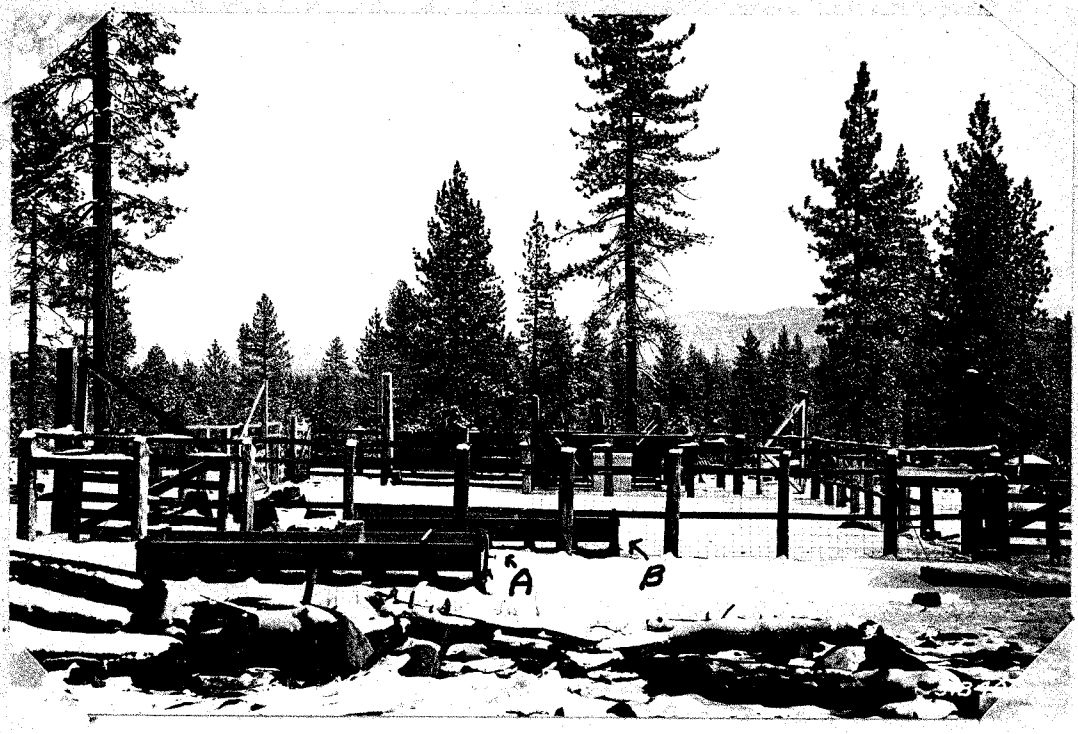


Photo 5

Evaporation trough (A), without hook gauge attached, in stock exclosure and cattle trough (B) in corral across fence.

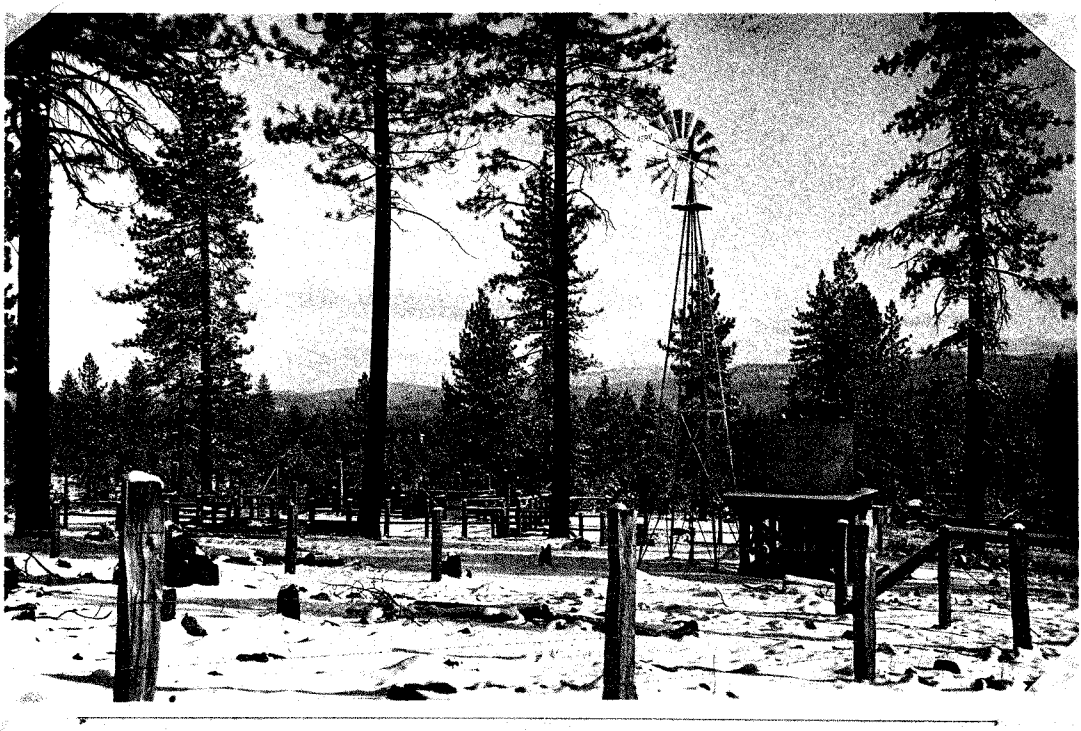
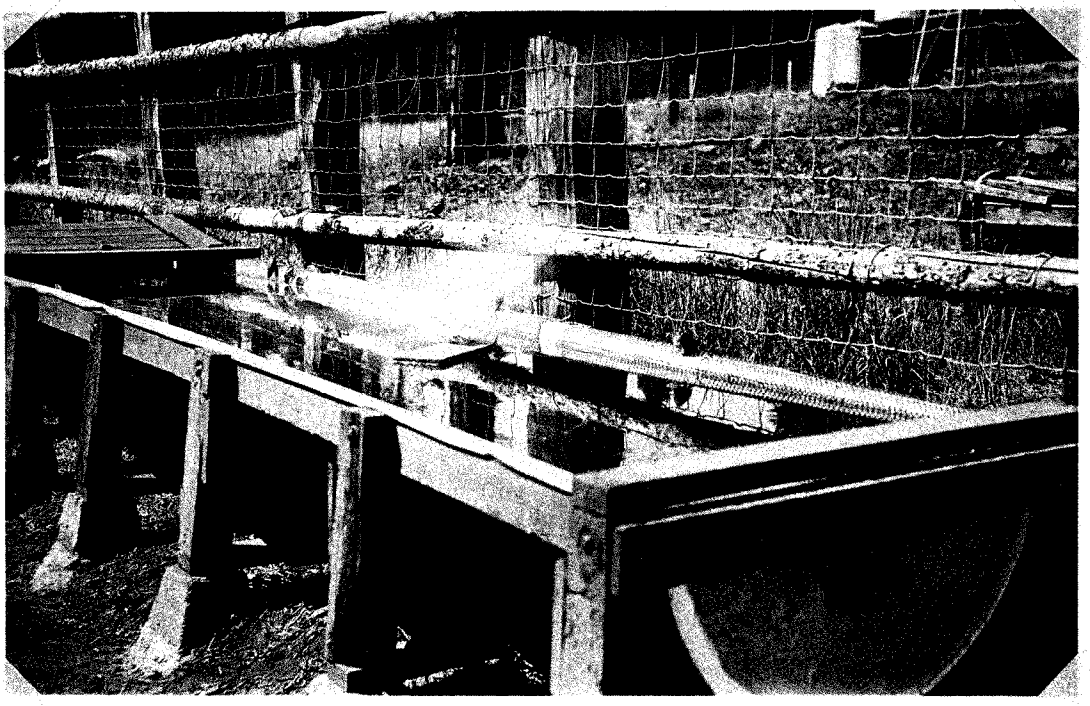


Photo 6

General view across stock exclosure. Water tanks on the right; top of two troughs visible near corral fence, left of largest tree.



Photos 7 and 8

Two views of stock-watering trough

wood frame. This contact is carried to a "buzzer" operating a pencil which then makes a horizontal mark on a paper attached to the tin drum rotated by an alarm clock. By recording the starting and stopping time of the vertical line made by the pencil dragging over the paper, the time of contact can be interpolated roughly.

SHORTCOMINGS OF PRESENT METHOD

1. Float valve closes gradually as water level of trough rises. This allows a small trickle of water to flow into the trough for a long time (at best, an hour after water is used, but if valve sticks slightly this time is extended). This influences time of water drop in auxiliary tank, confusing the "time of use" record. If water is still running into trough at time "amount of use" is recorded it confuses the records of two days.

2. Float valve does not stop water flow into the trough at the same level each time. Occasionally the level is 1/4 to 1/2 inch above the hook (such large variations usually caused by some foreign substance in valve). A variation in water level of 1/2 inch equals a difference of approximately 25 gallons in the contents of the trough, thus nullifying the 1-gallon accuracy in reading the glass gauge on auxiliary tank.

3. The float in auxiliary tank is not accurate enough to measure possible use by deer or individual steers. With present system each loss of 8 to 10 gallons from auxiliary tank is registered.

4. The contact arm on the float often stays at a level in contact with the wire on the frame for a period sufficiently long to run the dry-cells. Without a system of breaking contact this apparatus is not satisfactory and certainly cannot be refined for more accuracy.

PRECISION REQUIRED

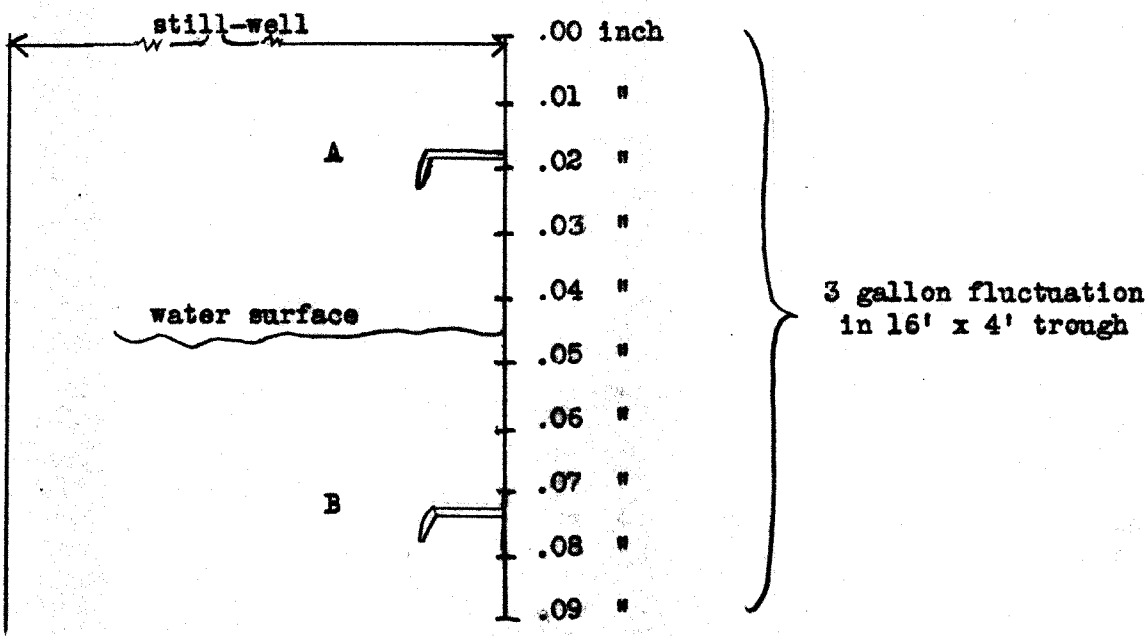
The water level that closes valve to trough should not vary more than three gallons in order that daily records have that precision.

Each three-gallon loss should be recorded within 15 minutes after it is lost from trough.

POSSIBLE SOLUTIONS

1. Development of a valve that will allow the water to flow into trough at full capacity of pipe until water in trough reaches desired level. The valve should then close immediately and open in the same way when water drops below desired level. It will probably be necessary for such a valve to work electrically. In order that it maintain a water level of 3-gallon accuracy in the trough the valve must be sensitive to a change of level less than .09 inch.

2. Development of a still-well with attached point contacts which will measure water level within the above accuracy. The following diagram may not be mechanically correct but illustrates a method that might possibly work.



The above graduations represent the vertical distance in which the water level in a still-well might fluctuate and maintain a 3-gallon accuracy in the trough. This would be possible if the valve would open when water contacts A and close as the water drops below B. Nearly a gallon could flow through the valve after the A contact and keep the level below .00. This leeway might be used in overcoming a lag in the water rising in still-well. The contacts would have to break immediately to keep from running the batteries down.

3. The other "invention" necessary is one to record the time that water runs into the trough (the real purpose is to record when cattle or deer remove water from trough, but if the valve works correctly this should be obtained within 15 minute accuracy by the above measurement.) It is possible to record the time by (1) recording actual passage of water through the pipes or (2) recording drop of water in auxiliary tank, as now done.

(1) Development of a meter that will tally each 3 gallons of water passing through the pipe. Each tally should set up a contact on a Bristol recorder.

(2) Refinement of "gadget" now in use.

RECORDING TIME OF USE OF SALT

PRESENT METHOD

Each day 1,000 grams of salt are placed in box (photo 9). Next day the remaining salt is removed from the box and weighed — difference equals amount used.

As cattle lick salt out of small box they push it down enough to make a contact which is carried to a Bristol recorder — a record of time of salting.

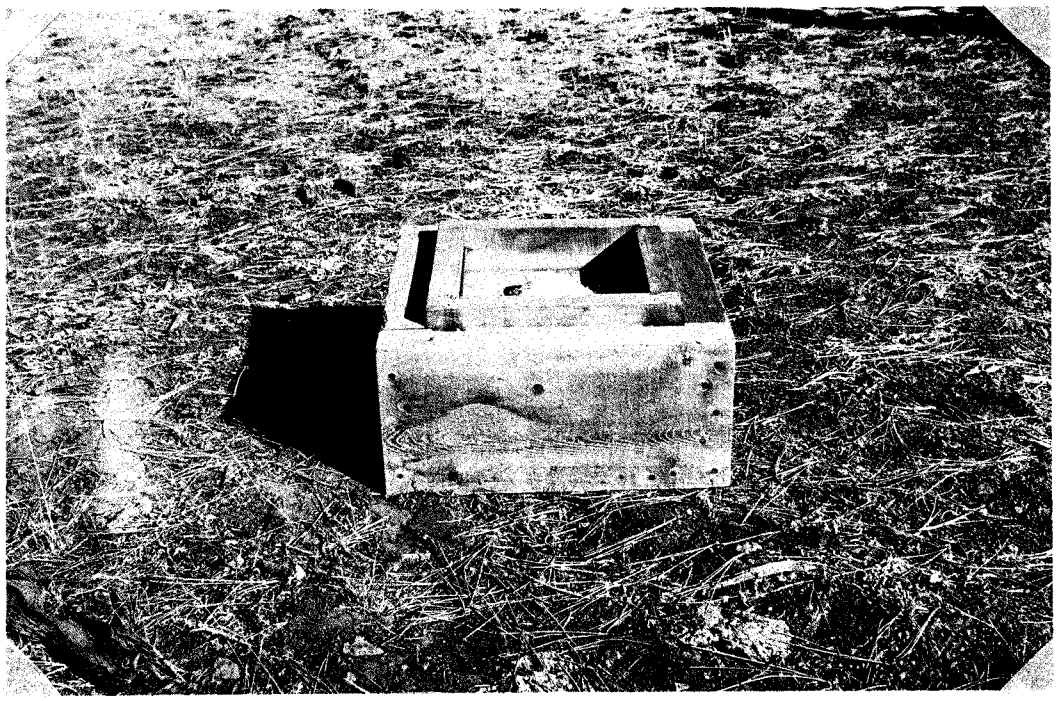


Photo 9

Recording salt box

SHORTCOMINGS OF PRESENT METHOD

The method is simple and works fairly satisfactorily as long as the Bristol operates correctly. Suggested improvements are:

1. Make small box removable from frame, for ease of cleaning out salt and to allow adjustment of springs beneath.

2. Make springs capable of adjustment as weight of small box varies, or contact variation due mainly to rain.

SUGGESTED METHOD FOR NEXT YEAR

Prepare 5 new recording boxes, place all at one salt ground, and connect each to a pen on a Bristol recorder.

Photos 10 and 11

CCC student technicians making daily change of salt in non-recording salt boxes. All tracks around box are marked out each day.

CONNECTING SALT AND WATER RECORDS TO ONE BRISTOL RECORDER

ADVANTAGES

1. Puts time record of water use from one trough and salt use from five boxes on one roll (aids in comparison).

2. Requires only one Bristol recorder (we have only one at present).

DISADVANTAGES

1. Requires enough batteries to furnish "juice" for the contact at the water meter to register on the Bristol at the saltground 3/4 miles away.

2. Requires approximately 1 1/2 miles of wire of a size and material to carry above contact.

3. Requires construction of 3/4 mile of line through cutover pine land.

4. Water-use records are 3/4 mile away from water installation, making it difficult to trace any mechanical breakdowns.

VITAL STATISTICS

1. Water trough is 16 feet long and 4 feet wide. Near the desired water level (for several inches at top of trough) each drop in water level of .01 inch equals approximately .33 gallon loss — 1 gallon = .03 inch.

2. The small auxiliary tank is 6 ft. high and 4 ft. in diameter. Each drop of 1 inch in water level equals approximately 8 gallons.

3. The trough is connected to the auxiliary tank by approximately 120 feet of 1" galvanized iron pipe. There is a drop of approximately 7 feet in ground level from the auxiliary tank to the water trough.

4. The experimental herd may consume as much as 200 gallons of water in five mimutes or less.

5. Electric power must be furnished by batteries.