CIHM
Microfiche
Series
(Monographs)

ICMH
Collection de
microfiches
(monographies)

Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

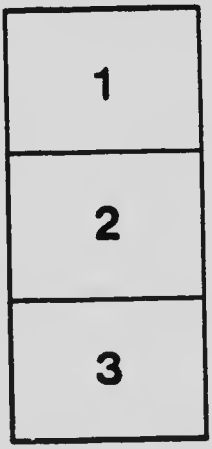
- ☐ Coloured covers / Couverture de couleur
- ☐ Covers damaged / Couverture endommagée
- ☐ Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- ☐ Cover title missing / Le titre de couverture manque
- ☐ Coloured maps / Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- ☑ Bound with other material / Relié avec d'autres documents
- ☐ Only edition available / Seule édition disponible
- ☑ Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- ☐ Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- ☐ Additional comments / Commentaires supplémentaires:

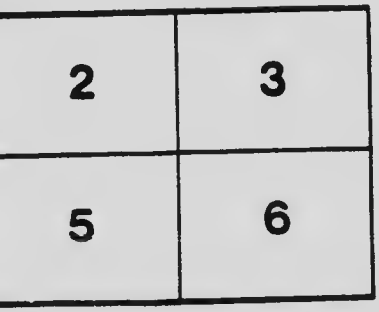
L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages / Pages de couleur
- ☐ Pages damaged / Pages endommagées
- ☐ Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- ☐ Pages detached / Pages détachées
- ☑ Showthrough / Transparence
- ☐ Quality of print varies / Qualité inégale de l'impression
- ☐ Includes supplementary material / Comprend du matériel supplémentaire
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- ☐ Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below / Ce document est filmé au taux de réduction indiqué ci-dessous.

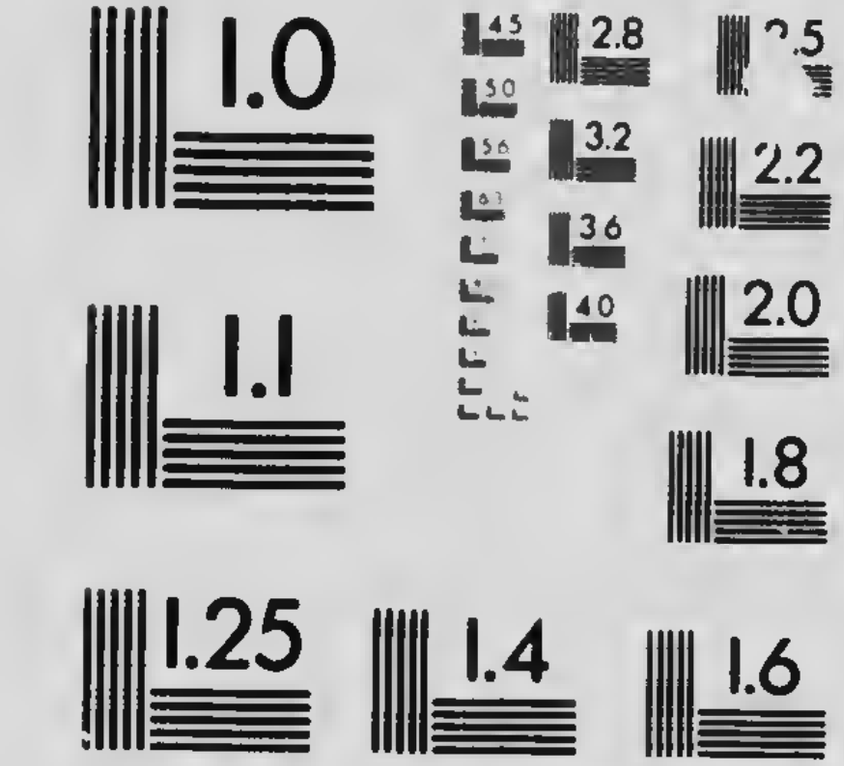
10x	12x	14x	16x	18x	20x	22x	24x	26x	28x	30x	32x
						✓					





MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

CIRCULAR No. 58. AUGUST, 1920.

MANITOBA AGRICULTURAL COLLEGE
Winnipeg, Canada

Chemistry of the Farm Water Supply

By W. F. GEDDES, B.S.A., A.C.I.C.
Assistant Professor of Chemistry,
MANITOBA AGRICULTURAL COLLEGE
WINNIPEG, MANITOBA

Probably at no other time has the problem of a water supply, either for domestic or industrial purposes, been so great as in these early years of the twentieth century. The increasing realization of the effect of contaminating materials, both organic and inorganic, on a municipal or private drinking supply, and history's record of the devastating nature of epidemics due to water-carried disease organisms—these have led to the careful investigations of water for its sanitary value, and the development of materials and equipment to fight and eliminate contamination; and they have increased by many hundreds of per cent. the safety of the public health.

There is scriptural authority for the statement that "bitter waters and sweet waters do not flow from the same fountain." The same truth applies to wells on the farm. The family that uses a well or spring subject to contamination is almost surely destined to taste the dregs of sorrow or suffering for having drunk its disease-laden output.

Sources of Contamination

Investigations made by the United States Department of Agriculture indicate that only very few farm wells can be classed as unqualifiedly safe and desirable. Forty per cent. of the samples of water sent to the Chemistry Department of the Manitoba Agricultural College for analysis were found to be unfit for domestic purposes. Convenience and first cost, and not safety, have been the deciding factors in many cases where the source of water supply is located close to barnyard, pigpens, privies, cess pools, etc. Too frequently the seepage from these and other sources, after joining the ground water, moves to wells, impairing the water supply by impurities that may be grossly dangerous.

Published by the Manitoba Department of Agriculture and Immigration

In fact, the desirability and importance of an ample supply of pure water on every farm can hardly be over-emphasized. Perhaps more than any other food element, it determines the healthy development of the family.

Water, as we see it every day, is a very simple looking substance; but in reality, it is never found pure. The moment water comes in contact with the atmosphere, it dissolves a certain amount of carbon dioxide, which increases its solvent powers. Because of its great solvent power, water dissolves some of the constituents of the soil or rocks over which it passes.

These dissolved substances frequently make water which we secure from our wells unfit for domestic use, although some of the impurities found actually make water more palatable for drinking. The most dangerous impurities found in water, however, are those which owe their origin to decaying plants and animals, seepage from barnyards, sewage, etc. The presence of organic matter in water is extremely dangerous, since it introduces many species of bacteria and provides food for their growth. From the specific germs that may be carried in sewage at any time, there may result typhoid fever, tuberculosis, cholera, dysentery, diarrhoea, or other dangerous ailment . It is not improbable that certain obscure maladies may be traced eventually to the poisonous effects of drainage from human waste. The causal organisms of these diseases are so small that they are invisible to the naked eye, and they may be unsuspectingly received into the human body. Sometimes the presence of organic matter discolors the water or imparts to it an undesirable odor, but this is not always the case, and often the clearest sparkling water may be dangerously polluted. For this reason, **the appearance of water cannot be relied upon as a test of its freedom from organic matter,** and a chemical examination should always be made.

Disinfection

For domestic purposes, small quantities of water may be purified by **boiling.** This kills the dangerous bacteria, drives off bad odors and renders the partially decayed organic matter inert. Water containing organic impurities may also be rendered palatable by the use of a **disinfectant,** the most suitable being hypochlorite solution. This solution may be prepared and applied as follows:

Hypochlorite Solution

(1) Dissolve 13 oz. of washing soda in 2 qts. of hot water, then add sufficient water to make a gallon.

(2) Mix one-half pound of Chloride of Lime (33% available Chlorine) with one pint of water and then add sufficient water to make a gallon.

(3) Mix these two solutions in a crock and allow the sediment to settle over night.

(4) Pour off the clear liquid and bottle carefully and keep in a cool, dark place.

For drinking purposes one ounce of this solution to five gallons of water should be used. This treatment gives the water an odor of Chlorine, but it soon passes off on standing.

The only satisfactory remedy, however, is to determine the source of the organic matter and protect the well from such contamination.

Mineral Matter

The inorganic impurities or those derived from the mineral constituents of the soil or rocks are seldom dangerous unless present in large quantities. Several samples of water analyzed by the Chemistry Department were found to contain an excessive amount of salts in solution, particularly Magnesium Sulphate (Epsom's Salts) and Sodium Sulphates (Glauber's Salts.) These salts in large quantities render the water unfit for domestic or live stock use, since they have a physiological action upon the system.

The chief objections to mineral or inorganic impurities are that the water is made "hard" by them and often unfit for cleansing, and cooking some kinds of vegetables. Hard waters are not suitable for many industrial purposes, since they deposit some of their dissolved salts in kettles, pipes and boilers, in which they are boiled, and the "furring" causes great waste of heat and shortens the life of the utensils. Hardness in water may be readily detected since it does not readily form a lather with soap, but produces a sticky, curdy substance which adheres to the hands or clothes.

Reducing Hardness of Water

The "hardness" in water may be somewhat remedied by various treatments, the particular treatment used depending on the nature of the hardness. The hardness in natural waters is of two kinds—namely temporary and permanent.

The **Temporary Hardness of Water** is due to the presence of bicarbonates of Calcium, Magnesium or Iron. By boiling the water, the carbon dioxide, which holds these salts in solution, is driven off; and they are deposited on the sides and bottom of the vessel, and the water is rendered "soft."

However, it frequently happens that after the preliminary boiling the water is still quite "hard," and this is known as **Permanent Hardness.** This kind of "hardness" is due principally to the presence of Chlorides and Sulphates of Calcium, Magnesium and Iron, and the only way to remove it is to treat the water with some kind of chemical, such as washing soda. The amount of washing soda necessary varies greatly and can be accurately determined only by a chemical analysis. For average waters, however, a dessertspoonful of washing soda to every gallon of water will remove the permanent hardness more or less completely. The sediment should be allowed to settle and the water strained before using.

Anyone desiring a chemical analysis of his water supply will be willingly aided in every way possible, through analysis, by advice and otherwise, by application to the Department of Chemistry of the Manitoba Agricultural College.

Sept 30

Procedure to Have Water Analyzed

Anyone desiring a water analysis should fill in the instruction form below and mail it to the Chemistry Department, Manitoba Agricultural College, Winnipeg, Man., sending the sample of water by express. Upon completion of the analysis, a report will be mailed to the applicant.

MANITOBA AGRICULTURAL COLLEGE

Instructions for taking and forwarding sample of water for analy

Amount—Not less than two quarts.

Receptacle—Glass or Stoneware. If corked, use new cork; if a sealer, use new rubber.

Collection—Scald out receptacle with boiling water. Rinse several times with water to be analyzed. If sample is from a pump, first pump out enough to empty the pump and so obtain a fresh supply from the well.

Forwarding—Express, prepaid, to Chemistry Department, Manitoba Agricultural College, Winnipeg.

Information required:—

(1) Reasons for having water analyzed.....

.....

(2) Source of Water—(Well, Spring, Creek) .....

.....

(3) Nature of Well—(dug, bored, drilled, casing).....

.....

(4) Depth .....

(5) Nature of Material passed through in sinking well.....

.....

(6) Distance from barnyard and privy.....

(7) Slope of ground to the well and barnyard and privy.
(State whether the higher or lower than the barnyard and privy).

.....

Section..... Township..... Range.....

REMARKS:—

NAME .....

ADDRESS .....