

**TILE DRAINAGE: AN
EXPLANATION OF HOW AND
WHY TILE WILL BENEFIT A LARGE
PERCENTAGE OF OUR LANDS
AND INCREASE OUR INCOMES**

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Tile Drainage: An Explanation of how and why Tile Will Benefit a Large percentage of our lands and increase our incomes by James A. King

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JAMES A. KING

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Tile Drainage

An explanation of how and why
tile will benefit a large per-
centage of our lands
and increase our
INCOMES

Together with instructions for the
proper installation of an
efficient tile drain-
age system.

BY JAMES A. KING

Practical Farmer, Specialist on Tile Drainage
for farms, formerly Professor in Extension
Department, Iowa State College, assistant
editor, "Farm Engineering" and managing
editor "The Farming Business."

Gift from the City of ... July 1913
TC 1073



James A. King

UNIV. OF
CALIFORNIA

A Statement by the Publishers

For several years we have realized the need for placing in the hands of land-owners a "Plain English" book on the subject of drainage—a book from which the technicalities of the usual text book would be eliminated.

We discovered Prof. Jas. A. King on the point of publishing the manuscript of this book. The first reading of the text revealed the fact that Prof. King's ideas and principles agreed with those we had held for years. We purchased the copyright rights to the manuscript and have published it in order to do our part in making known the great material benefits which the average farmer or land-owner may expect from properly tiling his farm.

Prof. King was born and raised on an Iowa farm. He spent two years in the Extension Department of the Iowa State College, at Ames. For four years he managed large farms in the wet areas of Iowa. For the past ten years he has been identified with drainage work and the Iowa State Drainage Association. He has been assistant editor of "Farm Engineering," and managing editor of the "Farming Business." At present he is managing his own farm in Mitchell County, Iowa, and writing for the leading farm papers of Iowa and Minnesota.

With such a wealth of practical experience in drainage and an unusual facility for telling others what he has personally experienced, no one is better qualified to state the real facts regarding drainage and to give reliable advice upon this important subject.

Prof. King's ideas upon the proper methods of drainage, its benefits and what is the proper tile, match up so perfectly with our own that we have taken the liberty of inserting a chapter at the end of this book to bring to your attention the merits of our product.

Mason City Brick & Tile Co.

By B. C. Keeler

*Mason City, Iowa
Sept. 16, 1918*

397212

Author's Introduction

Drainage is of two kinds. Sanitary drainage, or sewage disposal, is the drainage of surplus water and liquid wastes from cities and towns for sanitary reasons. Land drainage is the removal of surplus surface or soil water from land to make it available for farm uses.

Sanitary drainage or sewage disposal is as old as is the habit of human beings to live in settled communities or towns. The earliest known method of sanitary drainage was by means of open surface ditches. This method is still used in such backward portions of the world as is India and China, where house sewage may be seen being conducted thru the streets in open surface ditches.

The use of covered ditches, instead of open ditches, is in itself a very ancient practice. The first covered sewage ditches of any permanence were made by the use of flat stones to form a covered channel in the bottom of the ditch, then filling the rest of the ditch with dirt. The use of hard burned clay pipe, made in short lengths much as our sewer pipe and drain tile of today, is as old as the ancient art of pottery. Sewer pipe made of hard burned clay have been unearthed in the island of Crete; still whole and serviceable after being in the ground for nearly seven thousand years, ever since the year 5,000 B. C.

One seems to be justified in moralizing with the philosopher of old, "There is nothing new under the sun." For Cato, an ancient Roman author, in the year 200 B. C. discussed quite extensively the subject of farm drainage as practiced by the Roman farmers of his time. And centuries before that, the exact time of its beginning is unknown, the farmers of Egypt and of Babylonia drained their wet lands in order to make them yield crops of larger quantity and better quality.



*Hard Burned Clay Sewer Pipe laid in Island of Crete 5000 B. C. and still in perfect condition.
—Courtesy Clay Products Association*



Pallet
End view of Horse
Shoe Tile, the first drain
tile made.

So far as known, the first farm drainage was accomplished by means of open ditches. But even before the time of Christ, Roman farmers, and farmers of other countries bordering on the Mediterranean Sea, were using covered drainage ditches. These were made by digging the necessary ditches thru the wet areas of a farm, placing brush, sticks or stones in the bottom and then covering them with the soil. Thus it is seen that mere surface drainage of overflowed lands was soon followed by subsurface drainage which was designed to remove the surplus water from the soil itself.

These ancient farmers soon found that these subsurface ditches, which were filled with sticks, twigs or stones and covered over with dirt so as not to interfere with working the fields, filled or clogged up so they did not work so well. This led to building a channel in the bottom of the ditch with flat stones of more or less regularity in size and shape, which did not clog up so readily because there was a continuous open channel thru which the water could flow unimpeded. The chief fault to be found with this type of ditch was that too large openings existed between the stones because of unavoidable irregularities in their size and shape. So that these also would fill up in time, tho not so quickly by years as did those more ancient types of covered ditches.

Even the use of clay tile for land drainage is not a new thing, not by several hundred years. The farmers of France are given the credit of being the first to use clay tile for the construction of farm drainage ditches. They used a modified form of the medieval clay roofing tile for this purpose. A cross section or end view of one of these tile resembled a horse shoe, and they are known as "horse shoe tile" because of this resemblance. A flat piece of burned clay the length of a tile, called a "pallet," was laid in the bottom of the ditch and a tile was then laid on top of it with its open side down. Thus the pallet closed the open side of the horse shoe shaped tile and so made a closed tube for the water to flow thru. The exact date when these clay tile were first used for land drainage in France is not known, but is supposed to have been not later than the fourteenth or the fifteenth century.

The use of clay tile for farm drainage became a lost art in France, forgotten and unknown to her farmers for many generations. In the seventeenth or the eighteenth century it was again developed in England. The same horse shoe shaped tile, modified from the shape of the clay roofing tile, was also the first form used in England. These tile were first made by hand, and consequently were very costly. The first machine for making drain tile was developed in England in 1841. This greatly reduced the cost of drain tile, and correspondingly increased their use.

John Johnston, of near Geneva, New York, was the first man to tile land in America. At great expense he imported hand made, horse shoe shaped, burned clay tile from his native Scotland in 1835. His neighbors came from many miles around to view this "something new

under the sun" and to tell him that they would poison and ruin his land. But when the wheat crops he reaped from his cold clay soil increased from ten or fifteen bushels an acre to forty and even fifty bushels an acre some of them were convinced that maybe he was not a fool after all. Some very few even following his example. The result was that in 1848 one of those English machines for making tile was imported into this country. By 1851 Johnston had sixteen miles of tile ditches on his farm. These tile which were laid seventy to eighty years ago are still working successfully and the old Johnston homestead is one of the finest farms in that part of New York, one of the historic places of that state.

So you see that farm drainage, and even clay tile drainage, is not something new and untried. Land drainage is as old as the written history of the world. The use of clay tile for sanitary drainage or sewage disposal is also as old as is the written history of the world. And the use of clay tile for farm drainage is several centuries old. Until very recent years tile drainage has been confined to "wet" lands. Its purpose has been only to remove surplus water from land too wet for the production of tilled crops. But in recent years it has been realized that tile will very materially benefit soil which is not ordinarily considered to be "wet." More progressive farmers are now tiling high ground which the ordinary man does not consider needs tiling, and they are finding that the investment so made is returning big dividends. Soils which are "tight," but not "wet;" soils which are "cold," but not "wet" respond very markedly to tile drainage. They loosen up and become mellow to the depth of the tile ditches, thus permitting deeper penetration by the plant roots and a more free circulation of air thru the soil; they become warm and "quick;" all of these increase greatly the rapidity of crop growth and the quantity and quality of yields.

There can be no mystery, no sorcery or witchery, about anything which has been practiced so long as has farm drainage. Of course, all that can be known about it is not yet known. But all that is needed to be known about it to convince any reasonable man that it is a good business investment to tile his land is already known. The effect on his crops, and on his net income, is well known, and is proven by centuries of actual practice. Surely, no sane man needs any more argument than that to convince him.

This little book has been written for the purpose of presenting to the farmers of this country in a very brief and simple way the argument why they cannot afford not to tile their farms. Much of it has been written to explain in that same simple manner the processes by which tile drainage increases the quantity and the quality of the crops which are grown on the land. Still more of it has been written so that my brother farmers may know the fundamental principles involved in planning and in constructing a good and efficient system of tile ditches to meet the conditions existing on their farms.

It is written for farmers who own land which is not paying its owners as large profits as it should pay them, because it is not producing crops of as large yields or as high quality as it is able to, or should, produce. It is written by a farmer who has worked wet, un-

tiled land; who has tiled it and then worked it after the tile have done their duty. It is written by a farmer who has made an extensive study of the theory, and an extensive observation of the practice and the results, of land drainage. It is not written to make money for the author, for only those who write interesting fiction make money out of books. It is written to make more money for those who read it and follow the advice given in it. It is written to do the author's best to serve his nation in this crisis by helping to increase our food supply, when he is unable to serve by wearing the khaki as he once wore it.

The author realizes that the subject of "What Tile To Use" is one which has been avoided religiously by other authors writing on the subject of tile drainage. But my own experience taught me the importance of the subject of what tile to use, and the difficulty I had in answering the question for myself showed me how difficult it is for any one to get reliable information on it. The quality of the tile buried in the ground will make or ruin a drainage system, it will make or break the man who makes the investment. He should be, and is, vitally interested in that part of the subject of tiling; fully as much as in any other part of it. It is a question which the average man is unable to answer for himself, and he finds it very difficult to find any unbiased advice or opinion on the subject. The Professors of our colleges and experiment stations always avoid or side step the question for fear of possible criticism of their motives. Realizing the importance of the question, I have discussed it frankly and fearlessly in the last chapter of this book, under the title of "What Tile To Use." I am simply a farmer, with no "professional dignity" to preserve; I am writing this book for the benefit of farmers; I feel that this book would be incomplete and unsatisfying to its readers without a discussion of this subject. So I have discussed it and expressed my views frankly and without any apology other than this explanation of my reasons for doing so.

JAMES A. KING.
Otranto Station, Iowa
1918.