

tain irrigated lands will always exist, so that every rancher should be familiar with methods of drainage as well as irrigation.

The drainage of lands under rainfall is not a new subject, but is always an important one in the development of farms, either old or new. New men are constantly entering the agricultural field. Men more or less experienced in agriculture in one locality go to another and confront new difficulties in draining their lands, so that new phases of the subject appear at points where least expected and demand the prompt attention of the land owners. The treatment of some large drainage projects in Iowa is discussed in the light of existing conditions. Preliminary work in the development of these large fields is not always done with sufficient thoroughness. The following suggestions to drainage engineers indicate their responsibility in the matter:

Preliminary surveys should be complete and full data should be gathered and placed on the maps. Every owner of land within a proposed district is concerned and his interests should be looked after minutely in the development of a drainage plan. A series of bench marks should be established in each district, so that when repairs on ditches are required the original grade line may be reproduced and the ditches cleaned out to the depth originally dug. Amended maps and profiles of the work as finally completed should be filed for future reference. The value of these will be appreciated when it is remembered that practically every owner of land who pays an assessment toward the cost of the work has acquired certain drainage rights which will pass to consecutive owners. The improvements are permanent and are of public as well as private value.

The report describes the examination of particular cases which represent a class, for the purpose of sug-

gesting methods of handling problems in other localities where similar conditions and difficulties exist. It is valuable along these lines and especially suggestive to those who have the direction of preliminary drainage work of a comprehensive character. A few pertinent conclusions are here noted as indicating the general scope of the work accomplished:

While the necessity for the drainage of irrigated lands will doubtless be less obvious when water is more economically used and supply canals are improved in such a way as to diminish leakage, a considerable loss of water from both causes will always be unavoidable, so that drainage will always be an essential part of the improvement of irrigated land in some localities.

The complete drainage of farm lands in humid belts can be effected only by the enlargement and general improvement of the minor arterial streams which receive the drainage and by the excavation of new ditches where natural streams are insufficient. As the low lands near the streams are transformed into farms, they must be protected from the overflow which periodically endangers them. This must be considered in connection with the more complete improvement of higher lands, the drainage of which contributes to the supply of main streams. So many phases of the drainage problem are involved that the investigation resolves itself into an examination of individual cases in which local as well as general difficulties must be considered.

The ultimate removal of the surplus soil water from the fields is the end sought. At the same time the proper conservation and distribution of the water should be considered more fully in the improvement of farm lands than it has been in the past. The rate of removal of water from soils should be as slow as is consistent with efficient drainage.

The drainage legislation enacted in 1903 shows the importance with which the subject is regarded in States having inadequate drainage laws. New laws were enacted in Arkansas, California, Idaho and Nebraska, and amendments to existing drainage laws were passed in ten other States.

It should be added that the experiment with hillside underdrainage in Georgia for the purpose of preventing the erosion of land, so harmful in the South, promises good results and will be watched with much interest by cultivators of hill land. Such an experiment requires several seasons to fully demonstrate the efficiency of the plan adopted. Future reports will doubtless give results, together with cost and the best methods to be employed in work of that character.

The report contains 62 pages, exclusive of 18 diagrams and maps, relating to a variety of drainage problems the solution of which is of importance to the further development and improvement of the farming interests in many parts of the country. This report can be obtained free by applying to A. C. True, Director U. S. Experiment Stations, Washington, D. C.

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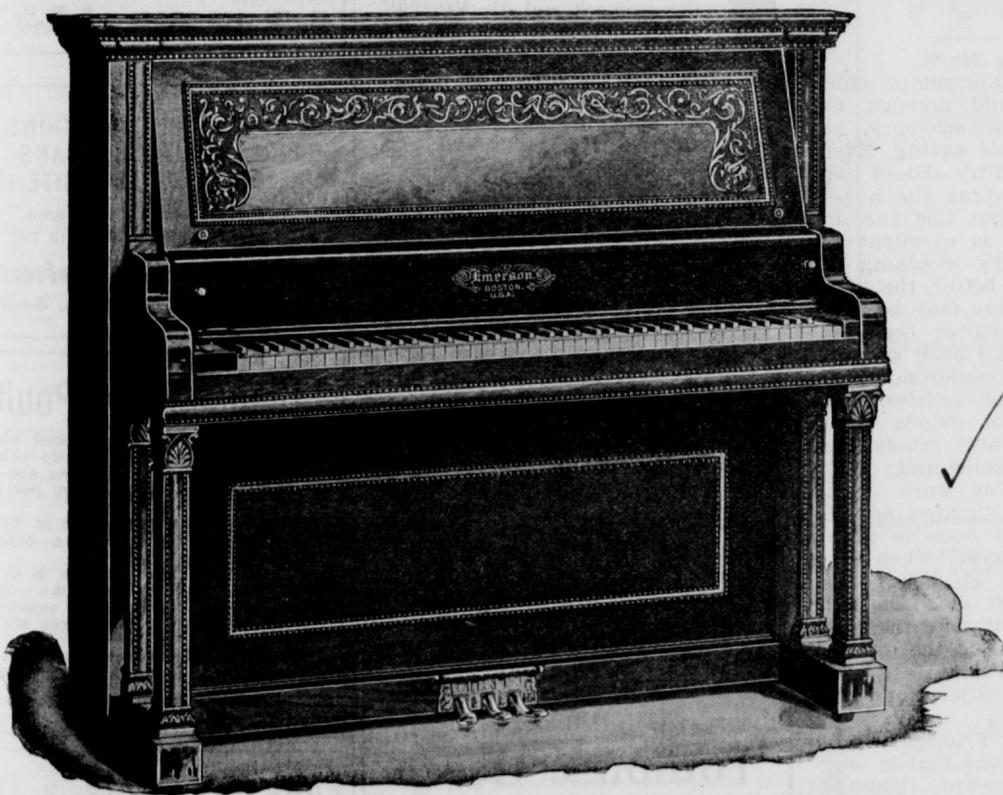
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