Speech by G. G. Stamm, Chief, Division of Irrigation and Land Use, Bureau of Reclamation, at the December 3, 1962 Evening Meeting of the Second Irrigation Operators' Workshop in Denver, Colorado

**Improvement of Irrigation Systems**

It gives me real pleasure to be here this evening and to meet with, what I consider to be, the Bureau of Reclamation's real public relations staff—you, gentlemen—the irrigation operators. We of the Washington staff must reluctantly admit that you are the ones that really "run" the Bureau projects, and represent the real grass-roots contact in your daily assignments.

Let me again welcome you to our 1962 Irrigation Operators' Workshop. We're sure by this time that you can appreciate why we chose that nomenclature. Tonight we would like to discuss "Improvement of Irrigation Systems." Irrigation is a dynamic business. It is constantly changing as new materials, new equipment, and better methods are developed. In this day and age when new equipment, products, and techniques are brought to our attention every day it is only natural that we should take advantage of these developments to improve the operation and maintenance of our irrigation systems.

Let us look at a few examples of these new developments and how their application can improve irrigation systems. First, let us consider the field of Protective Coatings, in other words—paints. The years since World War II have seen spectacular advances in the development of new paint materials and in the
improvement of many of the older materials. We have experimental installations of three of these newer paints on radial check gates in the Wellton Canal on the Gila Project. These coatings were applied ten years ago and have been exposed to the relatively corrosive Colorado River water continuously since that time. Their condition is still nearly perfect.

Another field in which recent developments have led to system improvements is that of water measuring devices. The development of the constant Head Orifice turnout, the adaption of the flow-meter to irrigation use and the development of other measuring devices have resulted in the improvement of accuracy in measurements and in the saving of time necessary to attain such accuracy. Where such measurements are needed the use of radio, telemetering and other electronic devices now make it possible for that type of data to automatically be recorded at one centralized project location at less cost than a few such measurements by obsolete methods.

Bureau of Reclamation research and development work in low-cost canal linings during the past 16 years have contributed to total savings to western water users of more than $20 million in the construction of irrigation canals.

These impervious, lower-cost canal linings not only have been built at a greatly reduced cost, but also have resulted in a tremendous saving of water in arid parts of the West.
The four most widely accepted lower-cost linings—as compared with more expensive linings used prior to the start of the Lower Cost Canal Lining Program—are unreinforced portland cement concrete, buried asphalt membrane, heavily-compacted earth, and pneumatically-applied cement mortar.

In addition to the four major linings being installed under the Lower Cost Canal Lining Program, other materials such as the water-borne chemical sealants are being used at a cost of one dollar per square yard or less. Some of these are experimental and they cannot yet be recommended for general construction until they are more fully evaluated.

Much progress has been made toward devising practical methods of controlling canal seepage. We know that much of this accomplishment is due to the excellent cooperation we have received from manufacturers of lining products, state colleges, the Department of Agriculture, and irrigation districts. The final test of a canal lining method is its application in the field, and many of you have helped us make these tests in problem areas in your canal systems. As we develop newer and better ways of controlling canal seepage we will be requesting more of your assistance.

While we are doing our best to reduce the initial cost of canal lining, this figure alone is not the whole story. Its effectiveness, life expectancy, and effect on annual O&M are what really count! Great strides have been made also in solving more economically one of your major operation problems—weed control—both ditchbank and water weeds.
The methods used today are a far cry from the hand cutting and other slow and laborious means used only a few years ago. Many new herbicides have been formulated and mechanical control has been greatly improved through the development of modern equipment. You irrigation district operators are responsible for many of the equipment improvements through ideas developed in your own shops.

In many instances chemical weed control is replacing all other methods as more specific and selective herbicides are developed. Ditchbank weeds are treated with modern ground rig sprayers with adjustable booms or sprayed from airplanes or helicopters. Combinations of chemicals can be used that control either grass type weeds, broad leaved weeds, or both.

From the results of tests made right here in the Bureau's laboratory, we are now enabled to control aquatic weeds which, as you know, can so seriously reduce the carrying capacity of a channel. Aromatic solvents do an excellent job in many situations. Chemical control of cattails also is now quite successful.

I'm happy to say that there is promise of even better herbicides which will give us more economical and more permanent weed control. Modern methods of weed control have not only solved many operation problems and cut the cost of maintenance due to weed growths but also have greatly reduced water losses.

Our studies of grass protected ditchbanks have resulted in a wholesale seeding of canals rights-of-way on many projects. A good
grass sod has been found to prevent erosion, reduce weed growths, and in general save the irrigation districts considered in O&M costs. You'll be hearing much more on this subject of weeds during the week.

Industrial improvements in the production of precast concrete pipe and the development of equipment and methods for casting concrete pipe in place have led to the design and construction of more closed pipe distribution systems and to the enclosing of many miles of open ditch in concrete pipe. While the desirability of closed pipe distribution systems is generally accepted by irrigation operators, I wonder if we really appreciate all the advantages that such facilities offer. Let me enumerate a few of these advantages.

1. Growth of water weeds and land weeds are eliminated, along with a popular haven for gophers.
2. The cleaning of silt from laterals is eliminated.
3. Seepage and evaporation losses are practically eliminated.
4. Right of way requirements are greatly reduced.
5. Farming operations may be carried on directly over the pipe so there are no problems of severance or of splitting farm units by the lateral.
6. Bridge maintenance is eliminated.
7. The length of a lateral may often be shortened.
8. It is not necessary to maintain access roads along all laterals.
Naturally, these advantages result in substantial reduction in operation and maintenance expenditures. One superintendent of a small California district expects to cut his O&M costs in half as a result of installing concrete pipe in all of his laterals.

Such major system modifications, while they are economically feasible, do entail large expenditures. There is, however, a great deal we can do towards improving our irrigation systems without resorting to costly changes to take advantage of new developments.

Suppose you have a system 30, 40, or more years old. If maintenance has been neglected in years past, major replacements may be necessary. The Bureau has been trying, through the Review of Maintenance Program, for the past 15 years, more or less, to avoid the need for such emergency major replacements. This program provides for the regularly scheduled examination of all irrigation facilities with the objective of discovering the need for repairs before deterioration becomes serious and costly to correct.

I am sure all of you have participated in the Review of Maintenance program which is pursued at several levels, specifically at the project, regional, and Denver Office levels. We expect the projects to know at all times the condition of the works under their jurisdiction. This may require examination of all of their works annually or possibly oftener. Then every 2 years, or in some cases every 3 years, engineers from the regional office visit your projects and go over the works. This is your opportunity to get "on the spot" assistance of the Bureau of any O&M problems which you wish to bring
up. The Bureau men are also interested in hearing from you about how the systems are performing, particularly as to adequacy of designs. Every 6 years the major irrigation structures are examined by engineers from the office of the Assistant Commissioner and Chief Engineer in Denver in company with engineers from the regional and projects offices. The Denver engineers also are anxious to learn from you whether or not the works they have designed are performing properly. If they are, it means such facilities can be provided on other jobs with confidence. If they are not, the designs must be improved before being used again. This is all part of our effort to build improved irrigation systems.

We believe that the free exchange of information and opinions between you gentlemen and our engineers is the greatest value to us both. Through such talks we may be able to help you with your problems and any information you furnish concerning the performance of the irrigation works is highly valued by us. We like to feel that you district men and we Bureau men are on the same team striving to provide our water users with the water service they need at the lowest possible cost.

While the cooperative exchange of information is an important part of the Review of Maintenance Program, the primary objective of this program is to determine the physical condition of the irrigation works. In the year 1961 there were included under this program

154 major storage dams

66 major diversion dams

48 powerplant structures
35 major pumping plants
14 special features such as major desilting works, aqueducts, siphons, tunnels, etc.
176 distribution and drainage systems
The program is expending every year as new works are constructed and placed in O&M status.

As our examiners go over the various facilities, they make recommendations concerning any repair work they believe is needed. It is the aim of our examining teams to reach agreement with the project officials concerning the need for the work recommended and they are glad to offer advice as to the best methods to use in accomplishing the needed repairs. Also, they categorize their recommendations in accordance with the urgency with which the repairs should be made. Any repairs needed to insure the immediate safety of a structure are placed in Category 1 for prompt completion. Repairs to be carried out as part of the normal maintenance program are placed in Category 2 and repairs or improvements which are desirable, but not urgent, are placed in Category 3.

A record is kept of all recommendations made and the regions report to Denver annually concerning the status of these recommendations, that is, whether or not they have been completed. A full report of examinations made and the status of recommendations is prepared annually by Denver for the Commissioner.

During the past 15 years, since the initiation of the Review of Maintenance Program, it has been quite gratifying to note how the
general quality of maintenance of irrigation works has improved.

While the Review of Maintenance Program may have been instrumental in bringing to our attention the need for repairs, the credit for actually making the repairs go to you people who operate and maintain the systems. It is only through your efforts in the improvement of our irrigation systems that the best interests of the water users and the Government can be protected!