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Department of the Interior
Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO. 41

July, August and September 1962

CONTENTS

Cover Sheet. Storm water reached this structure one night prior to priming and puddling. Settlement of the banks had occurred 12 hours later, followed by water washing under the upstream cutoff. The left bank was washed out and water washed down under the incline emerging at the opposite side of the bottom as discussed and shown in the article beginning on page 1. Photo No. PX-D-33699.

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INTRODUCTION

The Operation and Maintenance Equipment and Procedures release, published quarterly, is circulated for the benefit of irrigation project operation and maintenance people. Its principal purpose is to serve as a medium for exchanging operation and maintenance information. It is hoped that the labor-saving devices or less costly equipment developed by the resourceful water users will be a step toward commercial development of equipment for use on irrigation projects in a continued effort to reduce costs and increase operating efficiency.

This issue, Release No. 41, includes an article on the priming and puddling of new canals and laterals, presenting some factors to be considered and some general guides, page 1; an article on the use of low pressure gas in lieu of gasoline as fuel for operation of remote power units on remotely located equipment on the Salt River Valley Project in Arizona is described beginning on page 18; and several suggestions of project operation and maintenance personnel for improved devices and practices.

To assure proper recognition of those individuals whose suggestions are published in the bulletins, the suggestion number as well as the person's name is given. All Bureau offices are reminded to notify their Suggestions Awards Committee when a suggestion is adopted.

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Division of Irrigation Operations
Office of Assistant Commissioner and Chief Engineer
Denver, Colorado

PRIMING AND PUDDLING CANALS AND LATERALS

The problems related to the priming and puddling of new canals and laterals must receive careful attention if serious damage to new systems is to be avoided. To engender a keener appreciation by those in charge of the need for particular care in carrying out the priming and puddling operation, some of the inherent dangers are pointed out and a few guidelines are given in this article.

The article has been prepared by the Division of Irrigation Operations with the assistance of and in collaboration with the Earth Laboratory Branch of the Division of Engineering Laboratories and the Canals Branch of the Division of Design, Office of Assistant Commissioner and Chief Engineer; irrigation operations personnel of Regions 1 and 7 of the Bureau of Reclamation; and operation and maintenance personnel of the Columbia Basin Project.

Some Factors to be Considered

The job of priming and puddling a new system may proceed as a fairly routine operation or it may develop into a very costly troublesome procedure, depending upon a number of factors, such as:

1. Availability of experienced personnel who are familiar with priming and puddling methods.

2. Types of soils and geologic and topographic details of the location.

3. The condition of the structure backfill at the time of priming.

4. Design characteristics of the structure in the system.

Experienced Personnel

There is no good substitute for experienced personnel when it comes to accomplishing a job as full of uncertainties as is priming and puddling an irrigation system. The best assurance available to a construction engineer, or other official in charge, that his priming and puddling operation will be carried out with a minimum of difficulty, is the placing of an experienced irrigation system operator in charge of this work. This man, of course, must have had actual experience under varying conditions so that he will be prepared to meet the problems as they develop. He will know what materials, equipment, and help he needs before he turns the water into the system and he will know what procedures to follow to anticipate and avoid piping and breaks in the banks. He will know how to recognize the first indications of weak areas or incipient breaks and he will know how to strengthen such places. He will also know how large a priming head of water he should use, depending upon the conditions prevailing, and he will know what to do in case the ditch breaks in spite of his precautions.

Consider also that this experienced operator can be used in a number of other ways on the construction engineer's staff and that he will be available to supervise the operation and maintenance of the completed works when service to the lands is established. This man should be on the job at least a year before it is time to start priming the system so that he may be entirely familiar with local conditions.

Soils, Geology and Topography

The soils, the geology and the topography through which the system is located will have a great deal to do with the difficulties experienced in priming and puddling a system. Light sandy or silty soils can become very unstable when water is first introduced into the channels and the banks become saturated. Serious subsidence of the area adjacent to a large lateral is shown in Photograph No. 1. This is more or less typical of what may be expected in light uncompacted soils.

Photo No. 1

Settlement cracks that develop upstream from a structure such as the baffled apron drop, Photograph No. 2, can create a serious problem. In this instance the subgrade material was sand and silt with an underlying gravel strata. Storm water in the channel caused bank settlement and subgrade subsidence with serious damage resulting before the channel had been primed. The photograph on the cover page, and Photograph No. 3 are other views of this same structure. Water washing under the upstream cutoff of the structure, as shown on the front cover, passed along the left side of the inclined section of the drop and emerged at the lower right corner, Photograph No. 3. Only quick action by project forces saved the structure from destruction.

Photo No. 2

Photo No. 3

Photo No. 4

The same type of problem occurred at the smaller baffled apron drop shown in Photograph No. 4. Settlement of the foundation material upon becoming wet permitted water to pass under the upstream cutoff, wash a pathway under the structure, and emerge on the left side as shown. A somewhat similar problem in silty loessal soils is shown in Photograph No. 5, where failure of a grade control structure in this type of soil was attributed to post construction consolidation and subsidence.

Photo No. 5

In some areas also pervious or open gravel strata underlying canals have provided percolation paths for seeping water to follow, resulting ultimately in piping and serious washouts. In many cases the existence of these pervious strata remain undiscovered until the break has occurred, or, in some more fortunate cases, springs along the lower bank are discovered in time to prevent serious damage.

Sinkholes in gravels in the bottom of a lateral are shown in Photograph No. 6. Water passing into the underlying gravel strata through the sinkholes reappeared outside the channel bank, but continued for only a relatively short time.

Problems have also been encountered where siltstone underlies the canal bottom. Photograph No. 7 shows a large crevice in siltstone that had been filled with permeable material. Seepage from the canal into the crevices caused piping that resulted in washouts and canal bank failures.

Photo No. 6

Photo No. 7

Canals located on steep hillsides have always been sources of troubles for operators, especially in the early stages of operating or priming the system. A washout occurring in such a location is likely to destroy the entire ditch section before the water can be shut off. Repair of such washouts usually is expensive, involving the movement of rather large quantities of earth.

In case a leak or spring develops through the lower canal bank and for one reason or another it is not stopped by repairing immediately, daily measurement of the flow of the leak should be made and reported by the patrolman. This assures that he makes a special inspection of the leak so that any change in quantity of flow is immediately noted and any cloudiness of the water, indicating active erosion is taking place, is obvious.

Structure Backfill

The materials selected for backfilling around structures and the care exercised in compacting these materials can have a lot of influence on whether or not trouble is experienced in priming. The material should be stable, impervious and nonshrinking so that it will be fully effective when the time comes, possibly several months after the backfill is placed, to run the first water through the system. If the backfill has dried out and shrunk during the interim, piping channels are likely to develop around the structure unless corrective measures are taken.

The use of fairly well-graded sand-gravel material is favored by many of our project operators for the backfilling of structures which have been washed out, because the coarse particles lend stability. Photograph No. 8 illustrates such a washout on the right side of a drop structure. It is being repaired by backfilling with a silty and sandy gravel. This particular structure had been in operation many years prior to the failure due to piping under a cutoff wall and is typical of such failures.

If the canal water contains reasonable amounts of colloids and silts, any perviousness of the coarse backfill material is soon corrected by the trapping of the suspended materials. Where the canal water is clean, the introduction of silt or clay above the structure, or the mixing of clay with the backfill, will usually give good results.

Photo No. 8

In compacting backfill, care must be exercised to obtain good density throughout the backfill and through the plane of contact with the adjacent or underlying undisturbed natural material. Lack of density can result in the development of weak areas which invite piping around the structure or between the backfill and the adjacent natural soil. Where the compacted backfill may have shrunk away from the structure, a lot of good can be accomplished by spading and working the backfill against the structure as the priming water is checked up. The addition of silt and clay soils at these points is often necessary.

Because of uncertainties in evaluating the geological conditions and the performance of surrounding soils, inadequate resistance to percolation may exist at structures and areas of weakness may sometimes develop. This is particularly true in fine sandy and silty soils and soils which subside appreciably upon wetting. The damage to an automatic wasteway structure founded on loessal soil, Photograph No. 9, occurred about 10 weeks after water first reached the

Photo No. 9

Photo No. 10

structure and followed what would normally be considered to be an adequate priming procedure. The washed-out structure illustrates the hazards that must be expected when priming a new system.

Failure of a grade control structure in similar loessal soils attributed to post construction consolidation and subsidence has been previously shown in Photograph No. 5. The failure of another grade control structure is shown in Photograph No. 10. This failure was also attributed to settling and subsidence. The cutoffs alongside the structure are clearly evident and the path of the water can clearly be seen to have washed out all material along the sides of the main structure.

It is often desirable to prewet natural soils of this type during construction. It also is possible in this type of soil for settlement of the foundation to occur several months after the initial priming operation is completed. Operators are warned, therefore, against becoming complacent about their stabilization problems where loessal-type soils are concerned.

Structure Design

A favorite procedure among operation and maintenance men in the repair of washed-out structures is to extend the cutoff walls deeper into the banks and into the canal bottom. This is reasonable inasmuch as many such failures are caused by water going around cutoff walls. A failure of this type has been shown in Photographs No. 8 and 10. In some cases it may be desirable to place canal lining adjacent to structures at siphons where steep slopes exist. The percolation of water along a structure wall or floor may proceed very slowly or in the case of shrunken backfill, it can travel very rapidly. This is a factor which requires very close watching if serious troubles are to be avoided.

Another procedure employed by operation and maintenance people in stopping incipient washouts, or washouts in their earlier stages, is the introduction of bulky materials, such as hay or straw, along with earth and gravel fill into a piping hole. This would be a temporary measure to minimize damage as the canal was being drained to make permanent repairs.

General Guides

While we can venture to give some general suggestions to be followed in priming and puddling a new system, this operation needs to be governed very closely by local conditions which, also, emphasizes the need for an experienced man of the job. For average conditions, however, we offer the following guides:

1. Small head of water.--Use relatively small heads of water for initial priming, usually less than 10 percent of the designed capacity, depending upon the canal size. Consideration must also be given to the permeability of the canal materials since larger heads of water may be required to make any progress in large channels through very pervious soils. It has been found desirable on some systems to run the initial head of water through to the end of the channel, flushing it out.

2. Increase head by checking.--When this small flow has gotten through the reach being primed, increase the depth slowly by checking, beginning at the lower end and working back upstream. This plan has certain advantages. In the control of the water, if washouts or leaks develop, the initial bottom coverage will help locate any weak points or incipient break areas. Also, with checking starting at the lower end, it is possible to use the upstream areas for storage of transit water in the event troubles develop in the area where checking is occurring. Similarly as checking proceeds upstream, the downstream areas have been tested to some extent and release of water in the event of upstream trouble is less hazardous.

3. Constant patrol.--The closest watch must be kept on earth embankments and sections and especially on all structures to prevent piping or washouts. Constant patrolling of the canal or lateral is a must. Watch for whirlpools, they will likely be very small ones, or other indications that the canal water is escaping into the subgrade or around a structure. The importance of reliable and rapid

communications between the patrolman and his supervisor is emphasized. The permanent communication system installed for operation of the project could be utilized.

4. Priming by stage checking. --Under some conditions it may be desirable to prime the canal by stages checking the water up only to one-third or one-half of normal depth in the first stage. After holding long enough to wet the banks thoroughly the water should be dropped slowly and the banks permitted to stabilize for several days before the next stage of priming when the depth of water might be slowly increased to two-thirds of normal or to full depth. It is quite important that large sudden changes in water level, either up or down, be avoided.

5. Fall priming. --On some projects it has been found helpful, when construction is completed too late in the fall to permit a normal priming and puddling program, to run a small stream of water into the new canal late in the fall and, without draining, permit the water to seep away during the winter. The normal priming and puddling of the canal in the spring should not be initiated until all frost has left the banks.

6. Post-priming examination. --After emptying the canal or lateral following priming, the wetted perimeter of the channel, and areas adjacent to upstream ends of structures, should be closely examined for evidence of sinkholes or serious settlement. Sinkholes in the side of the canal such as those shown in Photograph No. 11, if left unrepaired, would in all probability eventually result in failure of the canal bank.

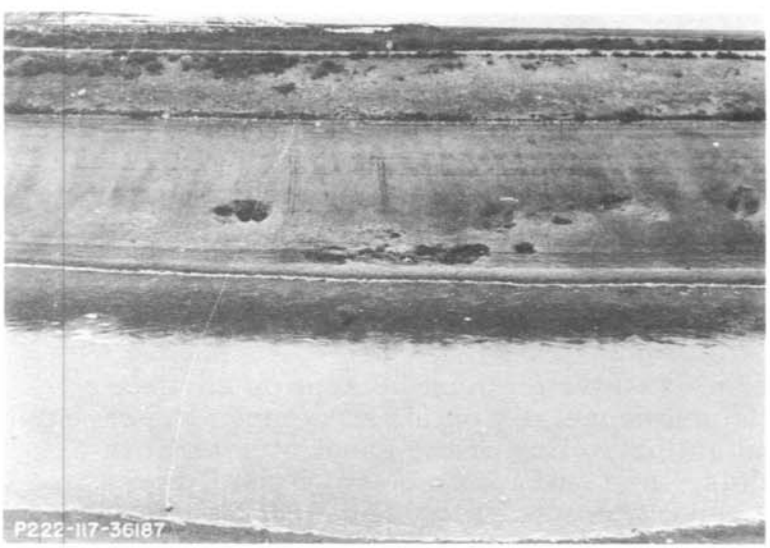


Photo No. 11

Sinkholes should be dug out and enlarged to a depth that will permit backfilling with sufficient material to create an impermeable and lasting bridge over the underlying voids. This often necessitates the placing of coarse gravel in the bottom of the excavation, followed by finer gravel and sand covered by a heavy layer of compacted stable impervious material of sufficient depth to prevent piping and subsequent recurrence of the sinkhole. Care should be exercised to repair an area large enough to avoid the development of new holes around the periphery of the repaired area. Any settled areas should also be brought back to grade before water is reintroduced into the channel.

The repair of sinkholes or piping holes around structures has been accomplished on some projects by puddling methods using a vibrator to work the mud down into the hole. One thing to bear in mind in using the puddling method is that the puddled backfill does not become stable until the excess water has drained away through the foundation material. For that reason it may be undesirable to puddle in locations where the foundation material is very slow draining or impervious. By the same token the backfill material used in puddling should be semi-pervious. Thus silty sands, and low plasticity silts are good for this purpose.

Photo No. 12

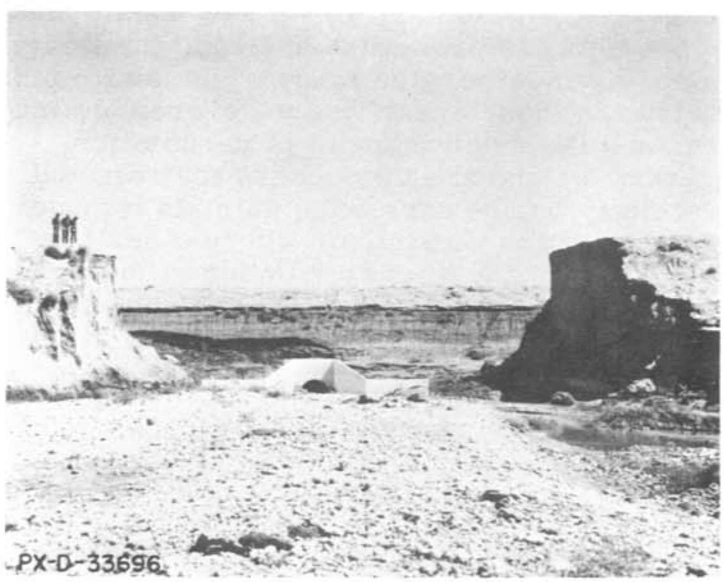


Photo No. 13

Correct procedures for puddling are described in the Earth Manual, 1960, page 302. Figure 12 shows a typical puddling operation around a turnout and weir box structure on a lateral. The occurrence of the break shown in a large canal, Photograph No. 13, at a culvert leads one to suspect that piping along the structure may have had something to do with the failure. Careful puddling and care in placing the backfill is important in such locations.

7. Lateral priming.--The priming of laterals is basically not much different from methods used to prime canals. There are, however, generally more structures on the laterals and the banks are lighter. On the other hand, water depths in the canals are greater and so exert more pressure on any existing weak spots.

8. Utilize daylight hours to advantage.--While canals and laterals being primed must be patrolled day and night, by proper planning the most hazardous operations such as checking up and puddling of structures may be performed during daylight hours.

9. Announcing availability of water.--It is quite important that all systems be thoroughly primed before any attempt is made to use them to maintain dependable service to irrigated lands. This will require careful planning in the announcement of the date of availability of irrigation water in relation to the time required to "Prime and Puddle" after construction is completed. Sometimes the pressure from water users for irrigation water prevents proper priming prior to heavy demands for use. If a break occurs during the priming stage the expense of making repairs is regretted, but if there are valuable crops depending upon irrigation water from the system, a break and the resulting crop loss could be disastrous.

Seasonal Filling of a Canal System

While the above discourse is concerned primarily with new canals and laterals, on many operating projects the procedure of filling the irrigation system with water each spring incorporates many of the above principles. This is particularly true in those areas where severe cold may cause movement of structures and the establishment of percolation paths around the structures, where expansive clay banks may dry out and crack deeply during the winter, where burrowing animals may perforate the banks during the nonirrigation season, or where other hazards may develop while water is out of the ditches. Under such conditions the filling of the systems at the beginning of the irrigation season must be attended by reasonable precautions and watchfulness to avoid costly ditch breaks.

* * * * *

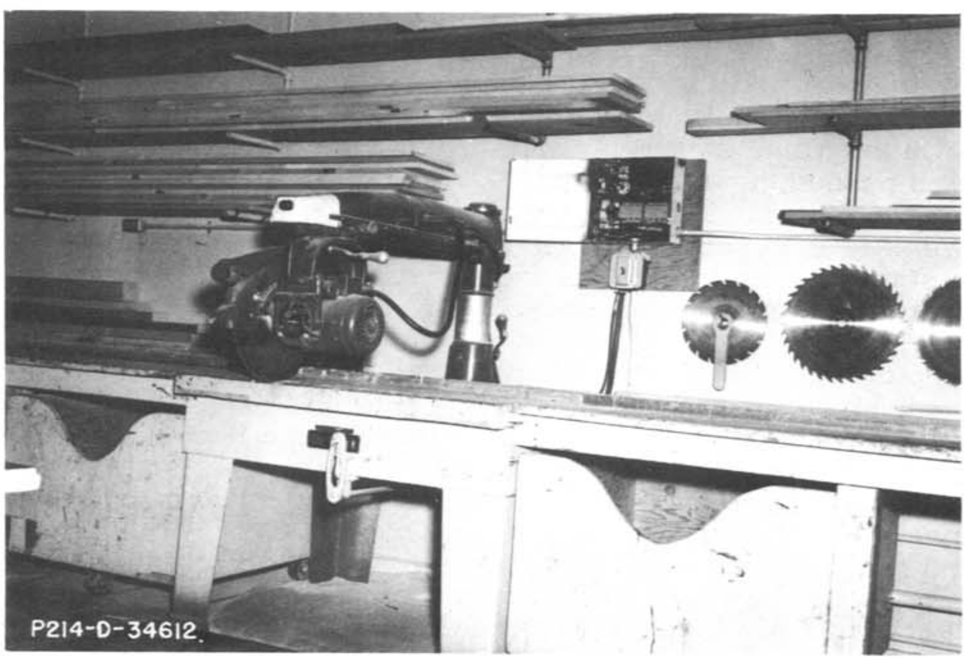
ELECTRODYNAMIC BRAKE ON POWERSAW
(Suggestion R2-61-56)

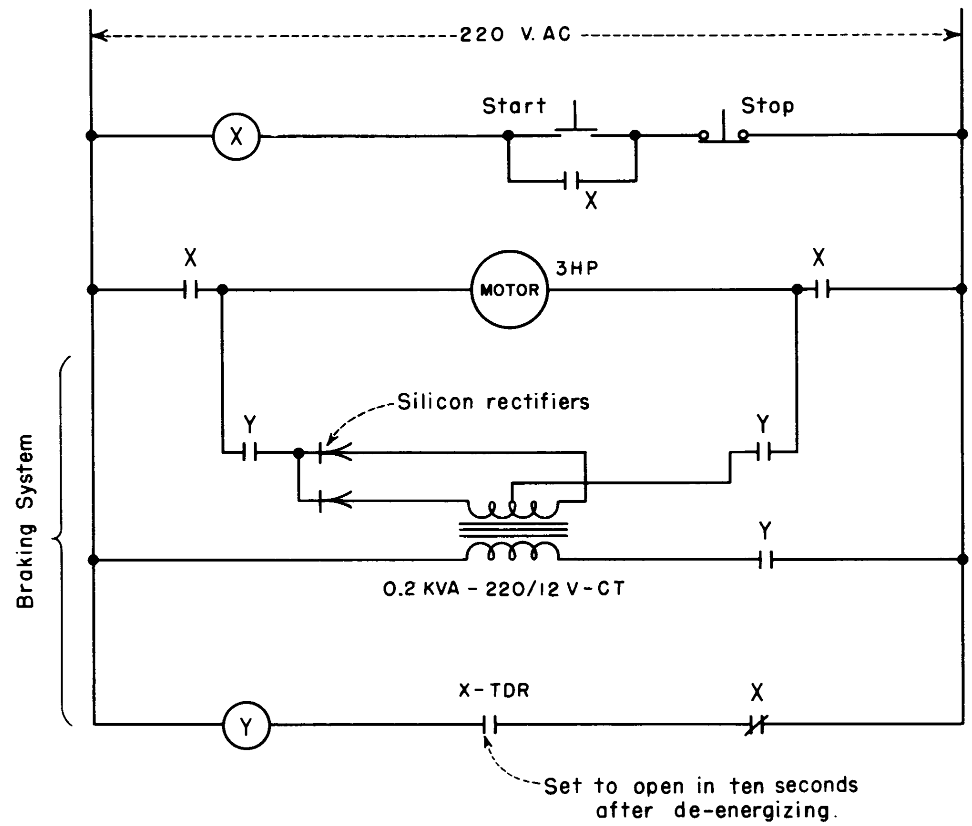
Two potential safety hazards existed in the operation of the electrically powered saw shown below in the carpenter shop of the Folsom Operations Field Branch of the Central Valley Project, California. These were:

1. The saw, being a 16-inch ball-bearing type, would decelerate to approximately 1,200 rpm., at which speed it would become very quiet; also the stroboscopic effect from the shop lighting would make it appear that the saw blade was no longer rotating.

2. Due to the above condition, the men often stopped the saw by holding a small board against the side of the saw blade.

The main objective of this suggestion, submitted by Raymond G. Stroh of the electrical maintenance unit of the operations field branch, was to reduce the coasting time of the powersaw from approximately 17 minutes to 6 seconds. Mr. Stroh explains that there are many ways to incorporate braking devices on power equipment, but that by use of a silicon rectifier, the use of electrodynamic braking is quite practical. The installation and operation of the braking unit are explained by reference to the photograph below and the electrical schematic diagram on page 14.





The photograph presents a view of the 16-inch powersaw with the dynamic brake system components mounted in a panel at the right of the saw. On starting, with reference to the schematic diagram, the start button is pushed, energizing the "X" contactor through the normally closed stop button. The contactor will "seal-in" through the "X" contact which is in parallel with the start button. Closing of the "X" contactor starts the motor, opens the normally closed "X" contact in the "Y" contactor circuit, and closes the X-TDR contact.

On stopping, the stop button is pushed, allowing the "X" contactor to open, deenergizing the motor. The normally closed "X" contact closes, energizing the "Y" contactor through the time delay "X" contact. The "Y" contactor closes, energizing the coasting motor with 12 volts direct current. This voltage is sufficient to excite the motor windings now being used as a direct current field. This induces a very high current into the rotating motor rotor. This very high current in the rotor is effectively short circuited requiring considerable torque to maintain rotation. Under these conditions the retarding effect stops the motor is approximately 6 seconds compared to 17 minutes if allowed to coast.

There may be several ways to accomplish the braking as stated previously; however, the method described was used because several of the components were available from surplus material on hand. The device has proven to be quite successful.

If further information is desired, write the Chief, Folsom Field Division, Bureau of Reclamation, Post Office Box 37, Folsom-Auburn Road, Folsom, California, or the Assistant Commissioner and Chief Engineer, Bureau of Reclamation, Denver Federal Center, Denver 25, Colorado, Attention: D-410.

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COMPRESSED AIR ACCIDENT

(From Safety Record published monthly by the Office of Assistant Commissioner and Chief Engineer, Bureau of Reclamation, Denver, Colorado.)

A Michigan mechanic with a small cut on the side of a finger washed some small parts in cleaning fluid and then, holding them in his hand, he played the airhose on them to dry the parts off.

Shortly after, in great pain, he staggered over to the manager complaining his body and head felt as if they were going to explode. At the hospital, his ailment was diagnosed as "air bubbles" in the bloodstream caused by the air jet striking the small wound on his finger, forcing entry into the bloodstream. This man recovered, but might have died. Using an airhose to "blow off" parts held in the hand is an unsafe practice, as this case bears out.

* * * * *

LOSS OF AIR IN TRUCK BRAKE SYSTEMS

(Suggestion R2-61-71)

Mr. Airon C. Burchett, of the Tracy Operations Field Branch, Delta-Mendota Canal Maintenance Unit, Central Valley Project, reports that while going over rough terrain the bleeder valve on a dump truck was knocked open, resulting in loss of air in the truck's braking system.

To eliminate a possible serious accident from happening in the future due to a sudden drop in the air reserve, Mr. Burchett suggested that such an eventuality could probably be eliminated by putting a cap on the bleeder valve, or by installing a suitable guard over the existing valve.

The valves on all trucks equipped with airbraking systems were accordingly examined in the project garage. Except for three dump trucks, it was found that bleeder-valves on all other trucks in service on the project unit were positioned in the reserve air tanks in such a way as to be sufficiently protected during operation through high vegetation or rough terrain. On the three trucks not so equipped the valves with longer handles have been replaced with small drain cocks having short T-handles which will effectively eliminate the hazard.

Although Mr. Burchett's recommendation was not used as suggested, it emphasized a potential safety hazard and one that could cause a serious accident. It is suggested that others may wish to examine the airbraking systems on their equipment and provide a different type bleeder valve or protection of the valve as the case may be.

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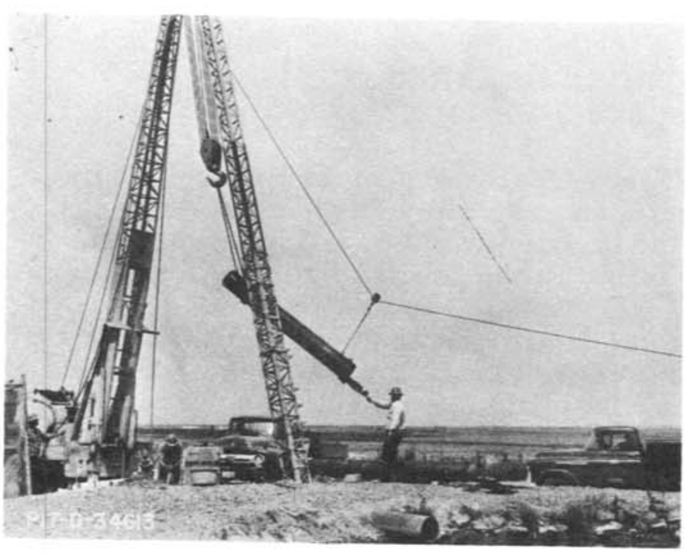
MOVING DEEP WELL PUMPS
(Suggestion R1-61-23)

During a rectification program on the North Side Irrigation Field Division of the Minidoka Project, an ingenious method was developed for moving turbine deep well pumps and their accessories.

This method was suggested by Mr. Virgil D. Temple, turbine pump repairman. He suggested that one end of the sand line of the pump rig be anchored by staking it near the place where the pump and the accessories are to be placed, as shown in the photograph below. Then by using a single sheave pulley over the line, the task of moving pump and its accessories can be accomplished very satisfactorily, as shown.



Previously on the Minidoka Project, a wrecker or winch truck was used to move the pump and its accessories and $5.00 an hour was charged for the use of this piece of equipment.

Mr. Temple's suggestion does not eliminate any personnel from the four man pump crew that is normally used to pull or install pumps, but it does relieve the truck and driver for other work. It also puts less strain on the pump rig while moving the pump. Additional information may be obtained by writing to the Regional Director, Bureau of Reclamation, Box 937, Boise, Idaho, or to the Assistant Commissioner and Chief Engineer, Bureau of Reclamation, Denver Federal Center, Denver 25, Colorado, Attention: D-410.

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UNIVERSAL JOINTS INSTEAD OF EYEBOLTS ON SPRAY RIG
(Suggestion R1-61-21)

The North Side Irrigation Field Division, Minidoka Project Office, reports less downtime when universal joints replaced the eyebolts on spray rigs. Mr. Charles H. Edwards made the suggestion that the eyebolts installed on the standards on the boom where the hydraulic cylinder is fastened be replaced by universal joints. This installation and the formerly used eyebolt are shown in Figures 1 and 2.

Photo No. 1

Mr. Edwards states that the eyebolts which were used formerly, crystallized and broke from strain and vibration. An eyebolt would last about 3 or 4 days before it broke, causing the spray rig to lose from 4 to 6 hours field time while it was being repaired at a cost in downtime of about $10.00 per hour. Mr. Edwards further reports that they get smoother and better operation with less strain on the hydraulic cylinder.

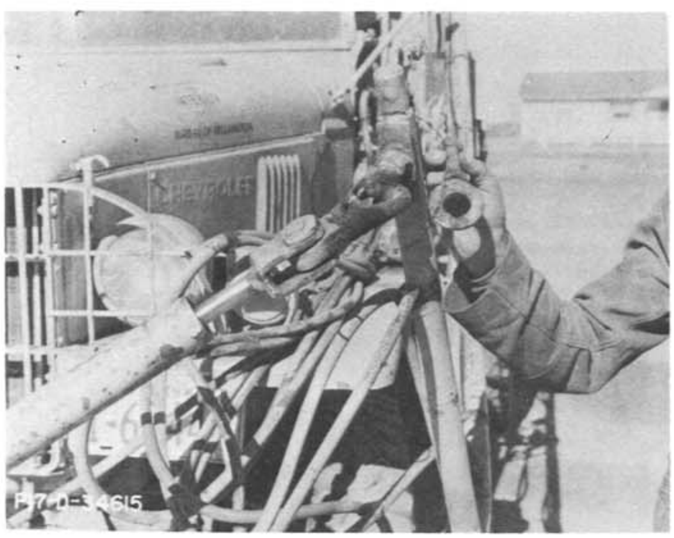

Photo No. 2

Should anyone be interested in receiving more information about this suggestion, it may be obtained by writing to the Regional Director, Bureau of Reclamation, Box 937, Boise, Idaho, or the Assistant Commissioner and

Chief Engineer, Bureau of Reclamation, Denver Federal Center, Denver 25, Colorado, Attention D-410.

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THE USE OF LOW PRESSURE GAS FOR REMOTE POWER UNITS

The problem of maintaining remotely located equipment driven by water-cooled gasoline fueled engines usually becomes quite expensive as corrosion, carburetor and gas tank gumming and other deteriorating processes occur.

The Salt River Project was faced with these same problems in maintaining their motor-generator sets which operate the spillway gates at four hydroelectric dams.

The project's solution to reduce the cost of maintenance is described in this article prepared by T. W. Bent, Supervisory Mechanical Engineer, and J. L. MacLaren, Mechanical Engineer, District Engineering, Salt River Project.

In 1960 an engine replacement program was engineered and inaugurated by the Engineering Department to materially reduce or eliminate maintenance difficulties. Each year for a period of 4 years one of two gasoline engines at each location was to be replaced with an air-cooled,

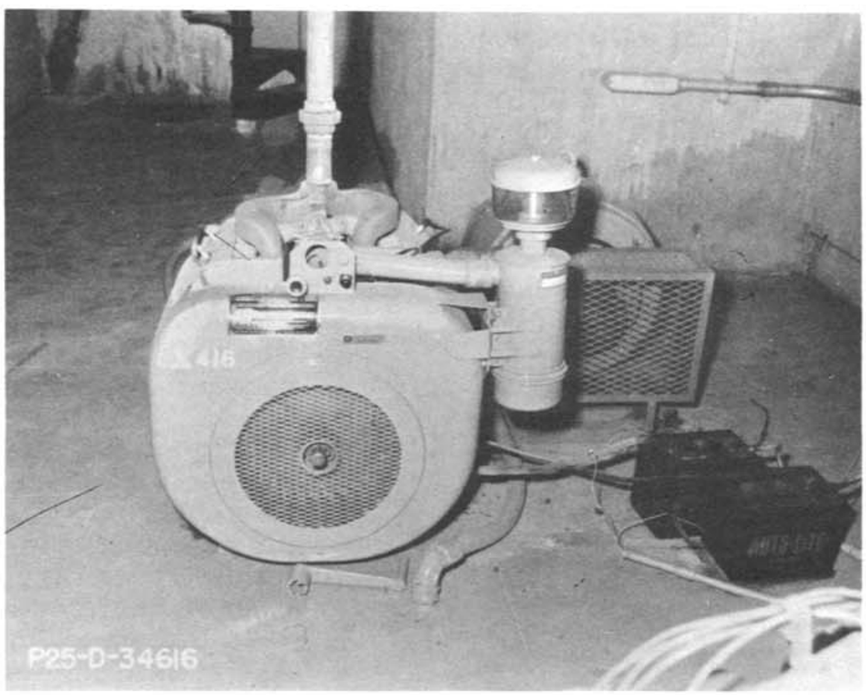


Photo No. 1

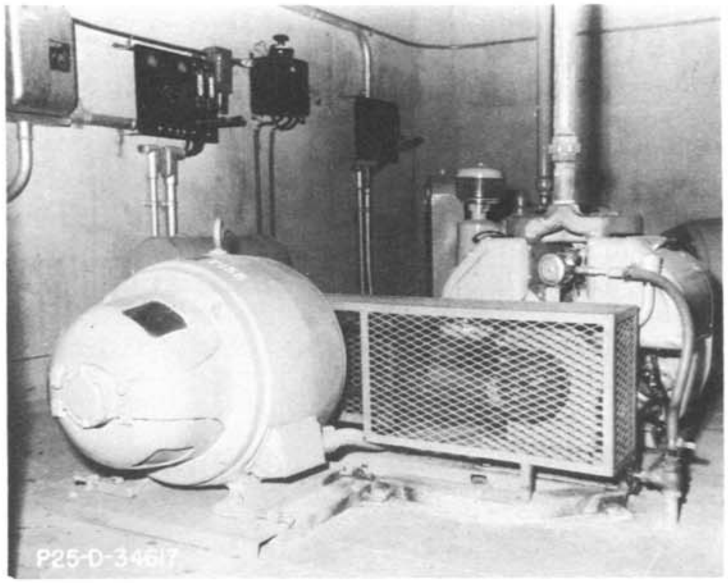


Photo No. 2

low-pressure gas (LPG) engine. This has been successfully accomplished at two locations, with a third and fourth scheduled in 1962-1963. The same process will be repeated for the remaining four stand-by engines after the first part of the program has been completed.

In order to reduce the stock of spare parts a standard unit was specified that would handle the load at all locations. Photographs No. 1 and 2 show a new standard LPG engine installation, while Photograph No. 3 depicts an original gasoline engine installation.

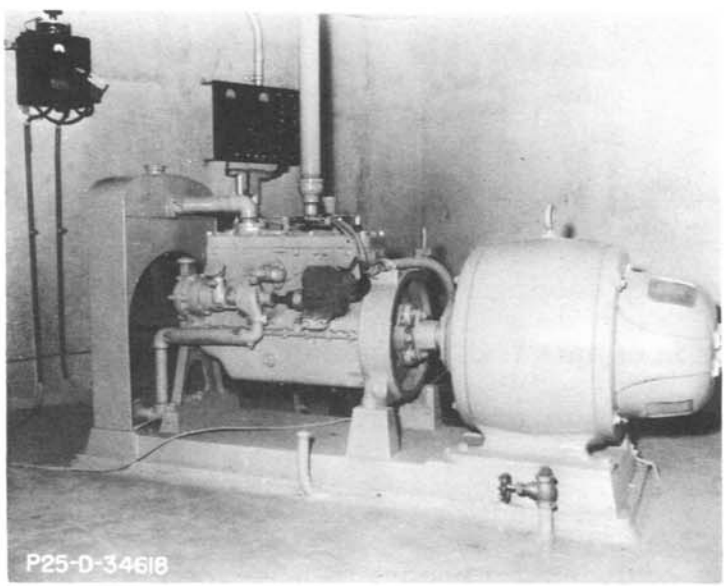


Photo No. 3

Remoteness of equipment can be thought of in two ways: First, geographical but with ease of access for operational and maintenance purposes; second, geographical but with moderate to difficult access. The motor generator sets of the project fall into both categories with three of the four installations in the latter.

It will be noted in Photograph No. 4 the motor generator house is located on one side of the dam and approximately 1,000 feet from the access road on the other. In this type of installation the use of LPG has an additional advantage over gasoline in that the LPG tank can be remotely located from the engine to allow ease of filling with the gas being piped to the desired location.

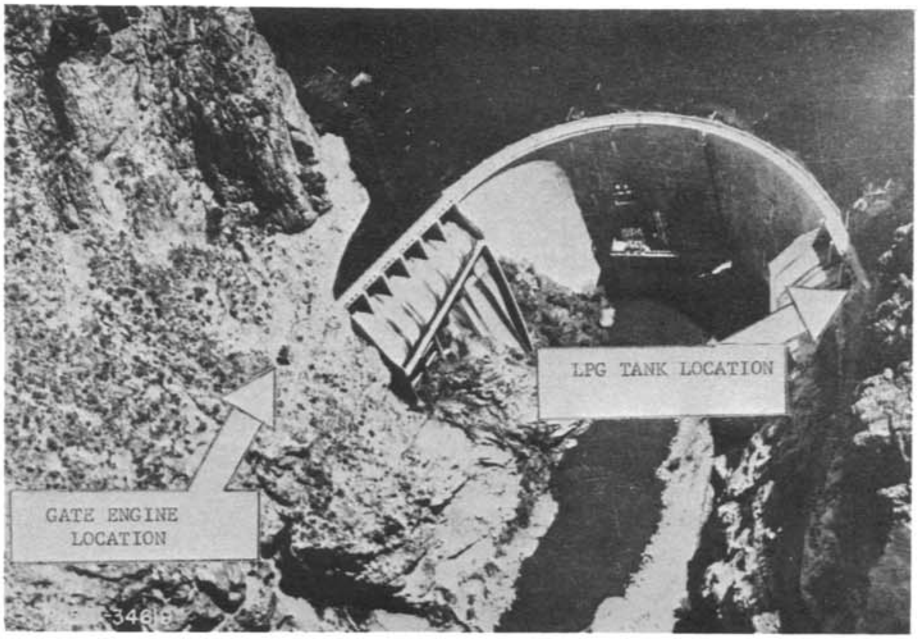


Photo No. 4

In summation some of the advantages of utilizing air-cooled, LPG engines where feasible are as follows:

1. Elimination of cooling system problems.

2. Elimination of carburation problems.

3. Elimination of internally corroded gasoline tanks and their resulting difficulties.

4. Reduction of fuel handling problems.

By adopting this replacement program the project expects relatively maintenance free operation of these sets for many years to come.

A 3-WHEELED WHEELBARROW

The removal of rock from a concrete-lined section of a main canal on the Kittitas Division of the Yakima Project where reaches of the canal are located in sidehill cut, Photo No. 1, cannot be classed as a major maintenance item, but it is one that is awkward to accomplish, becomes time consuming if done by hand, and costly and inefficient, for the amount of work to be done if large equipment is used. The depth of the canal below existing operating roads precludes the use of smaller motorized equipment.

Photo No. 1

Watermaster Adcock has constructed a 3-wheeled wheelbarrow, Photograph No. 2, which is pulled up to the lower canal bank to the operating road by a small gasoline powered winch mounted on the rear of a truck bed. The operation is quite efficient and effective.

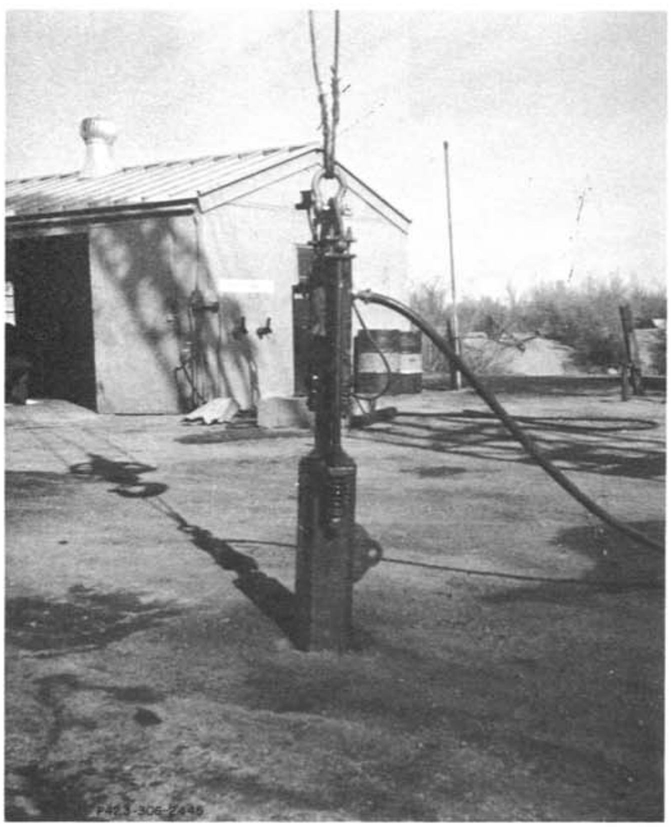
* * * * *

Photo No. 2

AIRHAMMER PILEDRIVER
(Suggestion R3N-62-1)

The pneumatic, commercially available, paving breaker modified for use as an airhammer piledriver shown in the photograph below was the suggestion of George A. Schwindt and Ralph H. McVey, foreman and welder, respectively, of the Bureau's Needles, California Office, which is responsible for the Colorado River Front Work and Levee System. The suggestion fulfilled a need for lighter weight equipment capable of driving railroad rail piling, posts, pipe, etc., in hard-to-reach places and for equipment that could be transported without use of a large transporting truck or tracked crane over the roads, sometimes for considerable distances.

The project utilizes the device primarily in driving 65-pound railroad rail as piling, and supports for water recording gage structures and for boat docks. It can be used for other similar driving work. Driving time to obtain 15 to 18 feet of pile penetration has ranged from 20 to 45 minutes in silt, sand and light gravel. This includes the time necessary for rigging the pile. Greater depth of penetration can be achieved, but the driver is not recommended for use where the pile must be driven in rock, cobblestones, or tightly packed gravel.



The paving breaker was revised for mounting on a shop fabricated piledriving hammer to fit 65-pound railroad rail as shown in the drawing, page 14. Provision for vibration is provided by the use of spring-loaded side rods held in place with four belts. The device can be powered by a 210-cubic-feet-per-minute-compressor and handled by a truck crane or truck-mounted A-frame.

In addition to being more easily transported with lighter duty equipment and thus saving in transportation costs over heavier equipment, the same job can be accomplished with less manpower.

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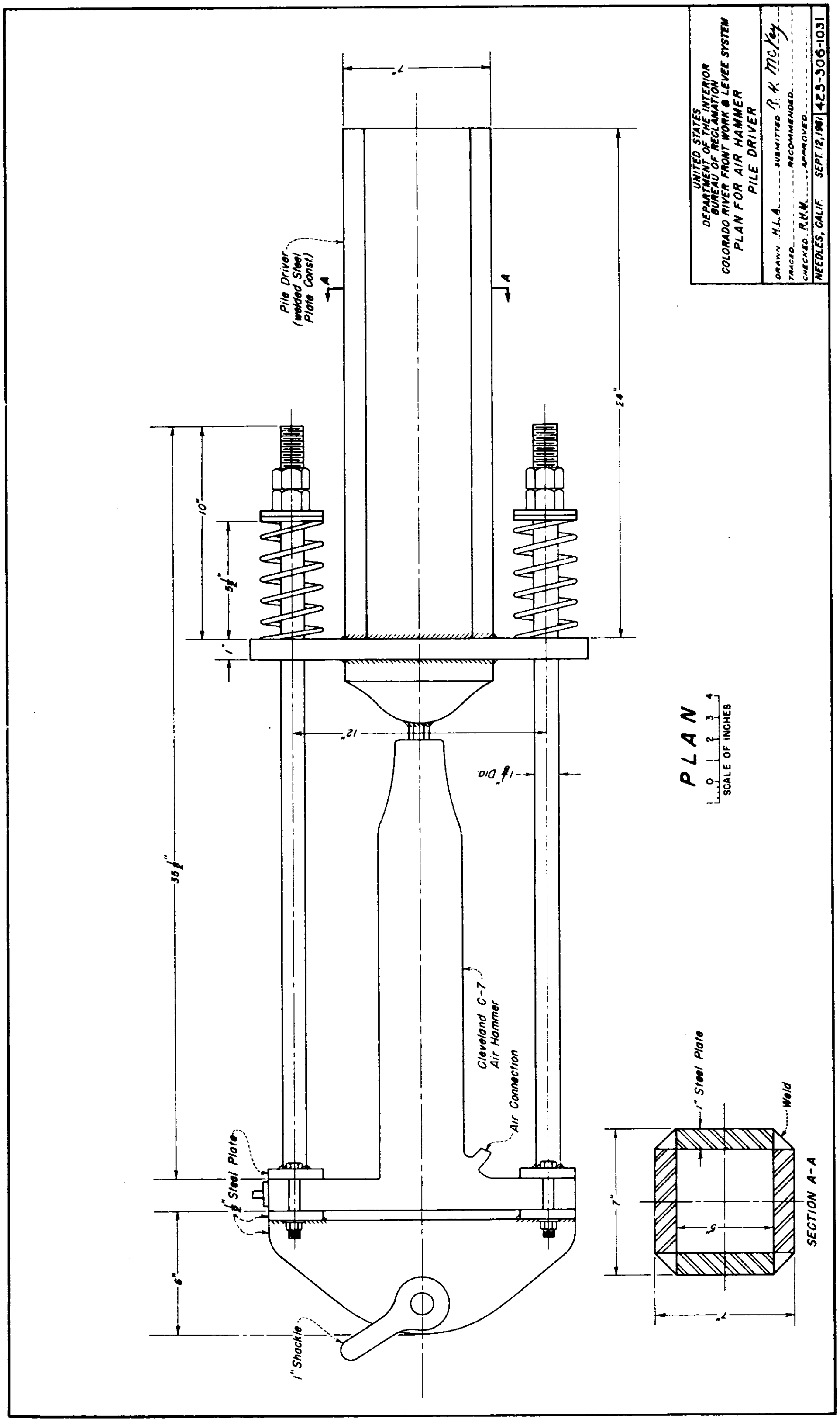

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO RIVER FRONT WORK & LEVEE SYSTEM
PLAN FOR AIR HAMMER
PILE DRIVER
DRAWN H.L.A. SUBMITTED R.K. McVay
TRACED RECOMMENDED
CHECKED R.H.M. APPROVED
NEEDLES, CALIF. SEPT. 12, 1961 423-306-1031
Pile Driver (welded Steel Plate Const.)
A
A
7"
24"
10"
5½"
1"
12"
1¼" Dia
35½"
Cleveland C-7 Air Hammer
Air Connection
½" Steel Plate
6"
1" Shackle
PLAN
SCALE OF INCHES
0 1 2 3 4
1" Steel Plate
Weld
7"
5"
SECTION A-A