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Bibkey ID: 655732

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
CASA GRANDE NATIONAL MONUMENT

OFFICE OF THE SUPERINTENDENT
OF
SOUTHWESTERN MONUMENTS

COOLIDGE, ARIZONA

December 11, 1933.

DEC 19 1933
☒ KITTREDGE
☒ BURNLEY
☐ EQUIPMENT
☐ ACCOUNTS
☒ LANDSCAPE
☐ VINT
☐ ROAD DIARY
☐ JOB DIARY
☐ ANSWERED
☐ FILE

Mr. F. A. Kittredge, Chief Engineer,
409 Underwood Building,
San Francisco, California.

Dear Mr. Kittredge:

I am transmitting herewith a copy of a report on Pipe Spring National Monument. Pages 4-13 inclusive deal with measuring the flow of the various springs there. The total possible water output there is far less than has been supposed by practically everybody who has looked into the problem of water division.

We have received copy of "Regulations for the Division of the Waters of Pipe Springs" from the Director. The regulations are dated November 2nd and the Director's letter of Transmittal, Nov. 7, to Asst Supt. Parker.

In your letter of Nov. 23, carbon of which you sent to us, you refer to a letter of Mr. Parker to you dated November 8th. It appears that we have now copy of this letter in our file.

Pages 24 to 36 describe in detail the way the waters were divided during the whole summer of 1933. Examining this section will reveal that a TIME division of the Interlocked Pools as follows would, with no meters, give a practical three way division of the waters: (1) Indians 3 days; (2) Park Service 3 days; and (3) Cattlemen 1 day, PLUS entire output of the Tunnel Spring. This would effect a three-way division of 14-gallons per minute to each party with exception of negligible amounts used by Acting Custodian's household and tourists.

We are looking into the matter of meters, types, costs, method of installation, etc. as prescribed in the regulations. Irrigation by CONTINUOUS flow of 14 gallons per minute rather than some provision for allowing accumulation of a quantity of water to be used at intervals of several days, with a rush, appears to be the weak spot in such arrangement.

A copy of this report went forth to the Director several weeks ago.

Sincerely yours,

Robert H. Rose,
Asst. Superintendent

cc.

Director

Water Supply System

yes
Kittredge
gas

Mr. A
Parker
attached

First
method

(very close)

no - Mrs
be involved in
Parker's 3 sons

yes - very weak K

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REPORT ON WATER RESOURCES AND ADMINISTRATIVE PROBLEMS

AT THE

PIPE SPRING NATIONAL MONUMENT

(Robert H. Rose, Assistant Superintendent, Southwestern Monuments)

INTRODUCTION

The water question and administrative problems at Pipe Spring National Monument have been under consideration recently. The fact that most of the discussions have been based upon estimated rather than actual rates of flow of the springs on the Monument, gives no solid ground upon which to start in attempting to settle the water difficulties. Also it is noted in instances that conclusions have been drawn as to administrative procedure at that Monument for the future and that these conclusions and recommendations were based upon very brief stays on the Monument. Certainly too little time was spent either (1) to measure, or satisfactorily estimate, rates of flow of all of the springs there, or (2) to get at the bottom of the many angles to the water question and administrative problems, both of which are related to three-quarters of a century of history of that Monument.

Upon the request of Superintendent Pinkley of Southwestern Monuments, I drove to Pipe Spring National Monument, arriving on the evening of September 12, equipped with sufficient geological and surveying instruments to make an accurate water resources survey and geological reconnaissance. I spent four full and busy days studying the many problems there and departed for Southwestern Monuments Headquarters on the morning of September 17. Enroute home the 17th I met Doctor E. D. Farrow, Superintendent of the Kaibab Indian Reservation, at the Kanab Hotel, Kanab, Utah, where I discussed the water problem with him for about one hour.

RELATIVE LOCATION OF SPRINGS AND SEEPS

Shown on the accompanying sketch, and presently described, are the springs and seeps on the Monument and the names by which I shall hereafter refer to them. They are:

I. The Historic Spring.

- A. This spring apparently rises about 10 feet from the west end of the north wing of the old Fort. It seems to come up beneath the westernmost door sill. Its waters run underground across the patio of the old Fort and first emerge to light in the northwest corner of the south wing. Here the water discharges from an iron pipe into a long wooden box trough. From thence the water is carried through the south wall of the Fort to the outside of the building and is conveyed by a stone-slabbed, open top flume across the road and into the northwest corner of the East Pool.

Indicate bottom of 1st rise get bottom of 1st rise

FOREWORD

Facts and observations based upon a four day study at Pipe Spring National Monument are contained in the following pages.

This report is lengthy. Yet greater length is invariably required for full presentation of facts and for an understanding of all angles to a given problem than is required for a mere setting forth of specific statements and recommendations.

My plea is for consideration of all of the facts relating to the water problem at Pipe Spring National Monument so that such regulations as might be imposed by the Secretary of the Interior in regard to the division of waters will be fair and just and be consistent with legal rights of the parties concerned.

Bringing the Monument property up to National Park Service standards involves restoration of the setting consisting of such acreage of trees, meadows, orchards, and fields as are consistent with historical facts.

Bringing the property up to National Park Service standards is expected of us by entire Mormonism and to maintain such standards requires that the National Park Service retain all rights they now have to the waters of the Monument. Whatever is then surplus may be diverted to Indian use.

R. H. Rose,
Assistant Superintendent.

I shall later submit data on the rate of flow of this spring.

II. The Big Spring.

- A. This spring eclipses all the others in amount of water discharged per unit of time. It rises outside the walls of the Fort near the root system of a large tree. Its precise location is:

Distance	25 feet from southwest corner of Fort.
Bearing	S 25° W

1. The Big Spring discharges immediately into a stone-slabbed flume with open top which carries the water about 15 feet. The entire flow then runs into a box trough and overflows into a stone-slabbed open top flume which conveys the water across the road and into the northwest corner of the West Pool.
2. Two very careful measurements of the flow of this spring were made which will be described later in this report.
3. The Big Spring was created in its entirety along in the early 1890's after dangers from Indian raids had passed. Prior to that time the Historic Spring inside the Fort was the only spring close to the building, therefore the Big Spring is a part of the history of the Monument.

III. The Tunnel Spring.

- A. The stream of water where it issues from the mouth of the Tunnel is 22 feet lower than the surface of the Big Spring. The tunnel goes into the hill about 30 feet bearing approximately N 25° E. From the Big Spring the mouth of the tunnel is:

Distance	about 200 feet
Bearing	S 40° W

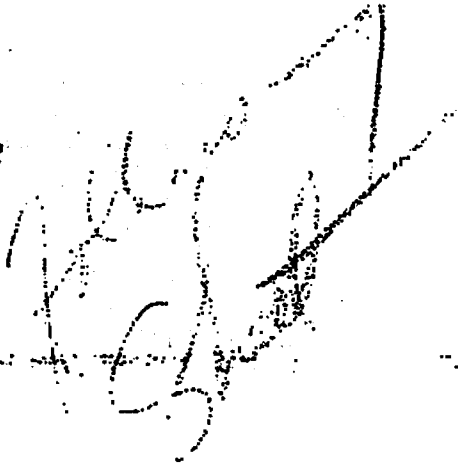
The significance of (1) the bearings, and (2) the 22 feet lower elevation will be considered in the geologic section of this report.

1. From the mouth of the tunnel the waters flow in a small running stream which leads a short distance downhill into the uppermost of the Meadow Pools. The overflow from the Upper Meadow Pool is conveyed in a small ditch for about 200 yards where it runs into two pools just outside the boundaries of the Monument where the water serves to water cattle belonging to the Cattle-men referred to later in this report.
 - a. There is a Lower Meadow Pool on the Monument which is kept filled from the Upper Meadow Pool overflow from time to time as desired.
2. I accurately measured the overflow from the Upper Meadow Pool over a period of eight minutes. These data will be recorded later.

IV. Seep Spring West of Winsor Castle (The Fort).

- A. This spring emerges 17 feet higher than the Big Spring. Its discharge is negligible compared with the Historic and Big Springs. By carefully cleaning out the place where the spring emerges, rocking the sides and bottom of the exit and immediately storing

MAP OF MONUMENT



the water, the entire output of this spring would not exceed 150 gallons a day. Its present flow was estimated to be not more than 50 gallons a day. (See figure 1a)

B. As there appears to be no evidence of seeps or clumps of vegetation indicative of moisture just above this seep, chances of increasing flow by tunneling into the hill are pretty meagre. I shall later explain in the geologic section the objections to such tunneling operations.

These four springs: (1) the Historic Spring, (2) the Big Spring, (3) the Tunnel Spring, and (4) the Deep Spring to the west of Winsor Castle, comprise the entire water output of the springs on the Monument.

MEASURING RATES OF FLOW OF SPRINGS ON PIPE SPRING NATIONAL MONUMENT

I. The Historic Spring.

A. Using two buckets, the water was carefully caught for exactly three minutes and poured into a washing tub. Error through waste was very slight.

Measured flow 17 gallons in 3 minutes
5.67 gallons per minute - flow of Historic Spring

II. The Big Spring.

A. The water was by-passed as shown in the picture and allowed to flow on the road. The box trough was then bailed empty. At an instant recorded by the watch the by-pass was pulled aside and the time required to fill the trough to the instant of overflow was recorded. Following are observations: (See Figure 1.)

September 13, 1953

3:30 P. M. By-pass pulled aside allowing trough to fill.

3:54 P. M. Trough filled to instant of overflow.

Exactly 4 minutes - time required to fill box to overflow.

Capacity of box - 14' long by 16" wide by 12" deep
filled to depth of 9½" at instant of overflow.

14.8 Cu. Ft. - or 110.7 gallons. (7.48 gal. = 1 cu.ft.)

4 Minutes -----	110.7 gallons
1 Minute -----	27.68 gallons

B. A second measurement was made two days later as follows:

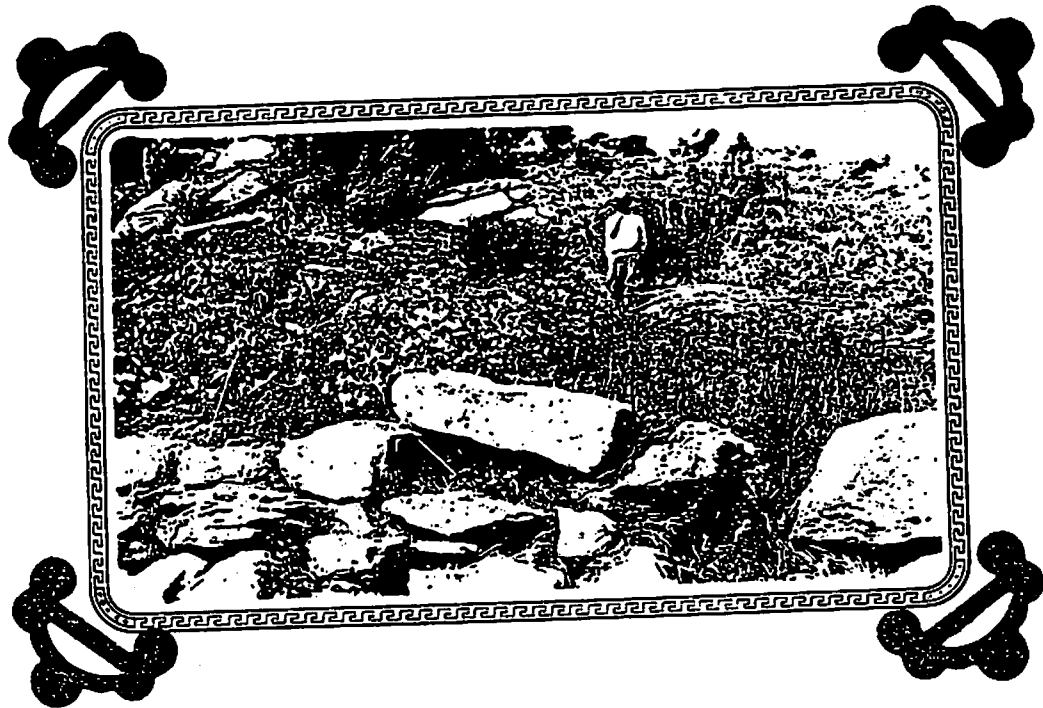


Figure 1-a.

West Slope Seep Spring. Estimated present flow, 50 gallons daily. Outflow soon lost by evaporation and seepage. This flow only one-twelfth of one percent of total daily flow of all springs on Monument.

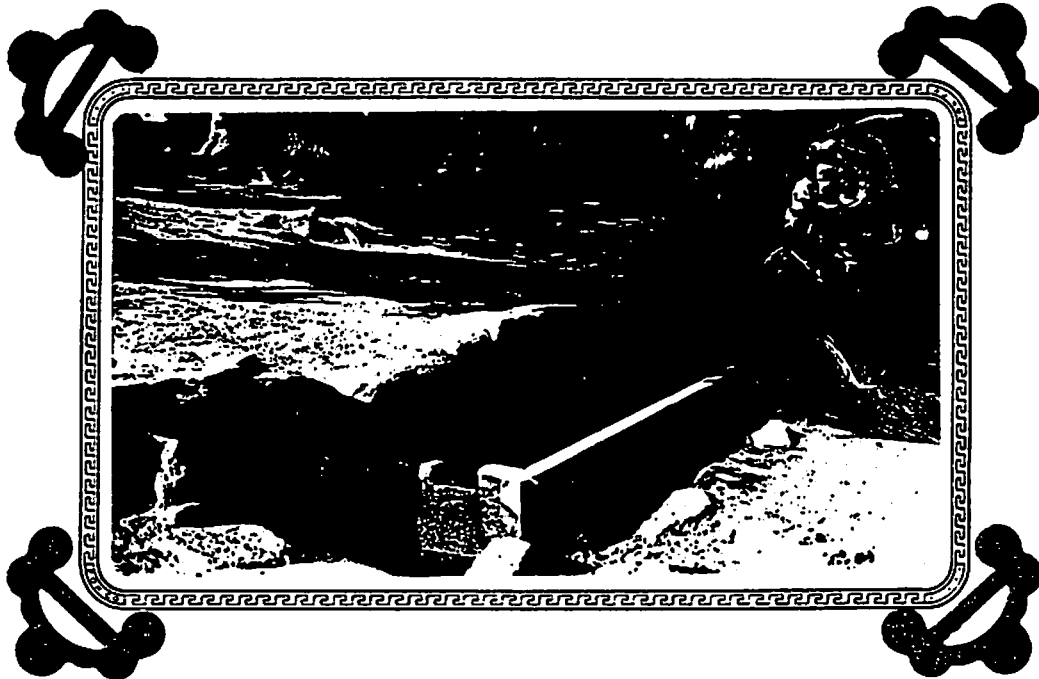


Figure 1.

Pulling the by-pass aside, the precise time required for Big Spring to fill the box to instant of overflow was noted. From dimensions of box, the total gallons, then the gallons per minute, were computed.

September 15, 1933.

Box filled to 9 3/8" depth in 3 minutes 55 seconds.

14' by 16" by 9 3/8" = 14.58 cu.ft. = 109.06 gallons

109.06 gallons in 3:55 equal

27.63 gallons per minute (second measurement)

Average:

First measurement	27.63 gallons per minute
Second measurement	<u>27.85 gallons per minute</u>

AVERAGE DISCHARGE BIG SPRING - 27.77 gallons per minute

- C. The (I) Historic Spring and the (II) Big Spring both discharge into two pools designated on the sketch as East Pool and West Pool. The flow into them is rapid and evaporation and seepage are negligible. The bottoms of the pools are sealed practically water tight by a clay deposit that is practically impervious to water. In the winter time, I am informed, some seepage occurs from the rocked up sides of the East Pool. This small seepage probably occurs in the summer also, but is consumed by evaporation because of generally higher temperatures and lower relative humidity of summer compared with winter conditions. The East and West Pools are interlocked by a wooden flume about 6" square such that 31 1/2" of water can be drawn from completely filled pools before they get too low to allow free flow between them. (See Figure 2.)

1. TOTAL FLOW INTO INTERLOCKED POOLS (EAST AND WEST POOLS):

The Historic Spring	5.67 gallons per minute
The Big Spring	<u>27.77 gallons per minute</u>
TOTAL	33.44 gallons per minute

D. Previous measurements and estimates:

1. A letter dated September 30, 1929, to Director Albright, and written over the signature of Commissioner Rhoades, states that a Supervising Engineer of the Indian Irrigation Service measured the flow of water from Pipe Springs and found it to be 33.56 gallons per minute. My measurements listed above check within .12 gallon per minute of this figure, or one-third of one percent.

2. In a report to the Director, National Park Service, dated June 6, 1933, by Assistant Superintendent Parker of Zion and Bryce Canyon National Parks, which report was based on approximately one hour study on the Monument ground, we find the statement on page 3: "My estimate of the flow of Pipe Springs is approximately 75 gallons per minute."

a. Mr. Parker's estimate seems to have been made with no attempt at even rough measurement. In view of the actual measurements made by the Indian Service in 1929 and my own measurements as reported above, I believe this estimate may safely be disregarded as hasty and unsupported by fact.



Figure 2.

West Pool looking northeast. Rocky walkway in left distance separates West and East Pools. These pools connected by box flume 31 inches below water level of full pools. The beautiful East and West Pools are a part of the history of the Monument, having been constructed originally by the Mormon pioneers about 1886.

3. In our conference at Kanab, Utah, Doctor Farrow indicated that there had been no accurate records of the flow of Pipe Springs made but stated that it probably approximated a half cubic foot per second. This would be about 225 gallons per minute, which is actually five times the entire rate of flow of ALL springs and seeps on Pipe Spring National Monument.

III. The Tunnel Spring.

- A. This flow could not be readily measured directly at the mouth of the tunnel. For that reason I took measurements at the point of overflow from the Upper Meadow Pool. Brush overhangs the mouth of the tunnel but the water flow is fairly free. The small stream from the mouth of the tunnel makes its way through a vegetation grown slope a short distance and enters the upper end of the Upper Meadow Pool. Thus, except for evaporation, seepage, and absorption of water by vegetation, the overflow of the Upper Meadow Pool is the flow of the Tunnel Spring. (See Figure 3.)

B. Measuring the flow:

A discharge pipe was installed at the overflow point of the Upper Meadow Pool. Care was taken that the intake end of the discharge pipe did not disturb the delicate water level of the pool. This was done by creating a small auxiliary reservoir at the intake end of the pipe which caught the water about where it was ready to leave the dam after overflow. In this way no error crept in and measurements could be taken immediately. (See Figure 4:)

September 15, 1933:

4:15 P.M. Began catching the flow in tub.

4:23 P.M. Ceased catching flow. (Absolutely no waste in catching flow.)

8 Minutes	-	flow	61.5 gallons
(no waste error)			

Therefore - 7.7 gallons per minute was the rate of discharge at overflow point of Upper Meadow Pool.

1. This water, flowing from the Tunnel Spring into the Upper Meadow Pool, overflows and is carried in a small ditch to the Cattlemen's pools just outside the southwest limits of the Monument. This is all the water cattlemen have been getting during the summer of 1933.
2. Due to the short distance between the mouth of the Tunnel and the Upper Meadow Pool, losses by evaporation, seepage and use of water by vegetation can't be extremely high. If it required several days for the water to run this distance of about 20 yards, then evaporation, seepage, and other losses would be high. However, as conditions now exist, it requires only a matter of minutes to less than an hour. Hence 30 percent would certainly be a high figure for these losses.

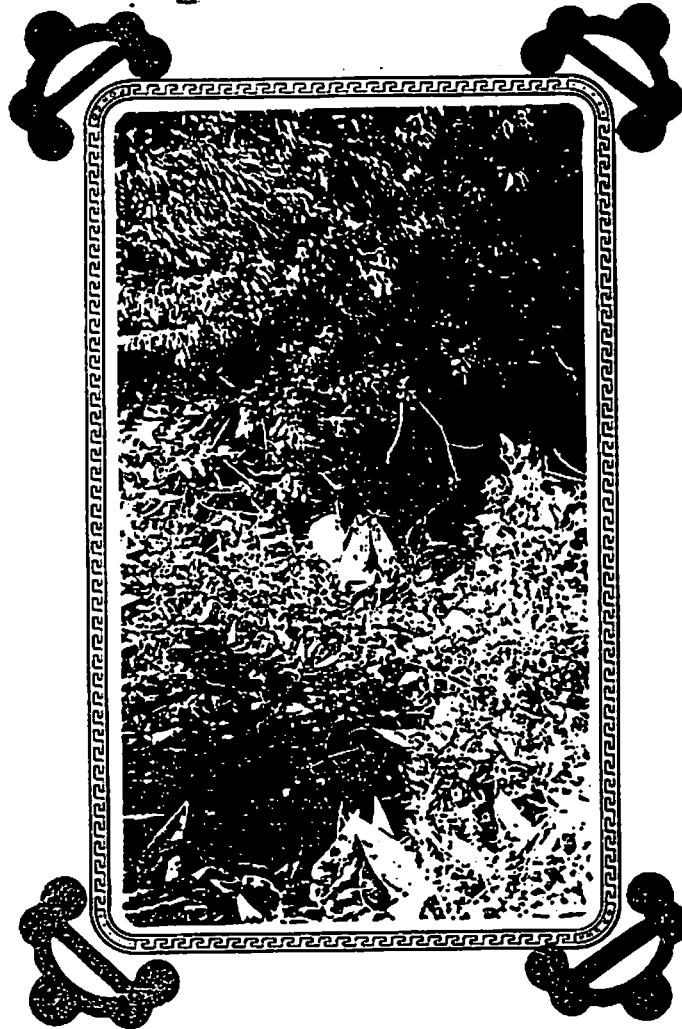


Figure 3.

Small spring emerges 32 feet lower than Big Spring. Setting possesses some natural beauty. Measurement taken from below this point at Upper Window Pool overflow.

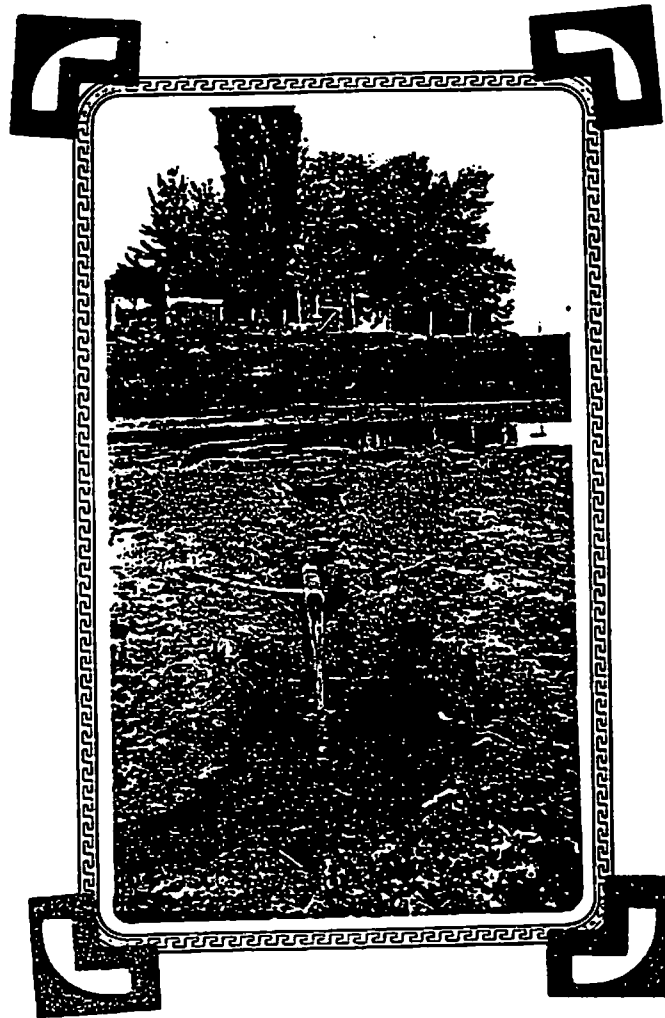


Figure 4.

Pipe installed at overflow of Upper Meadow Pool. Total of 61.3 gallons water flowed in 8 minutes, or 7.7 per minute. This overflow runs in small ditch by battlement outside of Monument, or, when needed, into Lower Meadow Pool on Monument.

3. Consider 30 percent for all losses between the mouth of the tunnel and the Upper Meadow Pool. This would mean that the 7.7 gallons per minute measured at the Upper Meadow Pool overflow was what remained of 11 gallons per minute that left the mouth of the tunnel. As I list 30 percent as the highest possible loss in this case, I wonder if someone will think this isn't nearly high enough. For that reason a little detail might prove valuable here: The possible losses considered in order are: evaporation, use by brush and other vegetation in growth, and seepage.

a. Evaporation: Experiments by the U. S. Geological Survey (U.S.C.S. Water Supply Paper No. 68, 1902) in the Truckee River region, California, give an evaporation rate of $6\frac{1}{2}$ inches for July as maximum, while during winter months $3\frac{1}{4}$ inch to 2 inches was the average evaporation per month. In extremely arid regions of the Mohave Desert, evaporation may total 6 feet per year, or equal 6 inches monthly. At 6 inches monthly evaporation on a vessel one foot deep and perpendicular sides would lower the level only $1\frac{1}{2}$ inches in a week, or 10 percent. The daily flow of Tunnel Spring is more than 200 Cu. feet daily, or 1,400 weekly - enough water to fill a rectangular vat 38 feet by 38 feet by 1 foot deep in a week. The surface moistened by the flow of the Tunnel Spring is less than 38 by 38 feet. Therefore 10 percent is certainly a high enough figure for evaporation loss of waters of Tunnel Spring in reaching the Upper Meadow Pool.

b. Growth of brush and other vegetation: On the basis of 11 gallons per minute issuing from the mouth of the Tunnel, 660 gallons, or about 13 barrels, is the flow in one hour. If this vegetation absorbed 13 barrels of water daily, this would be but about 5 percent of the entire daily output. Therefore we can be quite certain 5 percent loss in this way is high enough.

c. Seepage: On basis of 30 percent total loss, this leaves 15 percent loss by seepage. This would amount to almost 50 barrels daily. Since the water really flows in a free surface channel to the Upper Meadow Pool, and reaches this pool in a short time after leaving the Tunnel mouth, this loss cannot be exceptionally high. This would make a seepage loss of about 47.5 barrels daily.

C. Comment: I have gone to length in discussing possible increased output of the Tunnel Spring and losses because it is here that we must look to increase the total usable water of the Monument if it is to be done at all. All of the factors for the Tunnel Spring listed under 30 percent losses would amount to 95 barrels loss daily! This seems very high and would support the contention that 11 gallons per minute is all the water we could possibly expect out of the Tunnel Spring by installing all of the improvements one could think of.

1. The surest way to decrease, and possibly entirely destroy, the present flow of the Big Spring would be to attempt to push the tunnel farther into the hill. The Tunnel Spring flow can be materially increased only at the hazard of destroying both the Historic and the Big Springs. Together with being 22 feet lower than the Big Springs in elevation, the mouth of the Tunnel and the Big Spring bear the same directional relation to each other as the major fracture system of the Sandstone from which the water comes.

SUMMARIZED RESULTS OF MEASUREMENTS

Measured

(I) The Historic Spring	5.67 gallons Per Minute
(II) The Big Spring	27.77 gals. per minute
(III) The Tunnel Spring	7.70 gals. per minute
(Measured at overflow of Upper Meadow Pool)	

TOTAL 41.14

Estimated Possible Flow

(a) Historic Spring	5.67 gals. per minute (fixed)
(b) Big Spring	27.77 gals. per minute (fixed)
(c) Tunnel Spring	11.00 gals. per minute after retimbering and cleaning mouth of tunnel. This sup- poses a possible 30% loss from mouth of tunnel to overflow of Upper Meadow Pool.
(d) West Slope Seep	.12 gal. per minute, or 150 gallons a day after fixing up. Present flow is about a barrel daily, or .05 gallon per minute.

TOTAL ESTIMATED FLOW-AFTER INSTALLING EVERY IMPROVEMENT

- A. The 33.44 gallons per minute (Historic and Big Springs) can't be increased.

11.00 gallons per minute, possible flow Tunnel Spring

.12 gallons per minute, possible from west seep.

Therefore 44.56 gallons per minute is greatest amount of water that can be expected to be obtained for use at Pipe Springs National Monument. Present yield 41.14 gallons per minute.

- B. Present yield of 41.14 gallons per minute is 92 percent of greatest yield we can expect. In other words, cleaning, timbering, and constructing flumes for the Tunnel Spring and the West Slope Seep would increase the total water output of the Monument LESS THAN TEN PERCENT over present yield! Of course such improvement should be done, but it should not be counted on as contributing a magic touch to the solution of the difficult problem of proper division of waters.

44.56 gallons per minute, greatest possible flow that could be obtained after installing improvements.

41.14 gallons per minute - present yield.

3.42 gallons per minute - greatest possible increase.

This indicates that less than 10 percent increase in flow is all that can ever be expected on Pipe Spring National Monument.

GEOLOGICAL OBSERVATIONS

- A. 1. The prevailing massive sandstone possesses such low porosity that water cannot readily migrate between the individual grains.
2. Low porosity is indicated by the small basins on the hill slope that serve as catchment basins for the water and are dried by evaporation rather than by seep.
3. Both to the east and the west of Pipe Spring Monument the thick, massive, reddish to yellowish brown sandstone is underlain by a blue or a white shale member, or both.
4. This sandstone formation is continuous for miles in either direction from Pipe Spring and is lying quite horizontal except in approaching Pipe Spring, where the warping becomes more pronounced.
5. Right at the Monument, by warping probably, a system of joints and fissures has been developed. The most prominent joint system is oriented as follows:

Strike N 70 W
Dip 75 south

Minor fracture systems and fissures:

Strike N 15 to 30 W; Dip 25-35 N.
Strike N 70 E; Dip 85 S.
Strike N 30 E; Dip 85 N.

6. Undoubtedly the shale beds underly the sandstone at Pipe Spring at a depth of 50 feet or less. They are possibly instrumental in bringing water to surface.
7. The West Slope Seep Spring, as well as the Big Spring were observed to issue from the fractures in the sandstone.
8. Walking over the hill point, examination showed that gypsum is deposited in most of the fractures. Seeping waters are capable of dissolving and carrying the gypsum away, thus enlarging the passageway.

(See Figure 3.)

B. Significance of Geological Observations:

1. Fractures and joint systems afford passageways for the flow of underground water through the sandstone.
2. The Tunnel Spring bears S 40 W from the Big Spring. In an attempt to increase its flow, in the early days the Tunnel was dug into the hill about 30 feet bearing N 25 E. The figures on joint systems show minor systems running N 30 E and N 70 E.
 - a. The chance that tunneling into the hill farther would tap the big spring which issues more than 20 feet higher is almost certain in view of the following points:
 - i. The trend of two minor fracture or joint systems is in the direction of bearing of the two springs from each other.
 - ii. The 22 feet drop to the mouth of the Tunnel comprises a rather high pressure head and once a heavy flow is started underground between the Big Spring and Tunnel Spring, it would likely continue to increase until the Big Spring dried up.
3. The West Seep Spring comes from fractures in the rocks. This spring is 17 feet higher than the Big Spring. Since there is no heavy vegetation growing above this seep, and since there are no other seeps near, tunneling in here would do little or no good toward increasing water flow.

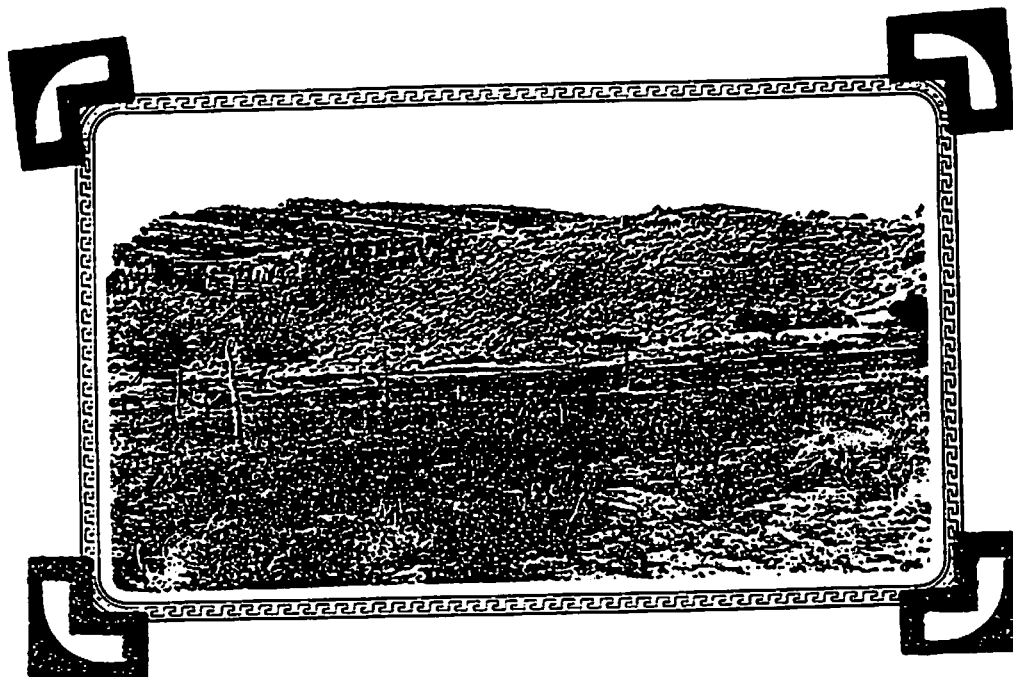


Figure 5.

Considerable warping and fracturing of the sandstone formation prevail in immediate vicinity of Pipe Spring National Monument. Springs and seeps emerge from fractures and joints.

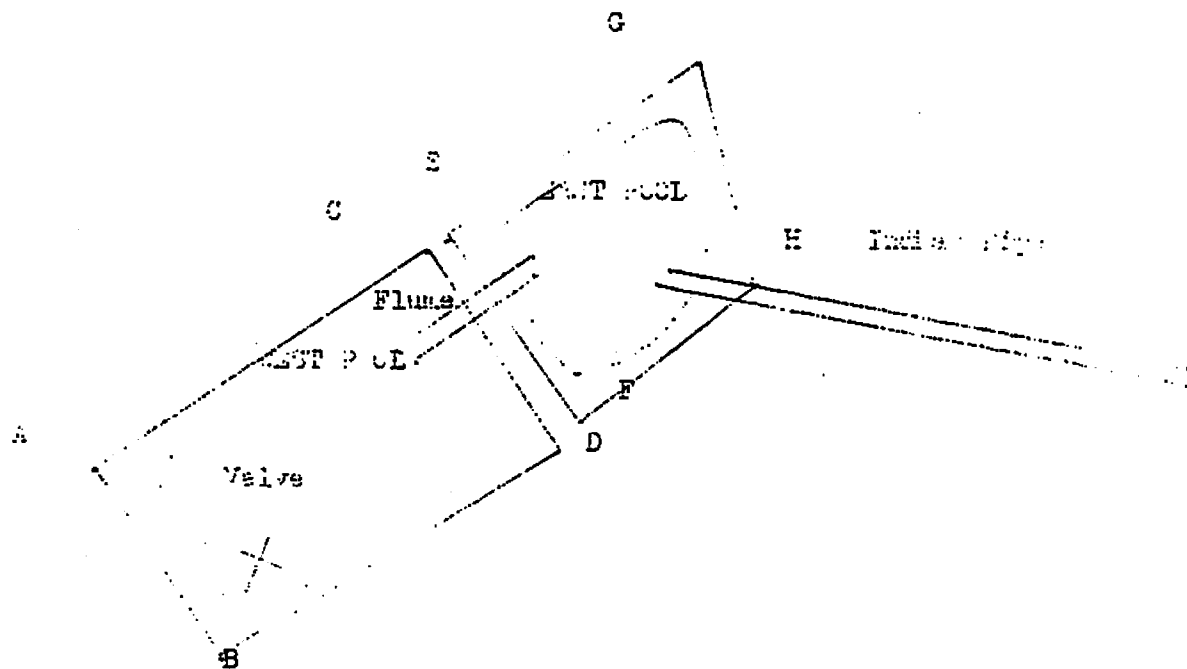


Figure 6a

Sketch showing dimensions and directions of sides of
Interlocked Pools.

4. All geologists and irrigation engineers are aware of the possible tapping and drying up of springs in jointed rocks by digging tunnels and the like near these springs. Tapping the Big Spring 17 feet lower is not likely to occur by tunneling in at the West Seep. However, it seems the water yield would not be increased by such tunneling of the Seep Spring, and there is some actual risk of disturbing the flow of the larger springs by such tunneling operations.

Therefore my conclusions in view of geologic conditions are:

- OK
- a. Clean up mouth of Tunnel Spring and construct and install such flumes and pipes as will conserve all the water possible.
 - b. No one should be permitted to enlarge or extend the Tunnel Spring into the hill because of the great danger of tapping the Historic and Big Springs.
 - c. The flow of the West Slope Seep Spring is so small and shows such small amount of possible increase that mere cleaning up the point of emergence and rocking up the place is all that should be done. The amount of water obtainable makes it unwise to expend much on flumes and pipe lines for using this water for stock or irrigation. Merely cleaning and improving of appearance is about all that is justified. Danger of disturbing flow of other springs would arise if tunneling were attempted here.
- See report
with same
all
OK

UTILIZATION OF THE WATERS OF PIPE SPRING NATIONAL MONUMENT

From Assistant Superintendent Parker's June 6th report I find the following excerpts which intend to show where the trouble centers in the water question:

? { "These letters show that the matter is of long standing and that the difficulty is between the local farmers of Moccasin, Arizona, and Superintendent Farrow."

"I feel that the Heaton's are using the Custodian to assist them in their long fight with the Indian Service."

"The Heaton family is working against the Indians through Custodian Heaton."

"This little settlement of Moccasin is composed almost entirely of the Heaton family."

? This implies that the Heaton's are the only people involved in the water problem. The following information will show definitely that this is not true. The following named men, or groups of people, comprise the Cattlemen's Organization. Note that the Heaton Brothers of Moccasin are but one of thirteen people or groups of people belonging to the organization that is

interested in watering cattle from the waters of Pipe Springs. The Heaton cattle usually comprise less than one-third of all the cattle involved in this watering problem. I am listing the cattlemen according to towns in which they reside:

1. Cedar City, Utah.

- a. Bullock Brothers
- b. Lehigh Jones
- c. John A. Adams

2. Kanab, Utah.

- a. H. J. Meeks
- b. B. A. Riggs

3. Orderville, Utah.

- a. David H. Esplina
- b. Ed Lamb

(Note the name Heaton Brothers is one in 13 listed. Their cattle comprise rarely more than one-fourth to one-third the entire herd to be watered.)

4. St. George, Utah.

- a. E. Foremaster
- b. John Schmitz
- c. John Finlay
- d. Mrs. Andrews
- e. Ben Sorenson

5. Moccasin, Arizona.

- a. Heaton Brothers

It is quite incorrect to leave the impression that a little local group of Heaton are the only people involved. These people are citizens from an enormous region of southern Utah and Northern Arizona.

CLAIMS OF VARIOUS CONTESTANTS TO PIPE SPRINGS WATERS

A. The following claimants are concerned in the water division problem.

- 1. The National Park Service
- 2. The Cattlemen's Organization
- 3. The U. S. Indian Service

B. Analyses of Bases for These Claims

- 1. The U. S. Indian Service.

- a. In the Presidential Proclamation creating the Pipe Spring National Monument dated May 31, 1923, are the following words:

"The Director of the National Park Service under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this Monument, as provided in . . . etc., ... Provided, that in the administration of this Monument, the Indians of the Kaibab Reservation, shall have the privilege of utilizing waters from Pipe Springs for irrigation, stock watering and other purposes, under regulations to be prescribed by the Secretary of the Interior."

Don't know if this is correct or not
Doubtless, at the time the proclamation was drawn, it was submitted for approval of the U. S. Indian Service, since it was concerned with lands bounded by the reservation. It is further definitely presumed that the U. S. Indian Service was instrumental in injecting this clause as to Indians using waters into the Proclamation. But a critical examination of this clause would show the following:

- Approved and returned to the Indian Service*
a. The Indian Service, in having a right merely to "Utilize waters" certainly haven't valid claim to utilizing ALL waters. Had this been intended to mean ALL waters, the statement would have said ALL waters, and there would be no need for inserting the phrase "under regulations prescribed by the Secretary of the Interior."
- b. The Indian Service doesn't control the waters of Pipe Spring National Monument, although in conversation with me, Superintendent Farrow talked to me of CONCESSIONS which the Indian Service was willing to make to the National Park Service, the Cattlemen, and others, as though the Indian Service was in complete charge of parceling out these waters. He stated some few years ago what would be considered a reasonable CONCESSION to the Park Service in stating that certain water for cooking, drinking, and for possibly a cow and chickens would be about right for us.

The National Park Service should remember that in reserving the Monument, we also reserved its setting. Irrigated trees, orchards, gardens, and a meadow were all a part of the history of the Monument. Anyone familiar with the history of the place will at once agree that the fields, orchards, meadows, and trees as the Mormons once had things developed, will take a large proportion of all of the water resources

See Arizona Water Law

of all of the springs of the Pipe Spring National Monument. In view of the fact that the Park Service has an obligation to fill in developing the Monument, the basis of the claim of our service to these waters will next be analyzed:

2. The National Park Service.

- a. Undoubtedly, when the Monument area was purchased for "the benefit and enjoyment of the people," we acquired whatever rights to the waters were possessed by the former owners. The former owners recognized the one-third right of cattlemen and the owners themselves controlled the remainder. Therefore, legally, there seems to be little reason for thinking anything other than that the National Park Service has rights to all water over and above that which any outside parties acquired prior to our purchase, under the "beneficial use and prior rights" clauses of Arizona Water Law. For that reason, I feel that Park Service needs, present and future, should be regarded as primary in whatever regulations may be prescribed by the Secretary of the Interior.
- b. A clause "utilize waters" certainly is indefinite as to just how much water, and cannot be construed to mean ALL waters any more than the right to "utilize air" for breathing would mean a man with this right could corner ALL the air for himself. This is the matter for regulation.
- c. Refer to the Proclamation; there is found a very significant statement:

"Now therefore, I President of the United States do proclaim that there is hereby reserved, SUBJECT TO ALL PRIOR VALID CLAIMS, and set apart as a National Monument to be known as Pipe Spring National Monument the lands shown"

This certainly means rights any and all parties had prior to the creation of the Monument, which rights were in accordance with ARIZONA WATER LAWS, are respected in this transfer of ownership. Under Arizona Law the cattlemen had watering rights to these waters and Arizona Law respected these rights. Under Arizona Law the previous owners of the Monument lands had beneficial use rights for cropping, irrigation, and upkeep use, of the waters of the springs. Certainly the National Park Service acquired these rights by assuming ownership. In other words, one of these days the development and maintenance of the Monument, tourists' facilities,

and beautifying the setting, are going to take a large share of these waters, which I firmly believe we now legally own.

3. The Cattlemen's Organization.

- a. I am presenting no defense plea for this group. I only want to refer to certain agreements and letters which would tend to establish a legal, and certainly a moral, right to the waters of this monument.

The following excerpts from correspondence indicate that the former Director Hather gave some pretty definite assurance to the Cattlemen that their privilege as to watering would be respected. Allow me to quote from some of these:

October 30, 1924.

"Dear Mr. Heaton:

Just before receiving your letter of October 24th, I wrote President Grant (President, Mormon Church) in regard to the acceptance of the quit-claim deed by the Department

"I do not think the Cattlemen's Association need have any fear that their watering rights at the Monument will not be fully recognized by the Department in view of the agreement of June 9th, which was signed by all concerned and officially approved both by the Commissioner of the Indian Office and the Park Service. As I wrote you on July 2, when the time comes, should it be necessary to run the water off the Indian Reservation, sufficient of the public land can be set aside as a public water reserve. The Commissioner of the General Land Office has this in mind and there should be no reason to worry about this as at the proper time it will be taken care of if the present permit is not renewed.

"I note that Mr. White is willing to stay on and look out for the old buildings and as Mr. Pinkley will have some funds to do some restoration work, he can be helped out from this source.

Sincerely yours,

Stephen T. Hather, Director."

Following is a copy of the agreement to which Director Hather was referring:

KAIBAB

Moccasini, Arizona,
June 9, 1924.

MEMORANDUM

"At a conference held upon the grounds at Pipe Spring, located on

the Kaibab Indian Reservation, at which representatives of the National Park Service, of the Cattlemen's Organization, also Mr. Heaton (claimant of the Pipe Spring), Mr. Jones of Cedar City, Doctor Farrow, and Mr. Reed were present.

"The object of this meeting was to arrive at a satisfactory arrangement concerning the use of the water from Pipe Spring by the aforesaid association of cattlemen. It was the consensus of public opinion and practically agreed upon by those present as but a fair and just solution of the situation that the cattlemen had the acknowledgement of all parties present to an ownership of one-third of the water from these springs and since a permit exists over the adjacent portion of the Indian Reservation that they have the right to conduct water to and upon any portion of the land covered by the permit, if said permit is not renewed, to conduct the water off the reservation.

(Signed)

E. D. Farrow
(Superintendent Kaibab Reservation)

Frank Pinkley,
(Supt., Northwestern Monuments)

Wm. Reed,
(Irrigation Engineer)

Charles C. Heaton,
(Claimant of Pipe Spring)

Randall L. Jones,
(Cattlemen's Association)."

- b. Mr. Mather, under date of October 29, 1924, wrote President Grant of the Mormon Church, Salt Lake City, making a statement that Mr. Chas. Heaton of Moccasin, Arizona, was responsible for giving \$1,000 of the total of \$5,000 involved in the purchase of the Monument and transfer to the Government.
- c. Under date of March 15, 1924, Director Mather wrote Mr. Heaton saying he didn't object to the caretaker Mr. White putting a garden down below the road and requested that Mr. White keep the premises in good condition. Mr. Mather again enclosed his personal check to further help Mr. White subsist on his small wage and garden.
- d. There are several more letters of Mr. Mather to Mr. Heaton and to President Grant of the Mormon Church indicating Mr. Mather's and President Grant's deep interest in this Monument and their hope that Cattlemen's rights would be recognized and respected.
- e. A letter of September 12 by President Grant's Secretary to Mr. Heaton indicates that the title to the Pipe Springs land, which title belonged to Mr. Heaton, would no doubt be found satisfactory to the government.

ARIZONA WATER LAW APPLYING TO THE CASE

A. From Revised Water Code of the State of Arizona, Compiled June, 1931, by the State Water Commissioner, Mr. Frank Trott.

a. Constitution of Arizona, Water Laws

"All existing rights to use of water in the state for all useful or beneficial purposes are hereby recognized and confirmed."

b. Paragraph 3230, Article I: Water Code

"A spring of water, as such, is not one of the sources from which water may be appropriated."

This means that if title to land is transferred from ownership of one citizen to the ownership of another, the new owner cannot promptly ignore all rights which might have been had to waters of springs on the property by neighbors. Transference of ownership of the Pipe Spring lands to Government ownership would carry with it, it seems, this same mandate to recognize and respect rights of citizens to the waters as would have been the case in a deal between Arizona citizens.

It appears that the Cattlemen were acknowledged to own one-third of the water at the time of or shortly after the transfer of ownership to the Government. If this is the case, we are therefore obligated to the State of Arizona to recognize whatever rights that were protected by state law while the land was in private ownership. Transferring the land from a private citizen to the United States, where water law is involved, would bind the United States to respect rights to waters that were held under Arizona law. On this basis, it seems that Cattlemen have a right to one-third of the water and the National Park Service the remainder. If there is some surplus, then the Indian Service could use it for the Indians as stated in the Presidential Proclamation. The Proclamation certainly doesn't abrogate all rights in the area and the full force of any Presidential Proclamation is contingent upon subsequent settlements and adjustments of ownership, rights, and other problems in the area.

The summarized results of bases of claims are:

- A. The National Park Service certainly obtained the rights held by former owners (private) under provisions of Arizona Water Law. All waters not subject to prior valid claims are certainly controlled by the Park Service.

- B. The Cattlemen's Association base their claims on (1) the Agreement of June 9, 1924, acknowledging their ownership; and (2) Arizona Water Law which gave them rights by prior usage and beneficial use while the land was in private ownership and which rights they feel still hold upon transfer of the Monument lands from private to National Park Service ownership.
- C. The Indian Services bases its claim on the clause in the Presidential Proclamation creating Pipe Spring National Monument. This proclamation said "waters" and is certainly conditional upon satisfactory settlement of all valid claims prior to the proclamation. The proclamation didn't give the Indian Service OWNERSHIP of the waters; it merely gave them the PRIVILEGE of utilizing WATERS an indefinite amount, and not 20 percent; 60 percent; or 99.9 percent; of all the water resources.

PRESENT DISTRIBUTION OF PIPE SPRING WATERS

I shall now go into the problem of how the water of the Pipe Spring National Monument has been handled during the past season. The present effective output of the Monument Springs is 41.14 gallons per minute. I explained in detail reasons why we can never expect this to exceed 44.56 gallons per minute. With the cattlemen now getting 7.7 gallons per minute, they are getting LESS THAN one-sixth the present output of the springs. If their claims are legal, they have a right to 13 gallons per minute - almost twice the present output of the Tunnel Spring.

Only 7.7 gallons per minute of the Tunnel Spring have been going to the Cattlemen all summer.

Of the 33.44 gallons per minute flowing into the interlocked pools, the Indian Service has been getting three-fourths and the Park Service for use on the meadow, one-fourth. Thus, the Indian Service has been getting 25.08 gallons per minute and the Park Service 8.36 gallons per minute. The following diagram illustrates graphically the amounts of water going to each claimant:

(See vertical bar graph, Figure 6, next sheet)

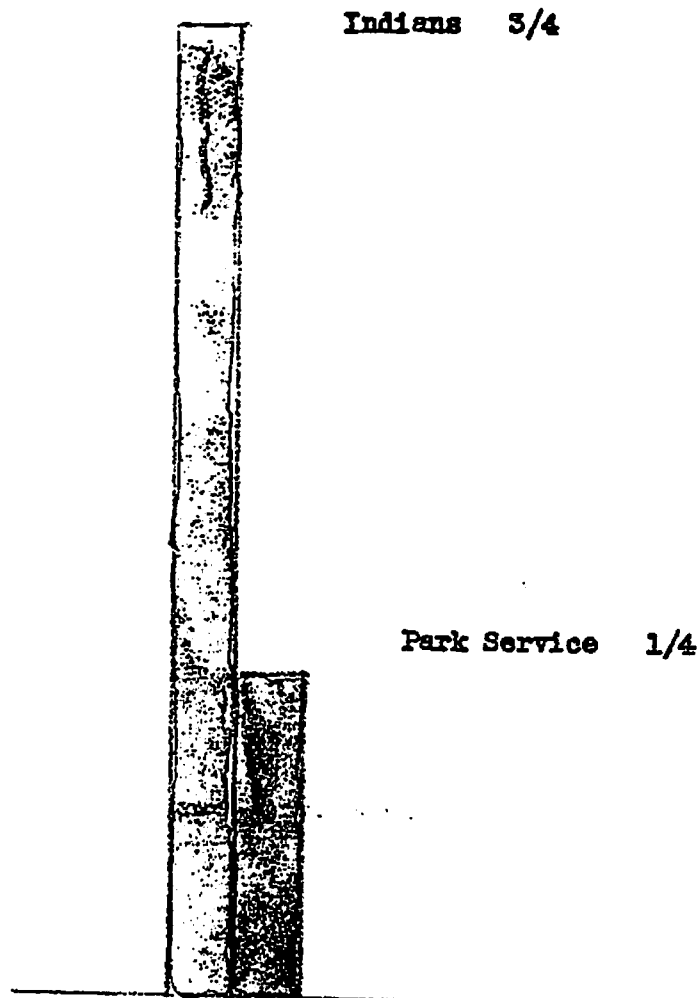


Figure 6.

Relative amounts of water supplied to Interlocked Pools going to the Indians and to the National Park Service during the summer of 1933.

Indians	$\frac{3}{4}$	25.08 Gals/minute
Park Service	$\frac{1}{4}$	8.36 " "

While on the ground at Pipe Spring National Monument, I carefully checked the areas of each of the Interlocked Pools and checked up on the manner in which the water flow is being controlled. The following are observed facts:

1. The Indian Service takes the water from the surface of the full pools. The pools must be full before the water is running into their pipe.
2. The water for the Park Service meadow is taken from a valve situated close to the bottom of the pool. In $1\frac{1}{2}$ hours the Interlocked Pools can be lowered 16 inches. Until the pools refill, no water runs into the Indian Service Pipes.
3. Acting Custodian (Laborer) Heaton allows the water to flow to Indians from full pools 9 days. At the end of the ninth 24-hour period, he opens the headgate allowing the rush of $1\frac{1}{2}$ hours flow to lower the interlocked pools by 16 inches. In 24 hours the pools refill and Heaton takes a second 16-inch head. Allowing refill again, he takes a third 16-inch head. Heaton then allows the pools to fill and just as the third 24-hour period ends, the interlocked pools are full and water is again running into Indian pipes from full pools. Thus, Heaton gives the Park Service one-fourth and the Indian Service three-fourths of water (35.44 gallons per minute). Note the accompanying diagram on division. (Figure 7)

DIMENSIONS OF INTERLOCKED POOLS

Directions of Sides

West Pool		East Pool	
AC -----	S 60° W=77'6"	DC -----	N 58° E=55'3"
AB -----	N 35° W=42'9"	CE -----	N 50° E=8' 4"
CD -----	N 35° W=44'9"	DE -----	N 32° W=43'
ED -----	N 60° E=75'3"	DF -----	N 42° E=9'6"
		FH -----	N 55° E=40'9"
		GH -----	N 18° W=43'4"

The pools are connected by one flume about 5" square. Bottom of flume is 31 $\frac{1}{2}$ " below the surface of the pools when they are full.

Mr. Heaton states that he draws 16" water out of the pools each of the three times he waters the Park Service Meadow and that each time it requires 24 hours for pools to refill. Considering a 16-inch withdrawal, and using the above dimensions, the following results are obtained:

West Pool -----	32,994.3 gallons
East Pool -----	20,640 gallons
24-hour withdrawal -----	53,634.3 gallons

Due to the fact that sides of the pool slope slightly, measurements of sides were taken outside actual water's edge, and the sides are irregular. there should

THE NATIONAL PARK SERVICE

PARK SERVICE MEADOW						INDIANS											
19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6

Interlocked Pools

uous flow.
 a, taking a 16 inch
 d, water was always

vice got 1/4.

llons per minute

nt of 8.36 gallons

Upper Meadow Pool.

TIME DIVISION OF WATER OF PIPE SPRING NATIONAL MONUMENT BETWEEN INDIANS
AS WAS DONE DURING LATTER PART OF SUMMER OF 1933

INDIANS									PARK SERVICE MEADOW			INDIANS				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

SEPTEMBER 1933

TIME DIVISION GRAPH (basis, supply of 33.44 gallons/minute flow)

In effect during latter part of Summer of 1933.

1. Indians received 33.44 gallons per minute during a 9-day period.
2. Park Service Meadow received 33.44 Gals./minute during next 3-day rush from the interlocked Pools. At the end of the third-24 hour diverted entirely to Indians.
3. Therefore ---- Indians got 3/4 of interlocked Pools supply-----
4. With supply of 33.44 gal./minute, Indians got equivalent of 25 continuous flow.
With supply of 33.44 gal./minute, National Park Service got equivalent of 25 per minute continuous flow.
4. Cattleman received 7.7 Gals./Min. output of Tunnel Spring at over (Not related to above diagram).

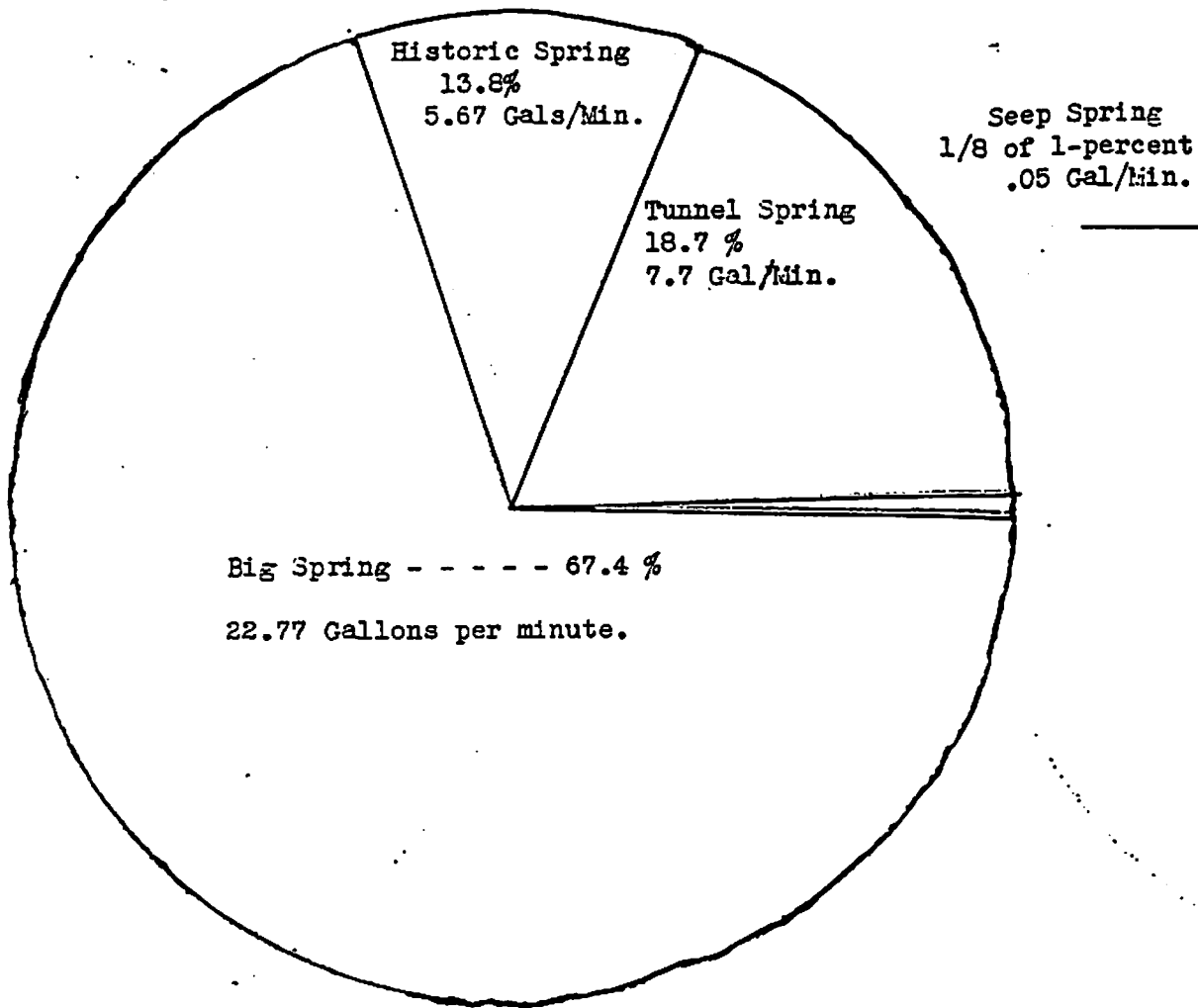


Fig. 8.

Flow of Springs on Pipe Spring National Monument shown as proportionate parts of 41.19 gallons per minute effective present flow.

Historic Spring-----	13.80 %	-----	5.67 Gals/minute		
Big Spring-----	67.40 %	-----	27.77	"	"
Seep Spring-----	0.12 %	-----	0.05	"	"
Tunnel Spring-----	18.70 %	-----	7.70	"	"
Total -----	100.02 %	-----	41.19	"	"

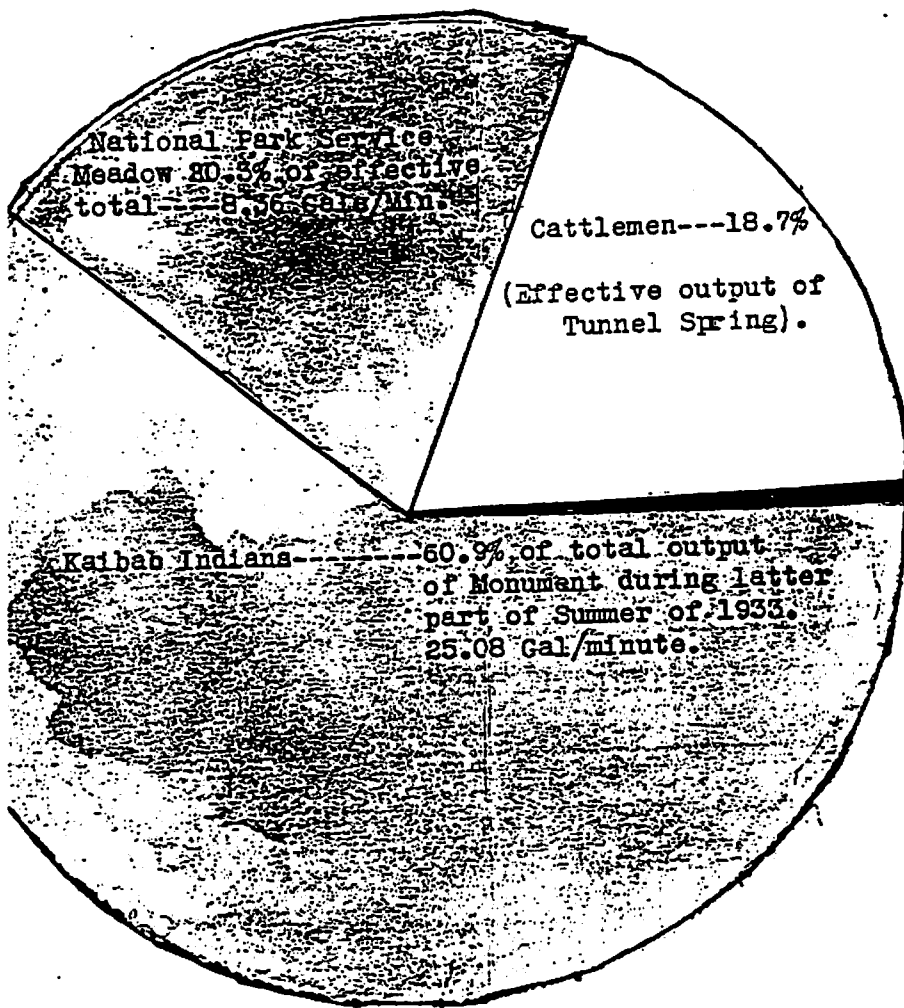


Fig. 9

Seep Spring

(Unutilized---.05 Gal/Min.
0.12%)

Division of the 41.19 Gals/Minute effective yeild as was done during Summer of 1933.

Kaibab Indians-----	60.90 %	of total output	(3/4 of water after Tunnel and Seep Springs deducted)
National Park Meadow-----	20.30 %	" " "	(1/4 after deductions).
Cattlemen Assoc.-----	18.70 %	" " "	(Output Tunnel Springs at Upper Meadow Pool overflow).
Seep Spring-----	0.12 %	" " "	(Unutilized)
Total -----	100.02 %	" " "	41.19 Gallons/Minute.

be approximately 10 percent reduction to take care of these factors. This would reduce the 53,634.3 to 48,270.87 gallons.

The 48,270.87 gallons in 24 hours checks out to 33.52 gallons per minute.

(See Figure 7a.)

Earlier in the day I stepped off the sides of the pool and allowing for loss of 10 percent since some corners are not square, and sides of pool slope, I obtained 34.1 gallons per minute. Dimensions used were:

West Pool

45' by 75'

East Pool

42' by 42' by 45' by 54'

16 inches as depth was taken

This is pretty ample proof that Acting Custodian (Laborer) Heaton is dividing the waters exactly as he explained. And of course, his procedure can always be checked by the Indians for the instant any water were to be taken at odd times, the water would cease running to the Indian Pools just outside the Monument and the Indians would immediately come forth with objections.

Thus, the 33.52 gallons per minute calculated upon the capacity of 16 inches of the Pools depth checks with the 33.44 gallons per minute obtained by adding the 27.77 for the Big Spring and the 5.67 for the Historic Spring.

See two graphs on the following page. See also bar diagram, Figure 10.

The report by Assistant Superintendent Parker states (page 3) that the two ponds designated as Upper and Lower Meadow Pools on my sketch "were recently constructed in the meadow as duck ponds by the Heaton's."

The elder Mr. Heaton (Charles) stated that Mr. Mather regarded the construction of these pools as an addition to the beauty of the little meadow. They were constructed, it seems, both with the approval of Director Mather and Superintendent Pinkley. This was done in 1926. Acting Custodian Heaton does have about a half dozen geese which range on the lower end of the Monument. No ducks were observed about. The burden of evidence will be found to prove these pools were designed for their scenic effect and approved with that end in mind.

ACREAGE UNDER IRRIGATION FROM WATER OF ALPINE SPRING

C. I. The National Park Service.

With one-fourth of the 33.44 gallons per minute in the Interlocked Pools, the Park Service Meadow of a little more than 2 acres is being watered. Trees of the Monument are also being irrigated. ←



Figure 7-a.

Valve situated near bottom of West Pool. Inter-locked Pools can be lowered 10 inches in 1½ hours. For 3 out of 12 days during summer of 1935, water was delivered through this valve to Park Service Meadow. Remaining 9 days, full flow of more than 33 gallons per minute went to Indians.

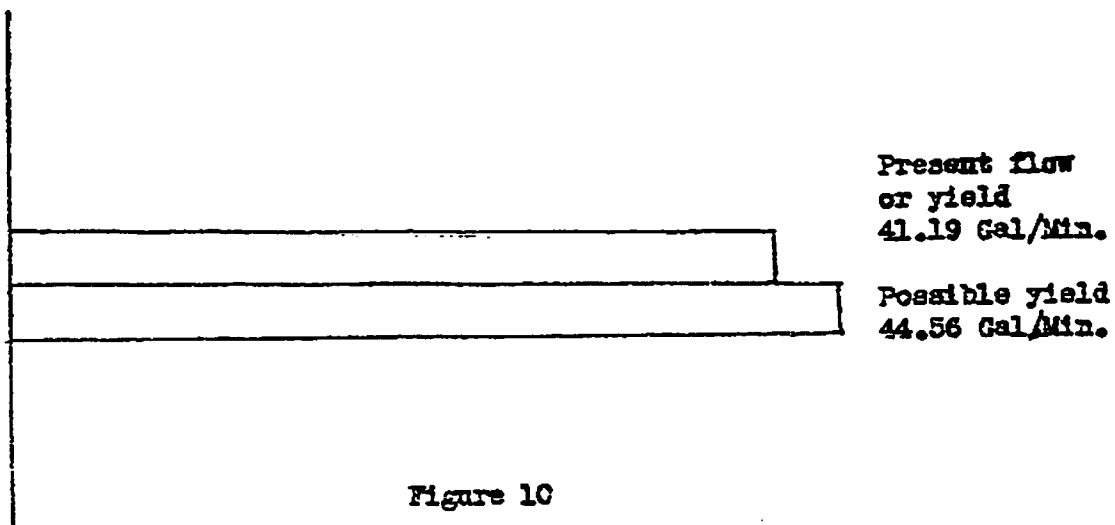


Diagram showing graphically that present yield is approximately 92% of greatest possible yield of all springs and seeps on the Monument.

The Monument area is 40 acres. The early Mormons had orchards, gardens, and many more trees than are now on the Monument. With the reservation of the Winsor Castle there was also the reservation of its setting. For increased cultivation and irrigation of the future, and with increased needs for tourists and the Custodian's residence and public facilities, it would seem unwise to turn over 99 percent of the water to the Indian Service after the Cattlemen have been recognized. The entire Mormon Church is interested in the preservation of this memorial to early Mormon history. If we give away all but a figurative spoonful of this monument's water and cannot carry out the development of gardens, orchards, trees, and meadows, we will be breaking the faith Mr. Mather developed with the heads of the Mormon Church. Some of the leaders of that Church were recently at Pipe Spring National Monument for the unveiling of a marker of the Utah Pioneer Trails and Landmarks Association which was erected at Pipe Springs.

The Mormon Church had faith in Mr. Mather's desire to recognize the rights of Cattlemen. They were also enthusiastic about Mr. Mather's intense interest in restoration of the place to its old historic standard. To do both of these things will require that (1) we recognize the Cattlemen's legal or moral right to water as the case may be, and (2) that we guarantee ourselves the necessary amount of water to care for all of the needs, present and future, of the Monument. With the Indian Service feeling that the Monument needs only enough for cooking and possibly for a cow and chickens, there is certainly a mistaken idea of the rather large proportion of the water that will be needed to develop the Monument as Mr. Mather and President Grant had in mind when it was turned over to us, and to develop it in accordance with present park standards.

II. The Cattlemen's Association.

The Cattlemen are getting the overflow from the Upper Meadow Pool that reaches their pools. Acting Custodian Heaton is not raising garden or other crops this year.

III. The Indian Service.

The Indian Service uses three-fourths of the total flow of the Historic and Big Springs. This three-fourths of 33.44 is 25.08 gallons per minute. With this three-fourths of the supply to the Interlocked Pools, they irrigate a patch of ground of the dimensions shown in the figure (Figure 11) shown on the next page. This area is 3.11 acres.

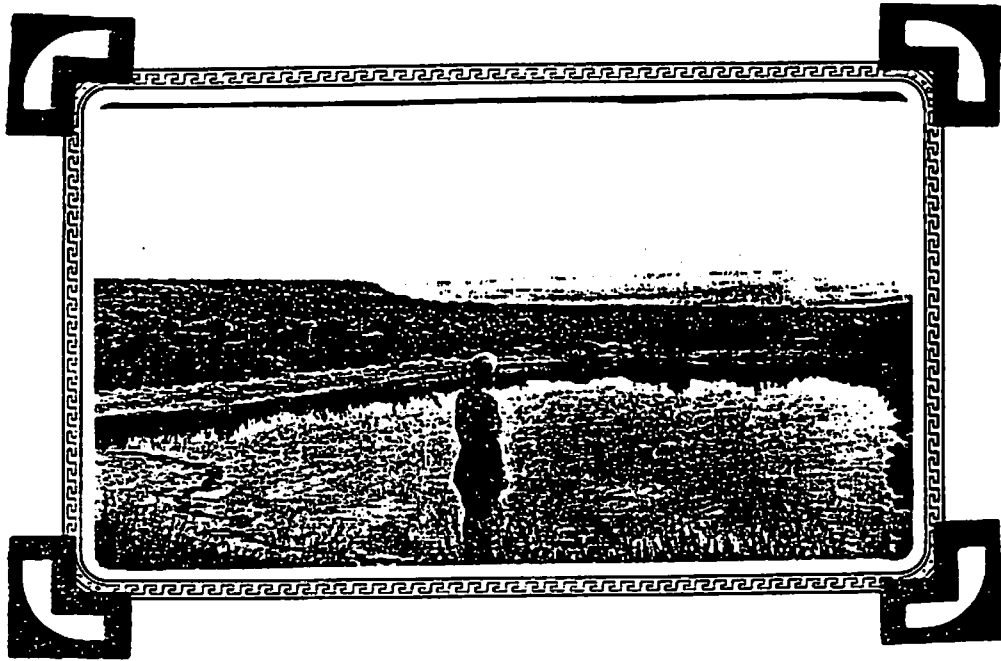


Figure 11.

Indian Pool just outside southeast edge of Monument, into which three-fourths of total flow into Interlocked Pools of Monument has been supplied during 1953 summer.

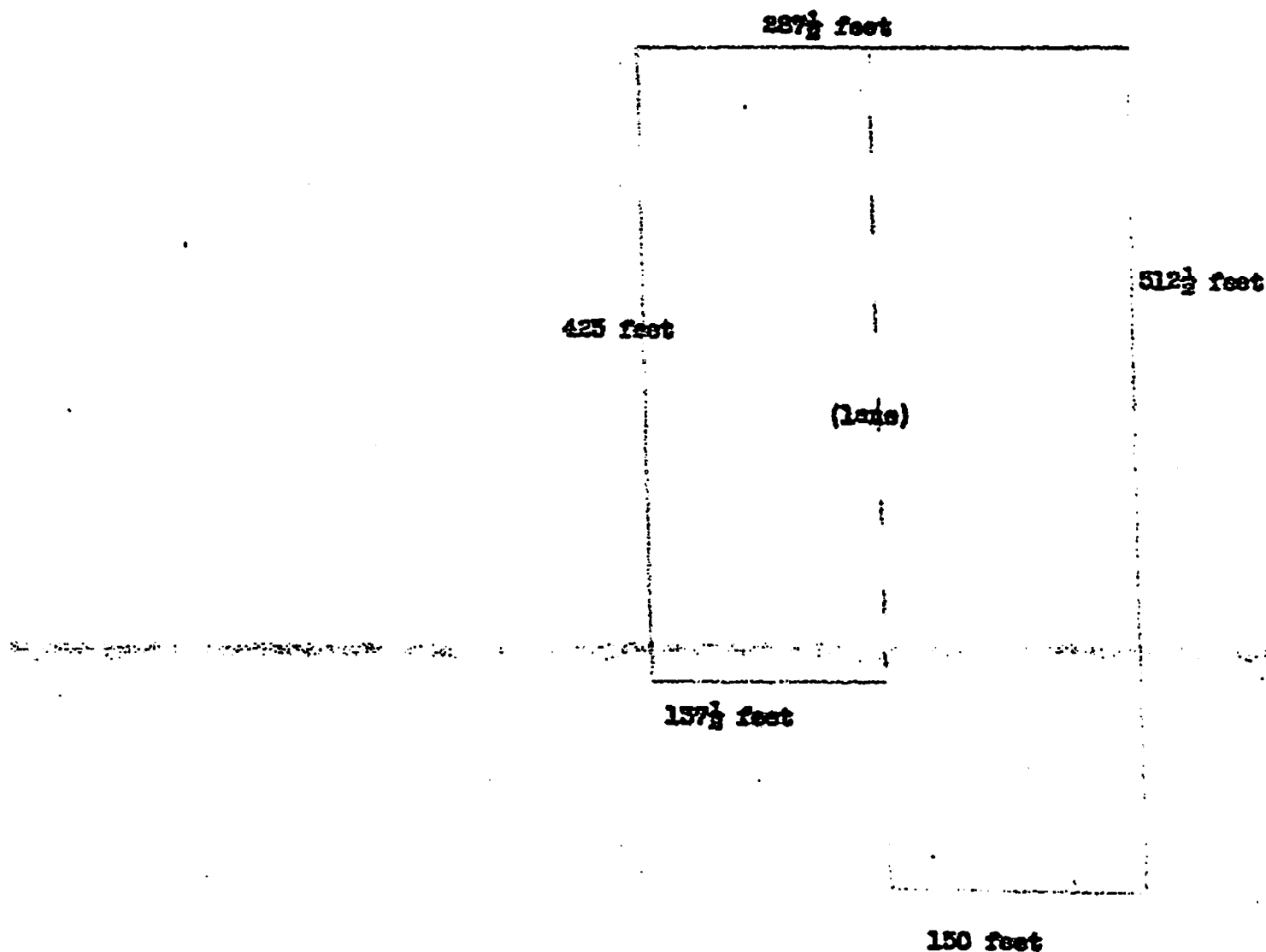


Figure 11.

Shape and approximate dimensions of 3.11 acre Indian corn field and garden plot just S.E. of Monument. Same amount of water ($\frac{3}{4}$ of 33.44 gal/min) should irrigate at least three times this much.

D. EFFICIENCY OF PRESENT UTILIZATION OF WATERS BY INDIANS

All water available on Monument with improvements ----- 44.56 gal.min.
or 2,673.6 gallons per hour, or ----- 64,166.5 gal. day
or in 8-month crop season, 240 days ----- 15,399,936.0 gallons
At 7.48 gallons per cubic foot, equals ----- 2,045,453.7 cu. feet
2,045,453.7 cubic feet equals 46.95 acre feet during 8-month crop season.
Duty of water in Pipe Springs region is about 2.5 acre-feet per acre.
Therefore $\frac{47.2}{2.5}$ equals 18.8 acres which could be irrigated with the
entire water output of Pipe Spring National Monument.

Leonard Heaton, Acting Custodian, and his father, Charles Heaton, never used the entire water output of these springs. However, they said that at best, with all water from the Big and Historic Springs and the Tunnel Spring that they could irrigate approximately 15 acres and in addition care for the needs of the Cattlemen. This is a pretty close check on 18.8 possible acres.

I. Acreage Irrigated by Indians. (See Figure 12.)

Instead of irrigating three-fourths of 15, or $11\frac{1}{4}$ acres, the Indians have a plot 3.11 acres under cultivation. In other words, they should be cultivating 3.6 times as much as they now are, with the same amount of water they have been getting during the summer. See diagram of Indian Field, Figure 12a.

a 4-inch pipe carries three-fourths of the supply of the Interlocked Pools to a pool of the Indians just off the Monument. The Indians can accumulate about $1\frac{1}{2}$ feet head of water in the pool by corking the end of a pipe. This method of irrigation with a small head of water causes great waste. The water is allowed to trickle in little ditches down the rows of corn and garden plants. Upon visiting this field, at its lower end a small stream of approximately 5 gallons per minute was going to waste. The snapshot enclosed shows this stream. (Figure 13)

It would appear, therefore, that no great need or emergency for water exists on the part of these Indians, who are raising 3.11 acres of crops where they should, properly directed, be raising more than 10 acres.

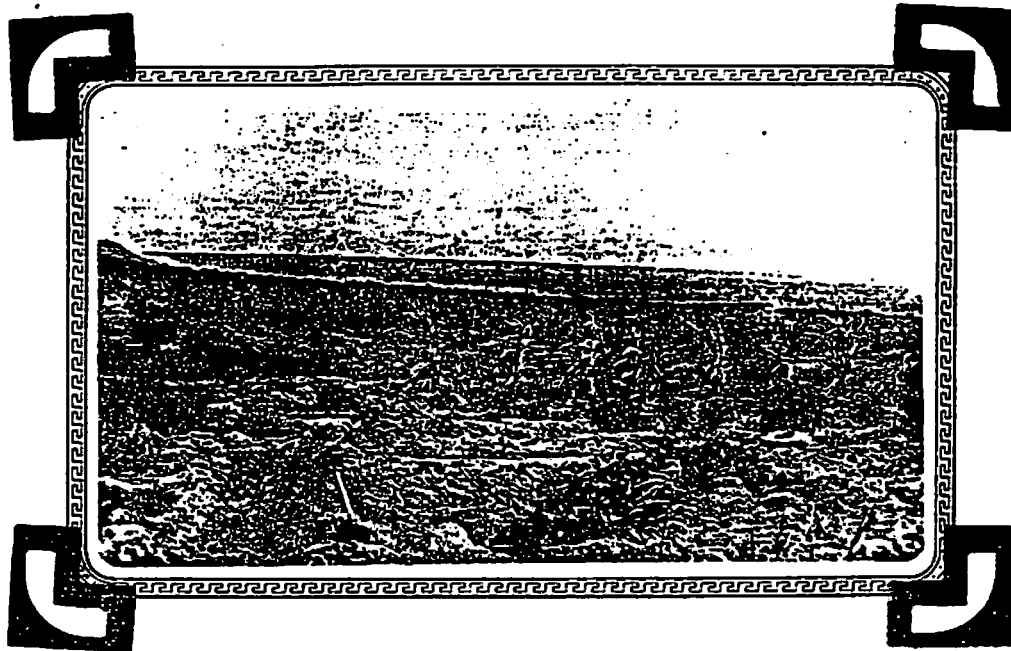


Figure 12.

View of 3.11 acre patch of garden and corn Indians raised during summer of 1933 with three-fourths of 35.44 gallons per minute that flows into Interlocked Pools. Efficient utilization should make possible about 11 acres on same water.

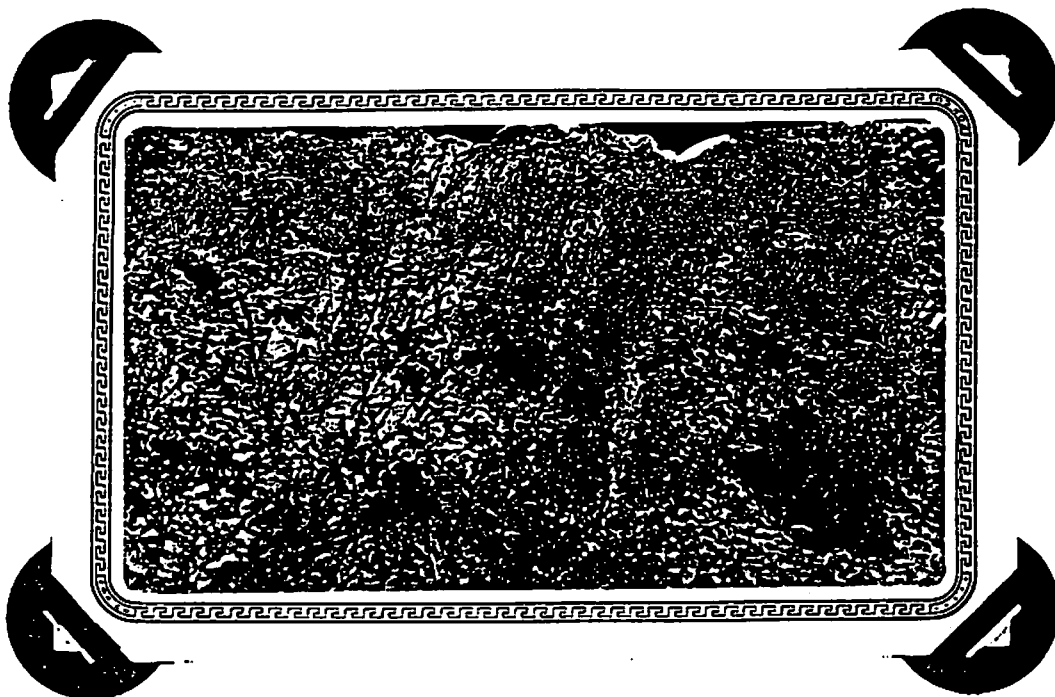


Figure 13.

Indians irrigate the 5.11 acres frequently, allowing much water to run away unused. This approximately 5 gal/min. was running away at time of observation.

Suppose 3.11 acres were the most that could possibly be irrigated with three-fourths of the Interlocked Pools output. On this basis, not even one more Indian family could be supported if they got four-fourths of this water, for two Indian families are represented in the 3.11 acres now under cultivation, and the remaining one-fourth of the water would, under this supposition, irrigate only .78 acre. On present usage, one family needs 1.56 acres.

SPRINGS AND SEEPS OUTSIDE THE MONUMENT USED BY INDIANS

Just outside the north boundary of the Monument on Indian Reservation land is a small spring near which is camped a family of Indians. This family is one of the two sharing the 3.11 acre patch south of the Monument.

A. Flow of North Seep Indian Spring:

Taking a small container nearby and my watch, I found the usable output of this spring less than a gallon a minute. It is in a very unsightly condition. Litter, old buckets, and trash are all over its exit slope. While a little tunneling has been done, other than that the spring presents a most neglected appearance. Yet, with the spring cleaned up, rock walled, and flumes constructed, the output could be made to approximate 1 gallon per minute, or 1,500 gallons a day.

The Indians were soaking a cowhide in one of the several mirey pools above the steel barrel section shown in the picture (Figure 14). This family is making no garden use of this water and to drink any of it would be most unhealthful. The point is that if there were a crying need on the part of the Indians, this spring could be cleaned up, production increased, and efficient utilization begun. (See also Figure 15.)

B. Two-Mile Wash (Indian Reservation)

It occurred to the writer that if this problem were to come to a head, the final decision would rest on the actual urgency of the need which Indians might have for more water. In other words, when there is no precedent or test case to look back upon, the outcome of a case coming up around entirely new sets of conditions will largely depend upon relative needs for water by the parties concerned.

The Two-Mile Wash is northeast of the Pipe Spring National Monument a distance of about two miles. The water seeps from the channel of an arroyo and runs some distance to where a small storage reservoir has been made by damming the arroyo. The following facts were observed:

- (1) The amount of water leaving the small reservoir in an open top ditch is practically twice the 33.44 gallons per minute supplied to the Interlocked Pools on Pipe Spring National Monument.



FIGURE 10.

North Deep Indian Spring just outside monument. This spring isn't cleaned up. An efficient utilization of waters is in effect. Present effective yield of approximately 750 gallons daily could be increased to 1,500 gallons daily.

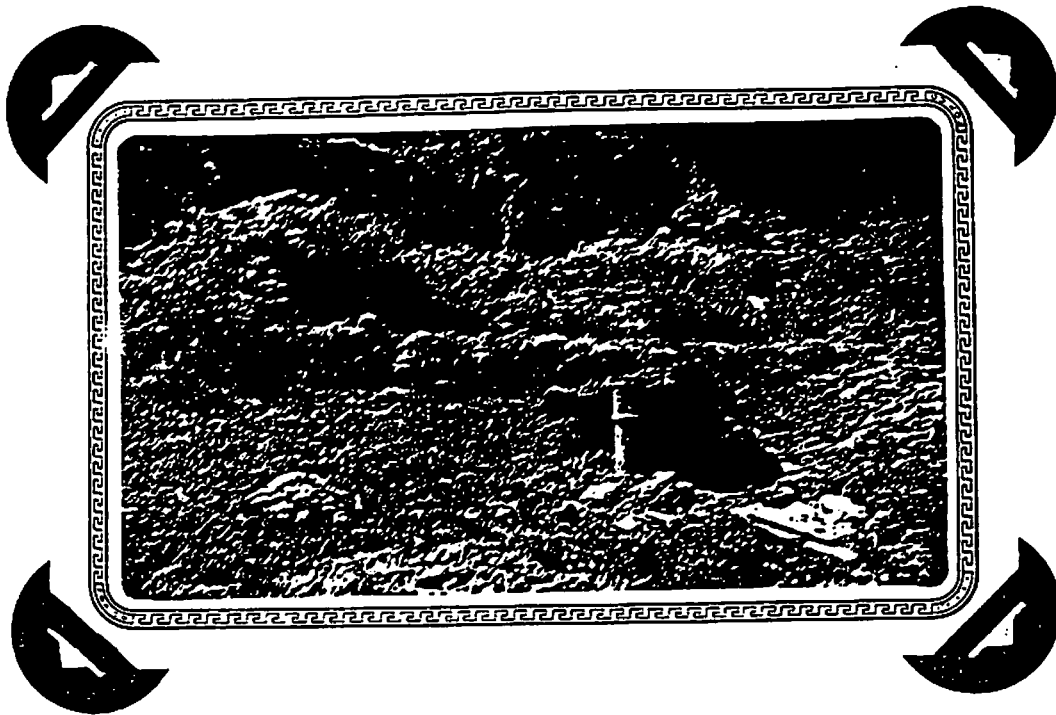


Figure 15. (Same Spring as Figure 14)

Considerable litter and mire about North Deep Indian Spring just outside Monument. Water not efficiently utilized by Indians.

- (2) Approximately 60 gallons per minute, is my estimate of the amount of water leaving the dam.
- (3) The 4-inch pipe leads the water from the dam into an open ditch. The soil is sandy and there is a very high seepage loss. In 300 yards flow in this open ditch the loss is around 30 percent.
- (4) At this rate, probably not more than half of the original 60 gallons per minute reaches the Indian fields and gardens.
- (5) Between two and three miles of pipe line to replace the open ditch would save almost half the amount of water leaving the dam.

C. Indian Use of Water:

- (1) Two little plots of ground, one less than 1 acre and the other less than 2 acres, are under cultivation. Thus, less than 3 acres are watered on about 30-gallons per minute - almost the entire output of the Interlocked Pools at Pipe Spring Monument.
- (2) On basis of previous calculations, the 30 gallons per minute should be irrigating nearly 12 acres of crops if efficiently used. The Indians are irrigating one-fourth that amount.
- (3) The seepage loss is high because the ditch walls, by capillary attraction, are moist for 6 inches to 1 foot above the running water surface. This is conclusive proof of both high evaporation and seepage losses.
- (4) With pipe lines direct from the small dam, approximately 60 gallons per minute could be supplied to the Indians - enough water for 25 acres of cultivation.

Hence, again, if there were an acute need for more water on the part of the Indians, with a little help they could be irrigating 25 acres at the Two-Mile Wash instead of the meagre 3 acres or less now under cultivation.

Therefore, in view of the following observations, summarized, I do not believe the Indian Service is in immediate need of more water for the Indians on the Kaibab Reservation.

- (1) Under efficient supervision, the Indians should be having more than three times the 3.11 acres under cultivation near the

south end of the Monument.

- (2) If acute need existed, the seep spring north of the Monument boundary could be cleaned up and improved both in point of flow and efficiency of utilization.
- (3) If an emergency need existed, the Two-Mile Wash Seep could deliver, with piping, almost twice the water now being obtained from it - enough to irrigate almost 25 acres of ground. The present output of about half that much is being used to irrigate less than one-fourth the crop yield that could be had from this available half. These figures are based upon the average duty of water in that area as accepted by irrigation engineers.
- (4) Though I did not personally make an examination of Moccasin Springs, it appears, from several I consulted about it, that Indians are not getting near the acreage from waters there that white people are obtaining.

ADMINISTRATION OF PIPE SPRING NATIONAL MONUMENT

Mr. Leonard Heaton, Acting Custodian of Pipe Spring National Monument, is on Laborer status. His yearly salary is \$1,200. Less 15%, leaves a net salary of \$1,020. I arrived at the Monument unannounced, but found Mr. Heaton dressed in the regulation uniform of the National Park Service as shown in the accompanying photograph (Figure 16).

Laborer Heaton has made meritorious efforts toward improving the appeal of the Monument to the visitors. Among these are:

- (1) He has secured the loan of old bedsteads, spinning wheel, old churns, and other items of pioneer history, from his wide acquaintance of Mormons in the Pipe Springs region.
- (2) Collected the more common snakes of the region and has them on display for the visitors.

View of Monument Contacted by the Visiting Public:

Pipe Spring National Monument, especially the old Mormon Fort and the Interlocked Pools, presents a really beautiful picture to the approaching visitor. This is proved effectively in the accompanying snapshot (Figure 17). This view and the one following ~~(Figure 18)~~ show the portion of the Monument the visitor sees in coming in. Mr. Heaton irrigates the trees, handles the distribution of the waters for the Monument, and serves as guide to visitors.

I walked down south of the Trans-Monument road and secured the view next shown (Figure 18). Visitors never go down as far as I stood to take this picture. In the cluster of trees are a few of the houses, including a garage and chicken houses. Mr. Heaton is moving the chicken houses on down to the south out of view and by next spring only the garage, the large



Figure 16

Laborer Heaven. Acting Custodian Pipe Spring National Monument.
Left foot is in background. Department care made for snakes
of vicinity, by Heaven.

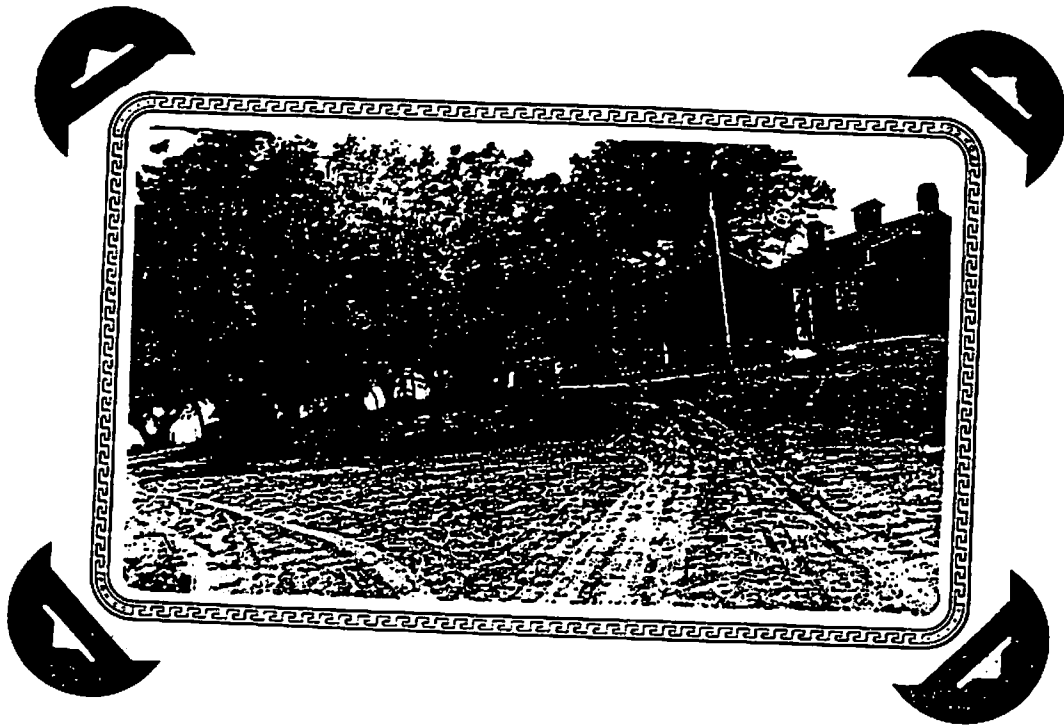


Figure 17.

View of labor house and surrounding area.

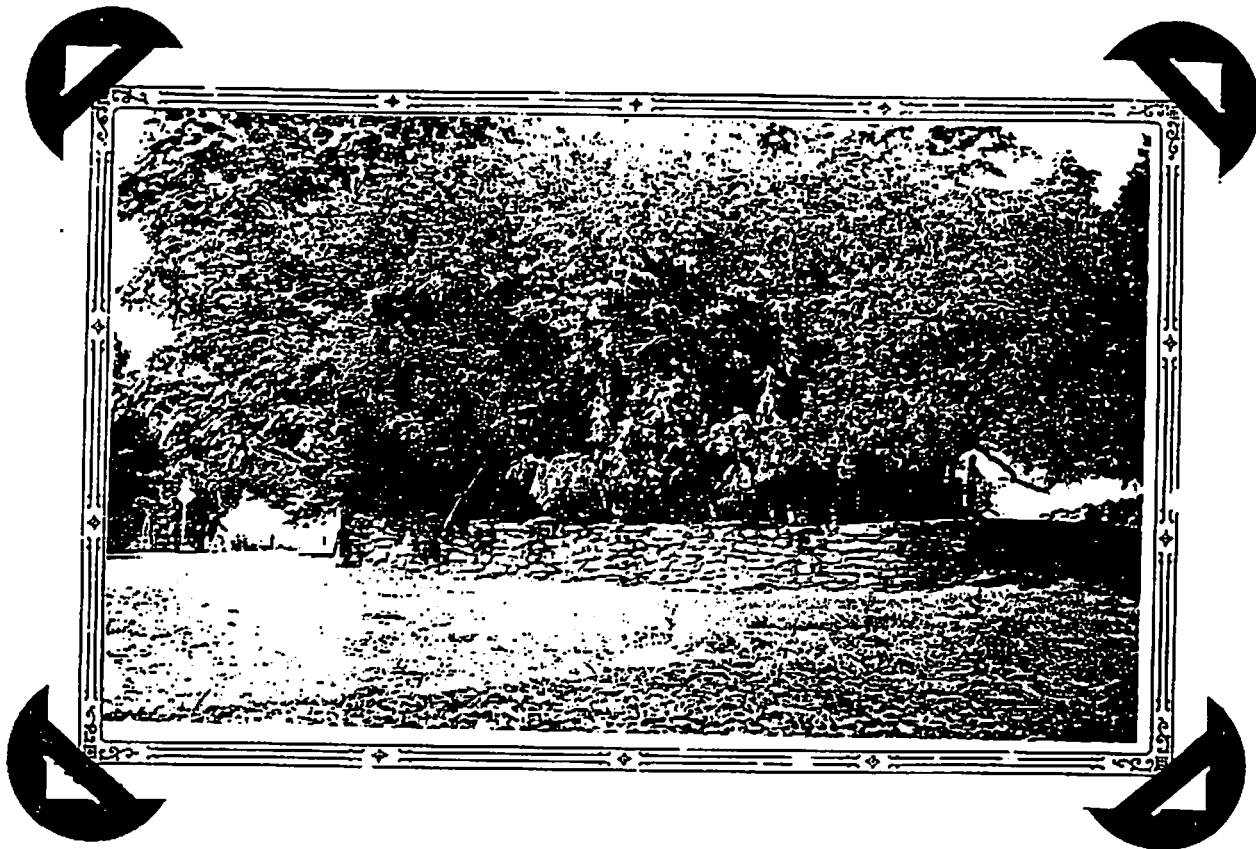


Figure 17a

There is shade in abundance about the Interlocked Pools and Winsor Castle. This photograph was taken about eight years ago. Visitors approach this view from the east.



Figure 18.

The Acting Custodian is moving smaller houses down to a more secluded spot on Monument. Picture taken from much closer position than visitors reach.

boarded building, will be left. This garage, Mr. Heaton wants to rebuild making it smaller and more attractive and if, on his \$1,020 salary, he can at all afford it, he will have that completed by spring also. Because of no Park Service money for all of this, Mr. Heaton will, at his own expense, remove old buildings that have been on the Monument for years. Under pioneering conditions, this would prove that a pretty creditable desire for improvement prevails at Pipe Spring on Laborer Heaton's part.

Another View Farther South:

See Figure 19. I took this snapshot standing below the last houses shown in the clump of trees above. This view is still farther removed from the area contacted by visitors.

Look carefully at the location shown by arrow. Here is where Heaton will finally have such chicken houses as will be left on the Monument. I found Mr. Heaton desirous of removing his cow, few calves, and chickens all off of the Meadow and placing them down in this secluded part of the Monument, or taking them five miles to Moccasin and range them on his father's and brother's land. On present meagre salary, Mr. Heaton rather badly needs these few chickens and cow near to enable him and his family to live on the Laborer's salary. With a little help, I think Laborer Heaton will cooperate in bettering appearances of the Monument as much as he can possibly afford.

Let us suppose that a full \$1,860 salary were immediately available and a man were drawn from Civil Service. Further, suppose this man had a Service-built residence to live in. This man could take 5 men, a team of horses and wagon, and in 10 days remove every evidence or trace of structures now needed by Mr. Heaton for chickens, cow, and calves. Upon inspecting the relocation with Architect Langley of the Branch of Plans and Designs, we agreed that Mr. Heaton is placing his chicken house and small barn in a successfully secluded spot on the Monument. This spot is 200 yards from any point a visitor will ever approach and the houses are secluded as shown in the last view above. Early Mormons had poultry and stock on the Meadow and, after all, this point isn't seriously inconsistent with history.

Fences About the Meadow:

See Figure 20. A previous report voiced a protest that "Custodian (Laborer) Heaton - parentheses mine - has been allowed to fence off a little oasis (approximately 2½ acres) and is using it for purposes of pasturing. . ."

In going into this problem of fences, I found that there have been fences in these exact locations since the 1880's. A few fences of the early days have actually been removed. Apparently, no fences in new locations have been constructed. Existing fences that have been there 50 to 60 years have been repaired or replaced from time to time.

Necessity of Fences:

While it is true that Heaton has been grazing the Meadow to a limited extent and the fences aid in keeping his stock confined, investigation

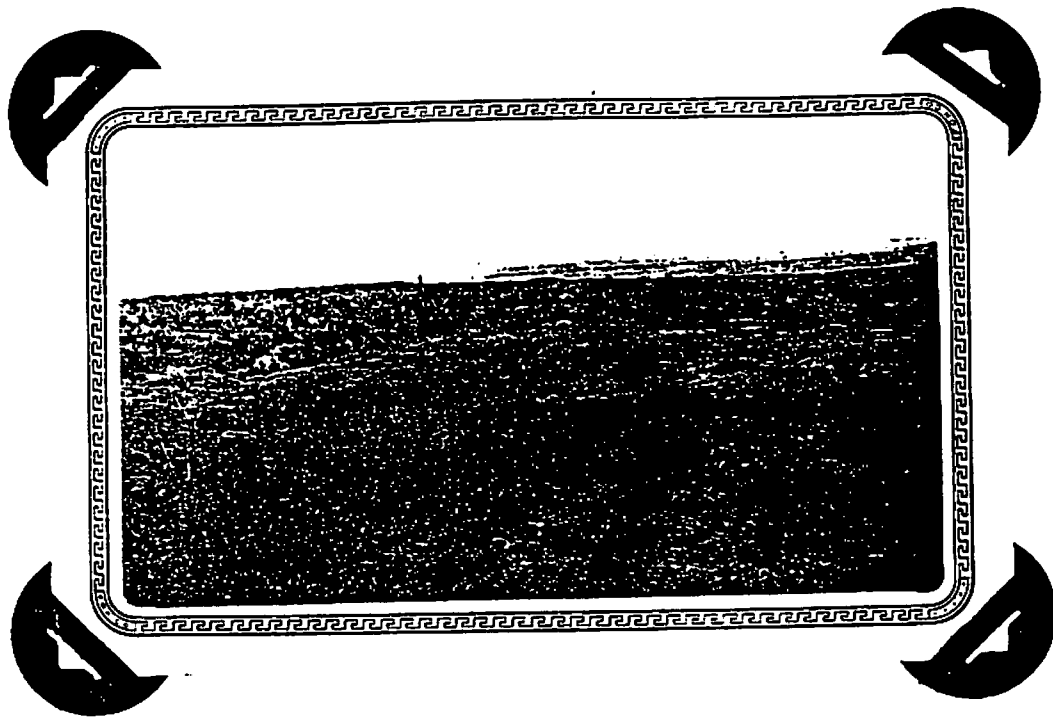


Figure 19.

Here's where small structures of previous view are being moved.

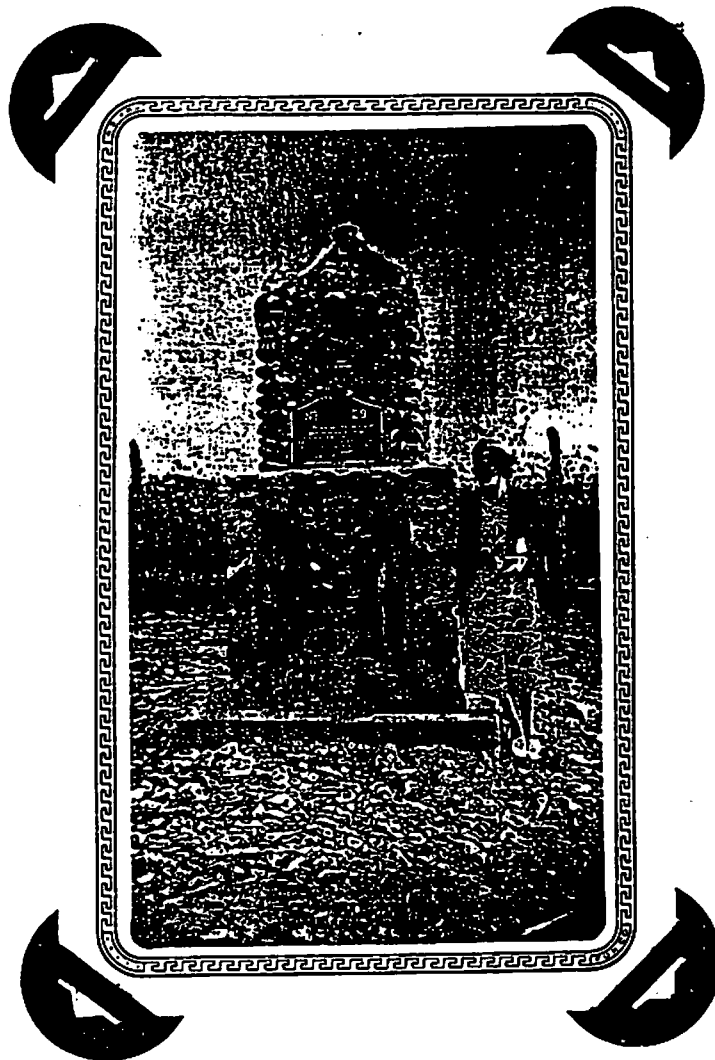


Figure 21.

Pipe Spring National Monument marker at Fredonia, Arizona, constructed by Utah Pioneer Trails and Landmarks Association. September 2, 1933, civic and Church leaders assembled here and at Pipe Spring for dedication of markers. Interest in Pipe Spring is live throughout the entire Mormon realm.

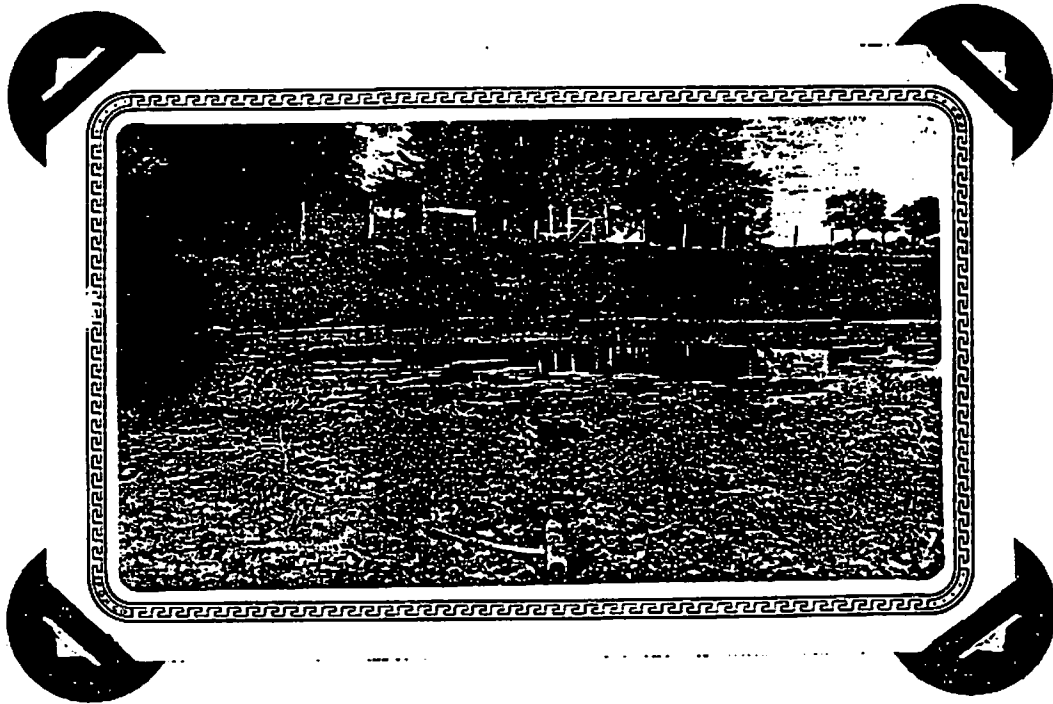


Figure 20.

Fences shown have been rebuilt where previous fences of early Mormon days were located. Fence along road absolute necessity to keep out stock running at large.

revealed that it is absolutely necessary to have the high fence along the road to keep out stray range cattle and horses. There are frequent drives of horses and cattle through the Monument on the Trans-Monument road and were it not for our high fences, our entire Meadow would be frequently overrun by the outside stock. The building of these fences cannot be charged to Laborer Heaton since they have been there almost since the history of the place began. In the future development of the Monument practically all of the present fences will have to be retained if the historical restoration is complete.

Summarization of Administrative Problems

I think the investigation outlined above proves the following:

- (a) That (1) the reallocation of the Laborer Position to a Civil Service Ranger Position; (2) the appropriation of necessary funds for an adequate residence for this Custodian; and (3) the providing of sufficient maintenance money through appropriation for this Monument; would promptly solve all problems as to the general appearance of the Monument. Even with Laborer Heaton retained, and the remaining conditions met, the problem of the appearance of the Monument would be completely solved.

The finest, most highly developed of the national parks have gone through their pioneering stages when the finest view of cliffs or a water fall was from a stock corral, or when temporary wooden shacks greeted the view of visitors on several turns of the road. Appropriation of sufficient funds for such parks easily solved the problem. Similarly, the problem at Pipe Spring will be solved - that is, the problem of temporary buildings, not the water problem, which is another independent issue entirely.

Pipe Spring National Monument is in its pioneering stages. We know that, and we know what is needed to remedy such administrative problems as exist there. The water problem is another matter. Solving the administration of the Monument doesn't solve the water problem. Tip-top Park Service standards wouldn't solve the Water Problem there, and I want to emphasize this point, for it must be understood in order to make the issues there clear.

SUMMARY AND CONCLUSIONS OF WHOLE INVESTIGATION

- (1) Water discharging from Big Spring (27.77 gallons per minute) and the Historic Spring (5.67 gallons per minute) totals 33.44 gallons per minute. This is the total amount flowing into the Interlocked Pools. The 7.70 gallons per minute from Upper Meadow Pool goes to Cattlemen. Total 41.14 gallons per minute, is present water yield at Monument.
- (2) Any material increase in available water at the Monument hinges upon cleaning Tunnel Spring entrance and constructing a flume.
The greatest possible increase: 41.14 gallons per minute might be increased to 44.56 gallons per minute, less than 10 percent increase over the present available water.
- (3) No further extension of the Tunnel into the hill should be permitted under any circumstances. Tunnel Spring emerges 22 feet lower than Big Spring and directional trend of fracture and joint system strongly indicates connection between the two springs.
- (4) This water difficulty is not between merely the Heaton of Moccasin, and the Indian Service. The Cattlemen's Association is made up of 13 signatures with Heaton Brothers as only one of them. Heaton cattle rarely make up more than one-fourth all of the cattle that figure in this water problem.
- (5) The Indian Service bases their claim to the waters and are contesting legal rights of Cattlemen solely on the wording of the Presidential Proclamation, which wording was in all probability inserted by that Service when the Proclamation was being prepared. They seem to interpret "use waters" to mean ALL water, and the Indian Service seems to pass up the statement " . . . subject to all prior valid claims . . . "
- (6) The National Park Service, it seems, is not aware that its future needs will require a large portion of all available water on the Monument after Cattlemen are recognized. Our Service should, it seems, remember that the Heads of the Mormon Church - not merely Heaton - are interested in the complete historical restoration of Winsor Castle and its setting of trees, orchards, meadows, and gardens. Mr. Mather's dream was to carry out this beautiful restoration. It seems to fall short of this future program would mean breaking the faith of the whole Mormon Church in the National Park Service and Mr. Mather. We must realize the magnitude of this intense interest in Pipe Spring. It is the whole Mormon Church and its leaders. Let's not make the grave mistake of underestimating this interest in Pipe Spring National Monument.
- (7) Under Arizona Water Law, and according to the Proclamation, the National Park Service accepted Pipe Spring Monument lands "SUBJECT TO PRIOR VALID CLAIMS" and there seems little reason to presume that the Indian Service OWNS the waters there now. The amount they receive, it seems, would be

contingent upon whatever SURPLUS is left after Park Service rights (acquired through transfer from private ownership) are preserved. These Park Service needs are, and will be, more than mere "culinary water, and possibly enough for a cow and chickens, and the small meadow."

- (8) The Cattlemen appear to have had legal rights to water under Arizona Water Law prior to the establishing the Monument. This would appear to be one of the "prior valid claims" which we, as owners of the land, should recognize in accordance with the Proclamation.
- (9) During the Summer of 1933, the Indian Service has been getting three-fourths of the 33.44 gallons going into the Interlocked Pools, except for small tourists' needs and water used by the Laborer's household.
- (10) The Park Service Meadow has been getting one-fourth of the same water after the small amounts taken are deducted.
- (11) It seems definitely established that the Indians are irrigating less than one-third the land their three-fourths of the water would irrigate if the Indians made the best use of available waters.
- (12) At Two-Mile Wash, if developed, the Indians could be cultivating 8 times the crops now being cultivated. Less than 3 acres are now cultivated, where possibly 25 acres could be irrigated if pipe were installed and farming were efficient.
- (13) THE INDIANS CERTAINLY ARE NOT IN DIRE NEED OF A FEW MORE GALLONS PER ACRE AT PIPE SPRINGS. If efficiently used, their present waters would irrigate from 3 to 8 times the amount of land they now have under cultivation.
- (14) Re-allocation of the Laborer's position to Civil Service Custodial grade and appropriation for residence and maintenance of the Monument would, in two weeks after operation, remove all trace of the pioneering appearance from the Monument.
- (15) Landscape architects should cooperate with us at once in working out definitely the future needs in trees, meadows, orchards, and gardens for an historical restoration of the Monument. The Engineers should then promptly have some one familiar with Irrigation Engineering submit figures on water the National Park Service needs for this restoration, and for residential and tourists' needs. We will then know just how much water we can turn over as surplus above our needs to the Indians.

Finally, solving the administrative problem at the Monument is only a matter of increased appropriations for (1) re-allocation of the Laborer position to Custodian or Park Ranger; (2) residence for the Custodian; (3) maintenance of the Monument premises; and (4) restoration of the Monument

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Setting as it was in past days. Such bringing of the property up to Park Service standards and maintaining those standards is contingent upon retention of rights we now have to Pipe Spring waters. The entire Mormon Church has a live interest in this most important historic landmark to their early pioneers. The Mormon Church fully expects us to bring the property up to Park standards by a full and complete restoration of Winsor Castle and its setting. To accomplish this end, most, if not all, of the water to which we now have legal right will be needed. Whatever is then surplus can be utilized by the Indians.

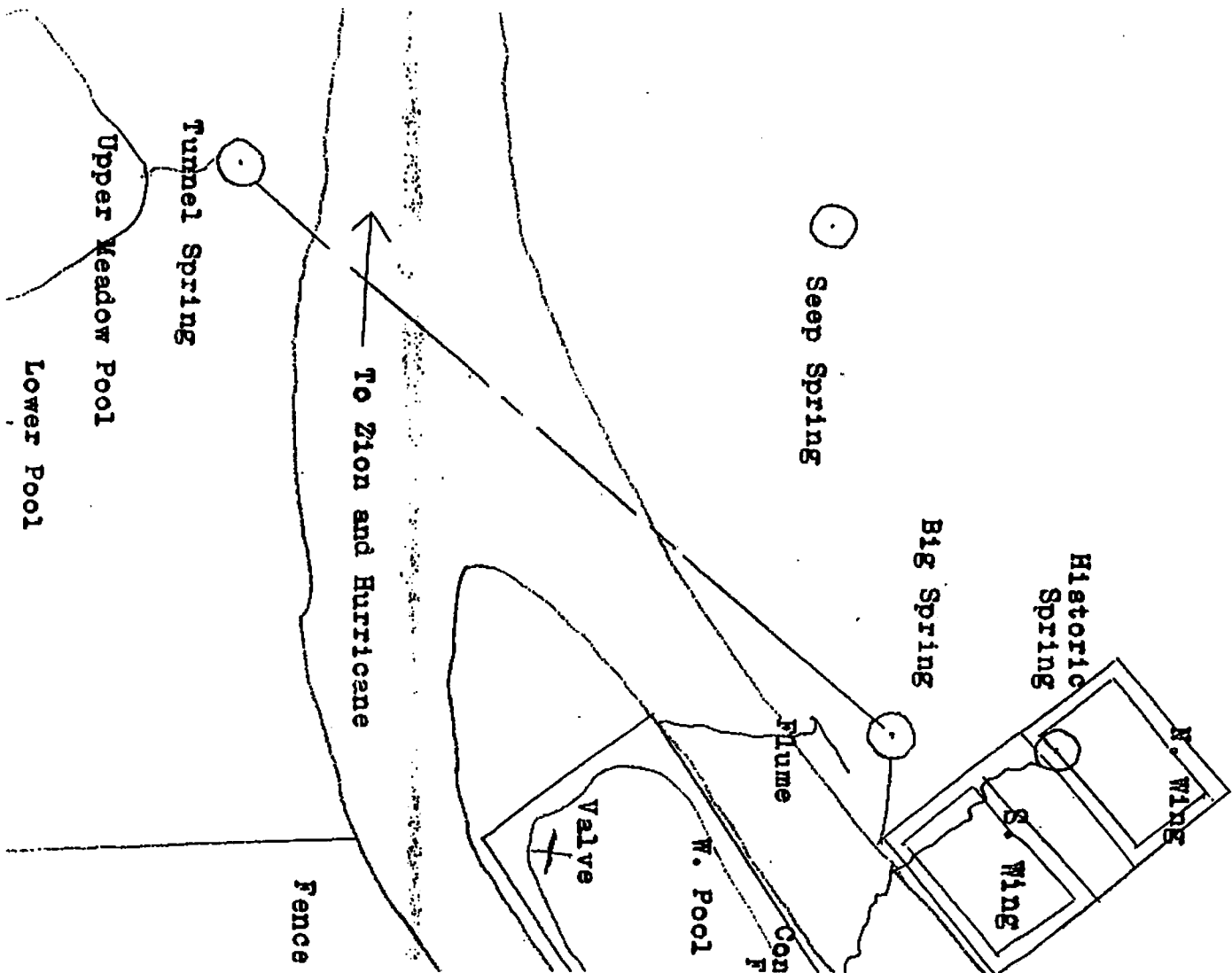
Respectfully submitted

Robert H. Rose,
Assistant Superintendent.

Approved:

Frank Pinkley,
Superintendent.

"Report on Water Resources and Administration
Problems at the Pipe Spring National Monument."
Robert H. Rose, Dec. 1933 - attachment



Records in the National Archives -- Rocky Mountain Region
Denver, CO 80225

RG NO. 79 *Nat'l Park Service*

ENS-079-94-143

39/16/112

*Letter: 660-05 water supply system (H.)
P.L.P.*