

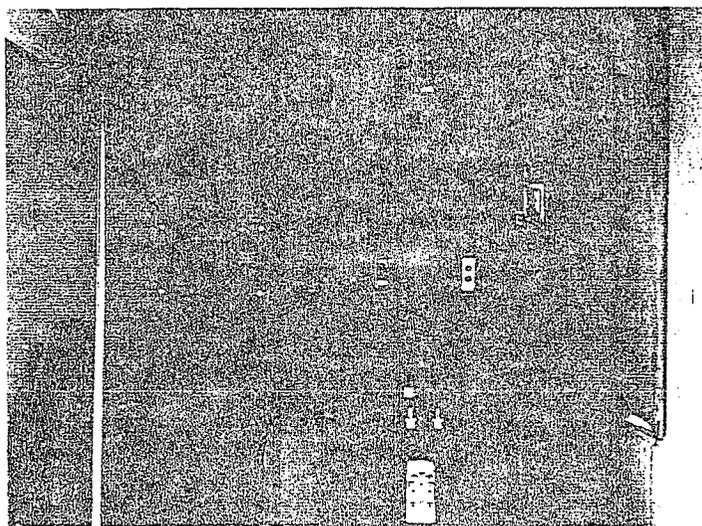
43

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: BOOSTER PUMP

Film No. 120

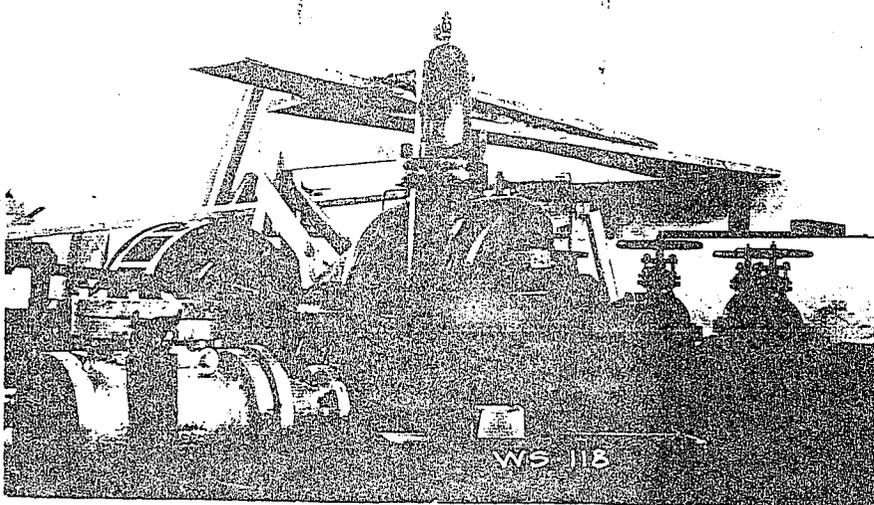
July 20, 1939.



Installing Switch Board and Starting Unit in substation  
at Booster Pump House.

Film No. 118

July 25, 1939.



Assembling Units connecting Pump to 10" Discharge Valves  
and Pipes. Check Valve on left.

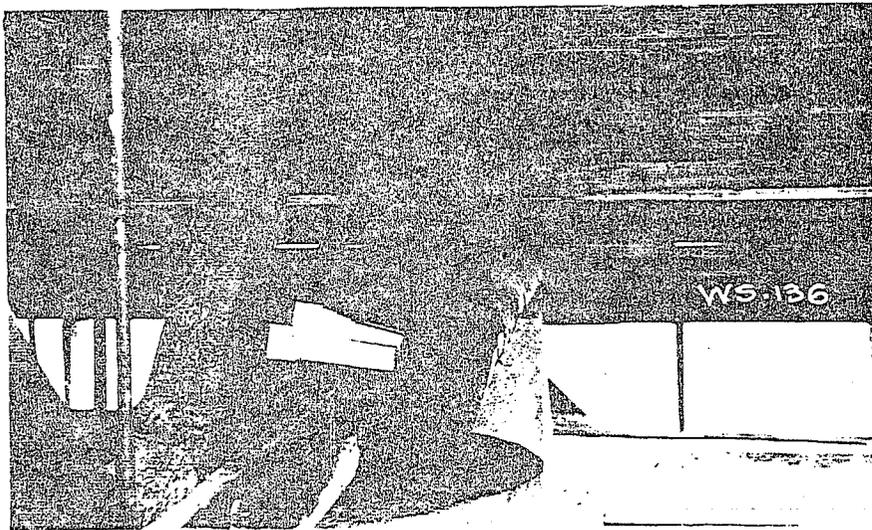
44 0

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: BOOSTER PUMP

Film No. 136

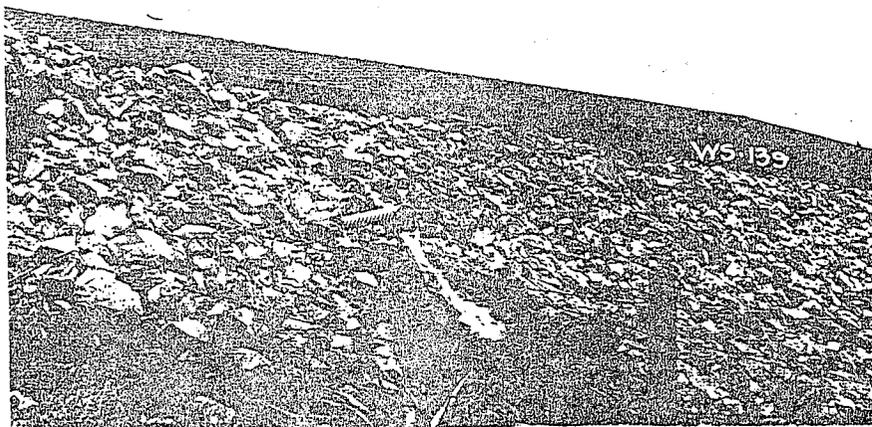
July 30, 1939.



Water from Booster Pump flowing from end of 10" Steel Pipe into Distributing Box of old Reservoir at rate of 530 gallons per minute.

Film No. 139

August 1, 1939.



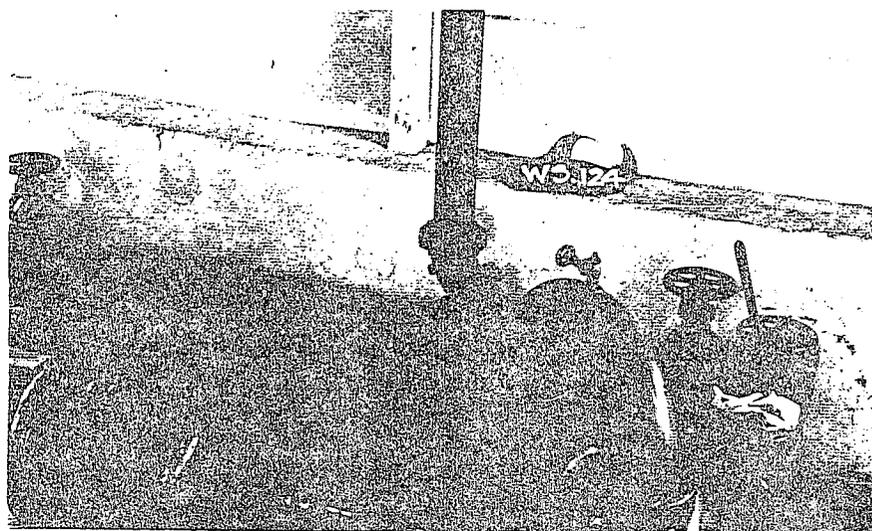
Water overflowing from New Reservoir filled to capacity through Discharge Pipe into Ravine Feeding.

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: BOOSTER PUMP

Film No. 124

July 28, 1939.



Installing Tank overflow lines and Clean-out Valves.

Film No. 125

July 28, 1939.



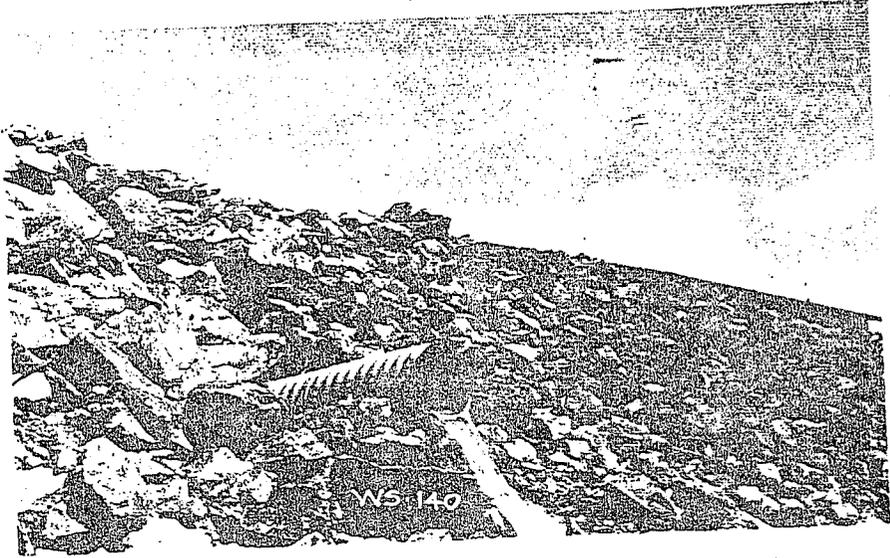
Electric connection made to Motor and Mechanical Coupling  
between Motor and Pump assembled and bolted.

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: BOOSTER PUMP

Film No. 140

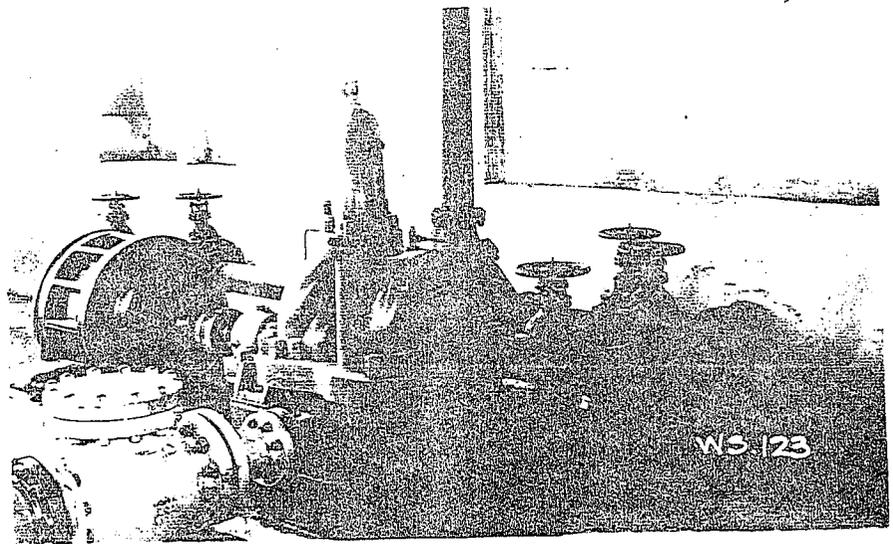
August 1, 1939.



Overflow from New Reservoir issuing from Discharge Pipe at  
100-gallons per minute.

Film No. 125

July 28, 1939.



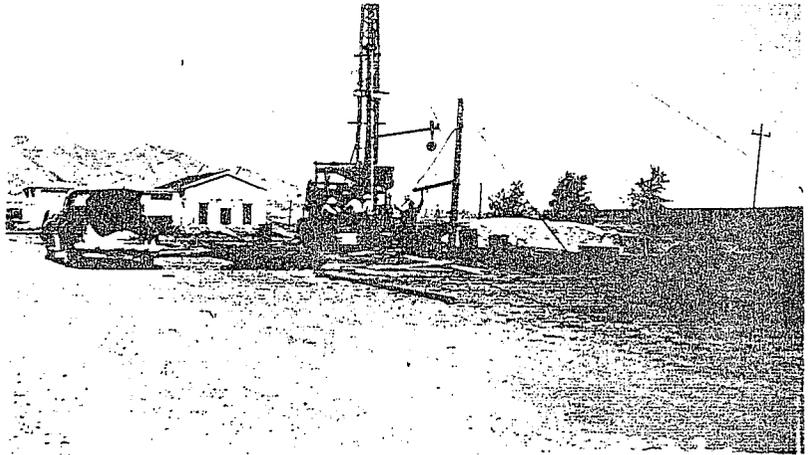
Completed installation, Booster Pump.

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: DEEP WELL TURBINE

Film No. 2072

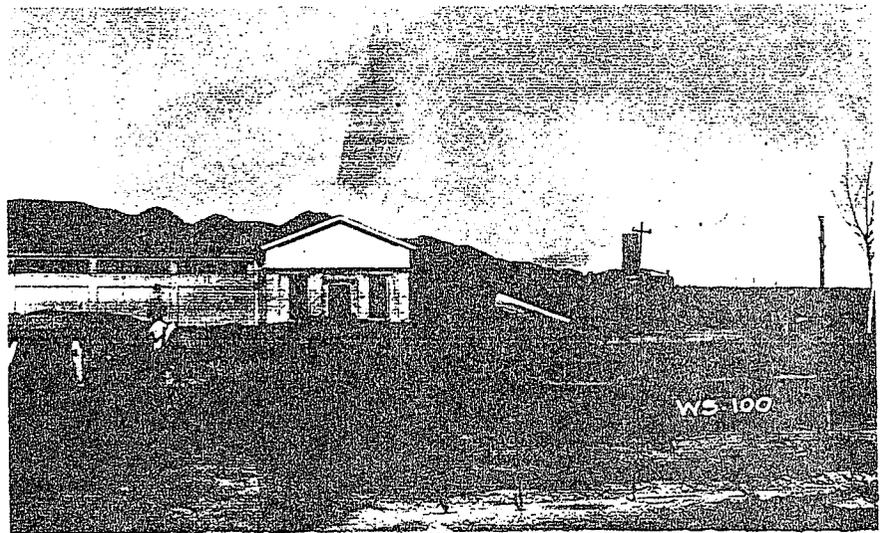
June 15, 1939.



Showing contracting equipment installing Pump and Column into 14" casing.

Film No. 100

July 1, 1939.



Head of Turbine Pump installed on concrete foundation; workmen starting wall forms for pump house.

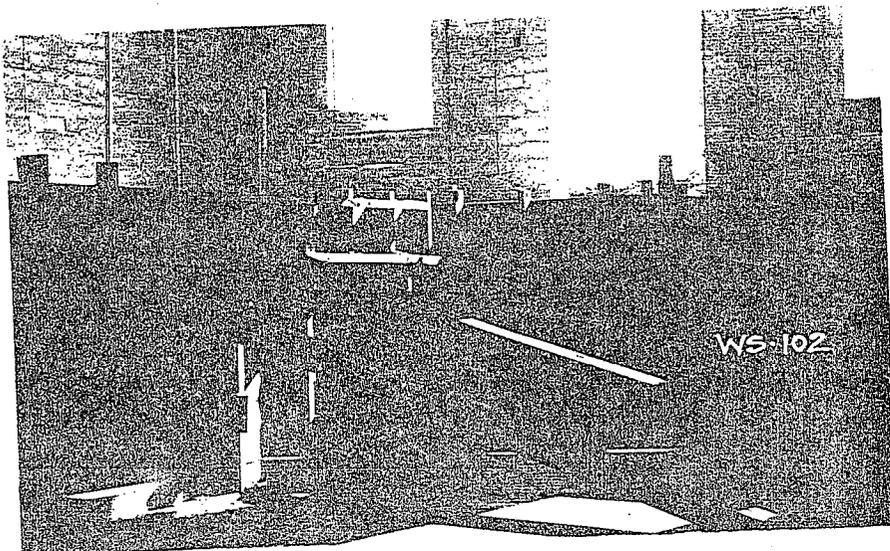
42

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: DEEP WELL TURBINE

Film No. 102

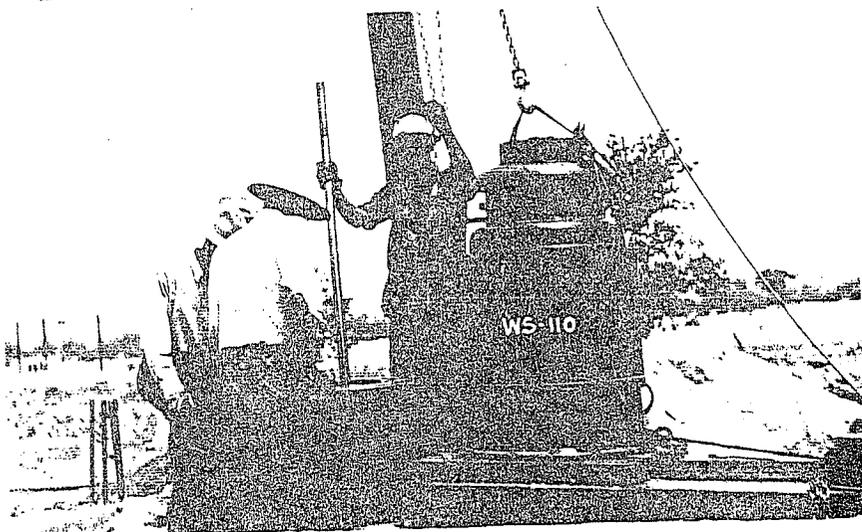
July 3, 1939.



Interior view of Booster Pump House showing concrete slat forms for electric station.

Film No. 110

July 11, 1939.



Contractor setting electric drive motor over Turbine Pump Head at 14" Well.



TEST ——— DEEPWELL TURBINE PUMP ———  
 WATER SUPPLY PROJECT ——— FOR HUACHUCA, ARIZ. ———

July 30<sup>th</sup> 1939 Surge Tank calibration One inch = 425 gallons

GALS PUMPED	RATE PER MINUTE	HEAD FEET	KW RATE	KWH	FSUM. HP RATE	WATER WASTED GALS	EFF. %	WATER SUPPLY FEET	WATER SUPPLY GALS	WATER SUPPLY RATE PER MINUTE
0			63.8	13.16						
4,250	530	520		3.45						
7,880	53			17.25						
7,980	53			17.25		77.8	34.2	59		
7,980	53			17.25						
7,980	530			17.25						
6,850	530			3.70						
				88.5						— GROSS
43,030	532			87.55						— NET

July 31<sup>st</sup> 1939 524.530 x 335 = 175,000 - 71.8 85.38 = 45.10 = 199

GALS PUMPED	RATE PER MINUTE	HEAD FEET	KW RATE	KWH	FSUM. HP RATE	WATER WASTED GALS	EFF. %	WATER SUPPLY FEET	WATER SUPPLY GALS	WATER SUPPLY RATE PER MINUTE
0			57.0	3.35						20
7,860	725	530	67.0	6.75						
7,860				16.75						
7,860				16.75	89.7	1705	73.5	2.15		
7,860				16.75						
6,330				3.35						
				83.65						— GROSS
37,770				80.36						— NET

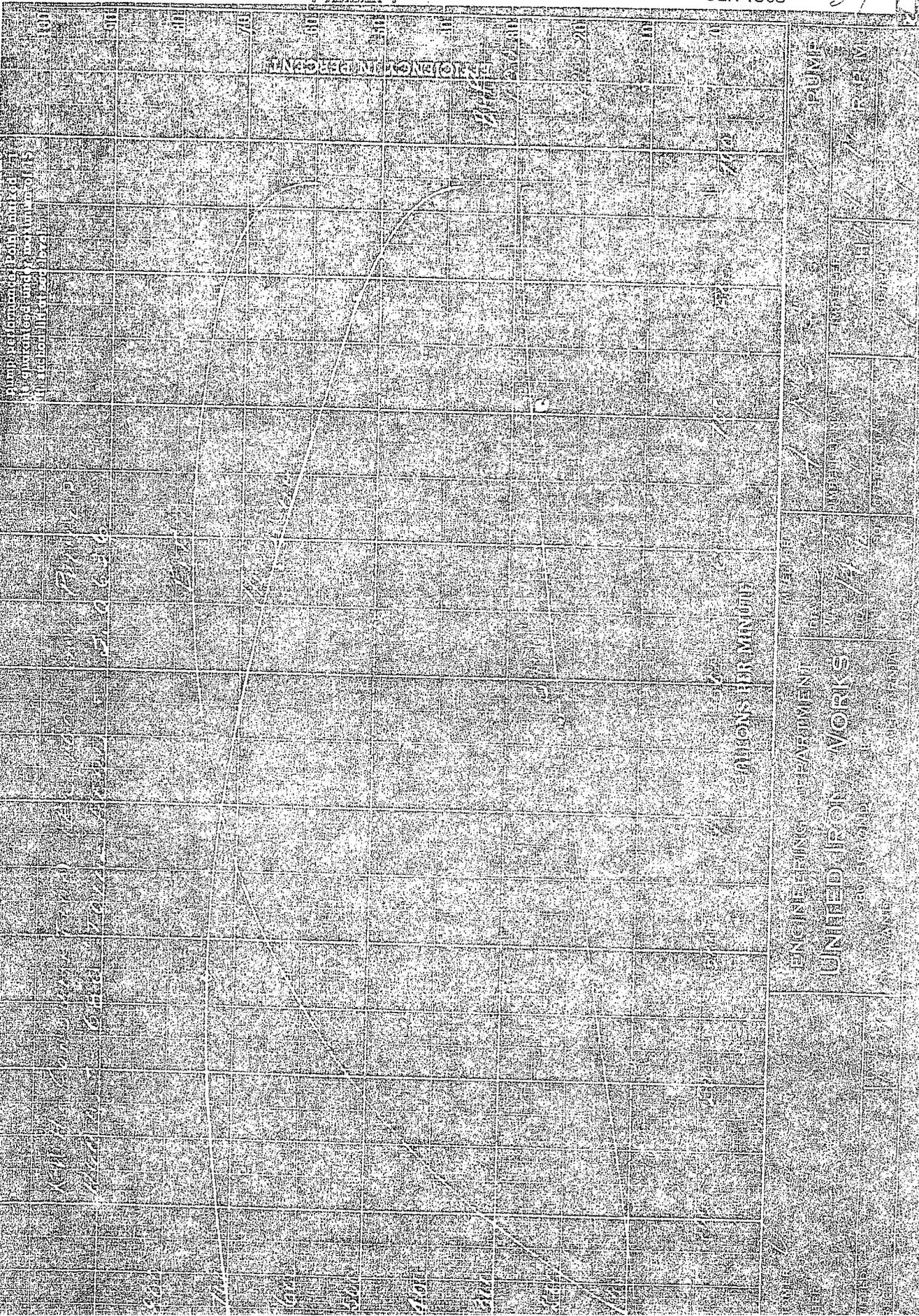
AUG 1<sup>st</sup> 1939 525.530 x 335 = 175,000 - 70.5 80.3 = 27.77 = 2.15

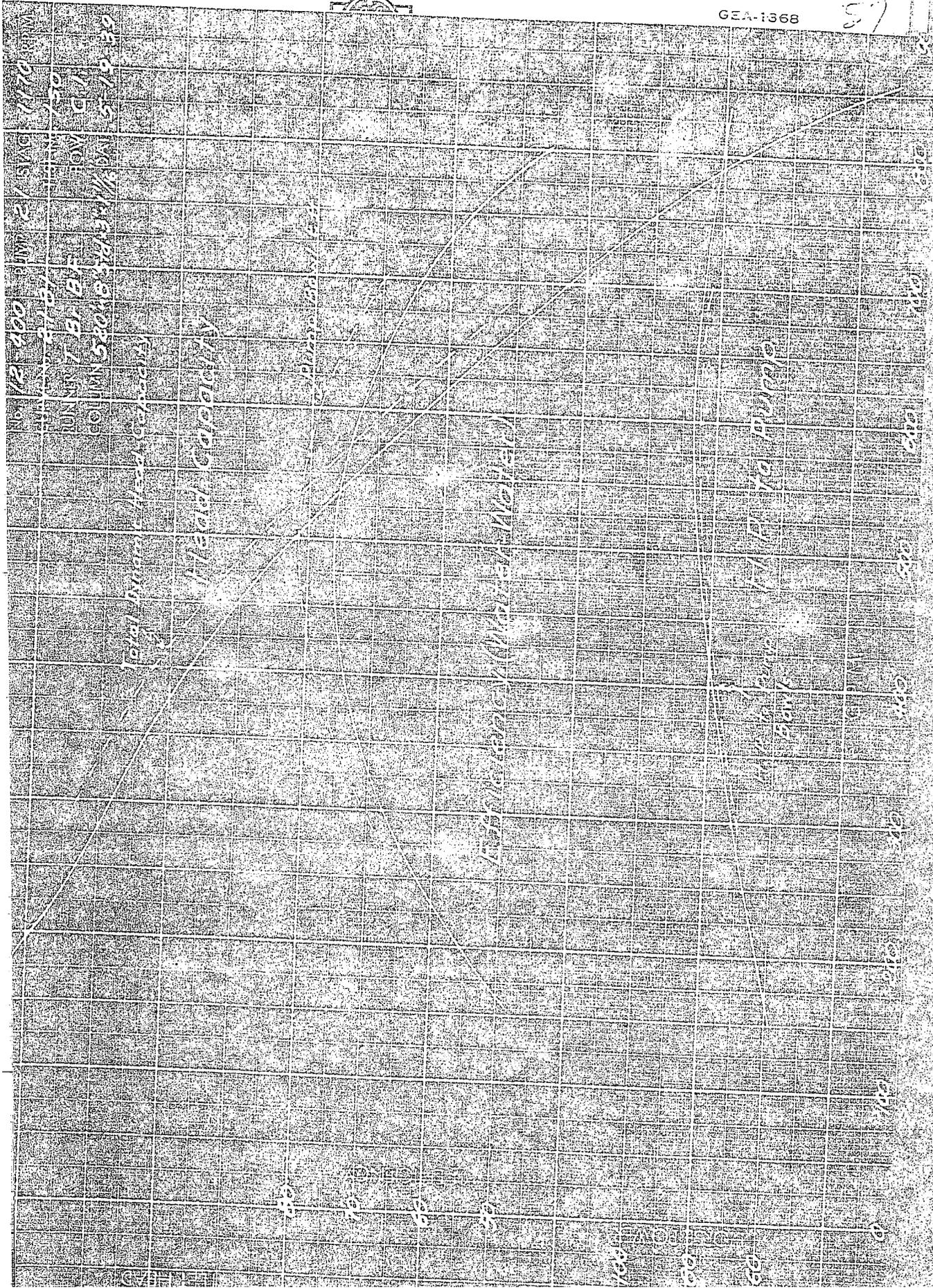
GALS PUMPED	RATE PER MINUTE	HEAD FEET	KW RATE	KWH	FSUM. HP RATE	WATER WASTED GALS	EFF. %	WATER SUPPLY FEET	WATER SUPPLY GALS	WATER SUPPLY RATE PER MINUTE
0			67.0	3.35						20
7,700	512	530		16.75						
7,730	514			16.75						
7,730	514			16.75						
7,730	514			16.75	89.7	686	76.4	2.13		
7,700	512			16.75						
2,000	512			4.47						
				91.57						
40,780				83.72						

72 x 520 x 335 = 125,000 = 66.6 88.22 = 40.58 = 2.13

Dwg No. 6203-1060-B

UNITED IRON WORKS  
 NEW YORK  
 PHILADELPHIA  
 PITTSBURGH  
 ST. LOUIS  
 CHICAGO  
 CINCINNATI  
 CLEVELAND  
 DETROIT  
 INDIANAPOLIS  
 KANSAS CITY  
 MEMPHIS  
 MILWAUKEE  
 MINNEAPOLIS  
 OMAHA  
 PORTLAND  
 RICHMOND  
 ST. PAUL  
 TAMPA  
 WASHINGTON  
 WICHITA



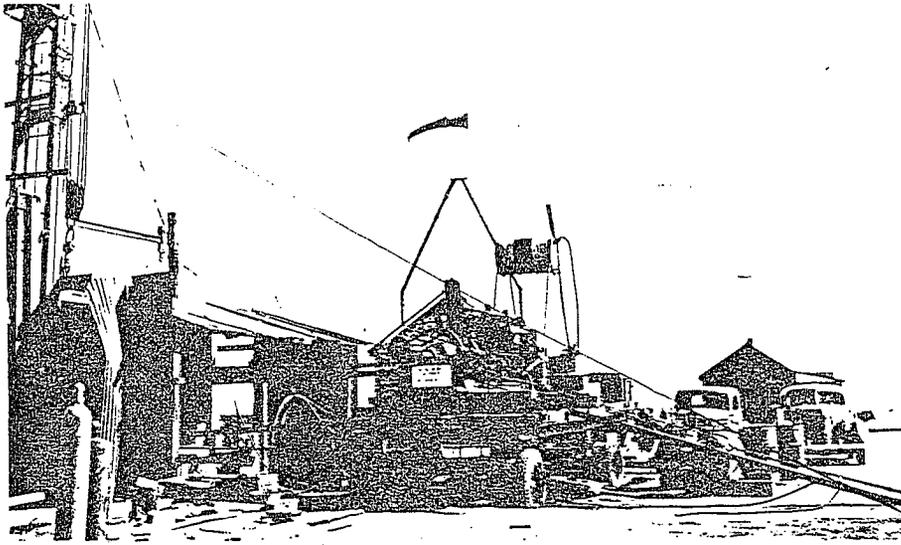


ALBERTA

TESTING 14-INCH WELL

Film No. 1800

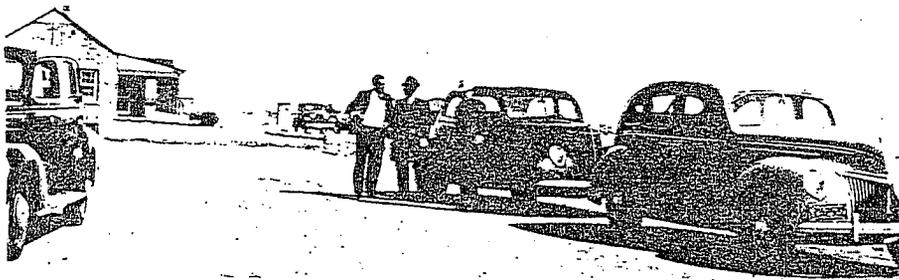
February 22, 1939



View of 400 H.P. gasoline engine mounted on truck ready to operate turbine belt driven pump in well.

Film No. 1801

February 28, 1939



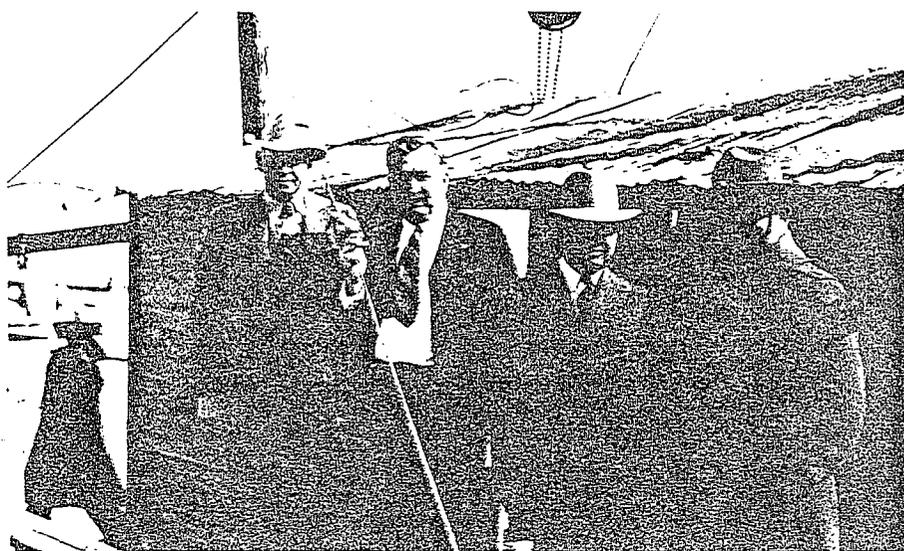
Arrival of guests from Eisbee to witness pumping operations.

FORT WUASHUCA  
ALASKA

TESTING 14-INCH MILL

Film No. 1802

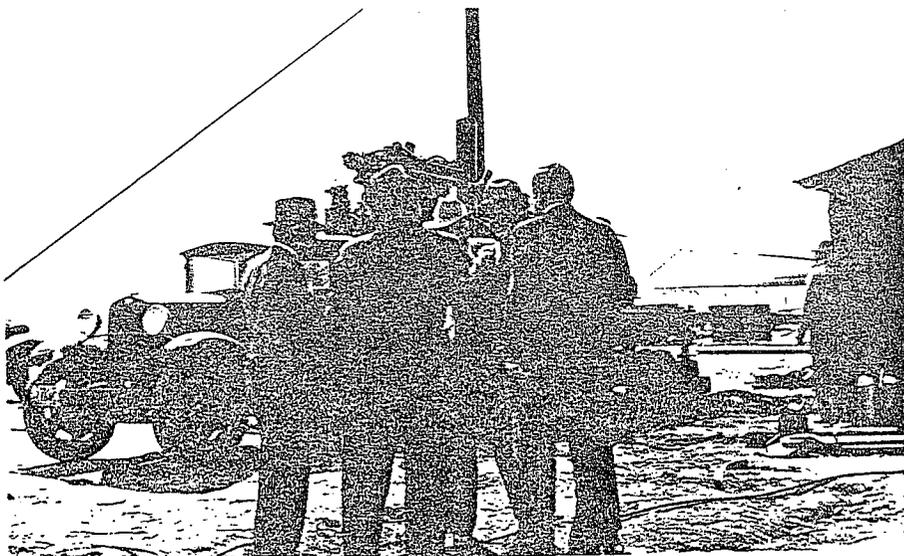
February 28, 1939



Contractor Lane, Secretary Michaels, President Woods  
of the Chamber of Commerce with Major Brooks.

Film No. 1803

February 28, 1939



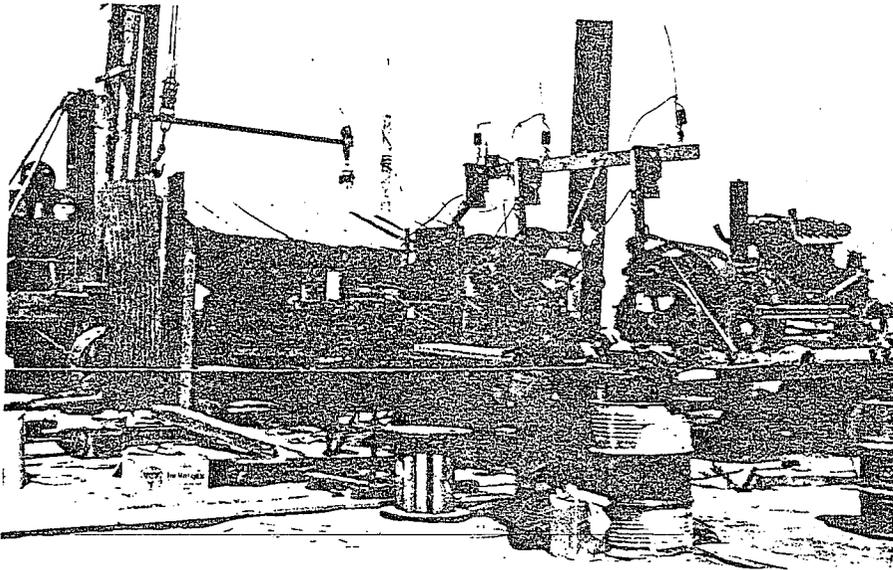
Major Brooks greets Associated Press representative

FORT HUachuca  
ARIZONA

TESTING 14-INCH WELL

Film No. 1804

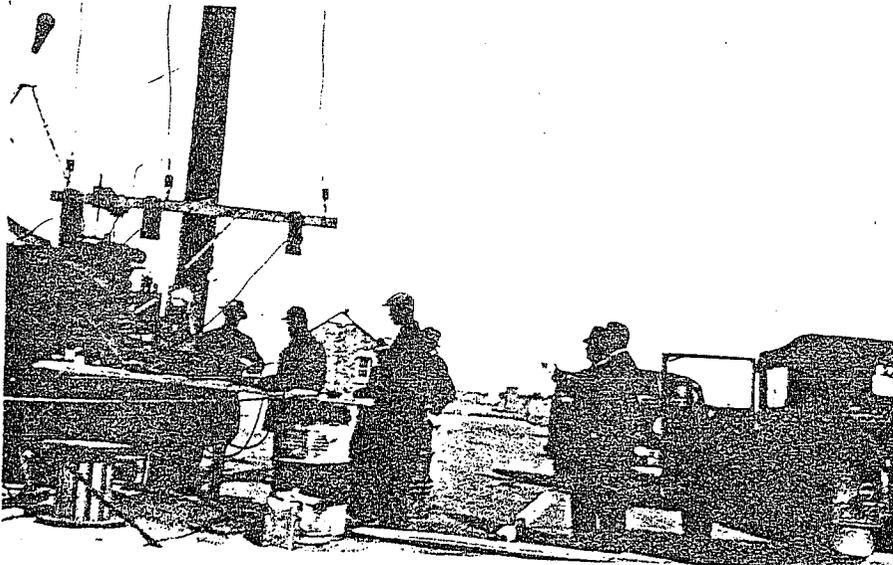
February 28, 1939



Chief Electrician testing connection  
between motor and transmission line.

Film No. 1805

February 28, 1939



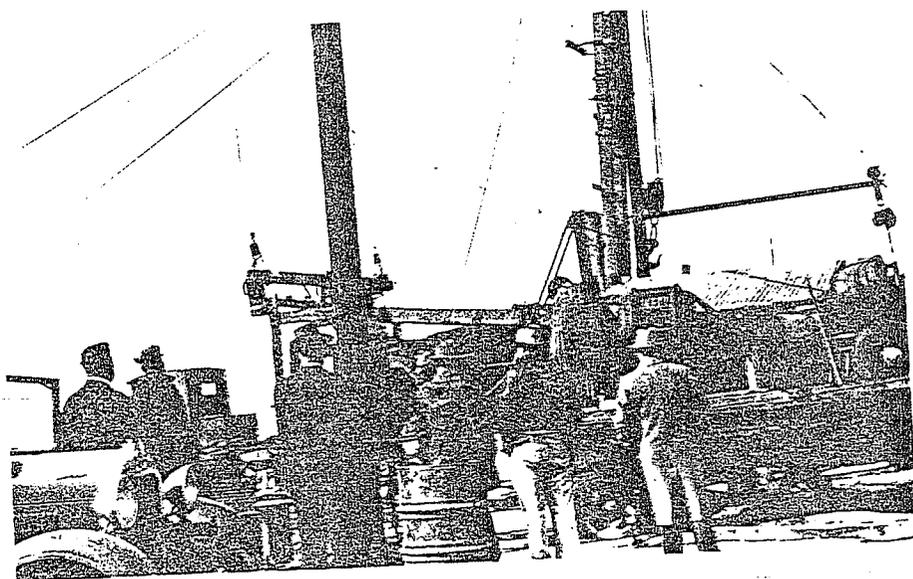
Major Brooks checks final connections

FORT HUACHUCA  
ARIZONA

TESTING 14-INCH PUMP

Film No. 1806

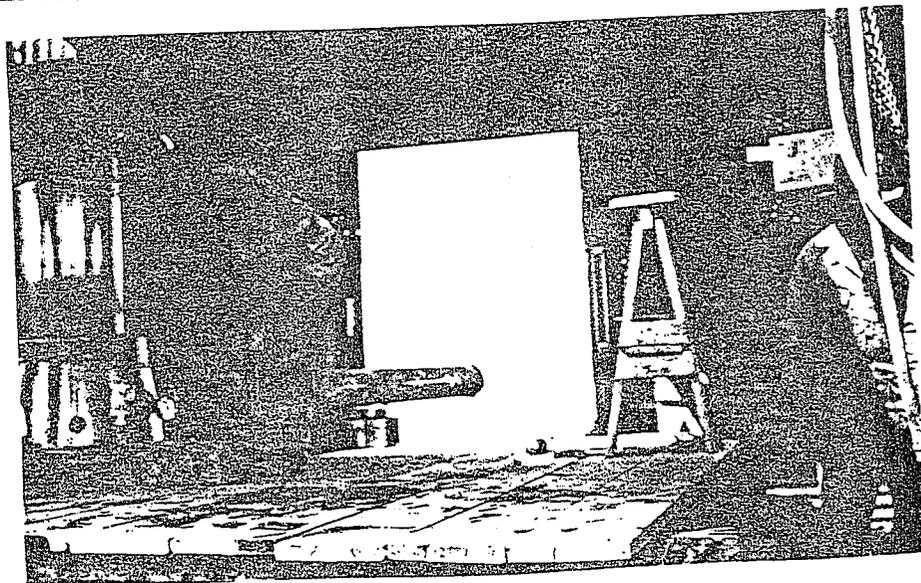
February 28, 1939



Visitors watching start of motor drive for pump test.

Film No. 1807

February 28, 1939



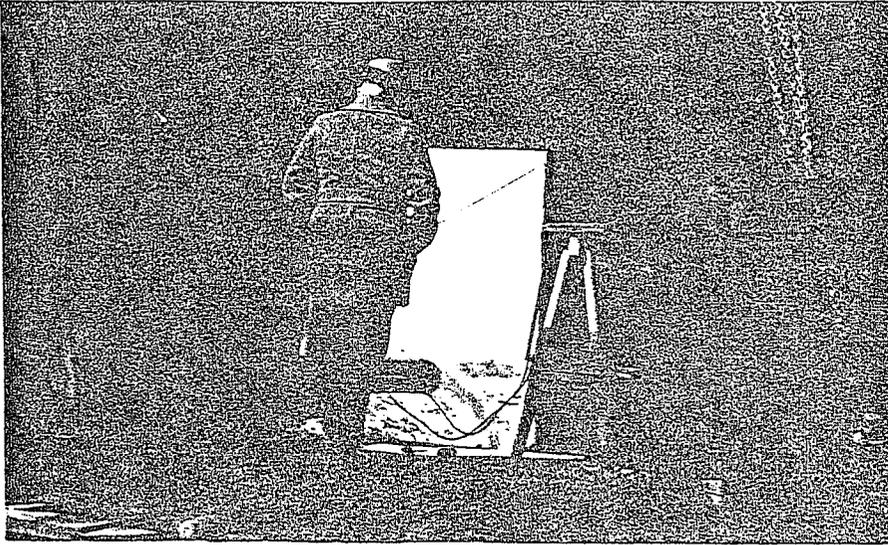
termination

PORT HULCHUCK  
ARIZONA

TESTING 14-INCH WELL

Film No. 1808

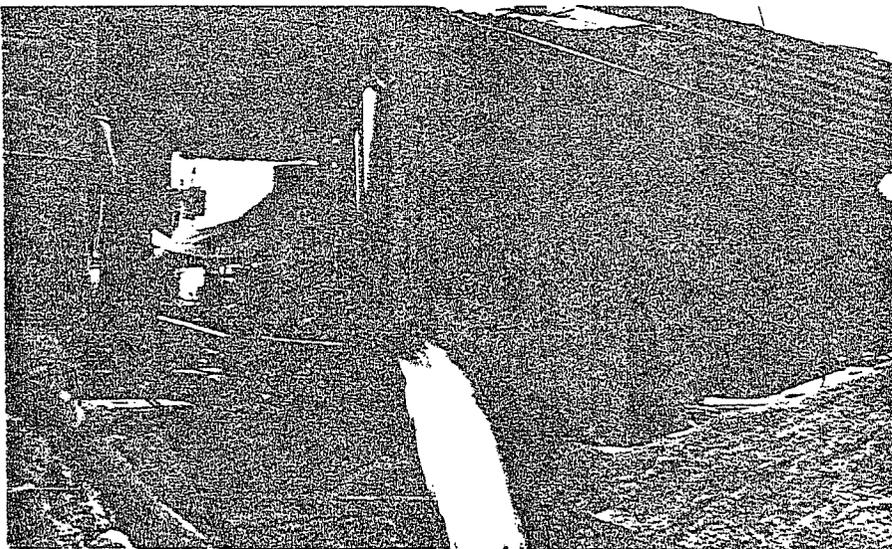
February 28, 1939



Three minutes after start of motor, water  
is discharged from end of eduction pipe.

Film No. 1809

February 28, 1939



View of discharge pipe, pump head and driving belt.

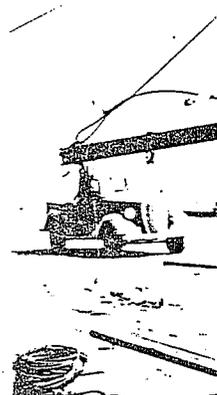
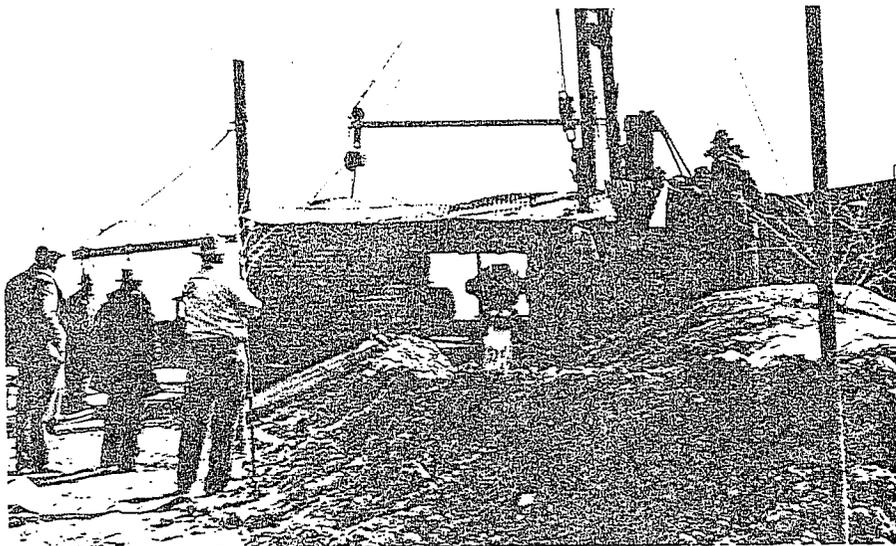
FORT HUachuca  
ARIZONA

TESTING 14-INCH WELL

Film No. 1810

February 28, 1939

Film No. 1812



Visitors viewing stream of water  
discharged into diverting ditch.

The Secretary  
observes the

Film No. 1811

February 28, 1939

Film No. 1813



The Associated Press representative asks the  
contractor some questions about quantity.

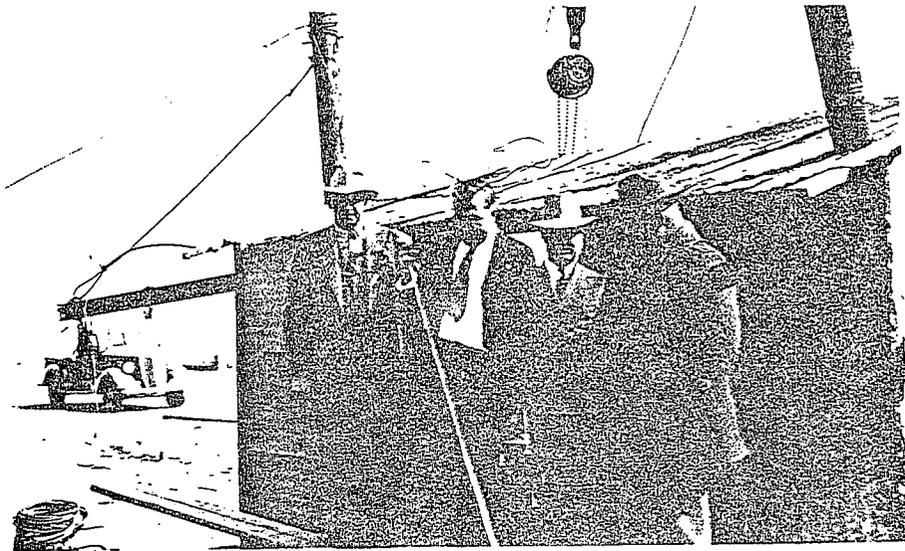
The President  
be pleased

FORT HUachuca  
ARIZONA

TESTING 14-INCH WELL

Film No. 1812

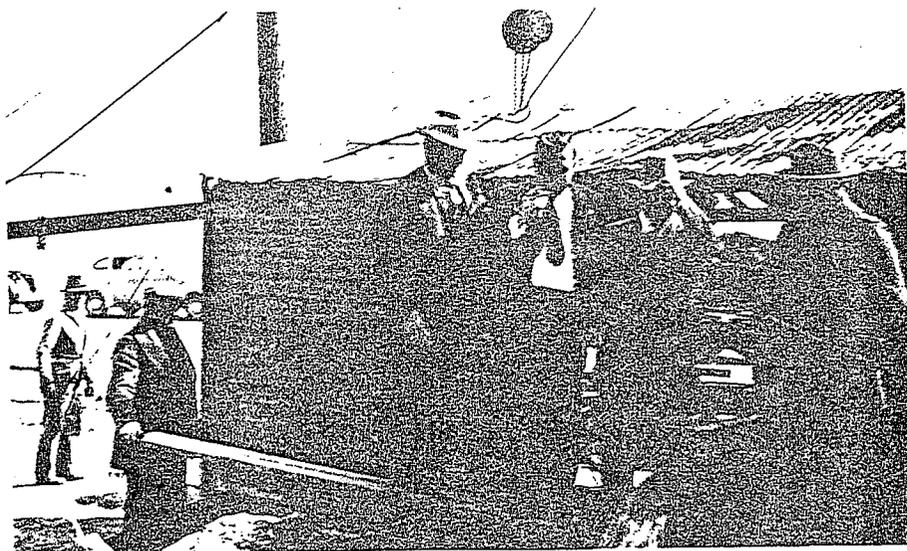
February 28, 1939



The Secretary and President of the Chamber of Commerce observe the flow of water from the discharge pipe.

Film No. 1815

February 28, 1939



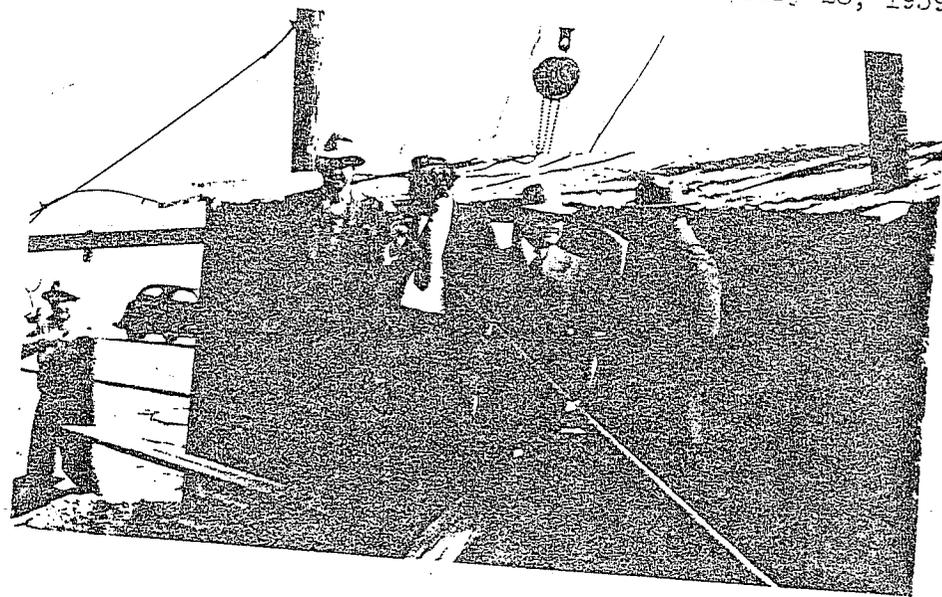
The President of the Chamber of Commerce appears to be pleased with the quantity of water discharged.

FORT HUachuca  
ARIZONA

TESTING 14-INCH WELL

Film No. 1814

February 28, 1939



The representative of the pump company  
(left) also appears to be pleased.

Film No. 1815

February 28, 1939



The representative of the Crane Company  
talking to Major Brooks.

FORT HUACHUCA  
ARIZONA

TESTING 14-INCH WELL

Plate No. 1316

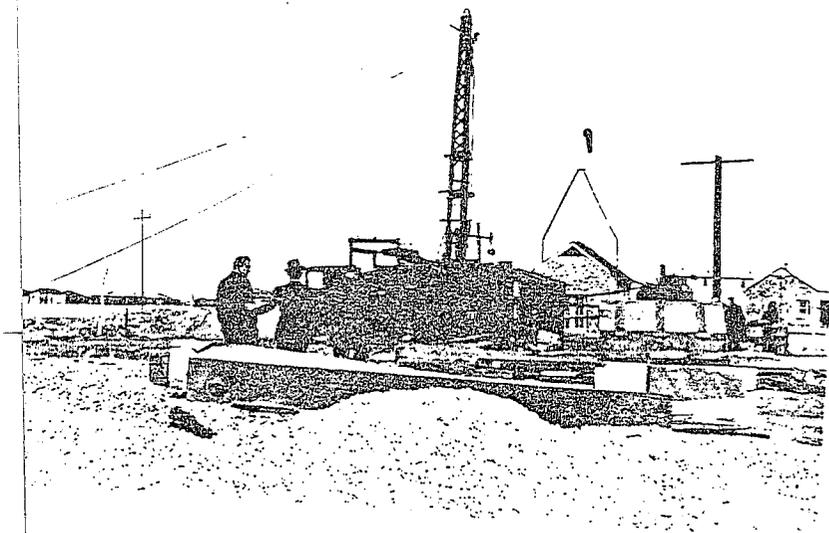
February 23, 1939



Water flowing from discharge pipe into the diverting ditch.

Plate No. 1317

February 28, 1939



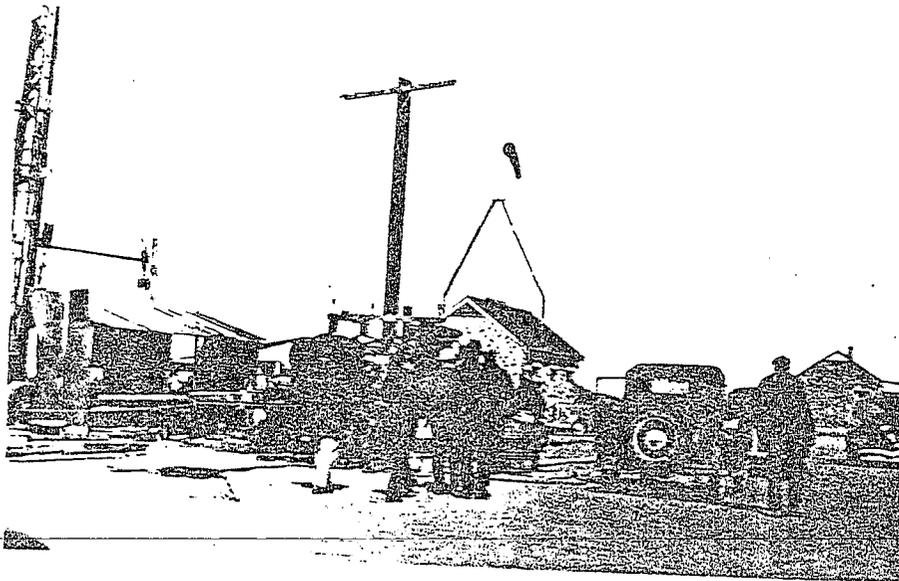
Viewing the well testing equipment from the site of the 50,000 gallon surge tank

FORT HUachuca  
ARIZONA.

TESTING 14-INCH WELL

Film No. 1818

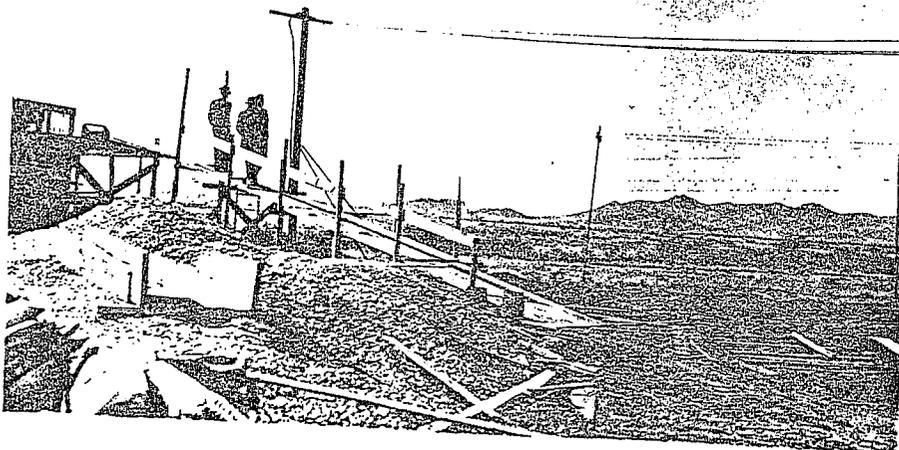
February 28, 1939



Visitors leaving after completion of well-test operations.

Film No. 1819

February 28, 1939



Visitors inspecting work on surge tank adjacent to well site.

*PL 2*

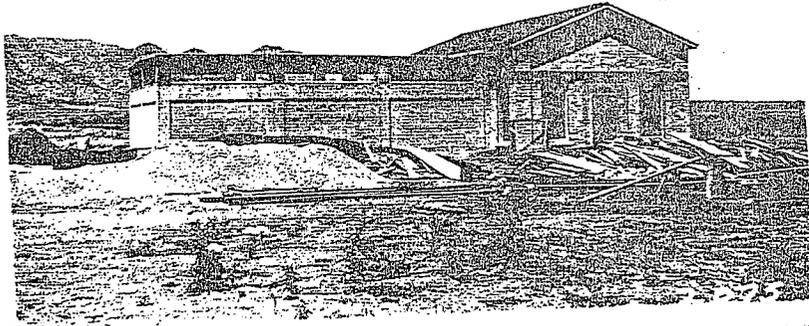
42

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: BOOSTER PUMP

Film No. 2073

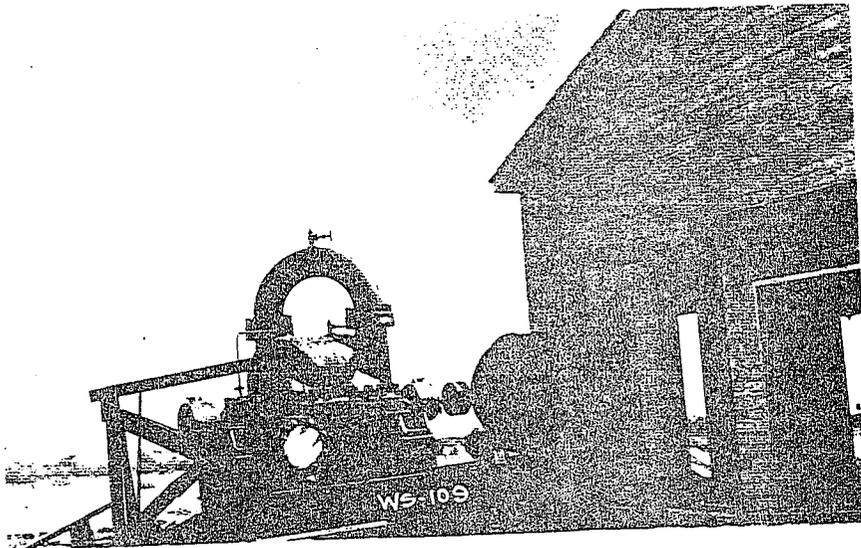
June 10, 1939.



Showing Pump House and Reservoir awaiting arrival of Pump Unit from San Francisco.

Film No. 109

July 11, 1939.



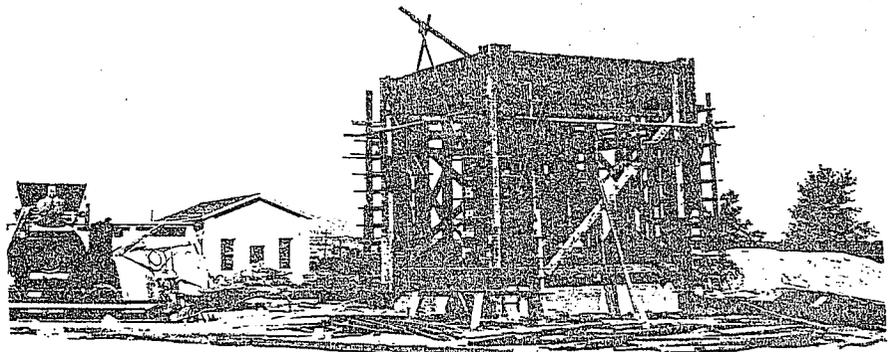
Four stage Booster Pump being unloaded from truck to doorway of Booster Pump House.

FORT HUACHEUCA  
ARIZONA

WATER SUPPLY SYSTEM: DEEP WELL TURBINE

Film No. 114

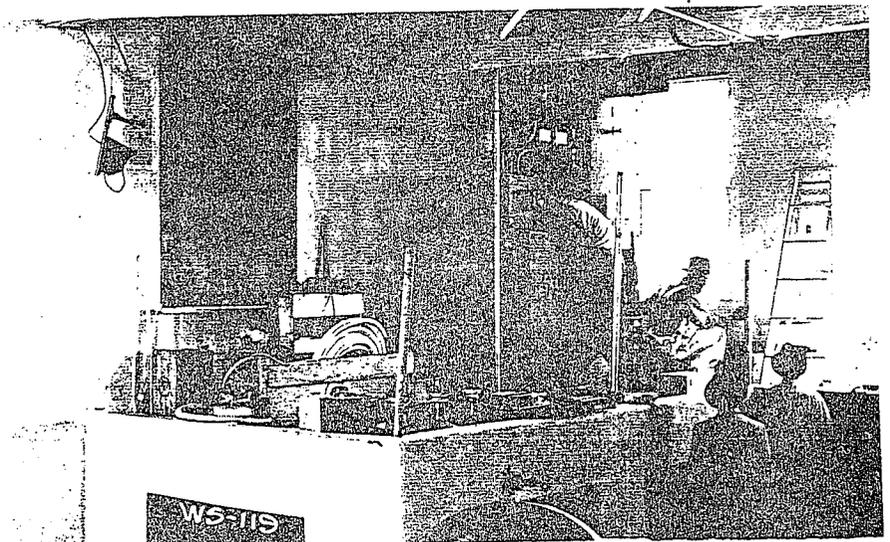
July 15, 1939.



Showing completed form work for base of Pump House covering  
Deep Well Turbine installation.

Film No. 119

July 25, 1939.



Electricians assembling Electric Units for operation of  
Turbine.

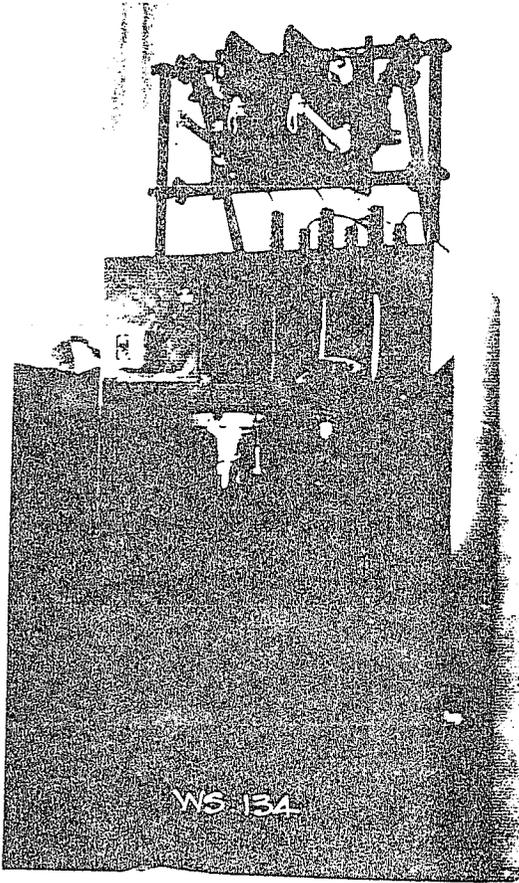
71

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: DEEP WELL TURBINE

Film No. 134

July 29, 1939.



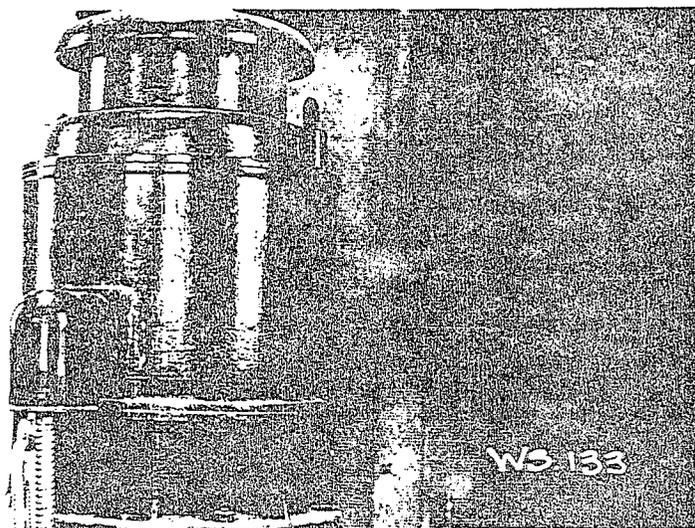
Motor-starting equipment for Deep Well  
Turbine installed by contractor.

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: DEEP WELL TURBINE

Film No. 133

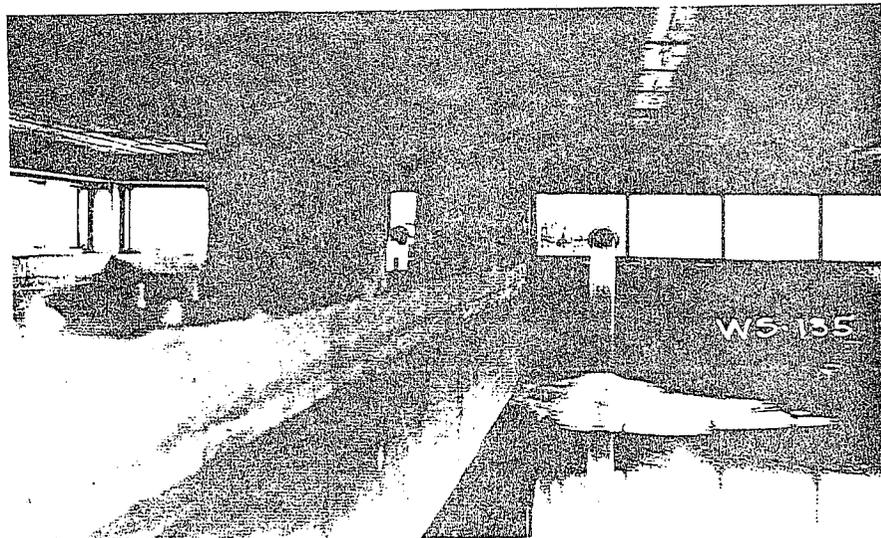
July 15, 1939.



Complete installation of Electric Motor on Pump-Head of  
Deep Well Turbine.

Film No. 135

July 30, 1939.



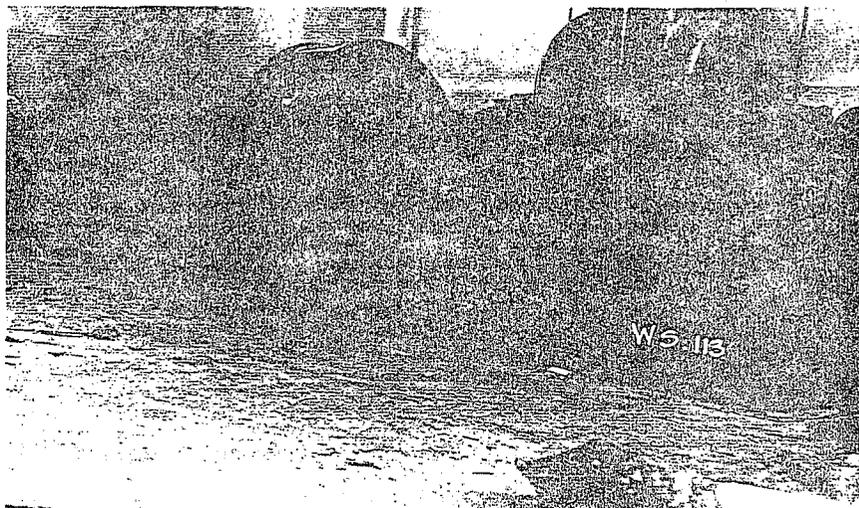
Water from Deep Well Turbine filling Surge Tank at rate  
of 320 gallons per minute.

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: BOOSTER PUMP

Film No. 113

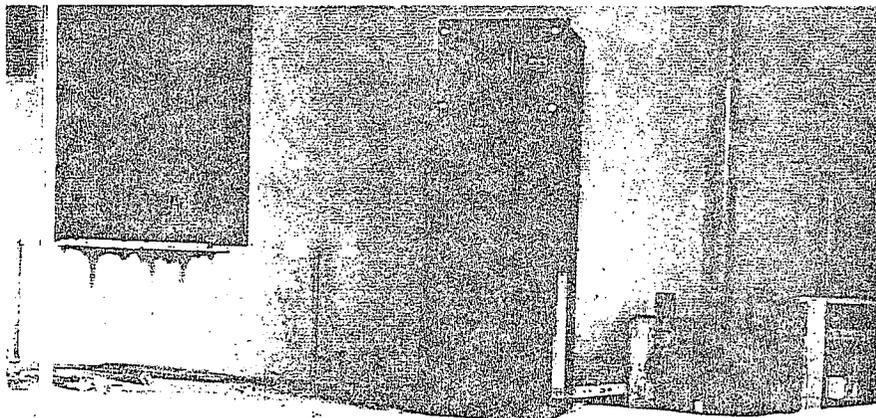
July 15, 1939.



Showing 4-stage Centrifugal Pump on its foundation in the  
Booster Pump Station at 14" Well.

Film No 115

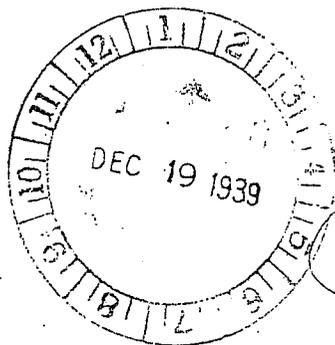
July 15, 1939.



Recording the arrival of Electric Starter for Booster Pump  
and varied assortment of Switch Board Equipment.

(4) Financial Data. -

- (a) List of Appropriations Involved -  
 Procurement Authority OP 752-13-1, (P.W.A. QM)  
 0581; 1938-1940, 21-408/00581  
 QM 3601 P13213 A0581-80 \$10386.65
- (b) Name and Address of Contractors  
 United Iron Works, 580 2nd St., Oakland, California.  
 Contract dated June 2, 1939, amount \$4300.00, no  
 change orders nor extensions thereto.  
 W.E. Lane, Box 333, Bisbee, Arizona, contract dated  
 June 1, 1939, amount \$5886.65, no change orders nor  
 extensions thereto.
- (c) 1. Total Cost of Work: \$10386.65  
 2. Cost of various items entering  
 into the work:  
 Labor (CQM) (Booster Pump Foundation  
 and Installation) 179.50  
 Material (CQM) (Booster Pump  
 Foundation and Installation) 20.50  
 3. Amount of Contracts.  
 (a) Horizontal Centrifugal Pump  
 Complete, Contract No. W-6203  
 qm-67 4300.00  
 (b) Furnishing and Installing  
 Deep Well Turbine Pump, Contract  
 No. 6203-qm-66 5886.65  
 4. Expenditures under Purchase and Hire: 183.00  
 5. Overhead and other charges: 17.00
- (d) Date of Final Payment -  
 September 5, 1939.
- (e) Amount and Disposition of Unexpended  
 Balance: None



*[Handwritten Signature]*  
 J.L. BROOKS,  
 Major, Q.M. Corps.,  
 Constr. Quartermaster.

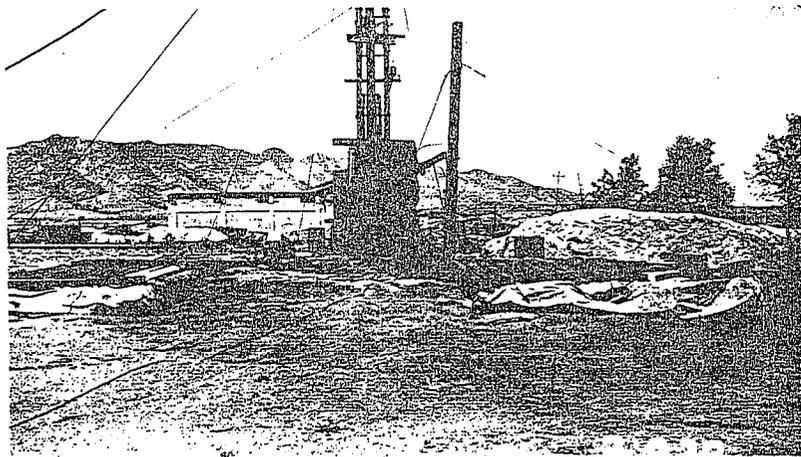
3910

FORT HUACHUCA  
ARIZONA

WATER SUPPLY SYSTEM: DEEP WELL TURBINE

Film No. 2070

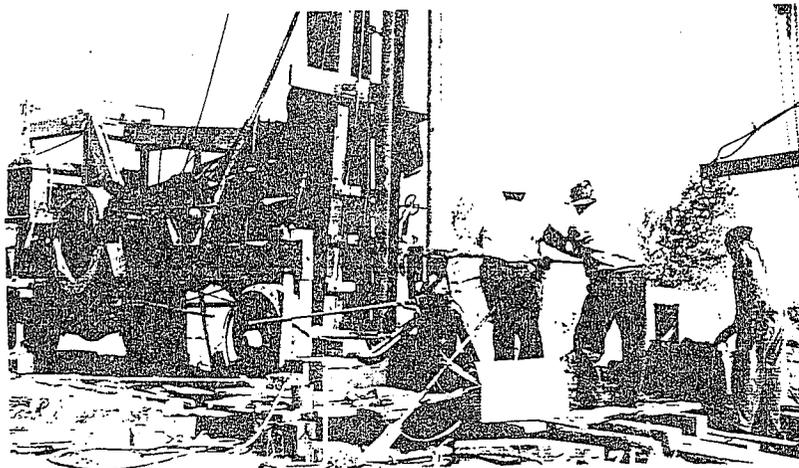
June 15, 1939.



Showing arrival of Pump Column Shafting, etc., for installation.

Film No. 2071

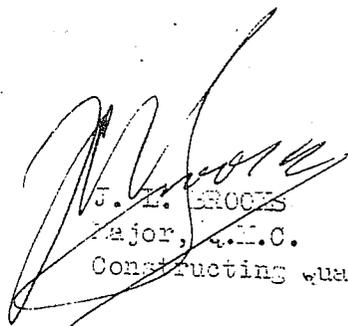
June 15, 1939.



Showing contractor assembling column and shaft and lowering unit into casing.

level of the reservoir of water outside of the pipe was scarcely altered in any degree whatever by these operations. It is further evident that a greater quantity of water could have been pumped from this well, should it be necessary, by increasing the number of perforations which were made on the basis that no greater quantity of water than five hundred (500) gallons per minute would be demanded by the Office of The Quartermaster General. In order to make these operations more clearly evident, there have been enclosed a number of photographs showing the character of this temporary set-up for testing the quantity of water in the well, and covering such subjects as the installation of the motor and the gasoline engine, and of the instruments set up for measuring the quantity of water by the two methods (that is, the orifice and the pitot tube). In several of the pictures, the water is shown flowing from the discharge pipe in a full stream, issuing with a velocity of about five feet per second for the seven hundred gallons per minute rate, and flowing off in the drainage ditch provided for the disposal of this water.

At present, all work at the well site has been discontinued awaiting further action by the Office of The Quartermaster General in the matter of purchasing a turbine pump and of a booster pump to handle this water from the well site to the reservoirs. As soon as specifications are written for these two pumps, the construction work at the well site will have been advanced to the point where both pumping units may be tested immediately to demonstrate the ability of each unit to perform its expected duty.

  
 J. L. GROVES  
 Major, U.S.C.  
 Constructing Quartermaster

JLms

enc. Print No. 6203-1025.  
 6203-1025B  
 6203-1025C  
 Photographs

Fort Huachuca, Ariz.

Book No. 1 A

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19. Garages for the Officer Personnel....WPA.....111-115
20. Training Camp.....WPA.....116-123
21. White City Gate Road.....124-129
22. Road Paving, OP 513-1-1.....130-134
23. Lookout Tower, Huachuca Peak.....135-139
24. Add'n to Post Laundry Bldg. #26.....140-142
25. Inst. of Oil Burning Heating Plant in Off. Qtrs. #3..143-144
26. New 14" Well #4.....PWA.....145-150
27. Testing 14" Well.....PWA.....151-156

I N D E X

## COMPLETION REPORT - NEW WELL

FORT HUACHUCA, ARIZONA

General Information -----Page 1

Description of Completed Project-----Pages 1 &amp; 2

Construction Data-----Pages 2, 3, &amp; 4

Financial Data-----Page 4

List of Inclosures -----Below

Print No. 6203-100 Progress Chart

Print No. 6203-1025A Well data

Print No. 6203-1025B Graph of Well

Print No. 6203-1025C Log and Location of well *To her location*

Print No. 6203-1025D Orifice chart

Test Report New Well

## OFFICE OF THE CONSTRUCTING QUARTERMASTER

FORT HUACHUCA, ARIZONA.

March 9, 1939.

SUBJECT: Completion Report of New Well #4; portion of O.P. 752-13-1.

TO: Quartermaster General, Washington, D.C.

- (1) General - The project consists of drilling, casing, perforating and testing New Well in the immediate vicinity of the East gate of the Military Reservation, Fort Huachuca. The purpose being to increase water supply to meet the needs of the Post by augmenting the present supply, which for several years has been restricted due to periodic annual shortages. The well was dug to a depth of 701 feet and cased with 14" OD Casing. Perforations were made in approximately 200 feet of the casing to permit the inflow of water from the water bearing gravel. The water level was fixed at 460 feet below the surface of the ground which level had risen approximately 10 feet above the water gravel. The work was done entirely by Contract and constitutes one item of the proposed improvements to the Water Supply System as set up in letter of July 19, 1938, file No. QM 671 CN-E, Official Project No. 752-13-1.
- (2) Description of Completed Project -
  - (a) General Statement as follows:
    2. Utilities -
      - (b) Water System -

Steel Casing 3/8" thick, 14" outside diameter, 703 feet in length lowered, anchored and perforated for 200 feet through water bearing gravel.
      3. New Well drilled, cased and perforated to supply additional water service for the benefit of the Government and the 25th Infantry at present stationed at Fort Huachuca, Arizona.
      4. The construction of this well was accomplished for the purpose of obtaining more water to eliminate restrictions and guarantee a sufficient quantity of water for sprinkling of lawns, irrigation of shrubbery, fire protection and other necessary uses.

Completion Report,  
Cont'd.

5. The land on which the well is drilled is on the Military Reservation and is owned by the Federal Government. No easements nor licenses are involved.

(b) The well is located near the East gate of the Military Reservation at Fort Huachuca, Arizona. Reference is made to Reservation Map, drawing No. 6203-100.

(c) No equipment is installed on which name plates would be necessary.

(d) Photographs -

Reference is made to photographs, with titles noted on each, as submitted with Narrative Reports during construction of well. The numbers of these photographs being as follows: 1650, 1662, 1672, 1673, 1696, 1709, 1731, 1737, 1764, 1765, 1766, 1767, 1768, 1769, 1770, 1771, 1772, 1773, 1774, 1775. Further reference is made to photographs No's 1800 to 1820 inclusive, and No. 1832 submitted with the accompanying report of Testing 14-Inch Well. Of these photographs No's 1808, 1809, 1810, 1811, 1813 and 1814 show water being discharged from the discharge pipe and authenticates the completion of the well.

(e) Soil data -

The soil at this location is hard compact gravel and silt. It's bearing value is 3000 pounds per square foot.

(f) Plans -

Reference is made to accompanying drawings as follows:  
No. 6203-1025A; showing data.  
No. 6203-1025B; showing a graph of well.  
No. 6203-1025C; showing log of well and definite location.  
No. 6203-1025D; showing orifice chart.

(g) Character of contract does not require guarantee as to maintenance of work.

(3) Construction data -

(a) General Conditions -

The contractor, W.E. Lane, of Bisbee, Arizona, received his notice to proceed with the drilling of the well on November 23, 1938 and by December 5, 1938, had transported his drilling rig to the location of the new well and constructed a shelter to protect the workmen while drilling operations were in progress and on that date started the actual drilling of the 14" drill hole. On January 3, 1939, at a depth of 470 feet water bearing gravel was encountered and continued without interception until

the water. These two smaller pipes were attached by heavy number nine annealed wire to the eight inch pump column as each section was assembled.

When finally completed, this pump assembly was set so that the lower bowl was five hundred and eighty (580) feet below the top of the fourteen inch casing. The end of the quarter inch air pipe was located at exactly the same elevation. A determination of the elevation of the surface of the water with an electrical device indicated that the static water level was located one hundred and seventeen (117) feet above this point, making a head of one hundred and seventeen (117) feet over the last bowl of the pump unit. About the 22nd of the month, the four hundred (400) H.P. gasoline engine was delivered by the trucking company engaged to transport this engine from the coast to the location of the well. This engine was immediately placed in position so that the pulley operated by the engine was in line with the pulley on the head of the discharge column through which the steel shafting extending from the surface of the ground to the bowl mechanism for rotating the impellers of the twenty-two bowls installed in series.

With the setting of this engine, the installation of which was complete about nine o'clock in the evening, the contractor was instructed to start operations at once following the outline given in his contract for the initial eduction of water from the well. These instructions read that the pump should be operated intermittently with frequent starts and stops to permit the rearrangement in and around the holes perforated in the pipe of the pebbles from the water bearing gravel, the intent being to jiggle these pebbles in a manner which would relocate them in position to form a screen which would prevent entrance of the finer particles of sand from the water bearing gravel into the casing, and therefore into the pump.

This type of operation was conducted for a period of two hours, stopping finally about eleven P.M., and from which the following facts were developed, these being further evidenced by the tabulations of results on print number 6203-1025, which accompanies this report. It is interesting to note that each time pumping operations were stopped, the water level returned from the draw-down elevation to the static elevation in five minutes. The important development of this preliminary set of operations was the fact that very little sand was ejected from the well and that a production of six hundred and twenty (620) gallons per minute created a draw-down of no more than twenty-nine and one-half (29½) feet below the static water level.

These determinations were made, as far as draw-down was concerned, by pumping the draw-down pipe to the top limit and allowing it to register the actual recession of the water as marked on the gage in feet.

For the determination of the gallons per minute, two measuring devices were used, the first of these was an orifice of exactly six inches in diameter inserted in the end of the discharge pipe. Connected with this orifice was a rubber tube set back in the discharge pipe about four feet behind the orifice and located in the exact center of the eight inch pipe. This tube terminated in a glass tube with graduations, the zero point being set at a fixed distance above the center of the discharge pipe. From this tube inches of head above the center of the orifice were measured and the discharge determined from a curve with readings along the horizontal axis indicating the exact number of gallons for each inch of head. This measuring device is shown in photograph 1807 being the one pictured on the left side of the doorway in the center of the picture. For the other measuring system, a pair of pitot tubes were used, set in the discharge pipe at a fixed distance from the plane of the orifice and connected by rubber tubes, as shown in picture 1808, to the gage mounted on the right side of the opening in the center of those pictures.

Beginning at midnight, the pump was operated continuously for four hours or until 4:30 A.M. For this four-hour period, the results tabulated on the enclosed sheet will indicate that there were produced six hundred and forty (640) gallons per minute with an accompanying draw-down of thirty-one feet below static water level. The R.P.M. of the engine for this period averaged twelve hundred (1200).

The next day, during some preliminary tests on the engine and pump, the contractor found a number of parts on his engine to be defective, and, in spite of the immediate repairs on these individual pieces of mechanism, the engine finally became totally disabled, and some other means of motive power had to be provided. The contractor went into Bisbee and, from the local copper company operating there, he obtained an electric motor, induction type, with windings for twenty three hundred (2300) volts alternating current. Five days after the completion of the first test and along about midnight of February 28th, this electric motor with a twenty-eight inch pulley was put into service by making connections to it from transformers terminating the 6600 volt line. The electrical connections were made in a manner to offer as much protection against contacts with this high voltage as possible and an area around the motor was roped off to prevent indiscriminate travel in and around the pump, the belt, and the motor.

As soon as these arrangements were completed, the electrical switches were thrown in and the pump started at midnight for the third test period of four hours. During this period the accompanying tabulation and graphs will show an average output of seven hundred and ten (710) gallons per minute with the pump rotating at twelve hundred and forty-two (1242) R.P.M. and with the draw-down of approximately thirty-four feet. A rough measurement taken with a portable meter of the quantity of electricity used indicated an approximate electrical input of one hundred (100) H.P. At

four-thirty A.M. the power was shut off and in five minutes the draw-down gage indicated that the water in the well had come up to the normal water level as determined in previous tests.

Since the quantity of power used was more than was available at the power plant during the day-time period, it was necessary to post-pone the next test until after midnight of the following day. Commencing at twelve-fifteen A.M., March 1st, and running through the four-hour period until four-fifteen A.M., it was developed that seven hundred and ten (710) gallons per minute could be produced with a draw-down of thirty-four and one-half feet and with the rotation of the pump shaft fixed at about twelve hundred and forty-two (1242) R.P.M. These results are also made evident from the tabulations and graphs on the blue print previously referred to.

In order to determine what further quantity of water might be produced while this equipment was set up in operating condition, the twenty-eight inch pulley was removed from the motor shaft and in its place was substituted a thirty-two inch pulley, the belt previously used being put in position over the new pulley by adjusting slightly the location of the motor without disturbing any of the electrical connections. At four-thirty A.M., March 1st, the power was again turned on and it was demonstrated that eight hundred and seventy-five (875) gallons per minute could be produced with a forty-six foot draw-down, the rotation of the pump shaft increasing to an average of thirteen hundred and ninety-four (1394) R.P.M. Under these conditions a second rough measurement of power used during this period indicated that one hundred and forty (140) K.W. had been input. This test was stopped because of the fact that the Post demand for electric power was becoming great enough to over-load the generators at the power plant should this test be continued; therefore, in order not to disturb the electric service at the Post, the test work was discontinued and a report made to the Office of The Quartermaster General of what had been accomplished. Then the test was stopped, the water again rose in five minutes to the static water level established at four hundred and sixty-three (463) feet below the collar of the fourteen-inch casing, or one hundred and seventeen (117) feet above the bottom bowl.

The results of these tests indicate very clearly that the draw-down was the result of the actual amount of restriction offered by the perforations in the pipe in regulating the flow from the water bearing gravel into the interior of the pipe. The draw-down evidently uncovered just exactly the required amount of opening in these perforations to deliver the necessary quantity of water to the pump as the pump increased the discharge from the well. This fact is further made evident by the rapid manner in which the water rose from the various draw-down levels to the static water level in just about the necessary amount of time to refill the pipe from these perforated openings. It is quite evident that the