# Supreme Court of the United States

OCTOBER TERM, 1930

## No. 14, Original

THE UNITED STATES OF AMERICA,
COMPLAINANT,

*v.*

THE STATE OF UTAH

## REPORT OF THE SPECIAL MASTER

FILED OCTOBER 15, 1930

PRESS OF JUDD & DETWEILER, INC., WASHINGTON, D. C.

# SUPREME COURT OF THE UNITED STATES

## OCTOBER TERM, 1930

# No. 14, Original

---

THE UNITED STATES OF AMERICA,
COMPLAINANT,

*v.*

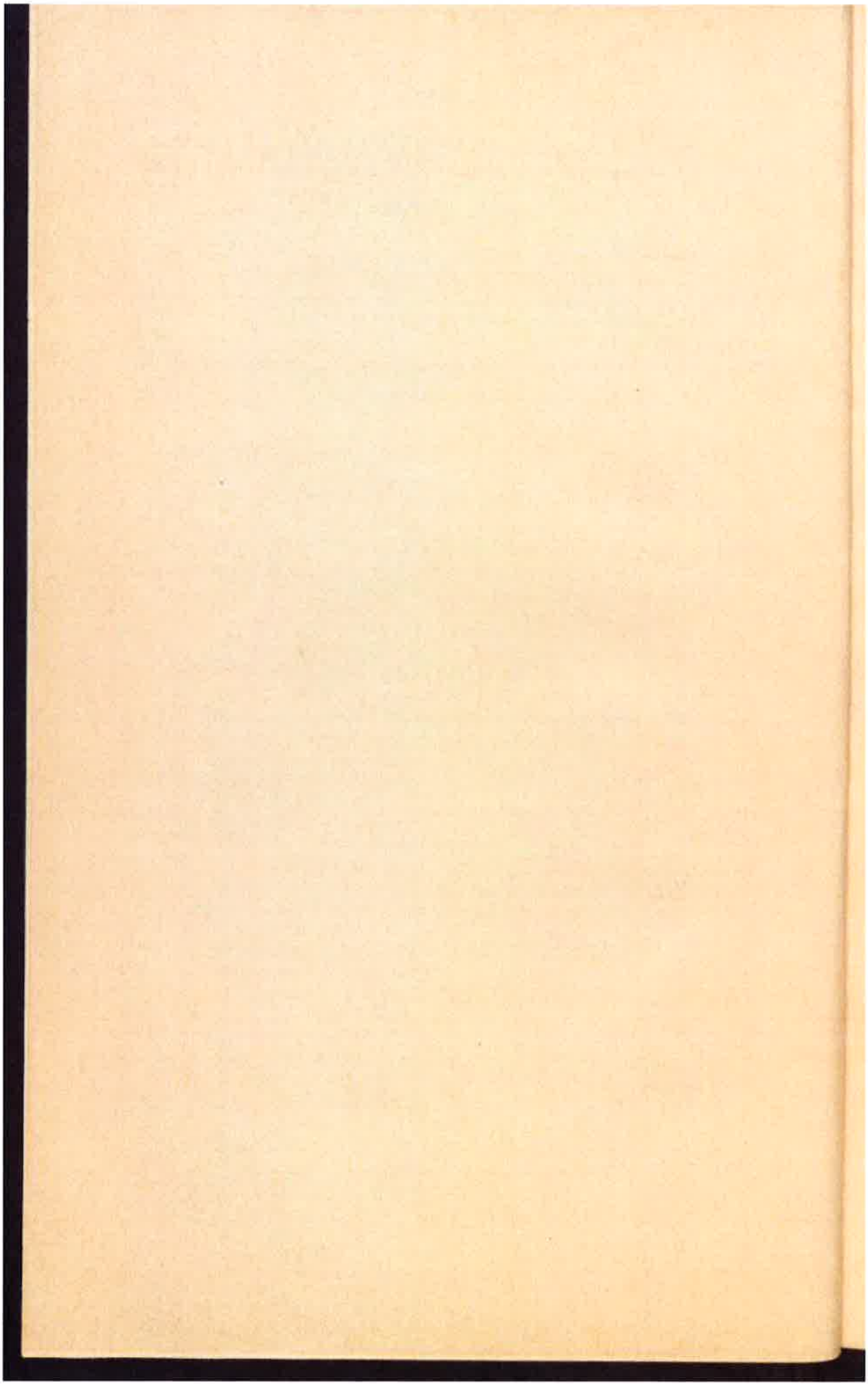
THE STATE OF UTAH

---

## REPORT OF THE SPECIAL MASTER

---

INDEX



IN THE

# SUPREME COURT OF THE UNITED STATES.

October Term, 1930.

No. 14, Original.

---

THE UNITED STATES OF AMERICA, Plaintiff,

v.

THE STATE OF UTAH, Defendant.

---

## Submission of the Report of the Special Master.

In the cause entitled The United States of America v. The State of Utah, being No. 15 Original, October Term 1928, this Honorable Court appointed me as Special Master, by its order dated March 11, 1929, as follows:

"On consideration of the motion by the United States for the appointment of a Special Master to take the evidence in this case and report the same to this Court with his findings of fact, conclusions of law, and recommendations for a decree,

"It is now here ordered that Charles Warren, of Washington, D. C., be, and he is hereby, appointed a Special Master with the powers of a Master in Chancery, as provided in the rules of this Court, to take the evidence viva voce or by deposition and to report the same to the Court with his findings of fact, conclusions of law, and recommendations for a decree—all subject to examination, consideration, approval, modification, or other disposal by the Court.

"The Special Master shall have authority (1) to employ competent stenographic and clerical assistants, (2) to fix the times and places of taking the evidence and to limit the time within which each party shall present its evidence, and (3) to issue subpœnas to secure the attendance of witnesses and to administer oaths. Depositions of wit-

nesses residing at any place may be taken upon stipulation of the parties, or by the mode provided in the rules of practice for the Courts of Equity of the United States, or as provided by sections 863, 865-867 of the Revised Statutes for the taking of depositions de bene esse in the District Courts, or as may be directed by the Master. They may be returned in the first instance to the Master. When the Special Master's report of his findings of fact, conclusions of law, and recommendations for a decree is completed, the Clerk of the Court shall cause the same to be printed; and when the same is presented to the Court in printed form, the parties will be accorded a reasonable time, to be fixed by the Court, within which to present exceptions. The Special Master shall be allowed his actual expenses and a reasonable compensation for his services, to be fixed hereafter by the Court. The allowances to him, the compensation paid to his stenographic and clerical assistants, and the cost of printing his report shall be charged against and be borne by the parties in such proportions as the Court hereafter may direct.

"If the appointment herein made of a Special Master is not accepted, or if the place becomes vacant during the recess of the Court, the Chief Justice shall have authority to make a new designation, which shall have the same effect as if originally made by the Court herein."

Pursuant to the above order, and at the request of both parties, I heard the case on oral testimony rather than on depositions, holding 31 public hearings as follows: in Washington, D. C., on September 5, 6, 1929; in Denver, Colorado, on September 12, 13, 14, 16, 17, 18, 1929; in Los Angeles, California, on September 23, 24, 25, 26, 27, 28, 1929; in Salt Lake City, Utah, on October 9, 10, 11, 12, 14, 1929; in Washington, D. C., on November 12, 13, 14, 15, 1929; and in Salt Lake City, December 3, 4, 5, 6, 7, 9, 11, 12, 1929, at which hearings the parties appeared before me as Special Master by their respective counsel, presented their evidence (171 witnesses testifying), and were further heard by me in argument in Washington, D. C., on April 9, 10, 11, 12, 1930, with respect to the findings of fact, conclusions of law and recommendations for a decree which they respectively desired me to make.

Now pursuant to the above order of this Court, I have reported the testimony (consisting of 5536 typewritten pages), and the exhibits (to the number of 638 offered by the complainant and 32 by the respondent—a total of 670) received by me as Special Master, by filing the same in the office of the Clerk of this Court with my certificate; and I herewith submit to the Court my findings of fact, conclusions of law, and recommendations for a decree.

Respectfully submitted,

CHARLES WARREN,
*Special Master.*

IN THE

# SUPREME COURT OF THE UNITED STATES.

October Term, 1930.

No. 14, Original.

---

THE UNITED STATES OF AMERICA, Plaintiff,

v.

THE STATE OF UTAH, Defendant.

---

## Report of the Special Master.

---

### THE PLEADINGS.

The suit was commenced on April 9, 1928, by the filing of the bill of complaint, by leave of Court, in the Supreme Court of the United States. After due issuance and service of process, the defendant, the State of Utah, filed its answer, October 10, 1928.

The purpose of the suit as alleged in the bill of complaint is to quiet the title of the United States to certain portions of the beds of the Green, Colorado, and San Juan Rivers within the State of Utah, as follows: *Green River*, from a point where the river crosses the township line between townships 23 and 24, S., R. 17 East (approximately the mouth of a tributary named the San Rafael River), to its confluence with the Colorado River, 95 miles; *Colorado River*, from the mouth of Castle Creek, to the Utah-Arizona boundary line, 296 miles; *San Juan River*, from the mouth of Chinle Creek to its confluence with the Colorado River, 133 miles.

The bill of complaint alleges that the United States acquired by the Treaty of Guadalupe Hidalgo of Feb. 2, 1848 (9 Statutes at Large 922) all of the river beds and riparian lands in the State of Utah; that the United States is now

seized in fee of the riparian lands, more particularly described in subdivision 2 of the bill, on the sections of the San Juan, Green, and Colorado Rivers set forth; that the lands have not been surveyed but the beds of the Rivers are plainly traceable by the water marks; that said Rivers throughout their courses travel a barren, desolate, broken country; except at a few isolated places the riparian lands are so high above the canyon streams as to preclude access to man or beast to the streams; that the region is uninhabited and substantially uninhabitable; that the region has not produced and does not produce commodities for water transportation, that the country is not susceptible of sustaining a population served by water; that the rivers carry large quantities of silt and sand; that the volume of water is variable; the flow rapid; the channels filled with fixed and shifting boulders producing rapids; the channels filled with shifting sand and gravel bars; that sand waves are found on the San Juan; that the Colorado, Green and San Juan Rivers in Utah are not and have never been navigable in fact; that neither trade nor travel can move over the portions of the rivers in Utah, in their natural conditions; that they are not used and have not been used as permanent highways of useful commerce within the State, between States, or with any foreign State; that the Green River enters the State through a rock-walled, practically inaccessible mountain gorge; that the Colorado enters the State through an open canyon and passes from Utah into Arizona through a vertical, practically inaccessible canyon; that because of the conditions use of the rivers as highways of commerce either intrastate or interstate is impracticable; that deposits of minerals exist under the river beds and the riparian lands; that the United States has granted permits to drill on said river beds and the riparian lands for oil and gas; that the permittees have entered into possession thereof under said permits and have spent large sums of money in exploring for oil and gas; that Utah claims an interest in said river beds adverse to that of the United States and asserts ownership thereto; that through its Board of Land Commissioners, without authority from the United States, is executing and delivering leases to said river beds granting to the lessees the right to drill for oil and gas in and under said river beds; that

Utah's actions constitute a cloud upon the title of the United States; that the United States has no plain, speedy, and adequate remedy at law; that unless its title is quieted the United States will suffer irreparable damage.

The bill prays (a) that Utah answer the bill of complaint and set up its title; (b) that the title of the United States be quieted in the United States; (c) that the full and exclusive fee simple title in and to the riparian and river bed lands and the minerals thereunder, except those shown in Exhibit A attached to the bill, be adjudged vested in the United States; (d) that the State of Utah be enjoined from asserting any estate, right, title, or interest in said river beds and the minerals thereunder adverse to the United States and be enjoined from in any manner disturbing or interfering with the possession, use, and enjoyment thereof by the United States; (e) for further relief to which the United States may be entitled.

The answer filed by the State of Utah admits the source of the title under which the United States claims; admits that the United States owns lands riparian to the Rivers and that the lands are unsurveyed and that the beds of the Rivers are marked plainly on the sides thereof; denies the United States is the owner, or has been since the admission of Utah as a State, of the beds of the Rivers; admits lands traversed by the Rivers are arid, barren, desolate, and broken and high above the waters and that certain areas do not produce nor have produced commodities which are transported on water; denies that the Rivers are inaccessible to man or beast so as to make said regions uninhabitable or to make impractical or impossible the sustaining a population served by water; alleges that vast areas along said Rivers are susceptible to the production of crops and other uses; alleges that the character or conditions of the lands traversed by the Rivers in no manner affects or destroys their navigability within the State of Utah; denies that the course of said Rivers is tortuous; denies the Rivers are laden with sand and silt; denies the flow is variable in depth or volume or that the channels are beset with fixed or shifting boulders or with rapids or cataracts; admits that at widely separated points boulders are present and rapids exist; that sand and silt are at times present and that there are at times sand bars which shift to some degree as a result of floods, current, and gradient, but de-

nies that these conditions or any other destroy the navigability of the Rivers in Utah; denies that the floods or any other characteristics affect the navigability of the San Juan; admits the existence of deposits of oil and gas in the lands under the river beds, but denies ownership therein by the United States since Utah became a State, admits United States has executed and delivered numerous prospecting permits to the river beds purporting to grant the right to explore for oil and gas but denies that under the terms of said permits, the permittees were granted such right; that said permits expressly provide that valid rights existing at the date thereof should not be affected; admits that permittees are in possession and have drilled at various points but denies any drilling in the river beds and alleges that if such possession has been assumed it is unlawful; admits State publicly asserts title to river beds; asserts ownership since statehood; denies title of United States and asserts navigability of the Rivers. The State admits granting of oil leases to the river beds by the State and asserts the right to do so as the owner thereof in fee simple; denies the United States will suffer injury if refused the relief prayed, because the United States has no title to the river beds; alleges that Utah was admitted to the Union, January 4, 1896, on an equal footing with the original States and upon admission became the owner of the beds of the Green, Colorado, and San Juan Rivers; admits that said Rivers are not navigable in interstate commerce, but alleges that said Rivers are and always have been navigable throughout the State of Utah and are well adapted for carrying freight and passengers in boats and other water craft; that at and prior to Utah becoming a State said Rivers were susceptible to navigation and had been actually navigated frequently and regularly by boats carrying freight and passengers; the answer prays for a dismissal of the bill and for further relief.

## The Issue.

The issue in this case is simple, single, and concrete; were the Rivers in question navigable within the State, on January 4, 1896, when Utah was admitted into the Union as a State? If they were, the river beds belong to the State; if they were not, they belong to the United States. There is no question in this case as to whether the Rivers were

"navigable waters of the United States"; there is no question as to navigation or capability of navigation in interstate commerce. In the pleadings, the Government alleges and the State admits (for the purposes of this case) that the Rivers were non-navigable in interstate commerce; hence, that question which has been the issue in so many of the adjudicated cases in this Court is eliminated. The only question is: were the Rivers navigable intrastate?

## The Law.

### (1) *Jurisdiction under the Constitution.*

It is well settled that the jurisdiction of this Court under the Constitution extends to suits by the United States against a State.

*United States* v. *Texas* (1892) 143 U. S. 621;
*United States* v. *Texas* (1896) 162 U. S. 1;
*United States* v. *Michigan* (1903) 190 U. S. 379;
*Kansas* v. *Colorado* (1907) 206 U. S. 46.

### (2) *Jurisdiction in Equity.*

The suit is a bill in equity to quiet title. It is alleged by the complainant and admitted by the respondent that the State of Utah claims estate, right, title, or interest adverse to the United States, and has publicly asserted its claim and assertion of title and has executed leases covering parts of the river beds in question. I find that the evidence also shows that the United States is in possession of the beds of the Rivers involved, and that the State of Utah has not only publicly and officially asserted title to the same but has also exercised overt acts of ownership and title by making leases of lands included in said beds; and that these acts of the State of Utah constitutute a continuing threat to the title or right of possession claimed by the United States, Under these circumstances, under the law as laid down by this Court, I find that the United States has no plain, adequate and complete remedy at law and that a bill in equity is the proper method of obtaining relief. *Holland* v. *Challen* (1884) 110 U. S. 15. See also *United States* v. *Wilson* (1886) 118 U. S. 86; *Frost* v. *Spitley* (1887) 121 U. S. 552; *Whitehead* v. *Shattuck* (1891) 138 U. S. 146.

(3) *The Law as to Title as Applied to the Issue.*

The applicable law as to title to river beds has been well settled by this Court. In conformity with the constitutional principle of equality under which new States are admitted to the Union, the title to the beds of the Rivers involved in this suit within the State of Utah passed to that State upon its admittance into the Union on January 4, 1896, under the proclamation of President Cleveland of that date (29 Statutes at Large 876), if such Rivers were navigable on that date, provided the beds had not prior thereto been disposed of by the United States; if the Rivers were not then navigable, the title to the beds remained in the United States which acquired title by virtue of the Treaty of Guadalupe Hidalgo of February 2, 1848 (9 Statutes at Large 922).

*Massachusetts* v. *New York* (1926) 271 U. S. 65, 89;
*United States* v. *Holt State Bank* (1926) 270 U. S. 49, 55;
*Oklahoma* v. *Texas* (1922) 258 U. S. 574, 583;
See also *Scott* v. *Lattig* (1913) 227 U. S. 229; *Shively* v. *Bowlby* (1894) 152 U. S. 1.

The test of navigability to be applied must be the Federal rule as laid down by this Court, rather than any rule established by the State.

*United States* v. *Holt State Bank* (1926) 270 U. S. 45, 55, 56;
*Brewer-Elliott Oil Co.* v. *United States* (1922) 260 U. S. 77, 87;

As to the navigability or non-navigability of these Rivers, and the respective rights and titles of the parties to this suit, are to be determined as of the date of Statehood, January 4, 1896, there is one point to be noted, as to which some confusion has arisen in the argument of this case before me, owing to the fact that the Bill of Complaint refers only to three rivers—the Green, Colorado, and San Juan, and alleges in Article 4 (b) that "the Colorado rises in the State of Colorado," etc., etc. The fact is, that on January 4, 1896, there were four rivers then existing in the State of Utah, instead of three, whose beds are brought in question in this suit, viz., the Green, the Grand, the Colo-

rado, and the San Juan. The Green and Grand were separate rivers, each distinct from the Colorado, and forming the Colorado by their junction. The Grand River, in 1896, appeared on all Government and State maps and reports as a separate river distinct from the Colorado; its navigability, therefore, in that year, between the points named in the bill of complaint must be ascertained as of a river separate and distinct from the Colorado. The Colorado River in 1896, began at the junction of Green and Grand Rivers; its navigability, in 1896, in Utah must, therefore, be ascertained from that point as of a river separate and distinct from the Grand.

It is true (as alleged in the bill of complaint) that Congress applied the name of the Colorado River to the whole length of the Grand River, by the Act of July 25, 1921 (42 Statutes at Large 146, c. 52).(1) But this Act of 1921 could have no retroactive effect; it could not convert a river of the State of Utah existing in 1896 into another river; and the Act itself specifically provided that it should "in nowise affect the rights of the State of Utah". Moreover, it is doubtful whether Congress, in 1921, had power to deal with a non-navigable river of the State of Utah in any manner, either by changing its name or otherwise except for the purpose of Government records of the United States; Congress, in 1921, would not appear to have had power to make any change in the status of the Grand River unless the

---

(1) "That from and after the passage of this Act, the river heretofore known as the Grand River, from its source in the Rocky Mountain National Park in Colorado to the point where it joins the Green Riven in the State of Utah and forms the Colorado River, shall be known and designoted on the public records as the Colorado River. Sec. 2. That the change in the name of said river shall in nowise affect the rights of the State of Colorado, the State of Utah, or of any county, municipality, corporation, association, or person; and all records, surveys, maps, and public documents of the United States in which said river is mentioned or referred to under the name of the Grand River shall be held to refer to the said river under and by the name of the Colorado River."

Grand River was then a navigable water of the United States; for navigability in interstate or foreign commerce (except so far as Congress possesses admiralty jurisdiction) alone gives Congress the power to deal with rivers in a State, (subject to the qualification laid down in *United States* v. *Rio Grande Dam & Irrigation Co.* (1899) 174 U. S. 690), that Congress may deal with non-navigable rivers to the extent of removing obstructions or preventing obstructions in them which would injure or impede the navigability of navigable waters of which they are tributary or headwaters).

**In view of the above, it clearly appears to be the duty of the Special Master to determine the navigability or non-navigability of four Rivers, the Green, the Grand, the Colorado, and the San Juan, irrespective of the fact that** in the bill of complaint the Rivers are described and designed as three in number.

(4) *The Law as to Navigability of Rivers.*

The law as to what constitutes a navigable river has been well settled since it was first laid down by Field, J. in *The Daniel Ball*, 10 Wall. 557 at 563:

"Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce over which trade and travel are or may be conducted in the customary modes of trade and travel on water."

The distinction between navigable waters of the United States and navigable waters of a State was pointed out in *The Montello* (1871) 11 Wall. 411 by Field, J. at 415:

"If, however, the river is not of itself a highway for commerce with other States or foreign countries, or does not form such highway by its connection with other waters, and is only navigable between different places within the State then it is not a navigable water of the United States but only of the State."

In *The Montello* (1874) 20 Wall. 430, at 441-442, per Davis, J., the Court held that:

"The true test of the navigability of a stream does not depend on the mode by which commerce is, or may be, conducted, nor the difficulties attending navigation. If this were so, the public would be deprived of the use of many of the large rivers of the country over which rafts of lumber of great value are constantly taken to market. It would be a narrow rule to hold that in this country, unless a river was capable of being navigated by steam or sail vessels, it could not be treated as a public highway. The capability of use by the public for purposes of transportation and commerce affords the true criterion of the navigability of a river, rather than the extent and manner of that use. If it be capable in its natural state of being used for purposes of commerce, no matter in what mode the commerce may be conducted, it is navigable in fact, and becomes in law a public river or highway. Vessels of any kind that can float upon the water, whether propelled by animal power, by the wind, or by the agency of steam, are, or may become, the mode by which a vast commerce can be conducted, and it would be a mischievous rule that would exclude either in determining the navigability of a river."

It will be noted that the words "their ordinary conditions" used in the *Daniel Ball Case*, were changed to "in its natural state". I conceive that no change of meaning was intended. At page 443, the Court further said:

"Indeed, there are but few of our freshwater rivers which did not originally present serious obstructions to an uninterrupted navigation. In some cases, like the Fox River, they may be so great while they last as to prevent the use of the best instrumentalities for carrying on commerce, but the vital and essential point is whether the natural navigation of the river is such that it affords a channel for useful commerce. If this be so, the river is navigable in fact, although its navigation may be encompassed with difficulties by reason of natural barriers, such as rapids and sand-bars."

Little has been added by the later cases to these criteria or tests of navigability. In 1891, in *Packer* v. *Bird* 137 U. S. 661, per Field J. emphasis was again laid on the fact

that: "It is, indeed, the susceptibility to use as highways of commerce which gives sanction to the public right of control over navigation upon them and consequently to the exclusion of private ownership, either of the waters or the soils under them."

In 1897, in *St. Anthony Falls Water Power Co.* v. *Board of Water Commissioners*, 168 U. S. 349, per Peckham, J., it was held that a river in order to be navigable, "it is not necessary that it should be deep enough to admit the passage of boats at all portions of the stream." One witness for the plaintiff in error said that in its natural state the river at this point was not navigable at ordinary stages of the water for one half mile below St. Anthony Falls, and in its natural state it was not navigable immediately above the falls.

In 1900, in *Leovy* v. *United States*, 177 U. S. 621, at 632, 634, per Shiras, J., it was held that since the power of Congress to regulate navigable waters of the United States is derived from the Commerce Clause of the Constitution the term, navigable waters of the United States, has reference to commerce of a substantial and permanent nature to be conducted thereon. * * * "In order to give it the character of a navigable stream, it must be generally and commonly useful to some purpose of trade or agriculture."

In 1913, in *Donnelly* v. *United States*, 228, U. S. 243, at 262, per Pitney, J., it was said that the test was "whether the stream in its ordinary condition affords a channel for useful commerce." The introduction of the word "useful", in my opinion, was intended only to exclude illegal commerce or merely trivial commerce; for otherwise it is difficult to conceive of an act constituting commerce which would not be useful to some one or under some circumstances.

In 1917, in *United States* v. *Cress*, 243 U. S. 316, at 321, per Pitney, J., it was said that "the public right is to be measured by the capacity of the stream for valuable public use in its natural condition." I assume that "valuable public use" was but a synonym for "useful".

In 1921, in *Economy Light & Power Co.* v. *United States*, 256 U. S. 113, at 122, per Pitney, J., it was held that: "navigability in the sense of the law, is not destroyed because the watercourse is interrupted by occasional natural

obstructions or portages; nor need the navigation be open at all seasons of the year, or at all stages of the water."

The law has been summed up in 1926 in *United States* v. *Holt State Bank*, 270 U. S. 49 at 56, per Van Devanter, J., as follows:

"The rule long since approved by this Court in applying the Constitution and laws of the United States is that streams or lakes which are navigable in fact must be regarded as navigable in law; that they are navigable in fact when they are used, or are susceptible of being used, in their natural and ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water; and further that navigability does not depend on the particular mode in which such use is or may be had—whether by steamboats, sailing vessels or flatboats—nor on an absence of occasional difficulties in navigation, but on the fact, if it be a fact, that the stream in its natural and ordinary condition affords a channel for useful commerce."

In the following cases, the Court applying the above tests has failed to find that the rivers were navigable waters of the United States or were navigable waters of a State:

*Egan* v. *Hart* (1897) 165 U. S. 188;
*United States* v. *Rio Grande Dam & Irrigation Co.* (1899) 174 U. S. 690;
*Leovy* v. *United States* (1900) 177 U. S. 621;
*Donnelly* v. *United States* (1913) 228 U. S. 708;
*Oklahoma* v. *Texas* (1922) 258 U. S. 574;
*Brewer-Elliott Oil & Gas Co.* v. *United States* (1922) 260 U. S. 77.

In the latter case, the Court accepted the findings of the District Court and of the Circuit Court of Appeals to the effect that "the Arkansas River, along the Osage Reservation, was not, and had never been, navigable within the adjudged meaning of that term"; and Chief Justice Taft summed up the law as to navigability as follows, at page 86:

"A navigable river in this country is one which is used, or is susceptible of being used, in its ordinary condition, as a highway for commerce over which trade and travel

are or may be conducted in the customary modes of trade and travel on water. It does not depend upon the mode by which commerce is conducted upon it, whether by steamers, sailing vessels, or flatboats, nor upon the difficulties attending navigation; but upon the fact whether the river, in its natural state, is such that it accords a channel for useful commerce."

(5) *Effect of State Laws, Constitutions or Court Decisions on Question of Navigability.*

This Court has decided that no provision of a State statute or State Constitution or decision of a State Court as to navigability of rivers can affect the title of the United States to its lands. *Brewer-Elliott Oil & Gas Co.* v. *United States* (1922) 260 U. S. 77, at 89; see also *Van Brocklin* v. *Anderson* (1886) 117 U. S. 151.

THE FACTS.

I find the facts as follows:

TOPOGRAPHY OF THE RIVERS.

The Wasatch Mountains, running north and south, split the State of Utah nearly in halves. The Uintah Mountains parallel the northern boundary of the State between the Wasatch Mountains and the Colorado line. Nearly the whole of Utah, east of the Wasatch and south of the Uintah Mountains, drains into the Green, Grand, Colorado, and San Juan Rivers, and forms what is known as the Colorado Basin; in addition, these Rivers drain a considerable portion of Wyoming, Colorado, and New Mexico. About 244,000 square miles are in this Colorado Basin, an area nearly as large as Minnesota, Wisconsin, Iowa, Illinois, and Missouri combined. (1)

---

(1) "Colorado River and Its Utilization" by E. C. LaRue, United States Geological Survey, Water Supply Paper 395 (1916), Complainant's Exhibit 58; "The Green River and Its Utilization" by Ralf R. Wooley, Water Supply Paper 618 (1930); "Brief Description" by W. G. Hoyt, Complainant's Exhibit 85; "Gazette of Utah" by Henry Gannett, United States Geological Survey Bulletin 166 (1900) Complainant's Exhibit 61.

*Green River.*

Green River and its tributaries drain an area comprising a large part of western Wyoming, northwestern Colorado, and eastern Utah, bounded on the north and east by the Wind River Mountains and the ranges forming the Continental Divide, on the south and east by the White River Plateau and the Roan or Book Cliffs, and on the north and west by the Gros Ventre and Wyoming Mountains and the great Wasatch Range. The area is roughly triangular in shape, its greatest length, north and south, being about 370 miles, and its greatest width, east and west, 240 miles, the total area being approximately 44,400 square miles. The River heads on the western slope of the Wind River Mountains in western Wyoming, its ultimate source being a number of small lakes fed by glaciers and the immense snow deposits always to be found on Frémont and neighboring peaks. Its total length to its mouth is about 700 miles. For about 25 miles, the river flows northwestward through the mountains; it then turns abruptly and runs in a general southerly direction across western Wyoming into Utah, receiving in its upper course in Wyoming numerous tributaries that head in the Wind River, Gros Ventre, and Wyoming ranges of mountains, some of them extending so far back into the abrupt, ragged canyons that they dovetail with streams flowing in the opposite direction. Between the town of Green River, Wyoming, and the Wyoming-Utah boundary, the Green passes through an open canyon for approximately 70 miles. Just south of the boundary, there is an open valley in which Henry's Fork enters from the west. Immediately below the mouth of Henry's Fork, the River enters Flaming Gorge and Horseshoe Canyons. Beyond Horseshoe Canyon, the River flows eastward through Kingfisher and Red Canyons and Brown's Park, into Colorado; thence southward in Colorado for 35 miles, passing through Lodore and Whirlpool Canyons. Just above Whirlpool Canyon it is joined from the east by Yampa River, a large tributary. Turning back into Utah, the Green flows south-

westerly through Split Mountain Canyon into an open valley in the vicinity of Jensen and Ouray, where it is joined by the Duchesne or Uintah River from the west and White River from the east. A few miles below the mouth of Duchesne and White Rivers, the Green passes into a 120 mile stretch, the upper section of which is known as Desolation Canyon and the lower as Gray Canyon. The rock walls of these various Canyons are of great height, ranging from 1200 to 2700 feet. Near the lower end of Gray Canyon, the River is joined by Price River, which enters from the west. About 7 miles below the mouth of Price River, the River passes out of Gray Canyon into the Green River or Gunnison Valley in which the town of Green River, Utah, is situated. The drop in elevation between the town of Green River, Wyoming, and Green River, Utah, is from 6067 to 4046 feet—2021 feet in 387 miles, causing many difficult and dangerous rapids. In stretches of less than one half of a mile, there are drops of 36.7 feet per mile, 45, 50, 22.5, 8, 43.3, 20, 66.7 and 20. For the first 23 miles from the town of Green River to where the San Rafael River enters from the west the country is more or less open. From the mouth of the San Rafael, south to the junction of Green and Grand Rivers, the Green flows through Labyrinth and Stillwater Canyons, the solid rock walls of which in many places rise almost vertically from the water's edge and in other places are over a thousand feet apart, with heights of 600 to 1300 feet. The average width of the River is 500-700; and at places, it increases to 1000 feet. In four or five places, there are bottom lands along the side in the Canyons. The course of the River is tortuous, the distance by bee line from the San Rafael to the junction being 43 miles; while the distance by the River is 94 miles. The slope of the River is very gradual, being from 4046 feet elevation to 3987—a drop of 59 feet in the first 23 miles to the mouth of the San Rafael River; and from 3987 to 3876—a drop of 111 feet in the 94 miles from the Rafael River to the Junction of the Green and Grand Rivers—less than 1.5 feet per mile.

*Grand River.*

Grand River and its tributaries drain an area of about 25,900 square miles, of which 22,290 are in Colorado and

the rest in eastern Utah. On the east and southeast, the basin is bounded by the high ranges of the Continental Divide in Colorado which separate it from the basins of Platte and Arkansas Rivers; on the north, it is limited by the White River and Book Cliffs Plateau. Grand River rises among the high peaks of the Rocky Mountains in north-central Colorado and flows southwestward to its junction with Green River, traversing approximately 423 miles. It flows throughout its course in a succession of long, narrow, fertile valleys alternating with deep canyons, whose precipitous walls attain a height, in places, of over 2,000 feet.

At Grand Junction, the north branch of the Grand, rising east of Glenwood Springs, joins the south branch which now bears the name of Gunnison River and which, in turn, has a large tributary, the Uncompahgre River. (1) Then the united stream flows west and southwest and through a deep canyon into the State of Utah, with the ridge of Roan or Brown Cliffs separating the Grand from the Green Rivers. There are many difficult and dangerous rapids, the largest of which is in Westwater Canyon, just below the Utah-Colorado boundary line, where the River drops 27 feet in a short distance. The total drop from Grand Junction, Colorado to Castle Creek, Utah, is from 4552 feet elevation to 3993—a drop of 559 feet in 94 miles, or 6 feet per mile; there are stretches of 5 and 5½ miles with an 8 foot drop per mile; 4 miles with a 21 foot drop; and 16 miles with a 6 foot drop. The distance from Castle Creek to the mouth of the Grand

---

(1) The south branch of the River was formerly called the Grand while the north branch was called the Blue River, or by its Indian name, the "Avonkarea" or "Nah-un-kar-rea." Captain Gunnison, in his Pacific Railway Survey of 1853, *33d Cong., 2d Sess., Senate Exec. Doc.* 78, Vol. II, p. 50, wrote:

"Our guide states that its (Grand River) main branch rises in the Elk Mountains to the west * * * Following the eastern slope of the Elk Mountains to their termination. Grand River passes to the south and west of them, where it joins the Nah-um-kah-rea or Blue River of the Indians and mountain men, which rises in the Middle Park, and is erroneously called Grand River on some of the most correct maps." In *The American Fur Trade in the Far*

and its junction with the Green is about 79 miles. From Castle Creek to Moab (14 miles) the slope averages 3.5 feet per mile and there are slight rapids or riffles and rocks in the stream. At Moab, there is an open valley (the town being located back from the River about 2 miles). Leaving Moab Valley, the Grand flows 65½ miles largely through solid rock canyons having walls in general 600-2100 feet high and in some places higher—but the walls are further apart, as a rule, than on the Green. The course of the River is slightly more tortuous than the Green, distances by water being over twice those by bee-line. The width of the River averages about 500 feet, and the slope is only a little over 1 foot per mile (from 3946 feet elevation to 3876, a drop of 70 feet in 65.4 miles).

*Colorado River.*

Colorado River begins at the Junction of the Green and Grand Rivers and flows southwesterly. For the first 36½ miles, it flows through a deep canyon, Cataract Canyon, with solid rock walls, 1500-2700 feet in height, with a rapid descent or slope from 3879 feet elevation to 3480, or 399 feet—a drop of 11 feet per mile. This drop is caused by a long series of high and dangerous rapids. The lower end of this canyon is very narrow, precipitous, and steeply sloped and is termed Dark Canyon. The country then becomes more open, the River somewhat wider and the canyon walls not over 600 feet, and from the end of Dark Canyon or Millecrag Bend to the Utah-Arizona boundary line is known as Glen Canyon. Two rivers enter from the west, Fremont (or Dirty Devil) River and Escalante River; and one from the east, San Juan River. As the Colorado approaches the Utah-Arizona boundary line, the canyon walls increase in height and average 1300-1600 feet high. There

---

*West* (1902), by Captain M. Chittenden, II, 782, it is said that: "As late as the Pacific Railroad Surveys (in the 1850's) the name, Grand River, was used to describe the southern branch now called the Gunnison. After Captain Gunnison's exploration (in 1853) his name was given to the tributary, while the name, Grand, became permanently fixed on the main stream. The latter was, prior to this time, called Blue River."

are various points at which bottom lands are cultivated in the river beds. The width of the River down from North Wash (about 140 miles above the boundary line) averages 600-700 feet; but further south between the mouth of the San Juan River and the boundary line the River rather narrows than widens. The slope or descent of the River is gentle, falling from an elevation of 3465 feet below Cataract Canyon to 3165 at the boundary line or 300 feet in 176 miles, i. e. less than 2 feet per mile.

No part of the River involved in this suit lies below the Utah boundary line, but to complete the picture of the River, it may be stated that 27 miles south of the boundary, there is a point known as Lees Ferry, the location of a former ferry and now of a bridge on the main travelled route between Arizona and southwest Utah. At this spot, the Paria River enters from the north into the Colorado which there flows southwesterly. Shortly below, the River enters into Marble Canyon, deep, with violent rapids; the Little Colorado enters from the south and at this point the Colorado turns and flows west, passing through the Grand Canyon with its mighty rapids. At a point called North Wash (near the boundary line between Nevada and Utah) the 284 miles of the Marble and Grand Canyon practically end; at a point 463 miles from the Gulf of California, the Virgin River enters from Nevada to the north; then the Colorado makes another great turn to the south and flows into the Gulf, passing through Black Canyon (the site of the proposed Boulder Dam,) by Fort Mojave and the Needles, by the mouth of Bill Williams River entering from the East about 400 miles from the Gulf; by the Gila River entering from the east, and then on 120 miles until it reaches the Gulf.

*San Juan River.*

As this River presents certain features differing from the other three, its topography, history, use, and conditions will be considered separately in another portion of this Master's Report.

TOPOGRAPHY OF SURROUNDING COUNTRY.

The Rivers in the sections involved in this suit have eroded their way through a vast rock plateau stretching for 25-30 miles on either side and having an elevation of 5000-

6000 feet. The River canyons, varying from 600 to 2000 feet in depths, are sometimes more or less vertical rock walls, and sometimes contain inner gorges rising in gigantic steps to the tops of the canyon and the plateau rims. This plateau is traversed by labyrinths of lateral and side canyons, where each stream, creek, and wash tributary to the main Rivers has eroded a deep canyon of its own, and narrow transverse valleys may extend from each of these lateral canyons. The various geologic strata of the plateau of sandstones and shales of varying degrees of hardness have been eroded by the elements into benches, terraces, buttes, mesas, domes, pinnacles, spires and bridges. The rocks which generally lie in nearly horizontal beds, do not all offer the same resistance to weathering, and for this reason the character of the surface features depends in large measure on the character of the rocks. Thick beds of hard sandstone and limestone form vertical cliffs, above which there are benches or plateaus, whereas shale produces slopes or badland areas. Stream channels cut entirely in sandstone and limestone are confined in narrow, steep-walled canyons; but the channels that are cut into thick beds of shale are bordered by wide valleys, whose slopes are surmounted by precipitous cliffs of the overlying hard sandstone. Owing to the nature of the rock and to the heaviness of the rains, the soil adheres with difficulty, so that a large part of the surface of the plateau is entirely bare, or else covered with a desert type of vegetation; and much of the surface is so broken as to support not even such vegetation. Sand and bare rock are everywhere to be seen. Trees are rarely to be found within a distance of 20 miles from the Rivers, except a few willows or cottonwoods on sand bars along the water's edge, and on a few River bottoms.

There are isolated mountains at a distance of 20-30 miles to the east of the Grand—the LaSal, 12,000-13,000 feet high, the Elk (9,000-11,000) and the Abajo (11,400); to the west of the Colorado, the Henry Mountains (8,000-11,250); and Navajo Peak (10,416) in Arizona, 40 miles southeast of the Colorado at the boundary line.

To the west of the Green and the upper stretch of the Colorado, the plateau extends in three benches or levels which are accessible from each other with difficulty. The pie-shaped tract between the Green and Grand Rivers

lies in two levels, making the plateau at the Junction extremely inaccessible, overland. The country to the west of the Grand is much broken by a divide between Kane and Indian Creek and by Lockhart Canyon and Indian Creek. The country east of the Colorado has been little explored and is difficulty of access except down White Canyon. The plateau to the West of the Colorado rises more sharply and is difficult to travel.

In the region near the junction of the San Juan and Colorado Rivers, north of the former, there was in 1879, and some time later, an accumulation of water known as Hermit or Pahrahrit Lake but this does not appear to be now in existence.

The scenery on these Rivers is of an unusual nature, beautiful, grand, fantastic. It can only be properly appreciated by examination of the many fine photographs which have been introduced in evidence. Three extracts from the writings of the earliest men to view it (one of them a witness in this suit) will illustrate the scenic conditions. Major John W. Powell wrote of the scenery at the Labyrinth and Stillwater Canyons of the Green River (1):

"We are down among the buttes and in a region the surface of which is naked solid rock—a beautiful red sandstone. * * * The Indians call this * * * The Land of the Standing Rocks. * * * a whole land of naked rock with giant forms carved on it, cathedral-shaped buttes towering hundred or thousands of feet, cliffs that cannot be scaled, and canyon walls that shrink the River into in-

---

(1) *Exploration of the Colorado River of the West* (1875), by J. W. Powell (Complainant's Exhibit 51) pp. 54, 55, 72.

(1) Capt. J. W. Gunnison in his report of his Pacific Railway Survey in 1853 wrote, p. 54: "The Salt and the Abajo Peaks were pointed out to us. The former is directly on the noted Spanish Trail from California to Abiquiu, New Mexico, and is a favorite resort for Utah and Navajo Indians for trade; while the latter is near the junction of the Grand and Green Rivers, considerably below the fords for this trail, or, as Leroux says, below any ford on Grand River known to the Mexicans and hence its name." ("Abajo" in Spanish meaning "below".)

significance, with vast hollow domes and tall pinnacles and shafts set on the verge overhead, and all high-colored, buff, gray, red, brown and chocolate. * * * bare and often polished."

Of the Colorado River in the stretches above the Utah-Arizona line, he wrote:

"On the walls and back many miles into the country numbers of monument buttes are observed. So we have a curious ensemble of wonderful features—carved walls, royal arches, glens, alcove-gulches, mounds and monuments. * * * We decide to call it Glen Canyon."

Frederick S. Dellenbaugh wrote of the junction of the Green and Grand Rivers (1):

"Here was revealed a wide cyclorama that was astounding. Nothing was in sight but barren sandstone, red, yellow, brown, grey, carved into an amazing multitude of towers, buttes, spires, pinnacles, some of them several hundred feet high, and all shimmering under a dazzling sun. It was a marvellous mighty desert of bare rock chiselled by the ages. * * * fantastic, extraordinary, antediluvian, labyrinthian, and slashed in all directions by crevices."

Lieutenant Leeds in his War Department Report of 1909 said of the Green River: "In most places, there are irregular walls on either side of red sandstone, eroded into fantastic shapes and often banded with shades of other colors, producing very beautiful scenery which is of the same nature as and only surpassed by that of the Grand Canyon of the Colorado in Arizona." (2)

The scenery of the Canyons on the Grand River from Moab to the Junction is similar, though perhaps not so striking. Many witnesses testified to the fact that these regions are to be placed in a class with other great natural scenic wonders of the West.

In addition, there are many prehistoric remains of cliff-dwellers in the canyons and plateau to the east of the Colo-

---

(1) *A Canyon Voyage* (1926), by Frederic S. Dellenbaugh, p. 116, (Complainant's Exhibit 14).

(2) *61st Cong. 2d Sess., H. R. Doc. No. 953*, Defendant's Exhibit 18.

rado River, especially, in the White Canyon region; and in the same region are many great natural bridges, one of the most remarkable of which is the Rainbow Natural Bridge (first seen by white men, in 1909), now made a National Monument, which may be reached by a trail and road overland in Arizona and also by a trail up Aztec Creek from a point on the Colorado River 41 miles north (by the River) of the Utah-Arizona boundary line.

## History of the Green, Grand, and Colorado Rivers from 1540 to 1869.

The Government in its brief submitted to the Special Master states that "in determining the question of the navigability of a river, ancient and early navigation is entitled to great weight. This is necessarily so, because in the early history of this country, there were few overland routes. Explorers, fur traders, merchants, and immigrants were forced whenever possible to use rivers as highways for trade and travel." The Government contends that the fact that history for many years discloses little use of these Rivers by boats constitutes weighty evidence that they were non-navigable in fact and in law. In view of this contention, I have found it necessary to investigate, through Government documents, standard histories, and the works of old explorers, the history of these Rivers more completely than it is set forth in the Government's testimony and brief.

Seven to twelve hundred (possibly two thousand) years ago, the great rock plateau and the canyons of the Colorado River and its tributary rivers and creeks were the home of thousands of Indians of that mysterious race now familiarly known as Cliffdwellers. Many extant signs point to a considerable agricultural population who cultivated and irrigated lands in this region. The ruins of their homes, with their implements, are still to be found in great numbers in the canyon walls of the Rivers involved in this suit, and in the canyons of the plateau east of the Rivers. Many of these dwellings are so located as to seem accessible from the water, but there are also signs of means of approach down the Canyon walls from the rims. It seems likely that use must have been made of the Rivers by these Indians, though no trace of boats or canoes used by them has been found. The present day Indians, the Navajos and the Utes, probably owing to old superstitions and legends, have not navi-

gated these Rivers in boats and do not now navigate them except to cross at fords. (1)

The history of the regions involved in this suit is the history of how the trails pierced the Far West.(2) It was in the year 1540 that the first white man laid eyes on the Colorado River. In August of that year, one year before Hernandez De Soto progressing west from Florida discovered the Mississippi River, and sixty-seven years before the first Englishman viewed the James River in Virginia, Hernando de Alarcon sailing north on the Pacific Ocean entered the Gulf of California and ascended the Colorado River beyond where the Gila River now flows into it. In the same year, Melchior Diaz came to the River from the

---

(1) W. E. Mendenhall, an old river man, testified that (Record 3525-3526): "We could never get Navajos Indians to do down with us into a canyon. They hear the rocks rolling down there and they say it is the Great Spirit. There are always rocks tumbling down from the sides of the Canyon and rolling down towards the bottom and these make a very loud rumbling sound. The Indians seem to believe the canyons are inhabited by spirits. They will not eat a fish caught from one of these streams. Their tradition is that they fought the Cliff-dwellers and defeated them repeatedly and finally drove them into a big bend of the River and rather than be captured the Cliff-dwellers jumped into the River and were turned into what is called the hump-backed fish and that reason has kept them from ever eating or catching a fish."

(2) For authorities in general, see *Utilization of the Colorado River*, by E. S. La Rue, Water Supply Paper, Complainant's Exhibit 58; *The Romance of the Colorado River* (1902) by Frederick S. Dellenbaugh, Complainant's Exhibit 13; *The Colorado River* (1923) by Lewis R. Freeman, Complainant's Exhibit 81; *The Ashley-Smith Explorations* (1918) by H. C. Dale; *The Trans-Mississippi West* (1928) by Prof. Cardinal Goodwin; *The Plains and the Rockies, A. Bibliography* (1921) by Henry R. Wagner; *Economic Beginnings of the Far West* (1912), by Prof. Katherine Coman.

Indian towns in northern New Mexico. In the autumn of 1550, Garcia Lopez de Cardenes starting from the Zuni Indian towns to the east reached the southern rim of the Grand Canyon of the Colorado. It was 275 years before there is any definite record of another white man viewing that stupendous sight (unless Garces saw it in 1776).

In 1604-05, Don Juan de Onate, Governor of New Mexico, made a trip to the Colorado River (near the junction of Bill Williams River) and descended it to the Gulf of California; in 1678, Padre Eusebio Francisco Kino reached the River near the Gila, and in 1702 descended to the Gulf. In 1744, Padre Sadelmair reached the River near the mouth of Bill Williams River. In 1761 or 1765, Juan Maria de Rivera, travelling to the north, crossed the San Juan River (east of the section involved in this suit), descended the Dolores River, crossed over to the Uncompahgre and the Gunnison Rivers, and so explored what is now western Colorado and the upper reaches of the Grand River. From 1771 to 1776, Francisco Garces made three trips to the Colorado River on missionary work, twice ascending it for some distance and travelling across it to the west and through to San Gabriel (near Los Angeles) and other Missions on the Pacific Coast; returning on one trip to Arizona and New Mexico, he passed within a few miles of the Grand Canyon. All these early trips by Spanish explorers started either from Taos or Santa Fe or Abiquiu, in northern New Mexico.

In 1774 and 1775, Juan Bautista de Anza made two notable expeditions from Tubac in southern Arizona to the Gila and across the Colorado into California, visiting the San Gabriel and Monterey Missions.

It was on July 29, 1776, twenty five days after the Declaration of Independence in Philadelphia (at a time when the only American settlements west of the Allegheny Mountains were a few in Kentucky and North Carolina) that the most notable of all early explorations of the Colorado River Basin occurred. On that day, Fra Padre Francisco Silvestre Velez Escalante, with a party of eight, started from Santa Fe, New Mexico to search a new and more northern route to Monterey in California. He crossed the tributaries of the San Juan River, near the southwest boundary line of the present State of Colorado, thence going north; then

he followed Rivera's trial to the Gunnison, and to the Grand River and down it crossing over considerably north of the present town of Moab; passing over to the Green River, he crossed it at a point 128 miles above the present town of Green River, and then went up the Duchesne River; from which he crossed the Wasatch Mountains by the pass (known later as Spanish Fork), and reached Utah Lake which he termed Lake Timpanogo; turning away from the direction of Monterey on the Coast, he proceeded southwesterly nearly to the Grand Canyon of the Colorado. Finally, owing to the lateness of the season and hostility of the Indians, he regretfully turned east again and came to the Colorado River at the point now known as Lees Ferry. Finding no ford there, he struck across the high plateau on the north bank of the River and finally climbed down the canyon wall at a point 13 miles above the present Utah-Arizona boundary line, where he made a ford which has ever since been known as *El Vado de los Padres—The Crossing of the Fathers.* This was on November 6, 1776. Proceeding southeast across the Arizona Desert through the Moki and Zuni Indians, he reached Santa Fé again on January 2, 1777, after a remarkable journey of over five months.(1) From the date when he crossed the River, it was over fifty years before another white man crossed it at that point, so far as the records show.

Between 1776 and 1821, a route from Santa Fé and Taos in New Mexico to southwestern Utah was travelled by Spanish traders, which later became known as The Old Spanish Trail and which followed substantially the following course.(2) Leaving Santa Fé (or Taos or Abiquiu), it proceeded north and west, by the present city of Durango, northwesterly up the Dolores River and across the region of the La Sal Mountain to the Grand River, which it crossed north of the present town of Moab, then west to Green River, which it crossed either at or slightly above

---

(1) For a good account of this trip, see *The Founding of Utah* (1923), by Prof. Levi Edgar Young, 48-52.

(2) See map, Complainant's Exhibit 221; also *The Old Spanish Trail* by Joseph J. Hill, *Hispanic American Historical Review* (1921), IV, 444.

the present town of Green River, then west to the present town of Castle Dale, then southwest, crossing the Wasatch Mountains near the present town of Salina, then southwest up the Sevier River Valley, and crossing to Little Salt Lake, and to the towns of Parowan, Cedar City and down the Virgin River by Las Vegas de Santa Clara, and St. George. This trail avoided the arid and torrid deserts of the south, and, as Fremont wrote later, was "deviously traced from one watering place to another"; for nearly fifty years, it had its terminus in Utah, and did not extend into California, the trade being with the Utah Indians. In the early years few Americans trespassed on this Spanish territory; but it is possible that as early as 1807, Ezekiel Williams and the others may have gone over a part of this trail (1); and as early as 1824, William Huddart and William Becknell are known to have followed it, at least as far as Green River.

Meanwhile, after a massacre in 1781 of the Spanish settlements on the Gila River by the Indians, that region was abandoned by the white man, and for forty years the southern route to California via the Gila and San Diego was little traversed. In 1824, however, James O. and Sylvester Pattie of Kentucky began trapping in the Colorado River country. In 1826, Ceran St. Vrain, took an expedition of beaver fur traders to the Gila. (2) In the same year, James O. Pattie became the first American to explore from the south the (then Mexican) regions involved in this suit.(3) His remarkable trip began at the mouth of the Gila, whence he proceeded up the bank of the Colorado to Black Canyon, of which he gave the first description by an American as follows:

"We reached a point of the river where the mountains shut in so close upon its shore that we were compelled to

---

(1) *History of the Pacific States of North America* (1890), by Hubert H. Bancroft, XX, 350 note 12.

(2) *St. Vrain's Expedition to the Gila in* 1926, by Thomas M. Marshall, *Southwestern Historical Quarterly* (1915), XIX.

(3) *Personal Narrative* (1831), by James O. Pattie.

climb a mountain and travel along the acclivity, the river still in sight and at an immense depth beneath us. * * * The river bluffs on the opposite shore were never more than a mile from us. It is perhaps this very long and formidable range of mountains which has caused that this country of Red River has not been more explored, at least by the American people. A march more gloomy and heart-wearing to people, hungry, poorly clad, and mourning the loss of their companions cannot be imagined."

Then he proceeded along the north rim of Grand Canyon until he reached a point probably near the later Lees Ferry which he described as follows: "We arrived where the river emerges from these horrid mountains which so cage it up as to deprive all human use of its waters. No mortal has the power of describing the pleasure I felt when I could once more reach the banks of the river." Thence, he proceeded up the Colorado and Green River (by a course impossible now to trace) to the neighborhood of southern Wyoming—a journey of 2,000 miles fraught with difficulty and hazard.

In 1827, Richard Campbell of St. Louis travelled with a party of 35 men from Santa Fé to San Diego in California, apparently reaching the Colorado River, near the Mojave Valley or the present Needles, and north of the Gila River. (1)

The time had now arrived when California was to be sought, not for gold, but for another article of commerce even more indispensable in the opening up of the trails and the early trade of America in the West. After 1821, the route between St. Louis and Santa Fé, known as the Santa Fé Trail, had become open to Americans, but for the development of the use of this Trail and generally for use in commerce, a supply of mules was needed. California had fine, large mules in great numbers; and in 1827, a party of 60 traders under the command of Antonio Armijo journeyed thither from Abiquiu by a new trail leading across northern Arizona south of the San Juan River, reaching

---

(1) *Journal of a Military Reconnaissance from Santa Fé, New Mexico, to the Navajo Country* (1852), by Lieu. James H. Simpson, being a report to the Secretary of War submitted July 2, 1850.

the Colorado at Escalante's Crossing of the Fathers, and proceeding thence over the plateau and mountains, across the Sevier and Virgin Rivers, and by the Cajon Pass to the San Gabriel Mission on the Pacific Coast—the trip taking 70 days. And thus was begun the trade in that world-renowned object—the Missouri mule. In 1829, Ewing Young of Tennessee, with Kit Carson, James Lawrence, James Higgins and others went on a trapping trip from Taos to San Gabriel Mission in California by a route which probably crossed the Colorado at Mojave. In 1832, the famous fur trader, David E. Jackson of Missouri, made a mule trading expedition from Santa Fé to San Diego taking the southern route via Tucson and crossing the Colorado at the Gila River.

Meanwhile, in 1830, William Wolfskill of Kentucky, fitted out a party from Taos to trap beaver in the valleys of the San Joaquin and Sacramento Rivers in California; and this party followed the Old Spanish Trail and on, 500 miles further, to the Cajon Pass and into California. From that date, caravans yearly set out from Santa Fé or Taos carrying blankets, etc., and returning via this Trail or via the southern Gila River route with mules and horses and also silks and other goods from China. The passage by the Old Spanish Trail which led entirely through Mexican territory was always a difficult one, traversable only by pack-horses and not by wagons. It was also hazardous by reason of the Indians who infested it and who, even when not dangerous to life, were piratical in the toll which they long levied on the livestock of the caravans. This Trail was more popular with the native Mexicans than with the Americans, and few emigrants to California used it; so that Fremont, writing in 1843, said that: "Although in California, we had met with people who had passed over this Trail, we had been able to obtain no correct information about it, and the greater part of what we had heard was found to be only a tissue of falsehood. The rivers that we found on it were never mentioned and others particularly described in name and locality were subsequently seen in another part of the country." Lieutenant George D. Brewerton who travelled over this Trail, in May 1848, with Kit Carson in company with a Mexican caravan, wrote that: "This caravan consisted of some two or three

hundred Mexican traders who go on one year to the California Coast with a supply of blankets and the articles of New Mexican manufacture and having disposed of their goods invest the proceeds in California mules and horses which they drive back across the desert. These people often realize large profits. * * * The line of march of this strange cavalcade occupied an extent of more than a mile." Brewerton, describing a difficult and dangerous crossing (on rafts) of the Green and Grand Rivers [redacted] mentioned the "turbid currents of the swollen streams."(1)

The attention, however, of explorers, hunters, and emigrants in the early part of the 19th century was directed far less to these routes of travel across the Rivers involved in this suit in the southern part of the continent, than to the northern and upper stretches of the Green and Grand Rivers (which joined to give rise to the Colorado). It must be recalled, in considering these early years, that Spain (and, after 1821, Mexico) owned all the country up to the 42d parallel comprising the present State of Utah and southern Wyoming. Hence, it was natural that the early attempts by Americans to explore a route to the Pacific Ocean should be made in the regions to the north, in their own Louisiana Territory. It is interesting to note that the first mention of the Colorado River in our Government records appears to be in the instructions given by President Jefferson, June 20, 1803, to Meriwether Lewis as to the scope of his famous expedition:

"The object of your mission is to explore the Missouri River and such principal streams of it as by its cause and communication with the waters of the Pacific Ocean, whether the Columbia, Oregon, Colorado, or any other river, may offer the most direct and practicable water communication across the Continent for the purposes of commerce. * * * Altho' your route will be along the channel of the Missouri, yet you will endeavor to inform yourself of the character and extent of the country watered by its branches, and especially on its southern side. The north river or Rio Bravo which runs into the gulph of Mexico, and the

(1) *A Ride with Kit Carson through the Great American Desert*, by George D. Brewerton, *Harpers New Monthly Magazine* (1853), VII.

north river or Rio Colorado which runs into the gulph of California are understood to be the principal streams heading opposite to the waters of the Missouri and running southwardly. Whether the dividing grounds between the Missouri and them are mountains or flatlands, what are their distances from the Missouri, the character of the intermediate country and the people inhabiting it are worthy of particular inquiry."

This Lewis and Clark expedition of 1804-1806 revealed the northern route up the length of the Missouri River and the Yellowstone River and thence over the Continental Divide to the Columbia River, but never explored the Colorado River, that is, its upper tributary, the Green. It was this northern route that Astor's Fur Company and other hunters and traders used, during the next twenty years. It was felt, however, that some other pass over the Divide must exist further to the south; and such a pass was actually discovered by fur trappers, Andrew Henry, Thomas Fitzpatrick, and others, returning east from Oregon about 1812 and later in 1823-1824. This was the famous locality later known as South Pass—a high plateau and plain lying at the end of the Wind River Mountains, connecting the Sweetwater River and the North Platte with the headwaters of the Green River. In 1823-1824, General William Henry Ashley (a Virginian) of St. Louis, established the Rocky Mountain Fur Company, and led two expeditions to the West from Westport (near Kansas City), going north to the North Platte, then to South Platte, then north again and through this South Pass, until he reached the fertile Green River Valley (now in Wyoming), then belonging to Mexico. From there, two of his party, Jim Bridger and Etienne Provost, went down the Weber River and the Bear River and were the first recorded white men to view Great Salt Lake. In 1825, General Ashley made a trip down the Green River, encountering many dangerous rapids and losing two boats; after descending some distance below the mouth of the Uinta or Duchesne River, he returned thither, at which point he met friendly Utes; "I understood from them that the River which I had descended and which I supposed to be the Rio Colorado of the West continued its course as far as they had knowledge of it, southwest through a moun-

tainous country." This junction of the Duchesne and Green Rivers was 128 miles above the present town of Green River, Utah. It is to be noted that at that time the Green River was known as "Spanish River," "Rio Colorado of the Gulf" and "Rio Colorado of the West" and the latter name was given to it on the maps of that period. Ashley, discouraged by what he learned of the stretches of the Green River below him, and by his experience above, abandoned that River and proceeded up the Duchesne, crossed the Wasatch Mountains, and went south to Utah Lake. (Lake Timpanagos.) In 1826, and again in 1827, one of Ashley's partners, Jedediah S. Smith, explored southwest Utah, descending the Virgin River to the Colorado River, and over the Mojave desert to California; returning through a pass in the Sierra Nevada Mountain into Nevada and southwest Utah.

It was not until 11 years after Ashley that another trip is known to have been made down the Green River—this time by a man of mystery, probably a French trapper, who must have gone down as far as its junction with the Grand River and then down through Cataract Canyon and into Glen Canyon on the Colorado River; for Major Powell's party in 1869, and subsequent parties, discovered cut into the rock walls of canyons of the Green and Colorado, at three points where the carving must have been done from the water, the following inscription: "D. Julien—1836—3 Mai," together with a rough picture of a boat with a mast, and another rough picture of some mysterious object. Earnest research has failed to disclose any facts as to this bold "D. Julien."

Meanwhile, after the discovery of the South Pass, Green River Valley in the north became a rendezvous for great numbers of hunters and trappers who followed the streams throughout the country which is now southern Wyoming, north-eastern Utah and western Colorado. There were three wintering centres for these hardy trail-makers—one Fort Uintah established by Antoine Robidoux of St. Louis on the Uintah or Duchesne River; another fort by Robidoux, near the junction of the Gunnison and Uncompahgre Rivers (tributaries of the Grand), in Colorado; and a third, Brown's Park or Hole (often referred to in books and in the testimony in this suit) a pleasant valley in the northeast corner of Utah, on the Green River. To reach these

regions, as well as those farther to the west, a regular trail began to be made from the Missouri River to the Platte at Grand Island (in Nebraska), thence up the North Platte to Fort Laramie (north of the present city of Laramie), and on beyond the present town of Caspar in Wyoming, and thence across to the Sweetwater River and through the South Pass to the Green River Valley. From there, the trail went on to the northwest down Bear River (following the present line of the Oregon Short Line Railroad) and over to Snake River at the post, named Fort Hall (which was built in 1834, by Nathaniel J. Wyeth of Cambridge, Massachusetts, near present Pocatello in Idaho), thence to the Columbia River and down it to Fort Vancouver—a total distance of about 2,000 miles. When the movement to settle Oregon with Americans began, from 1832 to 1845, this route became known as "The Oregon Trail." Wagons were first used on it about 1828; and the first white women travelled on it in 1836. Leading off from this trail at Green River Valley were the trails down the Weber and the Bear Rivers to Great Salt Lake, brought into especial prominence by the explorations of Captain Bonneville from 1832 to 1835, and by the discovery of routes to California over the Great Basin north and south of the Lake and down the Humboldt River (in Nevada) and across the Sierras to the Sacramento Valley. Fur traders and trappers transported their furs back by this Oregon Trail to St. Louis which became the great fur market of the United States. There was no port or market at the Gulf of California or at the mouth of the Gila; and as they were both in Mexican territory, the American fur trade would have been unlikely to pass down the 1,600 miles of the Green and the Colorado (even if navigable). (1)

During the 1830's, the Green River Valley in Wyoming came into further communication with St. Louis through the development of two other trails which traversed the country lying between that valley and the junction of the Green and the Grand Rivers. In 1831, William Sinclair of Arkansas came from Taos, following the Old Spanish

---

(1) See *Senate Exec. Doc. 39, 21st Cong., 2d Sess.*, reports of fur trade west of the Rockies, transmitted by President Jackson, Jan. 24, 1831.

Trail to the Green and up the Green to the Unitah and thence to Brown's Hole. In 1832, Kit Carson with Captain Stephen R. Lee followed somewhat the same route and spent the winter at Robidoux's fort on the Uintah. About the same time, trappers began to journey from Taos and from Bent's Fort in American territory on the Arkansas River (near where La Junta, Colorado now is), and following that River to its headwaters, proceeded over the Divide to the headwaters of the Grand and along the Grand and other rivers of northwest Colorado until they reached the Green River Valley. Trips in 1837 and 1838 were taken on this route by the famous trapper, "Uncle Dick" Wootton (1); and he seems to be the first recorded white man to see the junction of the Green and Grand Rivers, as he described an Indian attack made upon him, in 1837, after he had followed the Green down to the Grand and ascended the latter to "Piny Creek". A trip from St. Louis via Taos to the Uintah and Green Rivers was taken by Rufus B. Sage, in 1842, in company with the trapper, Robidoux, to the latter's fort, thence up the Green and down the Bear to Fort Hall. (2)

The knowledge of the Colorado River then existing in 1839 appears from an interesting account given by Thomas J. Farnham, who arrived at Independence on the Missouri River (near present Kansas City), May 21, 1839, bound for Oregon. He took the Santa Fé Trail to Bent's Fort, thence up the Arkansas River and over into South Park (or Bayon Salade) in Central Colorado, thence down the headwaters of the South Platte and over the Divide to the Grand River, and thence north by the Little Bear River and Yampa River to Brown's Park, (where was located Fort Davy Crockett or Thompson's Fort), and thence to the Oregon Trail, reaching Fort Hall on September 1. His guide gave him the following account of the Grand and Colorado Rivers (3):

---

(1) *"Uncle Dick" Wootton* (1890), by Howard L. Conard, pp. 59, 65, 68.

(2) *Scenes in the Rocky Mountains* (1846), by Rufus B. Sage.

(3) *Travels in the Great Western Prairies, the Anahuac and Rocky Mountains in Oregon* (1840), by Thomas J. Farnham, p. 51.

"During the evening while the men were angling for trout, Kelly gave me some account of Grand River and the Colorado of the West. Grand River, he said, is a branch of the Colorado. It rises far in the east among the precipitous heights of the eastern range of the Rocky Mountains, about midway from the Great Gap and the Kenyon of the South Fork of the Platte. It interlocks the distance of 60 miles with the waters of the Great Platte; its course to the point where we passed is nearly due west. From thence, it continues in a west by north course, 160 miles, where it breaks through the Anahuac Ridge. The cliffs of this Kenyon are said to be many hundred feet high and overhanging; within them is a series of cascades which roar like Niagara when the river is swollen by the freshets in June. After passing this Kenyon, it is said to move with a dashing, foaming current in a westerly direction, 50 miles, where it unites with Green River or Skeetskadee and forms the Colorado of the West. From the Junction of these branches, the Colorado has a general course from the northeast to the southwest of seven hundred miles to the Gulf of California. Four hundred of this seven hundred miles is an almost unbroken chasm of Kenyon, with perpendicular sides hundreds of feet in height, at the bottom of which the waters rush over continuous cascades. * * * The country on each side of its whole course is a rolling desert of loose brown earth on which the rains and dews never fall. A few years since Catholic missionaries and their servants on their way from the mountains to California attempted to descend the Colorado. They have never been seen since the morning they commenced their fatal undertaking. A party of trappers and others made a strong boat and manned it well, with the determination of floating down the River to take the beaver that they supposed lived along its bank. But they found themselves in such danger after entering the Kenyon that with might and main they thrust their trembling boat ashore, and succeeded in leaping the crags and lightening it before it was swallowed in the dashing torrent."

It is interesting to note that this is the first and last recorded time that the Catholic missionaries above referred to appear in connection with any boat trip on the Colorado.

The length of the Colorado from the junction with the Green to the Gulf as given by Farnham, 700 miles, was, of

course, erroneous, as the actual distance was about 1,000 miles. A Dr. Lyman of Buffalo, who, in 1841, took the Old Spanish Trail to the Green River and who appears to have travelled down to the Junction of the Green and Grand, reported the elevation there as 8,000 feet and the distance of the River to the Gulf as 700 miles, thus giving the fall as over 11 feet per mile. (1) The actual elevation was 3,876 feet. An account of the reported terrors of the Colorado is further found in Sages account of his 1842 trip. After describing the lower valley, he wrote that a vast canyon of five hundred to a thousand feet in height:

"is said to extend for five or six hundred miles, interrupting the river with its numerous cataracts, cascades and rapids, and opposing to its swift currents the sharp fragments of severed rock thrown from the dizzy summits. * * * In some places the impending rocks approach so near to each other from above, a person may almost step across the vast chasm opening to view the foaming river half obscured in perpendicular distance and dimmed by the shadows of thrice vertical walls. This superbly magnificent scene continues nearly the whole extent from the head of the Colorado valley to the boundary line between Oregon and California. * * * The Rio Colorado rises in the U. S. territory about lat. 42° 30′ north interlocking with the headwaters of the Columbia, Missouri, Platte and Arkansas. * * * Following its windings, it is some twelve or fifteen hundred miles in length. Owing to the rapidity of its current and its frequent falls and cascades the navigation is entirely destroyed till within one hundred miles of its mouth at the head of tidewater."

In fact, the Colorado, from the source of the Green to the Gulf was over 1,800 miles long. Farnham, in 1844, describing again the Colorado termed it "a stream of dreadful remembrances, of horrid events, over which the narrator of Indian legends as well as the chronicles of the early explorers shudders to take a retrospect." These descriptions only partially accurate were derived from Indians

(1) *Travels in the Californias* (1844), by Thomas J. Farnham, pp. 312 et seq., for report of Lyman's trip.

or from hunters, who had either trapped along it or who had travelled on the plateaus above it; for Sage records that at Fort Robidoux there were fur trappers who had come there from the Gila River far away to the south.

The next route through these regions to be developed was that taken by Dr. Marcus Whitman on his famous trip from Fort Hall in Oregon to the city of Washington. Starting in October, 1842, he rode south into Utah and down the Great Basin till he struck the Old Spanish Trail, which he pursued across the Wasatch Mountains and on to Santa Fé, and thence along the Santa Fé Trail to St. Louis, reaching Washington, March 3, 1843, after five months' journey. (1)

In the spring of 1842, Lieutenant John C. Fremont reached the Green River Valley, from St. Louis, pursuing the Oregon Trail and through South Pass. (2) In 1843, Fremont made another expedition to explore military routes to California and to throw further light upon the geography of that region; on this journey, he went up the Kansas, Republican, and South Platte Rivers to St. Vrain's Fort (near the present town of Greeley, Colorado), then proceeding north up the Cache-la-Poudre, Laramie, and Medicine Bow Rivers, he went west (south of the Oregon Trail) and finally striking that Trail, pursued it through the South Pass again to Green River Valley. It may be noted that in his Report, he referred to the Green River as the "Colorado or Green River of the Gulf of California"—"the great Colorado of the West," "the Rio Verde of the Spaniards." And he gave the following account which is the fullest of any recorded at that time:

P. 129: "The refreshing appearance of the River, with its timbered shores and green, wooded islands, in contrast to its dry and sandy plains, probably obtained for

---

(1) *Oregon, The Struggle for Possession* (1888), by William Barron.

(2) *Report of the Exploring Expedition to the Rocky Mountains in the Year* 1842 *and to Oregon and North California in the Years* 1843-4, by Brevet Captain J. C. Fremont (1845), 28*th Cong., 2d Sess., Senate Exec. Doc.* 174.

it the name of Green River which was bestowed upon it by the Spaniards who first came into this country to trade, some 25 years ago. It was then familiarly known as the Seedskeedee-agie or Prairie Hen River, a name which it received from the Crows, to whom its upper waters belong. * * * Lower down from Brown's Hole to the southward, the River runs through lofty chasms walled in by precipices of *red* rock; and even among the wilder tribes who inhabit that portion of its course, I have heard it called by Indian refugees from the California settlement, the Rio Colorado. * * * At this place the elevation of the river above the sea is 6,230 feet. * * * The descent of each stream is rapid, but that of the Colorado is but little known, and that little derived from vague report. Three hundred miles of its lower part, as it approaches the Gulf of California is reported to be smooth and tranquil; but its upper part is manifestly broken into many falls and rapids. From many descriptions of trappers, it is probable that in its foaming course among lofty precipices it presents many scenes of wild grandeur; and though offering many temptations and often discussed, no trappers have been found bold enough to undertake a voyage which has so certain a prospect of a fatal termination. The Indians have strange stories of beautiful valleys abounding with beaver, shut up among inaccessible walls of rock in the lower course of the River; and to which the neighboring Indians in their occasional wars with the Spaniards and among themselves, drive their herds of cattle and flocks of sheep, leaving them to pasture in perfect safety."

With Fremont was the famous scout and hunter, Jim Bridger, who built a fort and trading post, in 1843, on Black's Fork of the Green River, to which place the Oregon Trail was then diverted before swinging off down the Bear River into Idaho. Travelling for six days in this region in Mexican territory, Fremont proceeded into Oregon, then down into California, then back into southwest Utah from the San Joaquin Valley, around the end of the Sierra Nevada, and on to the Old Spanish Trail across Utah, then up to Great Salt Lake and across the Wasatch Mountains to the Duchesne River, and up the Green River to Brown's Park, in June, 1844, at which latter point, he described the

Green River as follows: "Here the River enters between lofty precipices of red rock, and the country below is said to assume a very rugged character, the River and its affluents passing through canyons which forbid all access to the water." (1) He then crossed to the upper part of the Grand River, and up that River (by the present Glenwood Springs) in Colorado, over a pass near the present Tennessee Pass into South Park, and then south to the Arkansas River (by the route later followed by the Denver and Rio Grande Railroad), and back to St. Louis. A year later, Fremont made another trip to the West; leaving Bent's Fort on August 16, 1845, he went up the headwaters of the Arkansas River, crossed the Divide to Piney Creek at the headwaters of the Grand River, and, descending the Grand, crossed to the Green and Duchesne Rivers and arrived through Spanish Fork Pass in the Great Basin, October 2.

In 1847, the Mormons driven from Illinois began their migration from Council Bluffs in Iowa to Utah. A party of 143 (including 3 women and 2 children) went along the Oregon Trail, in general, but keeping to the north bank of the Platte instead of the south bank in order to avoid the Oregon emigrants; after passing through the South Pass into Green River Valley, they took a more southern trail through the mountains than the Weber River trail used by members of Fremont's party, and they reached the Great Salt Lake Basin, via Emigrant Gap, on July 24, after a journey of 102 days.

One year later, in 1848, gold was discovered in California near the fort of John A. Sutter, who had come over the Oregon Trial in 1839. Up to 1848, however, the number of Americans in California was small—less than 400 in 1841, of whom only about 50 had come overland. The popular route for gold seekers from the East now led through the new Salt Lake City and across the Great Salt Lake Basin to the Humboldt River, over the Sierras and into Sacramento and San Joaquin Valleys. There could have been little thought of entering California by taking the 1,600 mile trip down the length of the Green and Colorado Rivers to the Gila, and then making the long trip over

---

(1) *30th Cong., 1st Sess., Senate Exec. Doc.* 33.

the deserts of southern California to San Diego on the only southern trail then existing. Such a route, even if navigable through the canyons of the upper Green and through Cataract and Grand Canyons of the Colorado, would have been impracticable because of its excessive length. The only person who is recorded as attempting it was a bold youth named William L. Manly, who with six companions sought to reach California, in 1849, by this route, relying on the misinformation given to him that the Green and Colorado Rivers "came out on the Pacific Coast," with "no obstacles except cataracts"; Manly's party went down from Green River Valley in a scow which was wrecked; building two 15 foot dugouts, the party proceeded, until, after running many dangerous rapids nearly down to the section of the Green River involved in this case, thr trip was abandoned owing to information given to Manly by Indians as to the canyons to the south.

From 1776 to 1848, few Americans except trappers and mule traders, crossed the Colorado en route for California on the southern route through Mexican territory, now Arizona. Most of the emigrants to California had pursued the Oregon Trail, though in 1841, twenty five (known as the Workman-Rowland party) went to California via Santa Fé and the Gila and crossing the Colorado proceeded to San Gabriel. The Mexican War, however, made a great change. In 1846, General Stephen W. Kearny, after capturing Santa Fé, marched a portion of his force to the mouth of the Gila (which point, he reported, "may one day fill a large space in the World's history") and on to San Diego—a distance of about 220 miles. Close on his heels, there followed Colonel Cooke with the Mormon Battalion, which force laid out an entirely new route through Mexican Territory in southern Arizona to Tucson, and then to the mouth of the Gila, a distance of over 500 miles (the route followed later by the Southern Pacific Railroad) (1). It was the desirability of having this railroad

---

(1) *The Conquest of California and New Mexico* (1847), by James Madison Cutts; *Notes of a Military Reconnaissance from Fort Leavenworth in Missouri to San Diego in California*, by Lieu. W. H. Emory, *30th Cong., 1st Sess., Senate Exec. Doc.* 7 (Dec. 16, 1847).

route in the United States that was a large factor in the Gadsden Purchase of 1854. After the close of the Mexican War, the acquisition of this territory, and the discovery of gold in California, these Southern routes became crowded with emigrants. Fremont, after his disaster in attempting to force a pass in the winter of 1848 through the mountains of southern Colorado, took this route to California. In 1850, Fort Yuma was built on the west side of the Colorado River for the protection of gold-seeking parties against hostile Indians; and a ferry was established across the River. In 1851, Lieutenant Derby was sent out to put into operation a route from the Gulf of California up the Colorado (150 miles) to supply the Fort garrison. In 1850, Lieutenant James H. Simpson reported information given to him as to a route from Santa Fe to California, via the Zuni and Moki Indian towns on a trail to the Colorado River at "a ford called El Vado de Las Padres", practicable only for pack animals. (1) In 1851, also, Captain Sitgreaves made an expedition from the Zuni towns west along the 35th parallel to the Colorado River near Mojave and followed the River down to Fort Yuma. (2)

The importance of a railroad to the Pacific Ocean for military and other purposes had now become recognized. Five routes were surveyed by the War Department—one near the 49th and 48th parallels by General Isaac I. Stevens in 1853-1854; one near the 42d and 41st parallels, surveyed by Fremont, and by Captain Howard Stansbury in 1851 (later the Union Pacific route); one by Lieutenant A. W. Whipple in 1853, along the 35th parallel, starting at Fort Smith, Arkansas, and going through to Albuquerque and the Needles (in part the route later of the Santa Fe Railroad); one along the 43d parallel, surveyed by Major W. H. Emory in 1847 and by Captain John Pope and Lieutenant John J. Parke in 1853 (later the route of the Southern

---

(1) *Journal of a Military Reconnaissance from Santa Fé, New Mexico to the Navajo Country* (1852), by Lieu. James H. Simpson, report to Secretary of War, July 2, 1850.

(2) *Report of an Expedition Down the Zuni and Colorado River*, by Captain Sitgreaves, *32d Cong., 2d Sess., Senate Exec. Doc.* 59.

Pacific Railroad. (1) The route which involved the region in question in this suit was along the 38th and 39th parallels. The first exploration of this route was by Lieutenant Edward Fitzgerald Beale, Superintendent of Indian Affairs in California, who, in 1853, made an expedition from Westport, Missouri, up the Kansas and Arkansas Rivers to Bent's Fort; thence across the Rockies by the Sangre de Christo Pass (south of the present Denver and Rio Grande Railroad) over the Cochetopa Pass, down the Gunnison and the Grand Rivers, and over to the Green River, which he struck probably at the ford at the present town of Green River, Utah (2); from that point, Beale went west on the Spanish Trail and through the Wasatch Mountains to Paragoona in southwest Utah, and thence on "The Mormon wagon trail" to San Bernardino in California. This route, he prophesied, would be a popular one for emigrants to California. In the same year, 1853, Captain J. W. Gunnison led a War Department party to survey a railroad route along very much the same trail which Beale had taken, viz, along the 39th parallel. The ford on the Green River which later was named after him "Gunnison's Crossing," was described (October 1) in the official report as "an excellent ford. * * * The river is 300 yards wide with a pebbly bottom. * * * The water, rising just above the axle trees of our common wagons flows with a swift current." Gunnison, after leaving the Green River Crossing, pursued the Spanish Trail in general into southwest Utah, where he was killed by Indians. (3) Still later in the same year, Colonel Fremont explored the same route, but went further

---

(1) *Reports of Expeditions and Surveys, 33d. Cong., 2d Sess., Senate Exec. Doc.* 78, Vol. I.

(2) *Central Route to the Pacific from the Valley of the Mississippi to California. Journal of the Expedition of E. T. Beale* (1854), by Gwinn Harris Heap. As an example of the ignorance of the geography of these regions, it may be noted that the map accompanying this account show- the junction of Green and Grand Rivers as below the 36th paralle-, and below the mouth of the San Juan River.

(3) *Report of Explorations and Surveys, 33d Cong. 2d Sess., Senate Exec. Doc.* 78, Vol. II.

west; pursuing the Santa Fe Trail to Bent's Fort, he crossed the Sangre de Christo Mountains, and across the San Luis Valley, and over the Cochetopa Pass to the Gunnison, Grand, and Green Rivers, and then by the Old Spanish Trail into southwest Utah to Parowan; from there he explored a new route into California over the Tejon Pass into the San Joaquin Valley. As to this route, he wrote: "It seems a treason against mankind and the spirit of progress which marks the age to refuse to put this one completing link to our national prosperity and the civilization of the world. Europe still lies between Asia and America; build this railroad and we will have revolved about—America will lie between Asia and Europe." (1)

Lieutenant Beale diverted attention from eastern Utah, in 1857, by surveying a new wagon route (about 560 miles) from Albuquerque along the 35th parallel, to the Colorado River near the Needles, and thence by a new route into California and the San Joaquin Valley over the Mojave Desert and the Tejon and Tehachapi Passes; with him went his famous camel corps. (2) In the winter of 1857-1858, Captain Randolph B. Marcy made an expedition from New Mexico along the Old Spanish Trail to the Green River, up the Green to Fort Bridger; returning to the Grand River far north of Moab, he passed through northern Colorado, and crossing the Rockies, descended Cherry Creek (near Denver) to the South Platte and thence north to Laramie. (3)

In 1859, a War Department exploring expedition under charge of Captain J. N. Macomb, coming up from Santa Fe through southern Colorado and southeastern Utah, reached the Grand River a little above its junction with the Green, but "finding it impossible to pass down in the vicinity of the Colorado to its junction with the San Juan," it retraced its steps toward the Sierra Abajo near the Colo-

---

(1) *33d Cong., 1st Sess., Senate Misc. Doc.* 67, letter of Fremont, June 15, 1854.

(2) *35th Cong., 1st Sess., House Exec. Doc.* 124; *36th Cong., 1st Sess., House Exec. Doc.* 42.

(3) *Report of R. B. Marcy's March from Fort Scott to New Mexico and Return, 35th Cong., 2d Sess., Senate Exec. Doc.* 1.

rado line, and across the San Juan "some 50 miles or more above its mouth," and went back south into New Mexico." (1)

The railroad route along the 38th and 39th parallels was highly favored by Thomas H. Benton, Senator from Missouri, and by Benton's son-in-law, Fremont. (2) If their views had prevailed, the settlement of eastern Utah would probably have occurred much earlier than it did. But the report of the Secretary of War, Jefferson Davis, in 1855, turned all attention away from that part of Utah, when he recommended that the railroad route to be chosen should be the southern, on the 32d parallel; since in his judgment the route on the 38th and 39th parallels through Utah would be too difficult as an engineering project and too costly in construction.

Coincident with the railroad route projects, the Government felt it important to ascertain how far up from the Gulf of California the Colorado River was navigable for boats, steamboats having used it up to Fort Yuma since 1855. Accordingly, on December 30, 1857, Lieutenant Joseph C. Ives began a trip up the River in the *Explorer*, a steamboat 54 feet long, having a stern paddlewheel, and drawing 2½ feet. This boat, after encountering many difficulties from sandbars, etc., reached Bill Williams Fork on February 1, and on March 10 it reached the head of Black Canyon (near the present site of Boulder Dam) where it found a current with "a flow of 3 miles an hour," regarding which point Ives reported that: "It appeared, therefore, that the foot of Black Canyon should be considered the practical head of navigation," since the water above had been so shoal and the current swift, with constant

---

(1) *Report of the Exploring Expedition from Santa Fe, New Mexico, to the Junction of the Grand and Green Rivers of the Great Colorado of the West in 1859* (1876), by Capt. J. N. Macomb.

(2) In *Thirty Years View* (1856), II, 721, Benton said: "It is the route for the Central Pacific Railroad which the structure of the country invites and every national consideration demands."

rapids. He then proceeded inland by the Grand Canyon, arriving at Fort Defiance in the Navajo country (north of the present own of Gallup), on May 22, 1858; and he concluded his report by saying: "It seems intended by nature that the Colorado River along the greater portion of its lonely and majestic way shall be forever unvisited and undisturbed." He reported, however, that, from the Gulf to Black Canyon, the River, "with a boat of proper construction can be navigated without trouble at all seasons of the year", but that the boat "should not draw more than twelve inches when light," and that "the boiler should be of large capacity and the engines of great power" and "she should have a large sternwheel" and flat bottom. "A steamboat built as above described and run by an experienced pilot would occupy in making a round trip from the mouth of the River to the head of navigation from twelve days to five weeks, depending upon the season of the year and the stage of the water." (1) In 1857 and in the early 1860's, other steamboats began to navigate up the River from the Gulf.

Meanwhile, the Mormons themselves had paid little attention either to exploration or settlement in eastern Utah, between 1847 and 1860. The Mormon State of Deseret, after becoming American territory in 1848 under the Treaty of Guadalupe Hidalgo, was made the Territory of Utah in 1850. Its total population, then, according to the United States Census of 1850 was only 11,380. No persons were then living east of the Wasatch Mountains; and in the 1860 Census, Utah, with a population of 40,244 had no settlements east of these Mountains except in the northern Green River Valley (which later became part of Wyoming). Between 1850 and 1860, the Mormon Church was devoting its attention to settling southwest Utah, in the towns (or "stakes" as they were called) of Parowan, Paragoona, Kanab, Santa Clara, St. George, and Cedar City (the latter being about 220 miles from Salt Lake City and located near the present Zion Canyon National Park). The only records of Mormon passage through that part of the Colorado River

---

(1) Complainant's Exhibit 72, Report of Lieutenant Joseph C. Ives, 36th Cong., 1st Sess., House Exec. Doc. 90.

Basin region involved in this suit appear to have been trips by Mormon missionaries and traders, in 1853 and 1854, who travelled east on the Old Spanish Trail to the ford on the Green River, and to the Moab ford on the Grand River, and thence to the San Juan River to deal with the Navajo Indians, and who returned on the same route. In 1855, on the same trail, the Mormon Church built a fort at Moab, but abandoned it in three months, owing to hostile Indians. In 1857 and 1858, there was little inducement to the Mormon Church to settle eastern Utah; for the United States Government sent a hostile military expedition against the Mormons, and there seemed a likelihood that the latter would carry out their announced threat to raze Salt Lake City and to retire to southwest Utah.

The United States now turned its attention to developing wagon road routes into the Great Salt Lake Basin, but they traversed eastern Utah north of the regions involved in this suit. In 1858, Captain James H. Simpson opened a route from Fort Bridger across the Wasatch Mountains to Camp Floyd near Utah Lake. (1) In the same year, Colonel W. W. Loring took a train of army wagons from Camp Floyd over a trail north of the Old Spanish Trail and through central Colorado and down to Fort Union (near Santa Fé. (2) In 1859, Captain Simpson reconnoitred a route for wagons up the Provo or Timpanogos River over the Divide and down the Duchesne River to the Green, which he hoped might prove a connection between California and Denver through northern Colorado, thus shortening the then postal route and providing a more direct trade route between the Mormon settlements and the country east of the Rockies. (3) The last two roads, however, were not built.

---

(1) See *35th Cong., 2d Sess., Senate Exec. Doc.* 40.

(2) *The Prairie Traveller* (1859), by Capt. Randolph B. Marcy (issued by authority of the War Department.

(3) *Report of Explorations across the Great Basin of the Territory of Utah for a Direct Wagon Route from Camp Floyd to Genoa in Carson Valley in* 1859, by Captain J. H. Simpson (Government Printing Office, 1876).

After 1858, the Old Spanish Trail appears to have been little used by either Mormons, traders, or emigrants. (1) The terrible massacre of a party of Arkansas and Missouri emigrants coming down from Salt Lake City which occurred in September, 1857, at Mountain Meadows near Cedar City, deterred emigrants from entering either eastern or southern Utah. As the terminus of the Trail was at Santa Fé, and as during the Civil War until the fall of 1862, it was a matter of doubt whether that town would be held by the Confederate troops or by the Union, the traders apparently kept off the Trail. General James H. Carleton, in his effort to retain New Mexico in the Union, marched his forces from California over the southern or Gila River route. During the rest of the Civil War and afterwards, the Navajos, Utes, and Apaches, relieved largely from Government attention, made travel through eastern Utah and northwestern New Mexico a dangerous matter. Moreover, after 1855, stage coaches and wagons and the overland mail began to use the southern route via Tucson, and also the northern route, via Fort Bridger and Bridger's Pass, rather than the route through eastern Utah, as the latter was only suitable for pack animals, mules, and horses. All these facts kept this region from being settled or explored.

Meanwhile, the Mormons were devoting their attention to the exploration of southern Nevada, southern California, and northern Arizona. As early as 1851, the Mormon Church sent out a party which travelled about 770 miles and founded San Bernardino in California, designed as an outfitting post for Mormon emigrants coming from Europe over the isthmus of Panama and by sea to San Diego. As early as 1855, the Church sent out a party to ascertain the navigability of the Colorado River below Grand Wash (the western end of the Grand Canyon). Mormon expeditions

(1) "The Old Spanish Trail, the inception of which was the Glory of God and the Catholic Faith, became a highway for horse trader and horse thief; and still later as between the Utah desert country and New Mexico, known as the Durango Trail, it became famous for cattle drives and bandit flights." *Kit Carson Days* (1914), by Edward L. Sabin.

reached the River also in 1856 and 1857. Lieutenant Ives' steamer trip up the River in 1858 was an object of suspicion to the Church, and agents were sent to interview him, who reported that the expedition was "of a military character and exhibited very hostile feelings against our people. * * * had been sent by the Government to examine the River and learn if a force could be taken into southern Utah from that direction, should it be needed to subjugate the Mormons." (1) In 1858, Jacob Hamblin, a noted Mormon missionary and explorer, was sent to the Moqui (now termed Hopi) Indians in northern Arizona, and he crossed the Colorado River at the Crossing of the Fathers, then known as the Ute Ford. This trip he repeated in 1860 and 1861, describing the ford as "deep and dangerous." In 1862, he made a fourth visit, this time finding a ford at the west end of the Grand Canyon, south of the Town of St. George, he returned by the Ute Ford, again finding "the water deep and the fording difficult and dangerous." In 1864, the Mormons founded a town of Call's Landing or Callville on the Colorado River (in present Nevada), "it being contemplated to have the Church emigration come to Utah via Panama and the Gulf of California and up the Colorado. * * * This landing is the highest practicable head of navigation." (Complainant's Exhibits 622, 623, 623). This town was about 40 miles above Black Canyon which Ives had reported as head of navigation. Two lines of steamboats in 1865 were operating up the River from the Gulf, carrying 100 or 125 tons; and in 1866, the *Esmeralda,* a steamboat 97 feet long, drawing 3½ feet, went up nearly to Callville. Except for Jacob Hamblin's trips across the Colorado at the Ute Ford, all these Mormon and Government activities with respect to the River were west and south of the Grand Canyon. That the River was not navigable through that Canyon was then an accepted fact. No explorations or settlements had yet been made on the River east and north of the Grand Canyon in Arizona or on that section of the River in Utah involved in this suit. Such regions were still dangerously subject to hostile attack by Navajo and other Indians.

---

(1) *Jacob Hamblin* (1909), by James A. Little, pp. 57, 64, 79, 83, 85, 87, 99, 103, 117-119, 139, 144-145.

In March 1869, however, Jacob Hamblin crossed the River east of the Grand Canyon, on a raft, at the point where Lees Ferry was later located; and in October, 1869, Hamblin with a party of forty men made a trip across the River at this point (their luggage being taken on rafts), to obtain information as to the constant raids upon Mormon settlements in southwestern Utah made by Navajo Indians coming across the River here and above. In 1870, the route across the Colorado here was definitely established as a practicable ferry crossing; and in 1872, John D. Lee built a ranch and fort and established a regular ferry, which he kept until he was hung, in 1877, for participation in the Mountain Meadows massacre of 1857. In 1871, 1872, and 1873, Hamblin crossed here to visit the Navajos near Fort Defiance. In 1874, he escorted a Mormon party with about 100 wagons across to settle in Arizona. In 1874, he again went to the Ute ford and to Lees Ferry with an idea of establishing a trading post. In May, 1876, another party sent out to settle in Arizona was caught by a violent flood while on the ferry, and one man was drowned and their wagons lost. For over 30 years, this ferry at Lees Crossing was maintained by members of the Johnson family (some of whom were witnesses in this case), and after 1910, by the county in Arizona; within the last few years, the United States Government has built a bridge across the Colorado, west of the ferry site.

*Conclusion as to Historical Conditions.*

Such were the historical conditions bearing upon the use of the Rivers in question in this suit. I do not find that either the limited historical facts put in evidence by the Government or the more comprehensive investigation into the history of these regions tend to support the Government's contention that the non-use of these Rivers in this historical period from 1540 to 1879 is weighty evidence that they were non-navigable in 1896 in fact and in law. The fact of the non-settlement of eastern Utah in these years, the fact that none of the trails to western Utah or to California were usable to advantage in connection with these Rivers, and many other facts, are to be considered in connection with the non-use of the Rivers. Undoubtedly, there existed a belief in their non-navigability in certain

portions. But the non-use itself I do not find to constitute evidence of their non-navigability in fact, in view of the many other factors in the situation.

USE OF GREEN AND GRAND RIVERS BY BOATS FROM 1869 TO 1929.

The case has been fully and admirably prepared; and the evidence has been presented by counsel with thoroughness and candor and in a spirit of helpfulness to the Master and to the Court, befitting the dignity of the sovereignties, parties litigant. The bulk of the testimony came from a most picturesque assemblage of witnesses, a rugged vital type of men with whom it is regrettable that this Court itself might not have had the enjoyment of being confronted in person—old Mormon settlers, old pioneers and frontiersmen, placer-miners, and prospectors, old trappers and hunters, experienced river-men, and "river rats" as some termed themselves, explorers of the Rivers who were the first to make journeys on them in boats, Indian guides and interpreters, Indian traders, oil prospectors, engineers, cattlemen, bottom-land farmers—men who passed their lives in the open air and who were utterly unfamiliar with court proceedings and with judicial technicalities as to navigability in law. Their testimony, with their anecdotes of adventures and hardships and with their striking descriptions of their careers and those of their associates, all picture a phase of American life much of which may never return as the West becomes fully settled.

There is little conflict of fact between the witnesses for the Government and the witnesses for the State, upon the question of the actual use of the Rivers by boats. The chief differences have been as to the ease or difficulty of such use. There have been variations of emphasis and of point of view; and the technical evidence by Government engineers has sometimes differed from the practical evidence by the rivermen. The counsel for the Government and for the State are wide apart upon the interpretation and effect to be given to the facts testified to.

I desire to point out at the outset that comprehension of the physical conditions prevalent on these Rivers can best be obtained by inspection of the excellent and remarkable photographs introduced in evidence by the parties, par-

ticularly Complainant's Exhibits 11 C, 11 D, 21, 49, 77, 389-399.

Much testimony has been introduced and offered by the Government as to conditions on the Green River far above the town of Green River, Utah, and on the Grand River far above the town of Moab. As these upper regions of these Rivers are north of the sections of the Rivers involved in this suit, and as I find that the water and navigation conditions in such upper regions were and are essentially different from the regions now involved, and hence that the evidence as to such conditions is not relevant upon the issue of the navigability of the regions now involved, I have omitted any detailed summary of the testimony and have only made such finding *supra* as to the topography of the upper regions of these Rivers, as may be sufficient to give to the Court a proper picture of the Rivers as a whole.

It will be noted that though the evidence as to these Rivers is chiefly of their use after 1896 (the year of the admission of Utah to the Union), it becomes relevant upon the issue of that *susceptibility* or *capability* of use in 1896 which this Court has emphasized in many decisions.

I set forth the actual use of these Rivers by boats, in chronological order and not in the order presented by the testimony or in he briefs filed with me by counsel. I have not attempted to summarize all details of the testimony of each witness (as this would unduly expand my Report), but only to give the salient facts as to the nature and extent of the witness' use of the River. In this portion of my Report, I have not described the various impediments to navigation which were encountered by each witness on each of his trips, such as sandbars, shifting channels, swift water, rapids, etc., at various times and in various places; but in a later portion of my Report, I have given special consideration to the general nature and extent of such impediments, in their bearing upon the question of navigability in fact and in law.

For convenience of the Court in following boat trips made on each River, I present a table of the principal localities (with their distances, and elevations) which were mentioned by the witnesses.

Navigation of these Rivers began in the year 1869, when the one-armed Major John W. Powell made his famous ex-

pedition down the Green and the Colorado, on his own initiative and not as an official Government surveyor—one of the most daring exploits in the whole history of American explorations. On May 24, 1869, Powell's party consisting of ten men with rations for ten months left the little town of Green River, Wyoming (to which the Union Pacific Railroad had only recently been built). They had four boats, three of 21 feet in length and one of 16 feet, built with watertight compartments at bow and stern. Before them lay a trip of 1200 miles over absolutely unknown water. The river was then at a high stage, and no one of the party had any conception of the rapids, falls and other dangers that might await them at any bend ahead. Proceeding down the canyons, they encountered relics of General Ashley's disaster, 44 years before, and of some other unknown later party which had attempted and abandoned the adventure. After many escapes in the dangerous rapids, they arrived at Gunnison's Crossing (the site of the present town of Green River, Utah) on July 12. Proceeding down to the junction of the Green and Grand Rivers, they arrived at the hazardous passage of Cataract Canyon in the Colorado, from which, after running some and portaging others of the high and swift rapids, they emerged on July 27. Proceeding down Glen Canyon, passing the Crossing of the Fathers where Escalante had crossed 93 years before, they reached the point now known as Lees Ferry on August 4, 1869. They then entered the stupendous Canyons known as Marble and Grand, which no man had ever penetrated by water, and through all the rapids they finally emerged in the end of August at the mouth of the Virgin River—the first men to make the voyage through this practically unknown wilderness, down the length of the Green and Colorado Rivers to this point. Two of the party continued on down to the Gulf, arriving in the end of September, 1869. In September and October of the same year, Capt. George M. Wheeler, attempting to find a head of navigation from the Gulf, farther north than Lieutenant Ives' limit in 1858, succeeded in taking boats with extreme difficulty up through Boulder Canyon and as far as Diamond Creek, near the westerly end of the Grand Canyon. At that point, he decided that boats could navigate no further, and he left the Canyon by an overland

route. (1) Two years later, Congress having made an appropriation for further exploration, Major Powell made a second trip from Green River, Wyoming, with eleven men including Frederick S. Dellenbaugh (a witness in this suit), in three boats, 22 feet long and drawing when loaded 14-16 inches. The party started May 22, 1871; after encountering again the dangerous rapids of the Canyons down to Green River Crossing, Utah, they reached that point on August 25. After remaining there a few days, they reached the junction of the Green and Grand, September 14; proceeding through the dangerous rapids of Cataract Canyon, they passed down Glen Canyon of the Colorado and reached the site of Lees Ferry, October 23. The winter of 1871-1872 was spent by the party in exploring southwest Utah, from a base at the Mormon town of Kanab. On June 22, 1872, a portion of this party (including F. S. Dellenbaugh) reached the Colorado River across the plateau to the west, at the mouth of Fremont River where in the previous fall they had cached one of their boats. Embarking once more on the Colorado, June 26, this party went down the River and arrived at Lees Ferry, July 13, where they were met by John D. Lee, who had built his ranch there since their previous trip. From here, the party proceeded down the rapids of Marble Canyon and Grand Canyon as far as Kanab Canyon, 108 miles below the mouth of the Little Colorado, but not through to the end of the Grand Canyon. At this point, owing to high water and to information as to hostile Indians, the trip was abandoned.

Seventeen years passed before anyone again tried to navigate the Green and the Colorado Rivers; the following portion of my Report will deal with the extent of the use of the Green River.

---

(1) Report of Capt. George M. Wheeler (1889), Complainant's Exhibit 73.

*Table of Distances*

| | Miles above mouth | Miles from Green River | Elevation |
|---|---|---|---|
| Green River Bridge | 117.3 | ... | 4046 |
| Little River Station | 111.4 | 5.9 | 4018 |
| Salt Wash Canyon | 103.3 | 14 | 4002 |
| Mouth of San Rafael River (Wheeler's Ranch, Wimmer's Ranch, Wolverton's Ranch, Riverside) | 94.9 | 23.4 | 3987 |
| Bowknot Bend | 68-61 | 49 | .... |
| Barrier Creek | 59 | 58.3 | .... |
| Horseshoe Canyon | 58 | 57.3 | 3944 |
| Fort Bottom | 38.5 | 68 | .... |
| Valentine Bottom | 33 | 84 | .... |
| Beaver Creek | 14.2 | 103 | .... |
| Junction | 0 | 117.3 | 3876 |

Prior to 1883, there was no town or settlement at Gunnison's Crossing on the Green River. The present city of Green River (hereinafter referred to as "the town") came into existence under the name of East Blake, when the Denver and Rio Grande Railroad was built through this region in 1883. By the United States Census of 1890, it had a population of only 375 (under the name of Blake Precinct) and by the same Census, the town of Moab on the Grand River had a population of only 333. From the figures of the United States Census between 1890 and 1920, it may be seen that no very large amount of navigation could have been expected by and between settlements of so limited a population.

| | 1900 | 1910 | 1920 |
|---|---|---|---|
| Green River | 222 | 824 | 771 |
| Moab | 623 | 615 | 856 |
| Moab Precinct (including Moab Town and other settlements) | .... | 833 | 1102 |
| Emery County (in which Green River is located) | 4657 | 6750 | 7411 |
| Grand County (in which Moab is located) | 1149 | 1575 | 1808 |

Although the section of the Green River involved in the present case begins 23 miles below the town, at the mouth

of the San Rafael River and although the conditions in these 23 miles differ materially from those lower down on the Green River, I find it more convenient to describe all boat trips—whether originating at, above, or below the town—especially as most of such trips did in fact originate at the town. It is, therefore, to be borne in mind that (as described later) boats were obliged to encounter in these first 23 miles to the San Rafael, riffles or rapid water, a gravel or rocky bed, and a gradient of about 2.6 feet, which conditions did not exist in the 94 miles below the mouth of the San Rafael.

In the early years of the town, a cable ferry was operated across the River, except at times of extremely high and dangerous water, and of extremely low water when the River was generally forded on horseback. Later, a bridge was built.

After the Powell expeditions in 1869 and 1871, the first persons testified to as having made the journey down the Green River were the Stanton party in 1889. One Frank M. Brown, in 1888, conceived the bold idea of building a railroad from Grand Junction, Colorado, down the course and through the canyons of the Grand and Colorado Rivers to the Gulf. He organized a corporation, the Denver, Colorado Canyon and Pacific Railway, and associated with him a number of capitalists and the distinguished engineer, Robert Brewster Stanton of Denver. The survey was begun, March 26, 1889, at Grand Junction, Colorado on the Grand River by F. C. Kendrick and another and continued down to the junction of the Grand and Green Rivers, in a small skiff and up the Green nearly to the mouth of the San Rafael. Here they were joined, on May 25, 1889, by Stanton, who with a party of 16 men, left the town of Green River, with six boats, 15 feet long with a 3 1/3 feet beam, having airtight compartments at each end. He reached the junction May 29, and started the survey of the Colorado River down through Cataract Canyon. After losing some of the boats in the rapids, the party reached Dandy Crossing, June 24. The surveying party reached Lees Ferry July 2. (1) Stanton reported that "from the head of the

---

(1) For interesting details, see MSS diary and field notes of R. B. Stanton, Complainant's Exhibit 776.

Colorado to the San Juan, a railway can be constructed with no more difficulty than along any mountain slope and with much less difficulty in some respects. * * * By stealing in some places the line from the River." The expedition, on continuing down from Lees Ferry, was abandoned before it reached the Grand Canyon, owing to the drowning of President Brown in a rapid.

In 1889, September, Joseph A. Ross (a witness) with William Gage, went down the River to Horseshoe Canyon (59 miles), in a flat bottom skiff, 15-16 feet long, drawing 6 inches. Two other boats with four other men accompanied them. It was a trip for pleasure and exploration, and they rowed back.

In 1891, July 10, a party of eight, in charge of J. D. Best, including Harry McDonald, head boatman, Elmer Kane and William H. Edwards (all three witnesses), left the town on a prospecting expedition, using two rowboats, 22 feet long with a 4½ feet beam; they descended the Colorado River through Cataract Canyon (losing a boat in running the rapids); at Hite, they picked up a flat-bottomed boat and continued down the River to Lees Ferry, staking gold placer claims on the way.

In 1891, a steamboat, the *Major Powell*, 35 feet long with an 8 feet beam, drawing 1½ feet (photograph, Complainant's Exhibits 474, 475, 476), equipped with upright boiler with two 6 horsepower engines and twin screws, was launched at the town as a commercial enterprise undertaken by the Denver and Rio Grande Railroad. It was run down the River as far as Wheeler's Ranch (23 miles) opposite the mouth of San Rafael River, where, owing to a broken screw, the trip was abandoned. In 1892, a second trip was taken a few miles down and abandoned. In April, 1893, William H. Edwards, repaired the *Major Powell*, changing it from a wood to an oil burner, and ran it down the Green River and down the Colorado River nearly to the first rapid in Cataract Canyon, returning up the Green River as far as Wheeler's Ranch. A second trip, ten days later, was also made down the Green River and return; but in 1894, the boat was brought up nearly to the town and was dismantled, owing to the fact that its two 6 horsepower engines did not furnish sufficient power to navigate successfully the Green River current upstream.

In 1892, late in August, Homer J. Hite (a witness) went down the Green River, in a flat boat with row boats, with one Valentine, his son, three daughters and two young grandchildren, together with household goods, equipment and supplies. The purpose of this trip was to take the family to some bottom land, 84 miles down the River, where they intended to settle.

In 1893, July, Joseph A. Ross took a trip down the River in a flat-bottom boat, 16 feet long, drawing 5-6 inches, with a 500 pound load of drills, supplies, etc. The purpose of the trip was to prospect a mining claim 8 or 10 miles above Valentine Bottom (84 miles), where his partner, Bullitt, and his wife, were living. Later in September, Ross went down to Valentine Bottom in another flat-bottom boat, 16 by 4 feet, and returned to Wheeler's Ranch, bringing back Mr., Mrs., and Miss Valentine and his sister. The trip back, rowing and towing, at a low stage of water took seven days. During the year that the Valentine family lived down the River, their son used to make frequent boat trips down the River and back, taking supplies to them. In November, 1893, Ross carried Bullitt down to his mining prospect and back; and between 1893 and 1905, Ross made various hunting trips down the River, and took supplies down the River to prospectors and others, for hire.

In 1895, September 20, Nathan Galloway and William Richmond went from Green River, Wyoming, all the way down the Green River and the Colorado River (through Cataract Canyon) to Lees Ferry, in flat bottom boats.

In 1895, William H. Edwards had charge of a gold dredge about 8 miles below the town of Green River, Utah, on the east side. It was operated by two 100 horsepower boilers, a steam engine and an electric generator—all the machinery and the coal used being brought overland down from the town.

In 1896, August, George F. Flavell and another made a trip in flat-bottom boats from Henry's Fork, Wyoming, down the Green and the Colorado Rivers, through the Grand Canyon, and reached Yuma, Arizona, in December, 1896.

In 1896, September, Nathan Galloway and Richmond again made the trip down the Green River and the Colorado River past Lees Ferry and through the Grand Can-

yon to the Needles in California, reaching there February 10, 1897.

In 1897, Harry T. Howland took his wife and young baby, Mrs. Kendall, his father, and John Ross down the Green River, 15 or 20 miles.

In 1900, September 9, A. V. Stevenson and son of Colorado Springs, with 2,000 pounds of supplies, left the town, expecting to go through to the Needles, in California, prospecting, in a boat 18 feet long with 5 feet beam, drawing 8 inches. Discouraged by the lack of gold prospects down to the 1st rapid in Cataract Canyon, they went up the Grand River to Moab (Complainant's Exhibit 460, *Grand Valley Times*, Sept. 28, 1900).

In 1900, February, Edward T. Wolverton (a witness) went from Wimmer's Ranch (opposite the mouth of San Rafael River) to the Junction and return, in a rowboat with a 9 inch draft, at a very low stage of water, spending 10 or 12 days prospecting. In 1901, he built a rowboat 18 feet long with a 3 feet beam which when loaded drew nearly 2 feet.

In 1901, July, Joseph A. Ross, who had done much boating on the river took a surveying party, in a rowboat, down to Cataract Canyon to survey a site for the erection of a contemplated Sanitarium.

In 1901, a large boat named the *Undine* was built for the purpose of carrying tourist parties. It was 56 feet long with an 8 feet beam, drawing 12-14 inches, having a 22 horsepower coal-burning steam engine, and a stern paddle wheel; it was equipped with block and tackle and lines and poles for use at sandbars (see photographs, Complainant's Exhibit 121). On this boat, Joseph A. Ross was engineer. It went down the Green River, in November, with a party to the proposed Sanitarium site and the party camped four or five days at the head of Cataract Canyon where there were Cliff-dweller ruins. The *Undine* then turned around and went up the Grand River to Moab. In February, 1902, it returned to Green River with passengers. In May, 1902, this boat having returned to Moab, made a trip upstream from Moab, six miles and return; on another trip upstream it was overturned and wrecked on a riffle, about eight miles up (see Complainant's Exhibit 460, *Grand Valley Times*, Dec. 13, 1901, Feb. 2, May 8, 16, 23, 1902).

In 1902, August, W. F. Reeder (a witness) went down the Green River to the head of Cataract Canyon, with R. C. Wheeler and supplies on a prospecting trip, in a rowboat, 16 feet long with a 4 feet beam; later, he made six trips down to the Junction with Wheeler, prospecting, and panning for gold. He also made a trip down to the Junction and up the Grand River to Moab. Going upstream they rowed and towed, and when the wind was favorable sailed. These trips were taken in August, September, October and November.

In 1903, autumn, Edward T. Wolverton built the *Wilmont*, 27 feet long with a 5½ feet beam, having a 4 horsepower motor and stern wheel, costing $1,350, and drawing empty 10 inches and loaded 3 feet (photographs 7, 8, 9, 12, Defendant's Exhibits 31, 32C, 32D). The engine was too light for upstream work; but in this boat, in the autumn, he made two round trips to the Junction and one up the Grand to Moab, taking tourists for compensation. Later, in 1904, he put in a 7½ horsepower engine and sidewheels and made two trips to Moab (one for hire); after that he put in a 14 horsepower engine and carried supplies down to his ranch (24 miles). He also built two scows 20 and 30 feet long, to haul low grade copper ore from a mine located 20 miles below his ranch on the west side of the River. This mine closed in 1908, and only 30-40 tons of copper ore were ever taken out. He carried several tons of this ore from a point opposite his ranch, up the river to the town in the *Wilmont* and in a scow (see Defendant's Exhibit 32 c, photograph). He also made in the *Wilmont* several more round trips to Moab for hire and also trips for hire with hunters and tourists; he frequently pushed a scow loaded with supplies down to Townsite Bottom, and pushed it back empty. In 1908, the *Wilmont* was caught in the ice, became leaky, and the machinery was taken out.

In 1903, H. T. Yokey (a witness) who has lived many years on the Green River and built and operated many boats, went down the River as far as Cataract Canyon, and returned in a rowboat, 15 feet long with a 3½ feet beam. This was a hunting trip, and was repeated in two or three other years.

In 1904, November, Louis M. Chaffin (a witness) took a trip with A. G. Turner, prospecting for mining claims

down to the Junction and up the Grand River to Moab, in two small rowboats, drawing 6-8 inches. From Moab, they proceeded down the Grand River, and down the Colorado River through Cataract Canyon (running some of the rapids) to the placer mines in Glen Canyon.

In 1905, H. T. Yokey built the *Black Eagle,* a boat 40 feet long with a 6 feet beam, drawing 7-8 inches (12 inches as testified to by Joseph A. Ross), equipped with a tube boiler and 20 horsepower engine. On a trip down the Green River to Valentine Bottom (84 miles) the boiler tubes became clogged with mud and it blew up. The boiler and engine were thereupon loaded upon Wolverton's *Wilmont* and were brought up stream to the town. Yokey testified that he had made many other trips to the Junction and back, in some years three to five, and in other years not more than once or twice.

In 1905, February 27, C. W. Anderson, H. T. Yokey and another made a trip from Green River to Moab to survey the channels (Complainant's Exhibit 460, *Grand Valley Times,* March 10, 1905).

In 1905, May, John J. Lumsden and Charles W. Anderson (witnesses) constructed a large boat, costing $15,000, designed chiefly for carrying passengers, and sight-seeing tourists from Green River to Moab, called the *City of Moab,* 50 feet long by 16-18 feet wide, having a draft variously testified to as from 12 to 24 inches; it had two decks, with six cabins on each side; its motive power was two 25 horsepower marine gasoline engines and twin screw propellers; and it was equipped with poles, pulleys and ropes for use at sandbars. On its first trip, it went down to the Junction in about 5 days, and then up the Grand River 2 miles to a point called Slide at which a mass of rocks from the canyon wall had obstructed the river to a narrow channel of about 100 feet. Through this channel the river, being at high water, was extremely swift, and the *City of Moab,* having insufficient power, was obliged to turn around and return to Halverson's Ranch about 12 miles below the town—the whole trip taking about two weeks. On this trip, there were about ten men (crew and passengers). Previous to this trip, in May, Charles W. Anderson, with two other men, went from Green River, Utah, to Moab in a boat,

16 feet long with two pairs of oars. This trip, taking 10 days was made for the purpose of reaching a conclusion as to the possibility of navigation by the *City of Moab*, and no difficulty was encountered in going up through The Slide. In the fall of 1905, the *City of Moab* was remodelled and called the *Cliff-dweller*, being made 10 feet longer (a total length of 61 feet) and a new coal-burning engine and a stern wheel being installed and a capstan. A trip was made in August down the Green River 84 miles to Valentine's Bottom and return, taking about three days each way. Seven tons of coal were on board and the boat drew 20 inches. Lumsden, owner of *Cliff-dweller*, agreed with Anderson and H. T. Yokey that they might continue to operate the boat at their expense, but later he sold it and it was shipped overland to Great Salt Lake.(1)

In 1905 or 1906, September, W. F. Reeder, with Wolverton, in his motor boat *Wilmont*, took four men from Indiana down the Green River to examine various bottom lands in the canyons with a view to irrigation for cattle and sheep purposes.

In 1906, Milton Oppenheimer built a boat the *Paddy Ross*, 27-32 feet long with a 6 feet beam, drawing at different times 8 to 15-18 inches, having a 14 horespower engine and paddlewheel. (Defendant's Exhibit 32 J.) In 1906, Edward T. Wolverton also built the *Colorado*, with a 7½ horsepower engine, costing $350; but as the frame was too light he only made a few trips a few miles down the river.

In 1906 or 1907, Thomas G. Wimmer (a witness) bought Wolverton's ranch of 350 acres, opposite the mouth of the San Rafael River and had built for him, at a cost of $700-800 the *Marguerite*, 30-33 feet long with a 7-8 feet beam, having a light draft when empty and drawing 2½ feet when loaded with 3½ tons; it had a gasoline engine and was propelled at various times by a stern wheel, and by a propeller. With this boat, Wimmer went into the business of river transportation, soliciting business by printed adver-

---

(1) For photographs of the *City of Moab* and the *Cliff-dweller*, see Complainant's Exhibits 101, 474, 476; Defendant's Exhibit 31, photographs No. 3, 5, 6, and 7.

tisement and circular; he also used the boat in travel and taking supplies between the town and his ranch, making trips in every month of the year from March to November, making at least 50 trips. In 1909 (see *infra* for details) he took a trip to the Junction and up the Grand River and return. In 1914, he had the contract for taking machinery and supplies for a United States Government party (see *infra* as to details). In addition, he made three trips to the Junction and return, two of which were made for compensation, transporting Government and oil company engineers.

In 1907, September 19, Bert Loper (a witness) left the town with Charles Russell and Ed Monette. They had three steel rowboats, 16 feet long with a 4 feet beam, drawing 7 inches. They proceeded down the Green River, and down the Colorado, through Cataract Canyon (portaging only one rapid) down to Hite. This was a trip prospecting for mining claims. Russell and Monette went on to Lees Ferry and then on through Grand Canyon. Loper later rowed down the Colorado River from Hite to Lees Ferry in five days in January, 1908.

In 1907, November, M. Oppenheimer took the *Paddy Ross* down to Cataract Canyon and back with ten passengers (including four women) and 1½ tons of freight of winter supplies for the Woodruff Mining Camp at Fort Bottom (78 miles). The trip took 10½ days, including 1½ days stop at the Canyon and numerous other stops *en route*, the actual running time down being 16½ hours and up 32½ hours, and the River being at its lowest stage. (Complainant's Exhibit 460, *Grand Valley Times*, Nov. 22, 1907.)

In 1908, May 27-June 6, Guy Stirling, mining engineer (a witness), went down the Green River to the Junction and head of Cataract Canyon and returned in a gasoline propeller boat belonging to Milton Oppenheimer, 30 feet long with a 5 feet beam, drawing 1½ feet (probably the *Paddy Ross*). The purpose of the trip was to survey a damsite and examine the River for navigability for freight to a prospective power-house. The trip took five days; on the return, at a point 15 miles below the town, the engine broke down. Stirling had taken a similar trip in the previous July, 1907, in a gasoline power boat.

In 1908, Edward T. Wolverton built at a cost of $500, the Navajo, 22 feet long with a 5 feet beam and drawing 1½ feet, when empty and up to 3 feet when loaded, having a 7½ horsepower engine and a propeller. From 1908 to 1912, the *Navajo* was used for hire to carry hunting parties and also tourist parties to the head of Cataract Canyon—also engineering and hunting parties down the Green and up the Grand to points below Moab; trips were also made for hire to persons at Townsite Bottom; and also in towing boats loaded with supplies—possibly 20 trips being made to the Junction. In 1912, Wolverton gave up the business, as he could not make it pay, and abandoned the boat at his ranch.

In 1908, December, Albert I. Anderson (a witness) made a trip down the River and return, with three men to investigate oil lands in Laterite Basin, 20 miles west of the River at the upper end of Townsite Bottom. They had two rowboats, each with a load of 900 pounds, which drew 10-12 inches of water. In March, 1909, he made the same trip in one boat with 1,000 pounds of supplies; and again in 1910.

In 1909, April 27-May 4, Lieutenant Charles T. Leeds of the Engineer Corps made an investigation of the navigability of the Green and Grand Rivers for the War Department, in compliance with the River and Harbor Act of March 3, 1909. He proceeded from Moab on the Grand down to the junction in a rowboat and up the Green in M. Oppenheimer's *Paddy Ross* with A. I. Anderson, which boat had been engaged to meet Leeds at the junction. In November, 1909, D. E. Hughes, assistant engineer for Leeds made a trip in the *Paddy Ross*, drawing 15-18 inches, from Green River to Moab and return, sounding the channel depths. As a result of these two trips Leeds made a preliminary report of August 3, 1909, and a final report of March 19, 1910, which will be considered later in my Report.

In 1909, June, Henry E. Blake (a witness), with a view to engaging in freight traffic to and from Moab, built a boat, the *Ida B*, 24 feet long with a 6 feet beam, having a 22 inch draft; it was equipped with a 14 horsepower en-

gine and propeller, and cost $1500 (Defendant's Exhibit 32 A, photograph). He made a trip with two men (and A. I. Anderson down to the latter's ranch) to the Junction and up the Grand River to Moab and return, at extreme high water and in heavy driftwood. From the town to Townsite Bottom, his travelling time was 8 hours, and to the Junction 10½ hours; from the Junction to Moab 8 hours; from Moab to the Junction, his running time was 5 hours. In July, 1909, Blake took a trip with Miss Anderson down to Townsite Bottom, where A. I. Anderson was living and carried supplies and a 450 pound barrel of gasoline. In August, 1909, Blake built another tunnel-propeller boat, the *Utah,* using the *Ida B's* engine, and drawing 18 inches. In this, in September, he took for hire an excursion party of six together with 2000 pounds from Green River to Moab; and returned with a load of 1000 pounds of peaches (which spoiled on the trip).

In 1909, September 12, Julius F. Stone (a prominent business man of Columbus, Ohio) made a trip from Green River, Wyoming, down the Green River, down the Colorado River, through Cataract Canyon, on to Lees Ferry and through the Grand Canyon to the Needles, in California. His four light rowboats were built especially for him, 16 feet long with a 4 feet beam 18 inches deep, and drawing when loaded 6-8 inches. The party consisted of 10 men, including Nat Galloway, a boatman long experienced with these Rivers. They arrived at Green River, Utah, October 9; left October 11 and arrived at Lees Ferry, October 27, making the 334 miles in 16 days. The purpose of the trip was adventure.

In 1909, September, William R. Newby (a witness) with several men, made a trip 60 miles down the River in the *Wilmot,* for pleasure and deer hunting. He went back in a gasoline boat called the *Despatch* owned by J. S. Ladd.

In 1909, November, Thomas G. Wimmer and his son took a party of 25-30 Salt Lake City business men or "boosters" in the *Marguerite* and in another gasoline boat from Green River to the Junction and up the Grand River to Moab in 6 days; his son returning down the Grand and up the Green to Wimmer's Ranch (the "boosters" party returning by rail to Salt Lake City); the supplies for this party were put on board the *Marguerite* at Wimmer's Ranch

being hauled thither overland. At this same time, Henry E. Blake took, for hire, 7 or 8 of the party and many supplies in his *Utah* from Green River to Moab, being delayed by an injury to his boat caused by a submerged rock just below the railroad bridge; the trip from Wimmer's Ranch to the Junction was made in 1½ days, camping over two nights; and from the Junction to Moab in about the same time. The return trip to Green River was made in 3 or 4 days, stopping to hunt on the way.

In 1910, September, Henry T. Howland (a witness) in a boat, 18 feet long drawing 12-14 inches, took his wife and three boys (6, 10, 14 years old) down the Green River and up the Grand River to Indian Creek, 16 miles from the Junction (photograph, Defendant's Exhibit 17). On the return trip, Wolverton's sidewheeler power boat towed them back up the Green from a point 35-40 miles up from the Junction.

In 1910, October, Clarence E. Baldwin (a witness) of Moab with two other men took Wolverton's *Navajo* from Wolverton's ranch down to the Junction and 27 miles up the Grand River to Lockhart Canyon, where they hunted deer and returned up the Green River, taking 18 days for the round trip and the hunting. They went up the Slide in the Grand River under power.

In 1911, September, Ellsworth L. Kolb (a witness) and his brother, Emery, expert photographers, who had lived long in the Grand Canyon near the El Tovar Hotel and who were familiar with river conditions, made a trip from Green River, Wyoming down the Green River and down the Colorado River to Lees Ferry and through the Grand Canyon, to the Needles in California. They had two specially constructed flat-bottomed rowboats, 16 feet long with a 4 feet beam, drawing 8 inches when loaded with 1200 pounds, and 4½ inches when empty. Arriving at Green River, Utah, on October 16, they left on October 19, and arrived at Lees Ferry on November 6, making the 334 miles in 18 days. The purpose of the trip was adventure and the taking of photographs. Neither man had navigated the River before, but they used as a guide Dellenbaugh's *A Canyon Voyage*.

In 1912, December, Nat Galloway and Charles Smith went from Green River, Utah, and through Cataract Canyon to

Hite (Complainant's Exhibit 400, *Grand Valley Times*, Dec. 13, 1912).

In 1912, July-August, Henry C. Tasker (a witness) went with Wolverton in the *Navajo* down to Townsite Bottom and return, to look over the country for cattle purposes. He maintained a camp there for three years, taking supplies down in a rowboat, and also in a motor boat with A. I. Anderson.

In 1914, a Government topographic survey was made of Green River from the town to the Junction.

In 1914, July, Bert Loper with Charles Russell left Green River, Utah, in two steel boats drawing 7 inches. This trip was for the purpose of taking moving pictures. The boats were lost in the rapids in Cataract Canyon, and Loper proceeded down to Hite on a sheep grazer's trail on the west bank.

In 1914, October, Charles Russell, W. F. Reeder and Judge went down the Green River and the Colorado River, through Cataract Canyon to Hite in a steel rowboat drawing 8-10 inches when loaded. The purpose of the trip was to take moving pictures.

In 1914, August-September, a Government party in charge of John F. Richardson (a witness) including Kenneth Sawyer, Lester A. Shaw and R. B. Worthy (all witnesses) were engaged in making a survey for a damsite and reservoir shortly below the Junction of the Green and Grand River. From July 10 to late August, a preliminary survey and trip to the Junction and back had been made by Richardson and Captain Yokey, with a barge called the *Betsy Ann*, 32 by 8 feet, with a 6 horsepower motor boat, carrying several tons of equipment which was cached at the Junction; the down trip took 1½-2 days, the uptrip 4-5 days. At the end of August, more equipment and supplies, boiler, engine, casings, tools, drill rods, etc., were freighted from the Denver & Rio Grande Railroad station at Floy by T. G. Wimmer overland to his *to his* ranch on the Green River and were there loaded on boats and taken down to the proposed damsite. There were two scows about 24 by 6 feet, fastened side by side, with a five foot space between, making one craft about 18 feet wide; two motor boats 14-16 feet along by 4-5 feet wide, drawing 7-8 inches; three rowboats; a barge called the *Betsy Ann;* and Wimmer's *Mar-*

*guerite.* The motor boats pushed the barge and the scows downstream. (1) This flotilla took on board the drilling and machinery and equipment, 10 or 11 men and a woman cook, provisions, supplies and coal for fuel for the boats and for the drilling operations, the entire load on the barge and scows being variously estimated at four to ten tons. (Record 2123-2136, 4747.) The trip down the Green River took between three and four days. The drilling operations below the Junction occupied over two months. During this period Wimmer made at least eight to twelve round trips on the *Marguerite,* bringing down at least half a ton of coal at a time and returning upstream; his down trips took two days or 14 hours running time and the up trips three days. During this period, also, Sawyer and Shaw took two trips in a motor boat up the Grand River to Moab and return. The drilling operations were abandoned, owing to a sudden rise in the Colorado River and to a collection of driftwood which made further work impossible. Thereupon, the *Betsy Ann* was made into a steamboat by installation of a stern paddlewheel, and loaded with a little over one ton of drilling machinery, three passengers, and 600 pounds of coal brought down by Wimmer, it proceeded up the Green River; the *Marguerite* pushed one scow and two motor boats pushed the other scow upstream with the rest of the outfit loaded on them; arriving at Wimmer's Ranch, the equipment was taken overland to the railroad; this 95 mile trip upstream took five days, or in actual running time 36½ hours—a little over 2½ miles per hour.

In 1915, October, Joseph A. Ross took the *Marguerite* with Dr. Middleton and four men, on a pleasure trip, down the Green River to Cataract Bottom.

In 1916, February, Walter R. Mendenhall (a witness), mining prospector, and his partner built a boat having a 7-8 inch draft when loaded, went down the Green River to the Junction and up the Grand to Moab.

In 1921, September 11, a joint expedition of the United prospecting for oil, piloted by George H. Frantz (a witness) went down the Green River to the Junction, in the late summer or early fall, at a low stage of water, in a boat, 24

---

(1) See photographs, Complainant's Exhibits 263, 264; Defendant's Exhibit 19.

feet long with a 5-6 feet beam, having a poor 6 horsepower marine engine. The geologists were met by a motor boat from Moab and taken up the Grand River. The trip downstream consumed five days, with stops to examine the country. Frantz returned to Green River upstream in 2½ days.

In 1921, September 11, a joint expedition of the United States Geological Survey and the Southern California Edison Electric Company left Green River, Utah, for the purpose of making a survey of the Green and Colorado Rivers for damsites. There were ten in the party under charge of William R. Chenoweth (a witness) including Leigh B. Lint, Henry C. Tasker and Ellsworth (all witnesses). They had two boats, 18 feet long with a 4½ feet beam, drawing when loaded 15 inches, these boats being of the Galloway type designed to go through the rapids of Cataract Canyon; a third boat, 15 feet long with an outboard motor drawing 18 inches; and a fourth boat under charge of Ellsworth Kolb, which he had used in his river trip in 1911. The boats carried from 1600 to 2000 pounds each. (Complainant's Exhibit 11, photograph No. 94). The party took four days to go down to the Junction, part of the time the three boats abreast being propelled by the motor boat. They proceeded down the Colorado through Cataract Canyon and picked up the survey at Fremont River and continued down the River, finally reaching Lees Ferry, October 8. While in the Glen Canyon section, they were furnished with supplies by Thomas G. Wimmer in a motor boat, as hereinafter described.

In 1924, in the autumn at a low stage water, Thomas G. Wimmer made two trips from Green River to Moab and return for the Marlin Oil Company—one with four engineers in two rowboats lashed together and propelled by a 4 horsepower outboard motor, the trip taking 3 days to go down the Green and 2 days up the Grand.

In 1924, John Galloway (a witness), son of the famous riverman and trapper, Nathaniel Galloway, took, with his brother, Parley Galloway, a trip down the Green and Colorado Rivers, through Cataract Canyon and in to Lees Ferry. He had previously made a trip from Green River, Wyoming, all the length of the Green and through Cataract Canyon on the Colorado to the mouth of Fremont River.

In 1925, May 4, two geologists of the Midwest Refining Co. left the town for Moab in an outboard motor boat; but about 6 miles above the Junction, the boat was destroyed by fire; the party was picked up by two employees of the Company coming down the Grand River in another motor boat, owned by the Company; return trip from the Junction to the Shafer Well took 2½ days.

In 1926, September 26, Selden Spencer Nye (a witness) of the United States Geological Survey (with E. T. McKnight) made a trip from the town to the Junction and up the Grand River to Moab, arriving on October 13, in a boat 16 feet long having an outboard motor and drawing 1½ feet—"having just enough power to make it up through the Slide." The purpose of the trip was to map the geological formations.

In 1927, November 10, a party of eleven, in charge of River, Utah, with Parley Galloway, and a party of nine young college men and a camera man none of whom had been on the river; they had two specially constructed boats, 22 feet long with a 5 feet beam, carrying 1,000 pounds, and one boat 16 feet long, carrying 800 pounds—these boats drawing from 14 to 18 inches. At a very high stage of water, they reached the Junction, June 30, they descended the Colorado River through Cataract Canyon in eight days, and proceeded on to Lees Ferry, reaching there July 12, the trip taking about 16 days; they continued on through the Grand Canyon to the Needles reaching there August 7. The trip was purely one of adventure and for the purpose of taking pictures and obtaining material for a book.

In 1927, November 10, a party of eleven, in charge of E. C. LaRue, including witnesses, Owen R. Clark, Constantine Rodin and Valentine Woodbury, left Green River, Utah, the trip being a commercial undertaking to obtain moving pictures, they had six boats of the Galloway type, four 18 feet long with a 5 foot beam, and two 16 feet long, drawing when loaded 4-6 inches; one boat drawing, loaded, 9-10 inches. Passing Cataract Canyon, they arrived at Lees Ferry on December 1, the whole trip consuming 21 days, moving pictures being taken throughout.

In 1927, Henry E. Blake built another boat, for experimental purposes, which was launched at Moab (photograph, Complainant's Exhibit 77).

In 1928, September 27, William Glenn Hoyt, an engineer in the United States Geological Survey, with Henry E. Blake and Samuel H. Moyer, one of the Government counsel in this case, left the town to make an examination of the Green and Grand Rivers, relative to their navigability. They had a boat, 16 feet long with a 4 foot beam, having an outboard motor, and drawing 12 to 15 inches loaded—also a canoe carrying one third of their supplies. The examination of the Green was finished October 17. At the junction of the Grand, they were met by a motor boat of the Moab Garage Company having a draft of 2½ feet, under charge of Virgil Baldwin and Merle Morse, and on October 18, they proceeded up the Grand River making observations, and arrived at Moab, October 23. (As to this trip, see Hoyt's Report, Complainant's Exhibit 75.)

At the time of the hearings, there were no boats being operated on the Green River, though apparently one or two were hauled up at the town of Green River. Most of the experienced boatmen—Wimmer, Wolverton, Howland, Anderson, Ross, Blake, etc., appear to have either moved elsewhere or taken up some other business. H. T. Yokey testified, however, that he now has a boat 22 feet with a 5 feet beam, made of iron, with an 18 inch propeller and a skag 10 inches deeper, which draws too much water, but that he was figuring on putting on a stern wheel, and intending to operate this boat down to the Junction and up to Moab.

USE OF GRAND RIVER.

*Table of Distances.*

| | Miles above mouth | Miles from bridge | Elevation |
|---|---|---|---|
| Castle Creek | 79 | | 3993 |
| Salt Wash | 76 | | 3986 |
| | 75.5 | | 3975 |
| Nigger Bill Creek | 68.5 | | |
| Sheep Creek | 68 | | 3951 |
| Moab Bridge | 65.4 | | 3946 |
| (Moab Garage Co. Dock) | | | |
| Kane Spring Wash | 59.5 | 5.9 | 3936 |
| John L. Shafer No. 1 Well | 48 | 17 | |
| Frank Shafer No. 1 Well | 47 | 18.4 | |

| | Miles above mouth | Miles from bridge | Elevation |
|---|---|---|---|
| John L. Shafer No. 2 Well.... (J. H. Shafer No. 1 Well) | 39 | 26.4 | |
| Lockhart Canyon ..... | 27 | 38.4 | 3904 |
| Indian Creek..... | 16.7 | 48.7 | 3900 |
| The Slide..... | 2 | 63 | |
| Junction ..... | 0 | 65.4 | 3876 |

The portion of the Grand River involved in this case lies between Castle Creek and the junction with the Green River. For convenience, this portion may be considered in two sections (a) the stretch of River from Castle Creek to the Moab Bridge—a distance of 13 miles; (b) the stretch of River from Moab bridge to the junction—a distance of 65 miles.

(a) *Castle Creek to Moab.*

As to the first stretch of River, there is little evidence of its actual use by boats either prior to 1896, or of its susceptibility to use in that year as shown by evidence of use subsequent to 1896.

In the summer of 1888, Elmer Kane (a witness) made a raft and drifted from Grand Junction in Colorado down to Moab (94 miles) and saw placer miners above Moab in a flat bottom skiff in which they had come down from Grand Junction. In November, 1888, Francis M. Shafer (a witness) and brother came down from Cisco to Nigger Bill Creek (about 30 miles) on a raft, with supplies, tools, and bedding of about 500 pounds; the trip was for placer mining; they took the raft back to near Castle Creek, and took a 14-15 feet rowboat there up the river, rowing and towing; the water being 2 feet deep in the rapids and the boat drawing 1 foot. In 1889, March-May, F. E. Kendrick and another made a survey of a possible railroad location down the Grand River from Grand Junction Colorado to the junction of the Grand and Green Rivers, in a boat.

In 1898, August, Henry Grimm (a witness) went upstream from Moab about 22 miles, in a row boat 24 feet long with a 5 feet beam and two pairs of oars, and having on board a load of 500 pounds. He returned hauling a raft of 6000 feet of lumber, which got stuck once on a rock.

In 1907, August, or September, Walter E. Mendenhall

(a witness) went from 10-15 miles above Cisco down to Moab in a 14-15 feet scow, having no trouble in getting through the rapid at Castle Creek, and the rough water at the mouth of Salt Wash and testified his belief that one could take a reasonable load of supplies down that stretch "if you always kept in the current."

In 1907, October, Emeline Coote (a witness), with Mr. and Mrs. Wilson, went upstream from Moab for about 12-13 miles, using a pair of oars and a single sculling oar.

In 1916, Ellsworth L. Kolb and Bert Loper (both witnesses) went from Glenwood Springs in Colorado down to Moab in a canoe with outriggers for oars, leaving on August 18, and arriving August 25.

In 1926, April or May, John and Parley Galloway (both witnesses) went from Westwater Canyon down to Moab (about 60 miles) in a rowboat 16 feet long with 5 feet beam, drawing 4 inches loaded.

At some time after 1924, Clarence E. Baldwin (a witness) went up the River beyond Nigger Bill Riffle to a point 6 miles above Moab, in a power boat drawing about 20 inches.

In 1928, August, Charles F. Moore (a witness), a Government engineer, travelled on a meander survey down from Castle Creek to Moab in a small rowboat, and up from Moab to Big Bend (6 miles) in one of the Moab Garage Company's outboard motor boats, 16 feet long.

There was evidence of trips by at least two other men in rowboats from a point 12-15 miles above Moab down to Moab and back; also evidence of men engaged in trapping from Westwater Canyon and points lower on the River down to Moab, in canoes with their furs and camp outfit.

There was evidence of the trip of the Steamer *Undine*, which was wrecked by being overturned eight miles above Moab in May, 1902 (see *supra* p. 71).

There was also evidence that, in 1897 and 1898, and again in 1902 and 1903 and possibly in other years up to 1908, lumber was shipped by Jesse M. Branson and his father from Castle Creek, down to Moab on lumber rafts averaging 48-64 feet long by 16 feet wide, built in three sections, carrying 10,000-15,000 feet of lumber when the water was low, and 20,000-25,000 feet when the water was high, approximately ten rafts per year, two men accom-

panying each raft—and in the months between June and December inclusive. These trips took 2½-3 hours at high-water, and 10 hours at low water. These rafts were profitable, since to transport lumber overland would take 6-7 four horse teams and 6 or 7 men. The Bransons lost only one shipment though occasionally the rafts stuck on a rock. Jesse M. Branson testified further to having gone from Castle Creek in a boat for pleasure, and also to occasions when he had gone part of the way—hauling and rowing the boats back upstream.

Little, if any, further evidence was introduced of the susceptibility of use of the section of the River from Castle Creek to Moab Bridge.

(b) *Moab to the Junction.*

Of the use by boats of that section of the Grand River from Moab bridge to the junction with the Green River, the chief evidence was as follows.

There was no permanent settlement in Moab Valley until 1878 or 1879, when the present town of Moab came into existence, located about two miles from the bank of the River. Prior to 1879, the only evidence of use of the River in that vicinity was the use of a ford as part of the trail leading from southwest Utah across the Wasatch Mountains, and east to Green River then to the Grand River, and thence more or less south along the old Spanish Trail to Santa Fe in New Mexico, crossing the San Juan River in the corner of Colorado, Utah, Arizona, and New Mexico. This trail was used by a party of traders in Navajo Indian goods who arrived in Salt Lake City from New Mexico in 1853, as who reported that "both the Grand and Green River fords were good, being about mid sides to their animals" (Complainant's Exhibit 622). In 1855, Mormon missionaries in July, 1855, crossed the Green River and the Grand River and built a fort near the present site of Moab, which was abandoned three months later, owing to hostile Indians. In June, 1879, Mormon settlers went from Montezuma on the San Juan River back along the Old Spanish Trail, crossing the Grand River at Moab and thence to the ford at Green River (Complainant's Exhibit 620). In August, 1880, a Mormon elder crossed the Grand River, the water running into the wagon boxes and the horses nearly

being obliged to swim (Complainant's Exhibits 622, 625).

Practically no evidence was introduced of any use of the River by boats south of Moab, prior to 1896, except its use by hunters and trappers in skiffs, each winter.

Between 1896 and 1929, use of the Grand River south of Moab was made by boats coming from the town of Green River down the Green River to the Junction and up the Grand River to Moab, as already described *supra* pp. 65-86.

From about 1920 to 1927, prospects of oil on lands adjoining the River and on its bed brought about surveys and the sinking of wells by various oil companies. Many oil leases were made to these companies by the State, and tests and drillings for oil were made for many miles along the banks. The following wells driven are especially mentioned in the testimony—John L. Shafer No. 1 (about 18 miles below Moab); Frank Shafer (18 miles); John L. Shafer No. 2 and John H. Shafer No. 1 (about 39 miles) and wells near Lockhart Canyon and Indian Creek farther down the River.

In 1920, August, an oil prospecting party in a metal boat went down from Moab to the Junction and return, taking one day to go down and returning at the rate of four miles per hour (Complainant's Exhibit 460), *Times Independent*, Aug. 19, 1920).

In 1923, August, and in other months in later years, the Moab Garage Company, owing to the increased interest in the River due to oil prospects, etc., operated a boat, 20 feet long, with an Evenrude 4 horsepower outboard motor, drawing 20 inches, carrying 5-6 passengers, called the *Punkinseed*. It carried passengers and light freight and took about 4 hours to go down to Lockhart Canyon (38 miles) and 8 hours to return (photograph Defendant's Exhibit 21).

In 1925, the Moab Garage Company, a common carrier reporting to and filing schedules of rates with the Utah Public Utitlity Commission, entered into a contract with the oil companies to transport, machinery, equipment, supplies, etc., to the wells and back. For this purpose, it built (at a cost of $7000) and operated a large scow, 75 feet long by 14-15 feet wide, 3 feet in depth, with a 40 horsepower automobile engine and an 8 feet paddlewheel. It had a draft of 4 inches, when empty; and of 12 inches when loaded with 12 tons, and 20 inches when loaded with 15 tons. It was

provided with a capstan and a 500 foot steel line for use at sandbars (photographs, Defendant's Exhibit 22, 25, 39). Between March, 1925 and June, 1927, this scow made about 200 trips (and between June, 1927 and June, 1929, about 40 trips in addition)—these trips being taken in every month of the year. Most of the trips were made to the Shafer No. 1 Well, Shafer No. 2 Well and the Frank Shafer Well. Some trips were made down as far as Lockhart Canyon. For transportation of freight alone the oil companies paid about $40,000, and many passengers were also carried for hire. At the outset, in March, 1925, the scow made three round trips in a week to the Shafer No. 1 Well, taking down each time a load of 12-15 tons. The down-trip was made at about 6 miles an hour and the up trip at about 3 miles an hour. In two weeks, about 100 tons of equipment were transported. In April, a pointed prow was added, which enabled the scow to make the round trip in about 9 hours; and five or six round trips a week were made with a down-load of 13-15 tons. It also took down a party of 46 people. In December, 1925, the well on the Shafer claim gushed, flowing 1000 barrels per day. A survey was at once begun by the Midwest Refining Company for a road and a pipeline leading from the west bank of the River to Thompson, a station on the Denver and Rio Grande Railroad. It was considered that if the oil field proved productive, the Moab Garage Company scow and others could not handle the necessary equipment, etc. In 1927, however, the oil field proved non-productive and the wells were closed down. The Midwest Refining Company in 2½ years of oil operations spent about $2,000,000. It is estimated that, since 1925, the Moab Garage Company had hauled down the River 3500 tons of freight, coal, supplies for cattle, outfits, equipment, etc. On upstream trips, it hauled equipment needing repairs and on one or two occasions barrels of crude oil from the wells. During part of the time, the scow operated on a regular schedule, both for freight and passengers.

In addition to the scow, the Moab Garage Company operated gasoline power boats to carry tourists, passengers, and light freight. (1) The *Punkinseed* above mentioned; (2) a boat, 20 feet long with a 4½ feet beam, having a Ford automobile engine, and drawing 10 inches, called the *Black Boat,* carrying 4 passengers and small freight, which, when

operated down as far as Lockhart Canyon, took 4 hours to go down and 7-8 hours to return; (3) a boat, 26-27 feet long with a 6 feet beam equipped with a Chandler motor, and drawing at least 19-20 inches, and when loaded up to 2½ feet, built to carry 10 passengers and 1-2 tons of freight; this boat having made trips to the Junction and back at all stages of water (photograph, Defendant's Exhibit 22). The Moab Garage Company also operated another 18 feet motor boat, and several rowboats and canoes with outboard motors. Clarence E. Baldwin testified that he operated the *Punkinseed* and the *Black Boat* for 6 or 7 months, making one to four round trips per week to the Shafer No. 1 and Shafer No. 2 Wells, and to Lockhart Canyon; that he operated the *Chandler* boat for 16 months, and that he made as many as 100 round trips in the three boats, trips being made in every month of the year; the *Punkinseed* made 3-4 miles an hour upstream; the *Black Boat* a little more; and the Chandler 5-6 miles an hour upstream. The large scow, the *Black Boat* and the *Chandler* are still at Moab, ready for use if occasion requires. The Moab Garage Company has advertised for and has obtained passenger and tourist traffic down the River, and to the Junction, the above boats having made 200-300 trips, since 1925, carrying passengers only. In addition to the boats of the Moab Garage Company, the Midwest Refining Company, the Texas Production Company and the Utah Petroleum Company (or Southern Utah Oil Company) operated motor boats of their own (see photographs, Defendant's Exhibit 3); and in March, 1926, five engineers and geologists surveyed oil locations down the River for the Texas Company in a 22 horsepower boat.

Other specific trips testified to were a trip by Governor Dern of Utah, with a party of 19, down to the Shafer No. 1 Well, in April, 1926; and a trip in May, a party of seven ladies were taken down; in May also, a party of officials of the Texas Company were taken down to Shafer No. 2. In October, 1926, the Utah Petroleum Company began to construct 12 miles of road from the mouth of Lockhart Canyon to its wells up on Indian Creek; in June, 1927, a party of 7 men, 5 women and 2 children were taken 50 miles down the River on a trip in its boat lasting 3 days. John L. Dugan (a witness), superintendent of the Utah Southern Oil Company, made, in its motor boat, frequent trips to the

Frank Shafer well, in every month in 1926; and between July and November made three trips a week down to Lockhart Canyon.

Besides the above use of the River by boats, there have been boat trips by Government surveying and engineering parties as follows: In 1909, April and November, the Leeds and Hughes investigation of the Grand and Green Rivers was made for the War Department as described *supra*. In 1912, October-November, a United States Geological Survey party made a topographic survey from Moab to the Junction, with a large flat-bottom boat drawing 10 inches to transport provisions in, and with two rowboats with a 10 inch draft (see photograph, Complainant's Exhibit 504). In 1914, John F. Richardson, a Government engineer investigating a damsite at the Junction went from Moab to the Junction several itmes in a motor boat with a draft of about 15 inches and returned. In 1926, August, Carroll E. Dobbin and J. B. Reeside of the United States Geological Survey (both witnesses) went from Moab to the Junction, in a 16 feet boat with outboard motor to make a geological reconnoissance of the banks, reaching the Junction on the second day, and returning, at the rate of about 2 miles per hour, in 3-4 days. During 1926, 1927 and 1928, a meander survey was being made of the River by Government engineers and surveyors. In May, 1926, G. D. D. Kirkpatrick (a witness), head engineer, made a trip down to Lockhart Canyon (38 miles) and return in a 20 feet boat drawing 10 inches called the *Black Boat*, going down in 2½-3 hours; he made another trip, in a 16 feet boat with an outboard motor, in May 1926, down to Shafer No. 2 Well (26 miles). The meander party maintained camps at various points on the River, and supplies were regularly brought down by the Moab Garage Company (hereinafter described) in its big scow and generally in its other power boats, sometimes to Shafer Well No. 2, and sometimes to Lockhart Canyon. The party operated two 16 feet boats of its own, with outboard motors drawing 10-12 inches. There was testimony of four of its members of trips (some nearly to the Junction) in Government and Moab Garage Company boats in the month of May and in every month from August to December inclusive; the work apparently being suspended during the winters. In 1929, September 25, Lieutenant Colonel Elliot J. Dent

of the United States Army Engineers Corps (a witness) went from Moab to the Junction and back, in the Moab Garage Company Chandler power boat (drawing 20 inches or more) to examine the navigability of the Grand River.

In addition to the above, there was evidence that trappers and hunters used the Grand and Green Rivers every winter in small skiffs or canoe-shaped boats which they poled and rowed. They were a hardy race of characters to whom neither sandbars nor rapids presented any especial obstacle or terror; and they went after the fur of beaver, mink, fox, and coyetes, around these Rivers since "when the fish collect in the back waters, game comes in to feed on the fish." An amusing side-light on the trappers was given in the testimony of an old witness—a miner and riverman, Harry McDonald—(Record 2226-2227) as to one old Green River trapper and hunter: "I would have stayed with him longer, but he was a little too tough for me. By gosh, he was the dirtiest man I ever saw. There was water enough in the river to bathe in, but he wouldn't bathe. * * * He would get his furs, go up there and trade them off at the ferry. He would start up there, by gracious, with tobacco and a jug of whiskey and not a bite of anything to eat, and go down there to be gone for months, just on what he could kill and catch."

### Impediments to Navigation on the Green and Grand Rivers

Impediments to navigation which, singly and jointly, the Government contends render these Rivers non-navigable are (a) ice, logs, and debris; (b) silt and sediment; (c) velocity of current, rapids, riffles, and rapid water; (d) sandbars; (e) lack of depth and discharge of water; (f) variations in discharge of water.

#### (a) *Ice, Logs, and Debris*

There is testimony that in floods and periods of high-water, these Rivers carry considerable quantities of logs and driftwood. The testimony, however, as to actual trips made by witnesses discloses little danger incurred from the presence of such debris, except in case of paddlewheel boats which run the risk under such conditions of breaking their paddles. I do not find that this condition constitutes any serious impediment to navigation or prevents the navi-

gability of these Rivers. Ice forms on these Rivers for a few months in the winter—being present ordinarily on the Green from the latter part of December to the middle of February; on the Grand from the middle of December to the end of February; and in the Colorado for a less time. These ice periods do not prevail in every winter, and they are shorter than on most of the rivers in the northern and northeastern States of this country. When the ice breaks up, there is a short time when floating cakes and mush or slush ice is to be found. In the accounts given by witnesses of actual trips made on the Rivers, there are few instances of difficulties in navigation due to ice, except during the short periods when the Rivers are actually frozen over from bank to bank, and except one or two instances of serious ice-jams on the Grand and on the Colorado. I do not find that ice conditions constitute any serious impediment to navigation or prevent the navigability of these Rivers.

(b) *Silt and Sediment*

As the plateau of the Colorado Basin is arid, with little vegetation to protect the rock surface, the rain precipitation, which occurs frequently in heavy downpours, runs off rapidly coming down the washes and side canyons and also over the edge of the main canyon rims and carrying off the soil which later appears as sediment in the Rivers. Erosion is the chief feature of all this region. In addition, much material is blown into the canyons by winds. As a result of these conditions, the Colorado River at Lee's Ferry carries more silt or suspended matter than any other river in the United States. (1) Expert witnesses testified

(1) "Quality of Water on the Colorado River," by C. S. Howard, Water Supply Paper 636B (1929); "Suspended Matter in the Colorado River", by C. S. Howard, Water Supply Paper 636 B (1929); "Denudation", by R. B. Doyle and H. Stabler, Water Supply Paper 234 (1909); "Silt in the Colorado River and its Relation to Irrigation", by S. Fortier and H. F. Blaney, U. S. Dep. of Agriculture Technical Bulletin 67 (1928); "Contribution to the Hydrology of the United States", by N. C. Grover, Water Supply Paper 400 (1916). Complainant's Exhibit 493, 494, 234, 68, 59, also Complainant's Exhibit 75, pp. 76-77.

for the Government as to tests and measurement made of the silt at Lee's Ferry, Goodridge Bridge on the San Juan River, and elsewhere, and also gave their estimates based on figures. I am not satisfied that at the present time sufficient tests have been made or sufficiently accurate methods adopted to make accurate measurements of the silt. There are estimates and evidence that the Green River carries over 8,000,000 tons per year of silt, that the Grand River carries 12,000,000-25,000,000 tons; that the San Juan River carries over 60,000,000 tons; and that the Colorado River at Lees Ferry carries 131,000,000 tons. Whether these figures are or are not accurate, it is evident that the chief bulk of the silt is contributed by the San Juan River. It is also evident from testimony of experts that the higher the velocities in a stream the more sediment will be carried in the channel.

I find that the amount of silt in the Green and Grand Rivers is very considerable and makes the water murky and unpleasant to drink. I also find that it has interfered to a certain extent with the operation of the engines, and propellers on motor boats, and particularly with the pumps; but I also find that improved methods of construction and operation have been discovered, devised, and adopted which largely obviate any impediments to navigation due to the action of the silt in connection with motor boats.

(c) *Rapids, Riffles, Rapid Water, and Velocity of Current*

Different witnesses necessarily differ greatly in the use of terms in describing water conditions, and the same water flow may be described by one witness as a rapid, by another as a riffle, and by a third as only swift water. I find that for practical purposes the definitions used by W. G. Hoyt, Government Engineer, in Complainant's Exhibit 80 present an excellent classification. In testifying and preparing a report upon river conditions, as based upon his inspection of the topographical and profile maps of the Rivers made by the United States Geological Survey (Complainant's Exhibit 10) supplemented by information from diaries, photographs, and notes by the survey parties, he classified as (a) "rapids", those portions of the Rivers where due to obstruction in the flow by rocks or boulders

a head of from 3-10 feet would be created in relative short distances, the water flowing in a high velocity, creating waves several feet in height; smaller rapids, sometimes called riffles, being caused generally by sand or gravel bars, producing a head of between 1 and 3 feet in a distance of between 1,000 and 2,000 feet, resulting in waves 2 or 3 inches in height. He classified as (b) "rapid water", those stretches where the fall in such as produces swift water, not broken in high waves, the slope exceeding two feet to the mile. He classified as (c) "quiet water", those stretches where the slope is less than about 2 feet to the mile. W. R. Chenoweth, who superintended the Topographic Survey of the Green and Colorado Rivers of 1921 termed as a rapid "a sudden increase in the fall of the stream causing rough water or white water, with boulders" (Record 3917).

Using Hoyt's classification, I find that in the portions of the Green River involved in this suit, there are no rapids, riffles, or rapid water, and the slope of the bed is only a little over 1 foot per mile.

I find that Hoyt's classification of the Grand River depicts water conditions with fair accuracy, as follows. From its junction with the Green up for 71.12 miles, i. e., up to a point 6 miles above the Moab Bridge, the Grand is "quiet water", as the general slope of the bed is only slightly over 1 foot per mile. At a point 2 miles north of the Junction with the Green, and 63 miles below Moab, there is a place called The Slide (see photographs 67, 147, Complainant's Exhibit 77) at which a mass of rocks fallen from the Canyon walls have obstructed the River to a narrow channel of about 100-125 feet. At times of very high water, the velocity of the current here is such as to make the upstream passage of boats difficult unless equipped with powerful engines or motors. In spite of this fact, however, boats owned by the Moab Garage Company, including the Chandler boat (which sometimes drew 2½ feet of water), appear to have navigated The Slide without much difficulty up or down stream. The only boat which was prevented from passing through this Slide was the large steamer *City of Moab* which attempted passage in its trip from Green River town to Moab, and was unable to ascend owing to lack of power.

At a point 71 miles above the Junction, (i. e., 6 miles above the Moab Bridge) a stretch of river bed begins which has a drop of 11 feet in 2.62 miles or at the rate of 4.20 feet per mile, which Hoyt classifies as "rapid water". At Mile 73.74 above the Junction, he finds a rapid where the river bed drops 7 feet in .59 of a mile or at the rate of 11.9 per mile. Succeeding this, upstream, is a stretch of 1.19 miles of quiet water; then a rapid at Mile 75.52 where the bed drops 11 feet in .73 of a mile or at the rate of 15.1 per mile, and another small rapid at Mile 76.94 with a drop of 4 feet in .38 of a mile, or at the rate of 10.5 per mile. Thus, on the Grand River from Castle Creek (Mile 79) down to the Junction, Hoyt finds a 6 mile stretch of water, viz. Mile 77 to Mile 71 in which there are three small rapids and two and a half miles of rapid water. I find that in this short stretch, there is considerable difficulty of navigation downstream and that as a matter of fact navigation either down or upstream has never been made by motor boats. There has been, however, considerable use of the River even here for lumber rafts. This 6 mile stretch, however, is not characteristic of the whole section of the Grand River involved in this suit and with reference to it, the words of the Court in *The Montello* (1874) 20 Wall. 430, may be applicable that a river may be navigable, if the facts warrant, "although its navigation may be encompassed with difficulty by reason of natural barriers such as rapids and sandbars." (See also Pitney, J. in *Economy Light & Power Co.* v. *United States* (1921) 256 U. S. 113 at 122 that "navigability in the sense of the law is not destroyed because the watercourse is interrupted by occasional natural obstructions or portages." (See Peckham, J. in *St. Anthony Falls Water Power Co.* v. *Board of Water Commissioners* (1897) 168 U. S. 349.)

Velocity characteristics of the Rivers in question can be shown accurately only at sections where actual measurement of velocity have been made, namely at the gauging stations which have been located by the United States Geological Survey, of necessity, where river-bed conditions are as favorable as possible, and where (considering the River), velocities are comparatively low and uniform. The figures obtained at these stations (Complainant's Exhibits 82, 82A)

refer to fair conditions and do not apply to sections where rapids, riffles, or excessive contractions in the channel occur. The Government admits that the velocities as shown for the Green River station are fairly indicative of velocities in the reasonably straight stretches of Green River located between the mouth of the San Rafael River and the junction; the velocities as shown for the Grand River near Cisco, Utah, are fairly indicative of that River between Moab and the junction with the Green (with the exception of the section at The Slide; and the section north of Moab up to Castle Creek).

The duration of maximum velocities averaged over a period of years, as shown on the plat or graph in Complainant's Exhibit 82 A, Plate 7, (with reasonable allowance for error) are as follows:

*Green River:*

| | | |
|---|---|---|
| From 1½ to 2 | miles per hour for | 45 days in the year. |
| 2 to 3 | miles | 63 days. |
| 3 to 3½ | miles | 43 days. |
| 3½ to 4 | miles | 34 days. |
| Over 4 miles | | 80 days. |

*Grand River:*

| | | |
|---|---|---|
| Less than 1 mile | per hour for | 6 days in the year. |
| From 1 to 1½ | miles | 88 days. |
| 1½ to 2 | miles | 108 days. |
| 2 to 3 | miles | 57 days. |
| 3 to 4 | miles | 28 days. |
| Over 4 miles | | 78 days. |

From the Government statistics, as well as from the testimony, I find that neither the current nor velocity of the Green and Grand Rivers impede navigation to any great extent, except in days of extreme or sudden flood. Navigation upstream is naturally hard work for men in rowboats, but motor boats of proper construction, power, and draft can navigate upstream without trouble, so far as current or velocity alone are concerned.

The Government has introduced considerable evidence as to the navigability of the Green River in the 23 miles

from the town of Green River down to the mouth of the San Rafael River—a portion of the River which is north of that involved in this suit. I find that in this 23 mile stretch the fall is 59 feet or at a rate of 2.6 feet per mile. Of this total fall, 37 feet is concentrated at 15 riffles having a total length of 4 miles and an average drop of 9.3 feet to the mile. The average fall in the 18.4 miles of the channel length between the riffles is 1.57 feet to the mile, corresponding to an average rate of 1.15 feet below the mouth of the San Rafael. The estimate of fall per mile in the riffles is, however, misleading; for in no riffle is there an actual fall of more than 4.2 feet and in only 4 out of the 14 riffles is there an actual fall of over 3 feet. These riffles have usually an gravelly or rocky bottom; some have exposed rocks; in some of them the channel is tortuous. The location of these riffles is, in general, constant from year to year, though their shape varies from time to time (Complainant's Exhibit 75). The depths over these riffles, as found in September, 1928, by W. G. Hoyt, Government engineer, averaged 3 to 5 feet at an extremely low stage of water, with a few soundings of less than 2 feet. It is clear, on the evidence, that boats have found more difficulty in navigating this 23 mile stretch than in the 94 mile stretch below the mouth of the San Rafael; but I do not find that the conditions in such 23 mile stretch have made navigation impossible or impracticable or constituted anything more than a reason for more careful navigation. I only report the above details because of the following contention made by the Government. It contends that no commerce does or can originate at or about the mouth of the San Rafael River; that the natural location or origin or terminus for commerce is the town of Green River; and it contends that one of the tests of navigability in law of a river is that it must have a terminus for the public at both ends. This contention is apparently founded on the statement of the law contained in *The Law of Waters and Water Rights* (1904), by Henry P. Farnham, section 23, which sets forth that: "In order to be public, it must have a terminus by which the public can leave it," citing *Chisholm v. Caines*, 67 Fed. 285, and *Manigault* v. *S. M. Ward & Co.*, 123 Fed. 707. This statement of the law is further explained by Farnham as follows: "To be useful for these (commercial) purposes, the water must connect with other waters or lead from one

public place to another, so as to be in the path of Commerce. So, a stream is not navigable so as to be a public highway which leads from a public river to a private house or to which the public have no access except at one point where a highway approaches it." Such a doctrine means no more than that a stream which has a terminus or both termini in wholly private property cannot be held to be a public highway. In the present case, it is clear that the public has a legal access to the River at both termini. The doctrine of law contended for by the Government has, in my opinion, no applicability to the conditions in this suit. Clearly, the question of navigability cannot be made to depend simply on the physical conditions prevailing on a River at the particular point at which the Government decides to make the starting point in a suit to quiet title. If the Government's contention is valid, it could have made an even stronger contention by taking the middle of Labyrinth Canyon as the starting point for that portion of the River bed to which it desired to establish its title. The validity of the Government's legal contention, is, however, in my opinion irrelevant; for I find that the public had both legal and physical means of access to the River in the vicinity of the junction of the San Rafael River with the Green River. Accordingly, I hold that, as the Government has not chosen to call in question in this suit the 23 mile stretch of Green River from the town down to the mouth of the San Rafael River, evidence as to conditions of navigation in that stretch is not relevant, or rather that it is relevant only so far as those conditions are similar to the conditions in the 94 mile stretch below, specifically involved in this suit.

(d) *Sandbars*

As already stated, the Green and the Grand run for the most part through canyons whose rock walls are in general 1500-2000 feet apart, though in places narrowing to 600 feet. Within these confines they have a certain amount of freedom of action to meander from side to side. The rock walls have been eroded into constant curves. At all times, except in the high water months of April-June each year, the current follows the concave curves or outside of the bends and forms there the deep channel; as the bend continues, the current is gradually thrown across the River bed and into the concave curve on the opposite bank. At

these curves or bends which form a considerable portion of the length of the River, there is found a reasonably steady and constant channel. In the highwater months, when the Rivers may fill from bank to bank, the current may leave this channel; but as the spring floods recede after the end of June, the current is found in the channel pursuing the curves as above stated. As the Rivers carry large amounts of very fine silt, sandbars of various types are formed throughout their course. The most constant type is formed on the sides of the Rivers on the convex curves or inside of the bends; they may be partially awash during low water periods, or they may have a height of 4-6 feet above the water, or they may be still higher and carry growths of small willows or other vegetation. Changes in stream discharge and in stream velocity, and floods caused by sudden heavy rains may affect the size, shape, and height of these side sandbars by cutting along their edges and transferring and depositing the sand further down stream. In general, however, after the spring highwater has receded, these sand bars have constant and fixed locations. The comparatively low velocities of these Rivers is favorable to the deposit of their silt burdens.

A second type of bar is that which forms at the mouth of tributary streams, creeks, or washes, generally at times of sudden floods caused by heavy summer rains. These bars are local and generally of short duration; and as the River cuts its regular channel through or around them, the silt or debris is washed away and local conditions become normal again. The River "housecleans itself", as one witness testified. Such local bars and temporary changes of channel may also be caused by some obstruction such as large boulders or mass of driftwood.

A third type of sandbar has been termed by Government engineers in testifying, "crossing-bars", though that term is unknown to most of the practical rivermen. Such bars are formed below the places where the Rivers cross from one side to the other in following the curves or bends; they are coincident in location with the reversals of the course of the Rivers. A crossing-bar may extend entirely across the river (generally in a diagonal line); or it may have a channel around it at either or both ends. Sometimes a crossing-bar will attach itself to one bank at a considerable distance below its starting point, so as to leave a long chan-

nel or pocket of water having a blind end, making it necessary for a boat which has followed this blind-end channel either to back out or to push its way through or across the bar. These crossing-bars are for the most part submerged, and are sometimes from 1000 to 3000 feet in length. Various theories have been advanced for the cause of this type of bar; and the Government engineer witnesses Lieutenant Colonel Dent (Record 1222 et seq.) and William G. Hoyt (a particularly able and helpful witness) present a full discussion of this subject. (Complainant's Exhibit 75.) It appears to me unnecessary to make any finding as to the cause of these bars, since the fact of their existence is amply proved.

Wherever these crossing-bars occur, there is generally more or less difficulty in ascertaining the course of the channel, as the stream of the River may divide into several channels, or it may distribute itself over the full length of the bar so as to lessen greatly the depth of the water from the depth prevailing in the well-defined channels which follow the bends. After the recession of the highwater stage after the end of June in each year, I find that the location of these crossing-bars is generally constant from year to year, or, in other words, that a crossing-bar may be looked for every year in substantially the same location. These bars, however, vary in shape, course, height, and size from year to year. They vary also from month to month, sometimes from week to week, and occasionally from day to day. These variations may be due to sudden changes in stream discharge and consequent changes in stream velocity; or to the regular cutting away of the side bars and consequent deposit of material from such bars in the crossing-bars farther down stream; or to the deposit of silt brought in by floods at other times of the year than at the regular spring flood season. (1) The variations so produced in the crossing-bars often result in changes in the

(1) The Government calls especial attention to photographs showing the nature of exposed bed, bars and banks as explanatory of the reasons why conditions in these Rivers cannot be permanent. Complainant's Exhibit 77, photos Nos. 37, 38, 42, 48, 49, 54, 55, 58, 61, 62, 64, 116, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 130, 131, 132, 134, 135, 137, 138, 139, 140.

course of the channel or channels across the bar or in raising the height of the bar and consequently lessening the depth of the channel. The variations, on the other hand, may result in improving or scouring out the former channel or producing a new and better channel across the bar.

The Government contends insistently that the difficulties of navigation caused by the presence of these various sandbars, particularly by the crossing-bars, especially when taken in connection with the variations of stream flow and velocities, precludes a finding that these Rivers are navigable.

It is clear that the mere fact of the presence of sandbars causing considerable impediment to the free passage of boats does not make a river non-navigable; for if it did, then many recognized navigable rivers, in former days prior to their dredging and improvement, must have been held non-navigable. For instance, in Francis Parkman's famous *The Oregon Trail,* describing his steamboat journey in 1846 on the Missouri River from its junction with the Mississippi River, it is stated (p. 2): "Thus laden, the boat struggled upward for seven or eight days against the rapid current of the Missouri, grating upon snags and hanging for two or three hours at a time upon sand bars. * * * The Missouri is constantly changing course; wearing away its banks on one side, while it forms new ones on the other. Its channel is continually shifting. * * * With all these changes the water is so charged with mud and sand that in spring it is perfectly opaque." And on his return trip down the Missouri River from Westport, Parkman wrote (p. 380): "The passage to St. Louis occupied eight days, during about a third of which time we were fast aground on sandbars." And Lieutenant Ives in his report of his passage up the Colorado River from its mouth to Black Canyon, in 1858, gives a description of difficulties encountered with sandbars which duplicates almost word for word the difficulties testified to by many witnesses in the present suit; yet, the Colorado River from the Gulf to Black Canyon was navigated by steam propelled vessels from 1858 to 1864, so far as the evidence in the present suit shows. Ives states (1):

---

(1) Complainant's Exhibit 72, see Hydrographic Report, pp. 9, 10.

"It is about one hundred and fifty miles by the river from the head of the Gulf to Fort Yuma, though only half that distance in a direct line. Concerning no particular locality can any special information be given that would be of value to the navigator. The shifting of the channel, the banks, the islands and the bars is so continual and so rapid that a detailed description, derived from the experiences of one trip, would be found incorrect, not only during the subsequent year, but perhaps in the course of a week, or even a day. * * * The bars are yielding, and any agitation upon their surface causes them speedily to wash away. A boat may frequently be forced over places where there was, at the time of its striking, six or eight inches too little water. * * * For several years the Colorado has been regularly navigated by steamboats between its mouth and Fort Yuma. At low water, trips are rarely made without the boat grounding many times a day. A sounding pole is constantly employed. Different points upon the bar are tried till the least difficult is found. The steamer is then worked backwards and forwards to loosen the sand. Lines are attached to a tree, snag, or to an anchor taken out ahead, and are heaved upon with the windlass or capstan. As a last resource, the boat is lightened of a portion of the cargo, and by these expedients the bars may always be passed, with more or less difficulty and delay. * * * Experience alone can impart the knowledge required to enable one to navigate successfully. Memory assists but little in selecting the channel, for it has been known to change from one bank to the other in a single night. Generally along a steep bank and a concave bend the deepest water is ot be found, but the rule is not invariable. The water being turbid and perfectly opaque, it is impossible to determine the depth as in the case of a clear stream."

The mere facts of impediments or difficulties caused by sandbars and crossing-bars, therefore, cannot be the sole test of navigability. And in *The Montello*, 20 Wall. 430, the Court specifically stated (p. 443) that a river might be navigable "although its navigation may be encompassed with difficulties by reason of natual barriers such as rapids and sandbars." The test must be, in my opinion, the extent to which those difficulties prevent persons from using the River by boats to attain the end or purpose which they

seek, or, in other words, how far the bars prove an impediment to the practical use of the Rivers in the commerce for which they are used or capable of being used. The evidence in this suit unquestionably discloses that the presence of crossing-bars in these Rivers affected the capacity of these streams for use in commerce by retarding and making more difficult the progress of the boats used. I find it unnecessary to report in detail the particular difficulties which each boat so used encountered, as a general summary will give an accurate picture of conditions. Four classes of witnesses testified for the Government as to such difficulties: (a) Powell's party and other early explorers after 1869 who wrote more or less contemporaneous accounts of their trips; (b) men who plied the Rivers in boats for purposes of trade or business; (c) Government engineers and other officials engaged in surveying; (d) Government engineers who made a trip down the Rivers for the purpose of testifying in this suit and whose sole experience with the Rivers was confined to such a trip. Most of the witnesses for the State were persons who had made practical use of the Rivers in boats. I do not find that the difficulties of navigation caused by sandbars were as great as some of the Government engineers testified, nor as negligible as some of the State witnesses testified. Moreover, since the engineers engaged on Government survey would naturally be obliged to cross the Rivers frequently and regardless of the location of the channel, and as their attention was not necessarily directed towards ascertainment of depths and locations of the channels, and as many of them were using the Rivers for the first and only time, I find it entirely natural that they should, in general, have encountered more sandbars than did the practical rivermen who used the streams frequently and whose attention was centered on channel conditions.

The presence of sandbars apparently proved no great obstacle to the Powell party in either its first or second trip down the Green River. Major Powell himself made no mention of them in his Report; and F. S. Dellenbaugh in his account of the second trip (Complainant's Exhibit 14, *A Canyon Voyage*) made only one mention of sandbars, though the trip was at a low stage of water; on September 9, he recorded that while pulling along in the midst of a heavy downpour of rain, "our boat ran on a

sandbar and got so far and fast that it required all ten men to get her off, the other crews walking in the water to where we were as the shoal was very wide" (at Bow-knot Bend). He made no other mention of sandbars in the whole distance from that spot down to the Junction (which he reached on September 15); and he mentioned that the "current was less than 3 miles an hour." Stephen V. Jones of this second Powell Expedition kept a careful diary (Complainant's Exhibit 628). He noted sandbars as follows:

"Sept. 19.—While looking at this grand sight (a rainbow) all the boats ran onto the sandbar. All were obliged to get out, the two boats in the rear were easily backed off but the Dean was on so far that we thought i- best to go ahead. The water grew more shallow until at last it was not more than two or three inches deep. The boat sunk into the sand and all were required to push her over the bar.

Sept. 11.— * * * Got fast on sandbars several times during the day.

Sept. 12.— * * * (Stillwater Canyon.) The water has been very smooth. * * * We ran the entire length of Labyrinth Canyon, and so far in this, finding nothing to stop us but sandbars."

Powell's boats drew very little water; but the various boats used by other exploring parties and by the local rivermen as set forth *supra* had a draft of from 6 inches to 2½ feet. I find that these boats encountered impediments from sandbars, varying according to the season and the stage of the water and the depth of the draft. I find that persons navigating the Green and Grand Rivers were, in general, likely to hit sandbars (particularly crossing-bars) sometimes three or four times a day, sometimes oftener. As a rule, boats were stuck for very short periods of time, and were pushed off by oars or poles. Frequently, agitation of the sand by the oar or the propeller would set the water to cutting away and deepening a channel sufficient for passage. Sometimes, men were obliged to step overboard and wade around to find the channel, or to drag the boats across the bars no channel being present sufficient to float them; but this was not a condition generally

prevalent. The large boats such as the *City of Moab*—a type evidently unsuited to these rivers—also the barge of the Moab Garage Company, were occasionally warped off the bars by ropes carried ashore, fastened and used in connection with a capstan or winch on the boat. This large barge of the Moab Garage Company in the Grand River was stuck on the sandbars for longer periods of time than any of the other boats (sometimes for several hours and once for over a day), owing to its unwieldy size and heavy loads; it had particular trouble at that portion of the River just below its dock, where tributary washes on each side frequently sent down débris, clogging the stream. On every occasion, however, when so stuck on bars, this barge was finally released and continued on its trip. Virgil Baldwin, in charge of the barge, testified to an opinion that for a quarter of the time they had no difficulties up or down stream; for a half of the time, they would be stuck only a few minutes, and for a quarter of the time, they would be delayed five or six hours.

The location and shape of the crossing-bars frequently cause considerable difficulty in ascertaining the actual river channel around or through them; and boatmen who mistake the channel are often obliged to back up and try another position of the stream or to push their boats over from one apparent channel to another. Ability to detect the correct channel at these points depends largely on the amount of previous experience with these Rivers; and those men who have long navigated them have less difficulty in finding the channel, though even they are frequently deceived. Men navigating without this technical "river-sense" will naturally miss the channel. An illustration of the value of this experience is found in the testimony of H. T. Yokey (Record 3445):

"Q. In the trips you have made on the Green River, have you always found the channel or the deepest water in the same location?

A. Generally, pretty close; always find plenty of water on the outside of a bend. Where you cross from one bend to the other, that is where you have trouble locating the channel. My experience is, you come along with the boat and come into a bar, you feel the pull of the rudders eases up. You edge along and come to deep water, and it will

turn in; by the sense of touch you can wind on through and bind the channel; otherwise, if you held you- rudder stiff, you would run aground."

Another witness, Thomas G. Wimmer (Record 4790) testified, in answer to a question by the Special Master as to how he could tell the right channel when in a straight stretch of the river below the bends the channels were "braided", i. e., distributed into a number of separate or interconnecting channels, as testified to by some witnesses:

"A. I never had any trouble in that: always able to discover it. There is one place down below, I don't know what they call it, pretty well down before you get to Cataract Canyon, there is a number of sandbars; it is still water what causes that, it is the wide spread of still water, but by taking sufficient caution and not running down there full head of steam, you can get through there all right: I never was stuck there. The first time you go down, if you haven't been down for a year, you have to look around a little. * * *"

Another witness, Joseph C. Ross (Record 4232) testified:

"At certain stages of the water, different heights of the sandbars, a man that is accustomed to sandbars on the river can distinguish the line of a sandbar under water, although maybe it is six, eight, ten or twelve inches under the water; always a little break in the water on the surface; a person wouldn't notice that unless they were experienced."

And again (Record 4245), in answering a question why familiarity with the river is of value, Ross answered: "Because you get kind of a system for judging the river, gauging the channel, the distance to sandbars, the depth of the water, the width of channels, practice the eye; the eye is trained to observe these things." Again (Record 4267), Ross explained how a riverman "read the water", how he found deep water by the aspect of the waves or ripples, etc. But, said Ross, describing a trip down the Green in 1893; (Record ---): "Now and then we would hit a bar, which you always will; can't read the bars all the time on any trip." And as to another trip in 1915 on the *Marguerite*, Ross testified (Record 4231); "Had the usual fair

trip, hit and miss, bumped along on the shallow places, good clear sailing between the sandbars." Harry McDonald (Record 2195) testified as to how he would "feel along for the channel." Lewis Ransome Freeman testified as to Thomas J. Wimmer (Record 2576) that "he was reading the water better and handled his boat with more skill."

I find that as these crossing-bars occur in substantially the same locations each year after the spring floods (though varying in shape from year to year), previous knowledge of their existence either by experience or by use of charts or maps is of advantage to a person navigating these Rivers. I find that the more frequently and regularly boats are run down these Rivers, the less the difficulty with sandbars and the more definite the channel across the sandbars is likely to be, since such boats will tend to keep a channel cut out, producing on the crossing-bars an effect similar to dredging; but I also find that instability of the sand and discharge and velocity conditions will always cause some change of channel on these bars. I find, however, that such a condition of constant change of channel location and depth is quite usual in a river carrying large amounts of silt; and as testified to by Freeman (who had navigated many of the large rivers of the world): "One takes that as a matter of course with any sand-bearing rivers; you get it anywhere." (Record 2593) I find that the practical rivermen treated the fact of getting stuck on sandbars as a perfectly usual incident to travel—"all in the day's work", as one witness termed it. "If we got out of the channel, hit a sandbar, we would stop, push off and go. * * * I didn't call that trouble; that is the only thing I ever encountered; like anybody else would get on a sandbar, why just push off." (Record 4619) I find that navigation downstream is more impeded by these bars than navigation upstream, since they are thicker and have a "shoulder" at their lower end, so that to a boat going upstream, they not only are more visible but are easier to push off from. Moreover, the velocity of the current tends to fix more firmly on a bar a boat going down, while it tends to release a boat going up. This lessened impediment from bars tends to compensate boats making the upstream trip for the increased difficulty of navigation caused by the velocity of the stream. The large Moab Garage boat, however, found more trouble with sandbars, going upstream

owing to difficulty in handling its size. I find that sandbars, while impeding temporarily the passage of boats, did not prevent the passage of any boat or prevent it from reaching its destination or from carrying out the end or purpose for which it was being used. Whenever a boat started for a point on these Rivers, it reached that point, so far as sandbars were concerned; the only obstacles which, from the testimony, prevented any boat of a draft of 6 inches to 2½ feet from reaching its destination, were accident to machinery, fire, and lack of power. As one Green River witness said: "Whenever I started to Moab, I went to Moab, and got there when I told them I was coming." (Record 4783) The large Moab Garage boat ran for some months on a regular schedule and was able to run in every month of the year. Undoubtedly, the sandbars rendered the boat trips slower than they would otherwise have been; but commerce may be none the less useful because it is obliged, or is content, to go slowly, In the *Montello* case, there was a portage of a mile, due to rapids; in the *St. Anthony Falls* case, there was also about a mile of portage, due to the falls; in the *Economy Light and Power Co.* case, there were several miles of portage; yet in each case the Court held the river navigable. The effect upon the practical commercial use of a river of being stuck in a sandbar for an hour would seem to be very little different from being required to portage for an hour.

An obstacle or obstruction, the presence of which is calculable in advance and which merely impedes or retards a boat and which is not dangerous to life or limb does not seem to me to be such as will render a river non-navigable, unless it is such as to render commerce wholly impracticable. It is clear that none of the obstructions or obstacles commonly met with, the sandbars in particular, on these Rivers constituted any substantial danger; for there is evidence that boats carried women and small children both up and down; and were sometimes navigated by women. I find that *that* the sandbars did not render these Rivers non-navigable.

(E) *Depth and Discharge of Green and Grand Rivers.*

The Government maintains ganging stations to measure the depths, velocities and amounts of discharge of water.

Attempt is made to locate these in straight stretches of water and so as to give as far as practicable an accurate picture of average conditions. On the Green River, the gauge was located (at different dates) at the highway bridge at the town of Green River, and in Little Valley, about seven miles below the town, at Mile 110½; but during practically all the time, however, the actual measurements of discharge were made from a cable across the river at about Mile 109½ (Complainant's Exhibit 10, Map 35) at which point the various cross sections were made. From a measurement on this map, as scaled by the Master, the width of the river at this point appears to be a little over 400 feet. On the Grand River, the gauge was located at Cisco, at the Dewey River Ferry (Complainant's Exhibit 10, map 21), at Mile 77, below Grand Junction, Colorado and about 1½ miles below the mouth of Dolores River. This point is 17 miles above Castle Creek where the section of the River involved in this suit begins. From a measurement on the map as scaled by the Master, the width of the River at the gauge appears to be about 400 feet. On charts or graphs prepared by Government engineers from measurements and figures at these gauging stations, the following appear, on an average, to be the mean depths (with reasonable allowance for error).(1)

*Green River.*

Between 1½ and 3 feet for 53 days in the year;
3 and 4 feet 114 days.
4 and 5 feet 76 days.
5 and 7 feet 62 days.
7 and 12 feet 60 days.

It thus appears that for 312 days in the year, there is a depth of three feet or over.

---

(1) See Complainant's Exhibit 82-A, Plate 9, "Curves showing duration of mean depth in feet of the gauging stations based on records of the Geological Survey"; Plate 6, "Duration curves, Colorado, Green and San Juan Rivers, compiled by W. G. Hoyt, based on daily discharge records collected by U. S. Geological Survey—based on estimated long time average."

With these figures as to depths, the following figures as to daily discharge of water during the year, on an average, may be taken into consideration (with reasonable allowance of error) (1). The term "second foot" in the figures

| | | |
|---|---|---|
| Less than | 1,000 second feet | 3 days in the year; |
| From | 1,000 to 2,000 | 72 days. |
| From | 2,000 to 3,200 | 141 days. |
| From | 4,200 to 6,000 | 35 days. |
| From | 6,000 to 10,000 | 40 days. |
| Over | 10,000 | 74 days. |

It thus appears that for 290 days in the year there is a discharge of over 2,000 second feet and for 149 days in the year of over 4,200 second feet.

As these figures, however, are averages of depths taken across a cross section of the river at the gauging station, they must be used with caution; for it is evident that if the actual channel of the River at any given place below becomes narrower than the total width of the river at the gauging station, then the water in this channel may become deeper than the gauge station figures. So, too, with the same amount of second-feet discharge of water, the depths may vary with the varying widths of the channel or of the River; the same amount of water going through a 100 foot channel may result in greater depth than in a 300 feet channel, though not invariably; hence, the Government in its brief submitted to the Special Master rightly makes the guarded statement that "to a limited extent, the variations in flow are an index to the variations in depths". With this understanding of the limited application of the figures as to discharge, it appears from the chart or graph that with a discharge of 2,000 feet or less for 75 days, there is a depth of between 1½ and 3 feet for 53 days; and hence that with a discharge at the Green River gauging station of about 2,000 second-feet, it may be assumed that there is an

---

(1) For compilation of figures as to discharge, see Complainant's Exhibits 79, 89, 90, 94, 97.
of discharge or flow of water means "the rate of discharge of water flowing in a stream, 1 foot wide, 1 foot deep, and at a rate of 1 foot per second."

average depth of about 3 feet; with a discharge of 4,200 second-feet, there is a depth of 4-5 feet, and with a discharge of 6,000 second feet or over, there is a depth of running from 5½ to 12 feet or over in flood waters—all subject to the variations in the width of the channel or of the River.

*Grand River*

The depths at Cisco's are as follows (with reasonable allowance for error) (1):

| | |
|---|---|
| 2.9—3 feet | 16 days in the year. |
| Between 3 and 4 feet | 190 days |
| Between 4 and 5 feet | 50 days |
| Between 5 and 7 feet | 48 days |
| Over 7 feet | 61 days |

It thus appears that for 349 days in the year there is a depth of three feet or over.

With these figures as to depths, the following figures as to daily discharge during the year on an average may be taken into consideration (with reasonable allowance for error) (1):

| | |
|---|---|
| From 1,000 to 2,000 second feet | 14 days in the year. |
| From 2,000 to 4,200 | 182 days |
| From 4,200 to 6,000 | 37 days |
| From 6,000 to 10,000 | 36 days |
| Over 10,000 | 96 days |

It thus appears that 351 days in the year, there is a discharge of over 2,000 second feet and for 169 days in the year of over 4,200 second feet.

As there are no tributaries to the Grand River between Cisco and the junction with the Green River contributing any considerable flow, and as the width of the river remains, in general, the same as the width at the gauging station, the figures as to depths and discharges may, roughly speaking, be applied to the whole length of the Grand River involved in this case. But the same qualifications as to the use of these figures made (*supra*) with re-

---

(1) Complainant's Exhibit 82 A, Plate 6.

(1) Complainant's Exhibit 82 A, Plate 3, Plate 9.

spect to the Green River are equally applicable to the Grand River figures. With this understanding of the limited application of figures as to discharge, it appears from the chart or graph that with a discharge of 2,000 second feet or less for 14 days there is a depth of about 3 feet for 16 days; and with a discharge of 4,200 second-feet or less for 182 days, there is a depth of between 3 and 4 feet for 190 days; and it may accordingly be assumed that a discharge of 2,000 second-feet will give a depth of 3 feet and of 4,200 second-feet of 4 feet, all subject to the variations in the width of the channel or of the river.

In addition to the above evidence as to depths in the Government statistics, many witnesses testified as to their various estimates of depths. There is little testimony, however, as to accurate soundings. W. G. Hoyt, Government engineer, on his trip in September, 1928, at a low stage of water made soundings, and reported and testified that the most common channel depths at the bends and between the sanbbars was 3 to 5 feet, and that "between bends at the crossing bar or at points approaching the crossing bar, the depths are 1 to 1½ or 2 feet in the channel"; (Record 226) and that "without exception the channel depths across these bars were shallow though generally a depth of between 1 and 2 feet could be found sufficient to enable its boats to plough through." (Complainant's Exhibit p. 75, 74.) Hoyt also testified that conditions on the Green and Grand Rivers were not substantially different, and that it was about as easy to navigate one as the other. The most satisfactory evidence as to depths is to be found in the report of the Leeds Survey of 1909 (Defendant's Exhibit 18, 61st *Cong., 2d Sess., House Doc.* 953). This was a survey by the War Department to determine the navigability of the Green and Grand and the advisability of their improvement by the National Government. Trips were made down these Rivers at both high and low water stages; and Leeds in his report of August 3, 1909, stated as to an examination made from April 27 to May 14 (at a comparatively high water stage):

"No difficulty was experienced by us in navigating these rivers in a boat which drew from 12 to 16 inches, while the Green River was at a stage of about 3 to 4½ feet above low water. Green River gauge records of 1907 and 1908

indicate that from about April 15 to about August 1, the rivers will average at least as high as at the time of this examination."

And in his Report of March 19, 1909, of a survey in November at low water:

"The average depth of water in the channels of both rivers was found to be 4 to 5 feet, varying from 15 feet along concave banks to not less than 2.5 to 3 feet on the crossings, and 3 feet on the riffles, except on the Farrer, Butterfly, and Mohre riffles, where it was 2.75 feet, and on the Brown riffle, where it was 2.5 feet. * * * Velocities of 4 to 5 miles per hour were found, but the average velocity was over all portions of the river of any considerable length was approximately 2 miles per hour. * * * At the time of the survey the Green River was discharging about 5,100 cubic feet per second and the Grand about 3,500 cubic feet per second. The Grand being narrower than the Green, there was but little difference in the navigable capacity of the two rivers, except for the upper 30 miles of the Green River, where the slope is much greater and where the riffles occur. These rivers have an average width of 500 to 600 feet. There are many "cross-overs" in both rivers which have a depth of between 2½ and 3 feet during the low-water stage. This depth is sufficient for light draft boats suitable to these rivers, and 3 feet is, therefore, taken as the governing low-water depth to be considered in improvement. The maintenance of a greater depth is not warranted by the probable commerce." * * * Mr. Hughes (assistant engineer) states as his opinion that a skillful pilot navigating the rivers regularly could, at time of ordinary low water, take a flat-bottom boat of ample power, 60 feet long, 12 feet beam, drawing 24 inches, from Moab to the Brown riffle, one-half mile below the bridge at the town of Greenriver."

Assistant Engineer Hughes in his Report to Leeds stated that:

"In November last, when these rivers were approximately at the low-water stage, our party of six men went in a launch from the town of Greenriver to Moab and back, making a general survey of the whole. The boat was a

flat-bottom 14 horse-power, gasoline launch, 32 feet long, 6½ feet beam, drawing from 15 to 18 inches. Soundings were taken at one minute intervals throughout the entire length, and more detailed surveys were made of riffles and other portions presenting any difficulties to navigation. * * * Throughout both rivers the average velocity of all portions of any considerable length was 2 miles per hour, our launch being able to go 8 miles per hour downstream and 4 miles per hour up, though in short stretches, at the riffles, velocities of 4 and 5 and in one case, 6 miles per hour, were found requiring in two instances poling and towing to assist the launch."

The conclusions reached by Leeds that:

"The portions of the Green and Grand Rivers which are commercially navigable, therefore, lie entirely within the State of Utah, and they do not form a highway for commerce with other States or foreign countries by their connection with other waters. I am therefore of the opinion that the Green and Grand Rivers are not navigable waters of the United States, but of the State of Utah, and further, they are not worthy of improvement by the General Government at this time."

While the conclusion reached by Leeds that the Rivers were commercially navigable in the State of Utah is not binding upon the United States, it has a certain amount of relevancy. I find that his conclusions as to depths, velocities, etc., are amply confirmed by the evidence in this suit as to actual boat trips on these Rivers made by witnesses.

(f) *Variations in Discharge*

The Government emphasizes the fact that the records of the gauge stations demonstrate an extremely wide variation in flow and second-feet discharge, and has presented tables showing the mean annual discharge and the minimum and maximum daily discharge covering the years 1895-1897 and 1905-1928, on the Green River (see Appendix A) and 1914-1917 and 1923-1928 on the Grand River (see Appendix A). I do not find that these figures are particularly helpful. The figures for a mean annual discharge

are obtained by averaging a few months of very high flow with the rest of the year in which a low or medium flow occurs—the result giving no fair picture of the real situation. Thus, the mean annual discharge on the Green River is put at 7,600 second-feet; but, as shown by the figures of daily discharge averaged over the years given above (Exhibit 82 A) there are only 114 days when the flow is over 6,000 second feet. So too the figure given for the minimum daily discharge on the Green River is 510 second-feet; but it appears from Exhibit 82 A, that there were only 3 days in all when the minimum daily discharge was less than 1,000 second-feet. So too the figures given for the maximum daily discharge of 67,300 second-feet on the Green River occurred only once; but it appears that in the months other than March, May, June and July, there has never been a flow in excess of 30,000 second-feet. In these same tables also (Appendix A of this Report), the Government presents, for each separate month of the year averaged over a period of years, the mean discharge, the maximum, and the minimum. Here again, the mean discharge is an average figure which may or may not mean anything as applied to the actual conditions; and the figures obtained above from Complainant's Exhibit 82 A, as to the average number of days in the year in which the discharge is over or under certain figures have a more direct bearing on the situation. So too the minimum daily discharge in any month means little, unless we know how many times in the period of years that minimum occurred in that particular month. I find, however, that in the months of January and of December of each year, there is a less discharge of water on the average, than in the other months of the year, and that navigation in January and December on these Rivers is more difficult than in the other months because of lack of water. These months, however, are the months in which ice is most likely (if at all) to close the Rivers, and hence navigation would be less likely to be undertaken in these months.

The months of extreme highwater caused by the melting of snows in the mountains are ordinarily late April, May, June, early July, with high floods occasionally in March and September. Local floods of short duration, caused by rainstorms, also occur in August and October. The Government emphasizes the fact that owing to sudden floods,

these Rivers are subject to very rapid changes of flow conditions, and it cites, in the brief submitted to me, the following changes of second-feet at Green River, as examples selected from Complainant's Exhibits 75, 79, 94, 97:

May 25, 1896, 7,830, to 43,500 June 3;
April 28, 1897, from 10,100, to 67,300 May 29;
March 21, 1906, from 2,990, to 21,800 March 28;
March 18, 1909, from 3,510, to 33,000 March 24;
June 27, 1917, from 66,700, to 10,800 July 30;
June 17, 1917, from 64,100, to 8,080 July 15;
Sept. 10, 1927, from 8,630, to 27,700 Sept. 14;
Sept. 26, 1928, from 1,680, to 19,800 Sept. 27.

These illustrations, it will be noted, all occurred in five months, March, April, May, June (the rising water months) and in September.

The Government also instances the following examples of rapidity of variation of flow on the Grand River (selected from Complainant's Exhibits 79, 84):

April 26, 1923 from 7,040, to 34,100 May 12;
June 16, 1924 from 49,900, to 9,820 June 16;
May 16, 1926 from 13,400, to 47,500 May 27;
Sept. 8, 1927 from 4,430, to 21,900 Sept. 13.

All these are examples in months of more or less high water.

I do not find from the testimony of witnesses who have actually boated on these Rivers that this element of variation in flow or of rapidity of variation has constituted any marked impediment to their operation of boats, except possibly in one or two instances where it caused anxiety though no actual danger.

## Commerce and Navigability

### (1) *What is Commerce?*

Counsel for the Government contend in a brief submitted to me that:

"It must appear that such River is commercially used or susceptible of commercial use by the public for the purposes of transportation. This of necessity excludes from the cat-

egory of navigable stream those river upon which travel and transportation are limited to private purposes."

And they summarize their contention as to what constitutes "commerce" or "useful commerce" and the susceptibility of a River for the same, as a test of navigability, as follows:

"Travel for personal purposes unaccompanied by any element of trade is not useful commerce according to the decisions of the Supreme Court of the United States, and it also follows that the susceptibility of a stream for use in commerce must include substantial commercial operation of boats."

The definition of "commerce" or "useful commerce" thus insisted upon by the Government appears to me to be altogether too restricted. "Commerce", of course, includes the element of barter, purchase, sale, and exchange of goods; but it is not limited to such element. The basis of the power of the United States over navigable waters is found in the Commerce Clause of the Constitution (together with the Admiralty Clause which is not applicable in this suit). It is because of that basis that the Court has applied as a test for navigability of waters their use or capability of use in commerce. Therefore, whatever is "commerce between the States", under the Constitution, must constitute the "commerce" for which waters must be used or be capable of being used in order to make them navigable waters of the United States. As this Court said in *Gloucester Ferry Co.* v. *Pennsylvania* (1885) 114 U. S. 196 at 203:

"Commerce among the States consists of intercourse and traffic between their citizens and includes the transportation of persons and property and the navigation of public waters for that purpose, as well as the purchase, sale and exchange of commodities."

And see *United States* v. *Hill* (1919) 248 U. S. 420 at 423-424:

"From an early day such commerce has been held to include the transportation of persons and property, no less than the purchase, sale, and exchange of commodities.

* * * The transportation of one's own goods from State to State is interstate commerce, and, as such, subject to the regulatory power of Congress." (See cases cited.)

*Thornton* v. *United States* (1926) 271 U. S. 414 at 424, 425:

"* * * the passage of diseased cattle from one State to another. This is interstate commerce. * * * They were on the line between the two States. To drive them across the line, would be interstate commerce. It is argued, however, that when the cattle only range across the line between the States and are not transported or driven, their passage is not interstate commerce. We do not think that such passage by ranging can be differentiated from interstate commerce. It is intercourse between States made possible by the failure of owners to restrict their ranging and is due, therefore, to the will of their owners."

And see *Federal Trade Com.* v. *Pacific States Paper Trade Ass.* (1927) 273 U. S. 52.

I am of the opinion that whatever constitutes "commerce" in testing the navigability of a River between States, also constitutes "commerce" in testing the navigability of a River within one State. The difference between interstate and intrastate commerce is geographic and not a difference in kind. It is possible that a greater amount of commerce may be required to constitute that interstate commerce which would bring into play the control of Congress over navigable waters of the United States than would be required to constitute that intrastate commerce which would make a river a navigable river of a State. Some expressions of this Court in *Leovy* v. *United States* (1900) 177 U. S. 621 would seem to point in that direction.

The Government counsel apparently contend that "commerce" is a restricted term and that the use of the River by boats must be made for hire, or in the carrying out of some barter, sale, purchase, or exchange of goods. I can find nothing in the decisions of this Court to support this or to hold that the word "commerce" does not include cases "where travel and transportation are limited to private purposes." If a man is engaged in a gainful business or trade, certainly the beneficial use which he makes of boats in connection with that business or trade must be deemed a commercial use and the river on which he uses his

boats successfully for that purpose must be "a channel for useful commerce". The use of boats by a man himself in transporting his goods, supplies, tools or equipment in the pursuit of his trade, business, or occupation may, it seems to me, be just as much a part of a commercial operation as if he hired another man to transport such goods, supplies, tools or equipment. To deny that a use of these Rivers in connection with mining constitutes a commercial use would be to eliminate consideration of its use in one of the principal forms of trade or commerce in the Western States of this country. I am of the opinion that whenever a river is used or is capable of being used by the public as a highway for the transportation of persons or goods in connection with their method of earning a living, such use constitutes trade or commerce. I believe that the following statement in *Harrison* v. *Fite* (1906) 148 Fed. 781 at 784, concisely develops the law as laid down by this Court: "To be navigable a water course must have a useful capacity as a public highway of transportation."

The counsel for the State of Utah, in argument, have advanced the further contention that the use of the Rivers or their susceptibility of use by pleasure boats or by persons hunting, trapping and fishing for their own satisfaction might also be sufficient to prove navigability, at least of an intrastate River; and they cite a leading State case of *Attorney General* v. *Woods* 108 Mass. 436. In that case the Court (at 439-440) said that: "the purpose of the navigation is not the subject of inquiry, but the fact of the capacity of the water for use in navigation. Counsel for the State contend that a river is navigable if it is susceptible of use as a public highway for travel. It is probable that one underlying reason for the English doctrine as to the bed of navigable rivers may have been a desire to protect public right of travel against a claim of private persons to own the bed and thus to affect the water navigation. The right of travel [redacted] as well as the right of commerce may have been one of the original rights sought to be guarded. But when, in this country, the respective rights of a State and of the United States become involved, it was necessarily held that navigability was to be determined by the element of "commerce", since it was by virtue of the Commerce Clause of the Constitution alone that the United States obtained any

power over rivers (except such power as it possessed under the Admiralty Clause).

I do not find it necessary to consider this contention of the State; for while there is much evidence of the use of these Rivers by pleasure boats and by hunting and trapping parties, there is also ample evidence of the use of the Rivers by men operating their own boats for the transportation of themselves and of their own supplies, tools, equipments, etc., in connection with their own business, trade or occupation, as well as by men operating boats for hire or compensation for the transportation of other persons and the goods, supplies and equipment of other persons.

(2) *Use and Susceptibility of Use for Commerce*

The counsel for the Government contend that the actual use of these Rivers as shown by the evidence falls short of the tests which they claim to have been prescribed by this Court. In a brief submitted to me, they assert as the criterion or test of navigability that:

"Commerce in boats must be of a substantial or a permanent character. It cannot be a commerce which is temporary, precarious, and unprofitable; neither does a theoretical commerce meet the test."

In arguing this contention, counsel for the Government fail to note the distinction between use and susceptibility to use. Thus, they refer to the use of the Moab Garage Company barge for the transportation of supplies and passengers to the oil wells down the Grand River, as follows:

"It will be seen * * * that the Moab Garage barge was constructed for a special purpose. The rates charged for transportation were excessively high, and the use of the River by the barge within the meaning of the cases cited must be termed a temporary or an exceptional use."

But even if such use was temporary or exceptional (and a use which continued for two years in every month of the year for such purposes could hardly be so termed), nevertheless, such temporary or exceptional use might afford complete proof of the susceptibility of the Grand River for use by such a boat in such form of commerce, whenever

the occasion might again arise in the future for the use of boats in connection with future operation of oil wells. In every decision of this Court "capability" or "susceptibility" of use has been emphasized as the test of navigability, as well as actual use.

Counsel argue that the use of these Rivers has not been of a permanent or substantial character. They again overlook the fact that the evidence as to actual use since 1896 has only been relevant upon the question of its susceptibility of use in that year. While the actual use of the Rivers in trade and travel may not have been very great, yet as was said by this Court in *United States* v. *Holt State Bank* (1926) 270 U. S. 49 at 57: "True, the navigation was limited but this was because trade and travel in that vicinity were limited." A very small amount of actual trade or travel when shown by satisfactory evidence may constitute ample proof of susceptibility to large amounts of similar trade or travel in the future, should occasion arise. I find that the evidence shows that these Rivers are susceptible of use by boats in commerce whenever commerce of the kind heretofore afforded shall again present itself. Thus, the transportation of passengers or tourists for hire is clearly a form of commerce of which these Rivers were in 1896, and are, susceptible. The transportation of supplies to persons farming on the River bottoms or to persons engaged in business operations of drilling, mining, prospecting, etc., similar to the operations of the Government drilling party in 1914 and to the oil operations on the Grand, is a form of commerce of which these Rivers were in 1896, and are, susceptible. The above susceptibility is illustrative. To enumerate the further susceptibility of use would require a reiteration of the evidence of the actual uses of the Rivers by boats, set forth *supra* 65-97.

### (3) *Profitable Commerce*

Counsel for the Government contend that the commerce required for navigability "cannot be a commerce which is temporary, precarious and unprofitable." Counsel further say:

"Commercial navigation on these Rivers has been a failure. The revenues derived from freight and passenger

traffic represent a small part of the cost of the boats. Failure of commercial navigation has been due to the fact that the Rivers possess characteristics which will always prevent them from serving the public as highways of transportation."

The mere fact that any particular act of commerce shown by the evidence in this case has not turned out to be profitable or permanent does not constitute proof that the River is not susceptible of profitable or permanent commerce. Profit or permanence of any particular act of commerce may be due to many causes other than non-navigability of the River. And conversely non-navigability of a River cannot be proved merely by evidence of lack of profit or permanence in any particular act of commerce upon it. Moreover, when the question in this suit is as to the susceptibility of the Rivers for use in commerce, their susceptibility for "profitable" commerce must, in the nature of things, generally involve to a considerable extent a mere guess or prophecy. As to the Green River, I find that the evidence shows that most of the boats have (in the long run) operated on it without profit. But I also find that many causes have intervened to produce this result. In some cases like the large boats the *Undine* and the *City of Moab* (*Cliff-dweller*), the type of boat was utterly unsuited to the condition of the River. In other cases, lack of capital, lack of advertising, the small population of the towns of Green River and Moab, lack of tourist travel in any great numbers, more convenient and shorter automobile routes between Moab and Green River, etc., etc., were responsible for absence of profit in the particular instances. While experience over a number of years may have convinced some of the boatmen like Yokey, Wimmer, Ross, Wolverton and others that the use of their boats was not a particularly gainful kind of business, the evidence clearly establishes the fact of successful trips made by them for hire in connection with the transportation of supplies, freight, and passengers. And no one can prophecy correctly how far similar trips in the future, under changed conditions, would or would not be profitable.

On the Grand River, counsel for the Government has not laid stress on the absence of profit; for it is clear that the

Moab Garage Company conducted a profitable business in transportation of supplies and passengers for the oil companies and also in the transportation of tourists; and such actual transportation is clear evidence of a susceptibility of the River for similar transportation in the future, if other oil or gold discoveries should be made, or if travel should be promoted by the railroads or others for the purpose of making accessible to tourists the remarkable scenery of these regions.

(4) *Possibility of Future Commerce*

The Government asserts that there must be a potential commerce capable of being carried on a River in order to render it navigable. This is undoubtedly true. But the question arises: What constitutes a potential commerce? The Government contends that, in the present case: "Taking the region as a whole into consideration, there is no evidence that it will ever become a substantially habitable country nor will it produce commodities which can be transported by water." This assertion, however, is purely a matter of prophecy; and as this Court has said: "One hundred years is a short time in the life of a Nation." He who has witnessed the development of the arid and desert lands of the southwest in the past fifty years would be a bold man who would state that no development of the country involved in this suit could be made, which might not be assisted by water transportation on these Rivers and from which commerce of a substantial nature to be so transported might not be derived. I, as Special Master, can certainly not find that there was, in 1896, no possibility of the then existence or future development of a "useful commerce" which could be carried on these Rivers, in case the Rivers were in other respects capable of being navigated. I cannot find, as counsel asserted, "within the realm of possibility there is not any hope for any commerce on these rivers in the future." Moreover, it seems to me entirely possible that any given river, at any given date, may be "susceptible of useful commerce," in spite of the fact that no one foresees at that particular time the particular source of the commerce in the future. There are expressions of the Court to the contrary, however, in *Gulf R. R.* v. *Davis*, 26 F (2d) 930.

To sustain the Government's contention it introduced much evidence as to the lack of commercial possibilities, and the State introduced much evidence as to the presence of such possibilities, in the region of the country involved. This evidence may be briefly summarized as follows. It does not appear to me to sustain the Government's broad contention that there is no potentiality of commerce in these regions.

(a) *Population.*

The population of these regions was, in 1896, scanty and is still so. Populations of Green River and Moab have already been cited in this Report. The following were the United States Census populations of the counties bordering on these Rivers (much of the area of the counties being located at considerable distance from the banks):

| | 1900 | 1910 | 1920 |
|---|---|---|---|
| Emery County | 4657 | 6750 | 7411 |
| Grand County | 1149 | 1595 | 1808 |
| San Juan County | 1023 | 2357 | 3370 |
| Garfield County | 3400 | 3660 | 4768 |
| Kane County | 1811 | 1652 | 2054 |
| Wayne County | 1907 | 1749 | 2097 |

While, during the gold mining periods on the Colorado River, there have been from 100-200 men living at Hite and at the various gold bars, there are today (1929) only two or three men living on the River. On the Green River, prior to 1909, there were several men living at the various bottoms between the town and the Junction, but there are none today. On the Grand River, during the oil excitement, there were more or less men connected with the wells, living on the River and up Indian Creek and Lockhart Canyon, but none are there today. A few cattlemen may be living on the plateau west of Green River, and east between it and the Grand. The Government's contention that these regions (except for the towns of Green River and Moab), are today practically uninhabited, I find to be correct. Its further contention that the regions were in 1896 and are today "uninhabitable" involves a guess and a prophecy which I hesitate to make; for certainly future

discoveries of gold or oil, or release of bottom lands for settlement, or formation of new bottom lands, would make these regions habitable, at least to the extent to which they were so at different periods in the past.

(b) *Agriculture.*

Most of the region, except that near the LaSal and Abajo Mountains near the eastern boundary line of Utah, receives an annual precipitation of rain of less than 10 inches. Owing to the nature of the soil and of the rock and to the lack of moisture, the vegetation, where there is any, is of the desert type, shadscale, sage, and other similar shrubs, and desert grasses. Large areas are so broken as to support no vegetative cover whatever. Pine, pinon, cedar, and other trees are found only around the mountain sections. There are a few willows and cottonwood on the high, sand, side-bars in the beds of the Rivers and their tributary creeks. Grasses and shrubs, where they exist, afford good grazing ground for cattle or sheep; and there is evidence of considerable grazing in the triangle between the Colorado and San Juan Rivers, and on the plateau west of the Green. At a considerable distance east from the Colorado and north from the San Juan, there are areas of dry-farming land near Monticello and Blanding. Land is now being tilled on irrigated tracts near the towns of Green River, Moab, and Bluff. Several thousand acres of scattered bottom lands along the Green and at least two bottom lands on the Colorado River have in the past been cultivated and are susceptible of cultivation. (1) According to Government reports additional areas can be irrigated of 28,000 acres near the town of Green River, 1000

---

(1) The Government has introduced evidence that the lands along the Green and Grand Rivers had been continuously in a state of withdrawal by the Government since September 1, 1909, under authority of statutes of the United States, and that this withdrawal order would include the bottom lands lying in the canyons of the Green and even below high water mark. But, if any of such lands belonged to the State of Utah in 1896, as constituting the bed of a navigable river, the withdrawal order of the United States could not legally affect or apply to them.

acres near Moab, and 25,000 near Blanding and Monticello. The State contends that a somewhat larger area is irrigable. In general, however, the greater portion of this territory is incapable of irrigation, under any now known conditions. In the vicinity of the LaSal and Abajo Mountains, there are very large areas of timber lands; but these are far from the Rivers.

(c) *Minerals*

In these regions, there are vein deposits or mines of coal, gold, copper, uranium, vanadium and manganese, especially in the Henry, LaSal and Abajo Mountains. Witnesses have testified that coal, copper and manganese have actually been mined at various points on or near the Green River and the Colorado River. Most of the operations were of an exploratory nature and little development has taken place. Manganese, under war conditions, seems to have been successfully taken out, and some copper. In addition, there is ample testimony as to gold taken out by the placer miners; but owing to the fact that the gold is found in the very fine form known as flour gold, mining has not, in the long run, proved thus far profitable, though no one can tell whether through invention of the new processes it might not be made profitable. Oil has been found, as set forth (*supra*, pp. 76-79) on the Grand River, in the Laterite Basin west of the Green River, and on the San Juan River. Much exploration for oil has been undertaken by engineers representing various companies. There are Government reports (see Complainant's Exhibit 638) as to mineral possibilities in these regions. I find it futile, however, to prophesy on the subject of the extent of mineral possibilities or the possibility of future profits from operation of gold, oil, copper, coal, manganese, uranium or vanadium properties. Such minerals apparently do exist in these regions. How and when they can be extracted and marketed under changed conditions, if at all, is a mere matter of opinion.

(d) *Roads, Trails and Fords*

By reason of natural conditions, the regions around these Rivers do not permit free travel overland to any great extent. There are, nevertheless, certain points on the

Rivers which are accessible by horses or wagons. There have also been at least six well recognized fords or crossings —Green River or Gunnison Crossing, ~~Moab~~ Crossing near Dandy Hite to which a trail led down White Canyon from the San Juan country to the east, and thence to the west to Hanksville (45 miles from the River); Hall's Crossing (since 1881) to which a road came from the east from Bluff on the San Juan River; Hole-in-the-Rock Crossing made by the Mormons in 1879 and now abandoned and unusable for many years; Crossing of the Fathers, a recognized travel route from Arizona into southwest Utah, usable, with difficulty, from 1776 until the Mormons blasted the canyon wall to prevent the Indian invasions; and Lees Ferry (after 1874).

The Green River bed can be reached from the west by a rough road down its bank to its junction with the San Rafael River; and by horse trails at Barrier Creek, Fort Bottom, and Valentine Bottom; from the east, it can be reached at Wimmer's Ranch by a road connecting with Floy (a station on the railroad) and with the town of Green River. The Grand River can be reached by a rough road down Lockhart Canyon connecting with a road up Indian Creek and with the road from Moab to Monticello—a very circuitous route from Moab to the River. The Colorado River can be reached from the east by a rough road from Hanksville to Trachyte Creek and across to North Wash and down to Hite; other very rough roads, in the past, led down Hansen Creek, and down Hall's Creek to Hall's Crossing; from the east, it cannot be reached between the junction of the Green and the Grand until the road at Dandy Crossing; then the road at Hall's Crossing; and then no road until the trail down Aztec Creek from the Rainbow Natural bridge.

The rock plateau west of Green and Colorado Rivers, is in general, traversed only on a road from Green River to Hanksville (about 70 miles), and roads between Hanksville and the towns of Torrey, Escalante and other towns, and roads to mines in the Henry Mountains. The pie-shaped rock plateau between the Green and Grand Rivers has practically no roads (other than those mentioned above) except the road from Moab to Thompson on the railroad, about 35 miles distant; no road or trail leads down to the Junction of the Green and Grand Rivers. The rock plateau

to the east of the Grand and Colorado Rivers contains in general (other than mentioned above) only the road from Moab to Monticello, Blanding, and Bluff, skirting the La Sal and Abajo Mountains, and far from the Rivers.

The limited means of access to these Rivers from the Canyon rims or from the level of the rock plateau in which they flow, I find to be an argument in favor of rather than against their navigability; for if mining or oil developments shall in the future take place in the beds of the Rivers, the natural, and in many places the only feasible, method of moving material, supplies and men from one place to another will be by water transportation.

(c) *Tourist Travel*

The Government's assertion as to lack of commercial possibilities fails to recognize one source of commerce which in the future will undoubtedly develop to a considerable extent—the use of these Rivers for the transportation of tourists for hire, to view the natural scenic wonders and explore the archeological features of these regions.

(5) *Customary Modes of Trade and Travel on Water*

As to the phrase "customary modes of trade and travel on water," as used by this Court in its test of navigability, I understand it to mean that the modes of transportation must be such as are customarily used in rivers at the date involved and must not be an unusual or freak contrivance adapted only to use on a particular stream; they must be recognized types and methods of water carriage. And the Court has explicitly held in *The Montello*, 20 Wall. 430, at 441-442, that no particular kind or type of vessel or mode of propulsion is requisite to make a river navigable. The watercraft most commonly used in commercial navigation on these Rivers at various periods of time have been rowboats of 16 to 18 feet in length, drawing 6-12 inches; rowboats 18 to 22 feet long, drawing 14-18 inches; steel rowboats 18 feet long, drawing 7-19 inches; motor boats of 20-27 feet in length, drawing 10 inches to 2½ feet; rowboats 16-18 feet in length, propelled by outboard motors drawing 15-18 inches; scows 32 by 8 feet, and 24 by 6 feet, drawing 8 inches; and the large barge of the Moab Garage

Company on the Grand River, 75 feet long, capable of carrying 15 tons and drawing up to 20 inches when loaded. There was also evidence of rafts used to a limited extent on the stretch of the Grand River between Castle Creek and Moab. Such commercial navigation would seem to be conducted according to the "customary modes of trade and travel on water".

THE FACTS COMPARED WITH THE FACTS IN OTHER CASES.

The Government contends that the decisions of this Court in *Oklahoma* v. *Texas* (1922) 258 U. S. 574; *Brewer-Elliott Oil & Gas Co.* v. *United States* (1922) 260 U. S. 77; *United States* v. *Rio Grande Dam & Irrigation Co.* (1899) 174 U. S. 690, are decisive of the present suit. Counsel for the Government have contended that the Special Master should examine the facts appearing in the original records of the first two of these cases, in addition to the facts stated in the opinions of the Court. I, however, have assumed that the Court has stated in its opinions all facts which were necessary to sustain the doctrine of law laid down in each case, and that it is not necessary for me to go outside the printed opinions for the purpose of comparing facts not therein appearing with the facts found by me in the present suit. Careful consideration of the opinions in the above cases fails to satisfy me that they are applicable to the facts found by me in the present suit.

In considering the navigability of the Red River, in *Oklahoma* v. *Texas*, 258 U. S. 574, the Court, with reference to the western part of that river, states, at page 587, as follows:

"The evidence also discloses an occasional tendency to emphasize the exceptional conditions in times of temporary high water, and to disregard the ordinary conditions prevailing throughout the year. With the explanatory comment, we turn to the facts which we think the evidence establishes when it is all duly considered.

"The river has its source in the Staked Plains of northwestern Texas and from there until it gets well into Oklahoma is within a region where the rainfall is light, is confined to a relatively short period in each year and quickly finds its way into the river. Because of this the river in

the western half of the State does not have a continuous or dependable volume of water. It has a fall of three feet or more per mile, and for long intervals *the greater part of its extensive bed is dry sand, interspersed with irregular ribbons of shallow water and occasional deeper pools. Only for short intervals, when the rainfall is running off, are the volume and depth of the water such that even very small boats could be operated therein.* During these rises the water is swift and turbulent, and, in rare instances, overflows the adjacent land. The rises usually last from one to seven days, and in the aggregate, seldom cover as much as forty days in a year." (Italics mine.)
And at page 288, the Court states:

"We regard it as obvious that in the western half of the State, the river is not susceptible of being used in its natural and ordinary condition as a highway for commerce; and there is no evidence that in fact it ever was so used."

It will be apparent that the facts thus summarized by the Court with reference to conditions on the western portion of the Red River are not similar to the facts and conditions on the Green and Grand Rivers as testified to in the present suit. For instance, no portion of the bed of those Rivers is "dry sand interspersed with irregular ribbons of shallow water and occasional deeper pools." On the Red River, even very small boats could be operated "only for short intervals when the rainfall is running off. * * * as much as forty days in a year." On the Green and Grand Rivers, on the contrary, boats drawing from 1 to 2½ feet of water can operate in at least nine months of the year, except possibly on a few days of unusually extreme low or high water. The boat trips testified to in the present case were not made under "exceptional conditions in times of temporary highwater, but were made under great varieties of conditions and in many varying stages of the water.

With reference to the eastern portion of the Red River, the Court states on page 589 of its opinion:

"Of course, the conditions along that part of the river greatly affect the part in the eastern half of the State. But the latter received additional water from the Washita and other tributaries, and has a practically continuous flow of varying volume, the extreme variation between high and

low water being about 30 feet. When the water rises it does so very rapidly, and it falls in the same way. The river bed has a fall of more than 1 foot to the mile, and consists of light sand, which is easily washed about and is carried down stream in great quantities at every rise of the water. At all times there is an almost continuous succession of shifting and extensive sandbars. Ordinarily the depth of water over the sand bars is from 6 to 18 inches, and elsewhere from 3 to 6 feet. There is no permanent or stable channel. Such as there is shifts irregularly from one side of the bed to the other and not infrequently separates into two or three parts. Boats with a sufficient draft to be of any service can ascend and descend only during periods of high water. These periods are intermittent, of irregular and short duration, and confined to a few months in the year."

And after noting that while light draft boats at one time "carried merchandise up the river to the mouth of the Kiamitia and other points in that vicinity and took out cotton and other products on the return trip," "this occurred only in periods of high water and was accomplished under difficulties," this Court states as follows:

"While the evidence relating to the part of the river in the eastern half of the State is not so conclusive against navigability as that relating to the western section, we think it establishes that trade and travel neither do nor can move over that part of the river, in its natural and ordinary condition, according to the modes of trade and travel customary on water; in other words, that it is neither used, nor susceptible of being used, in its natural and ordinary condition as a highway for commerce. Its characteristics are such that its use for transportation has been and must be *exceptional, and confined to the irregular and short periods of temporary high water*. A greater capacity for practical and beneficial use in commerce is essential to establish navigability." (Italics mine.)

It is apparent that the chief facts and conditions on the eastern portion of the Red River on which the Court based its decision, are not similar to those on the Green and Grand. Thus, it is said that on the Red River "boats can ascend and descend only during periods of high water."

On the Green and Grand, on the contrary, boats can ascend and descend, and have done so, during all stages of water, during at least nine months of the year (except possibly on a few days of unusually extreme low or high water) (though as before found by me, boats propelled by oars can ascend only with great difficulty at certain periods).

On the Red River, it is said that such periods of navigation "are intermittent, of irregular and short duration, and confined to a few months in the year." This statement is not descriptive of conditions on the Green and Grand.

As to the Red River, it is said that "its characteristics are such that its use for transportation has been and must be exceptional and confined to the irregular and short periods of temporary high water." These are not the characteristics presented by the facts found by me as to navigation on the Green and Grand.

As to the case of *Brewer-Elliott Oil & Gas Co.* v. *United States* 260 U. S. 77, this Court accepted the facts found by the Circuit Court of Appeals and by the District Court. The District Court, in its opinion in *United States* v. *Brewer-Elliott Oil & Gas Co.* (1918) 249 Fed. 609, at page 623, after reciting in detail much of the testimony summed it up as follows:

**"The use of that portion of the river for transportation boats has been exceptional and necessarily on high water, was found impractical, and was abandoned. The rafting of logs or freight has been attended with difficulties precluding utility. There was no practical susceptibility to use as a highway of trade or travel."**

See also the opinion of the Circuit Court of Appeals in 270 Fed. 100. This summary is not descriptive of the conditions on the Green and Grand Rivers.

In *United States* v. *Rio Grande Dam & Irrigation Co.*, 174 U. S. 690, this Court accepted the conclusion of the Supreme Court of New Mexico (see 51 Pac. 674 at 675-676) as to the facts and said that (page 669):

**"Obviously, the Rio Grande within the limits of New Mexico is not a stream over which in its ordinary condition trade and travel can be conducted in the customary modes of trade and travel on water. Its use for any pur-**

poses of transportation has been and is *exceptional*, and *only in times of temporary* high water. The ordinary flow of water is insufficient." (Italics mine.)

Here again, the facts found as to this portion of the Rio Grande are not the same as those presented with reference to the Green and Grand.

I consider that the opinions of this Court as applied to the facts in the above cases relied upon by the Government are not decisive of the present suit in which the facts are different.

The Government relies also upon the decisions in the following cases in the inferior Federal Courts:

*Toledo Liberal Shooting Co.* v. *Erie Shooting Club* (1898) 90 Fed. 680 at 682;
*Harrison* v. *Fite* (1906) 148 Fed. 781 at 783, 784.
*North American Dredging Co.* v. *Mintzer* (1917) 242 Fed. 553; 245 Fed. 297;
*Gulf & I. Ry. Co. of Texas* v. *Davis* (1930) 26 F (2d) 930;
*Davis* v. *Gulf & I. Ry. Co. of Texas* (1930) 51 F (2d) 109.

I do not find in these cases, anything incompatible with the law as applied by me to the facts in the present suit. While the language used by such inferior Federal Courts is not entirely the same as that used by this Court, it in general expresses the law as laid down by this Court when applied to the particular facts involved in the inferior Federal Court cases respectively. I do not find, however, that the facts in such cases coincide with or resemble the facts in the present suit. These cases involved a bay, a lake, a small river, a creek, a marsh or swamp, and a bayou; and clearly no one of them presented a public highway of commerce, or any conditions remotely resembling those obtaining on the great Rivers at issue in the present suit. Nor does the case of *Gratz* v. *McKee* (1920) 270 Fed. 719 (see *McKee* v. *Gratz* (1922) 260 U. S. 127), cited by the Government, present conditions as to navigation in the same class with those on the present Rivers, as may be seen from the summary of conditions in the case as given by the Circuit Court of Appeals, as follows:

"But even though the so-called river be regarded as navigable, in this very restricted sense, for small uses in the floatage of logs, and for skiffs and dugouts during high water, when the roads are bad, as is usual in most swamp and overflowed districts, nevertheless, such local, limited and intermittent forms of use cannot transform waters otherwise non-navigable into navigable streams, or catalogue them among the public waters of the state; and the use which any person may lawfully make of such waters is limited to such incidental right of floatage or qualified navigation."

MASTER'S CONCLUSIONS AS TO NAVIGABILITY OF THE GREEN AND GRAND RIVERS.

I am of the opinion and accordingly find as follows:

(1) The Green River (so far as involved in this suit), was on January 4, 1896, capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water. I find that its susceptibility of use as a highway for commerce was not confined to exceptional conditions or short periods of temporary highwater, but that during at least nine months of each year the River ordinarily was susceptible of such use as a highway for commerce.

(2) The Grand River (so far as involved in this suit) was on January 4, 1896, capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water. I find that its susceptibility of use as a highway for commerce was not confined to exceptional conditions or short periods of temporary highwater, but that during at least nine months of each year, the River ordinarily was susceptible of such use as a highway for commerce.

I find that on the Grand River in the 79 miles between Castle Creek and the Junction with the Green River, there is a stretch of about 3 miles out of the first 14 miles between Castle Creek and Moab Bridge in which there are three small rapids; and that in this 3 mile stretch navigation is more difficult and the River is less susceptible of

practical navigation for commercial purposes than in the remainder of the River. Even in this 3 mile stretch, however, there has been in the past considerable use of the River for the transportation of lumber rafts, and I find that this stretch was, on January 4, 1896, susceptible of such use by rafts; and even if such use be not considered sufficient to render the River navigable in this 3 mile stretch, I consider that the small rapids and rapid water in this limited stretch of the River come within the purview of the statement by Pitney, J. in *Economy Light & Power Co.* v. *United States* (1921) 256 U. S. 113, at 122, that "navigability in the sense of the law is not destroyed because the watercourse is interrupted by occasional natural obstructions or portages." See also Peckham, J. in *St. Anthony Falls Power Co.* v. *Board of Water Commissioners* (1897) 168 U. S. 349.

(3) The Green River, on January 4, 1896, was in fact and in law a navigable water of the State of Utah from a point where the said River crosses the township line between Townships 23 and 24 South, Range 17 East, Salt Lake Base and Meredian down to its confluence with the Grand River; and in consequence title to the bed of the River between such points vested on that date in the State of Utah, except so far as the United States of America may have theretofore made grants of said bed.

(4) The Grand River, on January 4, 1896, was in fact and in law a navigable water of the State of Utah from the mouth of Castle Creek down to the confluence of the Grand River with the Green River; and in consequence title to the bed of the River between such points vested on that date in the State of Utah, except so far as the United States of America may have theretofore made grants of said bed.

USE OF COLORADO RIVER

*Table of Distances*

| | Lees Ferry Miles from | Junction Miles from | Elevation |
|---|---|---|---|
| Junction of Green and Grand | 216.5 | .... | 3879 |
| Head of Dark Canyon | 182.8 | .... | 3510 |
| Foot of Dark Canyon | 182.7 | .... | 3500 |

| | Lees Ferry Miles from | Junction Miles from | Elevation |
|---|---|---|---|
| Mille Crag Bend | 177 | .... | 3471 |
| Fremont River (Dirty Devil River) | 169.5 | .... | 3462 |
| North Wash | 167.7 | .... | 3455 |
| Hite (Dandy Crossing) | 162 | .... | .... |
| Trachyte Creek | 161.6 | .... | 3445 |
| Red Canyon (Loper Ranch) | 150 | .... | .... |
| Tickaboo Creek | 148.4 | .... | 3404 |
| Hansen Creek | 130 | .... | .... |
| Bullfrog Creek | 120.4 | .... | 3349 |
| Hall's Crossing | 118.3 | .... | 3342 |
| Lake Canyon | 113-112 | .... | 3332 |
| The Rincon | 99 | .... | .... |
| Escalante River | 88.2 | .... | 3271 |
| Hole-in-the-Rock | 84 | .... | .... |
| San Juan River | 78 | .... | 3257 |
| Aztec Creek (Rainbow Bridge National Monument) | 68.6 | .... | 3234 |
| Crossing of the Fathers | 40.7 | .... | 3179 |
| Utah-Arizona Line (Warm Creek) | 27.7 | .... | .... |
| Lees Ferry | 0 | .... | 3120 |

Consideration of the use of the Colorado River by boats may be divided into two parts: (a) its use from the Junction of the Grand and the Green River to the end of Cataract Canyon at about Mile 176 above Lees Ferry; and (b) its use from Mile 176 or thereabouts down to the Utah-Arizona boundary line, a stretch of about 150 miles. I have taken as the point of division Mile 176 (which is at the foot of Millecrag Bend), since the end of Cataract Canyon is marked on the Government's Topographic Survey Map of 1921 as at Mile 176 (Complainant's Exhibit 10). The last rapid in the Canyon, however, is at Mile 181.

### (a) *Cataract Canyon*

The section of the Colorado River, for its first 40 miles from its beginning at the junction of the Grand and Green Rivers at Mile 216.5 above Lees Ferry down to Mile 176,

differs materially in its conditions, from any other section of the Rivers involved in this suit. Only a brief consideration need be given of the evidence, and the question of the navigability of this section of the River may be disposed of before considering the navigability of the remainder of the River south to the Utah-Arizona boundary line. In this section, the descent is from an elevation of 3879 feet to 3465, or 414 feet in 40.5 miles—an average of about 10 feet per mile. It consists of a series of rapids, long and short, which have been variously estimated by witnesses as from 40 to 70 in number, according to the stage of water when they were observed and according to individual judgment in separating or combining the rapids into distinct or continuous stretches. These rapids vary in steepness of gradient and violence of flow from 15 feet per mile to 100 feet per mile. It is useless to give additional figures, as the evidence is conclusive as to the dangerous conditions presented by the rapids. In addition the bed of the River is a tumbled mass of boulders and rocks which in combination with the swift current produce swirling whirlpools, sucking holes in the water, and high and rough waves. The conditions of the River through this Cataract Canyon can only be adequately visualized by consulting the excellent photographs introduced in evidence and found in bound volumes constituting Complainant's Exhibits 11 B, 24-45, 234-248.

The account of the boat trips made on the Green and Grand Rivers (heretofore given in my Report *supra* pp. 60-98) includes substantially all boats which are known to have succeeded in passing through Cataract Canyon; but there have been many instances of failure of passage and of the death of the adventurers, as to which no one has ever been able to make a record.

The stories of those who have passed through this Canyon, as told on the witness stand in this suit and in their books, are replete with thrilling adventure, hazard to life, hair-breadth escapes, and injury to and destruction of boats. As a rule, the passage has been made in boats of special construction, with airtight compartments at bow and stern; and to make the passage without wearing life-preservers is dangerous. Some men have shot all the

rapids; others have made the passage by portaging the contents of the boats and "lining" the boats themselves through some of the rapids (i. e., by letting the boats down by means of ropes tied to bow and stern and manipulated by the men on the bank). Such portaging and "lining" is possible at most places in the Canyon owing to the fact that on the water side at the foot of the Canyon walls, there are talus slopes or banks made up of gravel and jumbled rock, though frequently of huge size over which one may travel, with difficulty. At Dark Canyon rapids, however, the Canyon walls close in, without any shore between the walls and the River.

Many of the men who have come through the Canyon have had special experience in the operation of boats; and those who have had no previous experience with these or other rapids have owed their passage to courage and considerable good luck.

No motor boat has ever gone through Cataract Canyon and in my opinion no such boat could be navigated through it under power. No articles of commerce, other than supplies for the men making the passage, have ever been taken through the Canyon in boats.

In view of the above facts, I find that the 40 miles of Cataract Canyon and Dark Canyon, i. e., the first 40 miles of Colorado River from its beginning at the junction of the Grand and Green Rivers and down to Mile 176 above Lees Ferry were, in 1896, non-navigable. I do not understand that the State in this suit makes any very earnest claim that this section of the Colorado River was in fact navigable in 1896, but the State contends that even if this section were not navigable, nevertheless, if the Master shall find that the remainder of the River was navigable, he should also find that the River was as a whole (including this section) navigable, and that he should not split the River up into parts.

(b) *From Cataract Canyon to the Boundary Line—Glen Canyon*

The trips since the original Powell Explorations of 1869 and 1871 which have been made from Green River, Utah, through Cataract Canyon, and then down through Glen

Canyon to the Utah-Arizona boundary line and on to Lees Ferry have already been noted in the Green River section of this Report. They were briefly:

1. May, 1889, Stanton party.
2. July, 1891, Best party.
3. September, 1895, N. Galloway and Richmond.
4. August, 1896, Flavell and another.
5. September, 1896, N. Galloway and Richmond.
6. September, 1907, Russell, Monette and Loper.
7. September, 1909, Julius F. Stone party.
8. October, 1911, Ellsworth F. and Emery Kolb.
9. December, 1912, N. Galloway and Smith (as far as Hite).
10. July, 1914, Loper (as far as Hite).
11. October, 1914, Russell, and others (as far as Hite).
12. September, 1921, Chenoweth Government Survey party.
13. ——, 1924, John and Parley Galloway.
14. June, 1927, Eddy party.
15. November, 1927, LaRue and moving picture party.

In addition to these through trips, this Glen Canyon section of the Colorado River was used by boats to a considerable extent, in connection with gold placer mining which was in operation there from 1888 to about 1915, and particularly between 1888 and 1904. A summary of this use by gold miners is as follows.

In 1883, Cass Hite established a small ranch at some bottom lands near the mouth of Trachyte Creek (161 miles up from Lees Ferry) near where there was a recognized ford over the River called Dandy Crossing; and this ranch and a few other cabins built near it, with some acres of cultivated land was later known as the town of Hite, and became the postoffice for the miners, hunters, trappers and cattlemen of this whole Colorado River section. On the stretch of River between North Wash (5 miles above Hite) and Bullfrog Creek (42 miles below Hite), there were a series of long gravel and sandbars on the sides of the River, many of them above mean highwater mark. On these bars, for about 16 years there was placer mining in all its various forms, by pans, rockers, by pumps and sluices, dredges, etc. All equipment and supplies were

brought down to the River overland. For convenience, the following table of the principal bars is inserted:

| | |
|---|---|
| Tickaboo | Mile 148 |
| Goodhope | Mile 145 |
| Olympia | Mile 132 |
| California (Hansen Creek) | Mile 130 |
| Moki | Mile 128.5 |
| New Year | Mile 122 |
| Shock (Independence) | Mile 111 |
| Klondike | Mile 65 |

In April, 1888, Homer J. Hite and his brother, John P. Hite (both witnesses), went to Hite where there were then half a dozen men (including Cass Hite) engaged in placer mining, and 6-8 men also mining up the River at North Wash. The brothers took a 10,000 pound boiler, and two 1,000 pound vacuum pumps (which had been brought to the River overland) from Hite down to Tickaboo Bar (14 miles) on a scow, 20 by 10 feet, drawing 5-6 inches.

In July, 1889, when Homer T. Hite was made postmaster at Hite, about 20-25 men (miners and cattlemen) were getting their mail there, which was brought from the town of Green River overland via Hanksville, the miners using small skiffs up and down and across the river.

In December, 1888, Thomas Fotheringham (a witness) and another man went overland to Hole-in-the-Rock (53 miles north of the Utah-Arizona boundary line) and there built a flat-bottomed boat, 38 by 18 feet, with two decks, having an engine and paddles. Loaded with an hydraulic pump, screws, amalgamating boxes, etc., weighing 2-3 tons, it drew about 1½ feet. They took this boat and a small skiff down the River about 10 miles below the mouth of the San Juan River and placer mined on a bar there for two months. In April, 1889, they took this boat down nearly to Lees Ferry, as, owing to high and swift water, the boat was too difficult to handle to stop at other bars for placer mining.

In 1888, Harry McDonald (a witness), with five men, went overland from Green River and down to North Wash. They engaged in gold mining and prospecting, using a flat skiff on the river. In that year, a 60 horsepower boiler was brought overland down to the River and placed in

operation at the California Bar in connection with placer operations.

On December 10, 1889, Robert B. Stanton began his second expedition to survey the River for the construction of a railroad down the canyons from Grand Junction, Colorado, to the Gulf. He went overland about 110 miles from the town of Green River via Hanksville down to the River at Trachyte Creek near Hite. This survey party starting down the River, December 10, reached Lees Ferry, December 23, and continued down through the Grand Canyon, reaching Diamond Creek March 6, 1890—the first persons to pass through Grand Canyon since the Powell Expeditions of 1869 and 1871—and reaching the Gulf, April 26, 1890.

In 1891, November, F. J. Weber (a witness) came to the Colorado River from Colorado, taking the trail down White Canyon on the east side of the River to Dandy Crossing near Hite. He engaged in placer mining until July, 1892, at Goodhope Bar, and in 1893, at the California Bar, using a skiff for the purpose of going up and down the stream with supplies. Other boats were then on the River in use by the miners, also a scow 22 by 7 feet, drawing 14-15 inches, which had been built at Dandy Crossing and taken down the river and used for coal and supplies. In these years, 1892 and 1893, there were 25-30 men placer mining at Hite, Tickaboo Bar, Goodhope Bar and Hall's Crossing.

Louis M. Chaffin (a witness), in September, 1892, built a boat, 16 feet long with 3 feet beam, at Hansen Creek and poled and rowed with supplies up to Hite, prospecting with one Meskin who had long trapped up and down the River. In the spring of 1893, he went down to the River as far as Hole-in-the-Rock (78 miles) and mined on a Bar there, coming back up the River to Hite in February, 1894, and returning to Hansen Creek in August. In 1894 and 1895, he mined on the New Year Bar and Moki Bar, meanwhile having a contract to deliver at the California Bar timber which together with supplies he took down from Hite (32 miles) in his boat and on rafts. In these years, there were over 100 prospectors along the River from Hite to Hall's Crossing, receiving their mail at Hite. In 1896 and 1897, Chaffin had ten men working under him at Shock or Independence Bar, to which he took supplies (7 miles) down from Hall's Crossing in seven boats and rafts. In

1898, he took a prospecting trip down the River, with Meskin, as far as Lees Ferry, and back upstream as far as Moki Bar. In January, 1898, he went down the River from Hansen Creek to Klondike Bar (65 miles) in two boats, 18-20 feet long with 6 feet beam, fastened together abeam, heavily loaded with supplies, scrapers, and machinery, and drawing 1 foot; on this trip, a hole broke in one boat and the scrapers and the machinery were lost. From 1900 to 1908, he placer mined, moving his outfit in boats upstream or downstream to points desired.

In 1894, Homer J. Hite went down the River as far as Aztec Rapids (94 miles).

In 1895, March-April, Walter E. Mendenhall went on a prospecting trip with two men in three boats from California Bar to Lees Ferry (120 miles).

In 1897, David E. Rust (a witness) and brother took a boat down from Hite (122 miles) to Last Chance Creek just above the Crossing of the Fathers, and spent three months placer mining during which time he went upstream about 70 miles to Hall's Crossing, where there were then two or three small rowboats. In 1898, Rust worked on the Goodhope Bar, where about 20 men were employed in placer mining with a 300 feet sluice and a 40 feet wheel. Supplies were brought overland down to Hite and thence down the River in a 20 foot boat designed to carry a ton, having a draft of one foot, which boat was rowed and towed upstream. He navigated the River in every month except June (the highwater month).

In the winter and spring of 1897-98, Edward C. Sumner (a witness) was working at Hansen Creek for the Good Hope Placer Mining Co. Supplies came overland down to Trachyte Creek and were taken in boats, 16 feet long with a 5 feet beam. Boats also sailed up the river occasionally.

In December, 1897, Frank Bennett (a witness) went on the River to engage in placer mining and remained there for five years, staying through the winters; later he was then on the River for a portion of each year up to 1920. In 1898-99, there were 75-100 men working along the River living in little houses, tents and dugouts. Bennett worked at the Goodhope Bar, Tickaboo, California and Olympia Bars. He used a boat, 28 feet long, and a skiff, going up to Hite with gold and bringing down mail and supplies. Upstream trips were made rowing, towing and sailing. He

also used a motor boat, 23 feet long and a 6 feet beam, with stern wheel (later sidewheels); but owing to lack of power, he could not go upstream further than Goodhope Bar, i. e. not more than 15 miles. Later, he ran a propeller motor boat of 12 horsepower, 22 feet long with a 4 feet beam, drawing 8 inches, in addition to a propeller 14-16 inches deep; this boat he ran up and down stream between Olympia Bar and Goodhope Bar (13 miles), but it had not enough power to run further upstream. Still later, in 1906, Bennett built another motor boat with a tunnel designed to keep the propeller off rocks, having a draft of 16 inches, with the 12 horsepower engine; but the boat was unsuccessful. In October, 1900, *October*, he went in a small boat from Hite down to the mouth of the San Juan River (84 miles). In June, 1901, Bennett took lumber, machinery and engine equipment (5000 pounds) down the River, 30 miles, from Hite to Olympia Bar, on three rafts, 14 feet square, fastened together tandem with chains. In July, 1920, he took a larger craft from Hall's Crossing to Rincon (about 20 miles) loaded with an oil drilling rig and engine. At another time, he made three trips in a boat at highwater, taking a Keystone drilling outfit upstream from California bar to Goodhope Bar (15 miles), and taking it down again in November or December on a raft. He also, one year, engaged in copper mining with 10-12 men under him in White Canyon and carried sacks of ore amounting to over 100 tons across the River, in a boat, at Dandy Crossing. All his trips were made in pursuit of his business of for hire in the service of others engaged in business.

From March, 1895 to 1901, George H. Chaffin (a witness) worked on the River, placer mining, in every month except August. He made boat trips up and downstream between Moki and Tickaboo Bars (20 miles) carrying loads down of 1200-1500 pounds; and, at times sailed upstream through Bullfrog Rapids and Smith Rapids. In April, 1898, he went from Moki Bar to Independence or Shock Bar, (17 miles) with a party of eight, in a boat 20 feet long, carrying 2500 pounds, and also taking down a raft loaded with lumber, rails, and machinery.

In 1897 and 1898, Robert B. Stanton, the New York engineer who had became interested in the River when he surveyed it for Brown's railroad project in 1889, and who ac-

quired an enthusiasm for its gold prospects and had located mining claims all along it, was engaged, both summer and winter, in doing assessment work and testing the bed for gold. He employed about ten boatment and engineers, and used keel rowboats and a large flat-bottomed scow operating a heavy drilling machine. In the winter of 1898 or 1899, he went down the River with John P. Hite, Frank Bennett, and four others, to Lees Ferry in December, and the party was taken back upstream, in January, to Bullfrog Creek (120 miles) by Jeremiah Johnson( a witness) and a party of 13, in three keel boats, towing a propeller gasoline launch which lacked sufficient power to ascend. The upstream trip took 20 days; and the down stream 2 days.

In 1899-1900, Stanton had a dredge constructed for us- on the River; it weighed 180 tons, had 82 buckets, and the lumber for the hull, the buckets, pumps, 5 engines, 82 tables for saving gold, an amalgamator, settling tank and plates—all came to the River overland, from Hanksville, with eight and ten span of horses down a road blasted out for the purpose to a point on the River just above Bullfrog Creek (about Mile 121, see photographs, Complainant's Exhibits 11 D, 215). Fifteen carpenters worked in building the hull of the dredge which, when afloat, was operated by eight men. An iceplant and camp were also erected and a telephone line between the bars. A scow was built, 28 by 14 feet, which was sometimes let down the River by wire rope and windlass and hauled back; it was also used to carry machinery and as much as 3,000 pounds of coal (which was mined near the Henry Mountains, 17 miles up from the River). Stanton employed 50-75 men. The dredging operations continued for eight or nine months and gold was shipped out to New York overland via Hanksville. The dredge discontinued operations in 1901 and later was wrecked by river floods.

In the fall of 1899, one William Mitchell brought 3 tons of equipment, a steamboiler, engine, and supplies overland to Hansen Creek and from there down the River to Klondyke Bar (65 miles), in a boat, 26 by 10 feet, drawing 18-24 inches.

Early in 1901, Andy Strauss, with five men and two women, went from Hite to Hall's Crossing (44 miles) in two boats drawing not over 8 inches, to work claims there.

From the fall of 1898 to 1904, A. L. Chaffin (a witness) was placer mining at Moki Bar and other places upstream on the River. He received supplies at Moki Bar, 2 miles down from Hansen Creek in a boat, 16 feet long, having a 15 inch draft when loaded. In May or June, 1902, he worked for the Moki Mining Company on Olympia Bar and from Hite; they brought down (30 miles) 2½ tons of equipment, supplies, and lumber, in a boat, 28 feet long, named the *Lucy B.* and on two other boats and a raft. The *Lucy B.* had an old automobile engine of 2-3 horsepower, and in it Chaffin made trips up and down the River, carrying supplies, mining equipment, etc.; the motor was little used however, and poles, oars and sails took her upstream. He testified that he had sailed in small boats up the River on all portions between Hall's Crossing and Hite, except a 4 mile stretch above Red Canyon. In 1903 or 1904, Chaffin acted as watchman at the old Stanton dredge (at Mile 121), and for six or seven months ran a trading post on the River there to which the Navajos came on an old trail from Bluff; the supplies for this trading post came in at Hansen Creek and were boated down. He used a stern-wheel scow, 28 by 14 feet, with a 4 horsepower engine, drawing 8-10 inches, to carry supplies below and above the dredge for short distances. (This trading post was later operated by one Newby for a year.)

In 1904, at peak of high water, John P. Hite with Fritz von Wyschun and a party, made a trip from Hite to Lees Ferry to relocate mining claims, in a keel rowboat.

From 1907 to 1915, Bert Loper (a witness) had a small ranch in Glen Canyon at Red Canyon, and made numerous trips down and up the River in his boat to the various bars. His supplies came overland from Hite and he took them down in a boat (12 miles). In 1907, he followed Monette and Russell to Lees Ferry (see trip already described from Green River) in five days and pulled and towed his boat back up to Hite, in January-February—"an awful trip". In December, 1911, he went with one Seaboldt who was investigating placer claims, from Hite to Lees Ferry (162 miles) in five days, in an 18 foot boat drawing 6 inches; and he towed his boat back, taking 17 or 18 days. In 1915, he ran his boat up and down between Hite and Goodhope Bar (17 miles), taking mail, hay, and freight, etc., to placer miners for hire. All the traffic in boats that he saw was in

16 or 18 feet rowboats, a motor boat owned by Frank Bennett, and a 24 feet steel boat owned by Lon Turner.

From 1917 to 1929, David E. Rust ( a witness) engaged in taking "travellers who wished to take an unusual trip in that wild country" (Record 2258) for hire, from North Wash to Lees Ferry (167 miles), going in the month of April, July, August, September and October, sometimes more than once, but averaging once a year, and taking down two, sometimes three or four boats—folding canvas, steel-ribbed rowboats, 14 and 16 feet long with a 5 feet beam, carrying two passengers and luggage, and having a draft of six inches loaded. In April, 1926, he took Governor Dern of the State of Utah (a witness) and has taken wives of tourists and his own daughter (who cannot swim). He figures on five days actual running time (and three or four days for side trips).

In 1911, at a highwater stage, John P. Hite, with Lon Turner a prospecter, made a trip from Hite to Lees Ferry in one of Julius P. Stone's boats, and Turner came back to Hite upstream.

In 1915, Thomas G. Wimmer, went from Hite to Lees Ferry with LaRue and John P. Richardson—Government engineers, examining damsites.

In 1916, Lon Turner took Charles A. Gibbons (a witness) up the River from Red Canyon to Hite (12 miles) for hire, returning with 300-400 pounds of supplies for the cattle outfit which Gibbons was ranging, east of the River.

In 1920, when the Henry Mountain Oil Company was operating for oil on the east side of the River opposite the Rincon (Mile 99), T. Cummings Bennett (a witness) built a raft, in July, at the Goodhope Bar, 14 feet by 14 feet, drawing 7-8 inches of water, on which were loaded with about a ton of casings, six inch pipe, a wagon, etc., which he took (together with a small boat) down the River to Hall's Crossing when it was taken by F. Bennett down to Rincon. Later, in October and November, two other rafts, 10 by 20 feet, were taken down with drilling machinery, a total of about 5 tons were carried on the rafts. Three trips in a boat were taken upstream, in October, November and December—about ten to twelve miles per day.

In 1921, July-August, the Government Survey party, under William R. Chenoweth (described *supra* p. 83), in boats having 15-18 inch draft, surveyed the River from the

mouth of Fremont River to Hall's Crossing (51 miles); later, in October, the party went down to Lees Ferry (photographers, Defendant's Exhibit 20). This and the two other Government surveys of this year on the San Juan and from the mouth of San Juan to Lees Ferry were furnished with supplies in a boat operated by Thomas G. Wimmer and H. T. Howland for hire. This supply boat had a 2 horsepower Evenrude motor, and drew when light about 6 inches, and when loaded 8 to 12 inches, and on one trip carrying three men with 1100 pounds of baggage and supplies, the draft was at least 15 inches; it required a foot of water to operate the motor. This boat was taken up through Bullfrog Rapids several times but required the aid of oars. The boat operated from the base of supplies at Hal's Crossing and carried 500 to 1500 pounds of supplies up and down the River according to where the survey party was working. Supplies were taken in this boat as far down as Rock Creek to the Hough Survey party, 63 miles below, and the boat returned upstream on its own power to Hall's Crossing; and a heavy load of supplies were also taken down to the Trimble Survey party at the mouth of the San Juan (40 miles) and return; and another was taken down to the Escalante River (30 miles) and return.

In 1921, September 1, November 11, a Coast and Geodetic Survey party under charge of Lieu. F. W. Hough made a survey of levels from Hall's Crossing to the Crossing of the Fathers (78 miles), in two 18 feet boats with Evenrude outboard motors and an 18 foot canoe, (see Report of Director of the U. S. Coast and Geodetic Survey (1922) p. 199, Complainant's Exhibit 619).

In 1922, August-September, an educational trip was made by a party of six, invited by E. C. LaRue of the Geological Survey, and under charge of T. G. Wimmer (including Lewis R. Freeman, an explorer and author—a witness) from Lees Ferry up the river to Hall's Crossing to examine damsites. They had four 18 feet boats owned by the California Southern Edison Co., drawing 6-8 inches, and having three old Evenrude outboard motors of only 3 or 4 horsepower and a new 3 horsepower, hinged, Elto motor. Two motors gave out and the other two motors took the four boats up in pairs, lashed together tandem, the trip up (118 miles) taking about eleven days. At Hall's Crossing, Freeman went up ten miles further through Bullfrog Rapid.

The return trip to Lees Ferry was made in about a week, including stops to view sights. On the return trip, the boats took down a party investigating water and power possibilities for California cities from Hall's Crossing to Lees Ferry, 14-15 men in these four boats, two of the boats still being equipped with outboard motors, and drawing 8-10 inches when loaded with 500-1000 pounds of supplies. The boats were tied together in pairs, tandem, and thus proceeded under power. The trip (118 miles) including frequent stops to examine damsites took 8 days.

In 1928, March, Harry T. Howland (a witness) went with the two Galloways from North Wash to Lees Ferry (167 miles) in rowboats.

In 1929, September 1, Lieutenant Colonel Elliot J. Dent of the United State Army Engineer Corps (a witness), with Bert Loper, and A. D. Ryan, a Government engineer, made a trip from North Wash to Lees Ferry, arriving on September 4 (with one day out for a side trip to Rainbow Natural Bridge). This trip, undertaken for the purpose of investigating the navigability of the river and taking notes, was made at the rate of 55 miles per day. His boat, belonging to the Geological Survey, was 16 feet long with a 4 feet beam, having an 8 horsepower outboard motor, and drawing 1½ feet.

(e) *Between the Boundary Line and Lees Ferry*

Evidence was introduced by the Government as to use of the Colorado River at Lees Ferry, between 1910 and 1926, and in the stretch above to the Utah-Arizona boundary line. This testimony was relevant only so far as the conditions in this stretch resembled conditions north of the boundary line—i. e., only as applied to that 50 mile stretch of the Colorado River below the mouth of the San Juan.

In 1910, Frank Barnes (a witness) went to Lees Ferry overland to handle machinery and boats for the Chicago Exploration Company; he found there an 18 feet keel power boat, having an 18 inch draft; in this boat, together with a rowboat (with three other men), he went up the River as far as Dandy Crossing and return in July or August; the trip took 13 days, stopping on the way to make placer mining locations; he encountered difficulty with highwater and rapids and had to line his boats up, (he did not testify as to

the horsepower of the motor). Another motor boat, 26 feet long with a 5½ feet beam, having 2½ feet draft, with a 40 horsepower motor, was brought to Lees Ferry and went up the River with a scow, in August, 1910, to Warm Creek (27 miles) for coal, and returned (photographs of boats, Complainant's Exhibits 411, 412, 413, 414). In 1911-1912, a Chicago corporation was conducting gold dredging mining operations below Lees Ferry, having two barges with dredging machinery on them. An attempt was made by the Company to develop a coal mine on Warm Creek where about 15 men were working, to whom supplies were brought overland. In order to bring coal down to the dredging barges, a steamboat named the *Charles H. Spencer* was assembled at Warm Creek, from parts brought overland from San Francisco, at a cost of $30,000. It was 92 feet long with a 25 feet beam, having a 12 feet stern wheel, and drawing when empty 18-20 inches; it burned coal in a 10 foot boiler (photographs, Complainant's Exhibits 415, 416, 467, 468, 469, Exhibit 11 D, photograph No. 296). Though intended for use in pushing barges up the River which were to be loaded with coal, it only made two up-trips and three down-trips (less than 30 tons of coal being transported); and finally, it was tied to the shore (and later sunk), since owing to swiftness of the current its use appeared impracticable. It used, on at least one occasion, a heavy chain as a drag, coming downstream). The Company also had a 40 horsepower gasoline motor boat, 40 feet long with a 6 feet beam, having a propeller, the *Violet Louise;* this boat went up to Warm Creek in 1912 and got loose in a flood and was finally abandoned. Another motor boat, the *Mullins,* 24 feet long with 4 feet beam, having a 35-40 horsepower engine (possibly the boat as to which Barnes testified) was used for several trips to Warm Creek, but silt burned out its bearings, and it was finally tied to the shore and sunk by a flood. The Company also had two small boats of not more than 10 horsepower which broke away and went down the River in floods.

In 1921 and 1922, William L. Marrs (a witness) was employed at Lees Ferry by the Southern California Edison Company to operate a boat brought overland to the River. This boat was 26 feet in length with a 5 feet beam, having a 24 horsepower engine and a tunnel propeller, and drawing 12 inches (see photograph Complainant's Exhibits 408,

409); it was also equipped with a capstan and 500 feet of line used to drag it off or across sandbars. It was used chiefly to haul supplies, gasoline, etc., up to the Government Topographic Survey party of 1921 which was operating up to the Crossing of the Fathers (51 miles) from Lees Ferry under charge of Alvah T. Fowler (a witness). Marrs testified (Record 2455):

"We would move them perhaps three or four miles, then they would stay there for a day, and move them again. Each time, between moves, we would come back for more supplies, bring more supplies and bring the mail in. We were over there a total of five months."

The boat went up as far as Mile 68 (mouth of Rainbow Bridge Canyon) and it went about eight times over the Utah-Arizona boundary line; the boat made only 1-2 miles per hour upstream. It was operated in August, September, October, November, December, 1921. After the first few trips with a tunnel propeller on the boat, Marrs installed a five feet paddlewheel and was more successful in navigating upstream. In November and December, 1921, and January, 1922, the boat with a new 8 feet paddlewheel and new bow was operated hauling supplies and equipment up to the damsite five miles above Lees Ferry.

In 1921, another Government Topographic Survey party, surveying the San Juan River and the Colorado River down to the Crossing of the Fathers (Mile 51), under charge of K. W. Trimble, came down from the mouth of the San Juan to Lees Ferry in December; one of the party, Bert Loper, a boatman also went down separately and returned with half a dozen men in the 26 feet motor boat owned by the Southern California Edison Company. In 1921, July, still another party of engineers of the Government and of the Southern California Edison Company made a survey for damsite purposes up from Lees Ferry. T. G. Gerdine (a witness) Division Engineer of the Topographic Branch of the Geological Survey, went up as far as Warm Creek in the Edison Company boat; but the current was too strong for the boat. In 1921, October to November, a Government Coast and Geodetic Survey party, under charge of Lieutenant F. W. Joekel, made a survey of levels from Lees Ferry up to the Crossing of the Fathers in a boat with an

Evenrude outboard motor (see report of the Director of the U. S. Coast and Geodetic Survey (1922) p. 119, Complainant's Exhibit 619).

In 1926, July, Owen R. Clark, now in the United States Geological Survey, made a trip upstream from Lees Ferry, with another man and 25 pounds of supplies, in a motor boat 26 feet long by 5 feet beam, having a 16 horsepower Ford motor, and drawing 18 inches. They made 16 miles the first day, 24 miles the second, and stopped after 8-10 miles the third, owing to lack of gasoline; the return trip took 5-6 hours.

### Impediments in the Colorado River

In considering the Colorado River below Cataract and Dark Canyons, it must be borne in mind that its characteristics north of the point where the San Juan River joins it, i. e., in the stretch from Mile 176 to Mile 78 are somewhat different from those in the stretch below the mouth of the San Juan and down to the Utah-Arizona Boundary line and thence down to Lees Ferry. The increased flow added by the San Juan and especially the huge amounts of silt contributed by it, make the River swifter, more difficult to navigate, and more impeded by sandbars.

#### (a) *Ice, Logs and Debris*

What I have said as to these forms of obstacles in considering the Green and Grand *supra*, p. 80 is applicable to the Colorado.

#### (b) *Silt, Sediment, and Sandwaves*

The findings as to silt and sediment made in connection with the Green and Grand *supra*, p. 81 are applicable to the Colorado, with the further added statement that there is more sand in the Colorado than in either of the other two Rivers owing to the additional load carried down the side canyons and washes and blown over the canyon rims as the mileage of the River increases. Moreover, in the 50 mile stretch below the entrance of the San Juan into the Colorado an exceedingly heavy extra load of silt and sand is carried. The amount of this material in suspension makes the water murky ("muddy" as described by some wit-

nesses), unpleasant to drink and renders it difficult to ascertain by the eye the location and depth of the channel. I find that it has interfered to a certain extent with the operation of the engines and propellers on motor boats, and particularly with the pumps; but I also find that improved methods of construction and operation have been discovered, devised and adopted which largely obviates any impediments to navigation due to action of silt in connection with motor boats. The quantity of silt is lowest during the low stages of water and during the early floods. It is highest in the floods from July to October.

In the 50 mile stretch of River below the mouth of the San Juan (and to a slight extent in the River above the mouth) a phenomenon known as "sandwaves" occurs, which I will consider more in detail *infra* p. 176 in connection with the San Juan River. In general, due to large increase in silt and sand carried, instability of the deposits on the bed of the River, and increased velocity of current, the water of this River rises into waves, commonly about 3-4 feet in height (sometimes higher) consisting largely of silt and sand, which waves break upstream; they occur chiefly at the beginning of the high water stage and at its close, or after any temporary flood or cloudburst. These sandwaves are not an unusual event but are found only under the above special circumstances. They are an impediment to navigation at such times, but do not render impossible the passage of a boat as they seldom extend over the whole width of the River and can generally be avoided; if not avoided, they can be traversed, if care is used. They do not present (in the Colorado River at least) any particular danger, as Rust appears to have navigated each year in small canvas boats and transported women over this stretch of the River, and in twelve years has had only one accident—an accident due to negligence of the person operating the boat.

### (c) *Sandbars.*

The bed of the Colorado have the mouth of the San Juan is more gravelly than is that of the Green or the Grand. There are, however, long high sidebars of sand and gravel on which the placer mining has been done, and also a few sandbars or bottoms which have been cultivated. Crossing bars occur, but not as frequently as on the Green

and Grand and cause less trouble, probably owing to high velocity of the stream. I find that after the recession of the water at the end of the high water season, the channel remains more or less stable during the rest of the year. There is always, however, more or less cutting away of sidebars and deposit of their sand at places further downstream, due to changes in volume and velocity of the stream; and this action changes the channels somewhat; temporary floods or cloudbursts (which usually occur in July, August and September) and obstacles such as boulders, etc., thrown into the stream also change temporarily the course of the channel. I find, however, that in general the channel is less shifting than on the Green and the Grand. The river is less tortuous, the ratio between the river distance and a bee-line being 1.70 instead of 2.22 and 1.87 as on the Green and Grand Rivers respectively. The extent of the sandbars and the shifting of the channel is greater in the 50 mile stretch below the San Juan owing to the increased load of silt contributed by the latter River. I find that boats navigating this River usually strike sandbars, but by no means as frequently as on the Green and Grand Rivers. Navigation up from Lees Ferry across the boundary line, I find is more difficult because of the increased volume of water and high*we* velocity of the current. I find that the Government engineers engaged in examining or surveying this River for the first time found considerable difficulty with sandbars. The placer miners and other men who used the River more frequently were less impeded. This was natural, as experience with this River is of great value in avoiding bars, rocks and currents. I find that while causing much delay both on downstream and upstream trips, these sandbars did not usually prevent the passage of any boat or prevent it from reaching its destination or from carrying out the purpose for which it was being used. Even on the stretch up from Lees Ferry (below the portion of the River involved in this suit) a motor boat made regular trips hauling supplies up to a Government survey party, at various points. On downstream trips, every boat reached its destination (though a few rafts were lost by striking on rocks). On some upstream trips, rowboats and motor boats were sometimes unable to arrive at their destination; but this was due to lack of power and force of current, rather than to any obstacle presented by

sand alone. For further discussion of sandbars as an element of non-navigability, I refer to pp. 87-97 *supra*. I find that on the Colorado River north of the boundary line the sandbars did not in fact render the River non-navigable.

(d) *Rapids, Rapid Water and Velocity of Current.*

I refer to what I have already said *supra* pp. 82-83 as to varying definitions of rapids. The men who made more or less contemporaneous record of river conditions on their various trips differ considerably in their statements as to rapids. Major Powell in his account of his first trip down the Colorado (Complainant's Exhibit 51) in July, 1869, made no mention of rapids in Glen Canyon. On July 30, he noted: "We made good progress today, as the water though smooth is swift." On July 31: "We have a cool pleasant ride today through this part of the Canyon." (Above mouth of the San Juan.)

F. S. Dellenbaugh in his account of the second Powell Expedition (see *A Canyon Voyage*, Complainant's Exhibit 14) mentions rapids and sandbars to the following extent. Referring to the stretch below Hite (at a stage of low water), he wrote:

Oct. 2.—"In about three and one half miles, we ran several sharp little rapids but they were not of much consequence."

"Towards evening, we came to another Shinumo ruin where we made camp, having run altogether 16 miles with ten rapids, all small, between walls of red, homogeneous sandstone, averaging about 1000 feet in height. The river, some 350 feet wide, was low, causing many shoals, which formed the small rapids. We often had to wade alongside to lighten the boats, but otherwise these places were easy. A trifle more water would have done away with them or at least would have enabled us to ignore them completely."

"Oct. 3.—"In the morning, we were quickly on the water, pushing along under conditions similar to those of the previous day, making 27 miles and passing eleven very small rapids with a river 400 feet wide and the same walls of homogeneous red sandstone about 1000 feet high."

Oct. 5 (near mouth of the San Juan River).—"We have a rapid shallow river but the water was not so widely

spread out. * * * Arrived at a pretty rapid with a clear chute. It was not large but it was the only real one we had seen in the Canyon and we dashed through it with pleasure. * * * We ran down a considerable distance through some shallows."

When Dellenbaugh made his second trip down the Colorado, in the succeeding June (at a highwater stage) he wrote (p. 210):

"The high water completely obliterated the aggravating shoals which had bothered us the year before, and we had no work at all except to steer to land, the current carrying us along at a good pace."

In his *The Romance of the Colorado* (Complainant's Exhibit 13) Dellenbaugh wrote pp. 179 (in contradiction of a fictitious account of the river trip given by one, White) that:

"The whole 159 miles of Glen Canyon are simply charming; altogether delightful. One can paddle along in any sort of craft, can leave the river in many places and in general enjoy himself. I have been over the stretch twice, once at low water and again at high, so I speak from abundant experience."

Stephen V. Jones, on the other hand, who also kept a diary of the second Powell expedition (Complainant's Exhibit 628) noted rapids and sandbars as follows. On October 2, he mentioned six shallow rapids in the 16 miles below the Fremont River; October 3, he mentions 9 small rapids "some quite shallow, none bad"; "ran 3 long shallow rapids getting aground once" and 12 rapids; on October 4, he noted shoals with rock bottoms on which boats stuck; on October 5, he notes: "Ran a small rapid just after starting, the rest of the way nothing worthy of the name. Passed the mouth of the San Juan * * * ran through swift water all the afternoon, running 5 rapids, 2 big ones, on October 6, "ran a big rapid and the *Emma* struck a rock"; on the two days before reaching the Utah-Arizona boundary line (Oct. 15, 16) he noted: "Ran down a smooth river with the exception of two rapids * * * ran two small rapids"; below the boundary line, he mentions "smooth water" and four "small rapids." It may

be noted that no other witness has testified to any such amount of difficulty in navigation.

Robert B. Stanton, in the field notes of his survey expedition in June 1889, at a high water stage (Complainant's Exhibit 176) makes no mention whatever of sandbars, but notes 15 rapids, no one of which seems to have given his boats any very great trouble, though a few he termed "rough" and "choppy," and one rapid (probably the Aztec at Mile 68.6) he termed "bad." Franklin A. Nims, the photographer of this same Stanton expedition, writing the next year (Complainant's Exhibit 177 "Through the Colorado River" Aug. 1890) said of the River below Tickaboo Creek: "We now pushed out and owing to the long stretches of smooth water, with very few rapids, we arrived at Less Ferry 150 miles below on the afternoon of July 3." When Stanton made his second expedition in December, 1889, his field notes (Complainant's Exhibit 176) mentioned less difficulties from rapids than in his June trip, but found several shallow places with rock bottom over which the boats were dragged or contents portaged; he mentioned no sandbars. At Trachyte rapid (Mile 161.5) on December 10, he noted he took the wrong channel and bumped on the rocks that one boat stuck and the other two got over; on December 13, just above the California Bar two boats scraped or "swamped" on the rocks; on December 14, he noted as to a rapid "over which we ran last summer without difficulty" that "today the water was so low that we got through with great difficulty" and cargoes were portaged; on December 15 and 16, cargoes were again portaged; on December 19, he found the Aztec rapid "more rapid and rough than it was last summer."

Ellsworth L. Kolb, who made the trip in October and wrote a book upon it immediately thereafter, testified only to rapids at Bullfrog Creek, Bed Rock (Shock), and below Bridge Canyon (Aztec) having rocks close to the surface.

Of the Government engineers who testified in detail as to rapids, Lieutenant Colonel Dent, who made a trip with Bert Loper and A. D. Ryan, in early September, 1929, with his keel boat, 16 feet long, 4 feet beam, one foot freeboard, having a Johnson two clyinder 8 horsepower outboard motor, and drawing about 1½ feet, noted four rapids between Mile 160 and Mile 158, and rapids at Miles 150,

148.5, 132 (Smith Rapids), 129.7, 113.5, 113, 112.5, 109, 108.2, 107.2, 105.7 104, 103.2, 68.5. He also noted instances of touching rocks on bottom.

On the other hand, William G. Hoyt, Government engineer, in classifying river conditions from the profiles and the maps of the Government Topographic Survey made in July-August, 1921 (Complainant's Exhibit 10), termed only one stretch of water a "rapid", viz. at Mile 161.5 (Trachyte) having a fall of 5 feet in about one half mile; he classified as "rapid water" Mile 168.5-166 (below North Wash); 161-158 (below Trachyte Creek); 150-148 (Tickaboo); 120-119 (Bullfrog Creek above Hall's Crossing); 114-100 (below Lake Canyon); 69-68 Aztec Creek, the total of these stretches being about 23 miles, with a fall per mile of from 3-4 feet on an average—the greatest fall being in a stretch of 2.13 miles at Tickaboo Creek, where the bed drops 15 feet or at the rate of 7.04 feet per mile. All the rest of the river he classified as "quiet water." The difference between Dent and Hoyt is probably one of definition. W. R. Chenoweth, in charge of the Government Topographic Survey of 1921, did not designate Trachyte as a rapid on the original sheets or maps of his survey; and he testified (Record 3895-3896) to the presence of a rapid with a five foot fall below North Wash in July and to its disappearance in October, there being at the latter date "no perceptible fall," the rapid was "distributed down." Herman Stabler, Chief of the Conservation Branch of the Geological Survey who was in the large party from Hall's Crossing to Lee's Ferry in September, 1922, testified to 8 rapids in the first ten miles; but his definition of rapid consisted simply of any "increase in velocity sufficient to produce waves or wavelets"; he termed only 3 as "difficult"—Whirlpool rapid below Hall's Crossing, Aztec rapid, and a rapid at Mile 71, in each of which "the boats shipped water."

The men who used the River in connection with their placer mining operations testified to rapids at various times at Trachyte Creek, Tickaboo Creek, Smith Fork, Bullfrog (above Hall's Crossing), Shock, Whirlpool, Aztec Creek and a few others.

The entire drop in elevation between Mile 176 and Mile 27.7 (the Utah-Arizona boundary), in general, is only from 3,465 to 3,165 feet, or 300 feet in 149 miles, i. e., a slope of

only 2 feet per mile. I find, however, that there are four specific drops in the riverbed which may properly be termed small rapids—Trachyte rapid where there is a drop of about 5 feet in half mile; Tickaboo rapid, a drop of 15 feet in a little over two miles; Bullfrog rapid, a drop of five feet in slightly over one mile; Aztec rapid, a drop of 5 feet in a mile and one fifth. I do not find that these rapids were dangerous to life, or that they ordinarily made necessary any portage of boat or cargo.

I do not find that these rapids have proved any substantial impediment to a boat going downstream. Rowboats going upstream must ordinarily be dragged or poled up through, but to a motorboat going upstream these rapids form little obstacle, except in times of extreme high water; wide rafts have found difficulty in going down through some of these rapids at low water, without hitting upon rocks. Irrespective of the rapids, the ordinary velocities of the River present some difficulty to boats making the upstream trip. Such velocities in the 50 mile stretch between the mouth of the San Juan and the boundary line are 3½-4 miles per hour for about half of the year and over 4½ for the remainder of the year, but this rate is considerably in excess of velocities north of the mouth of the San Juan, except in the stretches of rapid water or in the rapids. Most of the witnesses who made trips in rowboats testified to being obliged to pole or drag their boats upstream in many places; and the up-trips were, as a rule, long and difficult, more particularly below the mouth of the San Juan where the volume and velocity of the water were greater. On the other hand, there is evidence that on many occasions the placer miners used to take their boats upstream for short distances by sail as well as oar power. I find that to navigate upstream successfully requires the use of motor boats. T. G. Wimmer in the summer and fall of 1921 used a 2 horsepower Evenrude outboard motor; Government parties in 1922 went upstream with 3-4 horsepower outboard motors; Lieutenant Colonel Dent, on his downstream trip in 1929, used an 8 horsepower outboard motor; going upstream from Lee's Ferry, 14, 24, and 40 horsepower motors have been used by witnesses at various times. It is probable that, at the Lee's Ferry end of the River, motorboats using stern paddlewheels are more successful than those using propellers. T. G. Wimmer, who

was one of the few witnesses who had navigated all three of the rivers—Green, Grand and Colorado—in motor boats testified (Record 4786):

"Q. Do you know of any conditions on the lower river which made it at all impracticable or unsafe to operate a properly constructed power boat of the kind you are familiar with up and down that stretch of river?

A. I should say this, I think I could do anything on the lower river I done on the Green River with the same boats."

And further (Record 4855-4858):

"Question by the Special Master. In view of your experience on these Rivers, will you tell me how the stretch of the Green River from the San Rafael to the Junction compares in ease or difficulty of navigation with the Colorado River from Hall's Crossing down to Warm Creek (the boundary line)?

A. I think there is more rapids on the Colorado River than there is on the Green.

Q. Which in your experience has been the easier to navigate with the boats that you used * * * going downstream?

A. Oh well, practically no difference because there is plenty of water in either case.

Q. That is, the months you have been there?

A. Yes, sir.

Q. Going upstream, which have you found it easier to navigate in the boats you have used?

A. I think the current is a little stronger we have to face in the lower Colorado than between the Junction of the Green and the San Rafael.

By Mr. Farnsworth:

Q. Would you say that there was any more obstacles except some difference in power would be required?

A. That is all; I think there is a little more current; in fact I know it is a little steeper, more cataracts.

Q. In a boat like the Marguerite would you say that there was any difference in the practicability of navigation up and down stream on the section of the lower Colorado

referred to in his Honor's question and on the Green River?

A. I don't think there would be any difference. I am sure there wouldn't. There is not enough difference in the two waters to make any difference with a boat like the Marguerite."

I find that so far as rapids and velocity of current are concerned, the Colorado River can be navigated downstream by rowboats and by motorboats drawing 1½ feet, and upstream by properly constructed motorboats having sufficient horsepower to pass through the rapids found by me. It is probable that boats with stern paddlewheels or outboard motors can operate more easily than boats with fixed stern propellers. I find that such boats can successfully navigate in at least nine months of the year. At extreme highwater upstream travel may be difficult and downstream travel less safe.

*Depth and Discharge.*

As to the 90 mile stretch of Glen Canyon from Mile 176 to the mouth of the San Juan River, there are no gauging station figures of discharge, flow, and depth which are applicable.

As the waters of the Green and the Grand join to form the Colorado, there must be a discharge of water in this Glen Canyon stretch equal to the combined discharge of the other two Rivers, and hence at all times sufficient water for navigation (so far as discharge alone is concerned) for boats which could navigate the Green or the Grand. As to depths, the Colorado in this Glen Canyon stretch should have a depth at least equal to that of the Green or of the Grand, inasmuch as its varying widths are not substantially different from the varying widths of the Green and of the Grand (and, in fact, in the lower portions towards the boundary line are somewhat less).

I find, on the evidence of the witnesses who used boats up and down this stretch of the River that at all times of the year, boats having a draft of 1½ feet can navigate, so far as depth alone is concerned, though boats with a stern paddlewheel or with an outboard motor can probably navigate with more ease than boats with fixed stern pro-

pellers. I find, however, that in low water stages of the River there may be difficulty of navigation at one point, namely a place variously described as the "reef" or "ledge" located below Lake Canyon and near Shock bar or rapids, in the neighborhood of Miles 110-112. At this point a strata or ledge of rock crosses the River, through which there are several channels of varying depths cut through the rock. Passage can generally be found along a channel on the west side of the River, having a width variously estimated at 30 to 50 feet, and having a depth of never less than one foot and generally two feet or more. While most of the boats seem to have passed through this spot without difficulty, there is evidence that some boats, especially at low water, have been obliged to be dragged over or through.

I find also that in the navigation of wide rafts downstream at low water, there is risk of having them strike submerged rocks at a few points; though the evidence shows that navigation by such rafts carrying heavy loads of machinery and supplies has been successfully carried on, in connection with mining and oil drilling operations.

As applicable only to the 50 mile stretch between the mouth of the San Juan and the boundary line, I set forth the figures obtained at the Lee's Ferry gauging station which consists of a gauge operated slightly below the ferry, and a cable from which discharge measurements were made, located about 1,600 feet above the ferry. From charts or graphs prepared by Government engineers from these measurements and figures, the following appear on an average to be the mean depths (with reasonable allowance for error) (1):

| | |
|---|---|
| Between 3 and 4 feet | 17 days in the year. |
| 4 and 5 feet | 77 days |
| 5 and 6 feet | 80 days |
| 6 and 7 feet | 40 days |
| 7 and 8 feet | 27 days |
| over 8 feet | 124 days |

With these figures as to depths, the following figures as to daily discharge during the year, on an average, may be

(1) Complainant's Exhibit 82 A, Plate 9, Plate 6, Plate 8.

taken into consideration (with reasonable allowance for error):

| | |
|---|---|
| Less than 4,000 second-feet | 13 days in the year. |
| From 4,000-6,000 | 60 days |
| 6,000-8,000 | 78 days |
| 8,000-16,000 | 75 days |
| 16,000-26,000 | 38 days |
| Over 26,000 | 101 days |

It thus appears that with a discharge of 6,000 second-feet or less for 73 days, there is a depth of between 4 and 5 feet for 94 days; with a discharge of over 6,000 feet, there is probably a depth of over 5 feet.

Selected examples of rapidity of variation of second-feet have been cited by the Government as follows (Complainant's Exhibits 79 and 90):

June 18, 1921, from 181,000 to 28,100 July 14;
Aug. 17, 1921, from 16,000 to 64,100 Aug. 25;
Apr. 22, 1922, from 12,500 to 119,000 May 30;
Sept. 18, 1923, from 9,310 to 47,800 Sept. 20;
July 1, 1927, from 191,000 to 17,700 July 24;
Sept. 9, 1927, from 14,400 to 110,000 Sept. 15.

So far as depth alone is concerned, I find that boats drawing 3 feet can navigate up or down the stretch of the River from the mouth of the San Juan to the boundary line. The River in this stretch is considerably narrower than the Green or Grand, averaging from Mile 100 down to the boundary line at Mile 27, only about 400 feet.

### Commerce and Navigability

As to the element of commerce on the Colorado River, what I have said *supra*, pp. 105-117, as to the Green and Grand Rivers is applicable.

I find that the use made of this River, both before and after 1896, by the miners in transporting supplies, mining equipment, etc., for use in their business constituted a commercial use. I find that, after 1896, the transportation of supplies, drilling machinery, etc., by persons engaged in drilling for oil as well as the transportation for hire of supplies to survey parties operated by the Government and by

an electric light and power corporation constituted a commercial use; and that the River was, in 1896, susceptible or capable of these and similar uses. I find that the peculiar conditions on this River with respect to its inaccessibility from the rims of the canyons and from the high plateau through which it flows, and with respect to the small number of roads and trails leading down to its bank, make the use of the stream as a highway for trade, travel, and commerce practically the only method by which transportation of goods and persons can be carried on from one point on the river to another. I find as I have stated with reference to the Green and Grand, *supra*, p. 117, that the limited means of access to the river from the surrounding country are an argument for rather than against its navigability; since, if mining, oil, agricultural, or other developments shall in the future take place in the bed of this River, the more likely, easy, and natural (and in many places the only feasible) method of moving material, supplies, and men from one place to another is by water. Another likely commercial use of which this River is susceptible is transportation for hire of tourists desiring to see the remarkable natural scenic wonders and archaeological remains of this region.

The counsel for the Government, in the brief submitted to me, states:

"The use of boats by the placer miners was a temporary expedient. It was neither substantial nor permanent. The operation of boats and rafts was hazardous. It never at any time rose to the dignity of commercial navigation."

That the use of boats was not a "temporary expedient" is shown by the fact that the mining operations were carried on for at least twelve years (1888-1900), with considerable success, and that some mining continued in places for fifteen years after 1900. But even if the actual use was "temporary", it is *susceptibility* or *capability* of use in 1896 which is to be ascertained. An actual "temporary" use may be evidence of a susceptibility for much greater use in the future if circumstances arise to bring such use into play. I find such proof of actual use both before and after 1896, whether termed temporary or not, as constitutes evidence of a susceptibility in 1896 of similar use in the future.

I do not find that the facts and river conditions in the cases cited by the Government and considered *supra*, pp. 118-123, are similar to the facts and river conditions on the Colorado River; and consequently I do not find that these cases are decisive of this suit.

## Special Master's Conclusions as to Navigability of the Colorado River

I am of the opinion and accordingly find as follows:

(1) The Colorado River south from the confluence of the Green River with the Grand River at Mile 216.5 above Lees Ferry down to the end of Cataract Canyon at Mile 176 above Lees Ferry, was, on January 4, 1896, not capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water.

(2) The Colorado River, on January 4, 1896, was in fact and in law a non-navigable water of the State of Utah from the confluence of the Green River with the Grand River at Mile 216.5 above Lees Ferry down to the end of Cataract Canyon at Mile 176 above Lees Ferry; and in consequence title to the bed of the River between such points was vested on that date in the United States of America, except so far as the United States of American may have theretofore made grants of said bed.

(3) The Colorado River from Mile 176 above Lees Ferry south to the Utah-Arizona boundary line was, on January 4, 1896, capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water. I find that its susceptibility of use as a highway for commerce was not confined to exceptional conditions or short periods of temporary highwater, but that during at least nine months of each year the River ordinarily was susceptible of such use as a highway for commerce.

(4) The Colorado River, on January 4, 1896, was in fact and in law a navigable water of the State of Utah from Mile 176 above Lees Ferry south to the Utah-Arizona boundary line; and in consequence title to the bed of the River

between such points vested on that date in the State of Utah, except so far as the United States of America may have theretofore made grants of said bed.

THE SAN JUAN RIVER.

*Table of Distances.*

| | Miles above mouth | Miles from Chinle Creek | Elevation |
|---|---|---|---|
| Chinle Creek (Comb Wash) | 133 | 0 | 4213 |
| The Narrows | 124-123 | 9 | 4136 |
| Mexican Hat | 118-117 | 15 | 4080 |
| Goodridge Bridge | 113-114 | 20 | 4044 |
| Mendenhall Loop | 111-110 | 23 | |
| Second Narrows | 105 | 28 | |
| Honaker Trail | 96.5 | 36.5 | |
| John's Canyon | 82.4 | 51.6 | 3812 |
| Slickhorn Canyon | 74.8 | 58.2 | 3748 |
| Grand Gulch | 71 | 62 | 3706 |
| Moonlight Creek | 65.5 | 67.5 | 3660 |
| Clay Hill Crossing | 57 | 76 | 3620 |
| Piute Farms | 54 | 79 | 3600 |
| Clay Gulch | 50.5 | 82.5 | 3580 |
| Copper Canyon | 47 | 86 | |
| Nokai Canyon | 44 | 89 | 3549 |
| Zahn's Camp (Gable Camp) | 42 | 91 | 3540 |
| Spencer Camp | 38 | 95 | |
| Piute Creek | 21.6 | 111.6 | 3431 |
| Wilson Creek | 14 | 119 | 3357 |
| | 11.6 | 121.6 | 3340 |
| | 10.7 | 122.3 | 3316 |
| Mouth of River | 0 | 133 | 3257 |

*Topography.*

The San Juan River presents in some respects a different picture from either of the other Rivers, and I accordingly treat it separately. (1) It rises in the San Juan

(1) For description of the San Juan River, see Water Supply Paper 538, by Hugh D. Miser, Complainant's Exhibit 56, giving list of all previous Government reports relating to the River, and adjacent territory; see also "Geologic Structure of San Juan Canyon and adjacent country, Utah," by Hugh D. Miser, United States Geological Survey Bulletin 751 D (1924).

Mountains of Colorado, flows southwest into New Mexico, then back into Colorado, and enters Utah at the corner of the four States of Colorado, Utah, New Mexico and Arizona, where it flows through the Navajo and Southern Ute Indian Reservations. Up to this point, it has been entered by several good sized tributary Rivers. Until it reaches the town of Bluff, and Chinle Creek (or Comb Wash) five miles below the town, the San Juan flows in a more or less open country. Below Chinle Creek for 133 miles, it flows southwesterly through canyons varying in depth from 500 to 1,500 feet, and in some places to 2,000 feet. The canyon walls sometimes rise practically vertically from the water's edge and are only a few hundred feet apart, as below Grand Gulch; and at other places they rise in terraced formation and slopes, so that (as above John's Canyon) they may be four miles apart at the top on the canyon rims. Between Clay Hill Crossing and Piute Farms (76-79 miles down from Bluff), the River runs in a wide and sandy bed, through a valley which is sharply bounded on the south by a mesa 2,000 feet high surrounded by cliffs, and is bordered on the north by lower country. From Piute Farms to the mouth of the River, for 54 miles the River runs through canyons, the walls in some places being vertical, in other places there being inner canyons 500-1500 feet high and sloping at the top back to the mesas 2500 feet above the River. Miser in his Report (Complainant's Exhibit 56, pp. 48, 49) thus describes the character of the River's course:

"The channel of the river in the box canyons is generally 150 to 300 feet wide, but at a few places near Goodridge and Mexican Hat it narrows to a width of 50 to 75 feet. One of these places is at the Goodridge Bridge, where the channel occupies a rock-walled gorge 75 feet wide, and another is at a point 1 mile due east of The Narrows, where it occupies a similar gorge only about 50 feet wide. In the box canyons the river is skirted here and there by gravel and sand bars, but at most places the water's edge is met by the base of talus slopes and by precipitous walls. A few rock ledges extend far out into the channel; none are exposed in the middle of the channel. Boulders of all sizes up to 60 feet in their longest dimension, submerged and unsubmerged, dot the channel here and there; and great

heaps of them that have been brought to the river by tributary streams and piled at their mouths form boulder bars that not only narrow the channel but produce rapids. In the open stretches—those that are not closely bordered by canyon walls—the channel is wider, attaining a maximum width of 3,300 feet at Piute Farms. An open stretch occurs near the mouth of Chinle Creek, a second between Clay Hill Crossing and Piute Farms, a third between the mouths of Clay Gulch and Copper Canyon, a fourth at and near Zahns Camp, a fifth at Spencer Camp, a sixth between the Great Bend and the mouth of Piute Creek, and a seventh extending 3 miles downstream from the mouth of Wilson Creek. In such open stretches the river is bordered by large bars of yellow sand and a few gravel bars, is dotted by islands of ripple-marked sand, and is marked here and there by boulder bars and their accompanying rapids.''

From Chinle Creek to Grand Gulch (57 miles), the River flows through limestone; below that point largely through sandstone. Its course is very tortuous with a distance ratio of 2 for 1. Its descent or slope is considerable, dropping from 4213 feet elevation at Chinle Creek to 3257 at its mouth— a fall of 956 feet in 133 miles or an average of 7 feet per mile, with numerous stretches of an even steeper gradient. In this distance, it has no tributaries of any size; but a few creeks enter it (carrying little water except in highwater and flood periods)—Chinle, Gypsum, Moonlight, Copper, Nokai and Piute Creeks from the south, and Comb Wash, Lime Creek, John's Canyon, Slickhorn Gulch, Grand Gulch, and Wilson Creek from the north. At various points there are high sand and gravelly sidebars and rocky talus.

The drainage area is about 25,800 square miles, located in four States. The topography and conditions of the surrounding country or rock plateau are like those around the Green, Grand and Colorado; though to the north, they are even more rugged, dissected and broken. (See under heading of Topography of the Surrounding Country, *supra* pp. 22-26.) There are no settlements in this stretch of River except Bluff, Mexican Hat (1) and Goodridge. The popula-

---

(1) The reason for this peculiar name is made plain by photographs. Complainant's Exhibits 294, 296, 298.

tion of the town of Bluff according to the United States Census was as follows: in 1880, 107; in 1890, 190; in 1900, 315; in 1910 ,1059; in 1920, 382. The other two settlements contained (except at the time of the oil excitement) only about half a dozen persons. The population of the whole County of San Juan has been as follows: in 1880, 204; in 1890, 365; in 1900, 1023; in 1910, 2377; in 1920, 3379. The only towns of any size within thirty miles of the River are Monticello with a population in 1890 of 44, in 1900 of 180, in 1910 of 375, and in 1920 of 768; and Blanding with a population in 1910 of 385, and in 1920 of 1072. South of the River is the great Navajo Indian Reservation, extending over the Utah boundary line into Arizona. Not more than two dozen people live in Utah north of the River and west of Bluff and of the Elk Mountains as far as the Colorado River.

Roads and trails near the River are few and difficult of passage. There is the main road north to Monticello and Moab; and thence to Thompson on the Denver & Rio Grande Railroad; a road runs east to Dolores in Colorado; a road runs along the north rim from Bluff to Mexican Hat, thence across the River (formerly by ferry now by bridge) at Goodridge (20 miles down from Bluff) and leading south for 50 miles to Kayenta in Arizona which is 155 miles from Flagstaff and 190 miles from Gallup on the Santa Fe Railroad. There is a road from Bluff, 5 miles down to Comb Wash. An old Mormon road from Bluff to Hole-in-the-Rock on the Colorado River has long been abandoned. A road or trail from Bluff leads across the plateau and over to Hall's Crossing on the Colorado, and another road or trail to White's Canyon and down it to Dandy Crossing and Hite on the Colorado. A poor road or trail leads along the north rim from Mexican Hat to Mendenhall trail down to the River; to Honaker's Trail, down to the River; to Slickhorn Gulch, down to the River. To the south of the River, a poor road leads to Moonlight and Copper Creeks, and down to the River whence Piute Farms, Nokai Creek, Zahns Camp, and Spencer Camp can be reached; and trails barely passable go down to some of the other Creeks. The agricultural and timber conditions in the country to the north of the River have been described *supra* p. 114. On the River itself, there are small areas of tillable and irrigable agricultural land at Bluff, at Piute Farms (79 miles

down from Bluff), and a few small possibilities elsewhere in some of the side canyons and on a few of the terraces. The lands of the high rock plateaus adjacent to the River afford good grazing in winter, and in general, are only fit for that purpose. Through the canyons and mesas adjacent to this River are habitations of the Cliff-dwellers and other archaeological features of great interest.

*History*

Up to 1879, few parts of the United States have been less explored and less known than the section of this River involved in this suit, and the surrounding country. No Spanish explorer has left any account of it. Those who travelled the Old Spanish Trail may have crossed the River, but far to the east in New Mexico. No American explorer touched this section of the River. Captain McComb, in his War Department reconnoissance to the junction of the Green and Grand Rivers, in 1859, wrote that on his return he crossed the San Juan "some 50 miles or more above its mouth," but as he was undoubtedly on the Old Spanish Trail, his crossing must have been at least 250 miles from the mouth. The railroad surveys of the 1850's did not touch this River. No Mormons explored it until 1853, when traders and missionaries crossed it to trade with the Navajos, but they reached the River probably well east of the present Bluff. No man is known ever to have gone down this River in a boat, prior to 1882.

No settlement was made on the River until 1879. In that year, an exploring party sent out by the Mormon Church to ascertain the resources of the region with a view to planting a colony, crossed Lees Ferry and took an Indian trail as far south as Moen-Kopi (the present Tuba City and then village of an Oraibe chief named Tuba), and then travelled northeast, up Moen-Kopi Wash, until the party struck the San Juan, after nearly 300 miles of travel, at a point now known as Montezuma, east of Bluff. Leaving a few settlers there, the party returned, breaking a new road to the north until they struck the Old Spanish Trail near LaSal, and then crossing the fords at Moab and Green River and back, via Salina and the Sevier Valley into southwest Utah. As a result of their report, the Church decided to send out another pioneering party to make a

settlement. This party, finally consisting of 200 men and women and 50 chidren with more than 100 teams, 82 covered wagons and 1000 cattle, left Cedar City and the vicinity, in October-November, and attempted to strike out a new trail directly east to the San Juan (instead of going north via the Old Spanish Trail or south via Lees Crossing and Arizona). They reached the town of Escalante and finally on December 14, 1879, the rim of the canyon of the Colorado River, at a place later called Hole-in-the-Rock (6 miles north of the mouth of the San Juan and 56 miles north of the Utah-Arizona boundary line) where the rock wall was over 1500 feet high, but where a crevasse seemed to make possible a descent to the River bed. (See Complainant's Exhibits 384, 406). After enormous difficulties and hardships, and blasting a rough road down, and after sending ahead a scouting party (some of who were witnesses in this suit), to examine a possible trail across the River and along the north side of the San Juan, they succeeded in lowering the wagons down to the River, between January 26 and February 10, 1880. Then they ferried them across on boats which they had built, and climbing the opposite wall of the canyon started over the rough plateau on a fearful journey of 150 miles which took until April 5, 1880, on which date they arrived at the spot where they built a town named Bluff.

*Use of the River by Boats*

Hugh D. Miser states in Water Supply Paper 538 (Complainant's Exhibit 56) that the first known trip down the River was made in 1882 by E. L. Goodridge, an oil prospector, from Bluff to Lees Ferry, with the loss of one boat. Until the 1890's, no other boat trip is specifically known to have been made, although boats were used to cross the stream at Bluff and at Comb Wash (five miles below Bluff). These crossings were made by whites and Indians for purpose of trade with the Navajo Indians, the latter dealing chiefly in sheep, and goat skins and blankets. A trading post was maintained at Comb Wash and a regular ferry with a 30 feet ferry boat was run there to take the Indians and their ponies across when the River was too high to ride or swim. A few trappers for beaver coming up from the Colorado River may have used boats; but above Bluff, it

was testified that trappers generally used "their Rocky Mountain canaries—burros."

In the early 1890's, a gold boom arose and from then until 1906, there was more or less placer mining up and down the stream. In 1892, the chief excitement was at Gable Camp (91 miles down from Bluff). This mining took place in the late fall, winter and early spring months, when the water was low and the bars were workable and not covered or flooded. And, as one witness testified, "as soon as it got warm in the spring, they would go back to the mountains." For over three years, there were perhaps 150-200 miners operating at various places between Chinle Creek and for about one hundred miles down the River. From 1902 to 1905, placer mining on a somewhat more extensive scale was conducted by the Zahns at a point known as Gable or Zahn's Camp. There is also testimony of a slight amount of placer mining by scattered parties, after 1906—in 1909, 1910, 1912, 1920, 1923-24, and 1928. Most of these placer miners came down the River from Bluff and from places further up east of Bluff. In connection with their downtrips and in their placer operations, many of them used small boats or skiffs of rude construction, some of which were built at Bluff by the miners and by others—flat-bottomed, straight-sided, and square ended, varying in length from 14 to 22 feet, with a 4 feet beam, and drawing when loaded 6-12 inches (see photograph of type of boats, Defendant's Exhibit 15.) In these boats, the miners carried their tools, equipment and supplies.

The principal boat trips down the River, specifically testified to by witnesses, have been as follows:

In the winter of 1892-1893, William H. Edwards went up the San Juan from its mouth, a very slight distance, finding only about 1 foot depth. In July or August, 1893, Walter E. Mendenhall went from Lake City in Colorado to Bluff and thence down to Comb Wash, at which place he and an old riverman made a boat 14-15 feet long and 3½ feet wide, drawing 8 inches when loaded, and also made a small raft of the balance of their lumber; loading the boat with supplies and mining tools, they went down the river 8 or 10 miles, where they placer mined. He returned to Colorado overland and in October, 1893, he went back to the San Juan River and placered without a boat. From March, 1894, he placered in the canyons below Mexican Hat, tak-

ing his supplies down to the River by pack animals on the Mendenhall trail. In August or September, 1894, he went down from Bluff to his camp 5 miles below Goodridge Bridge Site in a 15 feet boat, having to line the boat through rapids. After working there, he, with a party of five, went on down the River (to its mouth) in three boats which they built at his camp from lumber which they had packed in, one boat being 16 feet long with a 4½ feet beam, drawing 8-10 inches loaded and carrying about one ton of supplies, and the others 12 and 14 feet long; they also had a small scow which they picked up on the way down; they met with "very swift water," and rapids which they had to line frequently above Piute Farms; below they met rapids at the mouth of Copper Canyon, and Nokai Canyon and a "very bad one" 8-10 miles below the mouth of Piute Creek, at two of which they portaged their cargo; also a bad long rapid with a heavy fall below Wilson Creek. From the mouth of the San Juan, they went up the Colorado, and later in the year down to Lees Ferry, prospecting. In 1928, he went overland by a road south of the River to the mouth of Nugget Creek, near Pinte Farms from which he went in a canvas bottomed boat 14 feet long, drawing 3 inches, down the River to Pinte Creek (32 miles). At this time the rapids which he met in 1893 at Copper and Nokai Canyons had disappeared, being covered with sand; he then returned overland. He testified that neither he nor any other miners whom he saw ever went up the River in boats more than a short distance—"too hard work."

In 1893, also, C. L. Christiansen, who in 1890 came from Lees Ferry and overland to Hall's Crossing on the Colorado, thence overland to Bluff, took a boat 16 feet long with 2,000 pounds of supplies, from Bluff down to Rincon (where the trading post was located) and saw, in the spring, a raft of about 5,000 feet of lumber go down the River with a party operating at Gable Camp. In 1893, also, Adelbert L. Raplee started placer mining on the River, employing 8 or 10 men, on claims near Mexican Hat and about 20 miles below Bluff; he mined for over three years, bringing in overland and using a water wheel which pumped water to sluice with. For the first three years until a good road was built from Bluff to Mexican Hat, he got his supplies by go-

ing up to Bluff and returning in a boat. He stated that whenever he wanted lumber he would go to Bluff, build a boat there, load it and take it down the River. The trip down from Bluff by River took 10 hours at high water and 15 hours at low water. He testified (Record 404) that he never ran a boat upstream as it was "too hard work". His boats were 18 feet by 4½ feet, flat-bottomed, drawing 6 inches loaded. His boat trips were made generally at high water periods, a few at low water "but it was too much work". The counsel for the State of Utah, in a brief submitted to me, have stated that Raplee testified that: "In supplying my own operations there I made something like twenty four boat trips a year, carrying on each trip about 1,000 pounds, so that the freight I carried for my own purposes was about seventy odd thousand pounds during three years." I find that Mr. Raplee's testimony on cross-examination shows a confused state of mind (he being 75 years old) and is inconsistent with his testimony on direct examination to the effect that he never ran a boat upstream as it was "too hard work". I was convinced in hearing him testify at the hearing that he did not understand counsel's questions. The transcript of his cross-examination is as follows (Record 474-476):

"Q. I don't suppose you could give any approximation, even, of the tonnage carried?

A. Of the tonnage put through?

Q. Yes.

A. Oh, with my outfit there I put through there, I guess, about fifteen yards a day.

Q. I mean tonnage carried on the river in boats.

A. Oh, the tonnage?

Q. How much would it be a week, would you say, if you can make an approximation?

A. Of, I suppose probably couple of tons, such a matter.

Q. For the entire two hundred men?

A. Well, not for the entire two hundred men, but that is what was connected with me.

Q. You moved about an average of two tons a week?

A. Along about two tons a day.

Q. Two tons a day?

A. You mean of supplies?

Q. Up and down the river.

A. I meant what I put through, what dirt I put through. No, wouldn't probably go up more than twice in a month.

Q. That would be something like twenty-four trips a year?

A. Yes.

Q. You would carry how much during those twenty-four trips?

A. One of those boats would hold about a thousand pounds, I guess.

Q. Then you would say that you probably carried on the river there something like twenty-four thousand pounds a year?

A. Yes.

Q. For three years be about seventy-odd thousand pounds of freight that you carried?

A. Yes.

Q. What?

A. Yes, that would be about right, I think."

I find that Raplee's statement that he "wouldn't probably go up more than twice a month" did not refer to boat trips but to his trips from Mexican Hat to Bluff overland. I find also that he did not make 24 boat trips down stream and did not carry 24,000 pounds a year down the River in boats; for he had previously testified that his boat trips were usually made in highwater and only a few in low water stages. He testified that during his three years, probably 15-20 boats similar to his were built at Bluff for the miners, mostly carrying 500-600 pounds, and that these boats were generally poled down stream rather than rowed, and at times boats had to be lined round or through the rapids.

In 1894, March, Bert Loper went overland to the foot of Honaker Trail, in a party of six and placer mined. In July, 1894, his party went down the River from Bluff to Johns Canyon (51 miles) at a very low stage of water, in 16 feet rowboats with supplies. In August, 1894, with two other men, he went down from Honaker's Trail to Copper Canyon (50 miles) and back, in a 16 feet rowboat, with a roll of bedding "and very little grub"; they encountered a rapid at the mouth of Grand Gulch where they had to

take the boat out of the River and work it through the rocks. In returning upstream, he dragged the boat and did not row. In May, 1895, Loper left the canyon and returned to Bluff overland. He came back to the River in 1921 as boatman for the Government Survey party headed by Mr. Trimble.

In 1894, Ezekiel Johnson went from Flagstaff to the River at Copper Canyon, and Gable Camp; he saw a boat 25-35 feet long and 11-12 feet wide, (photograph, Defendant's Exhibit 16) about a mile upstream which was later taken downstream to Gable Camp (5 miles); on this boat were a boiler and engine weighing 8,000-10,000 pounds. At Zahn's Camp where he placered on and off for four years, he used a boat up and down the stream for a mile or two. At Honaker's Trail, to which he went in 1895 and 1896 overland from Bluff, he used on the River a small raft for a few miles up and down to take supplies in the course of working the bars, the raft being towed on the upstream trips. He has since acted as guide to tourist parties in this region and has crossed the San Juan at four or five places with his parties on horseback.

In 1894, Joseph H. Woods placer mined for John Bryce in June and July, from Mexican Hat down to Honaker Trail (21.5 miles), in three boats, 14 feet long with a 7 feet beam were used, each drawing 10 inches and carrying 1,000-1,500 pounds of supplies and equipment, sluice boxes, plates, etc.; on the trip down, he encountered rapids but had no difficulty with them. He saw 8 or 10 other parties of miners go down in similar boats (generally four men to a boat). In this same year, 1894, John P. Hite at Hite on the Colorado River saw some miners who had come down the San Juan River and up the Colorado in boats. In 1896, December, Louis M. Chaffin, a Colorado miner, went overland from Hite to Gable Camp on the San Juan and prospected down to the mouth (42 miles). In 1900, October, Frank Bennett, the Colorado River miner, went down that River to the mouth of the San Juan and 12 miles up the San Juan rowing and towing.

In 1904, Frank H. Karnell placer mined at Soda Basin, near Mexican Hat, using a boat 16 feet long with a 4-5 feet beam, drawing 7-8 inches; he worked the bars up and down

stream for four or five months (including August). He sometimes rowed and poled the boat upstream from 1 to 5 miles. In the spring of 1905, he built at Bluff another boat, 16 feet long with a 7 feet beam, drawing 8-10 inches, and took 1,000 pounds of supplies from Bluff to Mexican Hat; he remained until March 1906, using his boat to move his camp up or down the River. In March, 1906, he and another man built two more boats, 18 by 7, and 16 by 5 feet, and loading the three boats with supplies, camp outfits, rockers, wheelbarrows, etc., went down the River, at a low stage of water in March and early April, to Mendenhall Gooseneck (23 miles), and after working the bars continued for 14 miles further down to Honaker's Trail; the boats continued on for 22 miles further to Slickhorn Canyon; later in the fall, Karnell went from a point between Slickhorn Canyon and Grand Gulch (4 miles) down to Grand Gulch. In 1909, he took 700-800 pounds of supplies down the River from Bluff to Mexican Hat, and has made other trips on this River both up and down between Chinle Creek and Honaker's Trail, poling, rowing, and towing the boat when going upstream; he made the trips usually in the fall and winter months and early spring.

There have been oil developments and operations in the vicinity of this River, but no use of the River by boats seems to have been made in connection with oil, as all supplies, equipment, etc., were taken overland by roads and trails. Drilling for oil was first begun in 1907 in the plateau immediately north of the River and in the river bed 20 miles below Bluff; and as a gusher was found, other wells were rapidly sunk, from 1908 to 1911, at which latter date there were 27 drilling rigs in the field. A small town was established near Mexican Hat about 15 miles below Bluff by the road. Between 1911 and 1922, little drilling was done, but renewed activity took place in 1923-1924. Little has been done in the past three years. The oil taken out has been consumed chiefly locally. A Government report by Hugh D. Miser (Bulletin 751 D supra), in 1924, stated that: "Thorough drilling in the San Juan Canyon country may reveal commercial quantities of oil" but that there were unfavorable geologic conditions present and that drilling and marketing in this remote region is expensive.

Government engineers used boats on the River in connection with surveys made in 1921 and 1924; other Government surveys have been made of oil and geological conditions (see list in Complainant's Exhibit 56, p. 3 notes), but no evidence has been given of use of boats upon them. The 1921 Survey had for its object the mapping of the River (which had never before been accurately mapped) and a study of it in connection with proposed power and reservoir projects. Information as to River conditions at the time of this survey was given in Water Supply Paper 538 (Complainant's Exhibit 56) and also by members of the surveying party who testified in this suit (Kelly W. Trimble, Hugh D. Miser, Robert N. Allen, Hugh H. Hyde, Henry E. Blake and Bert Loper). This party left Bluff, July 18, 1921, and reached the mouth of the River, October 3, 1921. It used two boats (hauled overland from the town of Green River, Utah), 16 feet long with a 4 feet beam, drawing 1 foot (see photographs Complainant's Exhibit 283, 288, 289, 304, 307). Supplies to this party were taken overland and brought down to the River bank by the various trails down the side canyons or gulches.

Between September 1924 and May 1925, a Government Land Survey party was surveying land adjacent to parts of the River and meandering its bed, as testified to by Charles F. Moore and K. D. Williams. This party used a boat to go down and up the stream for distances of 3-4 miles in the meander work. Supplies were taken overland to the points on the River where the party was operating and were occasionally taken down the River in the boat from the place where the supplies were brought to the bank—once from Nokai Creek to Spencer Camp (6 miles).

## Impediments to Navigation of the San Juan River

### (a) *Silt and Sandbars.*

What I have stated *supra* p. 81 as to silt and sediment in the Green, Grand, and Colorado Rivers is applicable to the San Juan, which carries a greater load than the first two, and less than the latter below the mouth of the San Juan. The great quantities of sand, mud, stones, and boulders which are carried by the San Juan are not only brought

down from the sections of the River in Colorado and New Mexico, but are also constantly being contributed by the windstorms over the canyon rims from the plateau as well as by the numerous tributary creeks and washes. Owing to the steep gradient between Chinle Creek and Moonlight Creek (67½ miles) averaging over 8 feet per mile, the deposits of sand are comparatively small and little difficulty of navigation is produced by sandbars. At Clay Hill Crossing, Piute Farms, and vicinity, the River has spread out into the more open country and the sand has been deposited to a greater extent, so that the channel is shallow and shifting. Even in this region, however, the gradient is 5 feet to the mile (twice and a half the usual gradient of either the Green, Grand, or Colorado). The width of the River and sand deposits here have increased since 1896, and the depth of the channel has diminished, owing probably to increased bulk of silt, sand, and stones brought in by tributary streams. While these sandbars in this region and at a few other points have caused some impediment to travel, I do not find that this has been sufficient in itself to render the River non-navigable.

(b) *Depth and Discharge*

From charts or graphs prepared by Government engineers of the figures of depths and discharges at the Bluff gauging station located at Goodridge Bridge (1), it appears that on an average over a series of years, the mean depths at that point are as follows (with reasonable allowance of error):

| | |
|---|---|
| Between 1 and 2 feet | 167 days |
| Between 2 and 3 feet | 52 days |
| Between 3 and 4 feet | 38 days |
| Between 4 and 5 feet | 26 days |
| Between 5 and 7 feet | 46 days |
| Over 7 feet | 36 days |

It thus appears that for 219 days there is a depth of under 3 feet and for 146 days a depth of over 3 feet.

---

(1) Complainant's Exhibit 82 A, Plate 4, Plate 9; Complainant's Exhibit 82 A, Plate 6.

With these figures as to depths, the following figures as to daily discharge during the years as an average may be taken into consideration (with a reasonable allowance of error) (2):

| | |
|---|---|
| Less than 1,000 second feet | 81 days |
| From 1,000 to 2,000 | 90 days |
| From 2,000 to 4,200 | 66 days |
| From 4,200 to 6,000 | 30 days |
| From 6,000 to 10,000 | 36 days |
| Over 10,000 | 42 days |

It thus appears that for 171 days in the year, there is a discharge of less than 2,000 second-feet, and for 194 days of over 2,000 second-feet (and 128 days of over 4,200 second-feet).

The San Juan is narrower than the other Rivers and its width varies considerably at different points, so that these figures are not so accurately applicable throughout its length as are the similar figures taken at the ganging stations on the Green and Grand Rivers. Widths (approximate, as scaled by the Master on the maps contained in Complainant's Exhibit 10) are as follows: at its mouth, the width is about 300 feet; it averages 200-300 feet up to Mile 37 near Spencer Camp where it widens on an average to 400-500 feet; at Mile 42 (Zahn's Camp) it is 600 feet; at Mile 33 (Nokai Canyon), 300 feet; up to Mile 52, 400-500 feet; at Piute Farms at the widest place, it is about 3,000 feet; at Mile 57.5 (Clay Hill Crossing) its narrowest place is about 250 feet; above Clay Hill Crossing, 100-200 feet; at Slickhorn Canyon (Mile 75) 150 feet; at John's Canyon and at Honaker Trail (Mile 96.5) and up to Goodridge Bridge, 150-200 feet; at the Narrows (Mile 123-124) and from there up to Chinle Creek about 50-150 feet.(1)

Subject to the limited application of discharge figures owing to variations of River widths, it appears from the chart or graph that with a discharge of 2,000 and less

---

(1) Miser in his Report of the 1921 Survey (Complainant's Exhibit 56, p. 52) states that: "The channel of the River in the box canyons is generally 150 to 300 feet wide, but at a few places near Goodridge and Mexican Hat, it narrows to a width of 50 to 75 feet."

second-feet for 171 days, there is a depth of between 1 and 2 feet for 167 days; and it may be accordingly assumed that at Goodridge Bridge a discharge of about 2,000 second-feet will give a depth of about 2 feet. Since the River is narrower at points below Goodridge Bridge, the depth for a discharge of 2,000 second-feet is probably between 2 and 3 feet at such points. These Government figures as to depths check up fairly well with the testimony by witnesses. Most of such testimony, however, comes from men who based their estimates of depths not on soundings or tests made from boats used on the River, but on observations made when crossing the stream on foot or on horseback. For this reason, there are few estimates as to depths of the stream in the canyons or at any place other than recognized crossings or fords.

On the whole evidence, I find for a period of time equivalent to about five months in the year, there is a depth of no more than 2 feet, and that at other times there are places where the depth is less than 2 feet, where sand has to a greater or less extent filled the River, such as at Clay Hill Crossing, at the mouth of Nokai Canyon, at Piute Farms, and from there down to Spencer Camp. The River at Piute Farms, in 1921, was over 3,000 feet wide, with no practicable channel owing to the sand accumulations. It is evident from the testimony that this width had increased greatly since 1896 (the year of the admission of Utah as a State); but even before 1896, when the River at this point was about 300 feet wide (as testified by Bert Loper) there was little depth at low water, for Loper was obliged, in August, 1894, to drag his boat along. These places where the water is less than 2 feet in depth are, however, not characteristic of the River, in general. The River bed has never been entirely dry except in one year, so far as witnesses could recollect.

The Government emphasizes again the element of variations in flow and rapidity of variation; and I append in Appendix A of this Report figures presented by it giving averages of discharge of each month over a period of years. These figures are subject to the same qualifications expressed by me as to Appendix A figures (*supra*, p. 103). The Government cites selected examples of rapidity of variation of flow in second-feet (Complainant's Exhibit 96, 79):

July 25, 1915, from 6170 to 21,900 July 28;
Sept. 24, 1915, from 380 to 5,380 Sept. 28;
June 27, 1927, from 6130 to 52,000 June 20;
Sept. 6, 1927, from 1040 to 32,900 Sept. 10.

There is evidence of an observed rise of 18.2 feet in 20 hours (Record 3824), and of 30 feet in one night (Record 4472).

I find that in the past forty-five years, there have been three great floods, at intervals of about twelve years. Temporary floods due to cloudbursts occur each year, generally in September and often in July and August, at which times very large volumes of water pour down the bed with great suddenness. Miser, in his Report of the 1921 Survey (Complainant's Exhibit 56, p. 16) states that between July 18 and October 2, 1921 "rain from 38 or more thunderstorms fell on me. * * * Perhaps as many more passed by less than 2 or 3 miles away. These storms occurred in 10 days in July, 13 in August, 1 in September and 1 in October." During this trip, the highest temporary flood noted was 7 feet above low water stage; but there was evidence of such floods of 20 feet above low water. The average rainfall for the whole year in the canyon and adjacent country is about 5 inches. The narrowness of this River at several places in the box canyons is such as to enhance the effect of floods and increase the likelihood of danger to persons travelling at times of any sudden increase in the volume of stream discharge. (See, for instance testimony of Miser as to conditions at The Narrows, Record 3735.)

(c) *Velocities, Gradient, and Rapids.*

The duration of maximum velocities as found at the gauging station at Goodridge Bridge, average over a period of years, as shown on the plat or graph in Complainant's Exhibit 82 A, Plate 7 (with reasonable allowance for error) are as follows:

| | |
|---|---|
| From 2 to 3 miles per hour | for 12 days in the year. |
| 3 to 4 miles | 45 days |
| 4 to 5 miles | 70 days |
| 5 to 5½ miles | 40 days |
| 5½ to 6 miles | 37 days |
| 6 to 7 miles | 78 days |
| Over 7 miles | 83 days |

The velocities thus shown are not fairly representative of velocities, in general, on this River; for the section where the gauging station is located has a gradient or slope of rather less than the average. It is apparent that the San Juan River differs greatly from the Green River and the Grand River, in velocity of current. On the Green River (*supra*, p. 105), there were only 80 days in the year and on the Grand River only 78 days, in which the velocity was over 4 miles per hour; whereas on the San Juan River, at Goodridge Bridge, there are 308 days in the years in which the velocity exceeds 4 miles per hour. That the velocity of the San Juan River must of necessity be much greater than that of the other Rivers may be seen from the fact that the average slope of its flattest sections is greater than that of most of the rapid water stretches of the Colorado River through Glen Canyon (Complainant's Exhibit 80).

Thus, the elevation at Chinle Creek is 4213 feet and at the mouth of the San Juan 3257 feet, a total drop of 956 feet in 133 miles, or a gradient of about 7 feet per mile. In this distance there are, however, many stretches where the gradient is in excess of 7 feet and other stretches where it is less; but the gradient rarely, if ever, drops below 5 feet per mile. From the profile maps, made by the 1921 Survey party (Complainant's Exhibit 10), I constitute the following table of gradients:

From Chinle Creek (4213) to Goodridge Bridge, Mile 113.5 (4045), a drop of 168 feet in 20 miles or 8 feet per mile.

From Goodridge Bridge, Mile 113.5 (4045) to John's Canyon, Mile 82.5 (3815), a drop of 230 feet in 31 miles or over 7½ feet per mile.

From John's Canyon, Mile 82.5 (3815) to Slickhorn Creek, Mile 75 (3755), a drop of 60 feet in 7½ miles or 8 feet per mile.

From Slickhorn Creek, Mile 75, (3755) to Moonlight Creek, Mile 65.5 (3657), a drop of 98 feet in 9½ miles or 10 feet per mile.

From Grand Gulch, Mile 71 (3705) to Moonlight Creek, Mile 65.5 (3657), a drop of 48 feet in 6 miles or 8 feet per mile.

From Moonlight Creek, Mile 65.5 (3657) to Nokai Creek, Mile 44 (3550), a drop of 107 feet in 21½ miles or 5 feet per mile.

From Nokai Creek, Mile 44 (3550) to the head of Piute Creek Rapids, Mile 22 (3434), a drop of 116 feet in 22 miles or 5 feet per mile.

From the foot of Piute Creek Rapids, Mile 20 (3396) to the head of the rapids at Mile 11.5 (3340), a drop of 56 feet in 8 miles or 7 feet per mile.

From the head to the foot of the Rapids at Miles 11.5—10.6 (3340 to 3315), a drop of 25 feet in less than a mile.

From foot of the rapids at Mile 11.4-10.6 (3315) to the mouth of the River (3257), a drop of 58 feet in 10½ miles or 5½ feet per mile.

The above figures correspond, in a general way, with the table of gradients presented by Miser in his Report of the 1921 Survey (Complainant's Exhibit 56, p. 48).

On the basis of the maps and profiles of this 1921 Survey, W. G. Hoyt, Government engineer, classified the current of the River as follows (Complainant's Exhibit 80). He found no "quiet water." He classifies 128.98 miles of the River as "rapid water", in 17 stretches having respectively gradients as follows: (beginning at Chinle Creek) 8.7 feet per mile for a distance of 9 miles; 8.5; 7.03 feet for a distance of about 8 miles; 7.2; 7.57; 6.64; 7.4; 9.5; 6.9; 9.34; 5.5. feet for a distance of about 49 miles; 6.3; 6.8; 6.1; 6.4; 5.26 feet and 5.54 feet for a distance of about 11 miles down to the mouth. He classified as "rapids" 4.02 miles of the River and estimated that there were 16 rapids. It appears to me that in several instances he separates into distinct rapids that which another person might term one rapid; and I believe that 12 rapids is a more accurate number. Hoyt figures a drop of 117 feet in his 16 rapids, i. e., 8.5 feet per rapid and a drop of 839 feet in the 128.98 mile stretch of rapid water. He locates the rapids as follows (Complainant's Exhibit 80, p. 21), though I find it more convenient to present them from Chinle Creek down the River, rather than in the order given by him which is from the mouth up the River (mileage being reckoned from the mouth):

(16) At Mile 123.95 (above the Narrows) a 9 feet drop in .20 mile or 45 feet per mile;

(15) At Mile 121.87 (above Lime Creek) a 3 feet drop in .08 mile or 37.5 feet per mile;

(14) At Mile 113.80 (Gypsum Creek) a 4 feet drop in .10 mile or 40 feet per mile;

(13) At Mile 88.57 (below Honaker Trail) a 10 feet drop in .55 mile or 18.2 feet per mile;
(12) At Mile 82.26 (below Johns Canyon) a 4 feet drop in .10 mile or 40 feet per mile;
(11) At Mile 79.60 (above Slickhorn Creek) a 4 feet drop in .10 mile or 40 feet per mile;
(10) At Mile 77.53 (above Slickhorn Creek) a 3 feet drop in .07 mile or 42.9 feet per mile;
( 9) At Mile 77.24 (above Slickhorn Creek) a 3 feet drop in .08 mile or 37.5 feet per mile;
( 8) At Mile 73.76 (below Slickhorn Creek) a 17 feet drop in 1.01 miles or 16.8 feet per mile;
( 7) At Mile 70.37 (below Grand Gulch) a 3 feet drop in .07 miles or 42.9 feet per mile.
( 6) At Mile 21.26 (at Piute Creek) a 15 feet drop in .38 mile or 39.5 feet per mile;
( 5) At Mile 20.74 a 9 feet drop in .36 mile or 25 feet per mile;
( 4) At Mile 20.02 a 7 feet drop in .28 mile or 25 feet per mile;
( 3) At Mile 14.86 (Wilson Creek) a 4 feet drop in .08 mile or 50 feet per mile;
( 2) At Mile 11.40 a 13 feet drop in .18 mile or 72.3 feet per mile;
( 1) At Mile 10.64 a 9 feet drop in .38 mile or 23.7 feet per mile.

(No rapid from the latter point down to the mouth of the River).

As to these 16 rapids found by Hoyt, it may be said that, since definitions given by him and others require presence of rocks and waves as necessary to constitute a stretch of water as a rapid, and since such presence cannot always be ascertained from maps or profiles, it is probable that several of these "rapids" were, in actual navigation, only "rapid water". Miser in his report of the 1921 Survey states (p. 47-48) that in the 10.75 miles down from Chinle Creek, there were "several small rapids of which the largest, with a fall of 8 feet, runs over a boulder bar at the mouth of a southern tributary half a mile above The Narrows (Rapid No. 16 of Hoyt). At Gypsum Creek, he reports a rapid with a fall of 3.5 feet (Rapid No. 14 of Hoyt). "From a point 1.5 miles above the foot of the Honaker

Trail to the mouth of Slickhorn Gulch * * * numerous small rapids, none of which has a fall greater than about 4 feet. The part of the River extending from the mouth of Slickhorn Gulch to a point 3 miles below the mouth of Grand Gulch is especially swift yet it is marked by only one or two rapids one of which is at the mouth of Slickhorn Gulch." He reports in the 1.6 miles from the mouth of Piute Creek about five rapids "with a total fall of 35 feet of which a little more than 25 feet is in the first mile." And he reports Thirteen Foot Rapids at 11½ miles up from the mouth whose fall is about 24 feet. (It is to be noted that the fall given by Miser is the actual drop per rapid and not the rate of drop per mile.) In his testimony he detailed 37 rapids with their locations (Record 3743-3744); and R. N. Allen of the same survey party testified to 30 rapids. Miser's definition of a "rapid" is "an especially swift stretch of water where there is a perceptible fall and also where the water is fairly rough, much rougher than in the adjacent portions of the stream" (Record 3740); he did not use the term "riffle" but included in "rapid" everything that is "worse than real swift water".

I find that, in 1896, water conditions existed which should be termed "rapids" at the following points at least, viz. at the Narrows (about Mile 124), at Gypsum Creek (Mile 113.80), above at or below Slickhorn Creek (Miles 79, 77, 73) at Grand Gulch (Mile 70), at Piute Creek (Miles 21, 20), at Thirteen-Foot Rapid (Miles 11, 10). The actual drop at these points varied from 3 to 17 feet and from a drop of 16 feet per mile to a drop of 72 feet per mile. At other points there were conditions which might or might not be described as rapids, according to the witness and according to the time of year when they were seen; but even at these other places, the actual drop ranged from 3 to 9 feet and from 18 to 40 feet per mile.

---

* For photographs of Rapids in San Juan River, see Complainant's Exhibits 288, 289, rapid at Mile 130.8; Complainant's Exhibit 11 E, pp. 2, 3, 7, 14, 15, 40, 41 rapids at Miles 118.5, 92.5, 77-78, and at Piute Creek; Complainant's Exhibits 326, 327, 343, 376, 382, 383, rapids at Mile 77-78, Slickhorn Gulch, below Clay Hill Crossing, below Piute Canyon, "Cha" Canyon.

The amount of impediment to navigation occasioned by these rapids at a low stage of water has been described by Miser and other members of the 1921 Survey party in their testimony, and in substantially the same manner by Miser in his report from which I quote (pp. 50-52) (and it is to be noted that the rapids will naturally create more of an impediment at high water, though they may be reduced in number and though their depth may be increased).

"Most of the rapids are produced by boulder bars, at the mouths of side canyons. The bars are composed of boulders as much as 18 feet in their longest dimension that have been brought to the River by the torrential streams than down the side canyons. The bars attain a width and length of several hundred feet and are highest next to the mouths of the side canyons. They not only cause the river to flow against the opposite canyon wall, but some of them extend entirely across the main canyon. The rapids over such bars are known as boulder rapids. * * * Others occur where the channel runs between close canyon walls, as it does at the Goodridge Bridge and at The Narrows and also where rock ledges reach partly across the channel. Numerous small rapids are caused by the impingement of the main current against the canyon wall and by the consequent narrowing of the current next to the place of greatest impingement. * * * The boats of the Trimble expedition were run through most of the rapids. In shooting the worst ones Loper, the boatman, was the only member of the party to stay in the boats; the other men walked along the banks around such rapids. The loaded boats were nosed one at a time through a few rapids by the boatmen, who in wading held on to the bow and guided it downstream ahead of him. Both the boats and the camp equipment were portaged around the Thirteen-Foot Rapid (at Mile 10-11). The equipment was portaged around a rapid 3 miles above the mouth of Slickhorn Gulch (at Mile 77) and then the boats were run empty through the rapid. The equipment was portaged around the first and second rapids at the mouth of Pinte Canyon (at Mile 20-21); the empty boats were nosed through the first rapid but were run through the next. The loaded boats were run through a small rapid half a mile above the mouth of Johns Canyon at Mile 82-83, but one of the boats contain-

ing two members of the party not only narrowly missed striking the canyon wall but struck a boulder and was burst on one side from bow to stern. * * *"

There was testimony that miners using this River occasionally were obliged to "line" their boats around or through the rapids. Frank H. Karnell testified to a rather remarkable method of running rapids (Record 4468, stating that sometimes "it was necessary for me to strip and act as a rudder to the boat and shoot the rapids; in one or two places the other men would catch the boats and hold them below, after I got through." W. E. Mendenhall, an old river-man who appeared as a witness defined rapids as follows (Record 3453: "a rapid is rough water, more or less dangerous, filled with large rocks, water running down very rapidly and rough"; and he testified to the presence of rapids in the upper canyon about 8 or 10 miles below Comb Wash (Record 3457). "It is pretty swift through these canyons. * * * These rapids occurred quite frequently."

(a) *Sandwaves.*

The condition known as "sandwaves", a phenomenon peculiar to the San Juan and the Colorado Rivers and not found on other rivers, has been considered briefly, *supra*, pp. 140-141. A somewhat more detailed description of these sandwaves is required in connection with the San Juan; and the following is taken from a Government Report (1):

"On the wide, shallow sections of San Juan River and waves may usually be seen below the riffles at medium stages. In the deeper sections, they appear at their best development on rapidly rising stages. * * * The usual length of the sand waves, crest to crest, on the deeper sections of the river is 15 to 20 feet, and the height, trough to crest, is about 3 feet. However, waves of a height of at

(1) "The Measurement of Silt-Laden Streams," by Raymond C. Pierce in Water Supply Paper 400, Complainant's Exhibit No. 59; Miser's Report, Water Supply Paper, 538, Complainant's Exhibit 56, pp. 52-58.

least 6 feet were observed. The sand waves are not continuous, but follow a rhythmic movement. Their appearance, as seen on the lower San Juan, is as follows: At one moment the stream is running smoothly for a distance of perhaps several hundred yards. Then suddenly a number of waves, usually from 6 to 10, appear. They reach their full size in a few seconds, flow for perhaps two or three minutes, then suddenly disappear. Often, for perhaps half a minute before disappearing, the crests of the waves go through a combing movement, accompanied by a roaring sound. On first appearance it seems that the wave forms occupy fixed positions, but by watching them closely, it is seen that they move slowly upstream. In the narrow parts of the stream the waves may reach nearly the width of the river, but in the wider parts they occupy smaller proportional widths. Usually they are at right angles to the axis of the stream, but at some places, particularly in the wider parts of the river, they may suddenly assume a diagonal position, moving rather rapidly across the stream in the direction toward which the upstream side of the wave has turned."

Miser in his report of the 1921 survey gives the following description (1):

"Waves of a type that was especially conspicuous during flood stages are commonly known as 'sandwaves'. They resemble those thrown up by a stern-wheel river steamboat. They attain a maximum observed height of 6 or 7 feet and occur as a series of parallel waves at right angles to the channel, though on one occasion they were observed to extend diagonally across the channel. Such a series of waves starts at the downstream end of a swift stretch of water and travels slowly upstream to the head of the stretch. Each wave gradually increases in height and is accompanied at its climax by a breaking toward the upstream side. This process of breaking is known as combing and is accompanied by a roaring noise. Such a noise is continuous during the entire upstream advance of the

(1) For photographs of sandwaves, see Complainant's Exhibits 314, 315, 316, 317, 318, 404; Exhibit 11 E, pp. 14, 25, 38.

waves, for a few to several waves are always breaking at the same time. The current is somewhat checked by the waves, but below them, it picks up speed and is comparatively free from waves. No sooner has one series of waves died out upstream than a new series appears downstream and begins its upstream advance. The sand waves were so high and rough when the river was 2 feet or more above a normal stage that the Trimble party then stayed off the river, because the boats were open-topped and had no watertight compartments. That rowing under such circumstances is precarious was proved by experience on one occasion. * * * The sand waves take their name from the fact that sand forms a large part of the load of debris transported by the river along its bed at such times. They are produced by a peculiar method by which the debris is transported."

Walter E. Mendenhall, an old riverman, testified (Record 3509, 3512) that "when the river has run for a while at normal stage, the sandwaves more or less subside; it is only in the flood periods they are most active, either the summer or spring floods; they are not as abundant or as marked in the spring floods as in the summer floods." "We generally work to get along the outside edge of the waves, where the water would be some shallower * * * through any rough water we always backed down, stern on."

It is clear from the testimony, that by reason of the higher velocity of the current, the steep gradient of the River bed, the greater narrowness of the River in many places in box canyons, combined with the sudden floods which occur, sandwaves on this River constitute a much greater danger and impediment to navigation than on the other Rivers and render it less practicable to navigate commercially.

### Commerce and Navigability

So far as testified to, only one man, Walter E. Mendenhall, (other than the Government survey party of 1921) has ever gone in a boat the length of the River involved in this case, i. e., from Chinle Creek to the mouth; though there is hearsay evidence that there were two others who

did so (Goodridge, an oil prospector in 1882, and Nathaniel Galloway, a trapper, in unidentified years). The only evidence of any commercial use of the River is found in testimony from various witnesses that some of the placer miners went down the River, generally from the town of Bluff, in small rowboats with their supplies; but the testimony as to even this use is meagre. Mendenhall, Loper, Karnell, and Chaffee are practically the only witnesses who personally used boats for more than a distance of 20 miles; Raplee, Johnson, and Woods testified to using the River with boats for distances of 5-20 miles. None of the other miners who may have used boats have appeared as witnesses, so that there is no evidence as to the ease or difficulty with which they navigated or the distances down the stream to which they went or the times of year when they used their boats. That they must have met with obstacles is evident from the testimony of Loper as to the swift water and rapids which he met on his trips, and from the testimony of Raplee to the effect that even in the stretch of River with which he was familiar, i. e., from Chinle Creek down to Mexican Hat, boats had to be "lined" at times at the rapids. In the absence of details as to trips of miners who did not testify, it is impossible for me to find that such trips were or were not evidence of a susceptibility of this River for commercial use. Those few witnesses who testified as to personal use of boats present few details as to the months of the year when they made trips. Raplee testified that his boat trips were usually made on highwater and only a few in low-water stages. Loper testified as to specific trips in July-August and made statements as to use of the River through the winter but gave few details. Karnell testified to trips in the spring, in March, and December, and made a general statement that he had used boats in the fall, winter, and early spring. Chaffin testified to a trip in December. From this testimony, I find it impossible to make a finding as to the months in which this River is susceptible of navigation. In other words, the testimony is too meagre to establish affirmatively susceptibility of commercial use. None of the miners except Loper ever used this River to go upstream for any but short distances; whenever the miners wished to leave the River to return to Bluff or to other points upstream or north or east of the San Juan, they went over-

land along the trails or roads along the rim of the plateau north or south of the River. The only evidence of use of the River by boats other than by the miners bringing down with them their supplies, is the use by persons ferrying across for purposes of trade with the Navajos or otherwise; and the use of a large boat at Zahn's Camp as to which no evidence has been given sufficient to explain the extent or purpose of the use. Except the miners' supplies, no articles of commerce have ever been transported down or up the River. No keel boats or motor boats or outboard-motor boats have been used upon it. No tourists or other persons have been transported for hire or otherwise. No boats have ascended except for short distances, and boats ascending must generally be towed, dragged or pulled up.

Apart from the insufficiency of the evidence as to actual use, the physical characteristics of this River are such as, in my opinion, make it impossible that boats could be navigated practically or safely for commercial purposes. The evidence as to depth makes it clear that boats with a draft of two feet could navigate not more than half the year, and probably for a less portion of the year. The number of difficult rapids, with steep and rapid drops, (whether that number be 37 as estimated by Miser or 30 as estimated by Allen, or 16 or 12 as by Hoyt) make it impossible, in my opinion, for any boat to navigate safely unless conducted with great caution and by expert boatmen; and even then boats must ordinarily be "lined" or portaged or their cargoes portaged at several places. These rapids occur at intervals throughout the entire stretch of the River. Moreover, the general gradient or slope of the River bed, viz. an average of 7 feet per mile, with long stretches of 8 feet per mile, is so steep as to make navigation difficult and impracticable. Out of the total of 133 miles, there is practically no stretch of River of any considerable length where the gradient is less than 5 feet per mile (though there are stretches of 49 and 11 miles where it is about 5½ feet per mile). In other words, the gradient of the flattest stretch of this River is twice and a half the gradient of the Green River and of the Grand River; and there are only two places on the Colorado River from Cataract Canyon down to the Utah-Arizona boundary where the fall per mile is over 5 feet per mile and these places are Trachyte rapid and Tickaboo rapid. Accompanying such gra-

dients, there are naturally high velocities, far exceeding the velocities on the Green, Grand, or Colorado Rivers in the sections involved in this suit. Such velocities, combined with the narrowness of the River and with the fact that it flows in many portions through box canyons with no opportunity to spread out in case of sudden floods, unquestionably make navigation a matter of hazard to boats and cargoes, even if not to life and limb. The gradient of the bed, the velocity of the current, and the narrowness of the River make the presence of the phenomenon known as "sandwaves" a greater risk and danger to navigation than they are on the Colorado River where the conditions are different.

## Special Master's Conclusions as to Navigability of the San Juan River.

I am of the opinion and accordingly find as follows:

(1) The San Juan River from the mouth of Chinle Creek at Mile 133 above the confluence of the San Juan River and the Colorado River down to the mouth of the San Juan River at such confluence was, on January 4, 1896, not capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water.

(2) The San Juan River, on January 4, 1896, was in fact and in law a non-navigable water of the State of Utah from the mouth of Chinle Creek at Mile 133 above the confluence of the San Juan River and the Colorado River down to the mouth of the San Juan River at such confluence; and in consequence title to the bed of the River between such points was on that date vested in The United States of America, except so far as the United States of America may have theretofore made grants of said bed.

## Summary of Findings and Conclusions as to Law and Fact.

I find as follows:

(1) This Court has jurisdiction of this suit, as a controversy between the United States and a State.

(2) The facts admitted by the pleadings and established by the evidence present grounds for a suit in equity of which this Court has jurisdiction.

(3) The Grand River, on January 4, 1896, was a river of the State of Utah distinct and separate from the Colorado River, and so recognized by the Act of Congress of July 25, 1921 (42 Statutes at Large 146, c. 52); and the respective rights of the United States of America and of the State of Utah as to said River are to be determined as of such a distinct and separate river, irrespective of the fact that in the bill of complaint it is described as a portion of the Colorado River.

(4) (a) The Green River (so far as involved in this suit) was, on January 4, 1896, capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water. I find that its susceptibility of use as a highway for commerce was not confined to exceptional conditions or short periods of temporary highwater, but that during at least nine months of each year the River ordinarily was susceptible of such use as a highway for commerce.

(b) The Green River, on January 4, 1896, was in fact and in law a navigable water of the State of Utah from a point where the said River crosses the township line between Townships 23 and 24 South, Range 17 East, Salt Lake Base and Meridian down to its confluence with the Grand River; and in consequence title to the bed of the River between such points vested on that date in the State of Utah, except so far as the United States of America may have theretofore made grants of said bed.

(5) (a) The Grand River (so far as involved in this suit) was, on January 4, 1896, capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water. I find that its susceptibility of use as a highway for commerce was not confined to exceptional conditions or short periods of temporary highwater, but that during at least nine months of each year, the River ordinarily was susceptible of such use as a highway for commerce.

(b) The Grand River, on January 4, 1896, was in fact and in law a navigable water of the State of Utah from the mouth of Castle Creek down to the confluence of the Grand River with the Green River; and in consequence title to the bed of the River between such points vested on that date in the State of Utah, except so far as the United States of America may have theretofore made grants of said bed.

(6) (a) The Colorado River south from the confluence of the Green River with the Grand River at Mile 216.5 above Lees Ferry down to the end of Cataract Canyon at Mile 176 above Lees Ferry, was, on January 4, 1896, not capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water.

(b) The Colorado River, on January 4, 1896, was in fact and in law a non-navigable water of the State of Utah from the confluence of the Green River with the Grand River at Mile 216.5 above Lees Ferry down to the end of Cataract Canyon at Mile 176 above Lees Ferry; and in consequence title to the bed of the River between such points was vested on that date in the United States of America, except so far as the United States of America may have theretofore made grants of said bed.

(7) (a) The Colorado River from Mile 176 above Lees Ferry south to the Utah-Arizona boundary line was, on January 4, 1896, capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water. I find that its susceptibility of use as a highway for commerce was not confined to exceptional conditions or short periods of temporary highwater, but that during at least nine months of each year the River ordinarily was susceptible of such use as a highway for commerce.

(b) The Colorado River, on January 4, 1896, was in fact and in law a navigable water of the State of Utah from Mile 176 above Lees Ferry south to the Utah-Arizona boundary line; and in consequence title to the bed of the River between such points vested on that date in the State

of Utah, except so far as the United States of America may have theretofore made grants of said bed.

(8) (a) The San Juan River from the mouth of Chinle Creek at Mile 133 above the confluence of the San Juan River and the Colorado River down to the mouth of the San Juan River at such confluence, was, on January 4, 1896, not capable or susceptible of being used in its natural and ordinary condition as a highway for commerce over which trade and travel might be conducted in the customary mode of trade and travel on water.

(b) The San Juan River, on January 4, 1896, was in fact and in law a non-navigable water of the State of Utah from the mouth of Chinle Creek at Mile 133 above the confluence of the San Juan River and the Colorado River down to the mouth of the San Juan River at such confluence; and in consequence title to the bed of the River between such points was on that date vested in The United States of America, except so far as the United States of America may have theretofore made grants of said bed.

## Recommendations for a Decree.

I recommend that a decree be entered as follows:

(1) Dismissing the bill of complaint so far as it relates to the Green River.

(2) Dismissing the bill of complaint so far as it relates to that portion of the Colorado River which in 1896 constituted the Grand River.

(3) Dismissing the bill of complaint so far as it relates to that portion of the Colorado River from Mile 176 above Lees Ferry south to the Utah-Arizona boundary line.

(4) Decreeing that the Colorado River was, on January 4, 1896, a non-navigable water of the State of Utah from the confluence of the Green River with the Grand River at Mile 216.5 above Lees Ferry down to the end of Cataract Canyon at Mile 176 above Lees Ferry; and that title in and to the bed of the Colorado River between said points was on that date vested in the United States of America, except so far as the United States of America may have theretofore made grants of said bed; and that the State of

Utah be forever enjoined from asserting any estate, right, title, or interest in or to said river bed or any part thereof adverse to the United States of America or its grantees and from in any manner disturbing or interfering with the possession, use, and enjoyment thereof by the United States of America or its grantees.

(5) Decreeing that the San Juan River was, on January 4, 1896, a non-navigable water of the State of Utah from the mouth of Chinle Creek at Mile 133 above the confluence of the San Juan River with the Colorado River down to the mouth of the San Juan River at such confluence; and that title in and to the bed of the San Juan River between said points was on that date vested in the United States of America, except so far as the United States of America may have theretofore made grants of said bed; and that the State of Utah be forever enjoined from asserting any estate, right, title, or interest in or to said river bed or any part thereof adverse to the United States of America or its grantees, and from in any manner disturbing or interfering with the possession, use, and enjoyment thereof by the United States of America or its grantees.

(6) Providing that the United States of America shall in no wise be prevented from taking any such action in relation to said Rivers or any of them as may be necessary to protect and preserve the navigability of any navigable waters of the United States.

The counsel for the State of Utah have requested that if the Special Master shall find any or all of the Rivers to be navigable waters of the State of Utah, he shall recommend to the Court that a decree be entered ordering affirmatively that title to the bed is vested in said State. The State has filed no crossbill in this suit; but in its answer it has set forth facts which, if proved, would establish title. The prayer of the answer is that the complaint be dismissed and that defendant have such other and further relief as may to this Honorable Court seem fit and proper. If under these circumstances, and under Equity Rule 30, an affirmative decree is proper, I recommend that decree be entered that title to the beds of the Green River,

Grand River, and Colorado River from Mile 176 above Lees Ferry south to the Utah-Arizona boundary line was, on January 4, 1896, vested in the State of Utah, and is now so vested except so far as the United States of America may have theretofore made grants of said bed; and that the United States of America be forever enjoined from asserting any estate, right, title, or interest in or to said river beds or any part thereof adverse to the State of Utah or its grantees, and from in any manner disturbing or interfering with the possession, use and enjoyment thereof by the State of Utah or its grantees.

Respectfully submitted,

CHARLES WARREN,
*Special Master.*

## Appendix A

### *Stream Flow and Discharge by Months*

(As compiled by the Complainant from Water Supply Papers 538, p. 16; 380, pp. 96, 97; 617, p. 30; 418, p. 70; Complainant's Exhibits 56, 63, 65, 70; see also Complainant's Exhibit 88—all figures in the tables referring to second feet.)

| | Green River (a) | Grand River (b) | Colorado River (c) | San Juan River (d) |
|---|---|---|---|---|
| Mean | 7,600 | 9,660 | 19,500 | 4,070 |
| Maximum day | 67,300 | 73,200 | 119,000 | 51,100 |
| Minimum day | 510 | 866 | 1,000 | 199 |
| By month: | | | | |
| October: | | | | |
| Mean | 3,250 | 4,460 | 9,680 | 3,990 |
| Maximum | 12,000 | 14,200 | 30,600 | 28,300 |
| Minimum | 1,250 | 2,000 | 3,740 | 552 |
| November: | | | | |
| Mean | 2,690 | 3,510 | 8,440 | 1,340 |
| Maximum | 5,870 | 7,500 | 21,200 | 4,350 |
| Minimum | 710 | 2,290 | 5,020 | 552 |
| December: | | | | |
| Mean | 1,770 | 2,850 | 6,500 | 824 |
| Maximum | 4,820 | 4,170 | 11,800 | 1,400 |
| Minimum | 510 | 1,500 | 1,000 | 199 |

| | Green River (a) | Grand River (b) | Colorado River (c) | San Juan River (d) |
|---|---|---|---|---|
| January: | | | | |
| Mean | 1,770 | 2,550 | 5,680 | 996 |
| Maximum | 4,380 | 6,400 | 10,000 | 5,790 |
| Minimum | 930 | 1,600 | 1,500 | 350 |
| February: | | | | |
| Mean | 2,290 | 2,860 | 7,320 | 1,610 |
| Maximum | 8,640 | 8,350 | 11,300 | 4,820 |
| Minimum | 1,200 | 1,950 | 4,900 | 410 |
| March: | | | | |
| Mean | 5,070 | 3,710 | 10,300 | 2,810 |
| Maximum | 33,000 | 16,100 | 31,200 | 16,200 |
| Minimum | 1,450 | 2,050 | 6,020 | 758 |
| April: | | | | |
| Mean | 8,570 | 10,000 | 21,900 | 6,040 |
| Maximum | 24,900 | 30,900 | 49,000 | 13,900 |
| Minimum | 2,720 | 2,450 | 8,060 | 1,740 |
| May: | | | | |
| Mean | 20,700 | 27,500 | 57,600 | 9,110 |
| Maximum | 67,300 | 59,700 | 119,000 | 16,000 |
| Minimum | 4,580 | 8,560 | 19,500 | 3,910 |
| June: | | | | |
| Mean | 26,200 | 34,300 | 62,400 | 9,960 |
| Maximum | 66,700 | 73,200 | 119,000 | 51,100 |
| Minimum | 3,620 | 12,800 | 28,500 | 2,420 |
| July: | | | | |
| Mean | 11,300 | 14,000 | 27,800 | 5,610 |
| Maximum | 59,400 | 53,700 | 119,000 | 36,600 |
| Minimum | 850 | 2,870 | 6,650 | 802 |
| August: | | | | |
| Mean | 4,560 | 5,870 | 13,800 | 2,910 |
| Maximum | 19,300 | 17,300 | 64,100 | 14,500 |
| Minimum | 838 | 958 | 2,750 | 320 |
| September: | | | | |
| Mean | 3,420 | 4,210 | 12,600 | 3,620 |
| Maximum | 27,500 | 21,900 | 110,000 | 36,400 |
| Minimum | 834 | 866 | 2,290 | 380 |

(a) 1895-1897, 1905-1928; (b) 1914-1917, 1923-1928; (c) 1922-1928; (d) 1915, 1916, 1917, 1927, 1928.