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Article Summary: Brevet Major Charles W Howell's survey of the Missouri River made it possible for the Corps of Engineers to improve navigation on the upper Missouri. His journal records river depths, snags, and sand bars. He provides detailed descriptions of Omaha and Sioux City.

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AN ARMY ENGINEER ON THE MISSOURI IN 1867

Edited by LELAND R. JOHNSON

On June 24, 1867, Brevet Maj. Charles W. Howell, Corps of Engineers, a veteran Civil War combat engineer, was ordered to conduct an examination of the Missouri River from its mouth to the head of navigation to plan its improvement for the benefit of navigation. His report on this survey laid the groundwork for the operations of the Corps of Engineers on the Upper Missouri River for the improvement of navigation in the nineteenth century. Though the traffic which these improvements benefited has been called "the backbone for the economic development of portions of the Upper Missouri area," most commerce on the upper section of the river ended in the early twentieth century and Congress authorized the comprehensive development of the water resources of the region for flood control, irrigation, and other allied purposes, but not for navigation.¹

Major Howell was not the first army engineer to study and map the topography and hydrology of the Missouri Valley, for Maj. Stephen H. Long explored and mapped the region in 1819, and before the Civil War several army engineer officers explored the Missouri Valley. The Lower Missouri River was improved by the Corps of Engineers for the benefit of navigation from 1832 to 1856. These improvement operations were conducted by United States snag boats operating out of the Office of Western River Improvements, Corps of Engineers, Louisville, Kentucky. Capt. Henry Miller Shreve, the famous western steamboatman, served as superintendent of western

river improvements from 1826 to 1841, and Maj. Stephen H. Long held the same post from 1842 to 1856. But because the improvement of inland waterways by the federal government was a political issue prior to the Civil War, the improvements directed by Captain Shreve and Major Long were sporadic, funded only by intermittent appropriations by Congress. The Civil War ended this dispute, however, for afterwards the constitutionality of federally-funded waterways improvements was no longer seriously questioned. In 1866 Congress made a substantial appropriation for the improvement of rivers and harbors which greatly expanded the scope of operations designed to aid navigation, and regular appropriations have been made during the past century.²

In the Upper Missouri Valley, 1866 was a gold rush year, and the miners pouring into the region created a sudden increase in the demand for transportation facilities necessary to move the miners to the mining area and forward the supplies to sustain them. Before 1864 only six steamboats had navigated the Missouri River as far upstream as Fort Benton, Montana Territory; in 1866 and 1867 approximately seventy steamboats arrived at the port. In 1867 an estimated 10,000 persons took passage on steamboats up the Missouri, resulting in an estimated \$1,500,000 in income to steamboat companies, at an average rate of \$150 per passenger. About forty steamboats transporting over 12,000 tons of freight passed Sioux City on their way up-river before June 1, 1867, and most were bound for the head of navigation at Fort Benton.³

The large increase in commerce on the Upper Missouri in the postwar years led to an interest in the improvement of navigation. Col. John N. Macomb, Corps of Engineers, in charge of the Office of Western River Improvements at Cincinnati, Ohio (the office moved to St. Louis in 1870), directed Maj. Charles W. Howell to examine navigation on the Missouri and report on the feasibility of improvements designed to benefit the burgeoning commerce. Colonel Macomb's orders to Major Howell, dated June 24, 1867, were:

You will proceed without delay to St. Louis, Missouri, and from that city, by river, to Fort Benton, for the purpose of inspecting the condition of the Missouri river with a view to its improvement.

You are authorized to employ one assistant to accompany you, and make as complete and accurate a sketch of the river as practicable, to illustrate your report.

On completion of this duty you will return to Cincinnati, and make to this office a detailed report, in writing, embracing all information of importance you may have gained.

You will pay particular attention to the obstructions in the river, including snags, bars, and rapids, and report on the feasibility of removing them, together with approximate estimates of time, labor, machinery, and expense necessary to render navigation more safe and speedy.⁴

Major Howell departed Cincinnati on June 28 and spent most of the next three months on board the steamboat *Miner* on the Upper Missouri River. His final report, dated December 3, 1867, recommended the removal of dangerous snags and boulders, the excavation of a channel through rocky rapids by blasting, and deepening the channel at other locations by constructing low dams to close secondary channels around islands. The appendix to his report listed snags and wrecks he had observed in the Missouri, provided records of river stages at St. Louis and Fort Rice, summarized traffic on the river between St. Louis and Fort Benton in 1867, and listed the amount of government freight transported on the river in the same year.⁵

Major Howell kept a detailed daily journal during his journey by rail and stagecoach to the Missouri Valley and up the river by steamboat to Dauphin's Rapids just below Fort Benton. As the journal clearly indicates, a steamboat trip up the Missouri in 1867 was no pleasure trip. The boat on which he traveled was armored against Indian attack, mosquitoes made sleep difficult, and the boat was constantly delayed by many obstacles to navigation, including a herd of buffalo. Major Howell also described the villages of Omaha and Sioux City and speculated on their future prospects, explained several aspects of steamboat operations, noted the mineral and agricultural resources of the region, and described the military posts along the river. His journal, a portion of which follows, is, in short, a source of considerable historical interest:⁶

JOURNAL OF BREVET MAJOR CHARLES W. HOWELL,
JUNE 28, 1867 — SEPTEMBER 27, 1867

June 28, 1867, 6 p. m. — In obedience to orders from Colonel John N. Macomb, corps of engineers United States army, dated office of Western River Improvements, Cincinnati, Ohio, June 24, 1867, I to-day started from Cincinnati en route for Omaha, Nebraska, via Chicago, Illinois.⁷ I[t] is my intention

to reach Omaha on the afternoon of June 30, in time to secure passage for Fort Benton, Montana Territory, on the steamer Deer Lodge, which leaves Omaha on the 1st of July. I have secured, as an assistant on the duties specified in my orders, Major F. Von Werner, a stranger to me, but having very complimentary letters of recommendation from several distinguished officers, under whom he served as a staff officer during the rebellion.

I have directed him to collect such instruments and materials as may be required for surveys and sketching, and with them to overtake me at Omaha or Sioux City, with as little delay as possible.

June 29, 1867 — I arrived in Chicago 1 p. m., and left via Chicago and Northwestern railroad 3 p. m., crossing the Mississippi river shortly after dark.

June 30, 1867 — Arrived at Ames station, Iowa, 8 a. m., and was detained to 1 p. m., awaiting repairs to a broken bridge, one mile west of station. Reached Council Bluffs 9 p. m., and owing to the high stage of the Missouri could not cross during the night. I am informed that the river is over its banks at the usual ferry-landing, and ferryboats only run during the day, landing five miles above the city.

July 1, 1867 — Arrived in Omaha 12 noon, two hours after the departure of the Deer Lodge, and from the best information I could gain, thought it best to await the arrival of the steamer Last Chance, reported due on the 2d or 3d.

July 2, 1867 — Omaha is a city containing from 8,000 to 10,000 inhabitants, and derives its importance from being the eastern terminus of the Union Pacific railroad. Its interests are sustained and forwarded by eastern capitalists and speculators, on the supposition that it will remain, at least for a number of years, the great entrepot for the commerce of the country west and north. It is at present a large depot for the supply of our troops on the plains, and enjoys a lucrative trade with the Territories of Idaho and Montana; receiving its supplies by rail from Chicago, and by river from St. Louis. It is rapidly increasing in wealth and population, but as there is no agriculture country to the west, on which it can depend, it can never expect to be more than a distributing point for eastern products, and will soon outgrow the limited demands for those.

In case the railroad bridge across the Missouri is constructed at Bellville [Bellevue], fifteen miles below Omaha, we may expect to see the latter city sink to a second place as a commercial point, and gradually decay. The business portion of the city is built on the bluffs above overflow; the railroad, and buildings connected with it, are located on a sand flat beneath the bluffs, and at this time surrounded by water.

Not hearing from the Last Chance, I telegraphed St. Louis for information, and on receipt of answer concluded to overtake the Deer Lodge, if possible, at Sioux City or Fort Randall. This is made possible by reason of the tortuous course of the river; the trip by boat consuming from three to four days, and by stage but 24 hours.

July 3, 1867 — Starting from Omaha 10 a. m., I arrived at Council Bluffs station 12 n., and at St. John's 1 p. m., where I took stage 3 p. m. for Sioux City, a distance of 100 miles. St. John's is a village of six months' growth, at the junction of the Sioux City branch of the Chicago and Northwestern railroad. The branch is but just commenced, but I am informed is being pushed rapidly forward, and will be completed during the coming winter, making Sioux City the most northern point on the Missouri river, having railroad communication with the east.

The stage road, after leaving St. John's, runs for 40 miles through a hilly country, sparsely settled and timbered; it then strikes the bottom lands below the mouth of the Little Sioux river, and does not again turn into the hills until reaching Sargent's bluffs, a few miles below Sioux City. Through the bottom lands the road is but a trail, and at many points is subject to overflow. The soil is a rich alluvion, well adapted to farming and grazing. The higher portions of the bottom are well timbered with a vigorous growth of cottonwood. On reaching the Little Sioux bottom, 9 p. m., I found the road flooded nearly to the top of the prairie grass for a distance of nearly five miles; the overflow caused by a storm above, conjointly with the high stage of the Missouri. By liberally feeing the drivers I induced them to attempt the crossing. The night was quite dark, and the road only indicated by the absence of grass above the water. In the middle of the swamp the driver lost the trail and mired the horses in a slough, and it was with great difficulty that we succeeded in extricating them, and recovering the road.



A train (left) being unloaded from a ferry boat at the old Omaha ferry landing on the Missouri River.

At 4 o'clock on the morning of the 4th we effected the crossing.

July 4, 1867 — Arrived at Sioux City at 3 p. m., and found that I had anticipated the arrival of the Deer Lodge, thus gaining time to form an estimate of the importance of the place.

Sioux City is a village of between 2,000 and 3,000 inhabitants, all thoroughly imbued with an idea of the future greatness of their town. It is located at the base of the hills above overflow. The landing is good, but, owing to a large cut-off which occurred last spring a few miles above, is being slowly cut away, and unless protected will continue to cut for several years, probably forming a bar at the present landing.

The valleys of the Floyd and Big Sioux, together with the rich, wide bottom-lands on the west side of the Missouri, are tributary to the town, and when fully settled will sustain a thriving city.

While in St. Louis, last month, collecting information about the upper Missouri, I was informed that, except in extraordinary seasons, two trips to Fort Benton are impossible.⁸ It then appeared reasonable to suppose that owners of mountain boats would select some starting point higher up the river. Omaha at that time suggested itself, as the two round trips could be shortened from three weeks to a month. Yet, with all the enterprise and capital concentrated at Omaha, nothing of the kind has been projected, probably owing to the one absorbing idea, railroad.⁹

I am now disposed to think that Sioux City is the proper point for concentrating the upper river trade. The completion of railroad communication with Chicago will bring that powerful rival in direct competition with St. Louis, and, aided by Sioux City enterprise—which can only expand in that one direction—we may expect to see, within the next few years, the trade of Montana and the upper Missouri passing from the grasp of St. Louis, and absorbed by Chicago capital invested in Sioux City.¹⁰

By starting from Sioux City on the opening of navigation in the spring, boats can complete two round trips in the time now taken to make one from St. Louis, and return to Sioux City in the second, or, in other words, from five to six weeks less time than two round trips from St. Louis.

July 5 — To-day hear that the Deer Lodge broke her shaft below Decatur, and will return to St. Louis. I shall remain here to await the Last Chance.

July 6 — Joined by Major Von Werner.

July 7, 8, 9, 10, 11 — For Sioux City; Last Chance reported disabled at Little Sioux.

July 12, 10 a. m. — The steamer *Miner*, Captain [Alpheus F.] Hawley, in the service of the Northwestern Fur Company, arrived at Sioux City, having cleared from St. Louis for Fort Benton on the 29th June.

This boat having a good reputation for speed, comfort, and the uniform courtesy of her officers, I decided to secure passage on her for myself and assistant, although prepossessed in favor of the Only Chance, reported cleared from St. Louis on the 4th of July. Captain Hawley kindly afforded me every assistance in his power in furtherance of my duty, and placed at my disposal the best accommodations in the boat. We left Sioux City 10:30 a. m., and 2:30 p. m. stopped at Brazean's wood-yard, where half an hour was spent in wooding. We tied up for the night above Ponka [Ponca] 12 p. m. At Brazean's wood-yard I found the river six feet lower than the highest flood-mark for this season. From the 1st to the 10th of July the river fell slowly. We are now going up on a very slight rise, probably due to a storm on some of the tributaries just above. I find the river at too high a stage to make a report on its condition of any value for future operations in clearing obstructions.

The snags visible are mostly on bars and sand points, and, although numerous, are not in the way of navigation. Those visible in or near the course of the boat are to be seen at all stages of the river, and are, in consequence, not dangerous. The channel is at present so wide that boats can choose their way. It is only when the channel becomes contracted, (at low water,) and boats are forced to seek the deepest water, that snags become very troublesome and cause disaster or delay.

On the up trip I shall confine myself to generalities, and on returning devote my attention to the obstructions, in that way getting the best information possible. I have stationed my assistant in the pilot-house with all the necessary materials and instructions for making a sketch of the river.

July 13 – Started 3 a. m. River full of drift, as it has been for the last four days. All the drift passed yesterday and today has been large timber, both dry and green. The maximum stage of the spring flood swept the bottom lands clear of smaller drift and placed it beyond the influence of succeeding stages. The present drift comes from the higher bars, where it was left by the water before the present rise, and from banks now being cut away. In every bend of the river the banks are now undergoing this slow but steady undermining process, and the large cotton-wood trees are one by one toppling into the stream, to anchor, if their roots are sufficiently loaded with earth; to drift on the bars, if not. The bottom lands thus far I have found quite well timbered, but is is worthy of note that the timber, though some of it large, is with few exceptions young and vigorous, even the dead timber showing that old age was not the cause of death. Lay for the night above Bone river.

July 14 – Started 3 a. m. and reached Yankton village¹¹ 6:30 a. m. The river wide and clear, the drift less frequent. Lay up at 12.30 of the 15th. The country passed during the day similar to that passed yesterday, but with, perhaps, less timber[;] the bottom lands are sparsely settled, but fertile, judging from the fine looking cornfields.

July 15 – Started 4 a. m., arrived at Yankton agency 7 a. m. and at Fort Randall 12 noon, where we lay two hours.¹² Lay up for night 20 miles above, and for the first time on the trip were obliged to cut wood for use of the boat. During the day observed the bottom lands contracting, and timber becoming less abundant. At the mouth of the Niobrara and Ponka [Ponca] there are good bottoms, but above the farming land is confined to the east bank of the river. We are lying near the ranche of Major Hamilton, said to be the last farm we shall see in going up. The hills on either side are very regular in appearance, neatly rounded in outline, and covered with a short scanty grass, giving at a distance the idea of a well shaven rolling meadow, but when near at hand disclosing the barren soil, and looking dry and stunted. Timber is confined to the narrow bottom lands and islands, and to the short ravines occurring every few hundred feet. Cottonwood and cedar are the only species I could discover, the cottonwood choosing the low grounds, and the cedar growing in the ravines and on the larger

islands. The island cedar is of a very fair growth, that in the ravines stunted, and in many instances deadened by the fires that annually denude the hills.

July 16 — After a good day's run lay up for the night at mouth of creek opposite Bijou Hills.¹³ The river during the day full of islands, and no doubt bad in low water. Timber not abundant, but in sufficient quantity to meet the necessities of boats. Scrub-oak at several points. The cut bluffs expose a blue stratified rock, having the appearance of soft slate easily affected by the weather. The lines of stratification are nearly horizontal, and with frequent faults. Drift is becoming less frequent and the river falling slowly. Day clear and warm. Night close, and mosquitoes so annoying as to prevent sleep.

July 17 — Started at day-break, and late in the afternoon passed Fort Thompson without stopping, lying up for the night at St. John's wood-yard. Slate bluffs continue to bend above Fort Thompson, and there terminate. The fort is located above the entrance to the valley of Cow Creek¹⁴ on a wide open bottom land, from which the Santee Sioux manage to raise a scanty crop of corn; the fort is garrisoned by a single company of infantry for the protection of the agency. Wood scarce. Bottoms narrow, occasional narrow plateaus or prairie taking the place of bottom lands, many of the hills barren and topped with a dark-colored soil.

July 18 — Reached Old Fort Sully in the afternoon and spent the remainder of the day in wooding. The fort is the property of the North Western Fur Company, and was occupied until recently by the United States; it is now deserted, and the buildings being torn down for wood. We replenished our ice-box from a well stored ice-house near the fort. The hills in the rear of the fort are covered with cobble stones of all sizes, and although the same in contour as hills heretofore met are very different in formation, having a large portion of gravel. Wood from this point to the mouth of the Yellowstone is reported very scarce; boats depend on getting what they use from drift piles and deadenings in ravines. Green cottonwood is the poorest of fuel, and even when mixed with dry wood does not generate steam fast enough to move boats against a rapid current. Fortunately for the interests of commerce each year the bars and various bottoms above detain enough drift to supply the

wants of boatmen, but often detain it in inconvenient places. As the commerce of the river expands, wood-choppers will find lucrative employment in establishing wood-yards along barren reaches, and collecting drift at points easy of access.

July 19 — Reached New Fort Sully¹⁵ early, and remained until the morning of the 20th, discharging freight for the fur companies. We were obliged to land three miles below the fort, the landing near the fort being obstructed by a large sand-bar.

The location of the fort is not well chosen, and subject to severe criticism. The buildings are substantial, roomy, and comfortable. All are not yet completed, but probably will be before winter sets in. Wood can be obtained opposite and also a few miles above.

Lieutenant Walker, adjutant of the post, kindly offered to keep a gauge record, and collect information of interest as soon as men can be spared from work on the fort.

July 20 — Left New Fort Sully 12 noon, and lay up for the night near the mouth of the Big Shaienne [Cheyenne River]. But little drift in the channel, and water falling slowly. Current very rapid. Noticed for the first time a growth of box elder. The Ida Stockdale passed down yesterday, and reported hostile Indians on the bluffs at the mouth of the Big Shaienne. It is a favorite place for attacking boats. The bluffs are high, and the channel runs under them; the assailants have good cover and a plunging fire. To guard against attack we placed semi-circular shields of boiler-iron six feet in height on either side of the wheel in the pilothouse, and constructed log breastworks along the forward guards of the boiler-deck and around the ash-pans and engines on the lower deck. Arms were all loaded and placed in racks at convenient places, and a small old-fashioned field-piece was placed in a conspicuous position on the forward boiler-deck. No danger has been apprehended below this point. Many boats after leaving Fort Randall take the precaution, when tied to the bank, of sparring off and mounting guard. We have tied to the bank every night and kept no guard but the regular watchman. Captain Hawley informs me, that he has never deemed greater precaution necessary.

July 21 — Ran to small creek five miles above mouth of Little Shaienne [Little Cheyenne River], and tied up to right

bank. Very good dry wood 200 yads [yards] from boat. Were engaged in wooding until 12 p. m. Steamer Centralia 100 yards above us. She cleared from St. Louis June 12, 1867, loaded with army supplies for Camp Cooke, and has been delayed by reason of having pilots and captain unacquainted with the river, and in addition a mutinous crew of Irishmen.

The captain informed me that he had been burning green cottonwood, and that he could not make enough steam. We are now in the lower part of Swan Lake reach, known among river men as one of the most troublesome sections of the river at all stages. It is from 15 to 20 miles in length, and very much obstructed by sand-bars, making the channel tortuous and difficult to find.

I am informed that Irish crews almost invariably give trouble; they are clannish and unwilling to bend to the authority of the mate. When they work it is not with the alacrity desirable, and they seriously object to wooding in the night. Our crew of roustabouts is made up of negroes; they are always cheerful, obedient, and willing. When brought in contact with other crews, the contrast in the manner of working is greatly in favor of the colored crew. Our mate, who is an old river man, tells me that he has worked both white and black crews, and has a decided preference for the blacks.

July 22 — Started after sunrise, and passed Swan Lake reach with less trouble than apprehended. Once attempted a false channel, and were delayed an hour in sparring over a bar having on it three feet of water, the Miner drawing three and a half feet forward. This bar extended diagonally across the channel, and at no place gave a greater depth of water than three feet. Bars in straight reaches of this kind are subject to more frequent shiftings than in tortuous portions of the river, and only approximate to stability during low water. Lay up for the night below Fox island.

July 23 — Lay up at night and wooded at mouth of Bowerbenoc creek. River in excellent boating condition and falling. No detention during the day; channel well defined, running close inshore around the bends and making good crossings. Valleys of the Moreau and Grand rivers comparatively well timbered in the lower portions. Good grazing on the middle slopes; the lower bottoms thus far observed all present

the same geological features. They have been formed by sand and mud deposits from annually recurring floods—the deposit aided by luxuriant growth of willows, incident to lands subject to overflow. The depth of successive deposits is well shown in sections by alternating layers of sand and mud; even the small deposits from secondary and tertiary overflows being well defined. Owing to this regularity of formation and cause, the ages of points and bottoms can be very accurately ascertained.

July 24 — Wooded and lay by during the night below the mouth of Battle creek [also La Barge Creek]. During the day took on board a deputation of Crow chiefs on their return to Milk river, where they expect to rejoin their tribe. They were sent to hold a council with General [Alfred] Sully, the Indian commissioner, but failed to overtake him, and are returning to their tribe very much dissatisfied. I am informed that the Crows are the best of up-river Indians, and uniformly peaceful, but that bad faith has been kept with them. They have three times sent deputations to hold council with commissioners, and each time the commissioners have been in too great haste to wait for them. The next commissioner will have to meet them in their own country, and not in the hostile Sioux country. River very good; banks cutting rapidly.

July 25 — Reached Fort Rice 4 p. m., and remained until next morning. Landed near the fort inside the bar. The day has been sultry with indications of a storm; the river has been good during the day and has fallen slightly; dry timber has been scarce, and for the last three days we have been obliged to wood several times each day, and pick up such small supplies as we could find; green timber, though not abundant, is yet in sufficient quantity to furnish boats, provided wood-choppers could safely establish wood-yards. Several wood-yards have been attempted, but the Indians gave so much trouble that they were soon abandoned. The Indians attack the choppers, drive them to their cabins, and then fire the wood-piles. The territorial government also interferes by levying a heavy tax per cord, considered by those I have conversed with on the subject a species of black mail, and not sanctioned by law.

July 26 — Started at 3 a. m., and after running about 40 miles stopped to wood on right bank; on starting out again encountered a sudden and very severe storm and blow, which

forced us to the bank for an hour, during which time a cottonwood tree of one foot diameter was blown across the boat in rear of the cabin, breaking our larboard hog-chains and crushing through a portion of the boiler deck. The storm ceased as suddenly as it began, and after clearing away the fallen tree we ran a few hundred yards up the river, and tied up alongside a cut bank to repair. When we lay up the bank was cutting slowly, but soon began to fall in so fast as to make our position dangerous; tons of earth and willows falling frequently on the lower deck and threatening to sink the boat. We lay at this place for half an hour, when the small cottonwood to which we had tied 100 feet from the bank was washed in, and we were obliged to move to a better anchorage, which we found three miles above, where we lay for the night. As an instance of the instability of these bottom lands, I can cite nothing better than the above. The bank under which we lay was eight feet high and of the characteristic bottom formation, supporting a heavy growth of willows and young cottonwoods between five and six years old. On our arrival we found the current slowly undermining the banks; the presence of the boat caused a stronger current in the narrow chute between bank and hull and an eddy above. This slight change in velocity increased the rate of cutting a hundred fold.

July 27 — Although our repairs were not completed this morning, we were obliged to run higher for wood. This we found in the bight of the next right-hand [*sic*] bend, where a large pile of excellent drift had lodged on the bottom. We lay by all day wooding and repairing the damage of yesterday. In the afternoon a hurricane came up from the north-northwest and continued until late at night, with occasional lulls and heavy storms. At [as?] the wind was blowing us directly on shore no damage was done, although our chimney guys were strained at times to their utmost, and our pilot-house and cabin roughly shaken. The air was filled with clouds of sand, and the water was full of grasshoppers blown off shore. The waves during the night of the hurricane ran three and four feet high, and rapidly beat down exposed banks; a large quantity of green drift passed us during the day.

July 28—Made a good run and lay up for night above Square Buttes [near Bismarck, North Dakota], 20 miles below Fort

Stevenson. Noticed coal at one point cropping out of the bluffs at the water's edge, but not in any quantity. Did not have time to examine it. Hills very bare; good grazing in the bottoms and larger ravines. Firewood continues scarce. River good.

July 29— Started at 3.30 a. m. and reached Fort Stevenson¹⁶ 6 p. m., landing under a cut bank and very good. The officers at this post report plenty of coal in the neighboring hills, but of a poor quality. It has been used in stoves, but did not give entire satisfaction. It has also been used in the blacksmith shop, but did not give a good welding heat; it is a species of cannel. Stevenson is at present but an encampment; it is expected, however, that before winter fairly sets in buildings enough to shelter the garrison and stores will be finished. The quarters are to be of adobes with shingle roofs, and will present a very neat, comfortable appearance. The material for the adobes is found near the site of the fort, and when mixed with cut prairie grass promises to make very substantial walls. The bricks are made larger than usual, but dry well and retain their shape. The buildings will have stone foundations, and the walls will be strengthened by framing.

July 30 — Left Stevenson 3.30 a. m., and arrived at Fort Berthold 9 a. m., where we lay during the day and night, landing freight for the Northwestern Fur Company. At Berthold I found coal outcropping a few yards above the landing, and secured several specimens; it is a coarsely laminated lignite of a dark brown color, breaking into small fragments with irregular dull fracture when exposed to the air for any length of time, burning with a heavy yellow flame and smoke, and not possessed of great heating or illuminating power; the deposit exposed is in two seams, one of 10 inches thickness and the lower of three inches, conformably superposed on a bed of shale and covered with a compact gravel. In the hills back of Berthold I am informed this deposit has, for several years, been burning, and so near the surface as to cause the subsidence of many acres; (Major Galpin, Fur Company.) Wood scarce between Stevenson and Berthold. River good.

July 31 — Left Berthold 3.30 a. m., after a wakeful night spent in fighting mosquitoes. Lay during the night on a sand-bar in Great bend. Passed good timber at the mouth of the Little Missouri. Drift in bottoms scarce; dead timber becoming more

frequent. Channel quite clear and of good depth. Noticed several outcrops of coal during the day, all having the some appearance as at Berthold, but showing larger seams and a greater number of them. In one cut bluff about 50 feet high I counted 17, three of about 18 inches' thickness each, separated by shale of about same thickness, and above them 14 at irregular intervals, ranging from one and a half inch to three inches in thickness. The seams might be worked to advantage.

August 1 — Started 3:30 a. m., and although detained by stoppages for wood, made a fair run, tying up at dusk to a sand point where we found a very fine drift pile. The hills have gradually lost that regularity of outline so familiar in that section of the valley above Sioux City, Randall and Sully, and now appear broken and frequently rocky. Sandstone of an indifferent quality and poorly cemented conglomerate alternate with the shales and frequently crown the bluffs; the immediate valley of the river is very narrow, rarely exceeding 2,500 or 3,000 yards, and presenting low plateaus and bottom lands in nearly equal proportion; the bends of the river in nearly all cases cut into the hills, making high steep-cut bluffs, with opposite narrow timbered points, concealing barren plateaus, outwardly bounded by bluffs and high table lands.

August 2 — Started at daylight, and without stoppage run until 3 p. m., when we encountered a violent wind storm, and were obliged to tie up fifteen miles below Muddy river, and lay by for the remainder of the day. The river continues at a good stage, though falling slowly. The general characteristics of the valley remain as yesterday. Coal occasionally appears, and breaks of boulders may be seen in the channel under rock bluffs.

August 3 — Started at daylight, and without incident arrived at Fort Buford 5.40 p. m. On approaching the mouth of the Yellowstone the valley widens perceptibly, and the bottoms appear more fertile. The timber looks more vigorous and less scattered, the current is stronger, and the water-way has a more equitable width. The influence of the very rapid current of the Yellowstone, while gradually accommodating itself to the slower Missouri, is beneficial to the channel of the latter for a distance of nearly 100 miles below Buford; it then begins to deposit freely and spread out, forming at low water trouble-

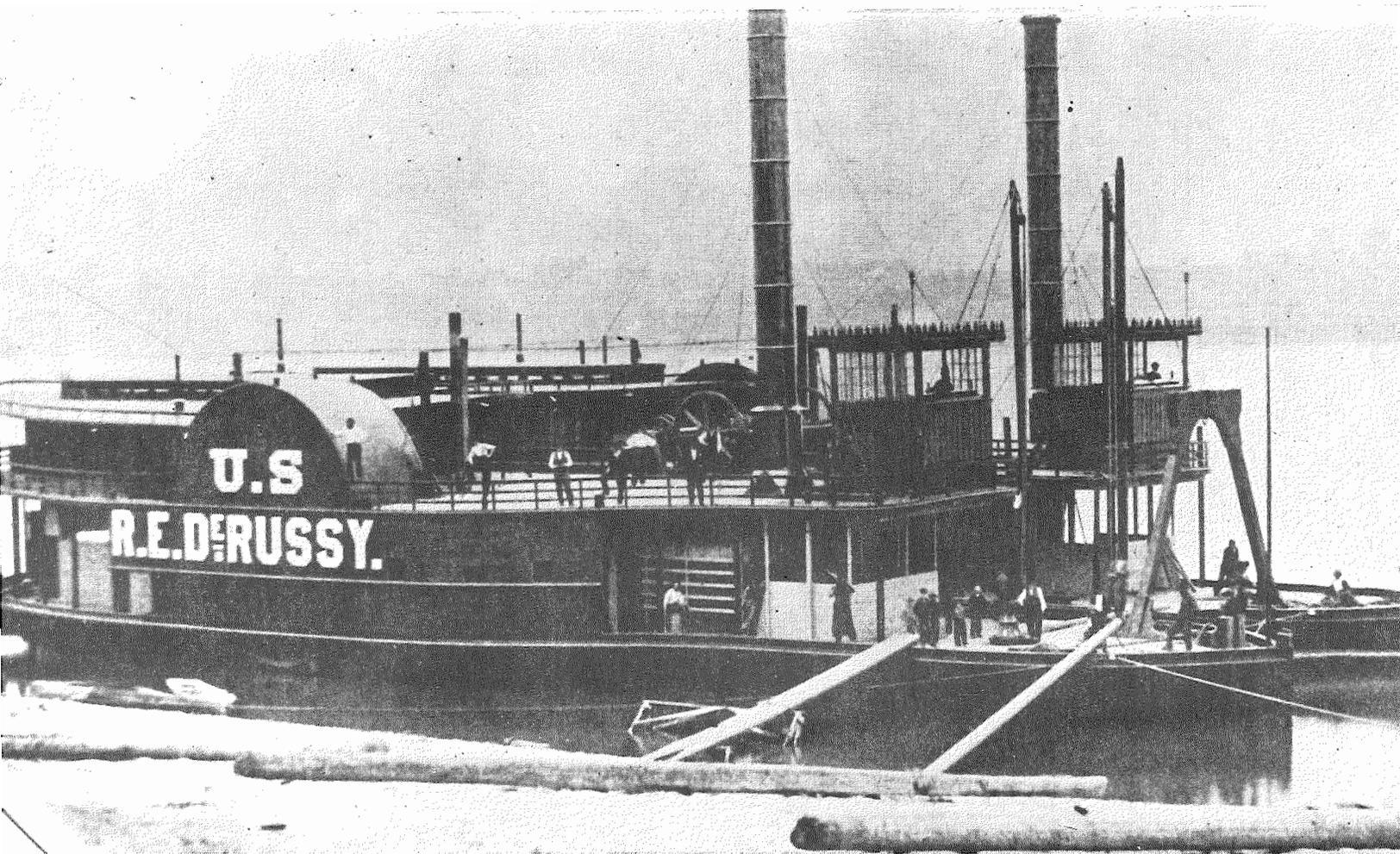
some bars, with shallow chutes. Fort Buford is situated on the left bank of the Missouri, 12 miles below the mouth of the Yellowstone, and on a wide plateau about 20 miles long, and from 20 to 50 feet above low-water mark. During the winter of 1866-67 it was garrisoned by a single company, now increased to five companies. A new fort is now in process of construction to occupy a portion of the old site, to be much larger, and to be built of adobes. The timber for the new buildings will be obtained near the mouth of the Little Muddy, some 30 miles above. The adobes are made near the fort, and are of good quality.

Yesterday the Sioux made a raid on the cattle herd and killed several animals, but did no further damage, easily escaping from the infantry. Garrisons along this portion of the river are continually annoyed because of their inability to pursue Indian raiders. A company of cavalry at each post would be invaluable.

August 4 — Started from Buford at 8.30 a. m., and were three hours in reaching Fort Union. Started from Union at 1.30 p. m., and lay during the night about 30 miles above [.] Fort Union is an old trading post, by land three miles above Buford. It will be dismantled shortly, and the traders removed to the latter place.

Found the river between Buford and Union very much cut up and difficult. Above Union quite good and with very few snags; the bed of the river much narrower, and the bottom lands wider. The bluffs are continuous on either side, running nearly parallel, touching the river only at each bend, and clearly defining the valley. Timber is not abundant, but the bottoms are full of young cottonwoods, giving promise in the future. I to-day left my assistant at Fort Buford, with orders to report for duty in Cincinnati, preferring to sketch the remainder of the river myself.

August 5 — Started at daylight, and after a fair run lay up at 8 p. m. in bend above Poplar river, where we were stopped by a very difficult crossing. Were delayed for several hours in the forenoon by a difficult series of bends below and above Old Fort Kip cut-off.¹⁷ Although the cut-off occurred several years ago, the river has not yet accommodated itself to its bed, and in medium stages of water cuts into the bank so rapidly that the debris cannot be carried away by the already well charged



Snagboats like the U.S. R. E. DeRussy helped to clear obstructions on the Missouri River. (Courtesy of the National Archives).

current, and is consequently left to form troublesome bars in the channel and crossings.

The points are quite well timbered with cottonwood, and frequent deadenings at convenient landings supply the necessities of steamboats. Noticed during the day the ruins of several encampments, from which wood-choppers were forced last winter. Passed large herds of buffalo, the first seen this trip, and run into one herd crossing the river. The channel was so completely blocked up by the living mass that the boat was stopped to let them get out of the way. A number were carried under the hull and into the wheel, but cleared us without damage. The scene was one of great excitement, passengers and crew firing with such recklessness as to endanger their own lives to as great an extent as the lives of the frightened buffaloes.

August 6 — Were engaged from daylight until 6.30 a. m., sounding for a practicable channel, and at no place could find a crossing giving more than two feet, the steamer drawing 33 inches. At 6.30 attempted the lower channel, and after six hours' sparring crossed the principal bar, and ran into good water above, where we found the side-wheel steamer *Viola Belle* waiting for a channel to cut out, so that she could go down. She had been waiting three days. The *Zephyr* and *Imperial* bound up were delayed for the greater part of three days at this place sparring over. We lay for two hours one mile above bar and partially wooded, but finding timber very unhandy, 900 yards from boat, ran into next bend and found a fine deadening, where we lay for the night, and took in a good supply.

The sand of which these bars are formed is of the nature of quick-sand. Iron and stone or other materials too heavy to be moved by the current sink below the surface of the sand in a few seconds; men or animals wading on the bars are obliged to keep in motion even on bars apparently dry. I yesterday saw Buffalo mired down to their sides, and exhausted by their efforts to get out. This characteristic of the bottom makes it simply necessary for a boat when working through a bar to push ahead with its spars, and keep in position so that the current may wash under and around it.

August 7 — Started 4 a. m., and entered a very troublesome part of the river known as Spread Eagle Reach, similar in every respect to the Swan Lake Reach below Fort Rice; we were five

hours in making a distance of 10 miles. Above the Reach we ran into a series of very good bends, and with but a single delay of two hours, caused by taking a false channel, reached a fine deadening near the mouth of Porcupine creek [or Boxelder Creek], and lay up for the night. The part of the river run to-day is but little obstructed by snags, and is sufficiently well timbered to meet the wants of boats. Deadenings are of frequent occurrence and convenient for wooding; they are located on the higher portions of each point, and are said to be caused by fire, though they but seldom show traces of it. The great majority of the dead cottonwoods are stripped of bark, and are perfectly dry and sound.

August 8 – Started at daylight, and at 8 a. m. reached Milk river. Above Milk river found the channel very shallow and much obstructed. At 7 p. m. lay up above the mouth of Dry (Dorun's) Fork, having made but 15 miles in the last eleven hours. Were three times obliged to spar over bars giving but two and a half feet of water. The obstructions in this section are due to a cut-off which occurred several years ago in the bend above Milk river, by which two large bends have been obliterated. The bed of the river is now in a transition state, gradually working toward a natural shape; during high water the current cuts material for lower stages to carry off, and in consequence at a medium stage such as we now have when the cutting and distributing powers are about equally balanced, this and similar parts of the river are in their least favorable condition for navigation. Landed our Crow passengers at Dry Fork to rejoin their tribe.

August 9 – Started 4 a. m., and till 4 p. m. had but little trouble. Not much water in channel, but the bends quite regular, and in consequence the channel well defined. Lay by from 8 a. m. until 12 m. [noon] for wood; 4.30 p. m. obliged to spar over a difficult bar, and in doing it broke a guy rope of derrick, and were detained by the accident until 6:30 p.m. After crossing the bar we ran until 9 p.m., when we lay up for the night. Passed several rocky bottoms during the day, but with good depth of water, and enough channel room to avoid boulders by running carefully.

August 10 – Started 4 a. m., and ran what is known as the Round butte, section beginning 15 miles below the butte and

ending three miles above. We ran carefully, and without sparring cleared the Butte Bend 1 p. m. The channel is badly cut up by sand and gravel bars, with boulders in portions near the shore.

The river throughout this section is wide and shallow, and the channel tortuous. After passing the butte, the valley assumed a character not before observed. The river winds in short regular bends through bottom lands ranging from half a mile to a mile in width, shut in by bold fancifully shaped hills bearing a stunted irregular growth of cedar and pine. The points are all well wooded midway to the hills; the banks are low and rounded, except in the bight of bends, where the current has cut into the base of the hills, and left perpendicular bluffs of from five to thirty feet in height. Sand points but seldom occur, and the few bars to be seen are formed near the middle of the stream. The river is very clear of snags, and the depth of the channel quite uniform. There are but few signs of recent flood changes, and those but slight. At one point in a cut bluff, 25 feet high, saw a large cottonwood tree 18 inches diameter, half washed out by the last flood, showing that after the tree had obtained its present growth, the plateau on which it grew had received a deposit 15 feet in depth. The top was stunted and decaying, and trees having the same appearance were to be seen around it, and on all similar plateaus observed during the day. From the general formation of these plateaus, I am disposed to think that they were made by washing from the hills, and indicate a very rapid denudation, which gives to this portion of the river its stability by giving it firmer material for its bottom lands than the ordinary flood-deposit. Eight p. m. passed the steamer Zephyr bound up, and 8.30 p. m. tied up for the night, and wooded below Point au Poche.

August 11 — Started 4 a.m., and reached Fort Hawley 9 p.m., river continuing the same as yesterday. Plenty of good timber on all the points. Channel in mid-river nearly all day, frequent bouldered bottoms requiring care in passing them; width of river quite constant, ranging from 150 to 200 yards.

August 12 — Started 4.30 a. m., and without trouble reached Two-calf island 8 p. m. Tried to pass the righthand chute, and found it closed at the head by a bar, giving only one foot water. So backed out, and lay up for the night. River same as the 11th and 12th, with the exception that the valley is more contracted,

and timber is less abundant. Two-calf island is the beginning of the rapid section of the river. Passed the steamers Richmond and Guidon, bound down, below Harriott's island. Lay up from 12 m. until 6 p. m., above Harriott's for wood; cut pine and cedar on the bluffs, and were obliged to carry it several hundred yards to the boat.

August 13 — Started 4.30 a. m., and passed up the middle chute at Two-calf island; obliged to get out cable, and pull over rapids at head of chute. Two and a half hours in passing the rapids; made slow progress against a very rapid current to head of Grand island, where we were obliged to spar over a gravel bar, giving two and half feet water; made the crossing 1 p. m., and reached Cow island 5 p. m., where we lay up to sound the rapids for a channel; obliged to keep the lead going most of the time during the day; from three to eight feet in the channel; bottom rocky, bottom land very narrow, and covered with sage brush; good timber on Grand island; found three feet over the rapids in east chute, and would have no trouble in getting over if it were not for the boulders that infest the channel. Will have to pull over to-morrow. Laid a deadman on shore, above the rapids, to fasten our cable for pulling up. A deadman is laid in the following manner: a trench four feet long perpendicular to the line of torsion, and from two to three feet deep, is dug on shore, and a log of wood securely fastened on the bottom by stakes; to this log the towing line is fastened, and a small trench dug in the direction of the boat to accommodate the rope, and prevent a lifting strain. From this deadman a line is taken to the capstan.

August 14 — Passed the rapids 3 p. m., and lay up two miles above, at the terminus of the Fort Benton and Cow island wagon-road. With the present stage of water it is not considered probable that we can get above Dauphin's rapids. Captain Hawley has decided to leave his Fort Benton freight here, and attempt the upper rapids drawing as little water as possible. On our arrival we found the steamer Imperial lying at the bank, with all her freight ashore. She was obliged to double trip from Grand island to this point, drawing three and a half feet. During the night put our Benton freight ashore, and lightened to 26 inches.

August 15 — Started at 7 a. m., and at 11 a. m. had made six miles, when we were laid up for an hour by a wind-storm. After

the storm we pushed ahead, and tied up at night two and a half miles below Dauphin's rapids; found from three to four feet in the channel; found plenty of water over Snake Point rapids, and passed them without trouble, although for a moment in danger of swinging on the rocks and wrecking the boat. Channel much obstructed by loose rocks in the greater part passed to-day. Current very strong, wood very scarce.

August 16 – Started at 5 a. m., and at 8 a. m. tied up one mile below Dauphin's, having made one and a half mile in three hours. Careful sounding gave but 18 inches water over the boulders in the rapids, and three feet if they could be removed. The captain then decided to abandon the trip to Benton, and return to his freight above Cow island, rather than further risk the safety of his boat. At 7 p. m. we started on our return, and after making three miles tied up for the night. During the day I examined the rapids, and climbed to the top of the hills. A distance of two or three miles from the river I found abundance of excellent pine timber growing in the ravines and hollows. To the south I could see the Judith mountains and intervening ridges, apparently all well timbered.

August 17 – Started at daylight, and had no trouble until reaching Snake Point, where it was deemed necessary to get out bow and stern lines to drop the boat through. In executing this maneuver we grounded on a flat rock, and were delayed until noon before getting off. Two miles below Snake Point, in making a crossing, the current drove us on a gravel bar, where we lay all night. Everything movable on the boat was put ashore in yawls to lighten her, after which we took a cable ashore, and made ready to pull off in the morning.

August 18 – At 11 a. m., by pulling and sparring, succeeded in getting off the bar and taking wood and freight on board; reached our Benton freight pile without trouble at 1 p. m. The rapids I have had an opportunity to examine can be very much improved and rendered passable by simply removing the boulders in the channel; most of them can be taken out without blasting. Further improvement can be made by closing island chutes, thus gaining increased depth of channel and greater scouring power to the current. Improvements of the latter kind can be made permanent, and at small expense, as all the necessary material can be found at hand, and much of it ready for use.

August 19 — Spent the day among the hills to the south of Cow island, and in making a survey of the obstructions. Found plenty of good stone on the north bank, and plenty of good pine timber, convenient for use, on the south side. Game is abundant; a working party could easily supply themselves during the summer and fall without going many hundred yards from camp. Indians make their appearance but seldom. It is too far north for the Sioux, and the Crows are friendly, and have better hunting grounds. The steamers *Only Chance* and *Zephyr* passed the rapids this morning with but little trouble, but are double-tripping from Grand island. *Only Chance* discharged her freight, and returned to Grand island for remainder.

August 20 — Seven a. m. started down the river, and had no trouble until we reached the head of Grand island. There found the *Only Chance* hard aground in the head of the chute, having been carried there by the current after crossing the bar. In attempting to cross the bar too high up, we ran aground 10 a.m., and did not get over until 5 p.m. Ran until dark without further trouble.

August 21 — Started at daybreak, and 9.30 a.m. arrived at Fort Hawley, a trading post of the Northwest Fur Company. Left Hawley 12 noon, and at 4 p. m. reached our wood-pile of the 11th, where we lay up for the night. During the afternoon we were greatly retarded by a strong head wind, which twice drove us into the bank, and twice set the boat on fire by sparks from the chimneys. The crew were engaged in wooding until 11 p. m. Since leaving Fort Buford we have been well supplied with fresh meat, principally of buffalo, deer, antelope, and wild geese. The country is full of game, and several of the mountain boats we have met depend so much on a good game supply, that they only bring as stores, hard bread, hams, bacon, sugar, coffee, and a few cans of vegetables.

August 22 — Started at daylight, and at noon ran hard aground on a bar, nearly opposite Round but[t]e. Put our wood and freight ashore with the boat's yawls, and after five hours' sparring, aided by a shore line, worked off and tied up for the night. Thus far down I have not noticed any perceptible change in the channel; just below, the channel through which we ran in coming up is completely filled, and a channel worked out on the opposite side of the river, giving two feet large in the shoalest place. The *Miner* is now drawing two feet scant, which

will not be greatly increased by the little freight she expects between this and St. Louis.

August 23 – Started at daylight, and at 7 a. m. ran aground on a hard bar opposite Round but[t]e. Again landed our wood and stores in the yawl, and tried to spar off, but without success, and finally laid a deadman on shore above us, and at 4 p. m. pulled off and reloaded. Made a short run, and without further trouble made a landing 10 miles below the but[t]e; tied up for night, and wooded.

August 24 – Started at daylight, and without sparring reached a point two miles below Milk river, where we found a very bad crossing, and were obliged to lie up for the night and sound for a channel. Found the river from Round butte to Milk river greatly changed, and for the better. The majority of crossings are lower down than we found them on the up trip, and deeper; several bars have entirely disappeared, and no new ones found. The channel has now reached its low-water position, and unless shifted by a fall flood, will probably remain as at present until the breaking up next spring.

On the up trip I noticed a peculiarity of all wooded points, from the mouth of the Yellowstone to the Round butte, which proves a continual shifting of the river bed towards its mouth. On the upper side of all points the banks are cut, and large cottonwoods are growing to the brink. In passing around the point, the cut bank becomes less and less in height, and the growth of timber gradually becomes younger, until the point culminates in a growth of willows, and beyond these plain sand. On the lower side of the point, until entering the bight of the succeeding bend, the shore slopes to the water with, first, a sand beach, then willows, young cottonwoods, old cottonwoods, and next the plateau's dead cottonwoods, in regular gradation of age; showing plainly regular denudation of the upper part of the point, and regular formation on the lower side. This gradual movement towards the direction of the current is also shown by the bluffs on either side; the whole line showing that at some time each portion of it has been subjected to the direct action of the river. The bearing of this characteristic on any plan of improvement is plain; showing that any improvement now made, unless it be for protecting the banks, for a few years hence will be on dry land.¹⁸

August 25 – Started at 5 a. m., and in attempting to enter the chute, in rear of the island to which we tied last night, ran aground, and were swung around by the current so as to lie directly across the channel; as the width of the chute was a little less than the length of the boat, and as the current set in very strong, we found great difficulty in getting off, but succeeded after two hours' sparring, and had no further trouble of moment. The island and chute lie near the centre of Milk River reach, and the cutting of the channel at this point determines its characteristics through the reach. Should the channel choose the chute, the reach will be fair; but should it choose to cross the bar, it will continue bad quite through the bend below.

The channel through the reach we found tortuous, but regularly formed and good, giving three, four, five, and six feet of water. We stopped to wood about noon, and, were detained two hours, after which we ran to Fort Charles bend, and at 4.30 p. m. lay up for the night alongside a good deadening. During the day saw thousands of buffalo and abundance of other game.

August 26 – Started at 5 a. m. and laid up at 4 p. m., on account of wind in bend below Elk Horn prairie. Had no trouble during the day; found three, four, and four and a half feet water over the worst crossings in Spread Eagle reach, and two and a half feet over crossing bend above Poplar river. The crossing at this latter place, although the river has fallen about two feet, is nearly the same as we found it going up. It is in the same place, and has the same depth of water, but is not so tortuous. Two bends above Wolf Point are much obstructed by snags, but are cutting freely and shifting the channel.

August 27 – Started at day-break and reached Fort Buford at 6.30 p. m. Were delayed by a strong wind which sent us to the bank several times, but without damage. Below the Big Muddy, at several points, high steep, rocky bluffs rise from the water's edge, and deposit dangerous rocks in the channel, which it would be desirable to clear. Coal makes its first appearance in these bluffs on the right hand side, and in fair seams. I am informed that these deposits of coal outcrop on the Yellowstone as far up as Powder river, and no doubt underlie the whole peninsula between the Yellowstone and Missouri. The buildings at Fort Union are nearly demolished, and the material taken to Fort Buford. The river between Union and Buford is

very much cut up, but has fair water in the channel. The Yellowstone is very low, and at its junction with the Missouri falls about 18 inches in a distance of 100 yards, over loose rocks, and with a very rapid current.

August 28 – Started from Buford at 8 a. m., and at 12 m. were forced by a strong wind to tie up. Started again in 6:30 p.m., and at dusk lay by for night 20 miles below Muddy river. Channel fair and but little changed in the last month. But few snags, and those not large or troublesome. The river full of drowned grasshoppers.

August 29 – Started at daylight, and after a fair run lay up below Tide creek. After passing Little Knife river, found the channel full of bars and difficult; grounded several times, but were not greatly delayed, except by the necessity of running slow and sounding frequently. Day very warm and indications of a storm.

August 30 – Arrived at Fort Berthold¹⁹ 12 noon, and left 6 p. m., expecting to make Fort Stevenson before dark. Eight miles below Fort Berthold encountered a violent wind-storm; were driven to the bank, and were obliged to tie up for the night. The wind was so strong that birds left the trees and sought shelter in the underbrush. Just before dark one of our pilots caught a half-grown eagle, who had sheltered himself in the bushes and could not rise from them. From Little Knife river to Berthold, the river is obstructed by bars and a few snags; below Berthold it is in better condition.

August 31 – Arrived at Fort Stevenson 8.30 a. m., and left 11 a.m. River improving, day cold, damp and windy. Four p.m., lay up below the mouth of the Big Knife river to wood, and remained during the night. Channel well defined and with good water. Not materially changed since going up, although the river has fallen about four feet in that time.

September 1 – Started 5 p. m., and without trouble reached Fort Rice 3.30 p. m. Here we expected to find 40 cords of good dry wood, cut and awaiting us, but were disappointed. The wood, though cut and well concealed, attracted the attention of another boat, and we reached the wood pile only in time to see the Centralia leaving with 30 cords on board, and Captain Hawley obliged to pay the bill at \$8 per cord.

Left Rice 6 p. m. and ran below the Cannon Ball, where we spent the greater part of the night picking up drift.

September 2 — Started 5 a. m. and ran until 4 p. m., when we were forced by wind to lie up 40 miles above Grand river. Day raw and windy, with occasional drizzle. River good, and had but little trouble, only grounding twice, and both times sparring off with ease. In conversation with Major Galpin, one of the oldest fur traders in this country, and the best informed I have met, he expressed the desire of all those interested in the development of the upper Missouri valley for a thorough geographic and geological survey of the country drained by the Little Missouri, Heart, Big Knife, Cannon Ball, Grand and Moreau rivers.

He has been over the greater part of the basin drained by those streams, and is impressed with its value as a grazing and mining country.

From his report I should judge a survey of importance in establishing future reservations for the Sioux Indians. I am informed that the climate is undergoing a gradual but marked change for the better, noticed even by those who have spent but a few years along the river. Rain is more frequent, vegetation more luxuriant, and winter sets in late, and in places cottonwood trees are giving way to ash and elms. Corn, potatoes, and oats, have been grown as far up as Fort Union, and although the stalks were stunted the grain was of fair size and quality. At Berthold I saw ears of corn six to eight inches in length, grown on stalks from 18 inches to 2 feet in height.

September 3 — Started at 5 a. m. and made a good day's run, tying up at 7 p. m. to right bank below Plum island, and 15 miles above mouth of Big Shaienne. River quite good with the exception of Swan Lake Reach, where we found the channel well cut but very tortuous. In passing the reach we were favored by a dead calm, which facilitated the handling of the boat, and enabled us by running carefully to keep the channel. Below the reach we were delayed an hour by taking the wrong outlet, but afterwards had no trouble. The bluffs passed to-day are based on a blue clay shale, crumbling where exposed, and easily blown down by wind. On the bluffs, under which we lay during the night, I found a group of syenitic boulders, some of them weighing as much as three or four tons. Wood scarce.

September 4 — Reached the Big Shayenne 9 a. m., and lay for night 10 miles below, having found a very bad river, much spread out and full of sand bars. Strong wind during the night, slightly abating before morning. Near this point, when going up, we found in abundance a plant used by the Indians to cure the bite of the rattlesnake. The stem is from two to four feet in length, and from an eighth to a quarter of an inch in diameter, the leaves long and slender, and from four to six inches apart, joining the stem along the line of a very oblique spiral. The stem is crowned by a yellow flower, about two inches in diameter, and having the appearance of a small sunflower. The root is long, and has but few ramifications. When stripped of its thick outer coating, it shows markings and color very much resembling the skin of the rattlesnake. My informant, an old hunter, who pointed out the plant, informed me that he had often seen it used, and with success. The person bitten chews a small piece of the root, swallows the juice and applies the pulp to the bite. The root has a pungent acid taste, but is not unpleasant. Dr. Kimball, United States army, stationed at Fort Buford, has a quantity of the plant, and will report on it to the medical department.

September 5 — Started 5 a. m., and reached Old Fort Sully 12 noon. Were several hours in passing Farm island.²⁰ The day clear, but cool and windy. Run the channel to the right of Farm island, and were several times blown aground five miles below the island, and lay during the night on the bar. Steamer Last Chance overtook us, and lay during the night a few hundred yards above.

Farm island is considered one of the worst places on the river, as the channel shifts frequently from one side to the other. The buildings at Old Fort Sully are all torn down.

September 6 — Made about 15 miles, and lay up on account of wind. Channel fair, but the surface of the water so much broken by the wind as to make it difficult to determine its position. Day clear and cool.

September 7 — Were not able to start until 6 p. m. We then made five miles, and tied up for the night. Wind continuing. Plenty of water in the channel, from 3 to 10 feet, but the surface too rough to make the crossings. A sternwheel boat is unmanageable in a high wind unless loaded down, and even then

it is generally safer to tie up than to run. The wheel can only act in the direction of the boat's longer axis, and in consequence when moving obliquely to the wind the boat has a certain amount of lee-way for which there is no remedy, and she is blown on a bar in narrow crossings, or ashore in bends.

With a side-wheel steamer it is different, for the wheels can be used in steering, and become powerful aids to the rudder when used skilfully. The only objection to side wheels is the amount of drift met in the early and middle seasons, to which they are very much exposed, and from which stern wheels are in a measure protected by the hull.

September 8 — Started at daylight, and at 9 a. m. were blown ashore by the wind about 20 miles above Fort Thompson, where we lay until 4 p. m. The bluffs at this point are composed of alternating layers of sand, gravel, and clay shale; at their foot, and apparently coming from the gravel beds, I found large numbers of two casts (shell and reptile,) some of them having a metallic filling of a light reddish brown color, very finely granulated structure, and of such hardness as to scratch glass with as much ease as a diamond would. The cross-section of these reptile casts is an ellipse showing a vertebral joint, solid in the centre of the ellipse, and with six radical points running to the outer coating, which is a rich pearly covering, oak-leaf markings on the inner skin. I have found at this place, and at several points further up the river, a large number of these remains with metallic spar and claystone fillings; yet, although I searched diligently, could not find a head.

The diameter of those seen varied from one-fourth of an inch to one foot. One small specimen in my possession has become highly polished in the exposed point, and resembles polished copper. The shell casts are of sand and clay stone, some of them with the shell yet adhering.

Started again at 4 p. m., and at night lay up at right bank opposite Crow creek, with wind continuing strong.

September 9 — Ran well all day, and reached upper landing at Fort Randall point 5.30 p. m. The channel runs close to Randall Point, and is obstructed by loose rocks, causing a very stiff current around the point. At 6.30 we attempted to cross the bar opposite Randall, and ran hard aground. The bar washed from under us very rapidly, and at 12, midnight, washed us

across where we lay until morning. An anchor put out above us in 18 inches of water, when raised in the morning, was found in a pocket six feet deep. This bar is a very troublesome one, and can only be remedied by clearing the channel at the point above, and throwing the water in bulk to the left shore. All the boats down within the last two weeks have grounded here, and lain from 6 to 48 hours. The day has been quite windy, and we were several times driven ashore. We passed the Centralia above Hamilton ranch, waiting on the wind.

September 10 – Started 7 a. m., and at 8 a. m. ran aground opposite Tower butte. The morning is clear and cold, with but little wind; cleared the bar at noon, and at 2 p. m. reached Yancton [*sic*] agency, the wind in the meantime having suddenly revived and driven us once ashore. Since leaving Fort Rice I have noticed a peculiarity in the bar formation, but seldom observed above. Sand bars and sand-islands form in the middle of the stream, giving a series of middle bars and doubtful crossings, the channel shifting frequently from one side to the other, and giving a difference in depth on either side so small as to often deceive the most practiced pilots.

Above Rice these middle bars are the exception, the bars forming below each point, and running obliquely towards the next lower, permitting but a single crossing, and that generally well defined. Left Yancton [*sic*] agency 5.30 p. m., and lay for the night above the mouth of the Niobrara.

September 11 – Started at daylight, and lay up for the night at the mouth of Vermillion river. Found the channel much obstructed by snags, those most in the way being of recent deposit. In the bend below Yancton [*sic*] village boats have been obliged to cut a channel through a cluster of very large green trees deposited within the last six weeks; the snags vary in diameter from 6 to 18 inches, and the most troublesome come from this season's cutting.

The mouth of Vermillion river is dammed up for a distance of 200 yards by a deposit of mud and sand from the Missouri. Over this distance the Vermillion falls 5½ feet, with a rapid current; the water-way is ten feet wide and from one to two feet deep—the water clear and cold. All the small streams below the Yellowstone have been dammed in a similar manner, but have

cut out, so far as observed. Above the dam the Vermillion is about 50 yards wide, and with a sluggish current.

September 12 — Started at daylight with a better river than yesterday, but still much obstructed by snags. Morning cloudy with a little wind; reached Sioux City 2 p. m., and remained until 3 p. m. Lay up for the night 15 miles below. In the first bend below Sioux City made a square crossing, and at its terminus found the channel contracted to about 100 feet, very deep, and so full of snags that we were half an hour in working our way through them. The bank was from 10 to 15 feet high, and falling in rapidly, promising to increase the width of the channel and the number of snags. At Sioux City recommenced sketch to connect with starting point of my assistant.

September 13 — Started at daylight, and ran well all day, reaching Omaha shortly after dark. The river very tortuous, and the bends full of snags. The section from Sioux City to Omaha is considered the most dangerous part of the Missouri, and when once cleared will require constant attention to keep it free from snags. Winding for the greater part of the distance through low easily cut bottom lands, it is subject to very rapid and radical changes of its bed; each flood sweeps into the channel many hundred acres of timber to form dangerous snags, and frequent cut-offs occur to add further obstruction. At several points to-day the pilots informed me that the whole water-way had shifted within the last two months from 300 to 400 yards into timbered points, leaving the last year's channel a barren sand bottom. On the night of the 8th of July a cut-off occurred above Peru, completely changing the channel for 15 miles on either side; several boats were carried through on the 9th, and barely escaped being wrecked. Another, shortly afterward, less fortunate, struck a log and was lost, together with several of her crew.

September 14 — Started at 11 a. m., and at 1 p. m. were driven ashore by the wind at St. Mary's cut off, and were obliged to lie by the remainder of the day. Boats have had trouble just above and in bend below us, even the packet getting aground, yet the river is considered at a good boating stage, and the river trade is quite brisk. Toward night the wind increased in violence, and the clouds of sand from the old bed of the river and from the point below us were almost blinding.



Omaha was a growing community in 1868 due to increased railroad and steamboat traffic. This view is from Eighteenth Street looking east down Douglas Street.

September 15 — Wind very strong all day, and we have not moved from our landing. Every portion of the cabin and state-rooms, coated with sand. Three boats passed us bound up; two of them side-wheel steamers, and the third a stern-wheeler. The side-wheel boats passed the bar above, and the stern-wheel was driven aground by the wind. Direction of wind from south to north.

September 16 — Wind at times increasing to a hurricane, and continuing from the south, with indications of a storm coming up from the northwest. The side-wheel packet *Cornelia* passed us down late in the afternoon, and the *Sunset* ditto after dark, tying up one mile below. Lay by all day, and have fair hopes of being able to push ahead to-morrow, as these blows generally last but three days.

September 17 — The wind having moderated during the night, we started down at 6 a. m., and made a run of about 70 miles, when the wind increased to such violence as to drive us to the bank at Nemaha, 1 p. m. A pelting rain accompanied the wind, and forced me to put my sketch aside and depend on my notes of obstructions. The wind abating in a few hours we again started down, and lay up for the night 20 miles below Nemaha. Passed the *Cornelia* at Brownville, the *St. Joseph* and *Sunset* at Plattsmouth, and the *Underwriter*, of Cincinnati at the wreck of the *H. S. Turner*, employed in raising it.²¹ With our light draught we have been able to run well, but boats drawing from three to three and a half feet experience great trouble in several of the crossings. Dangerous snags are of frequent occurrence, and all the bends are more or less obstructed.

September 18 — River fair all day. Reached *St. Joseph's* 5.30 p. m., and remained until next morning. The crossing above *St. Joseph's*, which three days ago gave great trouble and necessitated sparring on three feet of water, is now cut out, and at no place has less than five feet over the bar. Snags have not been so frequent as yesterday. Day fair and warm.

September 19 — After a run of 175 miles lay up for night at a wood-yard below *Liberty*. Night clear and cool. As wood is quite an item in the economy of a steamboat, I have collected the following tariff of prices:

At *Fort Hawley* \$8 per cord; *Fort Rice* \$8; *Fort Randall* and above from \$6 to \$8; above *Sioux City* \$5; above *Omaha*

\$2[.]50 to \$3[.]50; from Omaha down \$2 to \$3. The Miner burns in 24 hours 24 cords of hard wood or 30 cords of dry cottonwood. A portion of the river passed to-day is in very good condition, and other portions shallow and snaggy. Almost every bend has its wreck to attest the danger of navigation. Many of them are rotten with age, but others are of recent date, and have become dangerous obstructions. The current is slowly eating into the upper bight of each bend, removing the flood deposit, and daily disclosing new snags. It is a peculiarity of the Missouri, due to its wide flood-bed and low bottom-lands, that when at flood-height the channel is cut across the sand points, making the bight of the bend low down and filling in above. As the water falls the channel gradually works out from the point; the bight is made further and further up; shallow bars form, cut away and reform with wonderful rapidity and uncertainty; and when the river attains its medium stage the channel has passed over the greater part of the bed in the upper half of the bend, and brought in succession each snag in that portion directly in the way of navigation.

September 20 — Ran to Slaughter-house island, just above Lexington, and tied up for the night. During the day have passed alternating sections of good and bad river, reported in detail in my snag records. Above Glasgow one very bad bend obstructed by bars, and also a similar series of bends and crossings above and below Slaughter-house island. From Glasgow to the latter section the channel is remarkably good. The day has been warm and pleasant.

September 21 — Were detained at our moorings until 8 a. m. by a fog; we then ran until dusk, and tied up half a mile above Pinkney. Found the channel much obstructed by bars and snags. Loaded boats have had great difficulty at several points passed during the day. As we draw but two feet, we have had no trouble. The fog this morning, though not heavy, clung to the water and obscured the view at a distance ahead, so that the pilots could not judge of the terminus of the Pinkney and Miller's landing crossing, and be sure of taking the proper channel.

September 22 — Again detained by a fog until 8 a. m., when we started from Slaughter-house island, and at 1.30 p. m. made St. Charles without trouble, although we passed several very bad

bends full of snags. Made St. Louis 5.30 p.m. The river from St. Charles to St. Louis very good, with the exception of the Chobenier islands section, where the channel is liable to frequent shiftings from one side of the island to the other. The importance of clearing the river of snags from its mouth to Omaha is in a great measure due to the packet-trade on that section, which necessitates running at night, and makes obstructions of the kind so much the more dangerous.

September 23, 24 — Remained in St. Louis collecting commercial statistics from the quartermasters' and commissary departments, and from the records of the Union Merchants' Exchange.

September 26 — Three p. m. started for Cincinnati via Ohio and Mississippi railroad.

September 27 — Arrived in Cincinnati 5 a. m.²

NOTES

1. The original report of Maj. Charles W. Howell on navigation on the Missouri River is in the Record Group 77 (Letter M641-1868), Records of the Office of the Chief of Engineers, National Archives; it is also printed in United States, War Department, Office of the Chief of Engineers, *Report of the Chief of Engineers to the Secretary of War, for the Year 1868* (Washington: Government Printing Office, 1869), 622-669. The maps prepared by Major Howell and his assistant during this expedition are in Headquarters Map File (Q 137), Records of the Office of the Chief of Engineers, Cartographic Division, National Archives. No study of the operations of Army Engineers in the Missouri Valley exists, but some comment is provided by William E. Lass, *A History of Steamboating on the Upper Missouri River* (Lincoln: University of Nebraska Press, 1962), 176-82.

2. Several studies of individual expeditions of Army Engineer officers on topographical duties in the Missouri Valley exist, but for a comprehensive treatment and a significant modification of the Turner frontier thesis see William H. Goetzmann, *Army Exploration in the American West, 1803-1863* (New Haven: Yale University Press, 1959). An extensive investigation of the history of the civil works-internal improvement mission of the Corps of Engineers, United States Army, directed by Dr. Jesse A. Remington, Chief, Engineer Historical Division, Office of the Chief of Engineers, Washington, D.C., is underway, but at present the pre-Civil War history of the improvement of inland waterways is treated only in individual monographs. See Florence L. Dorsey, *Master of the Mississippi: Henry Shreve and the Conquest of the Mississippi* (Boston: Houghton Mifflin Co., 1941), and Richard G. Wood, *Stephen Harriman Long, 1784-1864: Army Engineer, Explorer, Inventor* (Glendale: Arthur H. Clark, 1966). A discussion of appropriations for waterways improvement is provided by Edward L. Pross, "A History of Rivers and Harbors

Appropriation Bills, 1866-1933" (unpublished Ph. D. dissertation, Ohio State University, 1938).

3. Authoritative on the subject of navigation on the Upper Missouri is Lass, *A History of Steamboating on the Upper Missouri River* (on page 37 he comments on the "unprecedented boom in steam navigation on the Upper Missouri" in 1866 and 1867); see also the earlier study by an Army Engineer officer: Hiram M. Chittenden, *History of Early Steamboat Navigation on the Missouri River: Life and Adventures of Joseph La Barge* (2 vols.; New York: Francis P. Harper, 1903). II, 270-276.

4. United States, War Department, Office of the Chief of Engineers: *Report of the Chief of Engineers to the Secretary of War, for the Year 1868*, 621-622.

5. *Ibid.*, 622-634, prints the recommendations of Major Howell for the improvement of the Missouri; *ibid.*, 653-669, prints the appendixes.

6. The journal is printed in *ibid.*, 634-653.

7. Major Howell was in a hurry to get to Omaha to take passage on the *Deer Lodge*. That he went by train rather than steam packets, which ran regularly from Cincinnati to St. Louis and up the Missouri to Omaha, provides evidence of the cause of the decline of passenger traffic on steamboats after railroad routes were opened.

8. There were two exceptions of record: the *Deer Lodge* made two round trips from St. Louis to Fort Benton during the boating season of 1866 and the *Only Chance* accomplished it in 1867. Lass, *Steamboating*, 44.

9. The successive movements of the headquarters of steamboat traffic on the Missouri from St. Louis to Omaha to Sioux City to Yankton and Bismarck are clearly outlined in *ibid.*, 57-87.

10. This was accomplished in 1868; *ibid.*, 57.

11. Capital of Dakota Territory, 1861-1883.

12. Complete information about Fort Randall and other army posts subsequently mentioned in the report is provided by Ray H. Mattison, "The Military Frontier on the Upper Missouri," *Nebraska History*, XXXVII (Sept., 1956), 159-182.

13. The Bijou are located about eighteen miles south of Chamberlain, South Dakota, just east of the Missouri River. Many outcrops of greenish quartzite used by Indians in manufacture of knives and other stone tools are found there.

14. Cow Creek is a small intermittent stream just south of Fort Thompson on the east side of the Missouri River. Crow Creek is a larger stream, usually with flowing water, located about ten miles south of Fort Thompson on the east side of the river.

15. New Fort Sully was a military post located about thirty miles upstream from Pierre on the east side of the river. It was built in 1867-1868 and abandoned about 1894. The first Fort Sully was built in 1866 near Pierre but abandoned because the location was bad.

16. Fort Stevenson was a military post from 1867 to 1883 and then was used as an Indian school until abandoned in 1894. It was located on the Missouri just west of Garrison Dam in west-central North Dakota.

17. Kipps Post was a Columbia Fur Company installation of 1826-1827. It was on the left bank of the Missouri near the mouth of the White Earth River in northwestern North Dakota.

18. An interesting note relating to this characteristic of the Missouri was told by Capt. Joseph LaBarge to Hiram Chittenden. It seems a farmer digging a well near Grand River, Mo., several miles from the channel of the river in 1896, discovered a Bible. On its cover was labeled *Naomi*. Captain LaBarge recalled that the steamer *Naomi* wrecked at that spot a half century before, and it had been customary to have

Bibles aboard ship attached by chains to a table and lettered with the name of the vessel. Chittenden, *Steamboat I*, 79.

19. Fort Berthold was located near Garrison Dam about 105 miles upriver from Bismarck. It was first an American Fur Company post built in 1845. In 1862 the company moved to nearby Fort Atkinson and it became Fort Berthold until abandoned in 1867, when troops moved to Fort Stevenson.

20. Farm Island is a very long island about two miles downstream from Pierre.

21. Col. John N. Macomb contracted with the *Underwriter* on Aug. 14, 1867, to remove snags and obstructions from the channel of the Missouri. The vessel began work on Sept. 2, 1867, and found the wreck of the *H. S. Turner*, sunk by a snag, about six miles above Nebraska City. The *Turner* was successfully raised on Sept. 20 and returned to St. Louis for repairs. The *Underwriter* cleared the river of its most dangerous snags and wrecks as far as Omaha during that working season. United States, War Department, Office of Chief of Engineers, *Report of the Chief of Engineers to the Secretary of War, for the Year 1868*, 594-596.

22. At Cincinnati, Major Howell completed his sketches and forwarded them to the Office of the Chief of Engineers; he organized a survey party, under G. B. Nicholson, civil engineer, and sent it up the Missouri on board the snagboat *DeRussy* to make a detailed topographic and hydrographic survey in 1868, *Ibid.*, 605. The Upper Missouri was again examined in 1872 by Thomas P. Roberts, employed at the time by the Northern Pacific Railroad. Roberts was the son of W. Milnor Roberts, famous waterways engineer, and served as president of the Monongahela Navigation Company for many years and was subsequently assistant engineer for the Corps of Engineers on the Ohio River. Another survey of the Upper Missouri was made by Maj. Charles R. Suter, Corps of Engineers, in 1875. A project for the mouth of the Yellowstone was adopted in 1877, and Lt. Edward Maguire directed operations to clear the channel beginning in that year. The Battle of Little Big Horn had occurred in 1876, and to safeguard his working parties Lieutenant Maguire armed them with rifles and arranged for one company of the Seventh Infantry to serve as escort. There is no evidence that Indians attacked the work party, but their water-gauge readings were destroyed by Nez Percés. See Lass, *Steamboating*, 176-178; Thomas P. Roberts, *Report of a Reconnaissance of the Missouri River in 1872* (Washington: Government Printing Office, 1875); and United States, War Department, Office of the Chief of Engineers, *Annual Report of the Chief of Engineers for 1877* (Washington: Government Printing Office, 1878), 519-521; *Annual Report of the Chief of Engineers for 1878* (Washington: Government Printing Office, 1879), 695.