UNION PACIFIC LOCOMOTIVE #119
AND
CENTRAL PACIFIC LOCOMOTIVE #60, JUPITER

AT PROMONTORY SUMMIT, UTAH, MAY 10, 1869

by

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REPORT ON JUPITER AND #119
CENTRAL PACIFIC AND UNION PACIFIC LOCOMOTIVES
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This report was undertaken for the purpose of determining whether the National Park Service can carry out a stated objective in the development of the Golden Spike National Historic Site. This was stated explicitly in the Congressional Hearings, both in the House and Senate Interior and Insular Affairs Committees, during consideration of the Golden Spike bill in the 89th Congress, 1st Session. The bill was enacted as Public Law 89-102, approved July 30, 1965, authorizing the establishment of the Golden Spike National Historic Site. The Hearings indicated that the scene in which Union Pacific locomotive #119 and Central Pacific locomotive #60, Jupiter met, pilot to pilot, at Promontory Summit in the ceremonies on May 10, 1869 signalized the completion of the first transcontinental railroad, should be reconstructed.

The two locomotives that met at Promontory Summit will have to be represented by replicas if the Congressional intent and that of the sponsors of the legislation is to be carried out. The centennial date of the completion of the first transcontinental railroad at Promontory Summit is May 10, 1969. The Congressional intent as evidenced at the Hearings is that the National Park Service

should have its development of the area for public use substantially complete by that time. This includes the presence there of locomotives representing the two historic engines, on a stretch of track, at the site of the original ceremony a hundred years ago. The legislation authorizes the appropriation of not more than $1,168,000 to include cost of land acquisition and development of the area. This sum includes an estimated $200,000 for obtaining either original locomotives or the manufacture of replicas of Jupiter and #119.[1]

This report attempts to set forth the problems involved in recreating the Jupiter - #119 meeting, and of determining whether it can be done within the approximately $200,000 that is expected to be available for that purpose. In assuming this undertaking the National Park Service has before it no precedent, because never before has it been involved in providing so complex and sizeable antique machinery which is no longer manufactured in this country. When the writer undertook to prepare this report about seven months ago, the National Park Service did not even know the name of the manufacturer of the original Central Pacific locomotive #60, Jupiter; and one alleged expert who had been consulted on the point gave an answer that proved to be entirely erroneous. This report has been pursued as

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1. Roy E. Appleman 6-page memorandum to Chief, Division of Interpretation, January 14, 1966, analyses testimony of the Hearings on intent of legislation and commitments of Departmental and NPS witnesses.

time permitted from my regular duties. Mr. William C. Everhart, Chief of the Division of Interpretation and Visitor Services, and Mr. Howard W. Baker, Assistant Director, Operations, gave their verbal approval and support for the work.

Conclusions and recommendations resulting from the study will be summarized first. The body of the report, with its appendices, sets forth the materials and findings on which the conclusions and recommendations are based.

CONCLUSIONS AND RECOMMENDATIONS

1. There is not available either in the United States or elsewhere original locomotives similar to Jupiter or #119. Replicas will have to be manufactured.

2. In order to manufacture replicas that will stand any scrutiny for accuracy of reproduction and represent successfully the Jupiter and #119, working or construction drawings of the two locomotives will have to be prepared.

3. Such working drawings can be prepared from the basic source materials assembled in this report. This is not only my judgment, but more importantly it is the judgment of several of the best informed experts in this field whom I have consulted on the matter.

4. A mechanical draftsman, experienced in drafting of early railroad and locomotive equipment, will have to be employed to make these drawings, using the material presented in this report. I am prepared to make a recommendation as to the person with whom the Service should enter into a contract to do this work. It will require a month or more of continuous work to prepare the necessary drawings. The estimated cost, $1,500 - $2,000.

5. When the construction drawings are finished, copies should be sent to a number of prospective manufacturers to obtain tentative bids or estimates. Only when these have been received will the

Service know the probable cost of obtaining the two locomotive replicas. All figures used thus far are worthless, or nearly so. I make this statement based on the findings of this report and of conversations with several railroad officials, and one manufacturer of related types of equipment. The Service estimate given in development costs used in the Congressional Hearings was $200,000 for both locomotives--an average of $100,000 each. This was for a "shell", and not a working engine. I doubt that this will prove enough unless manufacture is in a foreign country.

6. When estimates of cost have been obtained in the manner outlined above, Service decisions will have to be made at once on whether to proceed with manufacture, and the entire interpretive development of the area formulated without delay if the development goal of May 10, 1969 is to be met.

7. The best informed opinion, both within the railroad world and among private students of the steam locomotive that I have consulted, favors a careful and authentic reconstruction in the replicas if they are undertaken, rather than an amusement park or Hollywood standard. I take this view. Any other is not worth the financial cost involved and would be below our announced integrity in the field of historical preservation and interpretation. There is a large and growing awareness throughout the country of this project, and strong support exists for the making of the replicas.

Method of Inquiry and Research

A word may be in order to explain the method followed in pursuing this study, since at the outset I knew very little about the technical characteristics of the 1869 locomotive or where information might be obtained quickly. I had no idea of whether getting the answers needed would take a day, a month, a year, or indeed whether they ever would be forthcoming.

My first move was to go to the library of the Association of American Railroads, in the Transportation Building, 17th and H Streets, here in Washington. The Association has one of the largest and most complete reference libraries in the world on American locomotives and railroad history. In a series of visits there and in discussions with staff members I learned that the library had no working drawings of any locomotive of the period, few historical photographs of the locomotives we were interested in, and that the answers we sought would not be forthcoming quickly from their files. With the help of Mrs. Rowland at the Library I did have quick access to certain published sources. Mrs. Frances Meilleur of the Public Relations Department and Mr. L. T. McDougle, recently retired from the Association, gave me valuable references to libraries, special collections, and authorities on railroad history and early locomotives. This was a valuable help and saved me much time.

Acting on the suggestions received from the staff of the American Association of Railroads I continued my search by visits to several of the more likely institutions, collections of railroad materials, and by correspondence with many authorities in the subject across the country. The American Rail~~road~~ way and Locomotive Historical Society, with headquarters in Baker ~~Hall~~ Library, Harvard University, has been helpful, and particularly through its Pacific Coast Chapter, of which Mr. Fred A. Stindt, of Redwood City, California, is chairman. In March at its annual meeting and dinner, the Pacific Coast Chapter of the Society discussed the #119 and Jupiter problem confronting the National Park Service. As a result, Mr. Stindt asked Mr. Gerald M. Best of Beverly Hills, California, a recognized railroad historian and ~~a~~ resident Pacific Coast vice-president of the Railway and Locomotive Historical Society Mr. Best is also vice-Chairman of the Pacific Coast Chapter of the Society, ~~Pacific Coast Chapter of the Society,~~ to assist us in our work. Mr. Best has done so in correspondence and in giving a full day of conference with me early in May at his home. His assistance has been graciously offered on a continuing basis as needed. Mr. Best has been of important assistance to me.

Another person who should be mentioned specially as having given freely of his time, knowledge, and in suggestions is Mr. John A. White, Jr., Chief, Land Transport Division, National Museum, Smithsonian Institution. His assistance also is available on a continuing basis.

The body of the report, in its references and footnotes, will reflect the nature of help from many other persons and institutions.

THE 4-4-0 STANDARD AMERICAN LOCOMOTIVE

Before discussing the two locomotives that are the principal concern of this study, it may be well to describe briefly the locomotive type into which both the #119 and Jupiter fell. They were both 4-4-0's, 8-wheelers, and typical of the Standard American locomotive. The series of numbers in the term refer to the number of wheels a locomotive has; the first digit refers to the number of pilot wheels, the second digit to the number of driving wheels, and the third digit to the number of trailing truck wheels behind the drivers. This means that both the #119 and the Jupiter had 4 small pilot wheels and 4 drivers, but no trailing wheels.

The first 4-4-0 steam locomotive was built in 1837. The year before, in February, Henry R. Campbell of Philadelphia obtained a patent for an 8-wheeled engine, 4-wheel truck in front and 4 driving wheels. James Brooks of Philadelphia began building the engine a month later, and it was completed May 8, 1837.[2] This was the first of its type, and from it derived the two locomotives that met at Promontory, and all the many thousands of the Standard American 4-4-0 that operated in the United States in the last six decades of the 19th Century.

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2. Louis T. Peale, ed. and compiler, The History of the American Locomotive, illustrated with original engravings, Phila., Pa., The Scott Publishing Co., 1887, 46. The first 4-4-0 had 18 inch cylinders with a 12 inch piston stroke, 44 inch driving wheels, and weighed 12 tons.

Some authorities think "American Standard" is a preferable termonology to "Standard American" which I have used in this report in referring to this 8-wheel engine.

Because the 4-4-0 engine became outstandingly popular and successful, it became known as the Standard American. It was built increasingly in the 1850's and through the rest of the century. It was the type commonly in use on American railroads during the Civil War period, the subsequent period of building the transcontinental railroads, and the great period of railroad expansion in the United States. The Standard American engine was used in decreasing number after 1900, the last of standard gauge being manufactured in the 1920's. Baldwin built two 4-4-0 locomotives, 3-foot gauge, for Yucatan Railways in July 1946. These were the last built in this country as far as the writer knows. There are no 4-4-0's in use today on regular run standard gauge track in the United States or Canada.[3]

All the early famous manufacturers of railroad locomotives built the 4-4-0. Such well known firms as Baldwin, Mason, Cooke, Danford, Rogers, Schenectady, and Hinkley were household names in locomotive manufacture. Three manufacturers (Grant, Rogers, and Cooke) were located in Paterson, New Jersey, at one time. At first, the locomotives needed for motive power to serve the developing trackage in the United States were made in any large machine shop that desired to undertake the task. For many years the various makers incorporated special decorative design

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3. Paul T. Warner, "The 4-4-0 (American) Type of Locomotive," The Railway and Locomotive Historical Society Bulletin No. 35, October 1935, 10-37, is perhaps the best discussion available of the origin and subsequent development of the 4-4-0 in the United States. Also of some interest is H. L. Kelso, "Eight-Wheelers," Railroad Magazine, February 1957, 18-27. Ltr. Gerald M. Best to Roy E. Appleman, August 10, 1966.

and other features into their at first crude models. William Mason of Taunton, Massachusetts is generally credited with being the Master Stylist who perfected ~~working out~~ the classic design of the Standard American 4-4-0. The Standard American is identified with the Golden Age of railroading in the United States. No other locomotive design, steam or otherwise, has ever held a comparable place in the history of railroad operation over as long a period of time. And most students of the subject maintain that no other locomotive type ever approached it as a creation of beauty. Both the Jupiter and the 119 were representatives of the Golden Age of the Standard American 4-4-0.

The American Standard Locomotive as a Thing of Beauty

In the hey-day of the American 4-4-0, the locomotive was in a real sense a handicrafted thing of beauty. There were many manufacturers of the early locomotive, the industry resembling that of the automobile in its early days before the shakedown came that resulted in failures, mergers, and the emergence of only a few giant manufacturers. In this early stage any big machine shop could undertake the manufacture of locomotives and each had its individuality in design and decoration. This was markedly so in the 1860's when the Jupiter and #119 were built.

The locomotive of this time was highly attractive in the dark slate gray ~~blue~~ of its boiler jacket covering of Russian iron, red wheels and pilot or cow catcher, red smoke stack (generally black, however, as color tended to disappear when the engine got hot), varnished hardwood cab of

walnut, gold leaf lettering on green, and generally a painted scene or figure on the headlight and sandbox. To give the final touch there was a liberal use of brass as a material, and this was kept highly polished and gleamed like gold in the sunshine. The locomotive engineer of the period pampered his engine and kept it clean and highly polished as one would ~~of~~ something he was proud of and wanted to look always at its best. Old-timers say and have recorded that it was usual to see an engineer out cleaning and polishing his locomotive whenever the train stopped and he had an opportunity to do so.

It should be kept in mind that both #119 and Jupiter were new locomotives, only a few months in service, when they met at Promontory. And one can be sure they were groomed to look their rival best on that occasion.

The decorative paint schemes of locomotives of this time can be seen in numerous Currier and Ives lithographic color prints and other color prints showing locomotives of the period. Although none are known to be in existence for either #119 and Jupiter, it is certain that these two followed the general practice of the time and were similar in decoration.

A few examples showing the highly decorative character of the early 4-4-0 may be of interest. There follows a description of what Central Pacific locomotive #1, the Governor Stanford, looked like when it was new in 1863.

"On November 9 the cannon saluted the Governor Stanford in a heart-stirring suit of paint, as it chuffed along the track for the first time. The wood-burning locomotive, about twice the height of a tall man and 50 feet long, included its maroon tender, was a splendid sight. Its four driving wheels, $4\frac{1}{2}$ feet in diameter, were bright red, with a gold star painted on each hub. The driving rods and pistons were of brass, butter-colored and glowing in the sunlight. So were the bell, with its orange clapper, and the bands that girdled the gray-blue boiler. The locomotive's cab was maroon outside and apple green inside. Its name was painted in gold letters beneath the windows, whose frames were the color of ripe lemons. Vivid green fenders hooded the driving wheels, and above them on each side of the cab was an orange step for the crew to use for climbing aboard. The smokestack and wooden slats of the cowcatcher were as red as the driving wheels. The headlight was maroon, with a fat kerosene lamp sitting inside in front of a glistening reflector. Huge gold initials, 'C.P. R.R.,' decorated the tender's dark-red sides, which bore a chirpy stripe of orange along their base. Locomotive and tender, when carrying a full load of water and wood, weighed 46 tons." [4]

Schenectady, which built Jupiter, constructed the Commodore Vanderbilt for the Rensselaer & Saratoga Railroad in 1872. Here is what it looked like:

"Her drivers were a brilliant red and the spokes striped with gold, with a large gold star on each hub. Smaller gold stars adorned the wheel rims. Her overall coloring was green and red, gold-leaf lettering in script. Portraits of the handsome Commodore himself were painted in color on two sides of her box head-light." [5]

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4. Alfred W. Bruce, The Steam Locomotive in America: Its Development in the Twentieth Century, New York, W. W. Norton & Company, Inc., 1952, 39-40. Hereafter cited as Bruce.

5. H. L. Kelso, "Eight-Wheelers," Railroad Magazine, February, 1957, 19.

Perhaps the best source for a study of paint and decoration color schemes for the early locomotives is to be found in the color lithographs issued by the various makers for their locomotives. See John H. White, Jr., "Locomotives on Stone," Smithsonian Journal of History, Vol. 1, No. 1, Spring, 1966 for the best discussion of this subject. Charles E. Fisher in The Railway and Locomotive Historical Society Bulletin, No. 35, October, 1934, 38-51, gives a list of lithographs.

Another writer said of these early locomotives, "For sheer beauty of Victorian design the American locomotive of the seventies cannot be surpassed. What colorful characters these engines were! They wore bright paint and brass trinkets and their proportions gave them a distinctly theatrical appearance."[6]

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6. Ward Kimball in Foreword, Graham, Hardy, and Paul Darrell, American Locomotives 1871-1881, Oakland, California, 1950."

THE UNION PACIFIC LOCOMOTIVE #119

By the Act of July 1, 1862, Congress authorized the building of the Union Pacific Railroad. But it was not until the following year, in March 1863, that Congress in another bill established the gauge of the projected railroad at 4 feet, 8½ inches--since known as standard gauge. California wanted a 5-foot gauge; Lincoln favored that gauge. One railroad in New England at the time had a 7-foot gauge. There were many different gauges in use throughout the country. But as it turned out, the political combine with the most strength succeeded in securing legislation for the 4 foot, 8½ inch gauge.[7] Thus both the Union Pacific and Central Pacific had to build to that gauge and obtain locomotives to operate on that gauge track.

The Central Pacific broke ground at Sacramento on January 8, 1863, the Union Pacific at Omaha on December 2, 1863. But neither the Union Pacific building from the east nor the Central Pacific building from the west was able to do much until the Civil War ended. With the end of the war, iron and other construction materials and a man-power labor supply became available. Both railroad companies began purchasing rolling stock in some quantity in 1866. In that

7. John P. Davis, The Union Pacific Railway: A Study in Railway Politics, History and Economics, Chicago, S. C. Griggs and Company, 1894, 114-115. Hereafter cited as Davis.

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year the Union Pacific had 25 locomotives, all wood-burners, and each weighing between 25-35 tons.[8] At first, the Union Pacific followed the practice of giving names to its locomotives as well as numbers. The General Sherman was U.P. #1. Others were named after Civil War generals, and a few were given geographical names. But sometime in 1866 the practice of naming U.P. locomotives ended.[9] According to the Union Pacific list of locomotives, only the first 21 received names.[10] Accordingly, #119 never officially had a name.

The sister locomotives of #119 seem to have the same decoration on the sandbox, although this is not altogether distinct in the pictures available.

I have seen occasional references to Union Pacific #119 as "The Plainsman," or "Pride of the Prairies," I was unable to discover the reason for the name until I noticed that the picture painted on the sandbox of the engine seemed to represent a plainsman. I assume, therefore, that the name derived from that decoration on #119. Both the Union Pacific and the Central Pacific numbered their locomotives serially as they acquired them. Thus #119 stands in that sequence among the locomotives acquired by the Union Pacific.

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8. Wesley S. Griswold, A Work of Giants: Building the First Transcontinental Railroad, New York, Toronto, London, McGraw-Hill Book Company, Inc., 1962, 171. Hereafter cited as Griswold. This is the best researched, best balanced, and most reliable general history of the building of the Union Pacific and Central Pacific Railroads. Mr. Griswold is West Coast editor of Popular Science Monthly.

9. Griswold, 170.

10. Copy of Union Pacific List of Locomotives in possession of Mr. Gerald M. Best, 511 North Sierra Drive, Beverly Hills, California, and examined by Roy E. Appleman, May 3, 1966; the same list subsequently consulted at offices of Union Pacific Railroad, Omaha, Nebraska.

The first U.P. locomotives were delivered to St. Joseph, Missouri on railroad flatcars on the St. Joe Railroad. There they were transferred to Missouri River steamboats and moved upstream to Omaha where they were unloaded. This short river trip cost about $1,000 per locomotive. At this time there was no railroad connection from the east with Omaha. The nearest approaching railroad was the Chicago & Northwestern Railroad building through Iowa. The U.P. soon found that it could get its locomotives to Omaha cheaper by hauling them by ox-teams from the Chicago & Northwestern Railhead 100 miles east of Council Bluffs, then ferry them across the river to Omaha, than to move them upstream from St. Joe by river steamer, and this method was generally followed.[11] ~~I assume that~~ The #119 may have arrived at Omaha by this method, although I have seen no documentation to prove it. On the other hand, the Chicago & Northwestern Railroad was running a daily service to the Missouri River ferry station west of Council Bluffs, Iowa, as early as May 3, 1868, apparently, and it would appear likely, therefore, that the #119 would have been delivered by rail to the Missouri River ferry opposite Omaha.

It will be noted, in this connection, that although the Central Pacific had to transport its locomotives around South America and Cape Horn by sailing vessels to California or carry them across the Isthmus of Panama by the isthmus railroad to a second ocean-going vessel, the Union Pacific had its own kind of problem of getting locomotives and rolling stock to its eastern terminus at Omaha.

About the time the transcontinental railroad was completed the Union Pacific reported that it had bought 68 new passenger locomotives

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11. Griswold, 136; Ltr., Gerald M. Best to Roy E. Appleman, August 10, 1966. Best has a copy of a C & NW Timetable, dated May 3, 1868 which shows service to the Missouri River ferry at Council Bluffs.

for through traffic at a cost of $14,000 each, or a total of $952,000. Passenger cars at the same time cost $6,000, box cars $900, and Baggage, mail, and express cars $3,800.[12]

The Central Pacific Railroad at the same time had about 1,000 men employed at its Sacramento shops, and its rolling stock consisted of about 150 locomotives, 1,400 platform cars, 360 box cars, and 17 mail and baggage cars.[13]

Union Pacific locomotive #119 was built by the Rogers Locomotive and Machine Works of Paterson, New Jersey, and completed on November 19, 1868. It was one of 5 freight engines the Rogers Company built from one order, all designed to burn bituminous coal that the Union Pacific had discovered in workable quantities in western Wyoming. These five locomotives were numbered 116 through 120, and can be called sister locomotives because all five were built from the same specifications and looked alike.[14] This is important to know because a good

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12. American Railroad Journal, XXV, No. 23, June 5, 1869, 645.

13. Ibid, XXV, No. 23, June 5, 1869, 617.

14. List of Union Pacific Locomotives at the Union Pacific Railroad, Omaha, Nebraska; copy of same list is in possession of Gerald M. Best; Rogers Locomotive Factory List of locomotives in possession of John A. White, Jr., Chief, Land Transportation Division, National Museum, Smithsonian Institution, gives the dates of completion of #119 and its four sister locomotives, as follows: #116, October 23, 1868; #117, October 27, 1868; #118, November 18, 1868; #120 November 21, 1868. Thus, #119 was completed one day after #118 and two days before #120. It will be noted that all are in consecutive number according to date completed.
#119, November 19,

photograph of any one of them will show the characteristics of the others. The only differences might be the pictorial decorations on the headlight and the sandbox. These locomotives had extended smokeboxes because they were coal-burners and needed the additional length and space for cinder screens. Hence the headlights rested on the end of the smokebox rather than being carried on a bracket that extended in front of the smokebox, as was the case with wood-burners of the period. It should be noted, however, that not all coal-burners used extended smoke-boxes. I have been unable to determine the date #119 was delivered at Omaha and put into service, but it could hardly have been there and in service before the early months of 1869.

The #119 and its sister locomotives all had a stovepipe or straight, capped stack smokestack, rather than the flared, bell-shaped and diamond stacks so common at the time for the wood-burners. All had the same driving wheel dimensions and cylinder and piston capacities. The vital statistics for #119 and its sister locomotives are as follows:[15]

Driving Wheel Diameter	Cylinder Diameter	Piston Stroke	Weight
54-inches	16-inches	24-inches	54,000 lbs. (engine only)

15. The dimensions of the #119 driving wheels are with steel tires on the iron wheel center. The tires add about 3 inches to a wheel (center) as cast for a locomotive of the 1860's. Sometimes dimensions of driving wheels are given as center, and this means without the tires added. The tires for locomotives were made of steel and shrunk on the centers much as an iron tire is put on a wood wagon wheel.

I have found no record of the history of #119 after it was put into service other than what can be gleaned from a few photographs and from the Union Pacific List of Locomotives. The photographs show the #119 in service in western Wyoming and Utah. It is not entirely clear how many of these photographs were taken prior to the Promontory Summit ceremonies of May 10, 1869. Since #119 was a bituminous coal burning engine it is logical to assume that upon arriving at Omaha, probably early in 1869 as indicated above, it was sent immediately to the western end of the track to use the coal available along the right-of-way in western Wyoming. The photographic record of the ceremonies at Promontory on May 10, 1869 show clearly that #119 was the engine used to draw the Union Pacific train to the ceremonies, and that it faced Central Pacific #60 in the joining of the rails ceremony.

After the May 10 historic meeting of the locomotives at Promontory the #119 apparently went back to the routine work of a locomotive on a railroad.

Union Pacific #119 was rebuilt in the early 1880's and in the general renumbering of 1885 it became #343. The Historical Record List of locomotives at Union Pacific headquarters in Omaha indicates

that it was broken up and disposed of as scrap in April 1903. The initials "B.U.", standing for "broken up", tell its fate.[16]

None of the sister locomotives of #119 survived it~~s own end~~. Two of them had been rebuilt in 1883 and 1884 with 68 inch driving wheels, but they lasted only until 1902.

Construction Drawings for Union Pacific #119

So far as I have been able to determine there are no construction drawings in existence for #119. The Union Pacific Railroad has stated that it does not have them.[17] The successor companies to The Rogers Locomotive and Machine Works apparently have not retained any of the early drawings that may once have existed for their 19th century locomotives. Drawings have not been found in any of the institutional

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16. The writer examined this record in Omaha, together with subsequently dated official and unofficial data on U.P. locomotives in Union Pacific Railroad files. The Locomotive Historical Record List shows that the first Rogers built locomotives the Union Pacific purchased were #28-32, in 1867. They were all 4-4-0 engines weighing 54,000 pounds for "engines only." The same list gives the weight of #116-120 as the same, 54,000 pounds for the engines only. The U.P. Historical Record gives the weight of #119 rebuilt as #343 as 65,970 pounds in 1885, ~~but does not indicate whether it was for engine alone.~~ Often one will see the weight given for a locomotive without an indication of whether it includes the weight of the tender. The early practice generally was to give the weight of the engine without the tender. Later the practice veered to include the weight of the tender with that of the engine. A tender of the period would weigh about 20,000 pounds empty, and about 40,000 pounds loaded. The tender for #119 had a water tank capacity of either 2,000 or 2,200 gallons. I have been unable to determine which is correct.

17. Ltr, Edd H. Bailey, President, Union Pacific Railroad Company, to Representative David S. King, September 20, 1965, copy in files of National Park Service.

or private collections of railroad history, nor have any of the collectors or experts in railroad history I have consulted had any knowledge of the existence of such drawings. Only one set of drawings of a Rogers locomotive of the period has been found--and this in a work published in England. It will be described later.

But first it will be in order here to record briefly the history of the Rogers Locomotive and Machine Works to the present so that this report will reflect in a summary way the kind of effort that has been made to find drawings of #119.

The library of the Association of American Railroads in Washington and the Engineering Societies Library in New York City have a number of catalogues and histories of the Rogers Locomotive Works published by the company itself. These taken together give a good record of the company from its inception in 1831 in Paterson, New Jersey, until it was merged in 1904 with the American Locomotive Company. The American Locomotive Company had been formed in 1901 by merger of eight companies (2 more added later), including the Schenectady Locomotive Works. After the mergers the main offices and largest manufacturing facilities of the American Locomotive Company were centered at Schenectady, New York.[18] The company has in recent years given way to a new corporate firm, ALCO Products Inc., with operating and manufacturing headquarters at Schenectady but general offices

18. See next page.

in New York City. Inquiries directed to both places have failed thus far to obtain answers to questions about the location or disposal of the early records relating to its subordinate companies, Rogers which manufactured #119 or Schenectady which manufactured Jupiter. It is of interest that both companies involved in our study eventually became part of the American Locomotive Company and now of ALCO Products.

The 1886 edition of the Rogers Locomotive Works catalogue and history indicates that Figure 117 seems to be the stack, design in 1864, that #119 carried. The drawings for cylinders on page 51 gives their arrangement; Figures 143-144 show the

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18. Rogers catalogues of 1893 and 1897 may be found in the library of the Association of American Railroads. A copy of Locomotives and Locomotive Building: Origin and Growth of the Rogers Locomotive and Machine Works, Paterson, New Jersey, From 1831 to 1876, (published by Rogers), New York, J.W. Pratt, Printer, 1876, may be found in the Engineering Societies Library, 345 East 47th Street, New York City. The Library of the American Association of Railroads has the same work updated and reprinted in 1886, New York, Wm. S. Gottsberger, Printer. This work and the Rogers catalogues gives numerous drawings and describe the principle advances and changes made in design of locomotives throughout the period and the reasons for them.

Of interest also are a number of articles in Railway and Locomotive Historical ~~Association~~ Society Bulletins. See Bulletins No. 10, 1926, 22-25, for an article by Walter A. Lucas; Bulletins No. 11, 1926, 22-23, has an article on the Rogers work from 1832 to 1904. The Bulletins of the Railway and Locomotive Historical ~~Association~~, Society starting with No. 1 in 1921, have a wealth of information on various aspects of American railroading.

The 1876 edition of the Rogers history and factory catalogue indicates that Rogers locomotives carried a steam pressure of 130 pounds per square inch, cutting off at 50% and 70% of piston stroke. It also gives specifications of passenger and freight locomotives and general design on pages 49-53.

smokebox arrangement; and Figures 179 and 182-186 show spring and equalizing levers for the Standard American locomotive (pages 61-63).

In 1868 (the year of manufacture for #119) Rogers delivered 31 4-4-0 locomotives with 16-inch cylinders, the same size as #119. The next most popular model is reflected in 14 18-inch cylinder engines. Altogether, it built 70 locomotives in 1868 (Table, p.77).

The age of the steam locomotive came to an end about 1950 with the general acceptance of the diesel-electric. Nearly all the older locomotive companies have disposed of or destroyed drawings, photographs, and most of their detailed records of the steam locomotives they had built in the previous century. For instance, Baldwin (presently the Baldwin-Lima-Hamilton Corporation of Philadelphia) disposed of its older steam locomotive drawings about 1956.[19]

ALCO Products disposed of at least some of its remaining historical records of old steam locomotives in 1958. In May of that year the Historical Center of the City of Schenectady received from the company all the glass negatives of photographs of locomotives shipped between approximately 1880 and 1920 from the independent companies that had been merged after 1901 into the

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19. Ltr., Perry A. White, President, Baldwin-Lima-Hamilton Corporation, to Roy E. Appleman, February 22, 1966 (with enclosure from J. C. MacInnes to White, February 16, 1966)

American Locomotive Company, except for the Montreal works. These were identified according to builder's lists and indexed by the History Center. ¶ The announcement sent out by the History Center stated that builder's lists for the 10 companies merged into American Locomotive (Brooks, Rhode Island, Pittsburgh, Schenectady, Cooke, Rogers, Montreal, Dickson, Manchester, and Richmond) totalled 345 pages.[20] According to a statement from the City Historian, however, the records received included some 7,000 negatives, about 90% of which are on glass and date between 1885 and 1920. About 10% are on film and date between 1920 and 1947. ALCO Products apparently considered the latter year as marking the end of the age of steam locomotive. There were no line drawings or specifications for locomotives in the collection, according to the City Historian. Of immediate concern for our study were the builder's lists. Of these, the Rogers list in the History Center collection started in 1872, that for Schenectady in 1851.[21] Accordingly, there was no reference in the collection to Rogers built Union Pacific #119.

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20. The writer found a copy of this announcement from the Office of the City Historian, City of Schenectady, New York, dated December 23, 1959, in the library files of the Simmons-Boardman Publishing Company, Room 1622, 30 Church Street, New York, through the courtesy and help of Miss Edith Stone, Librarian. The Simmons-Boardman Publishing Company has a large and extensive library and file on railroad history, and Miss Stone is an unusually well informed person on the subject. The Company and its predecessors have been publishers of railroad journals, magazines, and books for nearly a century.

21. Ltrs., J.W. Joyce, Historian, City of Schenectady, N.Y., to Roy E. Appleman, March 23 and April 13, 1966.

With this information in hand, and with no cooperation to this date from ALCO Products, Inc., it appears that there are no construction drawings and specifications for the #119 to be had from the company, or its corporate successors, that manufactured it.

In the light of the information obtained during the course of this study, it appears that most if not all the locomotive manufacturing concerns have disposed of most of their records for the 4-4-0 early steam locomotives, and, further, that about 10-20 years ago with the advent of the diesel-electric locomotive and the obsolescence of the steam locomotives nearly all detailed drawings and specifications for steam engines were disposed of.

There is the possibility that working drawings for the #119 as much never existed, since in the 1860's methods of manufacture apparently did not always require complete drawings. Basic drawings and patterns were followed for a given model and machinists probably did not need or use new detailed drawings for all parts when orders for standard locomotives were received. ~~as is the practice today in machinery design and manufacture.~~

Colburn Drawings of Rogers Locomotive

But if there are no existing drawings of the #119, we have available drawings that are close to it and can serve as basic for production drawings of the locomotive. Strangely, this set of drawings appears in a British publication, in 1871, and consist of three plates $30\frac{1}{2}$ by 13 inches in size, drawn to a scale of $5\frac{1}{4}$ inches to 9 feet. These three plates may be described as engineering assembly drawings. Colburn was a native of the United States who became editor of the Engineer, published in London, and resided in Great Britain for many years.

Plate XVIII presents a ~~pictorial~~ side elevation view of the locomotive in profile ~~and~~ from the right side ~~view~~. Plate XIX presents the same view in a longitudinal cross section ~~terms of~~ showing working parts and exposed boiler tubes. Plate XX consists of a series of 10 separate drawings of details, such as view of cab from foot plate, section through cylinder, half section through fire box, front view of locomotive, two sections of Bissell truck, half plan of Bissell truck, piston, plan of cylinder and valve motion, section through guide bars, and section through cylinder and valve motion. The scale for Plate XX, details, is different from the scale for the other two plates, being 3 3/4 inches to 5 feet.

This set of drawings, published in 1871 and dating obviously from that year or earlier is precisely what the #119 would have been in 1868 except for the size of driving wheel, smoke box, and fire grates. These drawings are for a wood burning passenger locomotive as is indicated by the rocking grates and combustion chamber. ~~Accordingly,~~ They do not have the extended smoke box that #119 had, and the smokestack is a modified diamond stack instead of the stovepipe variety on #119. The driving wheels appear to be 68-inch diameter. These are features that can rather readily be adjusted in final drawings based on the Colburn plates. Otherwise the Colburn plates represent the Union Pacific Rogers-built #119. The essential parts are drawn and the assembly shown.[22]

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22. See next page.

These plates, together with the photographs of #119 that have been assembled, will serve as a sufficient body of authentic source material from which accurate construction drawings can be made, and from which the #119 replica can be manufactured. A set of black line photostatic positive prints of the Colburn plates is included as Appendix A.

Weissenborn Drawings

Of interest in this connection and possibly of some use in preparing the final drawings for #119, mention should be made of other drawings, chief of which is the unique set of construction

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22. Zerah Colburn, Locomotive Engineering, and the Mechanism of Railways: A Treatise on the Principles and Construction of the Locomotive Engine, Railway Carriages, and Railway Plant, with Examples (64 large engravings and 240 woodcuts), 2 vols., London & Glasgow, William Collins, Sons, & Co., 1871. Volume 1 contains text, volume 2 contains the plates. This set is unique in that most of the discussion and plates relate to English manufactured locomotives and rolling stock, with several models of French equipment also featured. There is only one American locomotive illustrated in the work, and it happens to be the Rogers passenger locomotive of the period of our interest. In this we are fortunate. Colburn gives the vital statistics of the Rogers 4-4-0 illustrated in Plates XVIII, XIX, and XX as follows:

Area of Grate	13 square feet
Heating Surface	787 square feet
Diameter of Cylinders	16 inches
Length of Stroke	24 inches
Diameter of Driving Wheels	5 feet 8 inches
Length of Wheel Base (extreme)	20 feet $1\frac{1}{2}$ inches
Length of Wheel Base to center of Bogie	23 feet
Length of Bogie alone	5 feet 9 inches

(Pages 266-267)

drawings in G. Weissenborn's large folio size two volumes on railroad locomotive and car drafting. This work was published in 1872, with the construction drawings in volume 2 carrying the notation, "entered according to the Act of Congress in the year 1871..." The drawings do not represent either a Rogers or a Schenectady locomotive, but are of Danfor~~d~~th, Baldwin, Hinkley, Grant, and New Jersey Locomotive and Transportation Company, (it replaced the N.J. Loc. + Transpt. Loc. in 1867), and others, together with drawings of tenders and cars. Most of these drawings have features common to both the #119 and Jupiter.

The set of drawings most complete of all and very close to the Jupiter, but somewhat less so for #119, is that for New Jersey Locomotive and Transportation Company wood burning passenger Locomotive #44. The drawings are in nine plates altogether, with 4 giving elevations, valve and link motions, half sections, longitudinal sections, and 5 plates incorporating a large number of detailed figures of parts. They are sufficiently complete so that for practical purposes they may be called construction drawings.

The New Jersey Locomotive and Transportation Company locomotive #44 is similar in vital statistics to the #119 and Jupiter, except that the length of the piston stroke is 22 inches instead of 24 inches. It may be considered a basic source for study and design of details. I have found no other set of construction drawings for the 1868 period 4-4-0 locomotive, nor do any of the experts in the field I have consulted know of another or of anything comparable

to it. I first found the Weissenborn work in the Engineering Societies Library in New York City,[23] A set of the Weissenborn plates for New Jersey Locomotive and Transportation Company locomotive #44 ~~is~~ constitutes Appendix B, together with certain other locomotive plates from the Weissenborn work and four plates showing construction details of a standard tender that would be suitable for #119 and Jupiter, if modified for certain details that show in photographs of their tenders.

Brief mention will be made here of other scaled drawings, diagrams, and pictorial sketches of a Standard American locomotive of the period that may be of some reference value in preparing the

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23. G. Weissenborn, American Locomotive Engineering and Railway Mechanism, With a Practical Treatise on the Draughting, Construction and Principles of the Locomotive Engine and Railway Cars; Illustrated with Large and Detailed Engravings..., 2 vols., 269 Pearl Street, New York, American Industrial Publishing Co.,1872. Weissenborn was a mechanical engineer. This work is unique in that there appears to be none other like it with the same degree of scaled detailed drawings of early American locomotives.

According to Mr. John A. White, Jr., Chief, Land Transportation Division, National Museum, Smithsonian Institution, these drawings can be used as a basic reference for both Jupiter, which was a woodburner, and for #119 a bituminous coal burner, since there would be no differences except for the extended smokebox, and a somewhat different firebox and grate. The firebox and grate would not be greatly different in a bituminous coal burner from those in a standard woodburner, but in an anthracite coal burner they would be much larger.

The Weissenborn work is considered a rare and valuable set by railroad buffs, and commands a high price. The Library of Congress has volume 2, but not volume 1, and some of the plates in its volume 2 have been removed or the copy was initally imperfect. The Library of the Association of American Railroads has volume 1 of the text, but not volume 2 of plates. The Smithsonian Institution has a near perfect set of the work, and it is from this copy that the copies of the Weissenhorn drawings in this report were obtained through the courtesy of Mr. John A. White, Jr., of the Smithsonian staff.

final drawings for #119 and Jupiter, although it is my opinion that they probably will add little or nothing to the Colburn and Weissenborn plates included in Appendices A and B. The Railroad Gazette for December 23, 1871 carries a scaled profile drawing of a Baldwin 4-4-0, at ¼ inch to 1 foot, 16 x 24 cylinder and stroke, 60 3/4-inch driving wheels, weight 65,000 pounds.

The Railroad Gazette for May 10, 1873 carries drawings of a Grant locomotive, and in its issue of April 13, 1877 it has a drawing of a New York Central and Hudson River Railroad, Standard 4-4-0 together with railroad specifications. In 1883 the Railroad Gazette Publishing Company published a volume entitled Recent Locomotives, which brought together a number of scaled drawings giving pictorial and profile characteristics of several Standard American 4-4-0 locomotives of the 1870's period. Some of these plates were reproduced in Graham Hardy & Paul Darrell, American Locomotives, 1871-1881, published at Oakland, California in 1950. This volume also includes certain drawings taken from Mathew N. Forney, Catechism of the Locomotive, 1873. Forney's book appeared in numerous reprints and editions in the later half of the 19th century and was generally regarded as the "bible" for a study of the steam locomotive. Some of the later editions contain numerous valuable drawings of locomotive parts. The 1875 edition is one of these, including even a drawing of a railroad water tank

drawinto scale (Figure 225); a Y turn-around (Figure 229); and a 4-4-0 locomotive and a turntable drawn to scale (Figure 227).[24]

Some of these drawings, including one with a glossary of parts keyed to a Grant Standard American locomotive and tender, are included in Appendix C. These may be listed as follows:

1. Grant Locomotive, Plate VI, scale 1/8 inch to 1 foot, table of dimensions and weight.
2. Grant Locomotive, Figures 4, A-5, A-6, A-7, A-8, A-9, A-10, in various scales shown on drawings. These drawings include loggitudinal section, plan, and boiler. Figures A-8 and A-9 give a list of parts with reference to drawings.
3. American Locomotive, New York Central & Hudson River Railroad, Figures 9,10,11,12,13,14,15,16,17 (15-17 of tender).
4. Meaured drawing of Baldwin Locomotive #11, 1872, Virginia & Truckee Railroad.

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24. Mathew N. Forney, Catechism of the Locomotive, Railroad Gazette Publishing Company, 73 Broadway, New York, 1875, 451, 456-457.

Specifications--Rogers Built Union Pacific #119

Accompanying construction drawings for a locomotive there normally would be a set of specifications describing materials to be used and containing certain other instructions. In the case of #119 no extant specifications have been found, just as there are no construction drawings. But fortunately there is a sheet of specifications for a Rogers 4-4-0 built in 1867, just a year earlier than the #119, and undoubtedly very nearly identical to the specifications for #119. For practical purposes in reconstructing a replica of #119 it is believed the specification sheet for the Rogers built Seminole will be valuable. This is the only specification sheet for any 4-4-0 locomotive of the period found in the course of preparing this study.

The Seminole: The Seminole was a 4-4-0 Standard American locomotive built by Rogers for the Union Pacific Railroad in 1867, #21. It was the last of the Union Pacific locomotives to be given a name. The Rogers factory list of locomotives indicates that it was completed on April 10, 1867.[25] Photographs show that it resembled the #119 in characteristics except that it has a flared bell-shaped or "Bonnet" smoke stack instead of the stove-pipe stack of #119, and was a wood-burner. It was eventually renumbered and was

NO! IT WAS BUILT FOR THE UNION PACIFIC RAILWAY, EASTERN DIVISION, WHICH BECAME THE KANSAS PACIFIC

25. Rogers Factory List of Locomotives, copy in possession of John A. White, Jr., National Museum, Smithsonian Institution.

transferred to the Kansas Pacific Railroad, a subsidiary of the Union Pacific.

In 1952 Alfred W. Bruce's book, The Steam Locomotive in America: Its Development in the Twentieth Century, was published. Bruce had been chief engineer of the American Locomotive Company, and in the nature of his position he had become familiar with the records of the original companies that had merged in the American Locomotive Company. At some point he had come upon the manuscript specification sheet for the Seminole. He used it as an illustration in his book. The Rogers Company apparently printed up specification sheets with a listing of all the special features and parts of a locomotive, providing space for writing in additional information as to materials and special instructions applying to the locomotive in question.

The Seminole sheet shows this, and even includes some rough pen and ink sketches to illustrate a point. The specification sheet in the size reproduced is hard to read in places, but this can be done with the aid of a magnifying glass. It shows, for example, that the driving wheels were 54 inches, the same as #119; that the bell frame was scroll, the same as #119; that the cab was of walnut and the seat of ash; the cylinders were 16-inch diameter but the piston stroke 22 inches instead of the 24 inches for #119; the pilot was of wood; that lettering was to be gold with black shade; and many other similar details.[26]

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26. See next page.

Although Mr. Bruce devotes the greater part of his book to *locomotives after 1900*, he includes an interesting chapter on the early development of the steam locomotive. Fortunately, in this he features the Seminole. Because of his own eminence as a locomotive railroad engineer, Mr. Bruce's comments about the Seminole specifications, and how much is left to the craftsmen and not detailed in specifications, are worth noting as this practice undoubtedly was of general application in the period and would relate to #119 and the Jupiter. On this point he says:

> "The specification makes no mention of the methods to be followed for the construction of the boiler or for the machining of the detail parts and their assembly, all of which are apparently left to the judgment and facilities of the locomotive builder. With but few exceptions, no mention is made of the material to be used for the important elements. However, since only brass, copper, and cast and wrought iron were then commercially available, this is not surprising, for early in the industry definite grades of material were recognized as being applicable to the different details."[27]

In another place, Bruce comments that, "As the art of reproducing drawings was undeveloped at the time, detail information on these old engines is often very limited." The "Main Drawing" and "Section

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26. Alfred W. Bruce, The Steam Locomotive in America: Its Development in the Twentieth Century, W. W. Norton & Company, Inc. New York, 1952, Figure 3, 40, reproduces specifications for the Seminole. Mr. Bruce is now dead and it might be hard to trace what happened to the original used in 1952, it probably is in existence.

27. Bruce, 41.

entries written in longhand in the blank space under the heading "DRAWINGS" indicates that there were generalized drawings that would do for basic needs in the manufacture of most of the locomotives of a given model, and that these would be consulted as needed. A copy of the Seminole specifications is included in this report.

The Seminole specifications, taken together with the Colburn plates and photographs of #119 and other locomotives of the time, are valuable basic information on the Rogers 4-4-0 locomotives of the period.

There is still another document, a form of description that falls short of being a specification for a Standard American 4-4-0 locomotive of the period, that will be useful. It describes parts and materials but is not a specification sheet as was that for the Seminole. This appeared in a book published by the Grant Locomotive Works, also of Paterson, New Jersey, in 1871, entitled, <u>A Description of Locomotives Manufactured by the Grant Locomotive Works of Paterson, New Jersey</u>, published by James Sutton & Company of New York.[28]

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28. A copy of this valuable work is in the Library of the American Association of Railroads. It contains unusually clear photographs of the principal mechanical parts of a locomotive, including even a lighted view of the boiler tubes arrangement. The frontispiece is a drawing of the Grant built Standard American 4-4-0 Locomotive "America" which won a gold medal at the Paris World Exposition in 1867.

A copy of the Grant "Description," as it appeared in the 1871 book, is included as Appendix D. The Railroad Gazette for May 27, 1871, editorialized about the specifications and reprinted them as being of unusual interest.[29]

There is another set of descriptions that support those already cited. These are for a Standard American 4-4-0 Baldwin built locomotive, 16x24 cylinders, the same as for both Jupiter and #119. A copy of these descriptions is also included as a part of Appendix D. A scaled drawing of the locomotive "Philadelphia" to which the specifications relate is also included.[30]

A comment is in order here about two or three works that have unusual reference value on many details of early 4-4-0 locomotives, and which should be consulted as needed. These are listed in footnote 31.

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29. Railroad Gazette, May 27, 1871, 101, 107-108.

30. Railroad Gazette, December 23, 1871. Drawings face page 399, specifications on pages 399-400. Issue of December 30, 1871 carries engraving of one half of front end and a half section about center of the engine. The Hardy and Darrell volume on American Locomotives 1871-1881 reproduces these drawings and descriptions, but they are not as clear as the original drawings in the Gazette.

31. See next page.

31. The various editions of M.N. Forney's Catechism of the Locomotive; also Locomotives and Locomotive Building, Being A Brief Sketch of the Growth of the Railroad System and of the Various Improvements in Locomotive Building in America Together with a History of the Origin and Growth of the Rogers Locomotive and Machine Works, Paterson, New Jersey, From 1831 to 1886, New York, Wm. S. Gottesberger, Printer, 11 Murray Street, 1886. The Preface by M.N. Forney indicates that he wrote the work at the request of the officers of the Rogers Locomotive Works, and that the company provided the materials from its records to illustrate the work at least as far as it relates to the Rogers Company. Mr. Forney's standing gives this work an authoritative value. It is richly illustrated with clear line drawings and engravings of the Standard American locomotive and its principal parts as it had developed down to 1886.

Two other volumes that are of value for all kinds of technical matters relating to the early locomotive are the following: Zerah Colburn, The Locomotive Engine, Philadelphia, Henry Cary Baird, 1872; and the American Locomotive Company's Locomotive Handbook, 30 Church Street, New York, 1917, which includes a brief sketch of the organization of the company and its history.

(originally written in 1851 but reprinted for many years even after it became out-of-date)

Photographs of Union Pacific #119

As evidence pertinent to preparing construction drawings of both the Jupiter and #119, an effort has been made to assemble copies of as many photographs as possible of these two locomotives before they were altered from their original condition by rebuilding. Most of the existing photographs were taken in connection with the joining of the rails ceremony at Promontory Summit, Utah on May 10, 1869. A few were taken a day or two before the ceremony or at some later date.

There were three photographers present at the Golden Spike ceremonies on May 10, 1869 and in the two or three days preceeding the ceremony. They were the following:[32]

Andrew Joseph Russell, of New York City, serving as official photographer for the Union Pacific Railroad.

Alfred A. Hart, of Sacramento, California, serving as official photographer for the Central Pacific Railroad.

Charles R. Savage, of Salt Lake City, apparently acting as a free-lance or independent photographer.

Of the three, it is now established that A. J. Russell took the most famous and best pictures of the ceremony. Several of these include views of #119. A few of Russell's pictures have been reproduced many times without any identification as to who took them, and if

32. Hugh F. O'Neil, "List of Persons Present, Promontory, Utah, May 10, 1869," Utah Historical Quarterly, Vol. 24, 1956, 157-164. I have seen no stereo views of the Golden Spike ceremony other than those attributed on the printed stereo cards to Russell, Hart, or Savage & Ottinger.

identified have been wrongly identified as being the work of Savage. The evidence has recently come to light that sets this matter straight. The photographs assembled as a part of this report will identify each one, where it has been possible for me to do so, as to photographer and the date or approximate date taken. Some photographs will be clear as to certain details of the locomotive in questions, still others will bring out additional details hidden, obscured, or missing in the first. Study of all of them will permit the draftsman preparing the construction drawings to reflect the actual appearance of details which might not be possible from any other of the basic materials he will use as sources.

All photographs of sister locomotives of #119, those made at or nearly at the same time by the same manufacturer and to the same specifications, are included. They show just as well as photographs of the #119 itself what the locomotive looked like, since they were identical in characteristics and features.

A. J. Russell emerges as the most important photographer of the Promontory Summit Golden Spike ceremonies of May 10, 1869 and of the locomotive there. The largest known surviving collection of original negatives, glass wet-plates, of the building of the first transcontinental railroad is of his negatives. This collection, known as the Combes Collection, is in the American Geographical Society, in New York City. There are 237 numbered negatives (a few missing) and 2 un-numbered negatives in the collection. They represent views

taken by Russell in 1869 in the course of a journey over the Union Pacific Railroad from Omaha to Promontory Summit, and three or four views taken west of there on the Central Pacific, including one of the Central Pacific terminus and machine shops in Sacramento. All negatives are 10x13 inches in size.[33] Seven views relate to the Golden Spike ceremonies and were taken on either May 9 or 10. Prints are included in the photographic section of this report.

Russell had served as a captain of infantry in the Union Army during the Civil War, spending much of his time as a photographer with the Military Railroads construction corps. It was this experience, undoubtedly known to General Grenville Dodge, Chief Engineer for the Union Pacific Railroad, that must have played an important role in his work for the Union Pacific Railroad in 1869. Russell had established himself in New York as a photographer at least as early as the first half of 1868, and he apparently made the trip west in 1869 from there. He carried a stereoscopic view camera as well as the large 10x13-inch camera.[34] The quality of Russell's work is unexcelled by any contemporary photographer; his landscape views are superb.

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33. Ltr., Charles B. Hitchcock, Director, American Geographical Society (Broadway at 156th Street, New York, N.Y. 10032), to Roy E. Appleman, May 25, 1966, together with list of Russell negatives.

34. William D. Pattison, "The Pacific Railroad Rediscovered," Geographical Review, Vol. 52, No. 1, 1962, 25-36. This is a most interesting and valuable article in reference to the Russell photos. Pattison's study has been the means of correcting long-standing errors in attributing to others the fine work of Russell at Promontory Summit. Pattison is Assistant Professor of Geography at the University of California, Los Angeles.

It has been my experience in the course of examining several hundred, perhaps a few thousands, of railroad and locomotive pictures of the 1860's-1870's period in a number of institutions, historical societies, and libraries to find that only a very few are identified as to who took the photograph, the date taken, and frequently a meaningful identification of the scene. This is true even of the collections in the Union Pacific and Central Pacific Railroads. Often pictures are wrongly identified. I have learned that one of the best ways of identifying a picture is to find it in a stereoscopic view. In the period of the Golden Spike events, the principle commercial outlet for photographic work was to make and sell sets of stereo views on a given subject. It was for most persons at that time the only substitute within their means of taking a trip to far off lands and enjoying novel and strange scenes. Many of the photographs in this report were copied from stereo views I found at various places. In each such instance the source is given in the identification. The largest stereo collections I have seen is a Russell collection at the Union Pacific Historical Museum in Omaha, and a collection of Hart's at Stanford University Library.[35] Among the better known photographers of the period, in addition to A.J. Russell, who took many stereo views were Alfred A. Hart of Sacramento,

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35. Pattison indicates that the American Geographical Society has more than 400 stereo negatives taken by Union Pacific Railroad photographers, but only a few prints made from these negatives. See above cited article.

The following of interest also concerning stereosocpic views of the railroad is William D. Pattison, "Westward by Rail with Professor Sedgwick: A Lantern Journey of 1873," Historical Society of Southern California, XLII, No. 4, December 1960.

Charles R. Savage of Salt Lake City, E. J. Muybridge of San Francisco, W. H. Jackson of Omaha, and John Carbutt of Chicago.

Mention should be made of drawings such as those of Arthur R. Waud that appeared as wood cuts or engravings in the popular magazines of the time, such as Harpers Weekly and Frank Leslie's Weekly. There were several of these that related to the subject of our study, but they do not have the same value as source materials as do photographs.

It may be well to insert a word of caution about the use of photographs of locomotives used in recent years to represent both Jupiter and #119 in the various railroad fairs that have been popular. An example is the Chicago Railroad Fair of 1948-1949. In the railroad equipment exhibit there were two locomotives painted and otherwise slightly modified to represent these two historic locomotives. Actually, the locomotive representing Jupiter was the Genoa from the Virginia & Truckee Railroad. The Genoa is a 4-4-0 Standard American locomotive built by Baldwin in 1872. Some features do not resemble the original locomotive it represented, yet these pictures, widely reproduced, are even now often presented as showing what the original locomotives looked like, and sometimes they are presented as actually being of the original. Likewise, Union Pacific #119 was represented by a rebuilt 1892 locomotive, #66, of the Hannibal & St. Joseph Railroad. One obvious discrepancy here was the absence of the

distinctive, fluted sandbox of the Rogers built locomotives; and the smokestack also was different. There were many other variations from the original locomotive ~~intended~~ represented that a knowing eye would quickly see.[36]

In 1939 Cecil B. DeMille made Paramount's movie "Union Pacific." In this movie two locomotives originally part of the motive power of the Virginia and Truckee Railroad in Nevada were used and modified superficially to look somewhat like the Jupiter and #119. The late Lucius Beebe was historical and railroad equipment consultant to Paramount in the making of this movie, which has some value in representing the building of the first transcontinental railroad. But neither of these two locomotives used in the movie are faithful to the originals they portray. They were early 4-4-0's, however, and are still owned by Paramount and in operable condition.[37]

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36. Chicago Railroad Fair Official Guide Book, 1949 (2d year, June 25-October 2, 1949) lists and illustrates some of the equipment on display there; Reed Kinert, Early American Steam Locomotives, First Seven Decades 1830-1900, Seattle, Superior Publishing Co., 1962, picture p. 123 of simulated #119 and p. 106 of simulated Jupiter.

37. Conversation with Gerald M. Best, May 3, 1966, in which we discussed this matter. Best knew Beebe well and worked himself for 40 years in the movie industry in Hollywood.

These two instances are mentioned to make the point that none of this material should be used in our work on Jupiter and #119. It is not reliable.[38]

38. Two picture books that contain many photographic illustrations of Union Pacific and Central Pacific locomotives, including some of Jupiter and #119, not always corectly identified, are William Kratville and Harold E. Ranks, Motive Power of the Union Pacific, Omaha, Barnhart Press (copyright by Kratville and Ranks), 1960; and Lucius Beebe, The Central Pacific & the Southern Pacific Railroads, Berkeley, Howell-North Books, 1963.

CENTRAL PACIFIC #60, JUPITER

The early genius of the Central Pacific Railroad, building eastward from Sacramento, California [~~which was to a meeting point with the Union Pacific~~], was Theodore DeHowe Judah, a civil engineer from the east, whose father had been an Episcopalian clergyman in Troy, New York. It was Judah who determined the feasibility of the railroad line across the Sierras, laid it out and guided the early efforts to build it. However, as financiers and managers, the Big Four--Stanford, Huntington, Crocker, and Hopkins--soon controlled the enterprise. Judah died November 2, 1863, only a matter of weeks after the Central Pacific had received its first locomotive. Although the Central Pacific had broken ground at Sacramento on January 8, 1863, the first rails were spiked to ties on October 26, a week before Judah's death.

On October 4, 1863, Central Pacific locomotive #1 was unloaded at the Sacramento levee. It had been brought by schooner from San Francisco where it had arrived by ship from the east coast and around Cape Horn. It was named "Governor Stanford." All the locomotives of the Central Pacific for the first few years came in sailing ships around the Horn, most of them disassembled. Some came to the Isthmus of Panama and were there placed on flatcars, carried across the Isthmus, and reloaded on ships on the west side and

carried on to San Francisco. Central Pacific #1 was built in 1862, a 4-4-0 with 16x22-inch cylinders, and 54-inch driving wheels.[39]

From this beginning in October 1863, the Central Pacific gradually built up its locomotive motive power and rolling stock, but with rapid growth only in 1868 and 1869 as the track construction neared completion. By the time the railroad was completed in May 1869, the Central Pacific had 150 locomotives.[40] As 1869 began, 35 ships were bound for San Francisco from the east coast with railroad materials for the Central Pacific, including 18 locomotives.[41] The cost of the Governor Stanford had been $13,688.86, including shipping and insurance. The freight charges on a locomotive shipped around Cape Horn averaged about $2,000 or more. There is a record of freight charge for one locomotive across the Isthmus of Panama of $8,100, although the average cost would be a little more than half that. A locomotive delivered at Sacramento might cost in the ~~neighborhood of~~ close to $20,000,[42] although the factory cost would be in the neighborhood of $10,000.

39. Griswold, 20,39; Central Pacific Railroad Company List of Locomotives, Stanford University Library.

40. American Railroad Journal, XXV, No. 23, June 5, 1869, 617. It also had 1,400 platform cars, 360 boxcars, and 17 mail and baggage cars.

41. Griswold, 296.

42. John Debo Galloway, The First Transcontinental Railroad, 1950, 141; Griswold, 83; Lucius Beebe, The Central Pacific and Southern Pacific Railroads, Berkeley, 1963, 21.

Central Pacific #60, named Jupiter, apparently arrived at Sacramento in early 1869, possibly January or February, after the sailing ship journey around Cape Horn. The engine was built by the Schenectady Locomotive Works, Schenectady, New York, as one of an order for 4 locomotives. The Schenectady Locomotive Order Book under the date of January 10, 1868, carries work order No. 505 for the Central Pacific R.R. Co. of California for delivery "22 c August 1868 JUPITER No. 60" and describes it as an "eight-wheeled Engine, Cylinder 16in x 24in Four Driving Wheels Coup. c 5ft. diam."[43]

The late David L. Joslyn, a long-time employee of the Southern Pacific Railroad which was corporate successor to the Central Pacific, and a respected student of the history of the Southern Pacific and Central Pacific Railroads, published a list of "The Old Iron Horses of the Central Pacific," in 1924 in which he indicates that #60 or Jupiter was in service in July 1868.[44] This table has been reprinted in numerous places and in some recent books, but it is in error as to the date of service for the Jupiter.

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43. Ltr., J.W. Joyce, Historian, Schenectady City History Center, to Roy E. Appleman, March 23, 1966, quoting Order book in History Center. This Schenectady Order Book had been deposited in the History Center, along with other railroad historical materials, in May 1958 by the American Locomotive Company.

44. See next page.

Mr. Best's copy of the Schenectady Locomotive Works engine list gives September 1868 as the date Jupiter was finished at the factory. Best is inclined to believe that #60, Jupiter arrived at Sacramento in February 1869. But I learned in conversation with him that he really has no firm information on this point.[45] In any event, the time required to tow the engine to Boston or New York for loading on an ocean going sailing ship, the trip around the Horn to San Francisco, unloading there, reloading on a river schooner, the trip to Sacramento, and unloading there would take at least two or three months. It is my conclusion, even though there is no documentary evidence at hand as to the date the locomotive arrived at Sacramento, that it probably was in January or February 1869. This would suggest that the Jupiter had been in service perhaps not more than 4 months when it participated in the Promontory Summit ceremonies on May 10, 1869--virtually a new locomotive.

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44. Railway and Locomotive Historical Society Bulletin No. 7, 1924, 59-61. Gerald M. Best and Fred A. Stindt, both long students of Central Pacific and Southern Pacific historical materials, feel that Joslyn often made the mistake of giving ~~as the date~~ the date a locomotive was completed at the factory as the date it was in service.
I made an effort in the limited time at my disposal to learn, if possible, from the Sacramento Daily Bee, the date the Jupiter might have arrived at Sacramento, but failed to find any item concerning it, and for that matter I found no mention of the arrival of any locomotive, although it is known that many were arriving in the first part of 1869. The Central Pacific Locomotive List indicates that more than 100 locomotives were built for the company in the last 4 months of 1868.

45. Ltr., Gerald M. Best to Roy E. Appleman, March 16, 1966; Conversation, Appleman with Best, May 3, 1966.

Jupiter, Central Pacific #60, was a Standard American wood burning, 4-4-0 locomotive, having the following basic characteristics:

Diameter Driving Wheels	Diameter Cylinders	Piston Stroke	Weight
60-inches	16-inches	24-inches	65,450 pounds

It will be observed that the driving wheels of Jupiter were 6 inches greater in diameter than those of Union Pacific #119, and that the engine was considerably heavier. Otherwise, the two locomotives were basically similar in motive power and construction. The most obvious difference to the eye would be the straight, relatively slender stove-pipe or straight, capped stack of the #119 and the flared, ~~bell-shaped~~ "balloon" stack of the #60.

From the time it arrived at Sacramento, probably early in 1869, the Jupiter undoubtedly was engaged in passenger and freight work on the railroad between the Sacramento terminal and points in California and Nevada. I have found no specific information on its history prior to the Promontory Summit event. And that it was there seems to have been wholly a matter of accident. It was not picked initially as the locomotive to take Governor Stanford and his special party to the stage of history at Promontory.

The regular morning train eastbound left the Central Pacific terminal at Sacramento at 6 o'clock Thursday morning May 6, 1869, carrying its usual allotment of passengers, plus several persons

bound for Promontory Summit where the ceremony of joining the rails was scheduled to be held two days later, on Saturday May 8. Departing a few minutes after the regular train was Stanford's special train carrying the railroad's president and his party. They were bound for Promontory for the ceremony. I have found no contemporary record which names the locomotive pulling either train from Sacramento on May 6. One of the guests on Stanford's special train said it consisted of the locomotive, tender, and the "superintendent's" car. The latter had been fitted for sleeping quarters for 10 persons.

The late David Joslyn, ~~an employee of the Southern Pacific Railroad nearly all his working life and devoted to its history,~~ wrote an article in 1956, presumably based on Southern Pacific records, in which he states that the Antelope was the locomotive selected to pull Governor Stanford's special train from Sacramento. He goes on to say that "somewhere along the line the Antelope was knocked out by a blast that sent a pile of rocks over into her. The Jupiter was in the house at Truckee and was quickly fired up, and made the run up the hill to where the president's train was stilled. She helped to re-rail the Antelope, and then dragged her and the train to Truckee. From there on the Jupiter took the limelight."[46]

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46. David L. Joslyn, "Steam Locomotives of the Southern Pacific System," an annex in Gerald M Best and David L. Joslyn, "Locomotives of the Southern Pacific Company," Railway and Locomotive Historical Society Bulletin, No. 94, March 1956, 157.
Gerald M. Best has informed the writer that the late David L. Joslyn told here in 1956 that Patrick Sheedy, a famous C.P. master mechanic, had been at the Truckee roundhouse in 1869, and had told him about the Jupiter being taken from there to pull Stanford's train. Sheedy died in 1924 and Joslyn is also dead. It is possible that the Jupiter was taken from Truckee to Wadsworth and there attached to the Stanford train. Ltr., Best to Appleman, Aug. 10, 1966.

This account may be correct as to the Antelope starting from Sacramento with the special train, but the account of what happened in the incident described is almost wholly wrong, except that there was a mishap to the special train. If the Antelope did indeed start with the Governor's party, then Central Pacific locomotive #29 (for that was its number), made by McKay & Addus in 1867, was cheated by fate from being a locomotive of history.[47]

The Jupiter entered upon the stage of history at Promontory. It may have been the locomotive that pulled the regular passenger train out of Sacramento on the morning of May 6. This certainly was the case unless the locomotive on the train was changed someplace between Sacramento and Promontory. On this point I have found no evidence, and lacking any to the contrary one may assume that the locomotive that pulled the train into Promontory was the one that started with it from Sacramento.

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47. The Central Pacific Locomotive List carries the Antelope as #29. It was a 4-4-0 and, like the Jupiter, had 60-inch driving wheels and 16x24-inch cylinders. It weighed 62,100 pounds. Copy of list in writer's possession. I found a blue print copy of the Central Pacific Locomotives list, revised and brought down to date from the beginning of the railroad to 1925, in an unclassified drawer of railroad material in the vault of Stanford University Library. This list was in a heterogeneous pile of loose materials of various descriptions and apparently the Library was unaware it had this valuable record. I brought it to the attention of the librarian with the recommendation that it be bound, classified, and held as a rare document. This list was prepared by David L. Joslyn in 1924, according to Gerald M. Best. A more complete record may be found in Railway and Locomotive Historical Society Bulletin, No. 94, March 1956, cited previously. Ltr., Gerald M. Best to Roy E. Appleman, August 10, 1966.

Now to follow the story of Stanford's special train from Sacramento. Fortunately, there are at hand two contemporary accounts, and there may be more that I have not seen, that agree as to the main incidents. On the special train as one of the guests invited by Stanford was Dr. J. D. B. Stillman, who had come to California by Ship with Mark Hopkins in 1849, and in 1869 was city coroner of San Francisco. In the July 1869 issue of The Overland Monthly he published an account of the trip to Promontory taken just a few weeks before. In it he describes the accident that befell the special train and came near being a tragedy for the party. I quote from this article:[48]

> Down the valley of the Truckee River winds the great highway, crossing the river several times. Just before entering a tunnel, when the road slips in between the mountain and the river, we came near driving our last spike. Some Chinamen on the mountain side were cutting trees, and seeing the regular train pass, and knowing nothing of a special one, they probably thought it a fit time to run a log down the mountain. But whatever may have been their intention, the log landed on the railroad just before us--its length fifty feet and its greatest diameter three and a half feet--the smaller end rested on the track midway between the rails, and the other rested on the

48. J. D. B. Stillman, "The Last Tie," The Overland Monthly, July 1869, 77-84.

bank at an angle of about forty-five degrees. The short turns of the road prevented the threatening danger from being discovered until we were almost upon it; but the promptness of the engineer, and the lightness of the train, saved us from a catastrophe. The pilot picked up the log, or did its best to do it, and went through bankruptcy; but the force of the blow was not lost, for the heavy frame of the engine tripped the log and landed it where there was just room for it, yet did not prevent it from clearing away the steps of the starboard side of the train from stem to stern. The only person injured--and he but slightly--was one of our party who was on the engine, who, seeing what seemed an inevitable crash, jumped from the train. The force of the blow can be conceived from the fact that the log was broken through the middle, where it was at least three feet in diameter.

It was near sundown when we reached the last crossing of the Truckee, where our crippled locomotive was sent into the hospital, and our cars were made fast to the regular train. Here the desert proper begins;...[7]

One of the men who made the trip to Promontory to report on the ceremonies was a correspondent of the Sacramento Daily Bee. He was a passenger in the train that left Sacramento the morning following the departure of Stanford's special. During the trip to Promontory

he sent back a number of dispatches describing the trip. One of these, headed "Truckee," and dated at Elko, May 7, carried a reference to the accident that befell the special train. It related that "yesterday afternoon" when the special train with Governor Stanford was following a few minutes behind the regular train, between Boca and Reno, "an immense log, three feet in diameter and fifty feet long rolled down hill by lumbermen and fastened between two ties, at 45 degree angle in the very center of the track." The account said, "The Engineer reversed brakes, when Mr. Harkness, riding in the cab discovered the danger. The collision destroyed the cow catcher. There were no personal injuries, except that Mr. Harkness sprained his ankle when he jumped from the train."[49]

There is other evidence that Harkness was riding on the cow-catcher or pilot instead of being in the cab, and that if he had not jumped just when he did he would have been crushed to death.[50]

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49. Sacramento Daily Bee, May 10, 1869, article signed O'L. This abbreviation stands for T.O. Leary, who was one of the 12 newspaper correspondents at Promontory Summit on May 10.

50. Ltr., George Kraus, Assistant Editor, Public Relations Department, Southern Pacific Railroad, to Roy E. Appleman, June 13, 1966. Edwin L. Sabin, in his Building the Pacific Railroad, J. B. Lippincott, Philadelphia, 1919, chapter 7, has "a guest" riding on the cowcatcher, who jumped and suffered a sprained ankle; also Sacramento Daily Bee, May 10, 1869.

According to the Sacramento Daily Bee article, the accident occurred between Boca and Reno. At the first station reached after the accident a telegram was sent ahead to stop and hold the regular train. Meanwhile, the crippled locomotive pulled Stanford's special at reduced speed until it came up to the waiting regular train. Stillman gives the location with some precision. He wrote: "It was near sundown when we reached the last crossing of the Truckee, where our crippled locomotive was sent into the hospital, and our cars were made fast to the regular train."[51]

The last crossing of the Truckee at the river's big bend, where it turns from south to west is at Wadsworth, Nevada, which had been founded just the year before. There is no mention of either Antelope or Jupiter in any of the contemporary materials I have seen in connection with the run to Promontory. But we know from photographs taken on 7-10 May, 1869 at Promontory that the Jupiter in fact did pull Stanford's train and was there on those dates. Lacking any evidence to the contrary, one may assume that Jupiter was pulling the regular train when Stanford's cars were attached to it at Wadsworth, and that it went on to complete the journey to Promontory Summit. Stillman records that most of the passengers on the regular part of the combined train left it at Elko where they set out for the White Pine country a hundred miles south of the railroad.

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51. Stillman in Overland Monthly, July 1869, 80.

Jupiter pulled the Central Pacific train into Promontory Summit on Friday ~~afternoon,~~ May 7. Two telegraph operators had their tents pitched at the ends of the respective Union Pacific and Central Pacific lines, only a short distance apart. Stanford's party made telegraphic communication with the Union Pacific ceremonial party eastward and learned that it would be unable to reach Promontory for the scheduled ceremonies the next day, May 8, and that May 10 would be the earliest they could arrive. The reason given for the delay was flood and high water in the Weber canyon region, east of Ogden. There had indeed been high water there, but this was not the real reason for Mr. Durant's and his party's delay. The real reason was the forcible stopping of Durant's train by several hundred Union Pacific contract workers, mostly tie cutters, who had not been paid their wages for several months. They would not let Durant pass until he had wired to Boston and had the money sent to him he needed to pay the angry mob. This was not known to the Central Pacific officials at the time.

With ceremonies thus postponed to the 10th, the Central Pacific party had time on its hands. Some of the rough characters that had begun to congregate at Promontory made it dangerous to leave the protection of the Jupiter train, in the opinion of some of its passengers. Part of the group were taken on to General Casement's Union Pacific construction camp eastward, and from there they were taken to Ogden. The next day, June 8, Casement brought a special

train to the end of track and took those who had stayed behind with the Jupiter on a sight-seeing trip eastward to Weber Canyon. On June 9, Jupiter pulled the Central Pacific party back west about 30 miles from Promontory to Monument Point, where the party spent several hours along the shore of the lake. Apparently Jupiter pulled Stanford's cars back to Promontory that evening, for Stillman writes that "On the morning of the tenth, as we looked out of the car, we saw a force of Union Pacific men at work closing up the gap that had been left at their end of the road,..."[52]

The story of Jupiter after May 10, 1869 is mostly clouded in obscurity and lack of a recorded history. It went on to perform many years of service on the Central Pacific line between Sacramento and Ogden. All that is known certainly about its subsequent history is that it was renumbered #1195 in the general renumbering of Southern Pacific locomotives in 1891. Rebuilt in 1893 at the Sacramento shops, it was sold the next year, 1894, to the Gila Valley, Globe & Northern Railroad as its #1. At that time Jupiter received a new boiler and other changes were made, including an extended smokebox, side sheets and firebox, and new and different steam dome and sandbox covers, which changed its appearance considerably. It still retained, however, its cab, chassis, and tender as originally built, and it had its

52. Stillman, Overland Monthly, July 1869, 82.

original bell. The rebuilt Jupiter was scrapped about 1906 in Globe, Arizona.[53]

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53. Ltr., Gerald M. Best to Roy E. Appleman, March 16, 1966; Best, Memorandum on Central Pacific Locomotive No. 60 "Jupiter", to Roy E. Appleman, April 1966; Conversation, Appleman with Best at latter's home, Beverly Hills, California, May 3, 1966. Mr. Best says that in 1937 he talked with Mr. Seth Arkills of the Gila Valley G&N Railroad who at different times had been fireman and engineer on the rebuilt Jupiter, #1 of the GVG&N Railroad, and that the latter said it was commonly known in Globe, Arizona, that #1 was the old, historic Jupiter of Promontory fame. There was some talk of saving it, but in the end this came to nothing and the old engine was cut up for scrap at the Globe roundhouse.

Mr. Best has been of great help to me in assembling data on the history of the Jupiter. In his personal files, he has about 80,000 photographs of railroad locomotives and trains and approximately 40,000 negatives, and his library on railroad history is extensive. Among other materials in his possession are copies of several of the early manufacturer's locomotive lists and of railroad companies locomotive lists. His long acquaintance with David L. Joslyn of the Southern Pacific Railroad, who was stationed at the Sacramento shops, has given him access to some obscure railroad records. In addition, Mr. Best is recognized as being a devoted researcher and historian of American Railroads.

The railroad interests of the Big Four, Huntington, Stanford, Crocker, and Mark Hopkins' estate, underwent extensive reorganization in the summer and autumn of 1884, and effective April 1, 1885, the Southern Pacific emerged as the corporate head of these interests, with the Central Pacific in a lease arrangement to it. See Stuart Daggett, Chapters on the History of the Southern Pacific, New York, Ronald Press, Co., 1922, 149-152.

Sister Locomotives of Jupiter

Jupiter was one of 4 locomotives built by Schenectady for the Central Pacific Railroad at the same time and from the same order. These locomotives, listed below were identical.

Shop Construction Number	RR Number	Name	Date Completed at Factory	Renumbered	Scrapped
505	60	Jupiter	Sep. 1868	1195 in 1891 (rebuilt 1893)	1906
510	61	Storm	Sep. 1868	1273 in 1891 (rebuilt 1873) 1517 in 1908	1910
511	62	Whirlwind	Sep. 1868	1196 in 1891	1900
512	63	Leviathan	Sep. 1868	1197 in 1891 2d 1216 in 1901 1489 in 1908	sold 1908

In addition to the three sister locomotives of Jupiter, there were 11 other locomotives built by Schenectady for the Central Pacific that in effect were sister locomotives as they had the same specifications, all 4-4-0 type, with 60-inch driving wheels, 16x24 cylinders, and weighing for engines alone 65,450 pounds. They were all built between November 1868 and July 1869. They were the following:

CP #148	Red Fox
149	Black Fox
150	Grey Fox
151	Yellow Fox
152	White Fox
158	Eureka
159	Diana
160	Sultana
161	Juno
162	Flash
163	Fancy

These eleven locomotives had all been scrapped by 1901, except for #161, Juno, which was sold to the Nevada Northern Railroad in 1905 and survived until it was scrapped in 1931.[54]

Drawings, specifications, or photographs of any of these locomotives before they were rebuilt would provide usable information about the construction and appearance of any of the others, except of course for decorations, numbering, and naming which would be obvious differences showing on the photographs.

It may be of interest to note that the Central Pacific Railroad continued the practice of naming their locomotives down through #178, Frankfort, which is the last named locomotive in the CP blue print list in Stanford University Library. There were a few locomotives with earlier numbers that apparently did not have names, as these do not show on the Railroad locomotive list. It appears, therefore,

54. Table prepared by Gerald M. Best for Roy E. Appleman, April 1966, of Central Pacific Railroad locomotives, based on his copy of Schenectady Factory List and CP Railroad List of locomotives. The writer's copy of the Central Pacific RR Locomotive List, made from the blue print copy he found in unclassified material at Stanford University Library vault, confirms the locomotive numbers, names, renumbering, driving wheel and cylinder dimensions, years built, and weight. Mr. Best informed the writer that his Schenectady Factory list is a copy obtained from a friend who made his copy from the Schenectady list he found at the American Locomotive Company, Schenectady, N.Y., in 1939. Also, ltr., J. W. Joyce, Historian Schenectady Historical Center, to Roy E. Appleman, March 23, 1966. Ltr., George Kraus, Southern Pacific Co., June 29, 1966 to Roy E. Appleman states their roster shows #61, Storm, was rebuilt in 1873.

that in early 1869 the Central Pacific discontinued giving names to their new locomotives.[55]

There are still other locomotives built just previous to CP #60, Jupiter, by the Schenectady Locomotive Works for eastern railroads that appear to be identical in specifications and appearance with Jupiter and its sister locomotives. This is what one would expect, since the 4-4-0 in the late 1860's was a standard piece of equipment for the time, and the Schenectady Works turned it out for general use on many railroads of the day. Mention of some of these earlier locomotives that were similar to Jupiter will be made in the section on photographs.

It may be of interest that the last steam locomotive the Southern Pacific Railroad (which after April 1, 1885 included the original Central Pacific) bought was #4294 in 1944 from Baldwin Locomotive Works of Philadelphia. It began service in March of that year. It is interesting to compare this huge steam locomotive with those of the Jupiter type of 1869. It is a 4-8-8-2 type, weighed 657,900 pounds (about 10 times the weight of Jupiter), and had a 67 foot, 3-inch wheelbase. From the cow catcher to the coupling device it measured 79 feet. 2½ inches. Its tender was 45 feet, 8 inches long. This last

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55. Central Pacific RR Locomotive List in writer's possession, copied from List in Stanford University Library.

steam locomotive of the Southern Pacific now stands in front of the Southern Pacific Railroad Station in Sacramento in Camellia Place, at 4th and Eye Streets.[56]

Not inappropriately, just across 4th Street from #4294 on the west side of the park stands a large, handsome bronze bust of Theodore DeHone Judah. It rests on bronze cross ties and the end of rails, and these in turn are on top of a huge granite bolder from the Sierras. This memorial to Judah was dedicated April 26, 1930 and carries the legend, "That the West May Remember."

Drawings for Jupiter

There are no known surviving construction drawings of the Jupiter or its sister locomotives. The fires that raged in San Francisco in 1906 after the earthquake there destroyed valuable records, most of the drawings, and many photographic negatives including old glass wet plates in the offices of the Southern Pacific Railroad. In 1917 a destructive fire broke out in the Sacramento shops of the Southern Pacific and destroyed several cases of old drawings and pictures of the Central Pacific and Southern Pacific Railroads stored in the loft of the car department.[57] Officials of the Southern Pacific Railroad

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56. Some of the information taken from marker at locomotive by writer, 7 May 1966; Sacramento Daily Bee, April 19, 1957.

57. David L. Joslyn, "The Old Iron Horses of the Central Pacific," Railway and Locomotive Historical Society Bulletin, No. 7, 1924, 62.

who have recently instituted searches for drawings, specifications, and related historical data on the Jupiter and its sister engines have found nothing original and contemporary.[58] This has included a renewed search at their Sacramento shops. There do exist two diagrams of some significance, but their importance has to be carefully evaluated. They will be discussed later. But first, mention will be made of drawings that might be presumed to have survived in the records of the locomotive manufacturing company.

The Schenectady Locomotive Works, which built #60, Jupiter, was merged in 1901 along with 7 other locomotive building firms into the American Locomotive Company. Subsequently other mergers brought the total to 10 formerly independent companies that by 1905 made up the American Locomotive Company. The Schenectady Works, which had been started in 1848, was the principal company of those merged, and it became the manufacturing and operating headquarters of the American Locomotive Company after 1901.[59]

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58. Ltrs., George Kraus, Assistant Editor, Southern Pacific Company to Roy E. Appleman, June 13 and June 15, 1966; Ltr., B. F. Biaggini, President, Southern Pacific Company, to Representative David S. King, August 18, 1965.

59. American Locomotive Company, Locomotive Handbook, 30 Church St., New York City, 1917. This book gives history of the company and contains many mathematical tables on motive power, cylinders, specific gravity, metals, and other highly technical aspects of railroad and locomotive operations.

In recent years the American Locomotive Company has given way to another corporate reorganization and today survives as ALCO Products, Inc., with operating and manufacturing headquarters still at Schenectady and management and financial headquarters in New York City. I have tried through correspondence, both with the New York and Schenectady offices of ALCO to obtain information on early records of the Schenectady Locomotive Works, but thus far have received no answer to my letters. I believe, however, that the company probably has disposed of all the records it once may have had on the early companies. This is borne out by comments from Historian J. W. Joyce of the History Center, City Hall, Schenectady.

In the course of my searches I learned from a copy of a release dated December 23, 1959, in the files of the Simmons-Boardman Company Library in New York City, that ALCO Products in May 1958 gave all of the glass negatives and photographs of locomotives shipped from the American Locomotive Company or its merged companies between the 1880's and the 1920's to the History Center of the City of Schenectady. Included in the transfer were also builder's lists for the 10 merged companies.

In response to an inquiry, Mr. J. W. Joyce, the City Historian at the Schenectady History Center, confirmed that the Center does have more than 7000 negatives, 90% of them on glass and dating between 1885 and 1920. Their collection, he stated, contained no drawings or specifications, but did have builder's lists for all the 10 merged

companies. The Rogers list started in 1872; that for Schenectady in 1851. Only for the Schenectady company was there an Order Book. Mr. Joyce stated that it was his understanding that ALCO Products had retained none of the drawings relating to steam locomotives, but that several former employees of the company have collections of drawings, negatives, and photographs obtained from its early files. He stated he did not know the identity of these persons.[60] It appears, therefore, that early drawings and specifications may survive in personal collections of persons unknown to us, but that probably none remain in the possession of the companies constructing the Rogers and Schenectady locomotives, or their corporate successors.

Mr. Joyce said that the American Locomotive Company and ALCO Products have in past years been so bedeviled by requests for information on early locomotives from railroad buffs that they have adopted as a policy the ignoring of all correspondence received on the subject, and that persons who make calls on the company in person are confined to the receptionist's office. He wrote me he would expect that correspondence even from the Federal Government on the subject would be ignored. It has been. A personal visit might get some results, but even this is doubtful.

Now, to return to the two diagrams relating to the Jupiter that have survived in the files of the Southern Pacific Railroad.

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60. Ltrs., J. W. Joyce, City Historian, Schenectady History Center, to Roy E. Appleman, March 23 and April 13, 1966.

First in point of date is a small diagram 7½ x 6 inches in size, with the title, "Diagram of 16"x24" 8 Wheel Schen. Engine 1228 Rebuilt. Office Supt. MP and S.P.Co. Sacramento, Sept. 20, 1895." Below this heading is the lettering "1 engine this class in service Sept. 1895 Engine went into service August 26, 1892."

The significance of this diagram is that locomotive SP #1228 was the renumbered 161, which had been built in 1869 to the same specifications as Jupiter, and can be considered a sister locomotive. This diagram shows the engine as rebuilt in 1895 with a different smoke stack, driving wheel diameters of 64 inches instead of 60 inches, same size cylinder and piston stroke as in the original #161, but with a greatly increased weight load of 80,150 pounds. Only a close comparison of some of the other dimensions shown with those of the Schenectady 4-4-0 Standard American locomotive of 1869 will reveal the extent of other differences. Mr. Gerald Best believes this diagram of rebuilt #161, renumbered #1228, retains the same length of wheelbase, distance between driving wheel center, distance between pony truck wheels and other principal dimensions as the original Schenectady #161 of 1869. Mr. Best, who has this diagram in his collection, states that it is the only one that the late Mr. Joslyn was able to salvage of Southern Pacific shop drawings of the period from the 1890's through the early 1900's.[61] There appear to be no

61. Memorandum on CP 60, Jupiter, Gerald M. Best for Roy E. Appleman, April 1966, with a copy of the #1228 diagram. Ltr., George Kause, Southern Pacific Co., to Roy E. Appleman, June 29, 1966, also includes copy of this drawing.

extant photographs of #1228 for this period. Mr. Best does have a photograph of CP #1273, which is the renumbered #61, Storm, a sister locomotive of Jupiter, which was taken in 1902. He feels that this good side view of #1273 can be used to scale dimensions of the original 1868 Jupiter, if that should be necessary. According to his opinion, the 1902 photograph of Storm shows it to have had original chassis, sandbox, and steam dome. Counterbalance weights had been added to the rear driving wheels, and an additional weight added to the main driving wheels. The boiler and steel cab are new, being typical Sacramento shop standard pieces of the mid-1890's.[62]

¶ This comment about photographs has been inserted here, rather than left entirely to a subsequent section because it has some use in connection with interpreting the diagram of #1228, a copy of which is included in this report. Mr. Best thinks the 64-inch driving wheels of #1228 are the same as the 60-inch driving wheels of Jupiter except that they have been provided with thicker tires. This raises many questions about practices in 1868 and later in referring to diameter of driving wheels center and with tires.

The second drawing from the files of the Southern Pacific Company is one that has just come to light and resulted from a search in June of this year (1966). It is a diagram of Central Pacific #60, Jupiter, and was prepared by David L. Joslyn in

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62. Ibid.

July 1944 at Sacramento. It measures approximately 25x12 inches, and shows a side profile with half sections of cab and front of locomotive. It indicates driving wheels of 63 inches diameter, and the legend notes that originally the Jupiter had steam pressure of 110 pounds but changed later to 125 pounds. The diagram is inscribed, "D.L.J. 7/5/44 Sac." It gives Jupiter dimensions to have been 8 feet between driving wheel centers, 11 feet 3 inches from front driving wheel center to rear front truck or pony wheel center, 5 feet 8 inches between pony wheel centers, the stack 5 feet across at its top, cab 64½ inches deep, main rod 85 3/4 inches long. Many other dimensions are shown. There was no indication in the file or on the drawing giving the sources that Mr. Joslyn used in preparing this drawing.[63]

It is not known at the present whether surviving members of Mr. Joslyn's family has any of his papers which might shed light on this question. It is a known fact that Mr. Joslyn was a long-time employee of the Southern Pacific Company at its Sacramento shops, was greatly interested in the history of its old locomotives,

63. Copy of the Joslyn diagram of #60 Jupiter was an enclosure in Ltr., George Kraus, Southern Pacific Company, to Roy E. Appleman, June 13, 1966. Mr. Kraus commented concerning it, "I have also found--and this is a great surprise to me--..." A search for the blue print or original drawing has not located it in the Southern Pacific files either in San Francisco or Sacramento. Joslyn worked in the drafting room of the Southern Pacific at Sacramento for more than 30 years, was familiar with the early pioneer locomotives of the Central Pacific and enjoyed a reputation for accuracy of detail. Ltr., Kraus to Appleman June 29, 1966.

and that he may have come upon some old drawing that he used in making this diagram. Mr. Best's comment mentioned earlier in connection with the diagram of #1228, however, and quoting from a conversation with Mr. Joslyn, would indicate on its face that Mr. Joslyn had not found any such drawing relating to the Jupiter. For the present, therefore, the Joslyn diagram of #60 must be considered a most interesting item but not completely evaluated. A copy of this diagram is included as Appendix F.

Certain other diagrams and drawings not relating directly to the Jupiter will be useful in studying the problem of preparing Jupiter construction drawings. Of these, I mention particularly the scale drawing of a Baldwin 4-4-0 Standard American Locomotive and the accompanying table of dimensions shown as Plate V, in M. N. Forney, Catechism of the Locomotive, 1875 edition, 554-555. This locomotive has basic dimensions that are identical or nearly so with Jupiter, 60 3/4-inch diameter driving wheels, 16x24-inch cylinders, and engine weight of 65,000 pounds. The driving wheels of this engine are only 3/4 of an inch greater in diameter than those of Jupiter, an insignificant difference; other general characteristics appear to be just about the same.

But of all the extant diagrams and drawings of locomotives of the period that have been found, the most valuable for the construction of a replica of Jupiter, just as for Union Pacific #119, are the *

Weissenborn construction drawings for the New Jersey Railroad and Transportation Company Woodburner No. 44, previously mentioned in the discussion of #119. The Colburn drawings of a Rogers locomotive, previously discussed, may also be useful. All the drawings and diagrams mentioned, used to supplement and correct where necessary the Weissenborn drawings, together with refinements taken from photographs, should result in producing an essentially correct set of construction drawings for Central Pacific #60, Jupiter.

The Weissenborn and Colburn Drawings are included in Appendices B and A, respectively, as stated earlier.

Specifications for Jupiter

There are no known extant specification sheets for Central Pacific #60, Jupiter. The closest approach to such specifications known to me are those discussed earlier in connection with Union Pacific #119. They would apply in a general way. These specifications and descriptions are included in Appendices C and D.

In connection with the appearance of early Central Pacific locomotives in terms of paint, trim, and decoration the following quotation from David L. Joslyn may be useful:

> Old employees of the Central Pacific always spoke of the original 163 locomotives of the Central Pacific as the 'Iron Horses.' Those old timers were iron, for as far as I can

learn there was very little steel about them. Considerable brass, gold leaf in trimming and lettering. Those used in passenger service had drive wheels painted a bright red. ...names in gold leaf on sides of cabs, stripes of gold wherever it could be applied with initials C.P and the number between the C. and P. on the tanks with more gold and shaded with green and red. Grab irons, hand rails, bands that held on the jacket, bell, whistle, safety valves and pumps of shining brass, rims of the mud guards edged with brass, head light painted a green color with gold stripes and every part of them shining.[64]

Photographs of Jupiter

Neither Rogers Locomotive Works nor Schenectady Locomotive Works had started the practice of taking photographs of locomotives as part of their construction records at the time #119 and Jupiter were built. This practice was started later, and for many later locomotives wet, glass plate negatives have survived in various collections. I have mentioned the large collection given by the American Locomotive Company to the Schenectady Historical Center. Thus, the only photographs of these two historic locomotives were those taken after they entered service, and these for the most part

64. David L. Joslyn, "The Old Iron Horses of the Central Pacific," Railway and Locomotive Historical Society Bulletin, No. 7, 1924, 62.

are those taken at Promontory Summit in connection with the May 10, 1869 Golden Spike joining the rails ceremonies.

There were three photographers present at the ceremonies on May 10, 1869. Alfred A. Hart, official photographer of the Central Pacific Railroad, with his studio at Sacramento, had made the trip to Promontory Summit to photograph the ceremonies. Andrew J. Russell had come from New York for the same purpose as the official photographer of the Union Pacific Railroad. Charles R. Savage of the firm of Savage and Ottinger, Salt Lake City, was an independent photographer present. These three men took all the known pictures of the ceremonies, some of which have been reproduced many times in various books and publications, as well as in thousands of stereoptic view sets of the time and later. Often the pictures have been incorrectly attributed to one of the three photographers present when in fact, they were taken by another. Recent studies have shown that the best views were taken by Andrew J. Russell, but reproductions of perhaps the most widely used have been wrongly attributed to Savage.

Several of the best views of Jupiter were taken by Hart on the day before the ceremonies, when the Stanford party was killing time in going back to Monument Point and sight-seeing along the right-of-way and on the shore of Salt Lake.

A few pictures of Jupiter were taken later, almost by accident it seems. And there are a few surviving pictures of sister

locomotives of Jupiter. I have assembled as many of these as I could find, and they are included in Appendix G. Many of them have been obtained from stereo views which have survived in certain collections. The best collection relating to the Central Pacific Railroad I have seen is the one in the Timothy Hopkins Collection, Main Library, Stanford University. Timothy Hopkins was the foster son of Mark Hopkins, one of the founding "Big Four" of the Central Pacific. He made a notable collection of early American railroad history, and left this collection to Stanford University. A valuable item for our present purpose is a large album containing about 300 stereo views showing the construction history of the Central Pacific Railroad. The pictures cover the route from the Sacramento docks to and across the Sierras, and hence over the Nevada and Utah deserts to Promontory. The pictures were taken mostly by Alfred A. Hart, and cover construction work between 1866 and 1869.

There are in addition a number of excellent photographs of Standard American 4-4-0 locomotives built by Schenectady about the same time the Jupiter came from its shops, as indicated by the shop work order numbers. Examples of these are Schenectady No. 472, completed January 1868 for the Utica and Black River Railroad, almost identical to Jupiter. And there is Schenectady No. 577, completed August 1869, and apparently identical to Jupiter, except for naming, railroad identification, and some aspects of paint decoration. Just as a Chevrolet Impala 4-door hardtop today, for

instance, is basically the same automobile whether sold and used in Cleveland or Santa Fe, so the Schenectady Standard American 4-4-0 locomotive of 1868 and 1869 was the same to all buyers with only minor decorative differences.

There appears to be no good reason to list here the photographs that appear in Appendix G relating to Jupiter. The photographs that have been collected relating to Jupiter will be found in that appendix.

It may be of passing interest to comment on photographs that sometimes appear in print representing locomotives said to be Jupiter or Union Pacific #119, but in fact are not. Most of these stem from two sources. One of these is Cecil B. De Mille's well known movie "Union Pacific" filmed by Paramount Studios in 1939. For that picture, Paramount fixed up Virginia & Truckee locomotive #18, which it bought for the purpose, to look somewhat like Union Pacific #119, and Virginia & Truckee locomotive #22 which was made to resemble Central Pacific #60, Jupiter. Metro-Goldwyn-Mayer Studios bought Virginia & Truckee locomotive #11 for movie making purposes. All three locomotives are retained by their studios today as valuable properties, and are in operable condition. V&T #18 is a Central Pacific Sacramento Shop built locomotive, dating from 1873; V&T #22 is a Baldwin built locomotive, dating from 1875.[65]

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65. Ltr., Fred A. Stindt, Chairman, Pacific Coast Chapter, Railway & Locomotive Historical Society, to Roy E. Appleman, March 3, 1966; Ltr., Gerald M. Best to Roy E. Appleman, March 16, 1966, and Gerald M. Best, memorandum report on Jupiter for Roy E. Appleman, April 1966.

The second common source of erroneous pictures representing the Jupiter and Union Pacific #119 are those of the two engines that were used to represent these two historic locomotives at the New York World's Fair in 1939 and 1940 and subsequently in the Chicago Railroad Fair of 1948-1949. Virginia & Truckee locomotive #12, Genoa, Baldwin, 1873, represented Jupiter; and rebuilt Hannibal & St. Joseph Railroad locomotive #66, originally built in 1892 and owned by the Burlington Railroad, represented Union Pacific #119.[66] They had the names and numbers of the original Jupiter and #119 and their owning railroads painted on them and their tenders, but anyone reasonably well acquainted with the appearance of the originals can easily detect the differences.

Tenders

It may be well to say a word about tenders, because the intent is to have tenders with each locomotive at the Golden Spike NHS. They are generally considered a part of an operating locomotive unit, and are usually included in illustrations of locomotives. Most of the photographs of #119 and #60, Jupiter, show their tenders. The tender for the Standard American 4-4-0 locomotive of 1868-1869 was a fairly uniform piece of equipment, and no special problem is anticipated in constructing replicas.

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66. Reed Kinert, Early American Steam Locomotives, 1st Seven Decades 1820-1900, Superior Publishing Co. Seattle, 1962; Conversation Roy E. Appleman with Gerald M. Best, Pacific Coast Chapter. ~~American Railway and Locomotive Historical Society owns the Genoa and expect to display it in San Francisco.~~

The Genoa was given to the Railway & Locomotive Historical Society, Pacific Coast Chapter, and is presently stored in West Oakland. It will be featured in the Railroad Museum projected for Aquatic Park, San Francisco.

There are construction drawings of standard tenders of the period in the Weissenborn drawings in Appendix B, and there are diagrams of them in some of the other appendices to the report.

There is in existence at Traveltown, in the San Fernando Valley, on the outskirts of Los Angeles, Stockton & Eastern locomotive #1 with its tender. This locomotive was built in 1864, a 4-4-0 of nearly the same specifications as Jupiter. Its tender as it stands in Traveltown today is nearly all original, still having the old tank in it. The locomotive was originally built by the Lancaster Works at Lancaster ~~Norris~~, Pennsylvania for the Western Pacific Railroad. If needed, the basic dimensions and specifications of this tender could be taken from the original and used in the drawings for Jupiter and #119 tenders.[67] But I do not anticipate this will be required.

Tenders were necessary adjuncts to locomotives. They did two things. They carried a supply of water for the locomotive boiler; they carried fuel to burn in the locomotive firebox to heat the water to make steam. Steam pressure operated the pistons in the cylinders and the driveshafts that turned the wheels and made the engine move.

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67. The writer examined this locomotive and tender with Mr. Gerald M. Best on May 3, 1966. According to Mr. Best, this tender is just about what both the Jupiter and #119 carried with them as original equipment.

The water tank in the tender for the 4-4-0 locomotive of 1869 was U-shaped, extending around both sides and across the rear end of the tender. The opening at the throat of the U and extending back a little more than half way of the tender frame was for the storing of fuel, generally wood at this time. The same space could be used for coal in the event the locomotive was a coal-burner. Wood was often piled on top the water tank as well as in the open area of the U. There would be no difference in 1869 in the tender for a bituminous coal burning 4-4-0 Standard American locomotive, such as was Union Pacific #119, and the Central Pacific #60, Jupiter, which was a wood-burner.

The tenders for the two locomotives that met at Promontory Summit carried either 2,000 or 2,200 gallons of water in their tanks, and as much wood as could be piled on. If coal was used about 3-4 tons could be carried. An empty tender would weigh in the neighborhood of 20,000 pounds. If loaded with water and fuel it would weigh 40,000 to 45,000 pounds. The typical Standard American 4-4-0 locomotive of the late 1860's with loaded tender would weigh about 100,000 pounds.[68]

68. M. N. Forney, <u>Catechism of the Locomotive</u>, 1875 ed., 357.

ESTIMATED COSTS OF REPLICAS

As a prelude to discussing the probable costs of making replicas of Union Pacific #119 and Central Pacific 60, Jupiter, and their tenders, it should be stated that there is no alternative to making the replicas if the two locomotives are to be represented at Promontory Summit. There are no locomotives like them in existence, so far as I have been able to determine. This has been confirmed by every "expert" I have talked to or written to on the subject. There are a few surviving old locomotives, perhaps half a dozen in all, that resemble in some considerable degree one or the other of the two we are concerned with here. But they are owned either by institutions that hold them as a part of a collection they would not part with, or by Hollywood studios for movie-making purposes and are not for sale. In one instance the Pacific Coast Chapter of the Rail~~road~~way and Locomotive Historical Society owns an old period locomotive. This locomotive is already committed to an outdoor railroad museum projected for San Francisco.

Congressman David King, of Salt Lake City, Utah, asked the State Department to make inquiry of its embassies in all South American and Latin American countries concerning the possible presence in their railroad systems of American built locomotives of the 1860's or 1870's period. It is known, of course, that many locomotives in past years were sold to these countries for their relatively primitive railroad systems after the locomotives had

become obsolete for use in the United States. It was thought that suitable period locomotives of the 1860's or 1870's might be found there and with slight modification could represent Jupiter and Union Pacific #119. Representative King's office has now received replies through the StatemDepartment from most of the embassies in South American and Latin American countries. None of the responses list any locomotive that comes close to being what is needed. Representative King has supplied me with copies of the cablegrams.

Also, with reference to the possibility of period locomotives being available in Mexico, Mr. Gerald Best told me that he has made several trips into Mexico to examine their older American-built locomotives of the 4-4-0 type, and he has found nothing that goes back to the 1880's, not to mention the 1860's. Even what there are of the 1890-1900 period have been rebuilt in one or several features, including nearly always new boilers.

Replicas can be of two types. First, there could be an operating locomotive, one that would have boiler, firebox, all the necessary working valves, cylinders and pistons. It could be fired up and run on rails. All the working parts would have to be machined to a close tolerance to assure satisfactory operation on a standard gauge railroad. Most of the parts would have to be literally hand-made, because locomotives of the type required are no longer built in this country. It has been thought impractical to consider

having them built abroad, in Japan, India, or possibly West Germany, for instance, where steam locomotives are still being produced. An operating locomotive would be very costly.

A fairly reliable estimate of cost for an operating locomotive like Jupiter or Union Pacific #119 was supplied by the Union Pacific Railroad to representative King in a letter from President Edd H. Bailey, dated September 20, 1965. The cost was given as about $500,000. In my discussion with Mr. Ed Shafer of the Union Pacific Railroad Company, he confirmed that this estimate was made by the motive power division of the Company at President Bailey's request, and that he would consider it as reliable as one could obtain today.[69]

The second type of replica would be a shell without interior working parts. There can be many types of shell replicas of the two locomotives with the cost varying according to type. Essentially, the cost of a shell will depend on materials used, concern for authentic appearance, and on whether the wheels will turn on the axles and the locomotives are capable of moving on rails with power supplied externally.

The estimates of cost of building replicas as given in the Congressional Hearings by the National Park Service was $100,000

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69. Ltr., Edd H. Bailey, President, Union Pacific Railroad Company to Representative David S. King, September 20, 1965; Conversation, Roy E. Appleman with Ed C. Shafer, Director of Public Relations, Union Pacific Railroad Company, Omaha, May 13, 1966.

Mr. Gerald M. Best is of opinion the $500,000 estimate is too high. He thinks the locomotives could be built operational at about $125,000–$150,000. This is on basis that MAPO Inc. of Glendale Calif. did the work, with Wilmington Iron Works, Los Angeles, doing all the steel and iron Castings and the Dixon Boiler Co. of Los Angeles building the boilers. He thinks boilers for Jupiter & #119 would cost about $25,000. Ltr. Best to Appleman, August 10, 1966.

for each locomotive. It is not clear whether this included estimate of costs for tender. And there was no definition whatever of the kind of replica intended. In fact, it is clear that the subject was never seriously studied. The estimates were supplied by the Southwest Regional Office, and this in turn, it appears, rested upon figures provided rather casually by the Hurlbut Amusement Company, Inc., of Buena Park (south Los Angeles), California. The Hurlbut Amusement Company has in the past manufactured some period type miniature railroad equipment for amusement parks, and currently holds certain concessions in the Knott Berry Farm, in Buena Park, which uses equipment of this type.

On May 4, 1966 I called at the offices of the Hurlbut Amusement Company and had extensive discussions with Mr. Bud Hurlbut and Dick Bagley of the Company. Mr. Bagley is a draftsman and a locomotive buff who would be responsible for the work done by the Company in any construction of replicas it might undertake. He has given assurances that the Hurlbut Company could build the replicas. But both he and Mr. Hurlbut said categorically that they could not estimate the cost of the replicas until they had studied any specifications we might supply--that the cost would probably not be under $100,000, and that it might very well go materially above that figure. I told both men that in any replica that was built the National Park Service would be interested in only scale size replicas

with fidelity to detail and authentic appearance. The type of work they have done in the past for the amusement parks, usually for 24 or 36-inch guage and at half or 2/3 size, with only the most casual attention to period appearance, would not do for us.

Also, in looking over their plant, which is in a corner of the Knott Berry Farm development, I noted that it has no equipment for the manufacture of a locomotive replica except some machines for milling metal. There are no foundry and casting facilities, no pattern making shop or workmen. In short, practically all the work on a replica would have to be sub-contracted out to other firms in the Los Angeles area. About all the Hurlbut people could do would be to prepare drawings where necessary based on Mr. Baley's knowledge and skill, if we want to trust to that, and then to assemble the engine after the various parts had been manufactured elsewhere and delivered to it. I would consider this an unacceptable arrangement and not in the interest of the project. No one in the National Park Service to my knowledge has discussed this subject with any other prospective manufacturer.

I mention this matter in the manner I have to emphasize that no one in the Service, nor any of the railroad and locomotive fans, buffs, and "experts" with whom I have talked, can give even an approximately realistic figure of what shell replicas will cost.

<u>The only way the Service will be able to know approximately what the replicas will cost is to obtain bids based on specifications and construction drawings of the equipment it wants reproduced.</u>

<u>RECOMMENDED PROCEDURE:</u> <u>Construction Drawings and Bids</u>

I believe there is only one sound way to proceed from this point toward building replicas of the two locomotives. The Service must produce working or construction drawings of the two locomotives and their tenders which can be sent to prospective bidders, obtain bids from them on the basis of the drawings and this report, and only then will we know what the replicas will cost. My own view in this is supported by that of Mr. John H. White, Jr., of the Smithsonian Institution, Mr. Gerald Best of the Rail~~road~~way and Locomotive Historical Society, and by Mr. Bud Hurlbut and Dick Bagley. This is the only way the Service can control the product and indicate in some detail just what is wanted as to form and standard, and it is the only basis on which a manufacturer can tell precisely what is to be built and bid accordingly.

The next step ahead for the Service, therefore, is to obtain construction drawings of the two locomotives. This will have to be done on a contract basis with a locomotive draftsman. Fortunately, I have been able to locate a qualified person through the assistance of Mr. John White of the Smithsonian Institution. He is Mr. Keith Buchanan, P. O. Box 217, Amsterdam, Ohio 43903. Mr. Buchanan has done locomotive and railroad equipment drafting for Mr. White and

the Smithsonian Institution. He is also an early locomotive enthusiast and buff. He is a free lance draftsman. Preliminary correspondence with him on the subject shows that he is eager to undertake the work because of a personal interest in the reproduction of the two locomotives and a desire to make a contribution to the Golden Spike project. His price for the work would be extremely modest, in my view, based on some tentative estimates he has given for it. Mr. White recommends him for the work. I believe he is the best person for the work within my knowledge. I have seen samples of his draftsmanship in drawings on file at the Smithsonian Institution. Mr. White has volunteered to give some guidance and a assistance to Mr. Buchanan as the work progresses, if it is needed. The Smithsonian Institution has agreed formally in writing that Mr. White may serve as a consultant to the National Park Service without pay in our efforts to produce authentic replicas of the two historic locomotives.[70]

I recommend that the Service approach Mr. Buchanan without delay to see if he will be willing to undertake the preparation of the construction drawings, using our research material as a basis. We will have to indicate rather closely the degree of authenticity we want and the degree of detail to be included in the drawings.

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70. Ltr., Robert P. Multhauf, Director, Museum of History and Technology, United States National Museum, Smithsonian Institution, to Assistant Director C.P. Montgomery, National Park Service July 12, 1966.

Mr. Buchanan can then supply an estimate of the fee he will require, and on that basis the Service can issue a personal services contract to him. The contract probably should be executed by the Southwest Regional Office. If there is any advantage, it could be issued here and the Washington Office reimbursed by the Southwest Regional Office. I should think the cost of preparing the construction drawings should be borne by that office. I will be glad to prepare the correspondnece to Mr. Buchanan on this matter.

I have considered other possibilities of getting the drawings prepared. For instance, I learned when I was in Omaha that Mr. Bert Flagg, formerly chief draftsman for the Union Pacific Railroad, has retired, and is living in Council Bluffs, Iowa. He might be interested in doing the work. No one has been in communication with him on the subject, however, and his attitude is unknown. Mr. Frank C. Harmon of Omaha also has done some locomotive drafting, and might be available. I learned the names of one or two persons on the west coast who have done work of this kind, but in each instance it has seemed to me that the distance from our supervision and ability to check on the work, and other unknown factors, plus certainly a higher fee, have turned the issue in favor of trying to get the services of Mr. Buchanan. This is what I recommend. There is no one in the National Park Service with the background training and knowledge necessary to do the work.

When the drawings have been completed, and bids obtained, the Service will be in a position to know whether it will have the funds to proceed with contracting for the work. If it does not have available the needed funds, it can attempt to supply the deficiency in a number of ways:

1) approach the Union Pacific Railroad Company and the Southern Pacific Company to have them build the replicas either as an operating or a shell type of replica, as an historical contribution and a public relations gesture; 2) obtain a financial donation from one or both companies to supplement Federal appropriations; 3) the two companies might contribute use of railroad machine shops and skilled personnel and labor in building the locomotives or parts of them (I understand that the Union Pacific has facilities in which it can build a locomotive if it so desires; 4) obtain financial aid from the Utah State Golden Spike Centennial Commission; 5) obtain a grant from a suitable foundation; 6) obtain additional Federal appropriation .

I estimate that it will take 2-3 months of steady work to prepare the construction drawings. Perhaps a month will be needed thereafter to obtain bids on constructing the replicas. If each step of the necessary process is huried forward without delay from this point, the Service should have the information at hand by the end of calendar year 1966 to know what it will cost to build the locomotive replicas, and can estimate its future course to accomplish their manufacture and installation at the Golden Spkke Site by May 1969.

I am prepared to suggest a number of names of prospective bidders and manufacturers of the replicas at the appropriate time. I do not believe they should be made a part of this report.

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The above material, together with the appendices, conclude the report on the locomotives themselves. A few additional subjects might be mentioned briefly here as having a close association with the replica locomotives and the related interpretive development of the Promontory Summit area.

Railroad Roadbed and Rails at Promontory Summit

The grade of the railroad track at Promontory Summit is practically level for the 1 mile section it is proposed to restore. The track for this distance would be rebuilt, according to present interpretive planning, with approximately half of it to the west of the locomotive meeting point, representing Central Pacific track, and half of it to the east, representing Union Pacific track. Approximately half a mile west of the Golden Spike site a low spur ridge of the South Promontory Range cuts off view of the right-of-way, which swings in a gentle curve southwestward from the Summit and Golden Spike site. The roadbed and rails should be restored to this point. Eastward from the Summit site, the right-of-way and track would be in view for a greater distance, but half a mile should be adequate to carry the track about as far as the eye will be able to see it reasonably well.

The roadbed will be of a primitive type. There should be only shallow ditch on either side--just enough to scrape up enough earth to form a low roadbed. This roadbed will be narrow, just wide enough to carry the ties and the standard gauge rails of 4 feet $8\frac{1}{2}$ inches. The roadbed will not, on average, be more than a foot or two in elevation ~~above~~ above the adjacent land it traverses. Historic photographs show clearly, and better than any words, just what this was, and should guide the reconstruction. A number of these photographs are included in the appendices. Several are of specific points within the area where the track will be reconstructed.

Weight of Rails: The Union Pacific laid down rails of only 40 pounds to the yard when it first started construction at the Missouri River. By 1866, however, it was using 50-pound rail, with 45-pound rail for sidings. Three years later when its line reached Promontory Summit it was laying 56-pound rail. The rail was of Pennsylvania wrought iron. The law required that the iron used in building the * track be American made. The 56-pound rails were normally 28 feet long, connected by fish plates. By the time the first transcontinental railroad was completed at Promontory Summit in May 1869 the weight of rolling stock had just about reached the limit that 56-pound rail would support. And soon thereafter steel replaced wrought iron in rail manufacture.[71] The Central Pacific also used American made 56-pound, wrought iron rails for its track at Promontory Summit.

The reconstructed track at Promontory Summit, therefore, should use rail weighing 56 pounds to the yard. Fortunately, this will be available as a donation. The Union Pacific Railroad Company has a small quantity of this rail on a minor branch line, and has offered to make a donation of enough of it to lay a mile of track at Promontory Summit.[72] This is a valuable contribution in terms of

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71. John D. Galloway, The First Transcontinental Railroad, New York, Simmons-Boardman Publ. Corp., 1950, 271; Wesley S. Griswold, A Work of Giants, New York, McGraw-Hill Book Co.,Inc., 1962, 136; Nelson Trottman, History of the Union Pacific: A Financial and Economic Survey, New York, Ronald Press, 1923, 56.

72. Conversation, Roy E. Appleman,NPS,with Ed. C. Shafer, Director of Public Relations, Union Pacific Railroad, May 13, 1966; Ltr., Edd H. Bailey, President, Union Pacific Railroad Co., to Assistant Director Howard Baker, National Park Service, June 25, 1966.

* Central Pacific rail varied from 56-pound to 65-pound rail, but that used at Promontory was 56-pound rail. Initially, the company had ordered 60-pound rail, heavy for that time. Galloway, 141-142, 159.

making it possible to secure historically authentic rail type, and it also represents an unknown but undoubtedly considerable financial gift because the cost of manufacture of a mile of special 56-pound rail would be high.

At the present time on trunk lines, rails weigh from 85 pounds to the yard upward, with some of them weighing as much as 174 pounds. No rails on Class I rail lines weigh less than 60 pounds to the yard.[73]

Railroad Ties, 1869, at Promontory Summit: Because putting down ties on which to lay rails will be a restoration feature at Promontory Summit, it will be well to note here what is known of the kind and quality of tie used by the two railroads. Interestingly, there was a marked difference between them in the kind of tie used. This is apparent from a study of the historical photographs of the Golden Spike ceremony which show the meeting point of the tracks and clearly delineate with detail the kind of ties placed by both railroads.

The Central Pacific used sawed and squared ties, with sawed ends; the Union Pacific used rough sections of small trees, the bark left on, and the ends chopped to angled points by axes, with one side adzed to make a relatively level surface on to which the tie was laid and spiked down. The effect was to give the Central Pacific

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73. Association of American Railroads, Quiz on Railroads and Railroading, booklet, 13th Edition, Washington, D.C., 1964, item 27.

ties an appearance not much different from those used today, while Union Pacific rails were laid on very primitive looking ties. The Union Pacific ties were also of unequal length, whereas those of the Central Pacific were relatively uniform in length. Photographs of the track at the Summit in 1869 show these characteristics clearly. These will be found in an appendix to this report.

Both companies faced great difficulties in obtaining the ties they needed. For hundreds of miles from the beginning of its track at Omaha, Nebraska, the Union Pacific was building across treeless plains. About 2,300-2,640 ties were required for a mile of track. The Union Pacific cut ties up and down the Missouri River from Omaha, and floated them on rafts to that point. Perhaps 1/6 of them were of red cedar or oak, and most of the remainder cottonwood. These were treated with an impregnation of zinc in a treating plant built at Omaha. The farther west into the plains the track built, the more expensive became the unit cost of ties. In later investigations into the cost and manner of building the railroad, testimony was given to the effect that in certain places ties cost $5 each.[74]

The first place west of Omaha that ties could be cut along the right-of-way was in the Black Hills of Wyoming west of Cheyenne. Beyond the Black Hills there were several hundred miles of bleak,

74. Galloway, 271-282; Griswold, 136; Trottman, 56.

treeless, upland plateau desert. Finally, in the Uinta and Wasatch ranges of Utah forests provided a source of timber for ties. In the Salt Lake basin Mormon contractors cut ties along the western slopes of the Wasatch and hauled them to the roadbed, or in some cases, floated them across Great Salt Lake to the vicinity of the right-of-way. The railroad ties used by the Union Pacific at Promontory Summit came from the canyons and slopes of the Wasatch eastward. They were all cut by axe, adzed on one side, angled at both ends by axe cuts, and had the bark left on except for the one side.

The Central Pacific, in contrast to the Union Pacific, at first had an ample supply of timber for ties. This source was at hand alongside the grade until the track had crossed the Sierra Nevada and emerged from the Truckee River valley into the great basin desert that continued unbroken eastward to Great Salt Lake and Promontory Summit. Across this Nevada and Utah desert the Central Pacific faced the same kind of problem the Union Pacific had confronted in building across the plains--it had to cut ties elsewhere and transport them as it built eastward. The source of supply for all the ties on the Central Pacific track across the desert were the forests of the eastern slopes of the Sierra in the Truckee valley and its vicinity. There it set up sawmills for producing bridging timbers and ties. A correspondent for the

Sacramento Daily Bee in 1869 said there were "some 30 sawmills at Truckee."[75] As the railroad neared completion many of these sawmills became idle as the need for timbers and ties came to an end. Thus, ties from the Wasatch and the Sierras held the rails that joined on the upland desert at Promontory Summit.

More need not be said on this subject here since the historical photographs taken at various points along the transcontinental railroad, and particularly at the Golden Spike site, show clearly the characteristics of the ties each railroad used at that point. These photographs are in the appendices.

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75. Sacramento Daily Bee, XXV, No. 3803, May 7, 1869, article signed "O.L."

PROMONTORY SUMMIT ON MAY 10, 1869

The Golden Spike scene at the ceremonies on May 10, 1869, is the most historic moment to be captured for Promontory Summit in the interpretive program there. It is of some importance, therefore, to know what the site looked like at that time. There are conflicting accounts in the literature, and particularly in the captions of photographs which purport to show what the place looked like on May 10, 1869. Many of the photographs, although so captioned, were not taken on May 10 but later, and accordingly they show many more tents and structures than were actually there at the time.

There will be no effort made here to give this subject exhaustive treatment, as that would require extensive research, and this study was not undertaken for that purpose in any event. The development of the railroad junction town of Promontory after May 10, 1869 should be the object of a special research study because the facts about it will be needed in planning the interpretive program of the Golden Spike area. And there should be a similar study on the extent and location of the Union Pacific construction camps on the eastern slope of the North Promontory Range and at its eastern base. But for the moment my purpose is to indicate only what will be immediately useful, that came to my notice during work on the locomotive problem, in planning the development for the locomotives in a May 10, 1869 setting at the summit.

The Central Pacific reached Promontory Summit with its track ahead of the Union Pacific, which was delayed by heavy rock excavations in cuts and building a high trestle on the steep east face of the North Promontory Range. On April 28, 1869 the Central Pacific was within 4 miles of the summit meeting point, and from there on the grade to the junction point was relatively level and of easy construction. The Union Pacific jumped ahead of its end of track and began putting in a siding at the Summit on May 1. On that day the Central Pacific completed its rails to the summit meeting point.[76]

During this last phase of the building of its track to Promontory Summit, the Union Pacific construction camps were scattered at different points on the east face of the North Promontory Range and at its eastern base near Blue Creek. They had such names as Painted Post, Hell's Half Acre, Last Chance, Murder Gulch, Commissary Camp, and Deadfall.[77] Pictures of them are often confused with Promontory at the summit, and narrative

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76. Robert M. Utley, "Special Report on Promontory Summit, Utah (Golden Spike National Historic Site)," National Park Service, Region Three Office, Santa Fe, N.Mexico.,Feb. 1960, 56. This is an excellent orientation report on the building of the transcontinental railroad.

77. Utley, 57; Ltr., Mrs. Bernice Anderson to Roy E. Appleman, July 15, 1966. Mrs. Anderson is President of the National Golden Spike Society, lives at Corinne, Utah, and has long been a local student of the Golden Spike site.

texts about Promontory often actually relate to one or the other of these construction camps. The exact location of these camps needs to be determined by research. Needless to say, some of them were tough, tough places.

As evidence of this, a Mr. T. O. Leary, correspondent for the Sacramento Daily Bee, wrote a dispatch for his newspaper from Promontory Summit on May 10, 1869 in which he described the reputation of the Union Pacific construction camp about 6 miles eastward of the summit when he arrived there on May 8. He said there were many "hard cases" in the vicinity, including one person known as "Behind the Rock Johnny, the hero of 5 murders and unnumbered robberies." Speaking of the main construction camp near Blue Creek he said there had been 29 murders there in one month during the past winter, with 8 in one day.[78]

Leary noted that the Union Pacific laid the last ½ mile of track on May 9 to close the gap with the Central Pacific. This left only the 56 feet of bare ground without either ties or rails separating the two lines. This gap was the length of two rails, one pair to be put in place by each company on the next day at the time of the ceremony.[79]

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78. Sacramento Daily Bee, XXV, No. 3808, May 13, 1869.

79. Robert L. Harris, "The Pacific Railroad--Unopen," The Overland Monthly, September 1869, 252.

In his dispatch dated 10 May, Leary said there were 17 tents at the summit, half put up since his arrival 2 days before. Railroad boxcars were being used as offices and boarding houses for some railroad officials. He noted on May 9 that the last transfer of passengers by stage between the Union Pacific and Central Pacific lines took place, and that on that day 40 bags of mail weighing about 3 tons were transferred from the Union Pacific to the Central Pacific.

Another eye-witness of the May 10 ceremony, Dr. J. D. B. Stillman, arrived at Promontory on the morning of Friday, May 7, as a guest of Governor Stanford on board the Stanford Special. He said there were two or three tents pitched in the vicinity of Promontory Summit for the rendezvous of ruffians in the neighborhood. There were also the tents of two telegraph operators of the two railroads within a few rods of each other. Any tents and other building features that might have been near the summit earlier had been removed to the east base of the Promontory Range, and as the day for the ceremony approached the summit site was one of open, upland desert sage brush country, save for the two railroad grades and a few tents.[80]

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80. Dr. J. D. B. Stillman, "The Last Tie," The Overland Monthly, July 1869, 81. This is a most interesting and useful article by one who made the trip from Sacramento with Governor Stanford, and was written almost immediately after the return of the California party from the Golden Spike ceremony. Griswold says there were 2 tents at Promontory Summit on May 7 (A Work of Giants, 318). He places 14 tent saloons there on the 10th (p. 324).

The historic photographs taken at Promontory Summit on May 10 show that most of the tents there were on the north side of the railroad track. There were a few, perhaps three or four at most, on the south side. The town of Promontory that grew up later at this point was mostly on the north side of the track, and this fact should be taken into account in the developments at the site and subsequent interpretation of the summit area.

It is important in locating the Golden Spike site and positioning the two replica locomotives, if they are constructed, to know that the meeting took place on the Central Pacific grade which was the northern one of the two at this point. The Union Pacific grade ran to the south of the Central Pacific across the summit area, distant from it 100-200 feet.

The connection was made at the end of the Central Pacific track at the summit because it had its rails laid down first and the Union Pacific had to make connection to it. The historic photographs show this condition clearly. At the present time, the county dirt-gravel road that runs west from the Golden Spike site is, I believe, on the alignment of the original Union Pacific grade. At the time of the ceremony, the Union Pacific grade did not have ties or rails on it at the summit. A siding approached the spot from the east but did not come quite to the summit meeting point on this grade.

I recommend that the Union Pacific grade be re-established in the immediate vicinity of the Golden Spike site as an historic feature. This will mean the obliteration of the county road for a short distance in this vicinity west of the site.

The Golden Spike monument was placed in 1915 where it stands today just south of the original Central Pacific grade, which became the operational line of the railroad. The actual junction site of the two locomotives, therefore, would be on the Central Pacific grade, which is still clearly visible, just opposite or on the north side of the monument. A United States flag was raised on a telegraph pole on the south side of the track at the junction point. This flag shows in several of the historic photographs taken ther on May 10 and later, and serves as a marker of the site in the changing scene. A replica of this telegraph pole and a 37-star flag should be re-established here as an historic feature of the scene. The photographs can be used as restoration guides.

In July 1869, about 2 months after the Golden Spike ceremony, William Henry Jackson visited Promontory Summit and photographed the site. The flag on the telegraph pole was still there. Many additional buildings had risen on the north side of the track.[81] This picture is sometimes mistakenly reproduced as having been taken on May 10.

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81. See p.100

Leary reported from the site to his newspaper, the Sacramento Daily Bee, in a dispatch written on May 10, that the Union Pacific broke ground on May 9 for a Y on which locomotives and cars could be turned around, and that the Central Pacific intended to build a turntable. He said that the Central Pacific would have to back its trains 70 miles from the summit before they could turn around.[82]

Nine years after the joining of the rails, we know there were still important railroad activities at the summit, although many of the structures that had hastily been erected there in the months immediately following May 1869 had disappeared after the junction point was moved to Ogden (5 miles west of Ogden) in November of that year. A guide book of the transcontinental railroad line, published in 1878, described some of the features at the summit, stating there was a well kept eating house for railroad and train men and a 3-stall roundhouse, as well as other buildings.[83]

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81. William Henry Jackson, Time Exposure: The Autobiography of William Henry Jackson, G.P. Putnam's Sons, New York, 1940, 175-179. This work quotes from a diary Jackson kept of his journey from Omaha, and one entry indicates that he was at Corinne, Utah on Friday July 9, 1869. He must have been at Promontory Summit within a day or two of that date. Lucius Beebe, The Central Pacific and Southern Pacific Railroads, Berkeley, Howell-North, 1963, has a fine collection of photographs of the Promontory ceremony, but his captions and text are not always accurate and must be used with discretion.

82. Sacramento Daily Bee, XXV, No. 3808, May 13, 1869. This newspaper printed in its May 15, 1869 issue a dispatch written by Leary at Promontory on May 11 giving an account of the situation, in which he said, "All is quiet at 'the front'...the crowd has departed."

83. Henry W. Williams, The Pacific Tourist: Illustrated Trans-continental Guide, New York, Henry W. Williams, 1878, 155-156, 164. This volume has wood cuts of views along the route and a time table then in effect. The Central Pacific and subsequently the Southern Pacific maintained facilities there until after the Lucin Cut-off was built in 1906.

The fare from New York to Sacramento, over the Union Pacific and Central Pacific lines from Omaha westward, in May 1869 was $190.35 for the 3,377 miles. From Omaha over the Union Pacific to Promontory Summit was a distance of 1,086 miles; the fare at 7¢ a mile was $76.02. From Promontory to Sacramento the distance was 695 miles; the fare was $82.33, at 11.84¢ a mile.[84]

84. American Railroad Journal, May 29, 1869, XXV, No. 22, vol. 42, 593.

There has been a multiplicity of nomenclature in the literature in referring to the meeting of the rails site down through the years that has persisted to the present. Promontory Summit, Promontory Point, and Promontory all have been used in varying degree. I was surprised to note that nearly all contemporary accounts speaking of the place refer to it as "Promontory Point." It seems desirable to me that this usage not be continued, and that all future references to the meeting point of the rails be "Promontory Summit." Promontory Point is a geographical feature where the South Promontory Range ends at Great Salt Lake, approximately 30 miles south of the summit site in the saddle between the North and South Promontory Ranges. The name "Promontory," I suggest, should be limited in our future usage to mean the railroad station and town that grew up at Promontory Summit after May 10, 1869.

This study is not concerned with the details of the events that took place in the ceremony on May 10, 1869 at Promontory Summit. Perhaps the best account thus far produced on that subject is in J. N. Bowman's two articles, entitled, "Driving the Last Spike at Promontory, 1869," that appeared in the California Historical Society Quarterly, Vol. XXXVI, Nos. 2 & 3, June and Sept., 1957. Also see Utley, previously cited.

2

24 Numbers to complete the work.

129
1720

AMERICAN LOCOMOTIVE ENGINEERING AND RAILWAY MECHANISM

WITH A PRACTICAL TREATISE ON THE DRAUGHTING, CONSTRUCTION AND PRINCIPLES OF THE LOCOMOTIVE ENGINE AND RAILWAY CARS

Illustrated

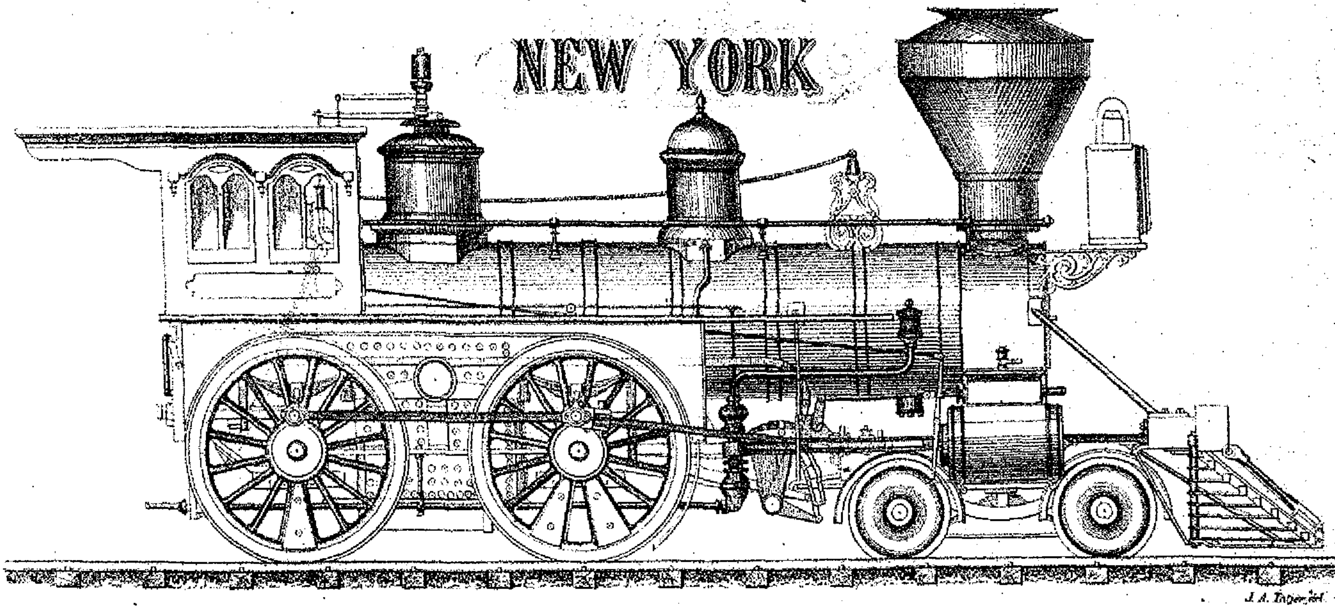
WITH LARGE AND DETAILED ENGRAVINGS OF THE NEWEST AND MOST APPROVED ENGINES, AND WORKING DRAWINGS WHEREIN THE DIMENSIONS ARE CAREFULLY MARKED ALSO DIAGRAMS DEMONSTRATING THE CONSTRUCTION AND ACTION OF THE VALVES AND LINKS ACCORDING TO THE LATEST AND BEST PRACTICE IN LOCOMOTIVE WORKS AND RAILROAD REPAIR MACHINE SHOPS IN THE UNITED STATES OF AMERICA

BY

G. WEISSENBORN

MECHANICAL ENGINEER

NEW YORK



J. A. Tager del.

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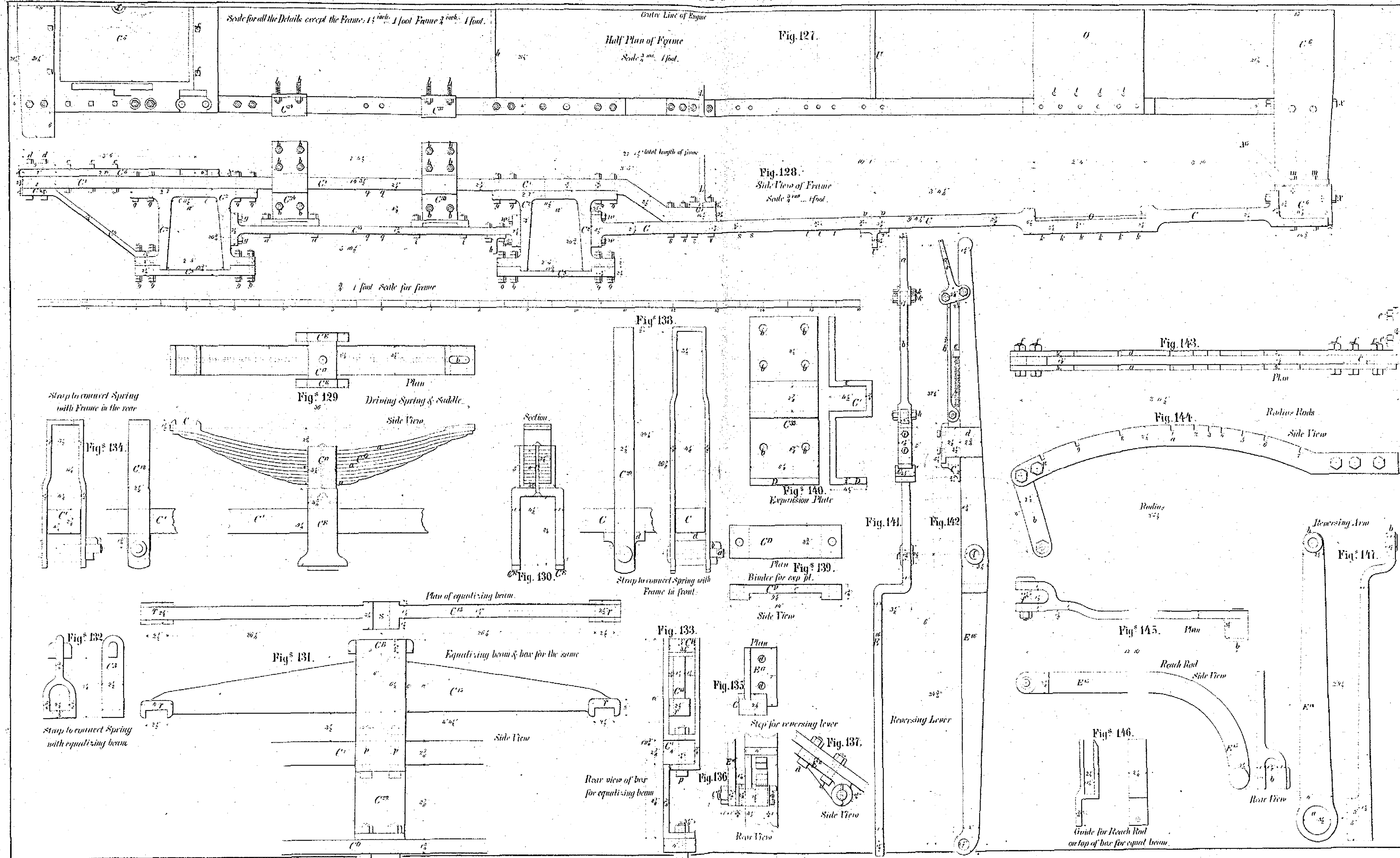
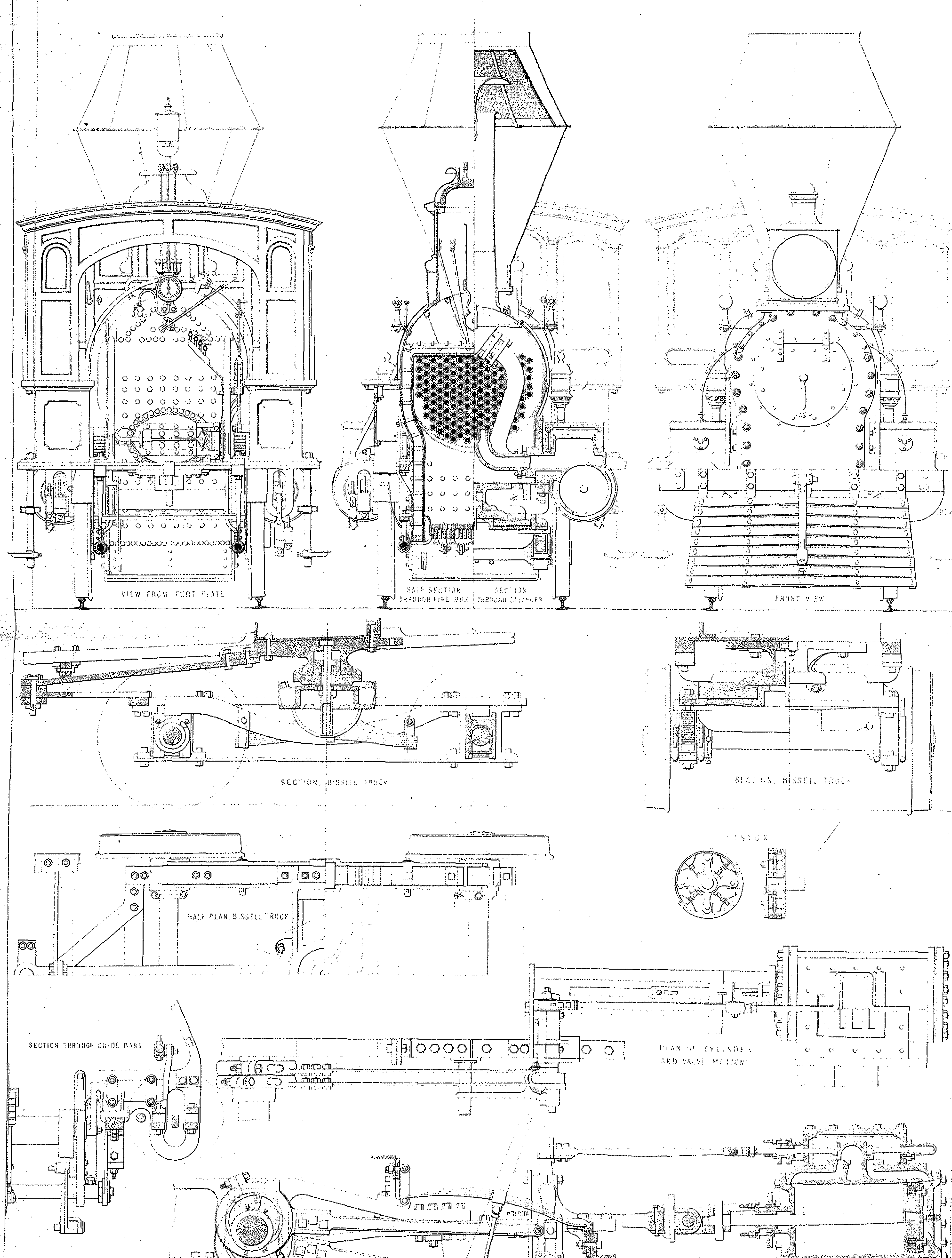
Plate IX.

DETAILS FOR WOODBURNING PASSENGER LOCOMOTIVE Nº 44.



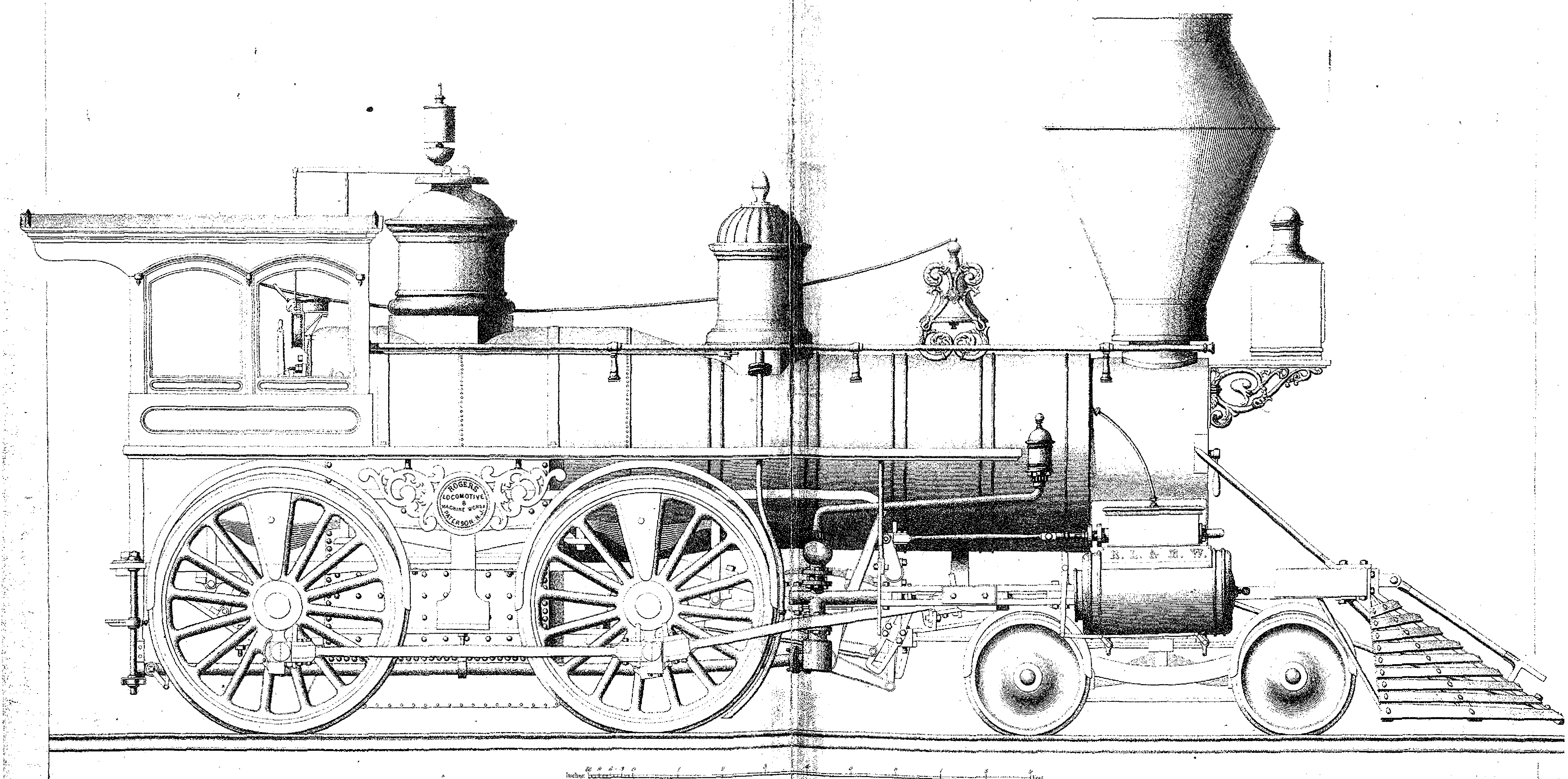
ENGINE BY ROGERS LOCOMOTIVE WORKS.



WILLIAM COLLINS, SONS & Cº GLASGOW, EDINBURGH & LONDON

Plate XVIII.

PASSENGER LOCOMOTIVE,
BY THE
ROGERS LOCOMOTIVE & MACHINE WORKS,
PATERSON, NEW JERSEY, U.S.



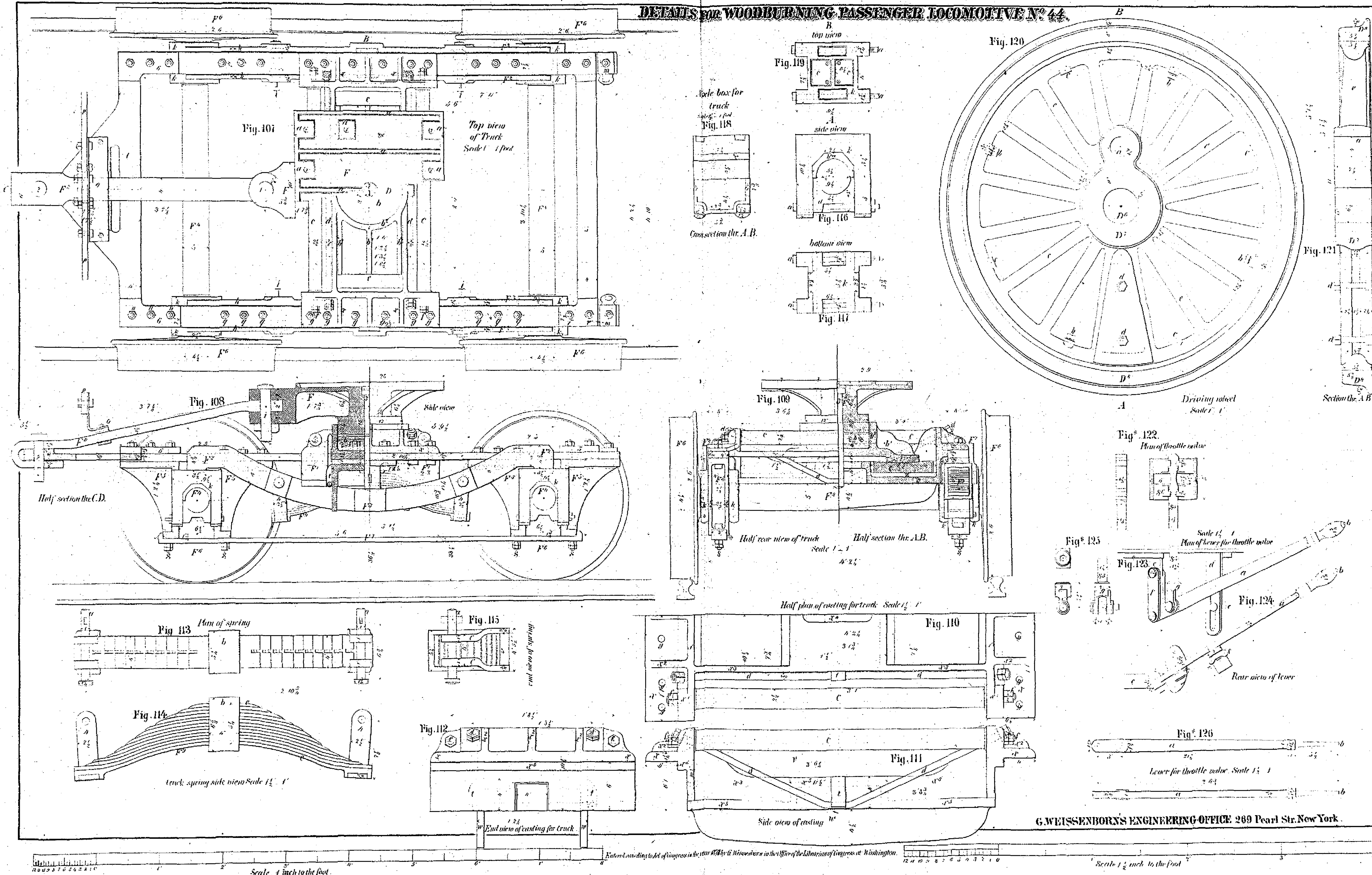
James Dredge, Del.

WILLIAM COLLINS, SONS & Co. GLASGOW, EDINBURGH & LONDON.

Zerah Colburn, Locomotive Engineering and the Mechanism of Railways, vol. II

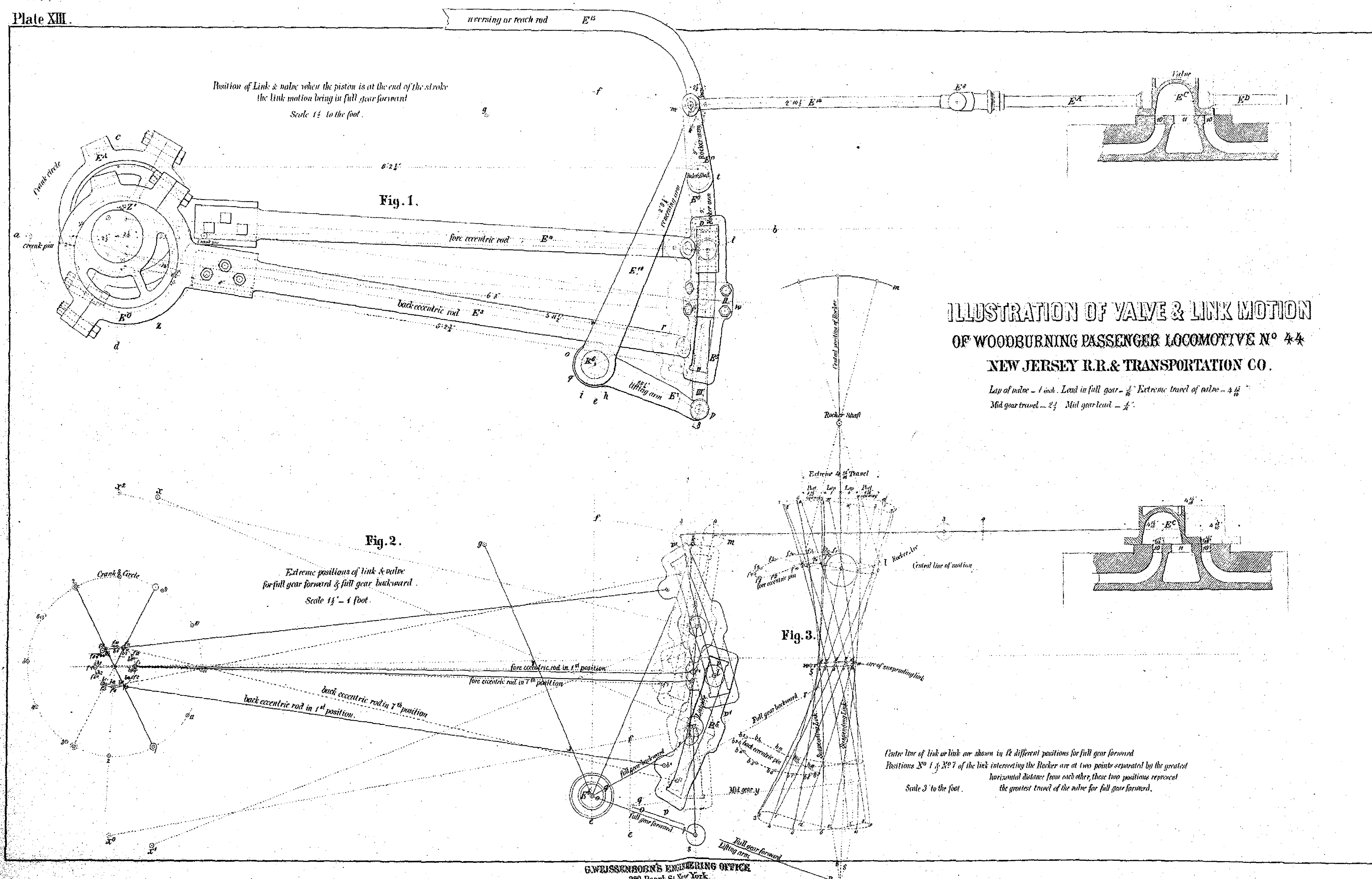
1871

Plate VIII.



DETAILS FOR WOODBURNING PASSENGER LOCOMOTIVE No. 44.
Fig. 107
Top view of Truck
Fig. 108
Side view
Half section thr. C.D.
Axle box for truck
Fig. 118
Cross section thr. A.B.
Fig. 119
top view
side view
Fig. 116
bottom view
Fig. 117
Fig. 120
Driving wheel
Fig. 121
Section thr. A.B
Fig. 109
Half rear view of truck
Half section thr. A.B.
Fig. 122.
Plan of throttle valve
Fig. 125
Fig. 123
Plan of lever for throttle valve
Fig. 124
Rear view of lever
Fig. 113
Plan of spring
Fig. 114
truck spring side view
Fig. 115
Fig. 110
Half plan of casting for truck
Fig. 112
End view of casting for truck
Fig. 111
Side view of casting
Fig. 126
Lever for throttle valve
G. WEISSENBORN'S ENGINEERING OFFICE 269 Pearl Str. New York.
Scale 1 inch to the foot
Scale 1½ inch to the foot

Plate XIII.



G. WEISSENBORN'S ENGINEERING OFFICE
269 Pearl St. New York.

Plate VII.

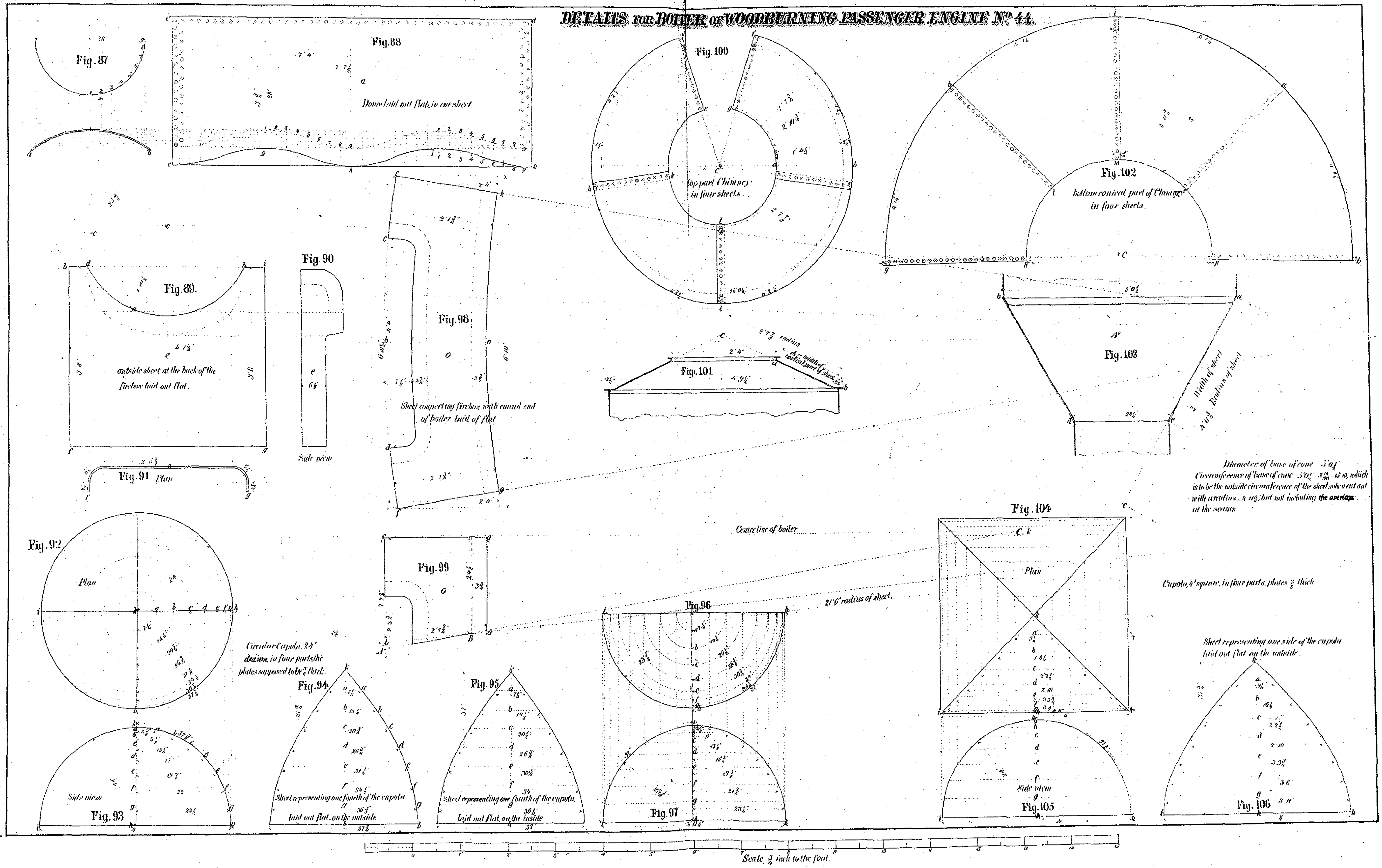
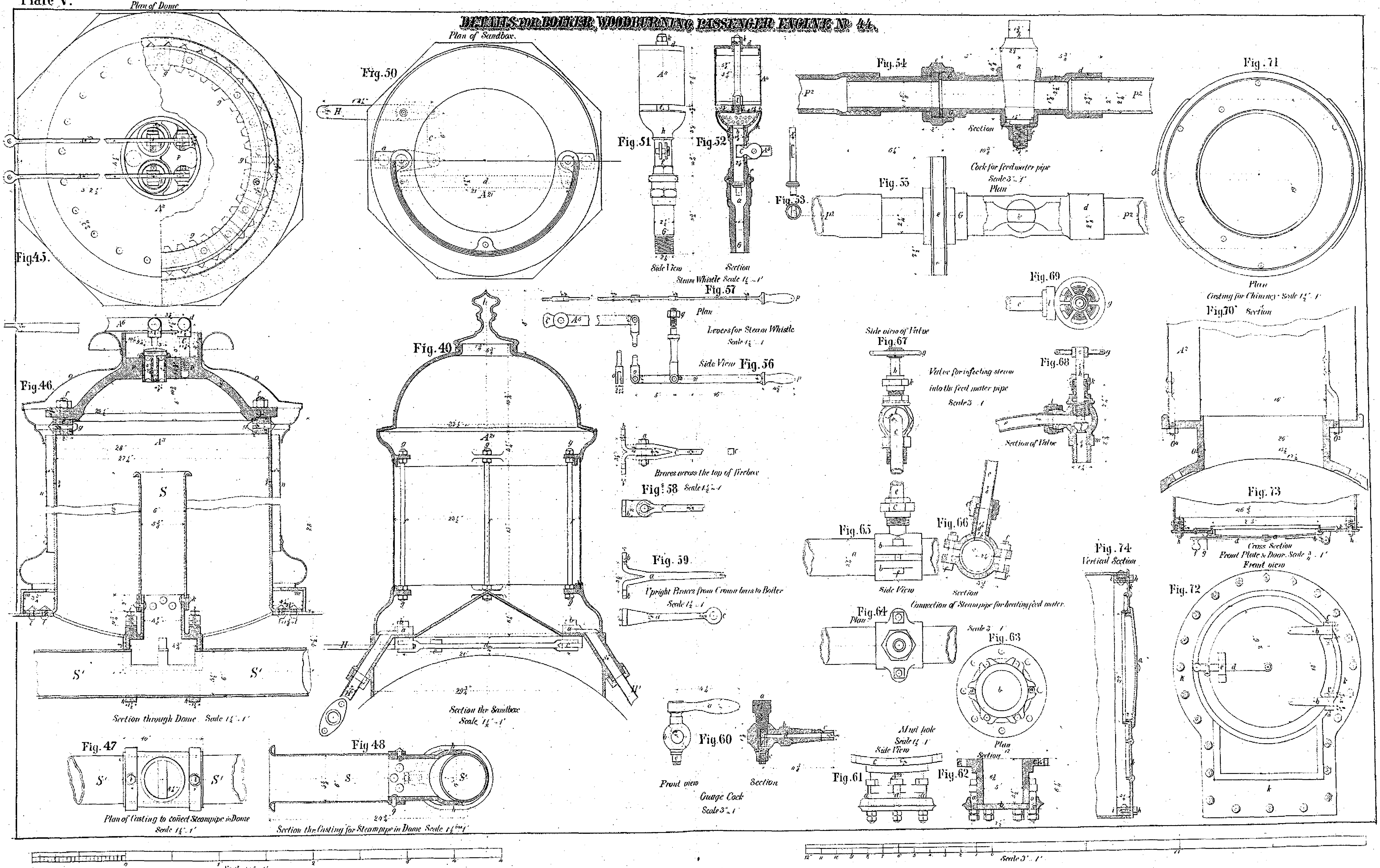
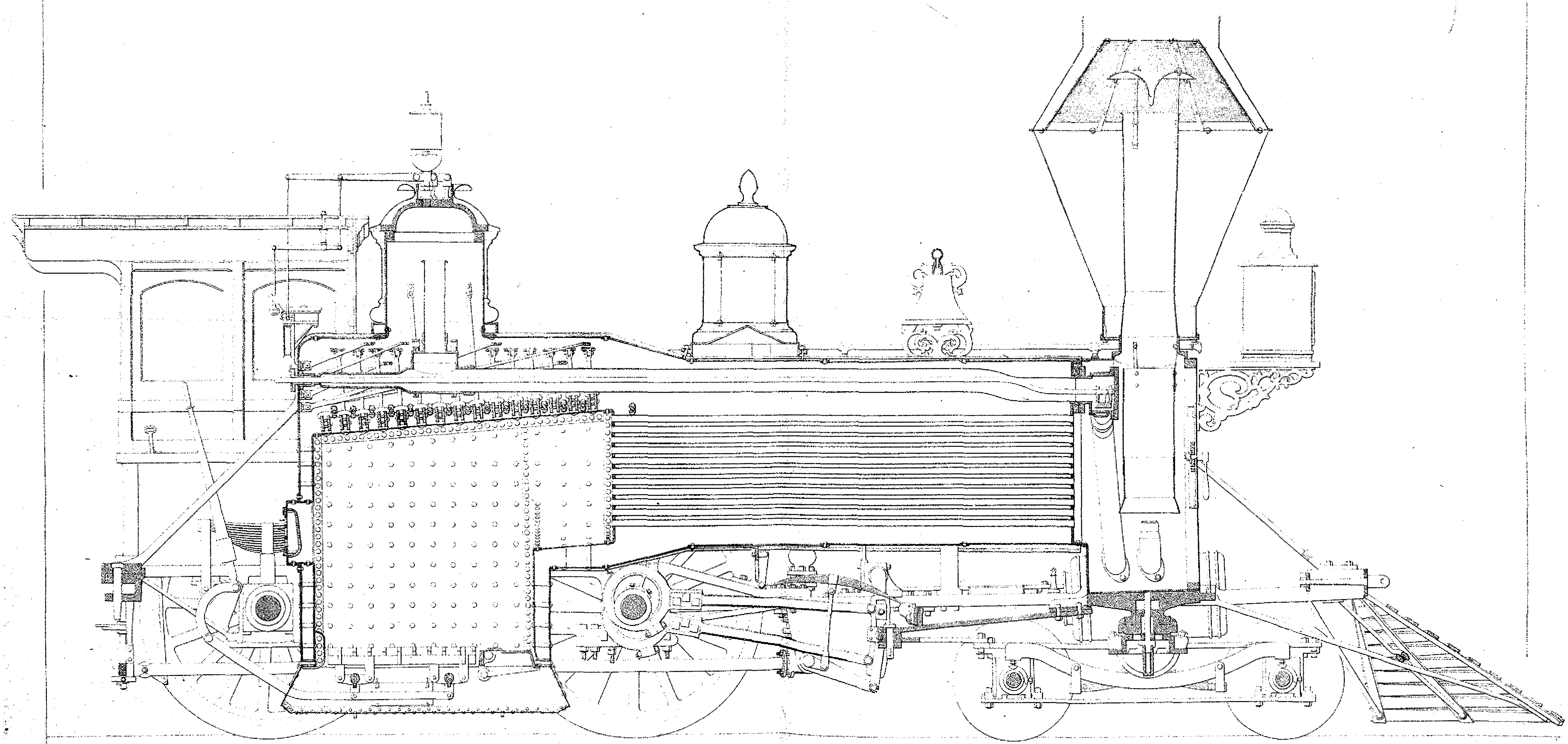

DETAILS FOR BOILER OF WOODBURNING PASSENGER ENGINE No. 44.
Fig. 87
Fig. 88
Dome laid out flat, in one sheet
Fig. 89.
outside sheet at the back of the firebox laid out flat.
Fig. 90
Side view
Fig. 91 Plan
Fig. 98
Sheet connecting firebox with round end of boiler laid out flat
Fig. 99
Fig. 100
top part Chimney in four sheets.
Fig. 101
Fig. 102
bottom conical part of Chimney in four sheets.
Fig. 103
Width of sheet
Radius of sheet
Diameter of base of cone 5' 0¼
Circumference of base of cone 5' 0¼ × 3 1/7 = 15' 10, which is to be the outside circumference of the sheet, when cut out with a radius 4' 11¾, but not including the overlap at the seams
Centre line of boiler
21' 6" radius of sheet.
Fig. 92
Plan
Circular Cupola, 24" drawn in four parts, the plates supposed to be ⅜ thick
Fig. 93
Side view
Fig. 94
Sheet representing one fourth of the cupola laid out flat, on the outside.
Fig. 95
Sheet representing one fourth of the cupola laid out flat, on the inside
Fig. 96
Fig. 97
Fig. 104
Plan
Cupola 4' square, in four parts, plates ⅜ thick
Fig. 105
Side view
Sheet representing one side of the cupola laid out flat on the outside
Fig. 106
Scale ¾ inch to the foot.

Plate V.



DETAILS FOR BOILER WOODBURNING PASSENGER ENGINE No 44.
Plan of Dome
Fig.45.
Plan of Sandbox.
Fig.50
Fig.51
Fig.52
Side View
Section
Steam Whistle Scale 1½"=1'
Fig.53.
Fig.54
Section
Cock for feed water pipe
Scale 3"=1'
Plan
Fig.55
Fig.71
Plan
Casting for Chimney Scale 1½"=1'
Fig.70 Section
Fig.57
Plan
Levers for Steam Whistle
Scale 1½"=1'
Side View Fig.56
Fig.69
Side view of Valve
Fig.67
Valve for infecting steam into the feed water pipe
Scale 3"=1'
Fig.68
Section of Valve
Fig.46
Fig.49
Braces across the top of firebox
Fig.58 Scale 1½"=1'
Fig.59
Upright Braces from Crown bars to Boiler
Scale 1½"=1'
Fig.65
Fig.66
Side View
Section
Connection of Steampipe for heating feed water.
Fig.73
Cross Section
Front Plate & Door. Scale ¾"=1'
Front view
Fig.74
Vertical Section
Fig.72
Fig.64
Plan
Scale 3"=1'
Fig.63
Section through Dome. Scale 1½"=1'
Section the Sandbox
Scale 1½"=1'
Fig.60
Front view
Section
Guage Cock
Scale 3"=1'
Mud hole
Scale 1½"=1'
Side View
Fig.61
Fig.62
Plan
Section
Fig.47
Plan of Casting to conect Steampipe in Dome
Scale 1½"=1'
Fig 48
Section the Casting for Steampipe in Dome Scale 1½in=1'
Scale 1½"=1'
Scale 3"=1'

PASSENGER LOCOMOTIVE,
BY THE
ROGERS LOCOMOTIVE & MACHINE WORKS,
PATERSON, NEW JERSEY, U.S.



Lemaitre Graveur de l'Empereur sc.

WILLIAM COLLINS SONS & Co GLASGOW, EDINBURGH & LONDON

Plate III.

DETAILS FOR WOODBURNING PASSENGER LOCOMOTIVE No 44.

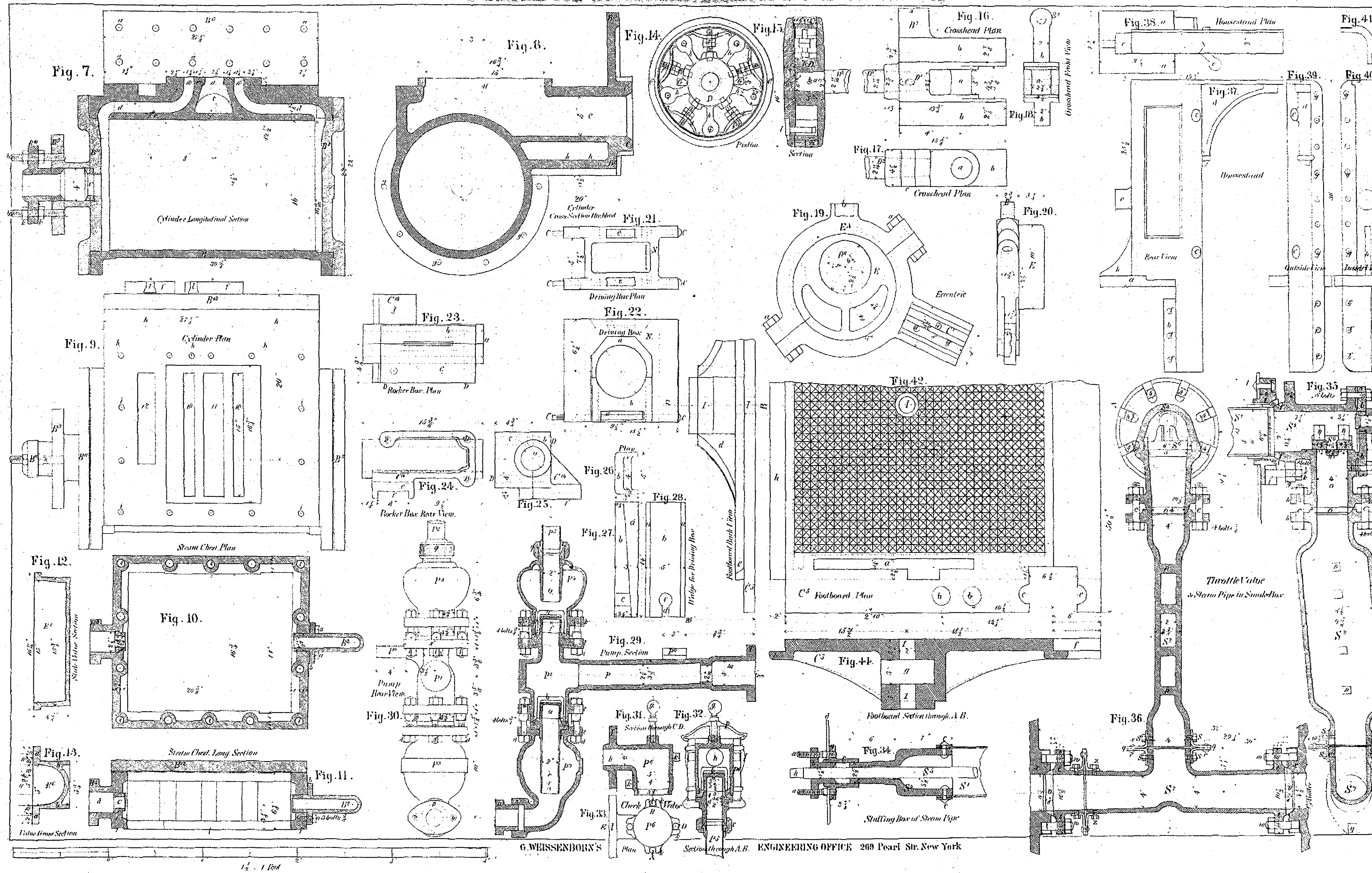
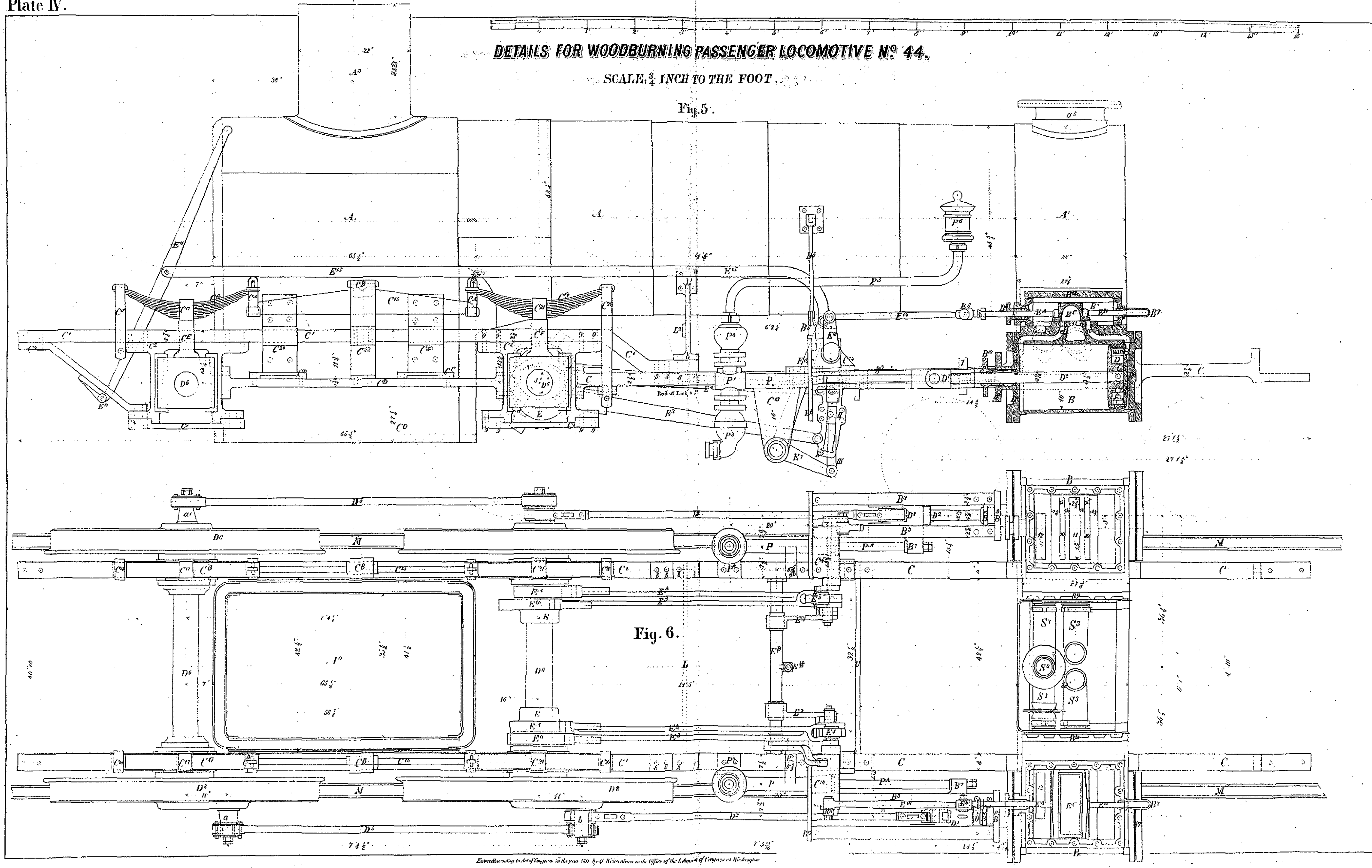
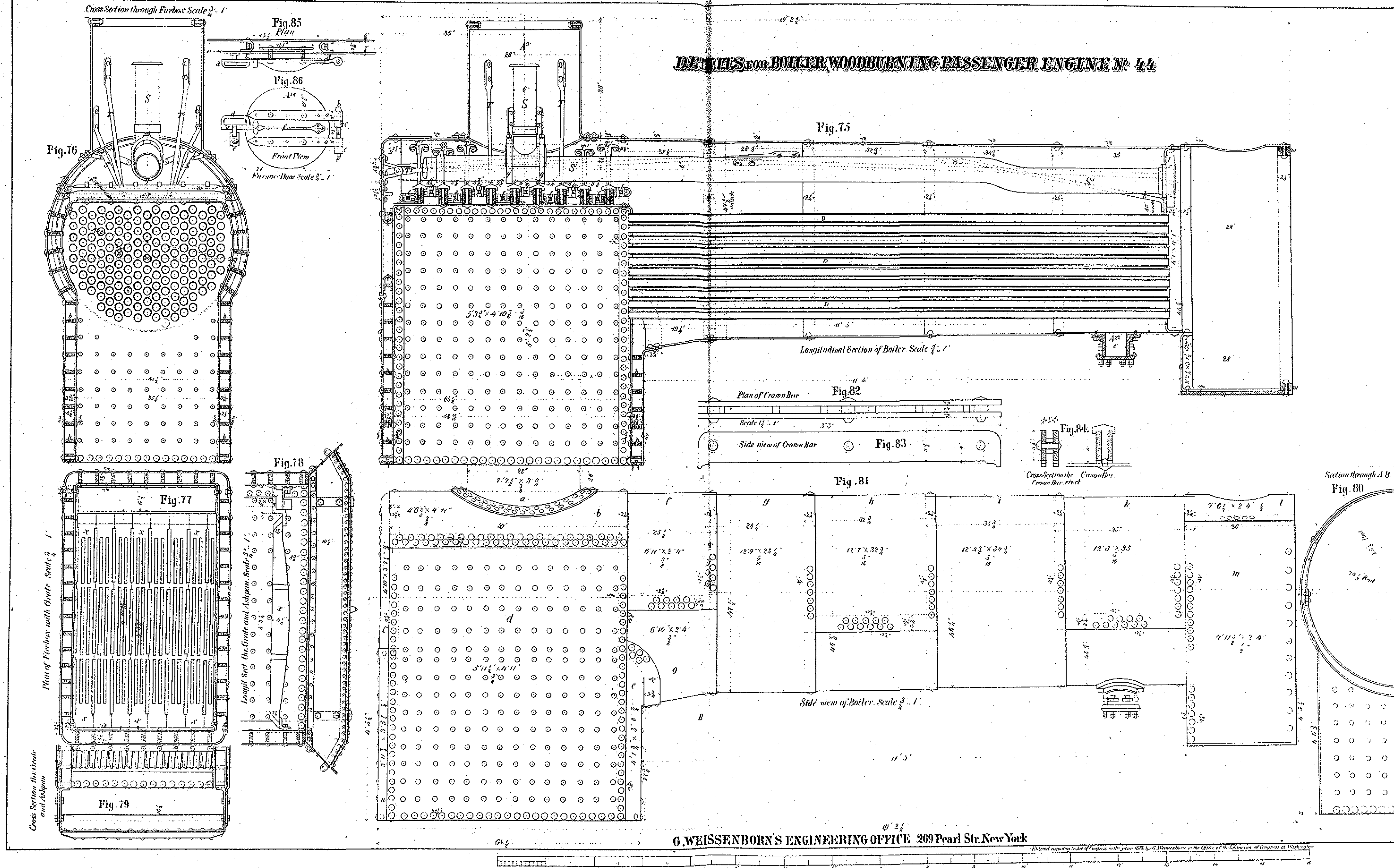


Plate IV.


DETAILS FOR WOODBURNING PASSENGER LOCOMOTIVE Nº 44.
SCALE, 3/4 INCH TO THE FOOT.
Fig. 5.
Fig. 6.



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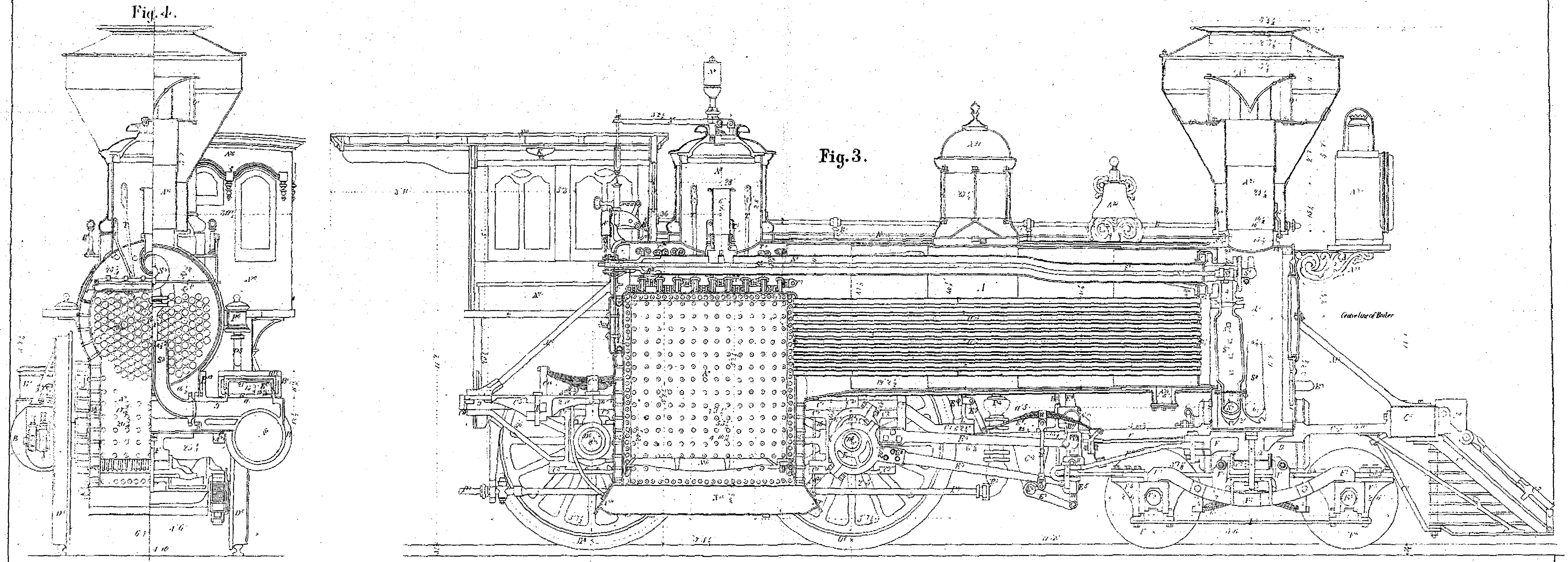
WOOD BURNING PASSENGER LOCOMOTIVE
Nº 44



HALF SECTION THR'FIRE BOX | HALF SECTION THR'SMOKE BOX & CYLINDER

LONGITUDINAL SECTION

Scale ½ of an inch to the foot.

Plate X.

DETAILS FOR WOODBURNING PASSENGER LOCOMOTIVE Nº 44.

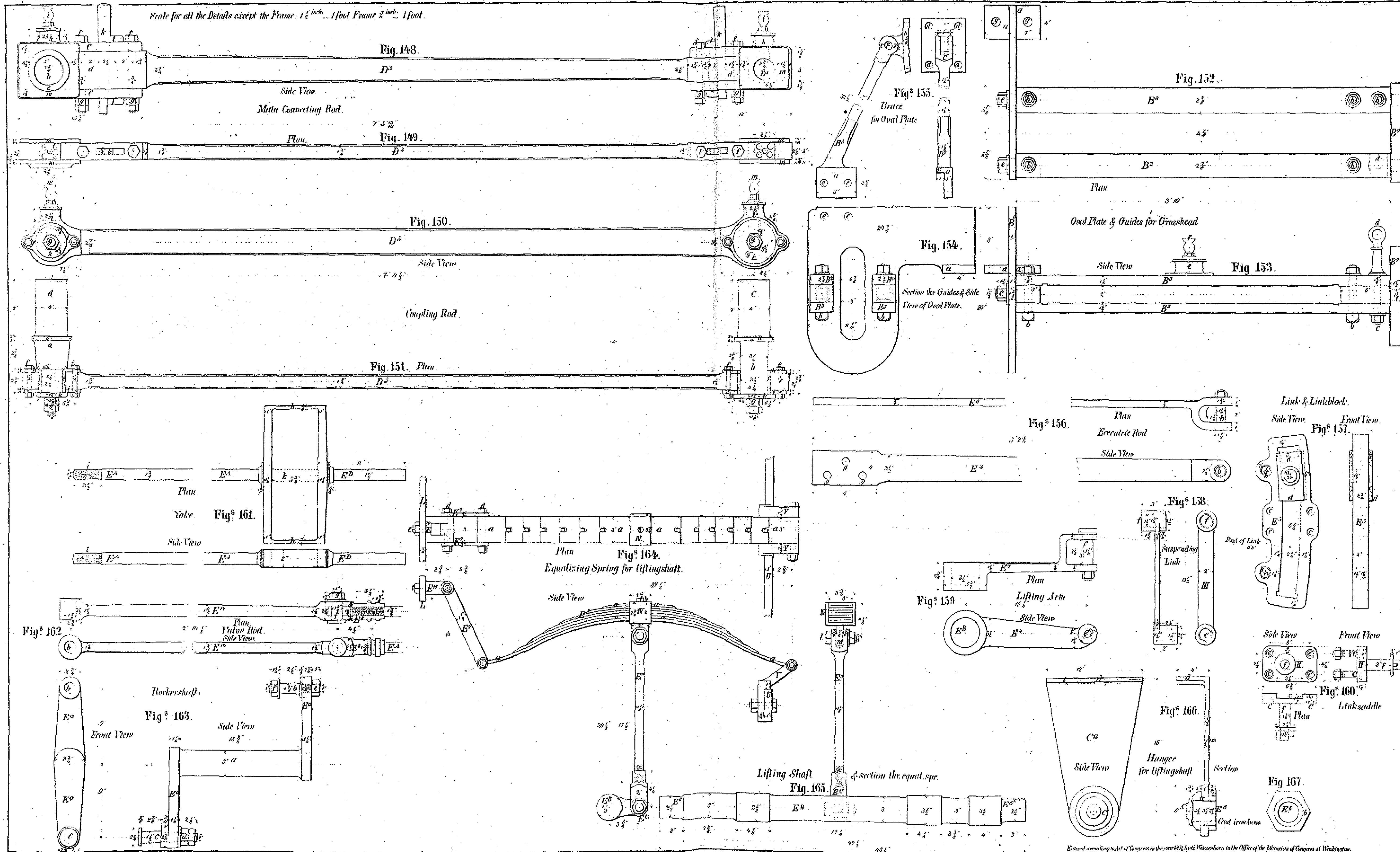


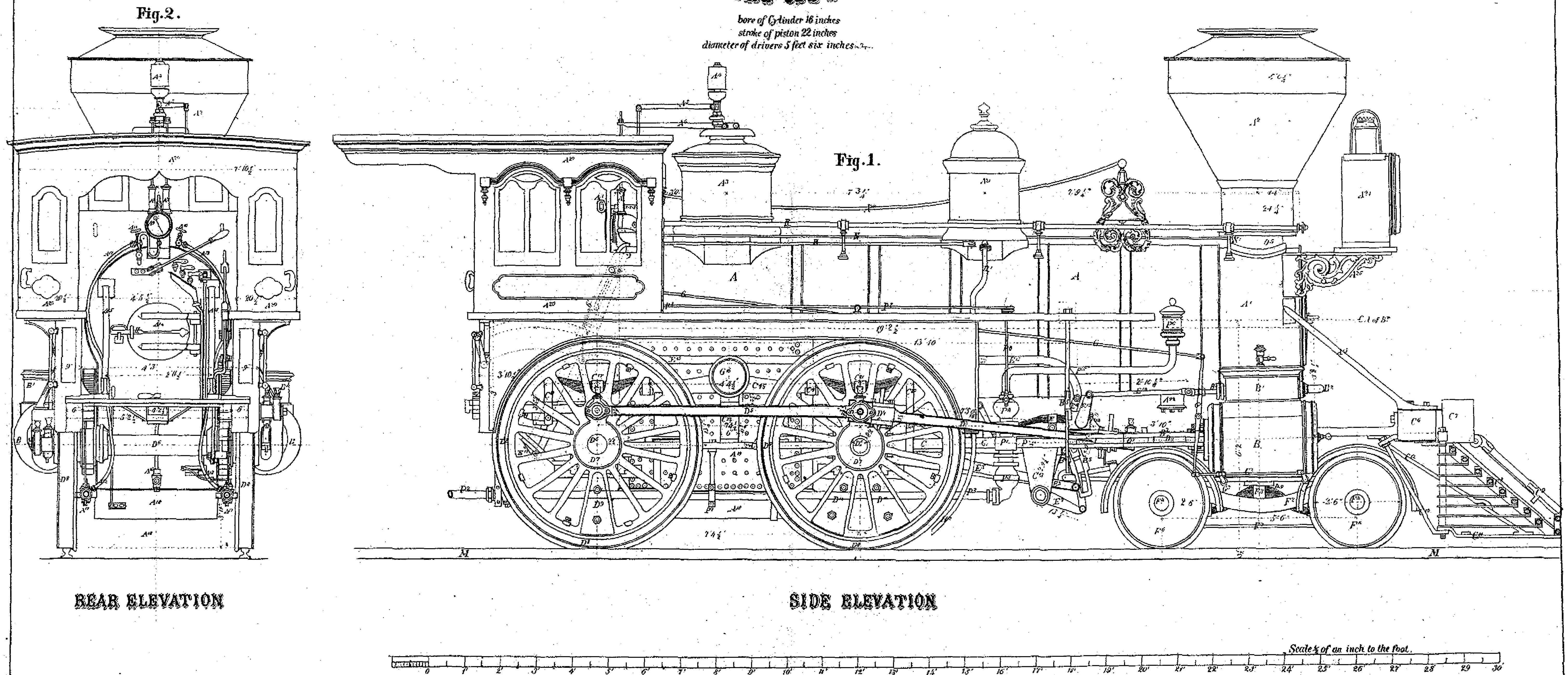
Plate I.

WOOD BURNING PASSENGER LOCOMOTIVE
Nº 44
BUILT AT THE NEW JERSEY RR & TRANSPORTATION CO. WORKS

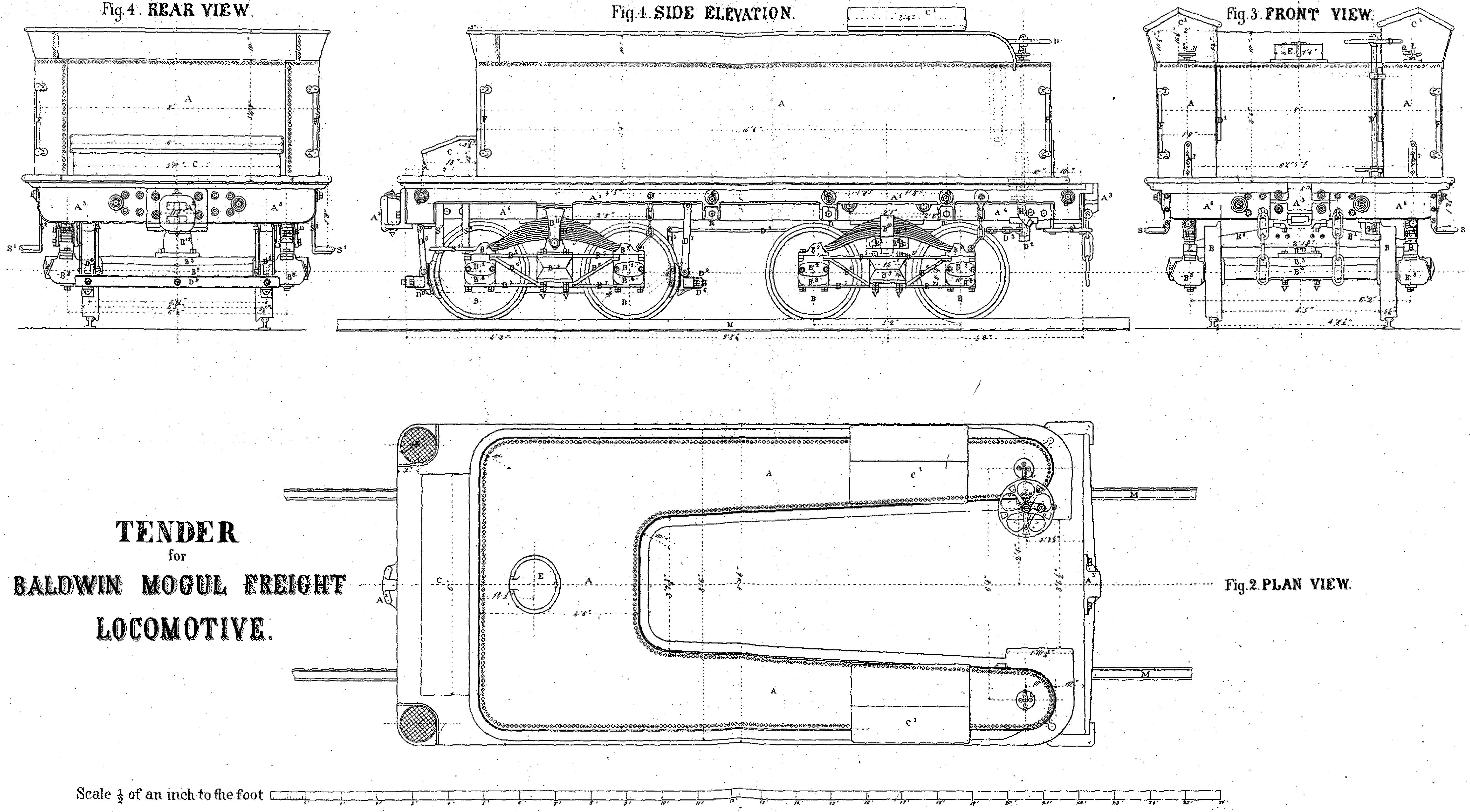
JOHN HEADDEN MASTER MECHANIC

JERSEY CITY N.J.

bore of Cylinder 16 inches
stroke of piston 22 inches
diameter of drivers 5 feet six inches.



G. WEISSENBORN'S ENGINEERING OFFICE
269 Pearl Str. New York



TENDER
for
BALDWIN MOGUL FREIGHT LOCOMOTIVE.

Scale ½ of an inch to the foot

G. WEISSENBORN'S ENGINEERING OFFICE
269. Pearl St. New York.

Plate LII.

DANFORTH LOCOMOTIVE & MACHINE CO.

PASSENGER ENGINE

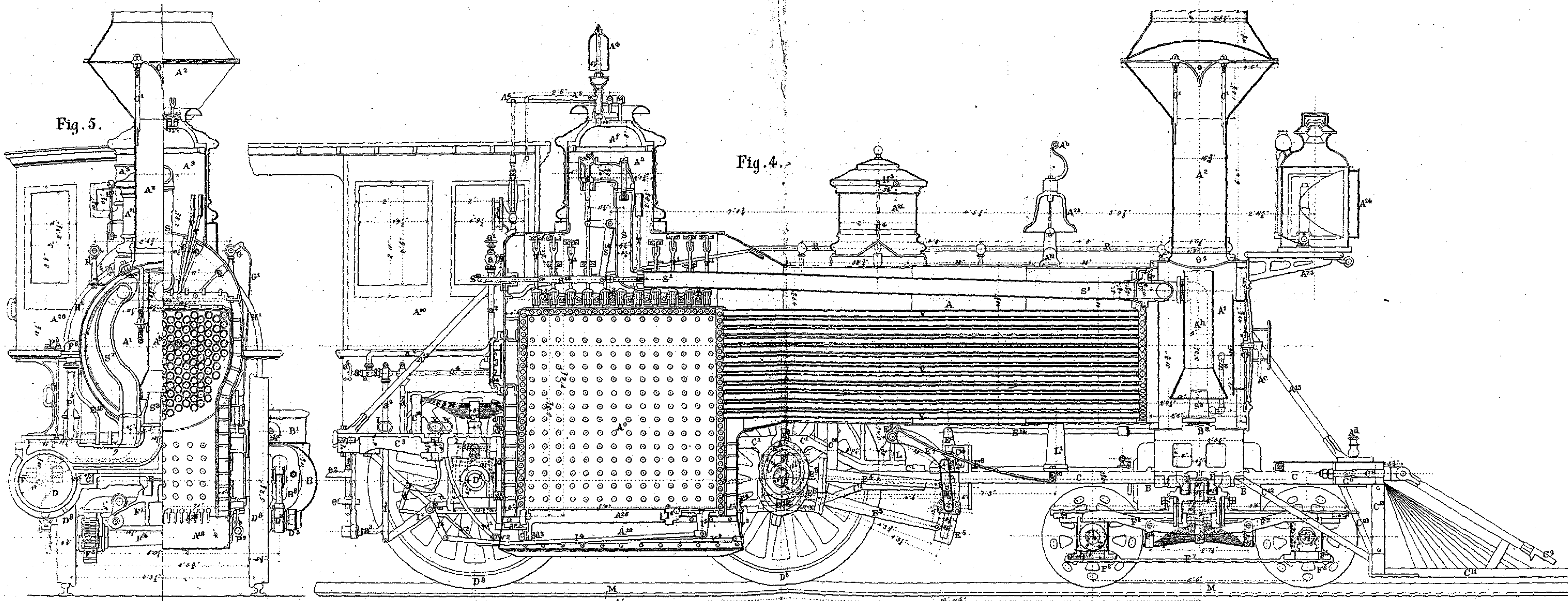


Fig. 5.

TRANSVERSE SECTION through Cylinder and Smoke Box

TRANSVERSE SECTION through Fire Box

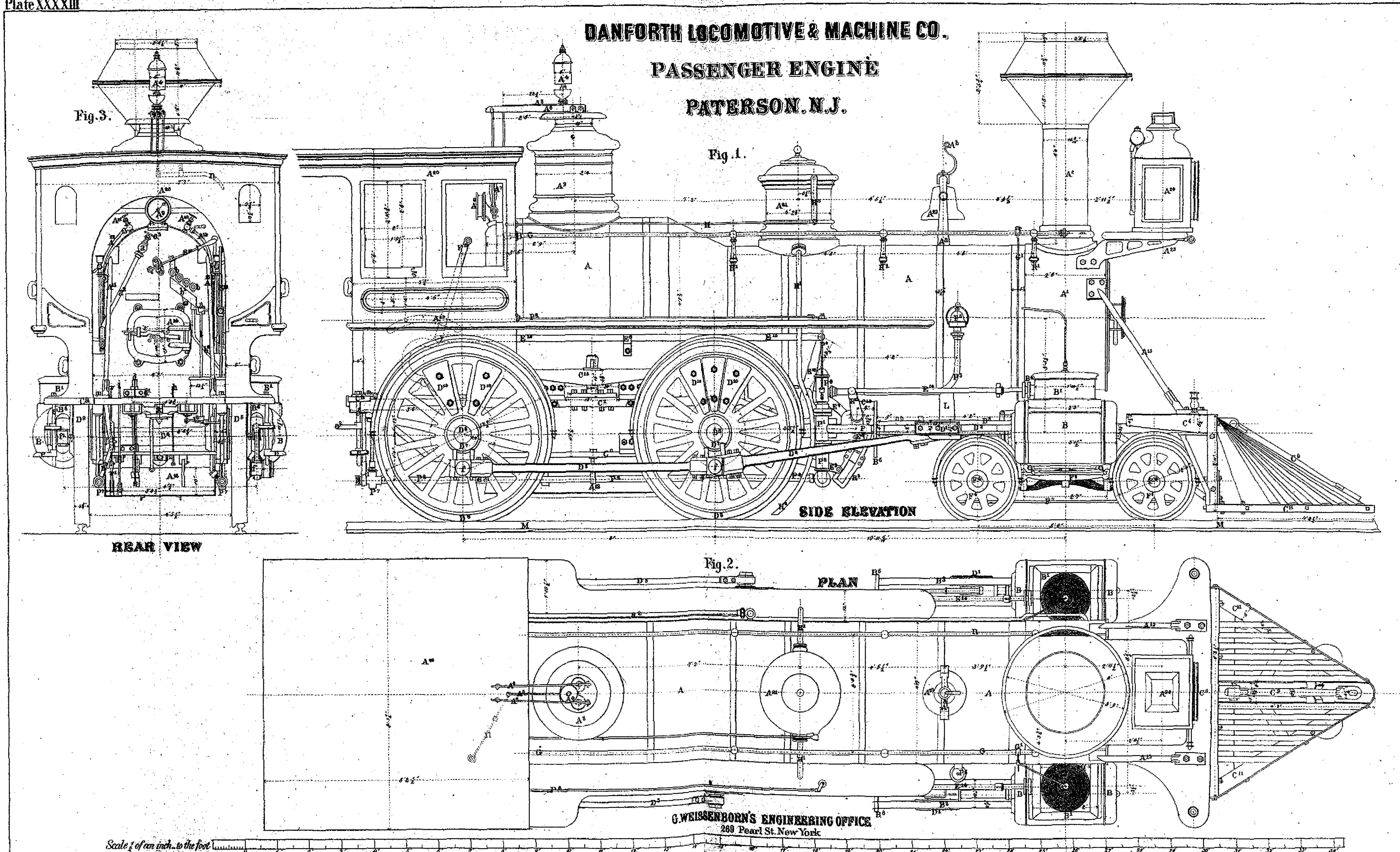
Fig. 4.

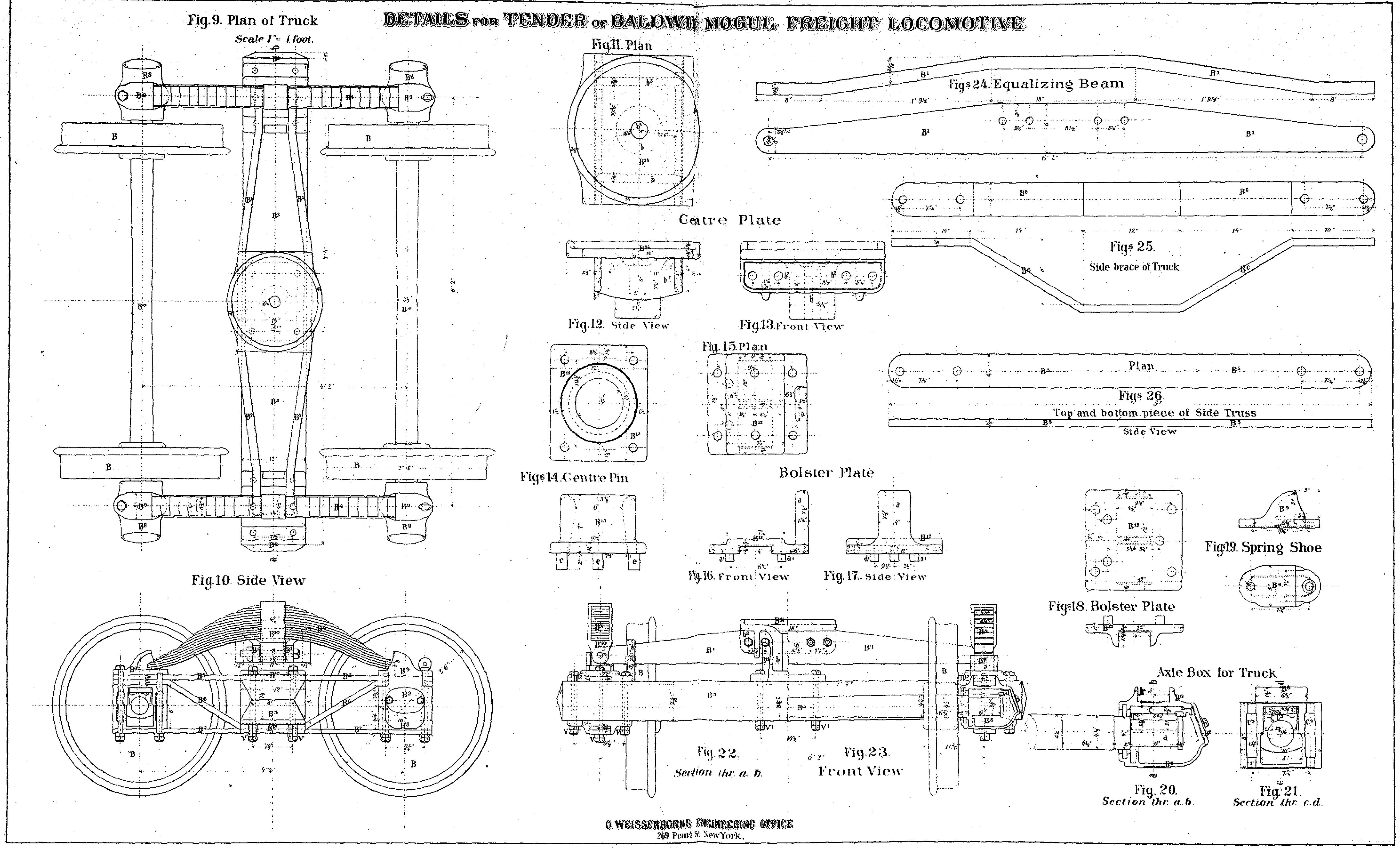
LONGITUDINAL SECTION

G. WEISSENBORN'S ENGINEERING OFFICE
269 Pearl St. New York

Scale ½ of an inch to the foot

Plate XXXXIII




DETAILS FOR TENDER OF BALDWIN MOGUL FREIGHT LOCOMOTIVE
Fig. 9. Plan of Truck
Scale 1" = 1 foot.
Fig. 10. Side View
Fig. 11. Plan
Centre Plate
Fig. 12. Side View
Fig. 13. Front View
Figs 14. Centre Pin
Fig. 15. Plan
Bolster Plate
Fig. 16. Front View
Fig. 17. Side View
Figs 18. Bolster Plate
Fig. 19. Spring Shoe
Axle Box for Truck
Fig. 20. Section thr. a. b
Fig. 21. Section thr. c. d.
Fig. 22. Section thr. a. b.
Fig. 23. Front View
Figs 24. Equalizing Beam
Figs 25. Side brace of Truck
Plan
Figs 26. Top and bottom piece of Side Truss
Side View
G. WEISSENBORNS ENGINEERING OFFICE
269 Pearl St New York.

TENDER FRAME FOR BALDWIN MOGUL FREIGHT LOCOMOTIVE

Scale ¾" = 1 foot.

Fig. 5. TOP VIEW OF FRAME

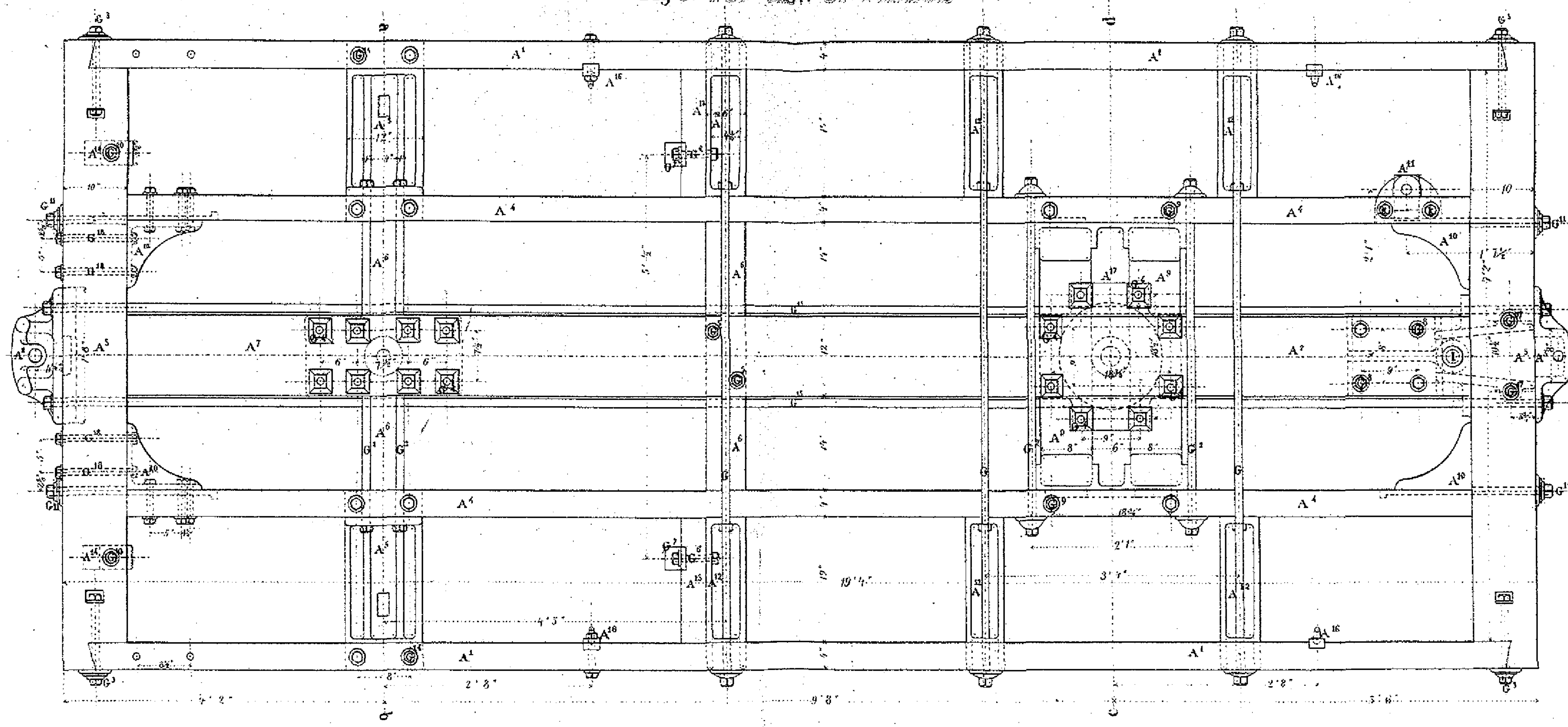


Fig. 7. TRANSVERSE Section through A.B.

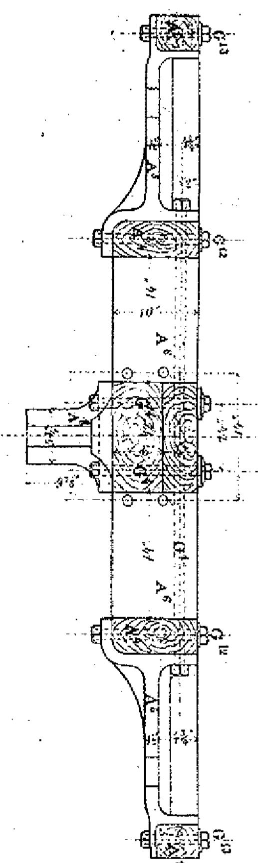


Fig. 8. TRANSVERSE Section through C.D.

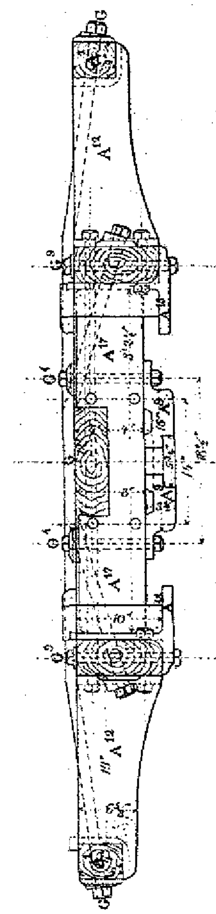
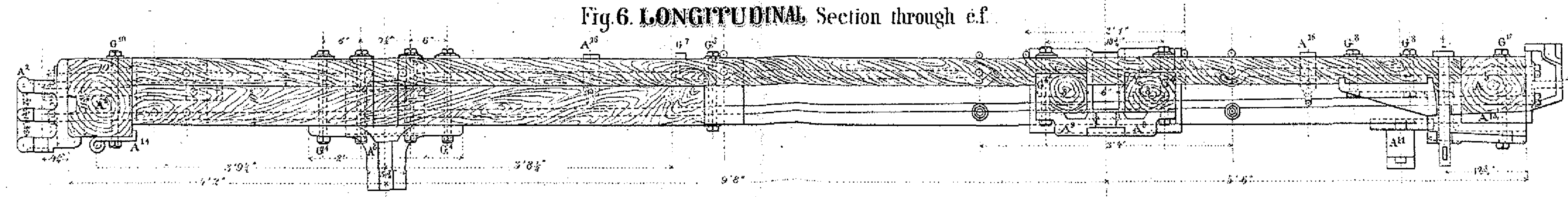


Fig. 6. LONGITUDINAL Section through e.f.



Scale ¾ of an inch to the foot

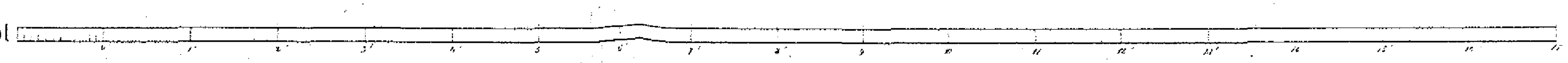
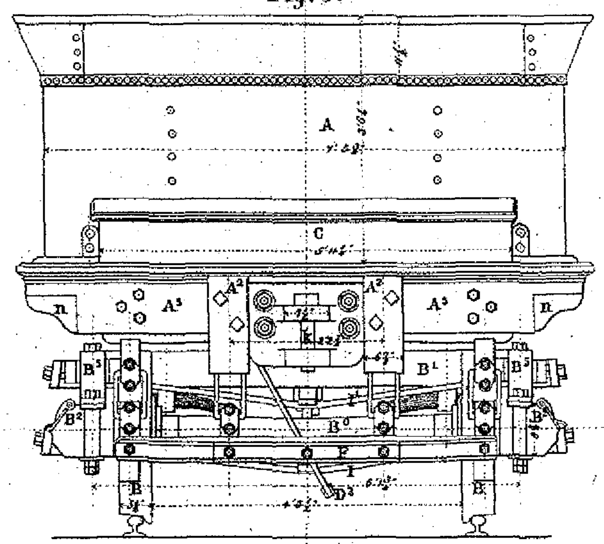


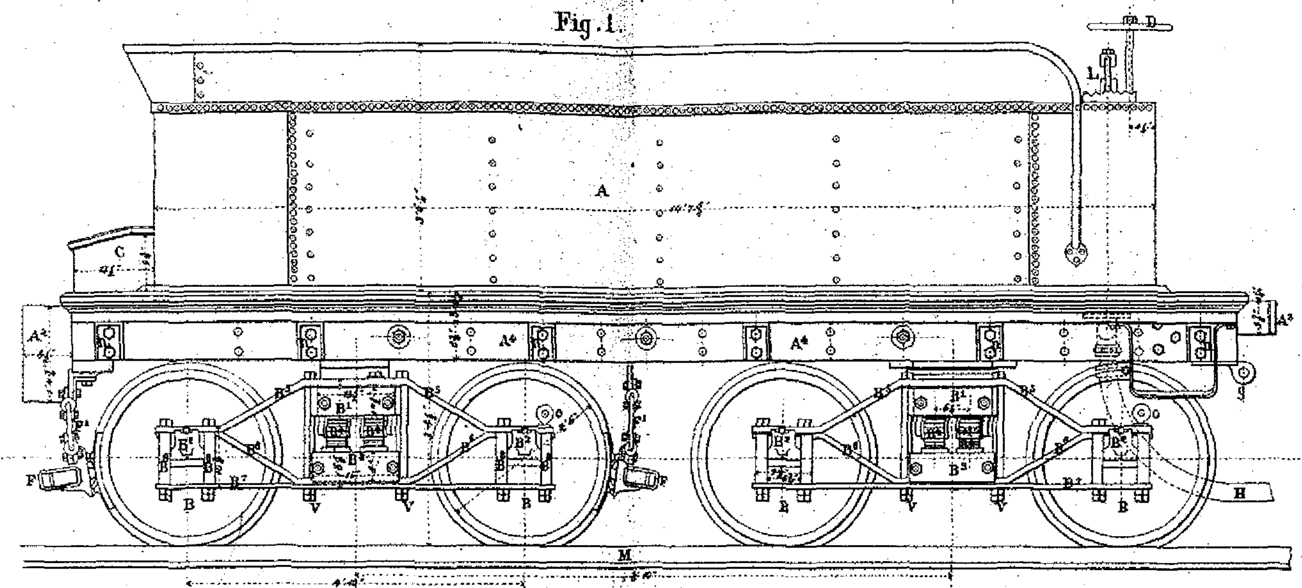
Plate LI.

Fig. 3.



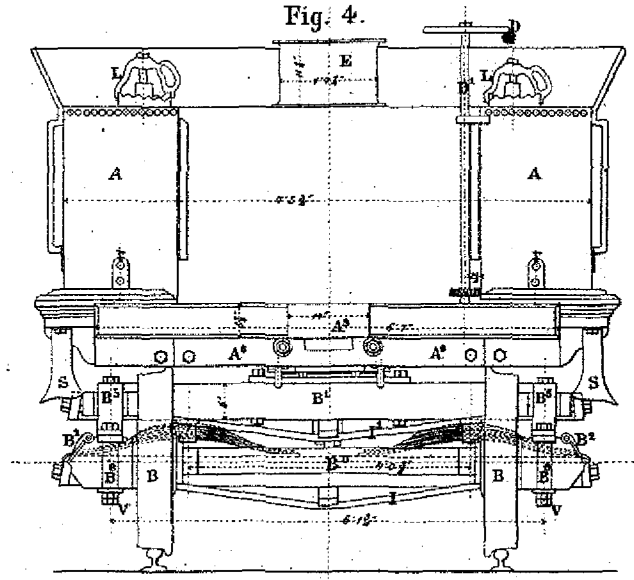
REAR VIEW

Fig. 1.



SIDE ELEVATION

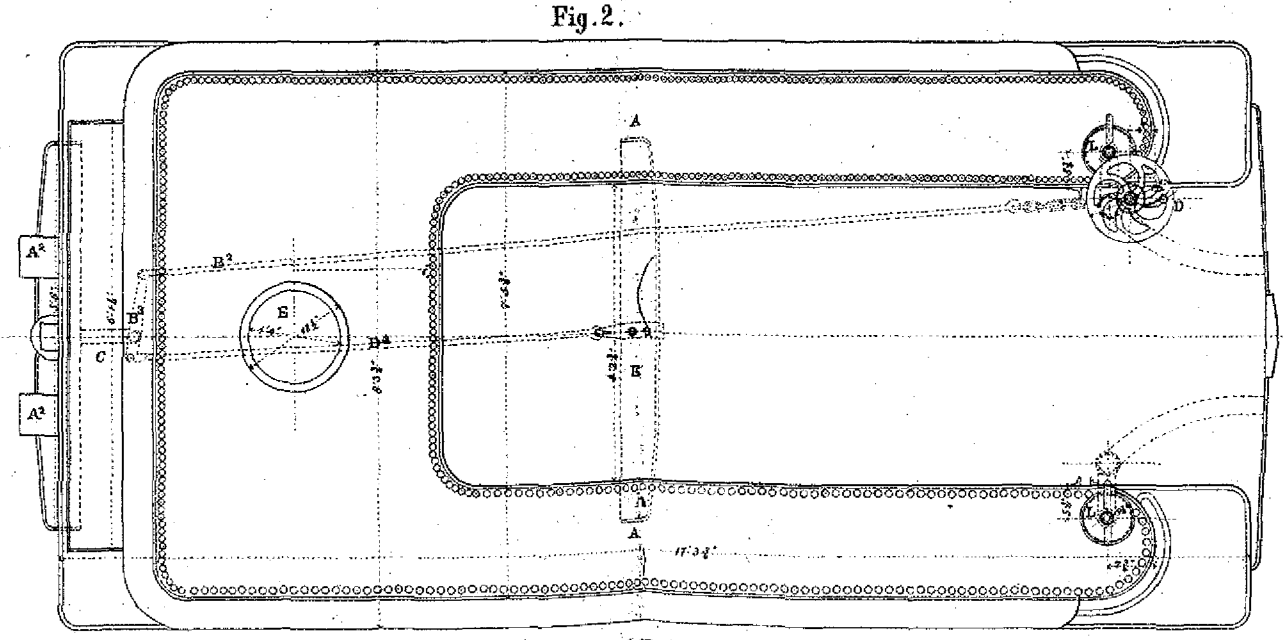
Fig. 4.



FRONT VIEW

ENGINE TENDER
for
ANTHRACITE COAL BURNING LOCOMOTIVE

Fig. 2.



TOP VIEW

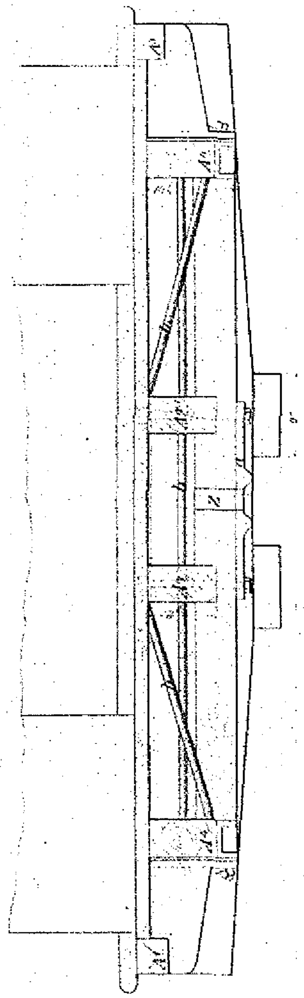
built by the

GRANT LOCOMOTIVE WORKS PATERSON N. J.

Scale ¼ an inch – to a foot

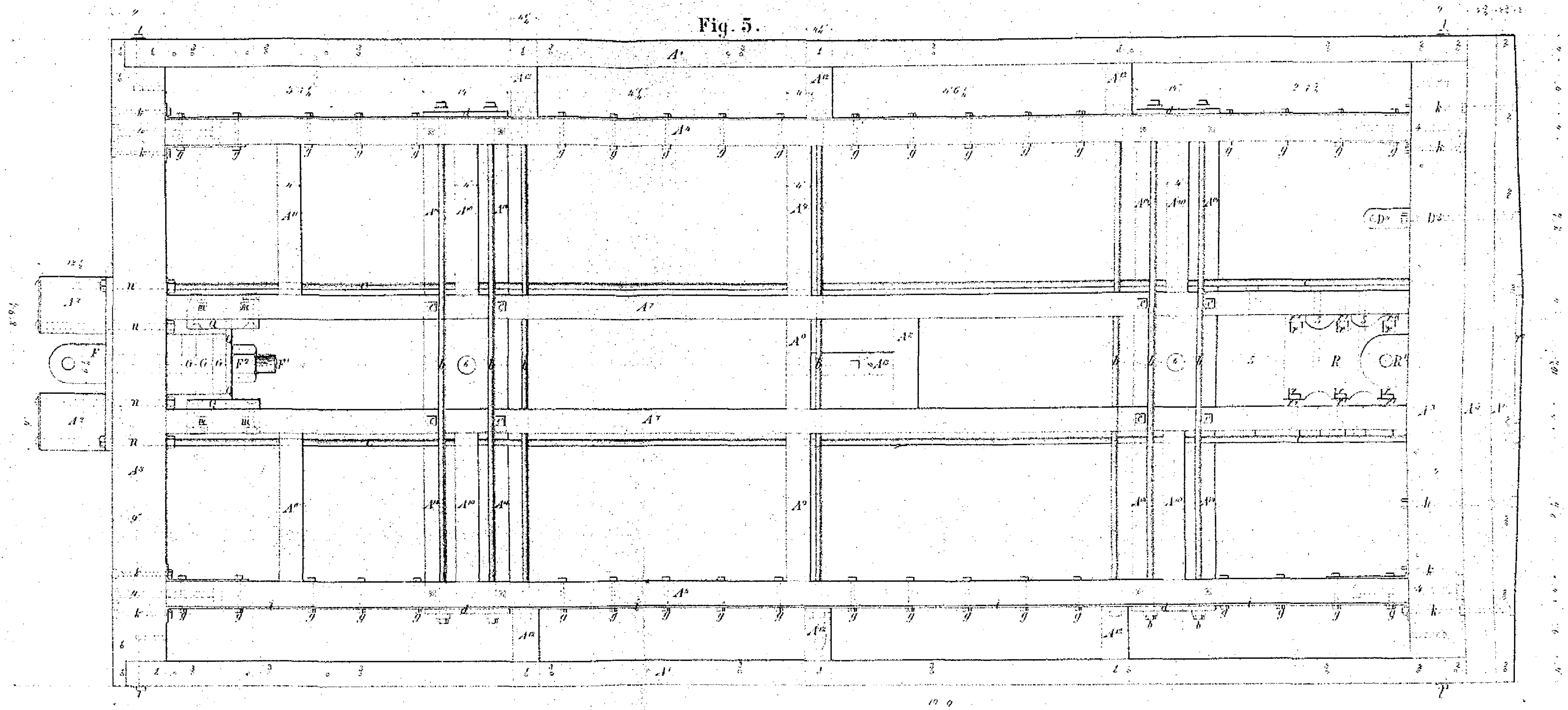
Plate XII.

Fig. 7.



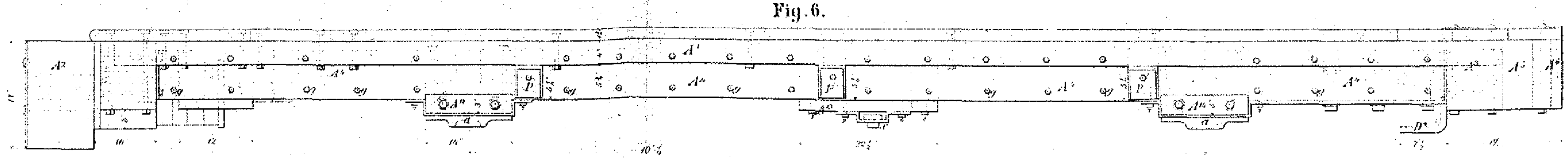
CROSS SECTION THROUGH FRAME

Fig. 5.



TOP VIEW OF FRAME

Fig. 6.



SIDE VIEW

FRAME

for

STANDARD TENDER

G. WEISSENBORN'S ENGINEERING OFFICE
269 Pearl St. New York

THE CONSTRUCTION OF THE LINK MOTION

WITH A TEMPLATE

How to find the mid gear travel, lap of the valve, position of saddle stud, location of lifting shaft for an equalized cut off in all gears, radius of link; lead of valve in full gear forward & return stroke and extreme travel of the link.

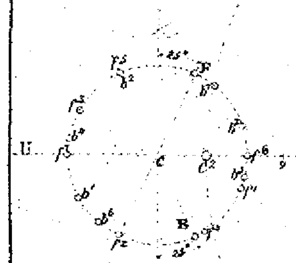


Fig. 16.

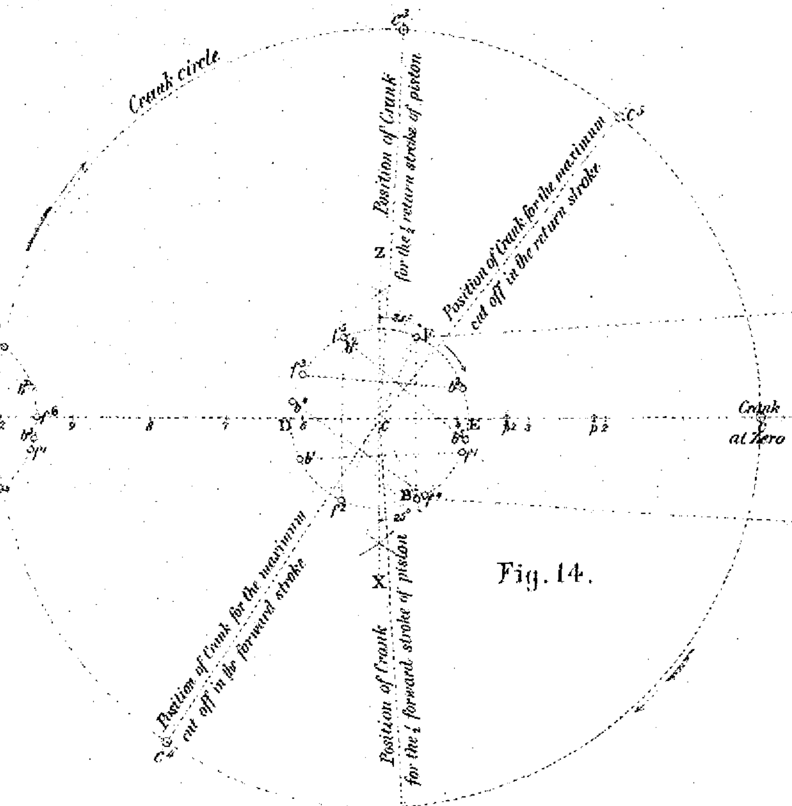


Fig. 14.

The following dimensions are given

Length of Connecting rod	7′ 2 ½″
Stroke of piston	22 inches
Diameter of eccentric circle	5 inches
Maximum cut off	0.8 stroke
Rocker from shaft	5′ 8 ½ inches
Front c. to centre of eccentric pins	12 ¾″ inches
Pins back of Link arc	3″ inches
Midgear Lead	⅛″
Length of lifting arm	18″
Length of suspending link	13 ½″
Length of rocker arm	9″

Scale 3 inches to the foot

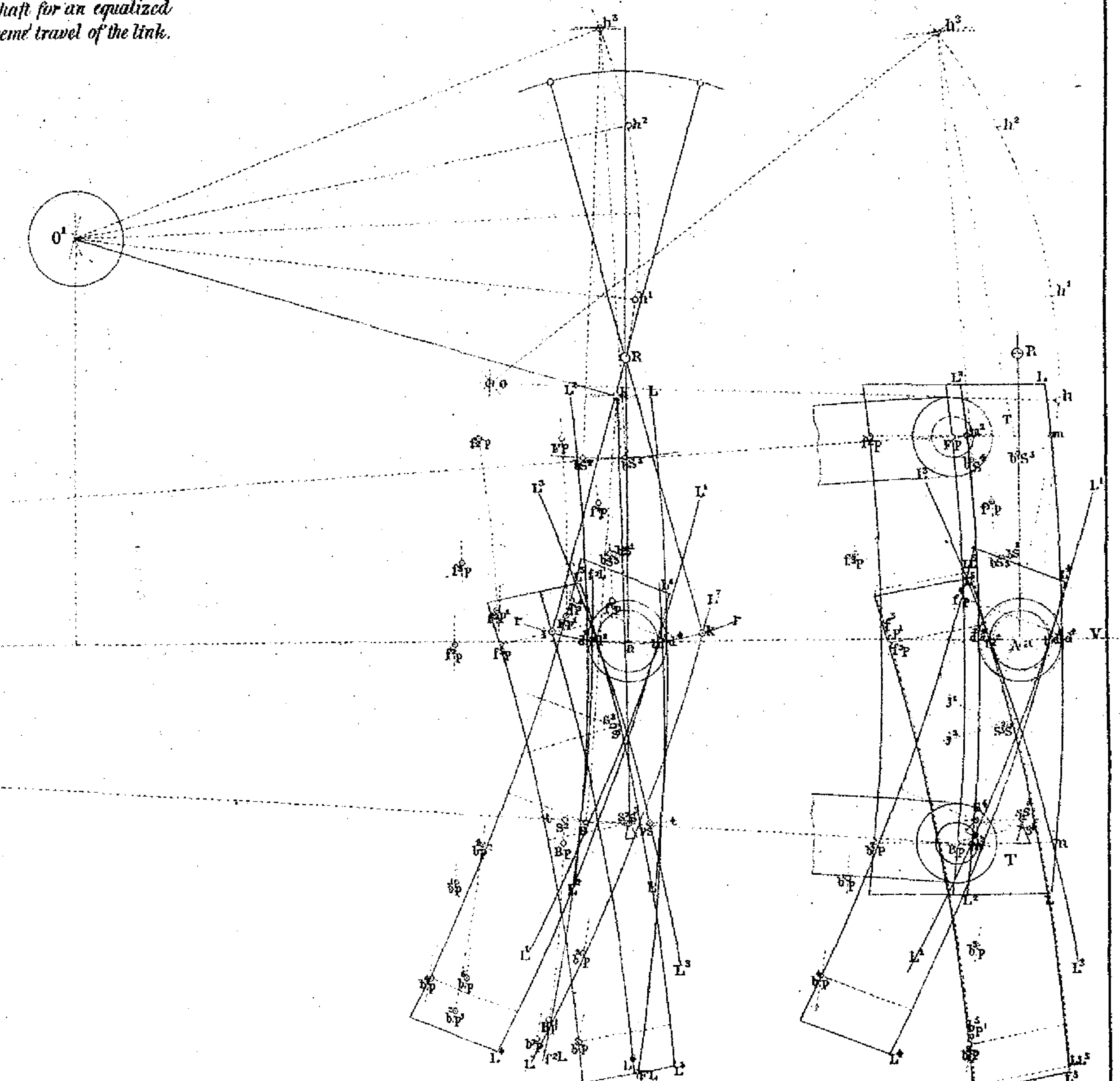


Fig. 17.   Fig. 15.

Plate LIX.

GENERAL WORKING DRAWING OF DANFORTH PASSENGER LOCOMOTIVE

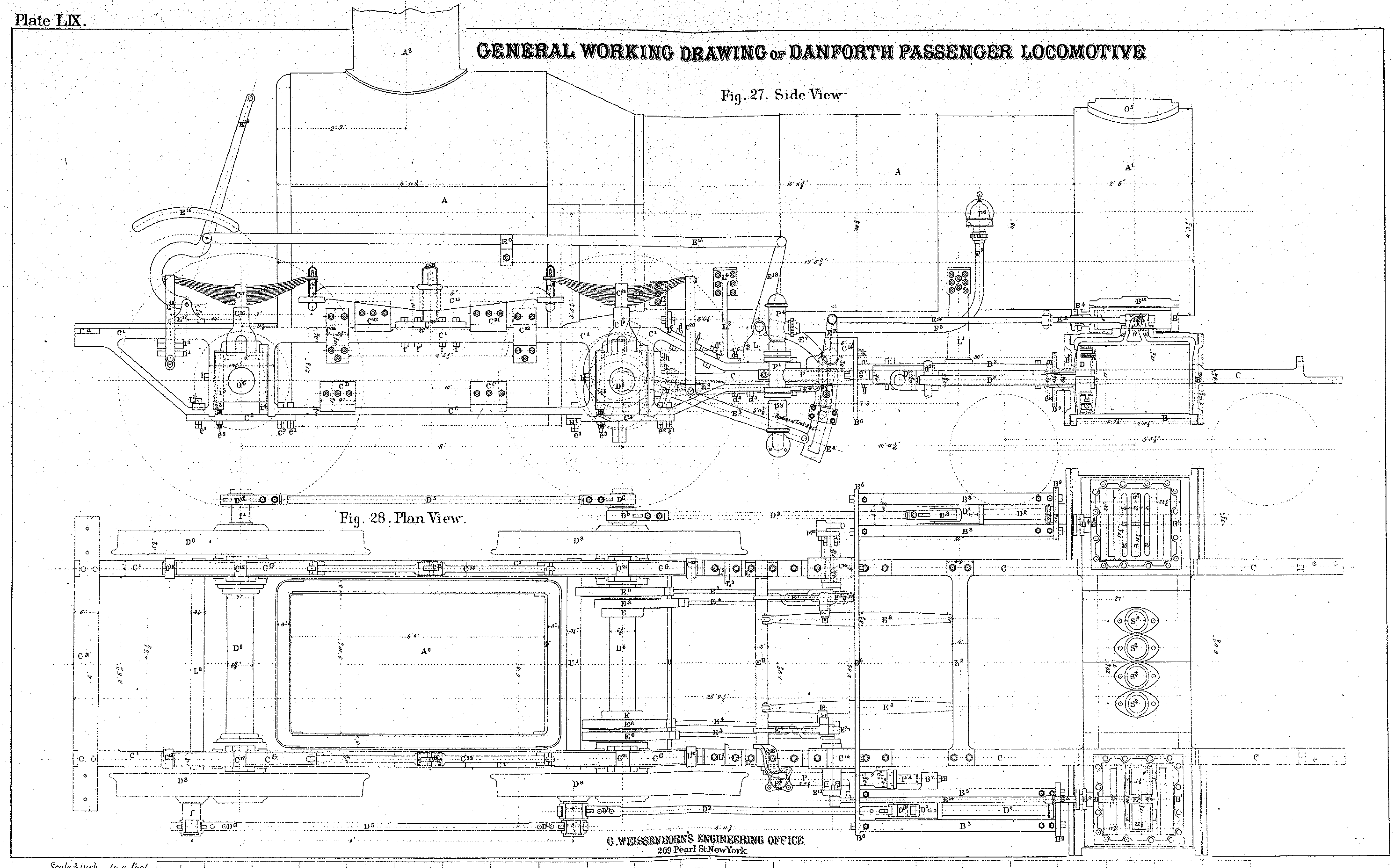


Fig. 27. Side View

Fig. 28. Plan View.

G. WEISSENBORN'S ENGINEERING OFFICE
269 Pearl St. New York

Scale ½ inch — to a foot

431/D-62
Part III

PART II

Appendices C., D., and F.

APPENDIX C Glossary of Locomotive Parts and Miscellaneous Drawings

1. Glossary of Terms, Machinery and Operation of Locomotive, Zerah Colburn

2. Grant 4-4-0 Standard American Locomotive, Dimensions, Weights, Diagrams

3. Nomenclature of Locomotive parts and location diagrams, Grant 4-4-0 Standard American Locomotive, 1871.

4. Diagram of Baldwin 4-4-0 Locomotive, 1872.

5. Diagrams 4-4-0 New York Central & Hudson River Locomotive and Tender, 1877.

6. Locomotive Smokeboxes & Stacks; and Table of Delivery of Locomotives, Rogers Locomotive Works.

7. Water Tanks & Turn-Tables, Forney, Catechism of Locomotives.

APPENDIX D Standard American 4-4-0 Locomotive Specifications and Descriptions.

1. Specification Sheet and Description for Seminole, Rogers-built, 1867.

2. Description of Grant 4-4-0 Locomotive, 1871.

3. Abridged Description and Diagram, Grant 4-4-0 Locomotive, 1853

4. Description of Baldwin 4-4-0 Locomotive, 1871.

APPENDIX F Jupiter-Type Locomotive Diagrams

1. Diagram of Rebuilt Schenectady-built 4-4-0 Jupiter type Locomotive, SP RR, 1895.

2. David L. Joslyn diagram of Jupiter, drawn 1944, SP RR.

APPENDIX C

Glossary of Locomotive Parts and Miscellaneous Drawings

APPENDIX C

1. Glossary of Terms, Machinery and Operation of Locomotive, Zerah Colburn

A GLOSSARY

OF TERMS APPLIED TO THE MACHINERY, AND TO THE OPERATION OF THE LOCOMOTIVE ENGINE.

[N. B.—Many of the names and terms here used are explained at greater length in the body of the book.]

Adhesion.—The measure of the friction between the tires of the driving wheels and the surfaces of the rails. The adhesion varies with the weight on the drivers and the state of the rails, but with a good rail is generally from one-fifth to one-seventh of the weight on the drivers. The load drawn is no measure of the adhesion, except the resistance of friction and gravity of the load be given.

Air Chamber.—A tight vessel attached to the pump. The feed water, entering it at the bottom, is subjected to the pressure of air within it, which forces out the water in a steady stream. Recent engines have two air chambers to each pump—one on the suction, and one on the forcing side of the same. The capacity of air chamber should equal that of the barrel of the pump.

Angle of Friction.—That pitch of grade at which a loaded car would just stand without descending, being kept at rest by the friction of its bearings. Allowing the

THE

LOCOMOTIVE ENGINE:

INCLUDING

A DESCRIPTION OF ITS STRUCTURE,

RULES FOR ESTIMATING ITS CAPABILITIES,

AND

PRACTICAL OBSERVATIONS ON ITS CONSTRUCTION AND MANAGEMENT.

BY ZERAH COLBURN.

New Edition.

PHILADELPHIA:
HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
No. 406 WALNUT STREET.
1871.

friction to be 7 lbs. per ton, this grade would be 16½ feet per mile; for 10 lbs. friction per ton, 23½ feet per mile.

Ash Pan.—A box or tray beneath the furnace, to catch the falling ashes and cinders.

Axle.—The revolving shaft to which the wheels are secured.

Blast Pipes.—Two pipes, contracted at their mouths, to discharge the waste steam from the cylinders. Their action excites an artificial draft or blast in the furnace.

Blow-off Cock.—A cock at the bottom of the fire-box, through which to empty the boiler.

Boiler.—The source of power; the vessel in which the steam is generated.

Bonnet.—A wire cap or netting, surmounting the chimney, to keep down the sparks and cinders.

Box.—A bearing, enclosing the journal of a revolving shaft. When made in two parts, the lighter is called the cap. When made as a single piece, and supporting the end of an upright shaft, a step; and when turned outside and fitted into a frame, or stand, a bushing. To reduce friction, boxes are lined with soft metal.

Brake.—A block or strap applied to the rim of a wheel, to check its motion and bring it to a stop.

Bunters.—Guards projecting from the ends of tenders and cars, and connected with springs, to prevent shocks from collisions.

Cam.—A plate or pulley, turning on a shaft out of its centre. When made round and encircled by a strap, and employed to work the valves of a steam engine, and for similar purposes, it is called an eccentric.

Case.—A casting sliding in the jaw, and to hold the brass box of an axle. For drivers, the case is lined with Babbitt metal, and forms the bearing for the axle.

Check Valve.—See *Valve.*

Counterbalance.—A large block secured between two arms of each driving wheel, to balance the momentum of the moving machinery connected with the axle.

Connecting Rod.—Rod to communicate the pressure on the piston to the crank.

Crank.—In inside cylinder engines is forged in the axle, and for outside cylinders is supplied by a pin in the wheel. The crank converts the rectilineal motion of the piston to the rotary motion of the wheels.

Cross Head.—A block moving in guides; having the end of the piston rod secured within it at one side, and a pin to attach the connecting rod at the other.

Cut-off Valve.—An additional valve, not indispensable, to shut off the admission of steam to the cylinder, when the piston has only completed a part of its stroke.

Cylinder.—A cylindrical vessel, closed at its ends by covers. Steam is admitted alternately at each end, to press upon a block called the piston. The piston is made to fit, steam tight, to the inner circumference of the cylinder, and the action of the steam keeps it in motion, from one end of the cylinder to the other.

Damper.—A door, to exclude the air from the furnace.

Dome.—An elevated chamber on the top of the boiler, from which the steam is taken to the cylinders.

Draw Iron.—A rigid bar, connecting the engine and tender, and secured to each by a pin.

Drivers, or *Driving Wheels.*—Those wheels turned di-

rectly by the moving machinery of the engine, and which, by their adhesion to the rails, propel the engine along.

Eccentrics.—See *Cam.*

Eduction Port.—A passage on side of cylinder to lead away the waste steam from same, to the blast pipes.

Equalizing Lever.—A bar suspended by its centre, beneath the frame, and connected at each end to the springs of the drivers, to distribute any shock or jolt between both pairs of wheels.

Expansion Valve.—See *Cut-off.*

Fire-box.—The furnace of the boiler.

Foaming.—An artificial excitement, or too great ebullition on the water-level, observed when the boiler has become greasy, or otherwise foul. Generally productive of priming.

Footboard.—A plate iron floor, behind the boiler, for the engineman and fireman to stand upon.

Frame.—Made to attach to the boiler, cylinders, axles, and all cross shafts, and binds the whole fabric together.

Friction, of Trains.—The friction of the bearings of the carriages, and for every ton drawn, offers a direct resistance of from seven to ten pounds.

Frost Cocks.—Cocks to admit steam to the feed pipes leading from the tender to the pump; used when the water becomes frozen.

Gauge Cocks.—Cocks at different levels on the side of the fire-box, and to ascertain the height of water in the boiler. When opened, water or steam will escape, according as the level of the water is above or below them.

Gland.—A bushing to secure the packing in a stuffing-box.

Grade.—The inclination of a road; expressed either by the number of feet rise per mile, or by naming the distance passed in rising one foot; thus, a grade of 1 in 330, which is 16 feet per mile.

Gravity.—The tendency which all bodies have to find the lowest level. The resistance in pounds, occasioned by the gravity of one ton on any grade, may be found by multiplying the grade, in feet per mile, by the decimal number ·4212.

Grate.—The parallel bars supporting the fuel in the fire-box.

Guides.—Rods, or bars, lying in the direction of the axis of the cylinder, and guiding the cross head, to insure a perfectly parallel motion in the piston rod.

Hand Levers.—Levers to work the main valves by hand.

Housing.—See *Jaw.*

Induction Ports.—Two passages on side of cylinder, to admit steam within it,—one port communicating with each end.

Jaw.—A stand secured to the frame, to hold the box of an axle. The jaw must allow the box to slide up and down within it.

Journal.—The part of a shaft or axle resting in the box.

Lagging.—A wooden sheathing around a boiler or cylinder.

Lap.—The distance which the valve overlaps on each

end over the induction ports, when in the middle of its travel.

Lead.—Distance to which the induction port is opened, when the piston commences its stroke.

Link-Motion.—An arrangement for working the valves, described in the body of the book.

Manometer.—An instrument for determining accurately the pressure on a given surface—as a square inch—within the boiler.

Man Hole.—A hole to admit a man within the boiler.

Mud Hole.—A small opening at bottom of water space around fire-box, to clear out deposites of dirt, and other matter introduced with the water.

Packing.—Any substance used to make a joint steam or water tight.

Pet Cock.—A small cock between the check valve and pump, to see if the latter is working.

Pintal.—An upright pin. There is a pintal secured beneath the forward end of the engine, to connect it with the truck frame, and to allow of the turning of the truck, independent of the engine.

Piston.—See *Cylinder.*

Piston Rod.—Rod secured at one end within the body of the piston, and at the other to the cross head. This rod passes through the cylinder cover, and is made steam tight by packing secured in a necking, or recess, outside of cover, and called a stuffing-box.

Plug, Fusible.—A lead plug tapped in top sheet of furnace, to melt and give warning when the water falls below it.

Plunger.—The solid piston of a pump, and pressing only by one end against the water.

Ports.—Openings, or passages.

Priming.—The passage of water, along with the steam, into the cylinders, when the engine is working.

Rocker Shaft.—A shaft rocking in its bearings.

Reversing Lever.—A lever in reach of the engineman, acting upon the valve motion, and to change the direction of the progress of the engine.

Safety Valve.—A valve on the boiler, to discharge the surplus steam generated, above what is required for the engine, and which by accumulating would endanger the safety of the machine.

Slide.—See *Guide.*

Smoke-box.—A chamber at forward end of boiler, where the smoke and sparks from the tubes are received and discharged through the sparker.

Sparker, or *Chimney.*—A pipe to discharge the smoke and waste steam, and surrounded by a casing to retain the sparks.

Springs.—These are required over each wheel to reduce shocks and jolts.

Steam Chest.—Box on top, or side of cylinder, and containing the valve to admit steam on the piston.

Steam Pipe.—Pipe entering the dome, and communicating with the steam chests through two branch steam pipes in the smoke-box.

Stuffing-box.—See *Piston Rod.*—Used in all situations where a rod or spindle, having any end motion, requires to be made steam or water tight around same.

Sub-Treasury.—A receptacle for sparks. Slightly dif-

ferent from those at the custom-house, but quite as beneficial.

Stroke.—The distance travelled by the piston at each period of its motion.

Tender.—A separate carriage, to carry wood and water.

Thimble.—A tube of iron or steel.

Throttle Valve.—A valve in the dome, and closing the mouth of the steam pipe.

Trailing Wheels.—A pair of small wheels, placed behind the drivers, when but one pair of the latter is used.

Traction.—Differing from adhesion in this: The adhesion is the power of the engine derived from the weight on its driving wheels and their friction on the rails; while the traction is also the power of the engine, but derived from the pressure of the piston applied through the crank and radius of the wheel. These two elements may not always be the same.

Truck Frame.—A separate frame, supporting four or six wheels, and turning on a pintal, independent of the body of the engine or car.

Tubes.—These are used to conduct the heat from the fire-box, through the waste of the boiler, to the smoke-box. When a tube is so large as to require to be made of plates, riveted together, it is called a flue.

Valve.—Any gate or fixture, other than a cock, to close a steam or water passage about an engine. The main, or port valve, which admits steam directly to the cylinders, is a block with a recess or cavity on its under side. The steam passes by the ends of the valve into the ports, and the motion of the valve, derived from the eccentrics, admits the steam at the proper time.

The uses of the cut-off and safety valves have been described.

The pump valves are either what are called ball valves, spindle valves, or cup valves. The check valve is an additional valve on the forcing side of the pump, and is to prevent all danger of forcing back the water from the boiler into the pump by the action of the steam.

Variable Cut-off.—An arrangement to alter the travel of either the main, or cut-off valve, to use full steam through a greater or less distance of the stroke.

Variable Exhaust.—An arrangement to enlarge or contract the blast pipes.

V-Hooks.—So called from their form of opening;—much better than the common kind, as they are sure to catch the pins, and for this reason (though an old idea) are coming into general use.

Whistle.—A hollow cup made to allow the steam to strike its lower edge, by which a shrill sound is obtained for signals.

APPENDIX C

2. Grant 4-4-0 Standard American Locomotive, Dimensions, Weights, Diagrams

Plate VI.

DIMENSIONS, WEIGHT, ETC.,

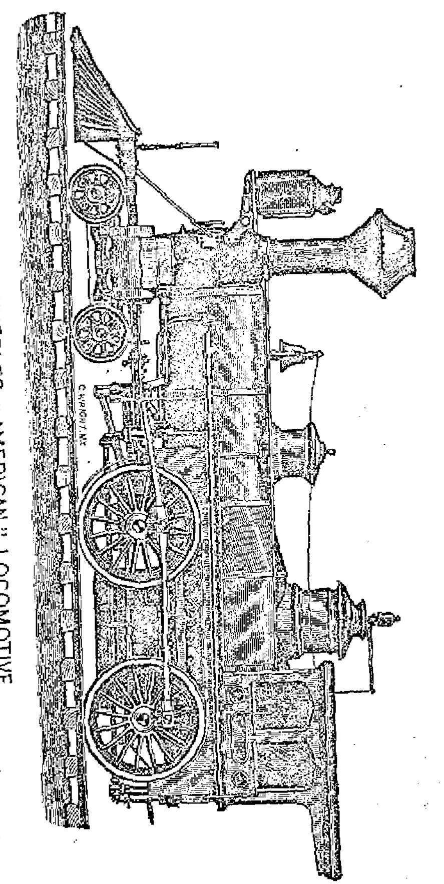
OF

EIGHT-WHEELED "AMERICAN" LOCOMOTIVE

By the Grant Locomotive Works, Paterson, N. J.

Gauge of Road	4 ft. 8½ in.
Number of Driving-Wheels	4
Number of Front Truck-Wheels	4
Number of Back Truck-Wheels	None.
Total Wheel Base	21 ft. 9 in.
Distance between centres of Front and Back Driving-Wheels	8 ft.
Total Weight of Locomotive in working order	62,000 lbs.
Total Weight on Driving-Wheels	42,000 lbs.
Diameter of Driving-Wheels	61 in.
Diameter of Truck-Wheels	28 in.
Diameter of Cylinders	16 in.
Stroke of Cylinders	24 in.
Outside Diameter of smallest Boiler Ring	48 in.
Size of Grate	60 × 34 in.
Number of Tubes	140
Diameter of Tubes	2 in.
Length of Tubes	11 ft.
Square Feet of Grate surface	14
Square Feet of Heating surface in Fire-Box	98
Square Feet of Heating surface in Tubes	805
Total Feet of Heating surface	903
Exhaust Nozzles — single or double	Double.
Diameter of Nozzle	3¼ to 3¾ in.
Size of Steam Ports	1¼ × 14 in.
Size of Exhaust Ports	2½ × 14 in.
Throw of Eccentrics	5 in.
Outside Lap of Valve	¾ in.
Inside Lap of Valve	None.
Size of Main Driving-axle Journal	6½ dia. × 7¾ in.
Size of other Driving-axle Journal	6½ dia. × 7¾ in.
Size of Truck-axle Journal	4½ dia. × 8 in.
Diameter of Pump Plunger	2 in.
Stroke of Pump Plunger	24 in.
Capacity of Tank	2,000 gallons.

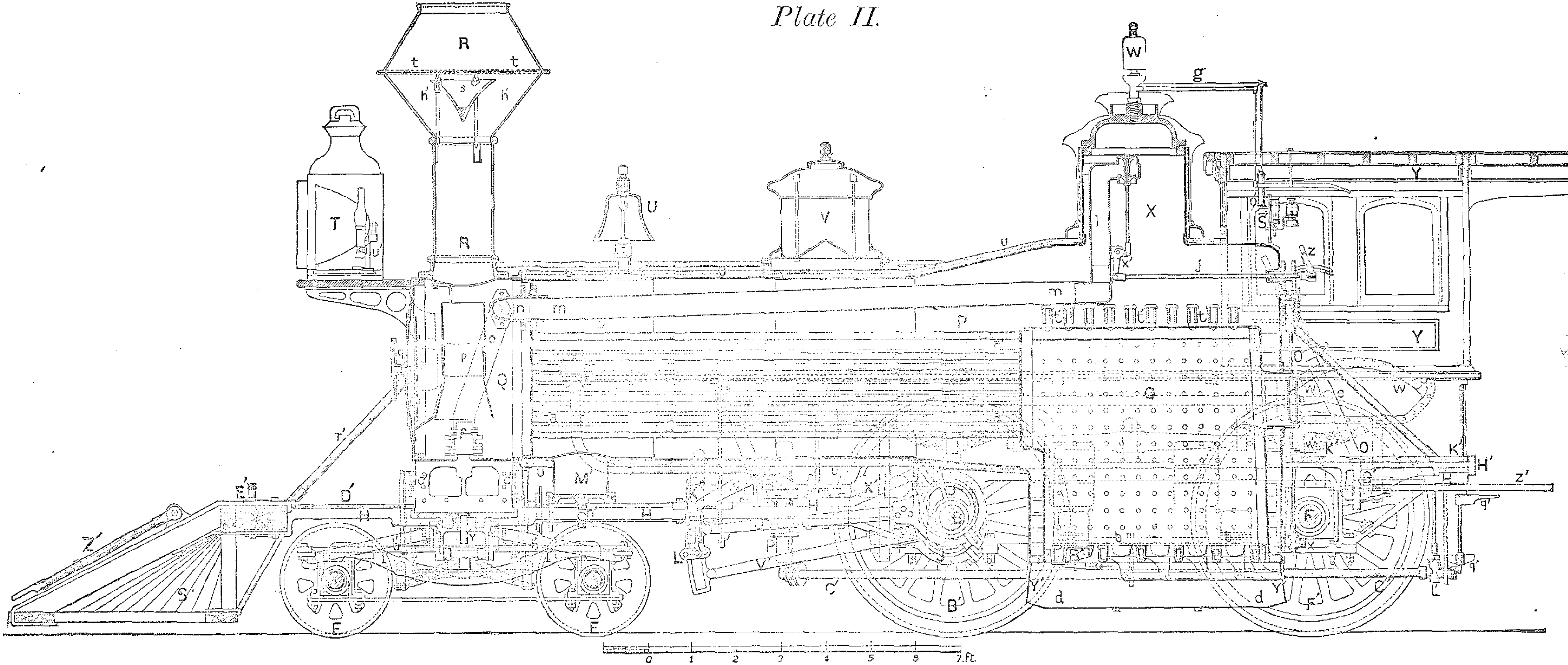
Plate VI.



EIGHT-WHEELED "AMERICAN" LOCOMOTIVE,
BY THE GRANT LOCOMOTIVE WORKS, PATERSON, N. J.
Scale, ⅜ in.=1 ft.

Plate I Matthias N. Forney, Catechism of the Locomotive, 1874
MISSING

Plate II.



LONGITUDINAL SECTION OF AMERICAN LOCOMOTIVE.

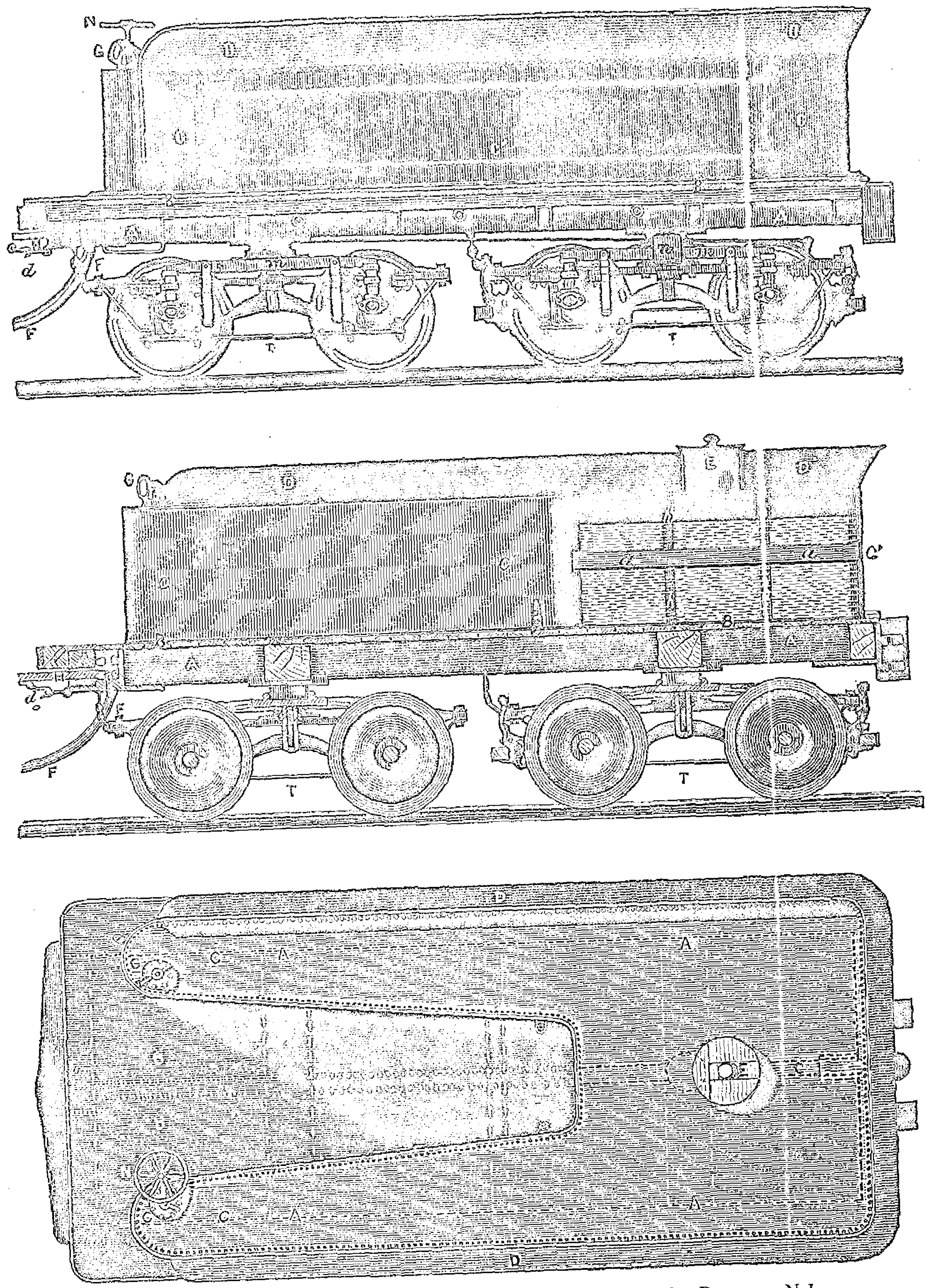
By The Grant Locomotive Works, Paterson, New Jersey.

Scale, ⅔ in. = 1 foot.

Matthias N. Forney, Catechism of the Locomotive, 1874

Plate I
missing

FIGURE A-10



Tender for American Locomotive by Grant Locomotive Works, Paterson, N.J.

LIST OF PARTS

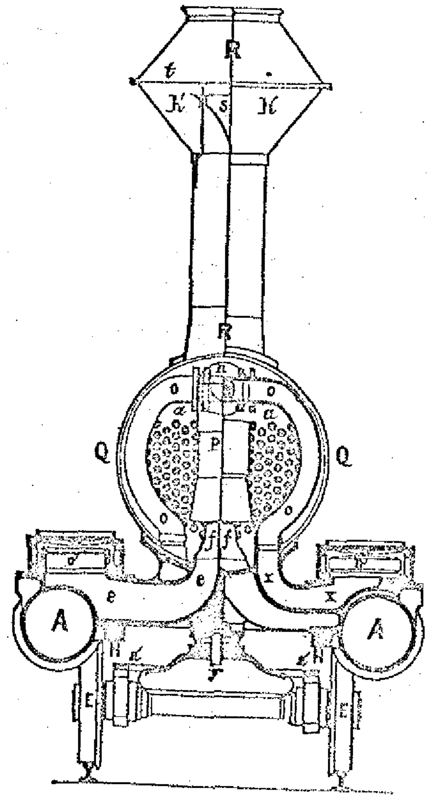
A, A, A, A, frame
B, B, floor
C, C, C, water tank
D, D, water tank rim
E, manhole
F, F, hose connection to engine
G, valve handle
H, draw-bar
N, brake wheel
T, T, trucks
a, a, brace, or stay, rods
b, b, brace, or stay, rods
o, coupling pin
d, safety chains
m, m, equalizing levers
n, truck side bearing

APPENDIX C

3. Nomenclature of Locomotive Parts and Location Diagrams, Grant 4-4-0 Standard American Locomotive, 1871.

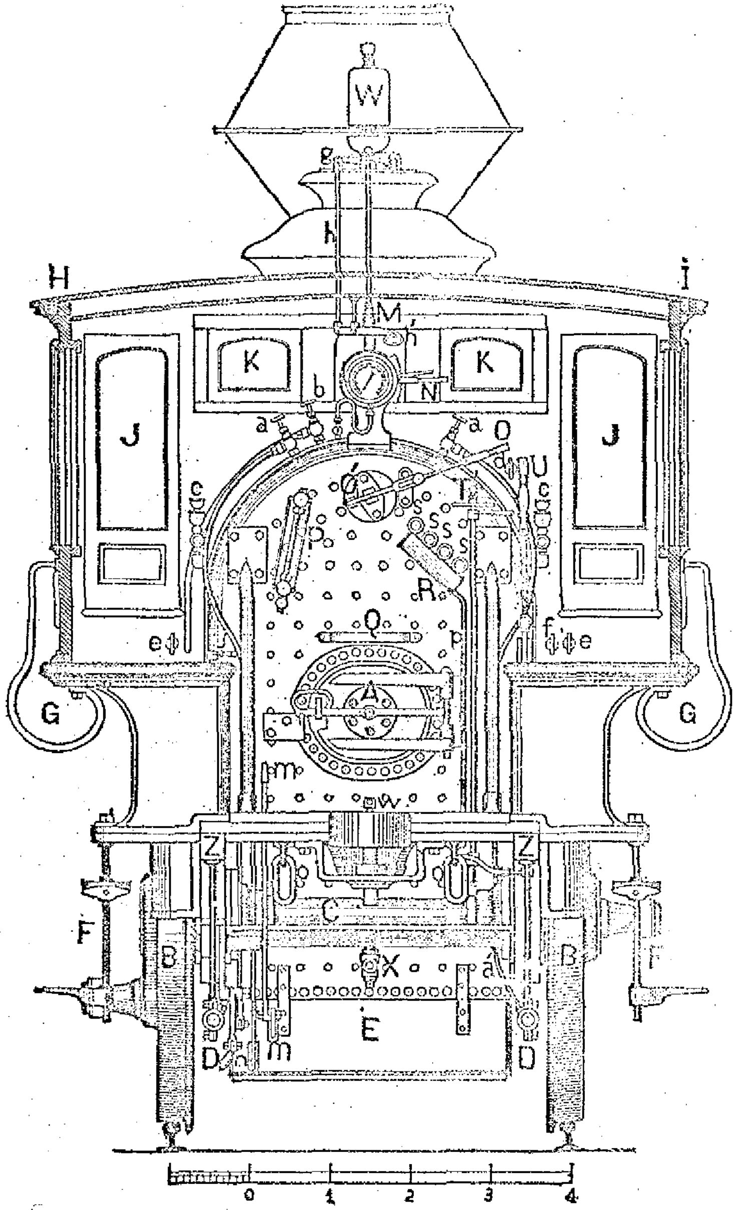
Nomenclature

[redacted]



Scale ¼ in. = 1 foot.

1. Transverse Section



Scale, ⅜ in. = 1 foot.

2. Cab View

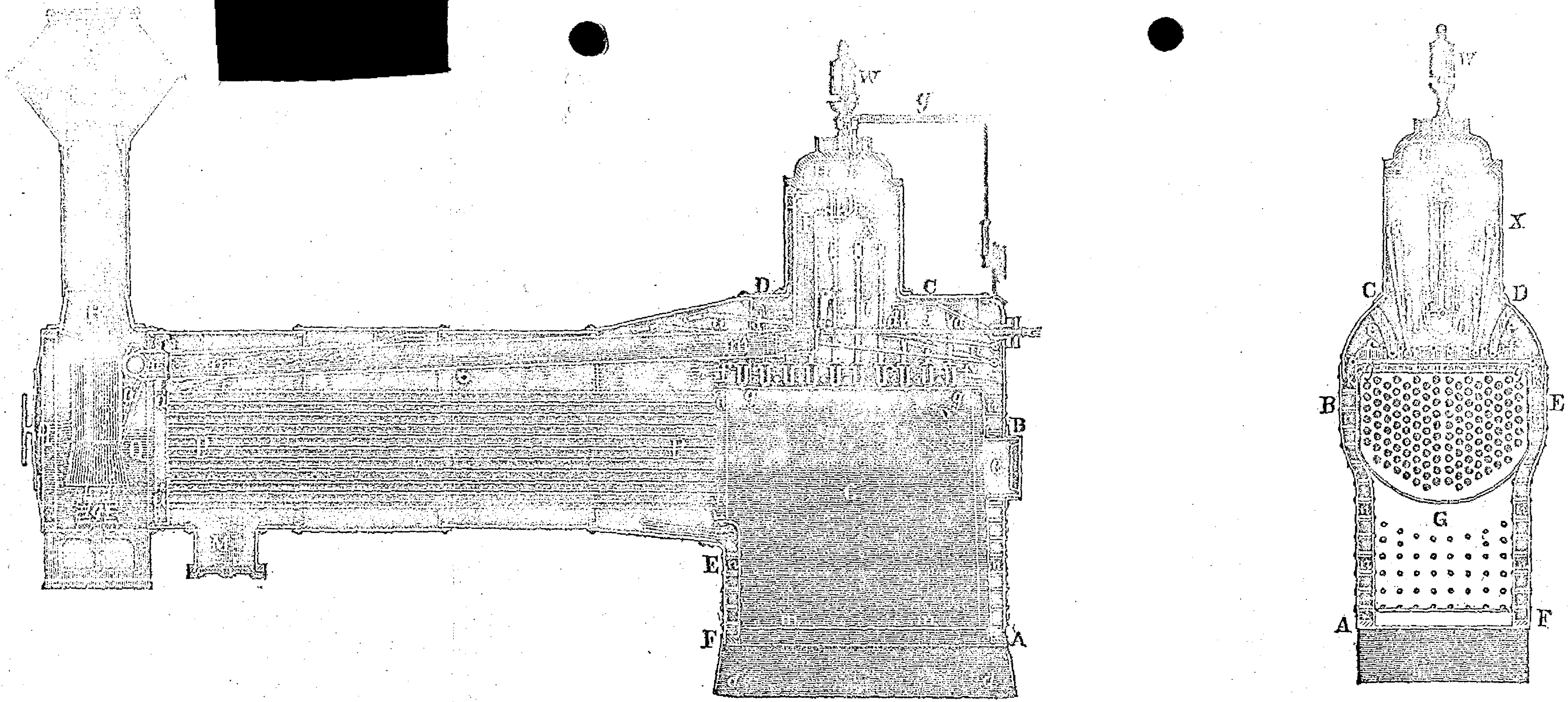
3. List of Parts

A, Furnace Door.
B, *B*, Driving Wheels.
C, Driving Axle.
D, *D*, Suction Pipes.
E, Ash Pan Damper.
F, *F*, Foot Steps for getting on and off the Locomotive.
G, *G*, Hand Holds for getting on and off the Locomotive.
H, *I*, Cab.
J, *J*, Doors in front of Cab.
K, *K*, Windows in front of Cab.
L, Steam Gauge.
M, Spring Balance.
N, Steam Gauge Lever,
O′ O, Throttle Lever.
P, Water Gauge.
Q, Stand for Tallow Can.
R, Drip Pipe for Gauge Cock.
T′ T, Rod for operating Feed Cock.
T′, Regulator for Feed Cock.
U V, Reverse Lever.
W, Whistle.
X, Blow-Off Cock.
Z, *Z*, Frames.
a, *a*, Heater Cocks.
a, *a′*, Heater Pipe.
b, Blower Cock.
c, *c*, Oil Cups for oiling Main Valves.
d, Handle for opening Valves in Sand Box.
e, *e*, Handles for opening Pet Cocks.
f, Handle for opening Cylinder Cocks.
g, Whistle Lever.
h,′ Whistle Handle.
h, Rod connecting Whistle Handle to Whistle Lever.
j, Handle for left hand Feed Cock.
m m, Lever for shaking Grate Bars.
n, Bell Crank for opening front Ash Pan Damper.
o, *o*, Check Chains.
p, Pipe for carrying off water from Gauge Cocks.
s, *s*, *s*, *s*, Gauge Cocks.
w, Handle for opening Blow-Off Cock.

AMERICAN LOCOMOTIVE BY THE GRANT LOCOMOTIVE WORKS
PATERSON, N.J.

FIGURE A-9

[redacted]



BOILER OF AMERICAN LOCOMOTIVE

By the Grant Locomotive Works, Paterson, N.J.

From M. N. Forney, Catechism of the Locomotive, 1873 (Reproduced in Grahame Hardy + Paul Darrell, American Locomotives, 1871–1881, 1950, Appendix

FIGURE A-8

List of Parts for Figures A-5 to A-9 Inclusive

A, A, Cylinders.
B, Main driving-axle.
C C, Main connecting-rods.
D D, Main crank-pins.
E, E, Truck-wheels.
F, Axle of trailing-wheels.
G, Fire-box.
H, H, H, Frames.
I, I, Frame-clamps.
J, J, Eccentrics.
K, K, Rockers.
L L, Links.
M, Lifting-shaft.
N, N, Lifting arms.
O O, Reverse-lever.
P P, Cylinder part of boiler.
Q, Smoke-box.
R R, Smoke stack or chimney.
S, Pilot or cow-catcher.
T, Head-light.
U, Bell.
V, Sand-box.
W, Whistle.
X, Dome.
Y Y, Cab or house.
Z, Back or trailing-wheel crank-pin.
A′ Pump air-chamber.
B′, B′, Main driving-wheels.
C′ C′ C′, Supply-pipe.
D′ Front platform.
E′ Bumper timber.
F′ F′, Back driving-wheels.
G′ Coupling-pin.
H′ Friction-plate.
I′ Check-valve.
K′ K′, Foot-board.
L′ Lazy cock.
M′ Mud drum.
N′ N′, Driving springs.
P′ Pump.
R′ Drop-door of grate.
S′ Steam gauge.
T′ T′ Feed pipe.
U′ U′ Forward eccentric rods.
V′ V′ Backward " "
X′ Lifting-shaft spring.
Y′ Y′ Dampers.
Z′ Pushing-bar.
a a′ Tubes.
b b, Grate.
c, Fire-box door.
d d, Ash pan.
f f, Exhaust-nozzles or blast-pipes.
g, Safety-valve lever.
h h, Cross-heads.
i i, Running-board.
j, Throttle-stem.
l, Throttle-pipe.
m m, Dry pipe.
n, T-pipe.
o o, Steam-pipe.
p, Petticoat pipe.
q, Smoke-box door.
r, Piston.
s, Spark-deflector or cone.
t t, Wire-netting in stack.
u u u, Boiler-lagging.
v v, Truck-spring.
w w, Sector or quadrant.
x, Blow-off cock.
e k, Reversing-rod.
y, Truck centre-pin.
z, Throttle-lever.
a′ a, Tubes.
b′ b′, Truck frame.
c′ c′, Bed-plate.
d′, Boiler brace.
e′ e′, Sand pipe.
f′ f′, Equalizing lever for driving-wheels.
g′ g′, Guide-bars or rods.
h′ h′, Receptacle for sparks.
i′ i′, Bell rope.
j′ j′, Guide yoke.
k′, Valve-stem.
l′ l′, Truck equalizing lever.
m′ m′ m′, Hand-rail.
n′, Blow-off cock in mud drum.
o′, Spring balance.
p′, Pump plunger.
q′ q′, Foot steps.
r′, Brace to smoke-box and frame.
s′ s′, Steam-chests.
t′ t′ t′, Crown-bars.
u′, Head-light lamp.
v′, Main valve.
w′, Blow-off cock handle.
x′, Bell-crank for throttle-valve.
y′, Piston-rod.
z′, Draw-bar.

[redacted]

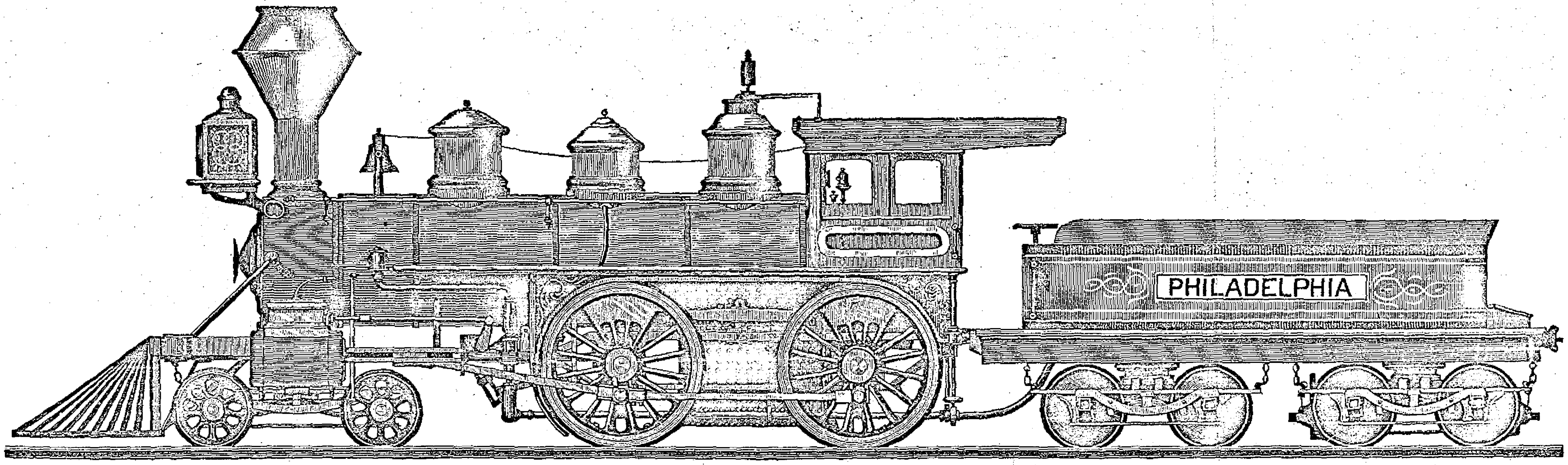


Fig. 1.

STANDARD AMERICAN LOCOMOTIVE.

By the Baldwin Locomotive Works, Philadelphia.

Scale, ¼ inch = 1 foot. [*Railroad Gazette, Dec. 23, 1871.*] For Description, see page 1.

FIGURE 1.

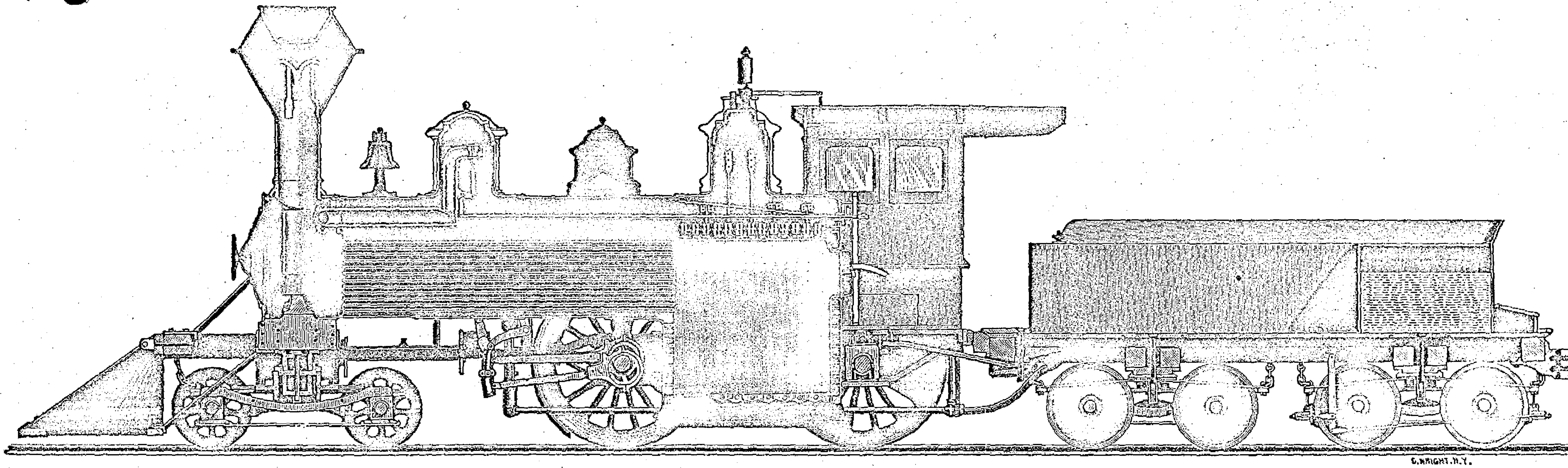
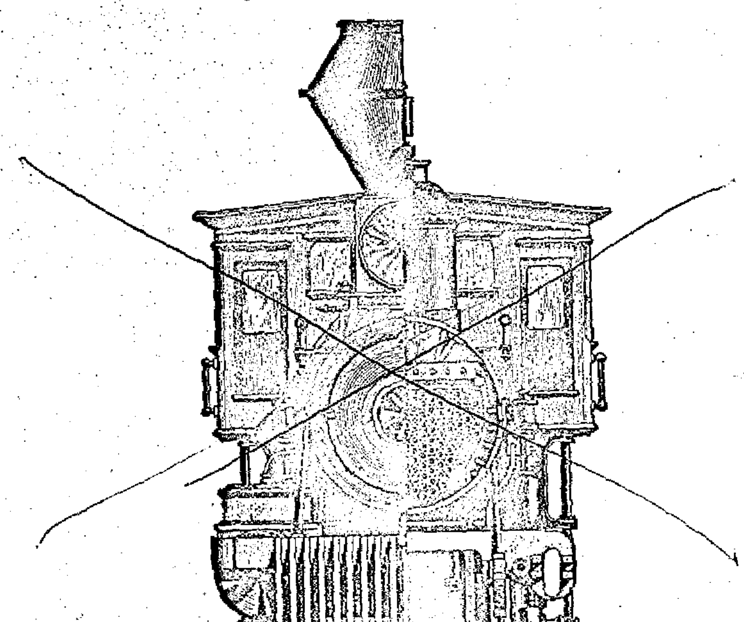


Fig. 2.
STANDARD AMERICAN LOCOMOTIVE.
By the Baldwin Locomotive Works, Philadelphia.

Scale, ½ inch = 1 foot.

[*Railroad Gazette, Dec. 23, 1871.*]

For Description, see page 1.



FIGURES 2 & 3.

[redacted]

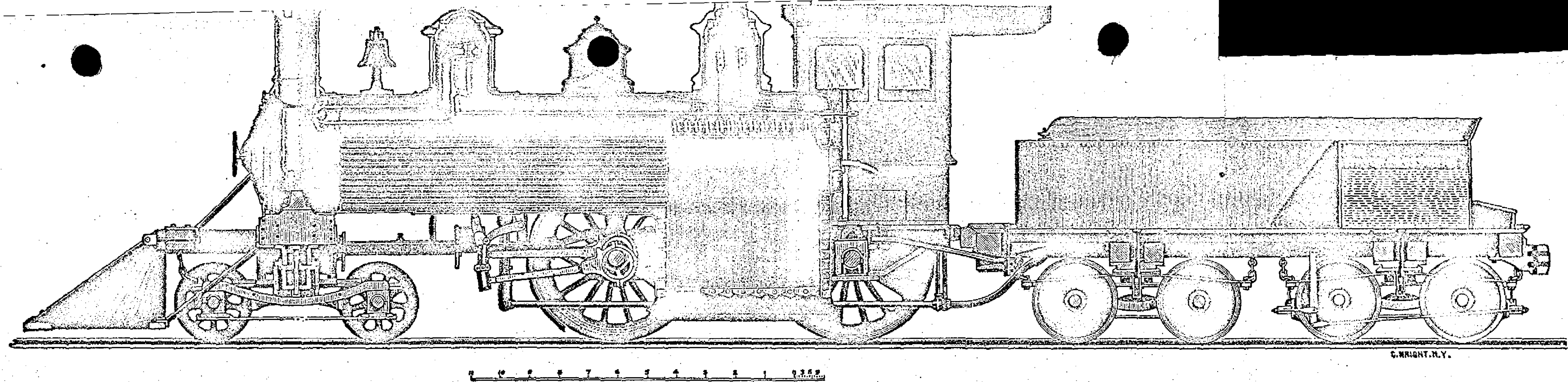


Fig. 2.

STANDARD AMERICAN LOCOMOTIVE.

By the Baldwin Locomotive Works, Philadelphia.

Scale, ¼ inch = 1 foot.

[Railroad Gazette, Dec. 23, 1871.]

For Description, see page 1.

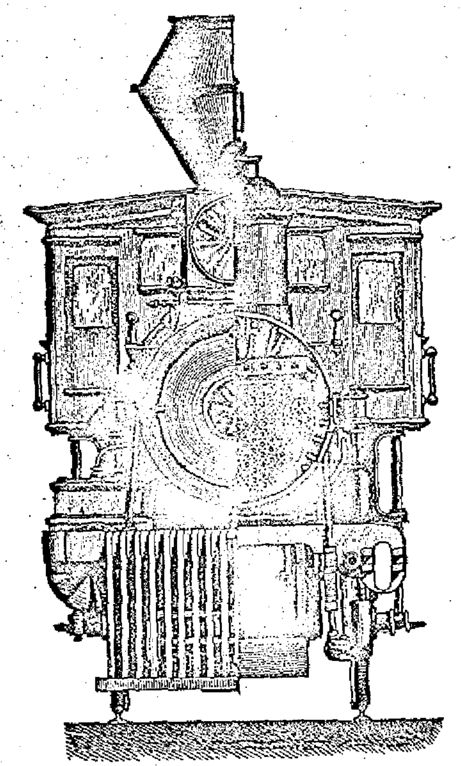
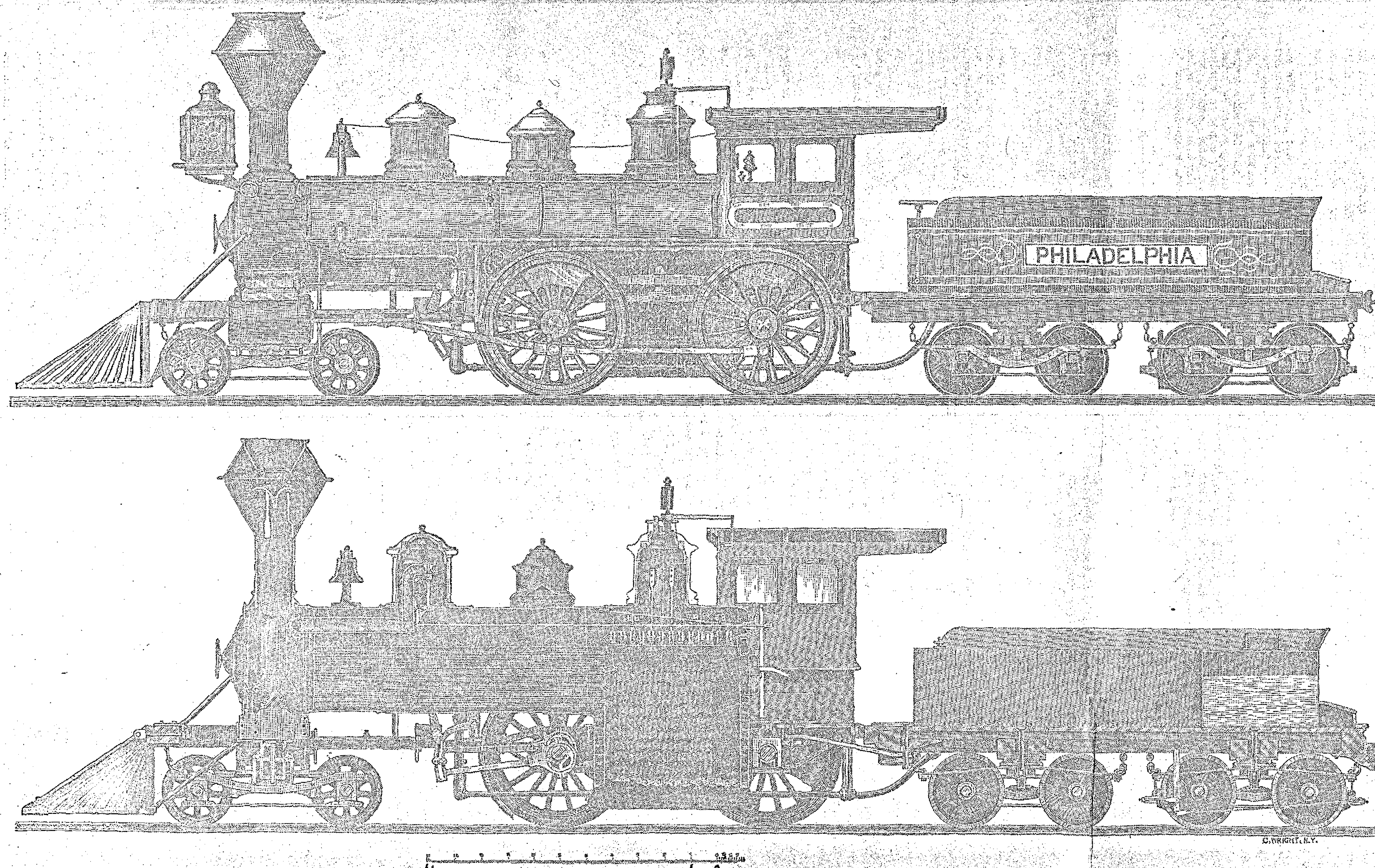


Fig. 3. Front End View and Transverse Section.



STANDARD LOCOMOTIVE ENGINE,

BUILT BY THE

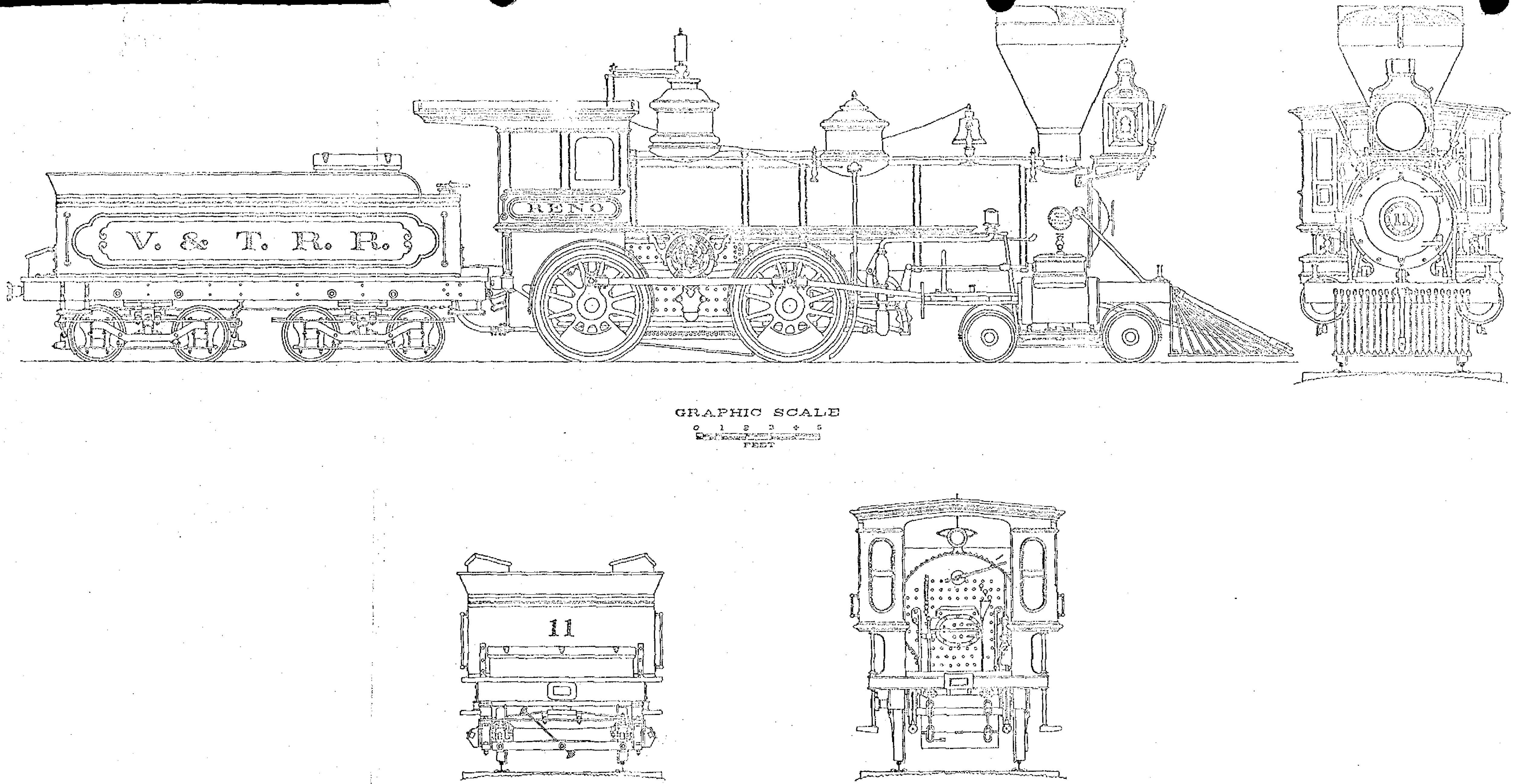
Baldwin Locomotive Works, Philadelphia.

APPENDIX C

4. Diagram of Baldwin 4-4-0 Locomotive, 1872

Diagram, Baldwin

[redacted]

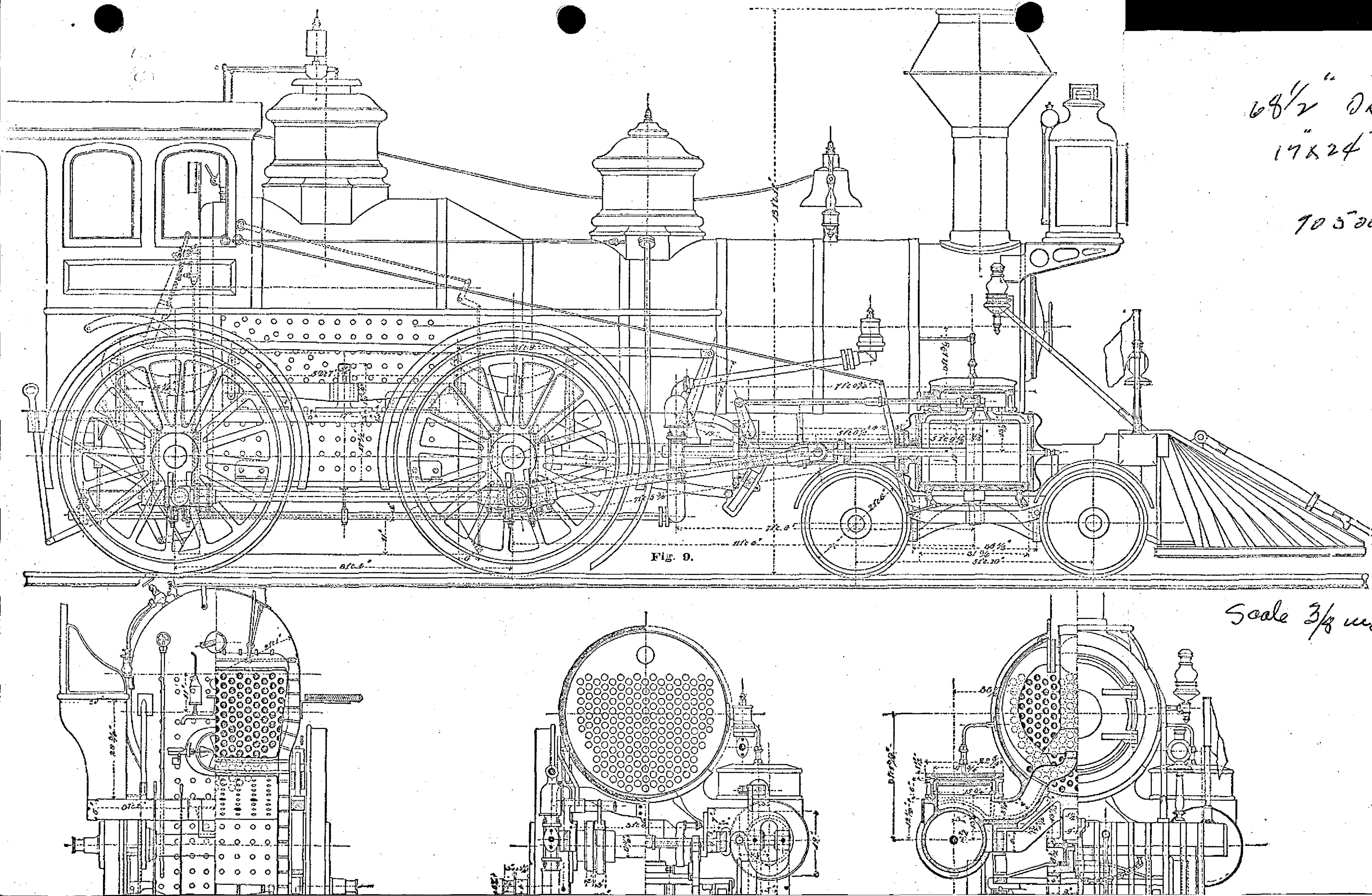


STANDARD GAUGE BALDWIN LOCOMOTIVE Nº 11 OF THE VIRGINIA & TRUCKEE R. R. - BUILT, 1872
MEASURED AND DRAWN BY FREDERIC SHAW, ARCHITECT, SAUSALITO, CALIF. - MARCH, 1950

FIGURE A-2

APPENDIX C

5. Diagrams 4-4-0 New York Central & Hudson River Locomotive and Tender, 1877.



68½" Dr. wheels
17"x24" cylinder & stroke
70500 weight

Scale 3/8 inch = 1 foot

FIGURES 9 to 12.

FIGURES 9 to 12.

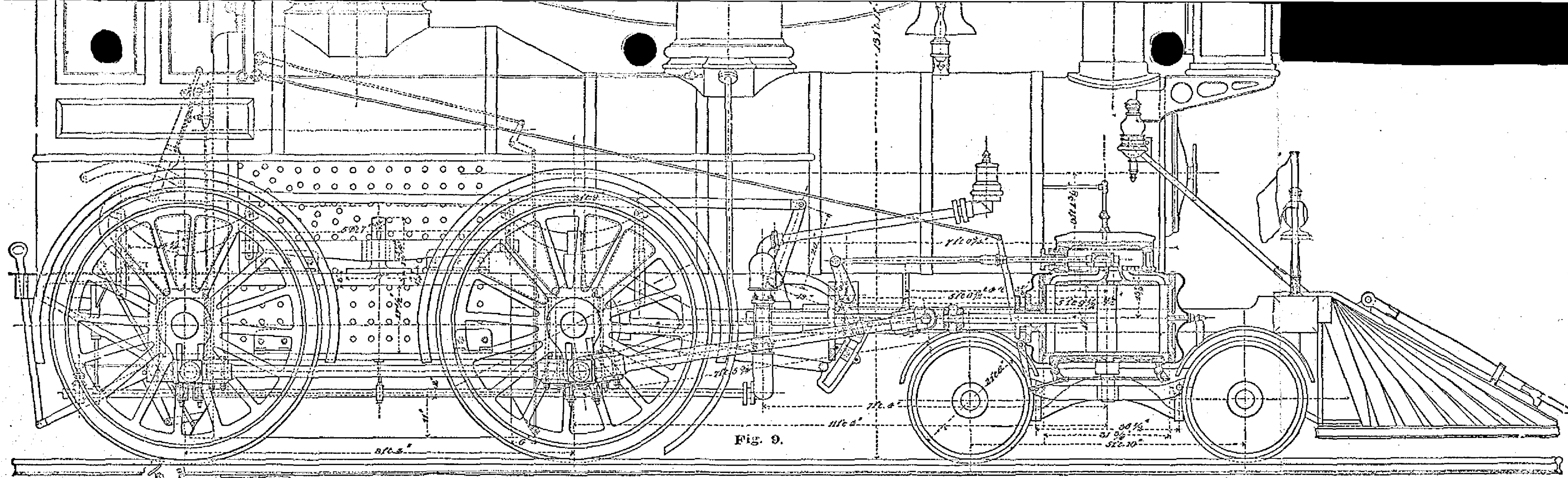


Fig. 9.

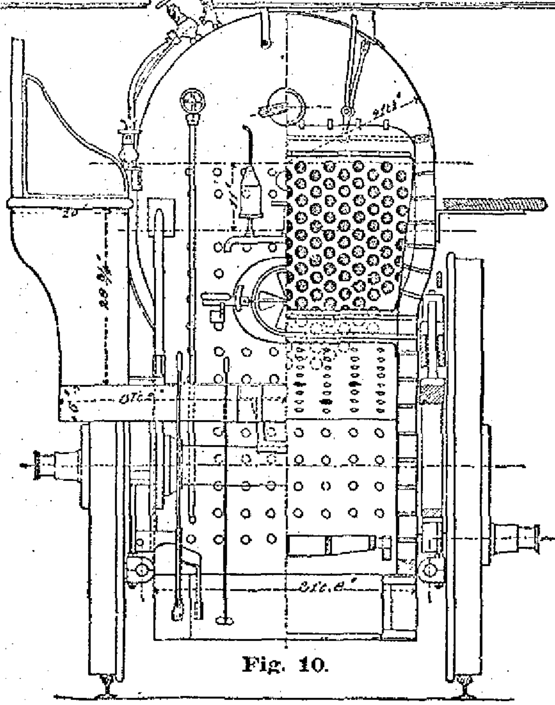


Fig. 10.

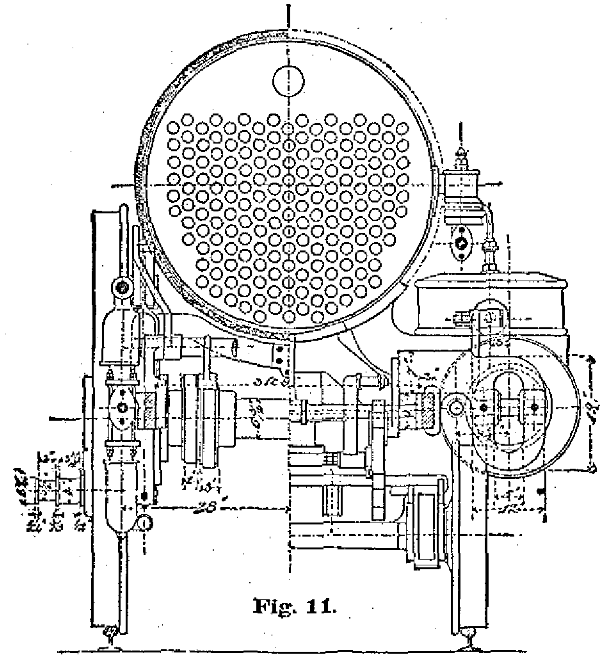


Fig. 11.

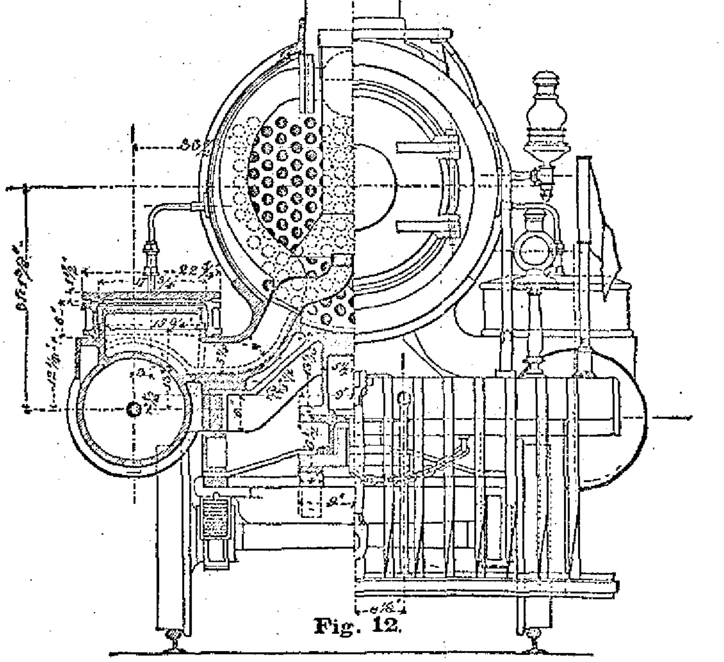


Fig. 12.

AMERICAN LOCOMOTIVE, NEW YORK CENTRAL & HUDSON RIVER RAILROAD.

Scale, ¾ inch = 1 foot. [*Railroad Gazette, April 13, 1877.*] Built by William Buchanan, Master Mechanic. For Description, see page 2.

3/8

[redacted]

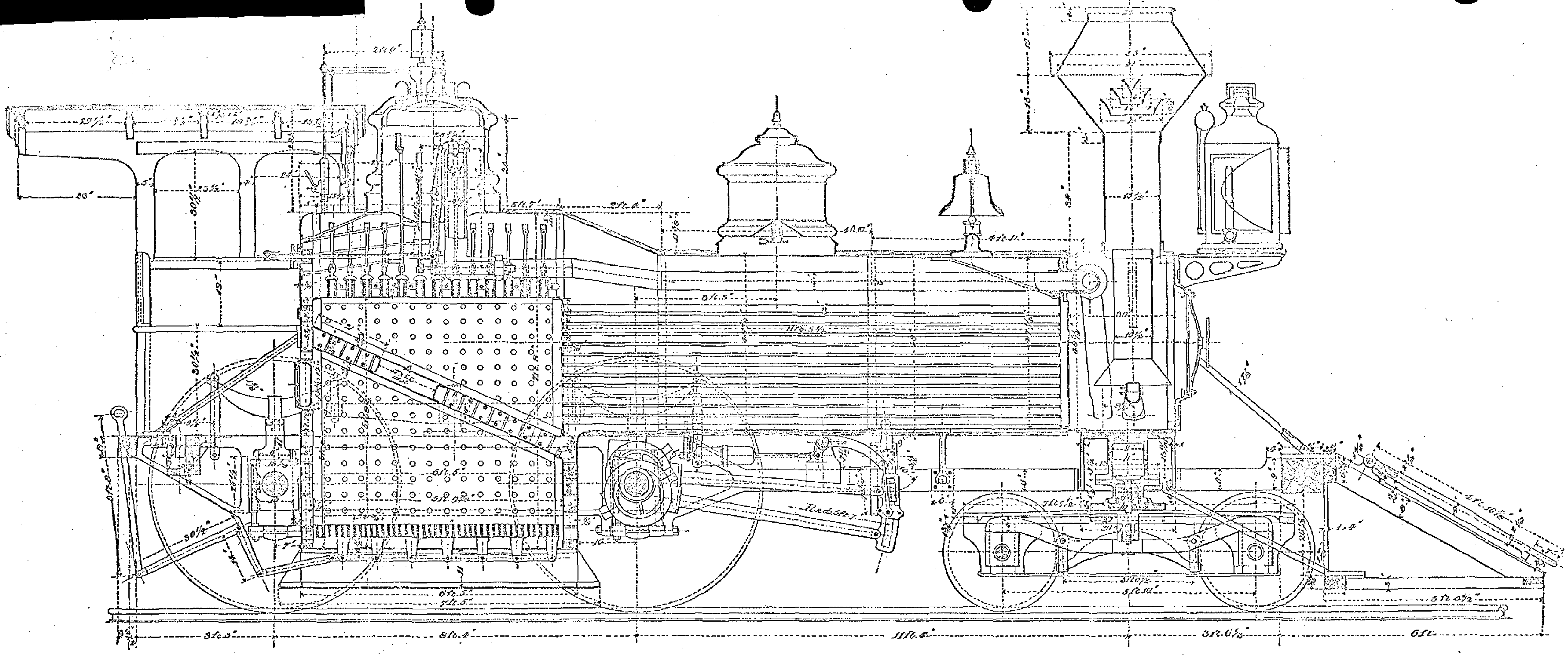


Fig. 13.

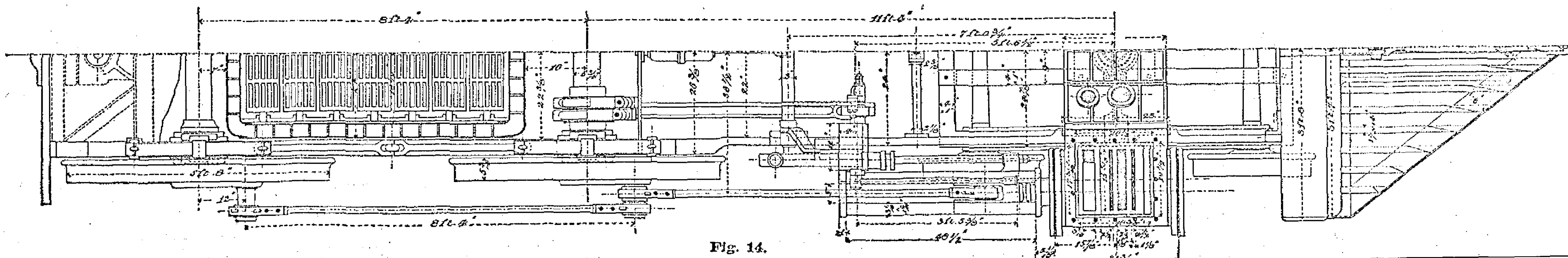


Fig. 14.

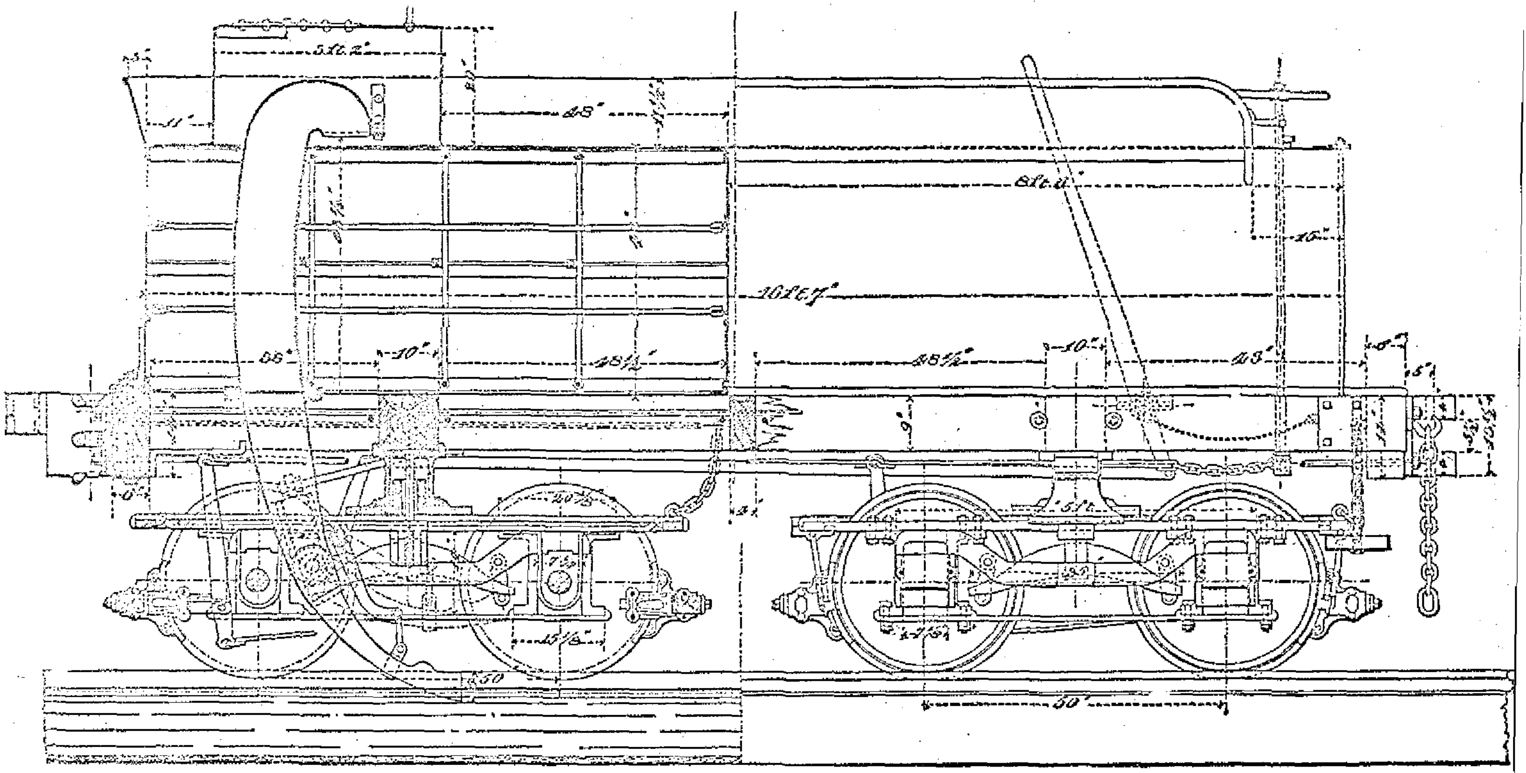


Fig. 15.

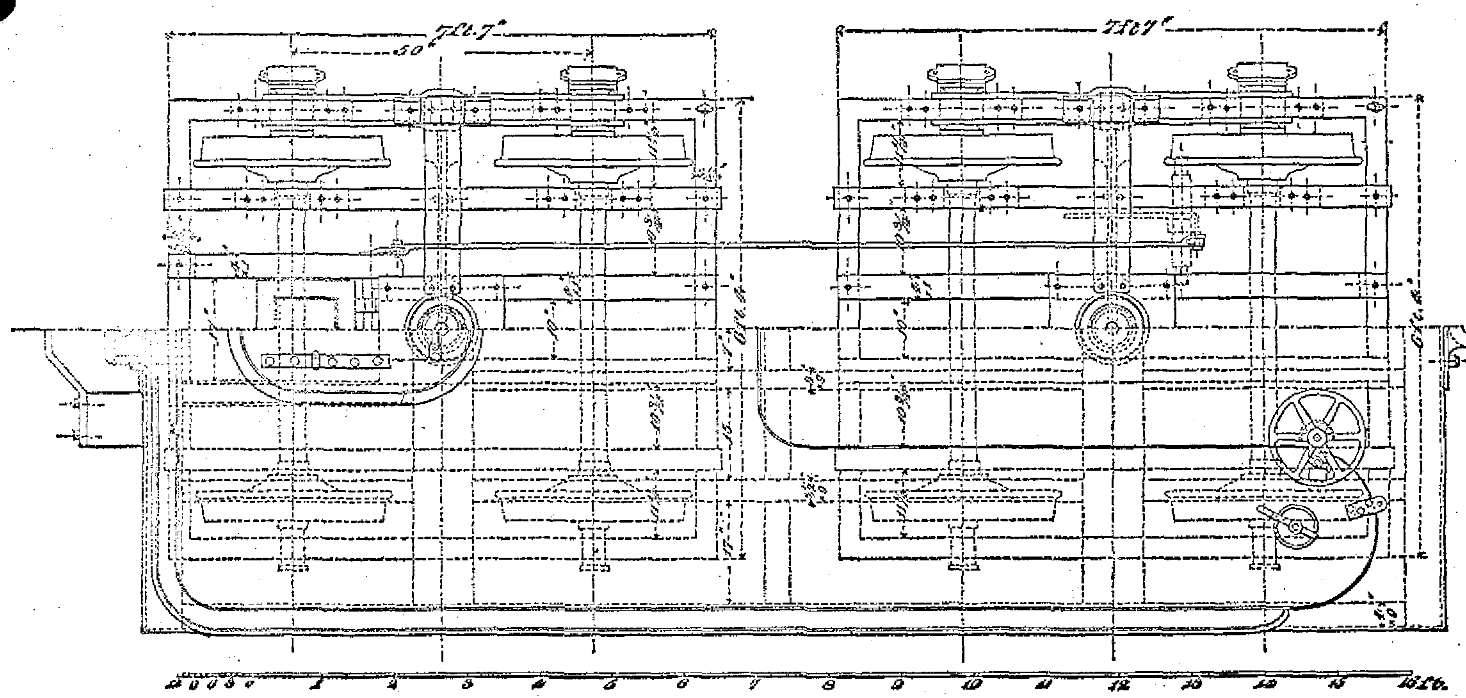


Fig. 16.

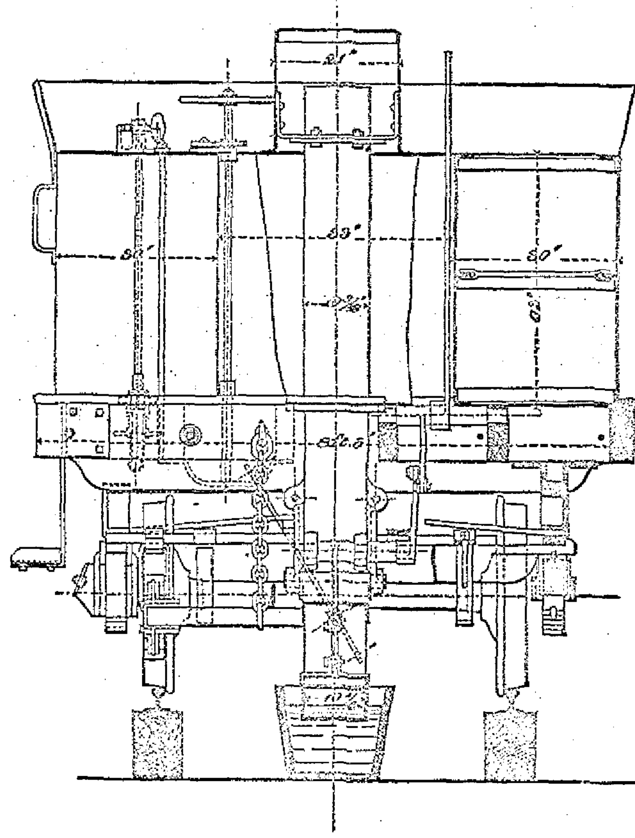


Fig. 17.

LOCOMOTIVE TENDER, NEW YORK CENTRAL & HUDSON RIVER RAILROAD.

APPENDIX C

6. Locomotive Smokeboxes & Stacks; Table of Delivery of Locomotives, Rogers Locomotive Works

Figs. 90, 91, and 92 represent a water grate recently introduced to burn bituminous coal.

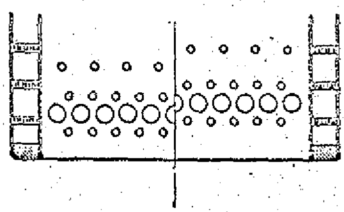


Fig. 91.

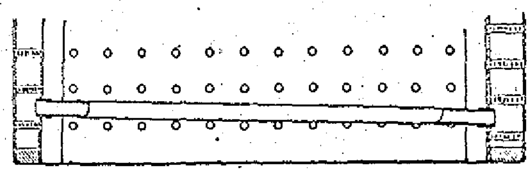


Fig. 90.

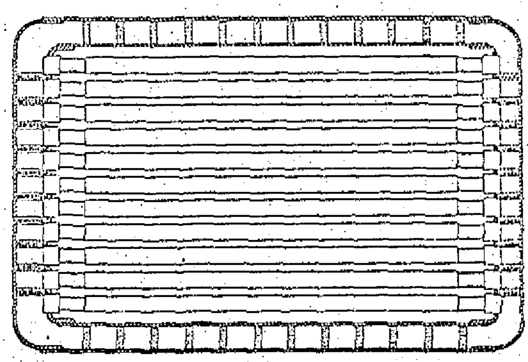


Fig. 92.

SMOKE BOXES.

As early as 1859 some engines were built at the Rogers Works for the New Jersey Railroad & Transportation Company with a form of extended smoke-box, shown in Figs. 93 and 94. A deflecting plate *A* was used in front of the top rows of tubes. In the same year the form of plate shown in Figs. 95 and 96, which had an adjustable piece *B* on its lower edge, was used on engines, both with and without the extended smoke-box. In 1862 the telescopic or adjustable petticoat pipe shown in Fig. 97 was applied to engines for the Nashville & Chattanooga Railroad. Figs. 98 and 99 show the extended smoke-box as recently applied to passenger engines. *A*, *B*, is a deflecting plate in front of the tubes, and *C*, *C*, *C*, is wire netting of number 13 wire, and $2\frac{1}{2}$ meshes to an inch. The exhaust nozzels *F*, *F*, it will be seen, are carried up above the horizontal centre line of the boiler. A receptacle *D*, for sparks, is attached to the under side of the smoke-box and has a sliding door *E*, for emptying the sparks and cinders which accumulate in the front end.

The extended smoke-box, when it was first introduced, met with little favor, but in recent years it has been extensively used.

Locomotives & Locomotive building etc.: Origin & Growth of the Rogers Locomotive & Machine Works, 1831-1886. N.Y. 1886-

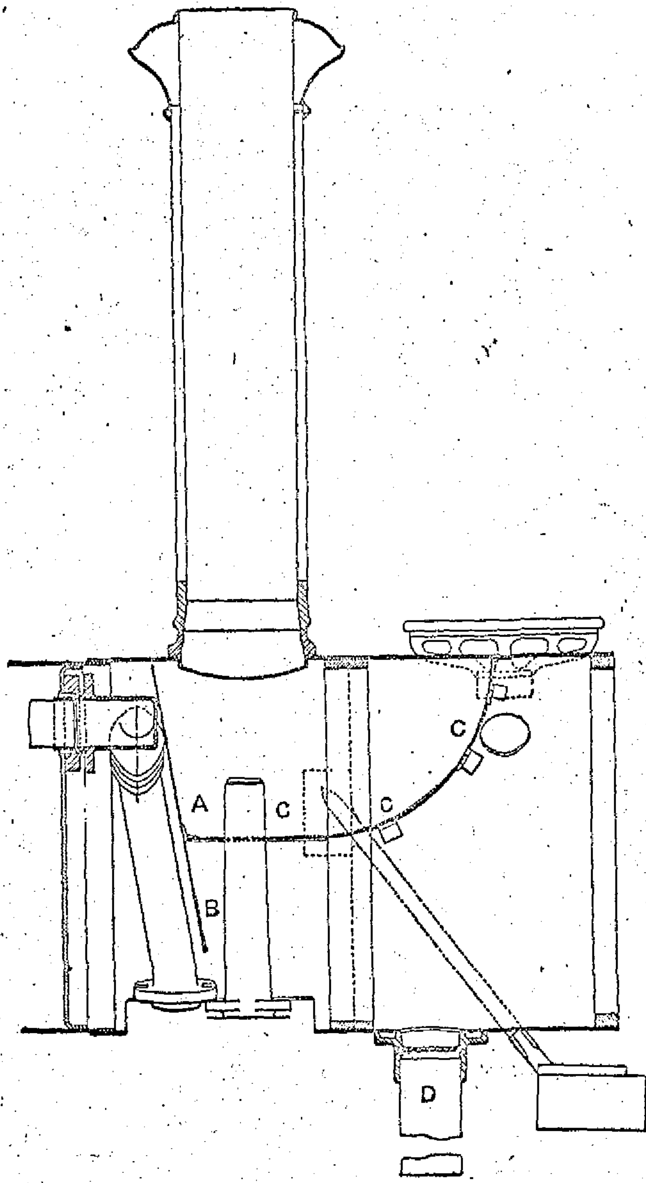


Fig. 98.

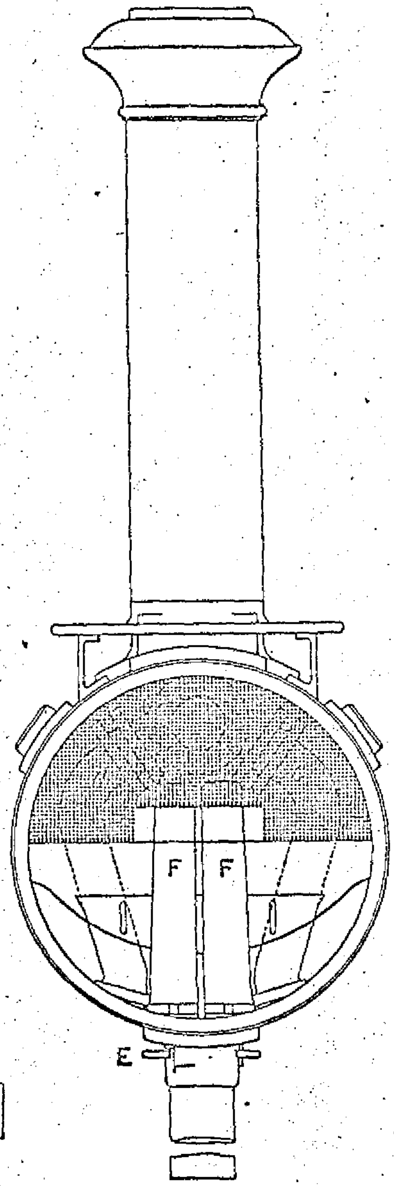


Fig. 99.

FEED WATER HEATER.

In 1859 Mr. Hudson designed a feed water heater, which is represented by Fig. 100, which he applied to a number of engines for the Southern Railroad of Chili, S. A. It consisted of a cylinder *C*, filled with small tubes *F*. At the end of the cylinder there was a chamber *A* and another *B* at the opposite end, which was connected together by

contact with the inclined surface *C, C,* would be deflected upwards through the opening *B, B*, and thus create an induced upward current out of the chimney.

Fig. 115 had a deflector with conical netting over it, which was open at the top.

Fig. 116 was the same as Fig. 115, but of different form.

Fig. 117 is a straight chimney with a cast iron grate at the top and a sliding damper at the base.

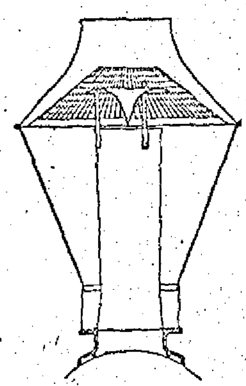


Fig. 115.
1862.—Bituminous Coal.

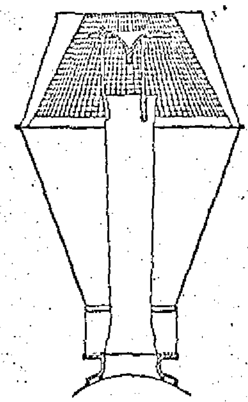


Fig. 116.
1863.—Wood.

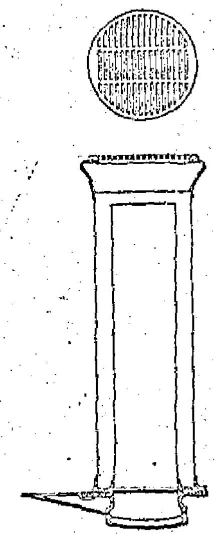


Fig. 117.
1864.—Anthracite Coal.

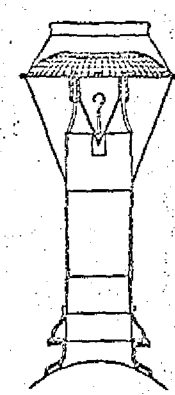


Fig. 118.
1866.—Bitum. Coal.

Fig. 118 had a deflector with netting over it, which was open in the middle. The opening was surrounded by a cylindrical shaped netting as shown.

Fig. 119 *was the same as* Fig. 110, but of different shape and proportions.

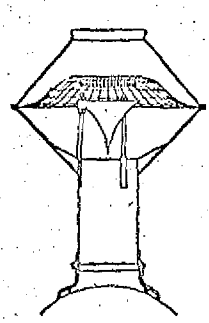


Fig. 119.
1867.—Bituminous Coal.

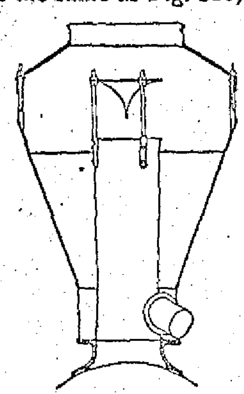


Fig. 120.
1869.—Bituminous Coal.

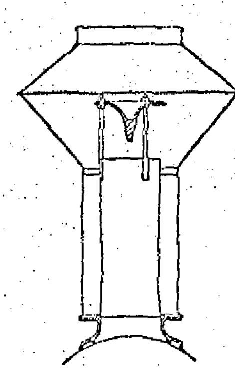


Fig. 121.
1869.—Bituminous Coal.

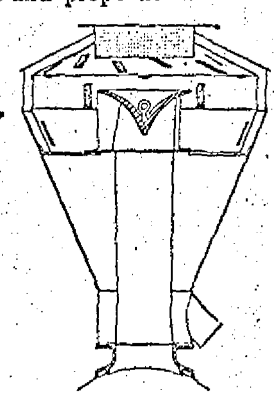


Fig. 122.
1870.—Wood.

Fig. 120 had a deflector with a very large casing or receptacle for sparks.

In Fig. 121 the netting was placed horizontally over the deflector.

Fig. 122 represents the celebrated Radley & Hunter stack, which was at one time very generally used for wood burning locomotives.

Table of Delivery of Locomotive Engines

From 1837 to 1885 inclusive,

Giving Number of Engines and Size of Cylinders of Engines.

Year	Diameter of Cylinders.																													Total Engines built.
	3½	4½	5	6	7½	8	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16¼	16½	17	17½	18	18½	19	20	
1837											1																			1
1838									1																					7
1839																														11
1840																														7
1841										1																				9
1842										1	2																			6
1843																														9
1844										2	4	2	2																	12
1845				1							2	7	2	1																14
1846										2	4		2	4		3			1	1										17
1847								1	1		3	2	3	2	2	2	3													22
1848									1	2	1	2		1	18		5	2		1				3						39
1849									1		1	3	4	1	5	5	3	2	5		4			8		3				45
1850										3	1	5	4	1	8		5	1	3		7			5						43
1851										1		1	1		8	2	4		11	2	4			14		3				53
1852										1	1	2	8	3	7	3	13	4	18		4		4	2						68
1853										2	1		12	4	7	21	18	4	3	3	12									89
1854											1	1	7	1	6	4	10	36	16	4	12					4				102
1855										2	1		3	2	9	2	5	8	37	1	11				1					82
1856													1	7	4		8	2	20		45				8					95
1857													7	8	5	3	7	2	8		41					3				84
1858											1		3	1	4	1	4		8		2									24
1859													4		6	4	10	3	26		5									58
1860							2				3		2	4	13	4	7	2	30	2	17	2								88
1861		1				1							1		3		3	2	7		6	3		1						28
1862														2	6	3	5	1	7	2	7	3		2		4				42
1863										2				1		5	5		16		36	5		4						74
1864																3	13	1	30	10	45			2						104
1865											1				5	1	9		20		24	10		6		19				95
1866														2	4		15	1	19	1	31	11		8		11				103
1867	1														1		5	2	14		22	6		1						52
1868															2	1	7		12	1	31		1	1		14				70
1869		1	2										1		10	3	14		19		50	1		11		5				117
1870			1				1			1					9	3	26		44		56		1	7		4				145
1871					4	3			1	2	2				5		17		38		59		3	19		12				165
1872					1					1					1	1	12		21		70			41		24				172
1873										1	1				1		10	2	17	1	72		1	55		32				193
1874																	1		5		11			2						19
1875			1				1				1		3			3	1		7		12			13						42
1876											1						1		2		5			3			5			17
1877							1						2				2		4					3		2				14
1878											2		6	1	1	2	4				19			3		8				46
1879						1	1				2		1	3		1	3		6	1	31			3		3				56
1880															2		2		5		32			34		9		24	17	125
1881											2				1		1		10		42			37		63		24	41	221
1882																	2		18		29			81		85		20	25	260
1883											1				2		5		35		21			84		77		53	1	279
1884									1						2		3		2		6			36		20		3	7	80
1885											12		1				3		1		2			34		20				73

APPENDIX C

7. Water Tanks & Turn-Table, Forney, Catechism of Locomotives

Water Tanks &
Turn-Tables

M. N. Forney, Catechism of the Locomotive, 1875 ed.

crustating substances in different kinds of water be determined?

Answer. The relative quantity of solid matter or mud which is held in suspension can be at least approximately determined by simply filling vessels, say large clear glass bottles, with different kinds of water and letting them stand for some time until the solid matter settles to the bottom.

An easy method of precipitating the lime and some other salts which are held in solution and which will not settle until they are converted into a solid form is the following: Dissolve in a goblet of pure water (distilled or freshly caught rain water) two or three teaspoonfuls of the *oxalate of ammonia*. Have equal quantities, say a goblet-full of each of the waters to be tested, ranged side by side and marked so as to be identified. Into each of these goblets stir equal quantities of the solution mentioned—about three teaspoonfuls will be enough—and let them stand for a day. The lime and some other salts will be precipitated and fall to the bottom as a powder; and the quantity of this precipitate in each glass will form a very good index of its relative injuriousness in the formation of scale.

When the oxalate of ammonia cannot easily be procured, an experiment may be tried, in the same way, by dissolving common white soap, or other pure soap, in a goblet of pure water, and then stirring into the glasses of water to be tested a few teaspoonfuls of this solution. The comparative amount of lime in the water will be shown by the amount of coagulated matter which will be thrown down.*

* Correspondent of the Railroad Gazette.

QUESTION 452. *How are locomotives turned around on the track?*

Answer. The most common means employed for that purpose is a *turn-table*, fig. 227. This consists of two heavy beams made of wood, cast or wrought iron, placed side by side and resting on a pivot in the centre, on which they turn. They are placed in a circular pit below the level of the track, so that when rails are laid in the ordinary way on top of the beams they will be exactly level with the track which leads up to the pit. By turning the beams on the central pivot so that the rails will come exactly in line with the permanent track which leads up to the pit, the locomotive can be run on the turn-table, which is then revolved a half-revolution, which of course reverses the position of the locomotive and brings it opposite

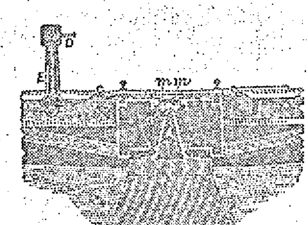


Fig. 228. Scale $\frac{3}{32}$ in.=1 foot.

the permanent track so that it can be run off from the table. In order to prevent the beams from tipping down when the engine first runs on or off of the turn-table, wheels are placed at their outer ends which run on a circular track and bear any inequality of weight that may be thrown on them if the locomotive is not equally balanced on the central pivot.

QUESTION 453. *How is the central pivot constructed?*

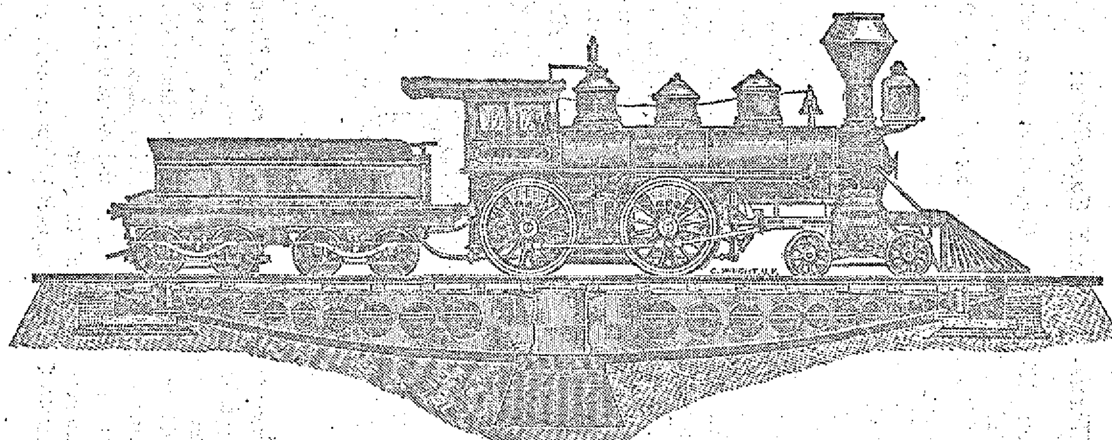


Fig. 227. Scale $\frac{3}{32}$ inch = 1 foot.
50-FOOT TURN-TABLE, BY WILLIAM SELLERS & CO., PHILADELPHIA.

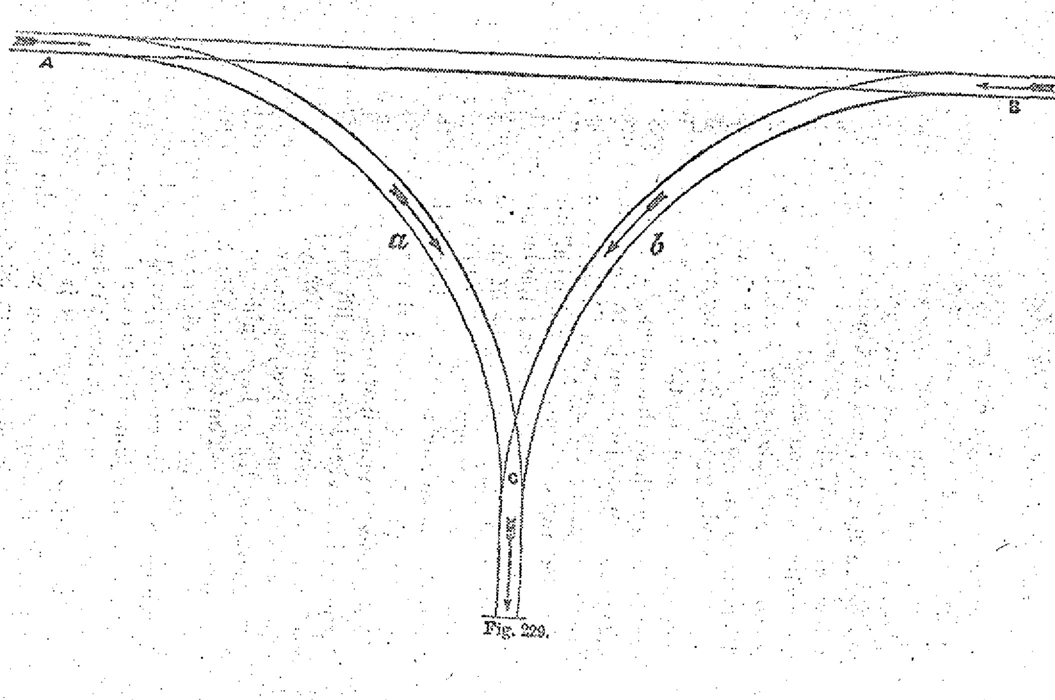


Fig. 229.

Answer. It usually consists of a vertical post, *A*, shown in fig. 228, which is a transverse section through the centre of the turn-table, the end of which rests on hard cast iron or steel bearings. In some cases, as shown in figs. 227 and 228, which represent a turn-table built by William Sellers & Co., of Philadelphia, the weight rests on conical steel rollers, *m m*, which revolve in a circular path formed in the top plates. Sometimes turn-tables are fitted with gearing and cranks, *D*, fig. 228; but if they are made so that the whole weight rests on the centre, and if they are of sufficient length so that an engine and tender can be moved on them sufficiently to be balanced over the centre, gearing will not be needed; but a simple lever fastened to the turn-table will be all that will be required to turn the table and the engine and tender on it. The tables should be of such a diameter or length across the centre as will enable the class of engine in use on any road to be balanced. With light engines the 50-feet table is large enough; with the long, heavy engine now used on the great trunk lines, the engine and tender quite fill up the entire length of 50 feet, leaving no margin for adjustment. In such cases, the 54 feet, 56 feet, or, better, the 60 feet, should be employed. These large tables are also made heavier in proportion. The table should be of such a length that engines, with tender either empty or full, when run on the table can be so placed as to bring the centre of gravity immediately over the centre. When so balanced, one man can turn the loaded table with ease.

In setting up turn-tables it is necessary that the foundation at centre, upon which the pivot rests, should be of the most substantial character, so as not to

be liable to settle. The circular track, which may be made of light rails, say 28 or 30 lbs. to the yard, should be level, and the table should be so adjusted as to swing clear of the circular track when loaded. The pit required is quite shallow near the edge and deepens towards the centre. Provision is made for covering the entire pit by a platform turning with the table, but this should be avoided whenever possible, as the best constructed cover does offer some resistance in turning. Even in roundhouses, where a covered pit might be considered preferable as presenting a smooth floor for crossing in any direction, it has been found advisable, in view of the greatest ease in turning and the facility offered by the open pit for cleaning, to dispense with the cover. The centre upon which the table turns is constructed of the best cast steel, and consists of conical rollers of steel between two steel plates grooved out to receive these rollers. This part of the table must be kept clean and well oiled, say with best sperm or lard oil and tallow of such a consistency as not to harden in cold weather. The top cap at centre is held in place by a circle of bolts. These bolts take the entire weight of the table and load; by slacking off the bolts the table can be lowered on the wheels on the circular track and the cap lifted off to gain access to the plates and rollers. These should be opened, examined and cleaned at least once every three months.

Under the cap and between it and the top of the centre box are segments of wood. These can be altered in thickness to bring the table in proper adjustment. If the centre foundation settles, these segments should be thinned sufficiently to enable the table to

be screwed up to a proper height. With proper care such tables are practically indestructible.*

QUESTION 454. *Is there any other method of turning locomotives?*

Answer. Yes; what is called a Y is sometimes used. This consists of a system of tracks laid somewhat in the form of the letter Y, as shown in fig. 229, in which *A B* is the main track, with two curves, *A C* and *B C*, laid as shown. If now it is desired to turn a locomotive which is standing in the position of the dart *a*, it is run on the curve *A C* to the position of the *A*, it is run on the curve *A C* to the position of the darts *a* and *C*. It is then run backward from *C* on the curve *C B*, as represented by the dart *b*, and when it reaches the main track in the position of the dart *B* it is evident that its position will be reversed, as is shown if we compare the direction of the dart *A* with that of *B*.

* Wm. Sellers & Co.

PART XXVI.

INSPECTION OF LOCOMOTIVES.

QUESTION 455. *What are the principal divisions of the work of operating or running a locomotive?*

Answer. They are: 1. Inspection and lubrication; that is, an examination of the parts to see that they are in good working order, and the application of oil to the journals and other parts subjected to wear. 2. Setting the engine in motion and starting the locomotive and train. 3. Management while running. 4. Stopping the engine and train. 5. Laying up. 6. Management in case of accident. 7. Cleaning the engine.

QUESTION 456. *When the locomotive is inspected, what should be especially observed about the boiler?*

Answer. In the first place, all new boilers should be tested by pressure before being used, and ALL boilers, whether new or old, SHOULD BE TESTED PERIODICALLY. The oftener the better. The ways of applying the pressure test are: 1, the cold-water test, that is, by filling the boiler with cold water and then forcing in an additional quantity with a force-pump so as to raise the pressure to that at which it is intended to test the boiler; 2, the warm-water test, by filling the boiler entirely full of cold water and then kindling a fire in the grate so as to warm this water. As water expands about one twenty-fourth in rising from 60 to

APPENDIX D

Standard American 4-4-0 Locomotive Specifications and Descriptions

1. Specification Sheet and Description for Seminole, Rogers-built, 1867.
2. Description of Grant 4-4-0 Locomotive, 1871.
3. Abridged Description and Diagram, Grant 4-4-0
4. Description of Baldwin 4-4-0 Locomotive, 1871.

APPENDIX D

1. Specification Sheet and Description for Seminole, Rogers-built, 1867.

Description, Seminole

Machine Works in 1867 and 1868 for the Union Pacific Railway Company. Among these engines was the *Seminole*.

The specifications in Figure 3 denote the track gage, diameter of all wheels (54-in. drivers), size of journals, frame sections, cylinders

Union Pacific Rlway Co. E. D.

Width of Track, 4 ft 8½

Drivers, 4 ft 6

Counter weights,

Tyres,

No. of Boiler,

No. of Flues, 158

Outside diameter of Flues, 2

Kind of Grate,

No. of Escape Valves, 2

Location of do.

Smoke Stack,

Inside diameter of Pipe,

Height of Stack,

Petticoat Pipe, 12 x 36

Sandbox,

Gauge-cocks,

Size of Steam Pipe,

Size of Throttle Valve,

Hand-holes in Boiler,

Dome and Escape Pipe,

Size and kind of Domes,

Blow-off Cocks,

Weight and location of Bell,

Bell Frame, scroll

Lamp and Stand, common / scroll

Ash-pan,

Steam Gauge,

Spring Balance,

Gauge Cocks,

Waste Pipe,

Surface Blow-off,

Location of Whistle, on dome

Sign,

Wheel Covers, common

Plate in front of Smoke Box,

Flagstaff, 2

Hand-rails,

Column for do.

DRAWINGS.

Main draw. # 14

Section:

Milwaukee & St. Paul

Staff

A 4 ft 8½ Track

CAB.

Cab of Walnut varnished

Back-board,

Seat of ash

Seat bound with brass to check

Columns or Slats, 9¼

Signal Bell, brass

FRAME.

Thickness of Frame,

Do. Brace,

General construction, solid

Pedestal,

Width of Pedestal, 4 x 5½

Length of Drawbar,

Distance between centres of Cylinders,

Do. do. inside of Frames,

Do. do. do. Boxes,

Do. do. Keys of Pedestals,

Inside diameter of Boxes, 6½ x 7½

AXLES.

Diameter of Axle, 6½

No. Axle in Order Book,

No. Truck Axle in Order Book, # 321

CYLINDERS.

Diameter of Cylinders, 16

Length of stroke, 22

Cylinders oiled,

Cylinders covered, brass

Cylinder Heads, brass

Cylinder Cocks,

Diameter of Piston Rod, 2½

From inside of Cover to Face Yoke,

Length of Cylinders between Covers,

Width of Valve Seat, 15½

Length of do. 12½

Position of do.

Centre of Cylinder to Steam Chest Seat,

Do. do. to Smoke Box,

From Steam Chest Seat to ctr. Valve Rod,

Measured on inside face of Chest,

Outside length of Chest,

Inside do. do.

Outside width of do.

Exhaust, single

Lap of Valve,

Distance from end of Steam Chest,

Do. top of Frame,

No. of Cylinder pattern,

Covering of Steam Chest,

Top do. do.

Iron **SLIDES.**

Length of Slides,

Thickness of do.

Distance bet. centers, 8

Width of do.

Length of Cross-heads,

Diameter and length of Pin,

Attachment of Pump to Cross-head,

Length of Blocks in Slides,

PUMPS.

Kind of Metal,

Length of Pump,

Outside diameter of Pump,

Diameter of Plunger, 2

Dist. from end of Pump to ctr. Air Chamber,

Dist. ctr. Pump to upper Valve Seat,

Do. do. lower do.

Size and shape of upper Air Chamber, 8 brass

Do. do. lower do.

Size of Valves,

Size and metal of Ingress Pipe,

Do. do. Suction do.

LINK.

Rad. of Link,

Dist. ctr. of Link to Ecc. Rod Joint,

Centre of Saddle, in centre

Length of Ecc. Rods,

Centre of Axle to centre of Rocker,

Width of Link, 2

Diameter of Ecc. Inside Strap,

Throw of Ecc.

Length of Hanger, from above

Do. Block,

Do. Link,

Thickness of Link,

Link counterbalanced,

INJECTOR.

No. of Injector,

Metal,

Adjustable,

Handle of Globe Valve,

Worked from

Takes Steam,

TRUCK. common

Length of Frame,

Width do.

Size of Iron,

Size and kind of Boxes,

Size and kind of Pedestals,

Single or double Bearings,

From ctr. of forward Axle to top Frame,

Top of Frame to bottom centre Pin,

Length of centre Pin,

Diameter of Truck Wheels,

Size of lower Crossbar,

Truck Springs,

Eng. do.

Connecting Rods,

Oil Cups of Connecting Rods,

Felting and Covering, common

Pilot, Wooden.

Braces from Frame to Boiler,

Belly bands,

Inside diameter of Ex. Thimbles,

Truck Wheel Covers,

TENDER. Ohio Truck.

No. of Gallons, 2000

Size of Tank,

Height of Tank,

Arrangements of Running Gear,

Size of Truck Frame,

Size of Iron,

Kind of Boxes,

Diameter of Wheels, 30

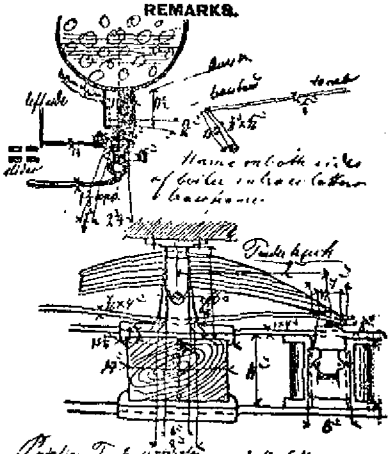
Kind of do.

Size of Springs,

No. of Axle in Order Book,

Size of lower Cross-bar,

REMARKS.



U. P. R. W. E. D.

Figure 3. Specifications for *Seminole*, 1867.

APPENDIX D

2. Description of Grant 4-4-0 Locomotive, 1871.

A

DESCRIPTION OF LOCOMOTIVES

MANUFACTURED BY

THE GRANT LOCOMOTIVE WORKS

OF PATERSON, N. J.

NEW YORK:
James Sutton & Company.
1871.

Description of the Grant Locomotive.

BOILERS.

The outside shell of the boiler is made with either a straight or wagon-top as desired. Each course of the barrel of boiler is formed of a single sheet. The side sheets of outside shell of fire-box join the crown sheet of shell 1½ inches above the crown of fire box.

Extra plates of iron are riveted to the inside of the side sheets, where the expansion braces are attached, to give double thickness of metal for the studs. All the horizontal seams in the shell of boiler and the seam which joins the barrel of the boiler to the fire-box shell are double riveted. All sheets ⅜ inch thick are riveted with ¾ inch rivets, spaced two inches from center to center. $\frac{5}{16}$ and ¼ inch sheets have ⅝ inch rivets spaced 1⅞ inches.

FIRE-BOX

at the bottom is as wide as possible, allowing sufficient water space, but is swelled out after passing the frames.

The flue and back sheets have flanges two and one half inches wide turned on the sides and top; the crown sheet has flanges on the sides; the side sheets have no flanges. The space between inside and outside sheets at the bottom of fire box is filled by a solid wrought iron ring, two inches thick, and riveted to both sheets by long rivets.

The stay bolts are made of Low Moor Iron ⅞ inch diameter, tapped through both sheets and riveted on both ends. They are spaced as near four inches from center to center as practicable. All fire-boxes are made of Homogeneous steel plates unless otherwise ordered.

The fire-box door is made by flanging the back sheet of fire-box into the water space, and riveting a flanged sheet on outside of shell; the two flanges are connected by a welded ring of plate iron. The door is of cast iron and has an inside lining of cast iron perforated to admit air, the supply of which is regulated by a register on the outside.

CROWN BARS, BRACES, &c.

The crown sheets are supported by bars formed of two pieces 4x¾ inches welded at ends. They are placed across, and ¾ inch above the crown sheet, each end having a lip turned down and resting on the edge of the side sheets. The bars are placed 5 inches from center to center, and are fastened to the crown sheet by T head bolts riveted on the under side of crown sheet. Each crown bar is connected to the outside shell by two braces bolted to crow feet.

The domes are also braced to the crown bars, by four braces. The back end and front tube sheet are braced by longitudinal braces. In wagon-top boilers the sides of throat are braced by angle irons riveted to them and connected by suitable braces.

SMOKE-BOXES

are circular, and have a solid wrought iron ring riveted to the front end to receive a cast iron front. The smoke-box door is circular, hinged on the side and fastened by four hook bolts held in position by lock nuts.

TUBES

are put in vertical rows. The two middle rows are arranged so that the tubes in them come opposite to each other. Iron tubes are set with copper ferrules at the fire-box end.

MUD HOLES.

An elliptically shaped mud hole, $2\frac{1}{2}$ x $3\frac{3}{4}$ inches, is placed on each outside corner of the fire-box near the bottom ring. Each hole is covered with two cast iron plates, one inside and the other outside the boiler, and fastened with a bolt which passes through both.

BLOW-OFF COCKS.

A brass blow-off cock is placed in the back leg of the boiler, underneath the foot board, and arranged so it can be opened from the cab.

LAGGING.

The boilers are lagged with $\frac{3}{4}$ inch pine, and sheathed with Russia iron. The latter is held on with brass bands, drawn tight with bolts and nuts. The domes are also lagged with $\frac{3}{4}$ inch pine, covered with Russia iron. Each dome has a cast iron base, and an ornamental molding made of sheet iron or brass at the top and bottom.

FRAMES.

The frames and jaws are forged solid, of hammered scrap. The jaws, top of pedestal and feet in the jaws, are all forged out of one shape, which is bent so as to form each part. The top bar of the frame is then welded on at the point where the jaw and pedestal unite, and the bottom braces are welded to the feet.

Both sides of the frames are planed to a gauge, so as to make the thickness the same through their whole length. The jaws are all made tapered to receive the wedges. The form of the jaws, &c., is laid off from a template. Each pair of frames are bolted together and finished on a slotting machine, to the form and size of the template. The distance from the back face of the cylinder pocket to the center of the main driving-box is accurately gauged by a steel rod. All the holes are drilled from a cast iron gauge or template which is bolted to the frames.

A brace extends across the mouth of the jaws, from one foot to the other, and is held by a lug on each foot, which is let into a corresponding slot in the brace. The lugs and the slots to receive them, are both planed to gauges which fit to each other. The braces are bolted to the feet, and each bolt is secured with lock nuts.

The frames of all engines which have a four-wheeled truck are spliced in front of the front driving-wheel. For this purpose the frame is made with two braces, one welded to the top bar, and the other to the foot of the front jaw, and inclined towards each other, and left open to receive the front bar. The braces are bolted to the bar with bolts which pass through all three. The front bar has a ⊢ shaped lug on the end, which is bolted to the front jaw. The frames of engines without four-wheeled trucks are made solid, *i. e.* the front bar is welded to the back end of frame.

A recess or pocket is made in the front ends of the frames to receive the cylinders, which are keyed in with a key, driven in in front of the cylinder.

WEDGES.

The forward jaw of each pedestal has a cast iron dead wedge fitted snugly between the top of pedestal and bottom brace. This wedge is bolted securely to the jaw with two bolts. The back jaw of each pedestal has a cast iron movable wedge, which can be adjusted by a bolt tapped into the bottom brace, and secured with a lock nut underneath. The wedge is held in position by a movable bolt, which passes through a slot in the jaw. The faces of each pair of wedges are laid off on the frame by a gauge, so as to be square with the top of the frame and parallel with each other.

EXPANSION BRACES.

A wrought iron expansion plate of an L shaped section is bolted on each side of the fire-box. The bottom flange of this plate rests

upon the frame. On top of the flange of the expansion plate is another wrought iron plate, with a lug at each end, which rests on the frame and is bolted to it. The latter plate has round holes, and the expansion plate has oblong holes to receive the expansion bolts which pass through the frame. Each bolt has a washer on it of the same thickness as the flange, and received by the oblong holes. The top plate is then bolted down hard on these washers, and is stationary on the frame, while the expansion plate moves with the boiler. When a pair of drivers is behind the fire-box, a wrought iron clamp is bolted outside both the expansion plate and the frame. This clamp holds the fulcrum for the equalizing lever, and runs down with a foot and a bracket. The foot is bolted to the fire-box, while the bracket rests on the bottom bar of the frame, and has oblong holes the same as the expansion plate, with washers, and a top plate bolted down hard on the washers. The top bar of frame is fastened to the fire-box by additional wrought iron clamps, and the bottom bar by wrought iron brackets where they are necessary.

FRAME BRACES.

A tail brace made of hammered iron extends across and is let into the back end of each frame. It has a ⌓ shaped piece forged on it, to which the draw casting is bolted. All engines with the exception of some anthracite coal burners, with long fire boxes, have two braces made of round rolled iron bolted to the tail braces next the frames, and extend upward at an angle of about forty-five degrees to the shell of the fire box, to which they are bolted with a suitable foot.

A wrought iron cross brace is bolted to each frame in front of the main driving axle. An angle iron, made of boiler plate, is bolted to this brace, and riveted to the boiler. The angle iron has a projection or lug to hold the counterbalance spring.

The frames which are spliced have a brace, the foot of which is held by two of the splice bolts, and the other end is riveted to the shell of the boiler.

The front ends of the frames are braced to the smoke-box by a brace made of round rolled iron, and bolted to the top of the bumper timber and the frames by a foot with a lip, which locks against a corresponding lug on the frame. The foot has two bolts which pass through the timber and frame. The upper ends of the braces are bolted to the smoke-box by a suitable foot.

DRIVING SPRINGS

are made of cast steel. Each plate is punched in the center so as to make a cavity on one side and a projection on the other, which prevents the plates from slipping. A band is then shrunk on the center of the spring. The spring hangers are made of hammered iron. The ends which are attached to the frame are hung on rubber seats. The saddles for driving springs are made of cast iron, and rest in sockets cast for the purpose in the driving boxes.

EQUALIZING LEVERS.

All engines with the exception of those with only four wheels, have suitable equalizing levers between the driving springs.

CYLINDERS

are all horizontal, cast of Lake Superior charcoal iron: one half the saddle, the steam and exhaust pipes are cast on each cylinder. Both cylinders are alike, and are bolted together at the center of the engine. The smoke-box is round, the cylinders are fitted and securely bolted to it. The cylinders are bored, and the flanges turned and faced to gauges, then planed parallel with the bore, and the face of one where they join each other, drilled through a template. They are placed together, leveled by the frame seat, and the second cylinder marked off and drilled, then clamped together and the holes reamed, and the

cylinders bolted together. The center casting for the truck and its seat are planed and drilled through a template, and bolted in position.

The ports in the valve seat are milled to size by a cutter from a gauge which is bolted on the valve seat. The cutter works in a block which slides in slots in the gauge, corresponding to the ports. All the holes for steam chest studs, cylinder head, and frame bolts are drilled through templates. The templates are made of cast iron, and have the holes in them bushed with hardened steel.

CYLINDER HEADS

are the same diameter as the flanges of the cylinders, and are fitted thereto with scraped joints. The front heads have a groove turned in them next to the counter-bore, to protect the cylinders in case of accident. The flanges of the stuffing-boxes on the back heads are circular to receive the casings. Both the stuffing box and gland have brass bushings fitted to the piston-rods. The gland studs are case-hardened and provided with lock nuts.

STEAM-CHESTS

are made with pockets on the inside for the bolts, the covers have ribs both on the inside and the outside to stiffen them. The joints between the chest cover and cylinder are made with copper gaskets.

All the holes in the chests and covers are drilled through the same template that is used for the cylinder.

VALVES

are of cast iron, and have their faces scraped to the valve seat. The stem is attached to the valve by a yoke which embraces the valve. The stem is connected to the valve rod by a socket joint.

PISTONS.

The heads and followers are made of cast iron, are turned to gauges, and fitted with brass packing rings. The piston-rods are made of cast steel, and are fitted taper into the pistons and cross-heads, and keyed to them.

GUIDES

are made of cast steel, four to each cross-head, and are placed central on the cylinder head. Each pair of guides is bolted at each end to a block, one of which is fastened to the cylinder head and the other to the guide yoke by a stud and nut. The guide blocks are faced off in a special chuck (which receives a full set) to an exact thickness. The guides and blocks are bolted together and planed and finished to a gauge.

The holes in cylinder head and guide yoke which receive the slide block studs, are drilled through a template.

GUIDE YOKES.

are made of plate iron, planed and finished to a template. They are bolted to the frames by a lug and to the rocker-box. They are fastened to the boiler by an angle iron, and form a bracket for the running board.

CROSS-HEADS

are made of hard cast iron, and are all fitted with glass bearings to prevent wear.

The neck of cross-head is first bored taper to fit the piston rod, the cross-head is then placed on a mandril with a gauge attached to it and planed. The journal for the connecting-rod is cast in the cross-head, as is also the lug for driving the pump.

ROCKERS

are made of wrought iron, forged solid, and are finished all over, to gauges. Each arm has a boss on the end, and is furnished with case-hardened taper pins for valve rod, and link.

The rocker-boxes, are made in two pieces, bolted together, and also bolted to the frame and yoke brace.

VALVE GEARING

is the shifting link motion. The links are forged of Low Moor Iron and case hardened, and are made either solid or skeleton. They are hung in the center vertically and back of the center, horizontally.

The suspension pin is forged on the saddle, and the latter is bolted to the link.

CONNECTING RODS

are made of best hammered iron. The body of the rod is tapered from the front to the back end. The corners are chamfered off, and the rod accurately planed, and finished all over. The front end has a strap and two brasses. The lost motion is taken up with a key placed vertically in the stub end, and secured by double nuts. The key bears against a wrought iron plate. The straps are held by two bolts.*

The back stub end has two brasses, which are held by a strap bolted to the rod with two bolts. The lost motion is taken up with a key, which is secured with lock nuts, and bears against a wrought iron plate.

COUPLING-RODS

are made of best hammered iron, planed and finished all over, with the corners of the body of the rod chamfered off. Each of the crank pin journals has two brasses, held with straps bolted to the rods with two bolts. The lost motion is taken up with suitable keys, secured with lock nuts.

LIFTING-SHAFTS

are made of wrought iron, forged solid. The arms have wide taper bearings for the pins of suspension links. The vertical arm to which the reach rod is attached, is curved so as to clear the boiler. The ends are supported by cast iron stands, bolted to the frame.

In the center of shaft is a short arm to which is attached a rod which passes through two volute springs, which serve as a counterbalance for the links.

REVERSE LEVER.

The fulcrum is at the frame. The quadrant is made in two parts, case-hardened, and notched to hold the lever in the desired position. The lever is connected with the lifting shaft by the reach rod, which is supported by a bracket, fastened to the running board.

ECCENTRICS

are cast with a boss on one side; they are bored and turned to special gauges. Each eccentric is fastened to the axle with two steel set screws, cupped on the end.

ECCENTRIC-STRAPS

are cast iron. They are bored out with a recess to receive the eccentrics; all parts accurately made to standard gauges. The two parts are joined at an angle of forty five degrees, with the center of the eccentric rod. An oil cup is cast on the top of the back half, and an oil cellar on the bottom of the front half.

ECCENTRIC-RODS

are bolted with three bolts to the straps, and have a jaw on the front end to take the links. A pin with a steel thimble, which turns in the link, is fitted into the jaw.

DRIVING-WHEELS.

The driving-wheel centers are made of cast iron, with hollow spokes and hollow rim. The section of the spokes is elliptical. The hubs, for axles and crank pins are cast solid, and are flush with each

* The rods which are used with cross-heads having two guides have solid ends in front, with two brasses, and a horizontal key.

All the brasses of the connecting-rods are Babbitted, and each journal has one of Ricker's patent oilers.

other on the outside. The wheels are each keyed on the axles with a key, an inch square, and are placed with the right hand crank ahead. They are pressed on by a hydraulic press, and the holes for the crank pins bored in a quartering machine. The outsides of the wheels are turned, the hubs bored and faced to gauges for each.

TIRES

are made of steel of an approved manufacture, and are bored out and shrunk on the centers, and secured with 1¼ inch bolts. The bolts are tapped into the rim of the wheel, and their ends are turned down to ⅝ inch diameter, and are fitted into a hole drilled into the tire to receive it. The hole is drilled deeper than the length of the bolts, so that the latter do not bear on the bottom of the hole.

DRIVING AXLES

are made of hammered iron. The main axles are turned their whole length to receive the eccentrics, the others are left rough between the inside collars. The collars are made of cast iron, shrunk on the axles, and form an inside bearing for the driving-boxes. The axles are all finished to gauges for their diameter and length.

CRANK PINS

are made of steel, fitted into the wheel with a straight bearing, and pressed in by a hydraulic press. The diameters and length are all turned to standard gauges. The main pins have a collar between the bearings for main and parallel rods, and all the pins have collars on the outer end.

DRIVING-BOXES

are made of cast iron, with brass bearings Babbitted. The top of the brass is round, and is turned where it bears against the box. The seat for the brass in the box is first laid off from a template, and then slotted out to a gauge. The sides and faces of the box are all planed to gauges for the length of bearing and thickness of flanges. The oil cellars and recesses to receive them are also planed, and the cellars held in position with two ½ inch bolts, which pass through the flanges of the box.

COUNTER BALANCE WEIGHTS

are made of cast iron, and are bolted in pairs between the spokes of the wheels. Each pair is held in position by three bolts, with countersunk heads on the outside, and nuts which are let into a recess cast in the weights on the inside.

WHEEL-COVERS.

All the wheels have sheet iron covers, arranged to prevent the wheels from throwing mud over the engine.

ENGINE TRUCKS.

The frames for four-wheeled trucks are forged in one piece, and are planed on the outside edges and where the pedestals are bolted on. All the holes are drilled from a template, and the frame planed to a gauge. The pedestal jaws are made of wrought iron; the faces, sides, and top and bottom are planed to gauges. They are bolted to the frame with two bolts at the top, and with one bolt to the brace at the bottom. The boxes are planed and bored to gauges in the same way as the driving-boxes. Each box has a Babbitted brass bearing, and an oil cellar. The axles are made of hammered iron or steel. The wheels are double plate or spoke cast iron, and are pressed on the axles by hydraulic pressure.

The trucks have a center bearing, with Smith's swing motion. A cast iron center casting is bolted to the bottom of the cylinder casting, and rests on the truck center. A center pin passes through both.

The truck springs are made of cast steel, in the same way as the driving-springs. They are placed underneath the truck frame, and

are hung between two curved equalizing beams, which rest on top of the truck boxes. Check chains are attached to the engine and truck frames, at each end of the latter. Suitable sheet iron covers are arranged, so as to prevent the truck wheels from throwing mud on the engine.

PUMPS

are made of brass or cast iron, are full stroke, driven from the cross-heads. They have cage-cup valves, and top and bottom air-chambers. The top chamber is connected to the check by a copper injection pipe, fitted with coupling nuts. The bottom chamber is connected with the suction pipe, by a stuffing-box. The suction pipes are brass and are furnished with adjustable feed cocks, under control of the engineer. Each pump is supplied with a pet cock, worked from the cab, and also with frost plugs.

CHECK-VALVES

are of brass, and are attached to the boiler with ball joints; they have the same valves as the pumps.

THROTTLE-VALVES

are double seat poppet valves, with the spindles standing vertical. They are placed in the top of the dome. The seat is cast on the upper end of the dry pipe. The valve and seat are both made of cast iron. The spindle of valve extends down below the bottom of the dome, and is worked by a bell crank attached to the dry pipe. The crank is attached by a rod to the throttle lever.

THROTTLE-LEVERS

are made of the most approved pattern, and located in a convenient position, usually at the back end of the furnace.

DRY PIPES.

Consist of a vertical cast iron pipe in the dome, which is connected to the smoke-box by a wrought iron pipe. The latter has a brass neck riveted to it, and is fastened with a strap bolt to two lugs on the cast iron pipe. To the front end of the dry pipe a brass sleeve is riveted, which makes a steam-tight joint, with another brass casting riveted to the inside of the front tube sheet.

STEAM PIPES.

A cast iron T pipe is bolted to the tube sheet in the smoke box, and joins the brass sleeve in the dry pipe with a ball joint. Two curved cast iron steam pipes connect the T pipe with the cylinders. The steam pipes are bolted at each end with two studs.

EXHAUST NOZZLES.

Double exhaust nozzles are bolted to the exhaust pipes. Three sizes are furnished with each engine, to be used to suit the conditions under which the engine is worked.

PETTICOAT PIPES

are made with a flared mouth at the bottom. The pipe is made telescopic, the lower half sliding into the upper, and fastened to the latter with two bolts. The upper part is attached to the smoke box with three bolts, and the height is regulated with jam nuts on each of the bolts.

CYLINDER AND STEAM-CHEST CASINGS.

The cylinder heads are covered with either a cast iron or brass casing. The body of the cylinders are lagged with wood, and sheathed with brass or Russia iron. The casings for the covers of the steam-chests are made of cast iron, and that for the sides of Russia iron or sheet brass.

CYLINDER COCKS.

The cylinders each have two cocks, so arranged that they can be opened from the cab.

OIL COCKS.

Two oil cocks are located inside the cab, and are connected to the steam-chest by solid brass pipes, so that the slide valves can be oiled from the cab. The cocks are so arranged that steam can be admitted behind the oil to force it into the steam chest, or the pipes be cleaned when necessary. At the point where the pipe joins the steam-chest, a valve is provided which is closed by the pressure of the steam in the chest.

CAB.

The cabs are made of ash, with walnut moldings, all of good quality and well seasoned. They are well framed and bolted together with ½ inch joint bolts. Two pieces of sheet iron ⅛ inch thick, are bolted one inside and the other outside the cab, where it rests on the boiler. The rafters are curved, and the roof covered with tin. All the windows and doors are fastened with convenient and substantial fastenings. The inside and the outside of cab are varnished. Suitable handles, and cast iron steps to get on and off the engine are attached to the engine in convenient positions. A gong for the bell rope is attached to the under side of roof or ceiling.

RUNNING-BOARDS

are made of ash 2½ inches thick, supported on wrought iron brackets bolted to the boiler. The outside edges of the running boards are bound with brass.

DRAW CASTINGS.

A suitable casting to receive the coupling and pin is bolted to each end of the engines.

FOOT-BOARDS

are made of ¼ inch sheet iron, covered with oak planking.

GRATES, ASH PANS, SMOKE STACKS & PILOTS

will be made on the most approved plan, and adapted to the fuel and service for which the engines are to be used.

SAND-BOXES.

The top and bottom of the sand-boxes are made of cast iron, with ornamental moldings. The body is made of heavy sheet iron. Two iron pipes extend from the sand box to within 2 inches of the rails forward of the front driving wheels. Suitable valves and a lever are attached to the cast iron base, to let the sand into the pipes. The valves are worked by a rod attached to the lever, and extending to the cab.

BELLS AND STANDS.

The bells are hung by a cast iron yoke between two ornamental cast iron columns, fastened to a base which is bolted to the top of the boiler. The bell cord is attached to a brass arm fastened to the bell yoke.

HAND-RAILS

are made of brass pipes, supported by cast iron arms which are screwed on to a stud tapped into the boiler.

LAMP BRACKETS.

Two cast iron brackets are bolted to the outside of the smoke box, and have a board, bound with brass, bolted to them to receive the head light.

NUMBER PLATES.

A circular cast iron plate with the number of the engine painted on it is put in the center of each smoke-box door.

FLAG-STANDS

with ornamental brass bases are placed on each end of the front bumper timber.

MISCELLANEOUS.

A steam-gauge, whistle, two safety valves, gauge cocks, and two heater cocks are attached to each engine. Oil cans, jack-screws, pinch bars, wrenchers, chains, tool boxes, extra bolts, and pokers are furnished with all engines.

GAUGES.

A complete system of standard gauges, male and female, is used for finishing all the work, so as to make it practically interchangeable. A special department is devoted to the manufacture and care of the gauges and tools.

BOLTS.

The heads and nuts of bolts are made of the same size, so that the same wrench will take either, and the size of finished heads and nuts are made the same as those which are rough. The system of threads used is the Franklin Institute U. S. Standard. The holes into which bolts are fitted are invariably reamed with reamers made and kept to the standard size.

TENDERS

have two four-wheeled trucks, either iron frames or wood.*

TANK

made of charcoal iron, riveted with ⅜ inch rivets, and strongly braced and securely fastened to the tender frame. The sides of the tank are made of No. 8, and the top and bottom of No. 6 iron. The sheets are secured together at the corners with angle iron. The legs of the tank are rounded at the front end, and taper back to the body of the tank. A suitable man-hole is put on the top of the tank at the back end. The front end of each leg of the tank has a valve for letting the water into the feed-pipes, which are connected to the tank by rubber hose attached underneath the tender valves. A cock is put into the tank near the bottom, and furnished with a piece of rubber hose for wetting down the coal and foot-board.

* Four-wheeled switching engines sometimes have four-wheeled tenders.

TENDER FRAME

is made of three longitudinal, two end, two bolster, and one center transverse timber of well-seasoned oak. The outside timbers are framed and fastened together at the corners with strong castings. The bolsters are also attached to the outside timbers with castings, and the whole bolted together with 1 inch transverse rods, running through the frame from one side to the other. Cast iron brackets on the outside of the frames carry a timber on which the tank rests.

The flooring is 1½ inch thick, made of pine, and securely spiked down. A strong draw casting is attached to the frame at each end. The front end is coupled to the engine with a heavy bar. On each side of the bar are two heavy safety chains connecting the engine and tender together.

TENDER TRUCKS

Each have four cast iron plate wheels. The axles have outside bearings. The front truck has a center, and the back truck side bearings. The frames are made of an approved plan, of the best material and workmanship, and have check chains on each corner of both trucks. The back trucks have brakes, with a wheel and shaft in a convenient position for setting the brakes.

PAINT

The engine and tender each have one coat of priming, one of filling, and one of body color, and then ornamented, and finished with three coats of varnish.

APPENDIX D

3. Abridged Description and Diagram, Grant 4-4-0 Locomotive, 1873.

Description & Diagram,
Grant 4-4-0, 1873

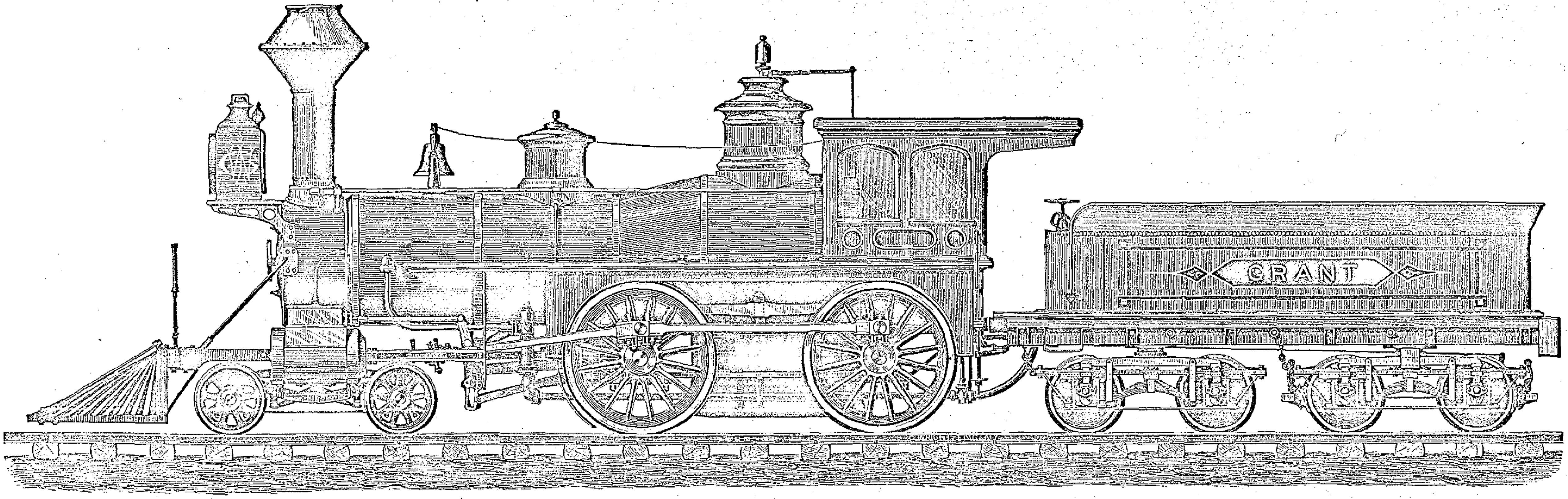
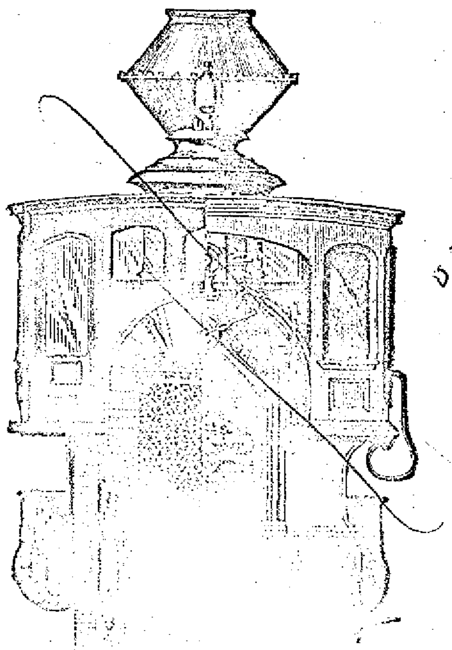


Fig. 4.



5

STANDARD AMERICAN LOCOMOTIVE.

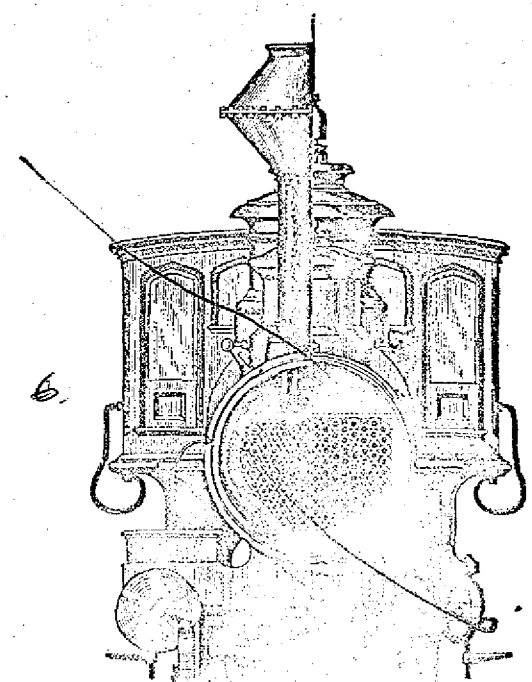
By the Grant Locomotive Works, Paterson, N. J.

Scale, ¼ inch = 1 foot

[*Railroad Gazette, May 10, 1873.*]

For Description, see page 2.

6.



[redacted]

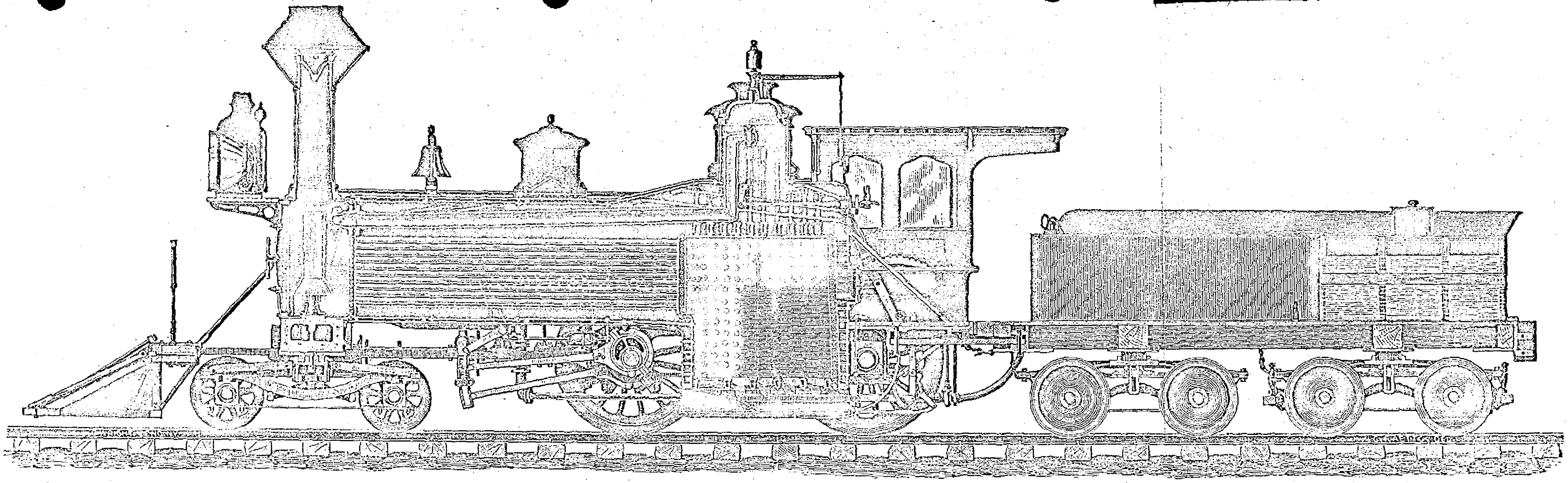


Fig. 7.

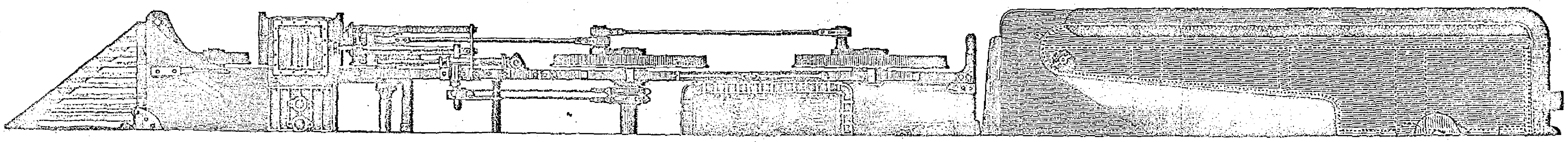


Fig. 8.

STANDARD AMERICAN LOCOMOTIVE

By the Grant Locomotive Works, Paterson, N. J.

Scale, ¼ inch = 1 foot. [*Railroad Gazette, May 10, 1873.*] For Description, see page 2.

STANDARD AMERICAN LOCOMOTIVE.

By the Grant Locomotive Works.

Figs. 4 to 8.

Figs. 4 to 8 represent a standard American locomotive built by the Grant Locomotive Works in 1873.

The following is a specification of this engine:

GENERAL DESCRIPTION.

Cylinders, 16 in. diameter and 24 in. stroke.

Driving-wheels, 61 in. diameter.

Gauge, 4 ft. 8½ in.

Fuel, coal.

Weight of engine in working order, with fuel and water, about 62,000 pounds.

Wheel-base of engine, 21 ft. 9 in.

Rigid wheel-base of engine, 8 ft.

BOILER

of extra hammered, cold-blast charcoal-iron ⅜ in. thick, all horizontal seams double riveted, 48 in. in diameter at smoke-box end, made wagon-top and with one dome, to be well and thoroughly stayed in all its parts, provided with hand-holes on each corner of fire-box and front flue-sheet.

Flues of iron, 140 in number, 2 in. diameter and 11 ft. in length.

Fire-box, 60 in. long and 62 in. deep inside, of best homogeneous cast-steel; sides, crown and back sheets $\frac{5}{16}$ in. thick; flue-sheet $\frac{7}{16}$ in. thick; water space, 3½ in. sides, back 3 and front 3½.

Stay-bolts ⅞ in. diameter, screwed and riveted to sheets, and not over 4½ in. from centre to centre. Crown-sheets made of two pieces of iron, 4½ by ¾ in., bearing on side-sheets; placed not over 4½ in. from centre to centre, and secured by T-bolts through crown and riveted; crown-bars raised from crown-sheets ¾ in.

Grate, cast-iron, with rocking-bars.

Ash-pan, 12 in. deep, No. 6 iron.

Smoke-stack, cast-iron, suitable for coal burning.

CYLINDERS

placed horizontally, each cylinder cast in one piece with half saddle, so as to be reversible and interchangeable, accurately planed, and fitted, and bolted together.

PISTON,

plete set of tools, consisting of two jack-screws, pinch-bar, monkey, packing and flat wrenches, hammer, chisels, etc.

FINISH.

Cylinders neatly cased with brass; heads of cast-iron; steam-chests with cast-iron tops, bodies cased with brass; dome with brass casing on body and brass top and bottom moldings; boiler lagged with wood and covered with Russia-iron, secured by brass bands polished.

TENDER.

Tank 2,000 gallons capacity, of No. 8 charcoal-iron; frame of selected oak, sheathed with iron and securely braced with corner castings and bolsters in cast-iron sockets, and mounted on two four-wheeled iron trucks; axles of best hammered-iron, journals 3¼ in. diameter, 5½ in. long; plate-wheels 30 in. diameter, of approved pattern.

AMERICAN LOCOMOTIVE.

For the New York Central & Hudson River Railroad.

Figs. 9 to 14.

Figs. 9 to 14 represent a locomotive built in the shops of the New York Central & Hudson River Railroad, in New York, in 1877, by Mr. Wm. Buchanan, the master mechanic of that line. The chief peculiarity of the engine is the fire-box, which has been patented by Mr. Buchanan. It consists of an inclined "water-table" or partition, shown in fig. 13, which extends from the back flue-sheet backward and upward and divides the fire-box into two parts, between which the only communication is an opening —about the size and form of an ordinary fire-box door—in the water-table, through which all products of combustion must pass. The currents of smoke, gas and air are thus brought into closer contact with each other in passing through this opening than they would in an ordinary open fire-box, and by admitting a supply of air above the fire, it becomes mixed with the gases both in passing through the opening in the water-table and afterward in what may be called the second or upper chamber of the fire-box. With this fire-box bituminous coal can be burned with less smoke than is produced by any other form of boiler in use. Nearly all the passenger engines and some of the freight engines of the Hudson River division of this road now have this kind of fire-box. The following is a statement of the performance of one of these engines with passenger trains:

placed horizontally, each cylinder cast in one piece with half saddle, so as to be reversible and interchangeable, accurately planed, and fitted, and bolted together.

PISTON,

brass and Babbitt metal packing.

GUIDES

of steel fitted to guide-yoke.

VALVE MOTION,

most approved shifting-link motion, graduated to cut off equally at all points of stroke.

Links made of the best hammered-iron, well case-hardened.

Rock-shafts of wrought-iron, journals 3¼ in. diameter and 10 in. long.

Reverse-shafts made with arms forged on.

DRIVING-WHEELS

4 in number, 61 in. in diameter. Centres of cast-iron, with hollow spokes and rim, and turned to 56 in. diameter to receive tires, and counter-balanced by lead in rim.

Tires of cast-steel, shrunk on wheel centres—all flanged 5½ in. wide and 2½ in. thick when finished.

Crank-pins of Vickers' cast-steel.

Axles of hammered-iron, journals, 6½ in. diameter and 7¾ in. long.

Springs of best quality of cast-steel.

Equalizing-beams of most approved arrangement, with steel bearings.

Connecting-rods of best hammered-iron, furnished with straps, keys and brasses, accurately fitted to gauges.

FRAMES

of hammered-iron, planed, slotted and drilled to templets.

Pedestals cased with cast-iron wedges, to prevent wear by boxes.

PUMPS

made of brass, fitted to gauges with valves and cages of hard metal; plunger of iron; cock in feed-pipe regulated from foot-board.

ENGINE TRUCK,

wrought-iron frame with centre bearing; spoke-wheels of approved pattern, 28 in. diameter. Axles of the best hammered-iron with inside journals, 4½ in. diameter and 8 in. long. Springs of cast-iron.

FURNITURE.

Engine to be furnished with sand-box, alarm and signal-bells, whistle, two safety-valves, steam-gauge, heater and gauge-cocks, etc.; also a com-

engines and some of the freight engines of the Hudson River division of this road now have this kind of fire-box. The following is a statement of the performance of one of these engines with passenger trains:

Total miles run.	No. of trips.	Miles per trip.	Cars per trip.	Miles per hour.	Coal in lbs. consumed per trip.	Lbs. per. mile.	Lbs. per car per mile.
1,761	12	286	6	$37\frac{1}{2}$	$5,271\frac{41}{100}$	$28\frac{3}{4}$	$4\frac{3}{4}$

Figs. 15, 16 and 17 represent the tender of the engine with the arrangement for taking water while running. The spout, which extends from the top of the tender down into a long trough between the trucks, is shown in figs. 15 and 17. This spout has a joint, shown between the axles of the truck in fig. 15, which allows the lower end of the spout to be raised and lowered by means of a lever, shown by dotted lines in the right side of fig. 15. This is connected to one arm of a rock-shaft over the lower end of the spout, and the other arm is connected to the jointed end of the spout. When the engine reaches one of the troughs the lower end of the spout is depressed until its mouth just dips into the surface of the water. The motion of the engine then forces the water up into the tank. One of these troughs is shown in section in fig. 17. They are about 1,200 ft. long. The track alongside of the troughs is laid on longitudinal timbers, so as to raise the top of the rails about flush with the top of the troughs, as shown in fig. 17. The latter are made of wood on the Hudson River road, but on the Pennsylvania road they are made of iron. The kind of fuel used is bituminous coal.

The following are the dimensions of this engine and tender:

WEIGHT AND GENERAL DIMENSIONS.

Gauge of road, - - - - - -	4 ft. 8½ in.
Total weight of locomotive in working order, including two men, - - - - - - -	70,500 lbs.
Total weight on driving-wheels, - - -	44,850 lbs.
Total wheel-base, - - - - -	22 ft. 7 in.
Distance between centre of front and back driving-wheels,	8 ft. 4 in.
Distance from centre of main driving-wheels to centre of cylinders, - - - - -	11 ft. 4 in.
Length of main connecting-rod, from centre to centre of journals, - - - - - -	7 ft. 5¾ in.
Tranverse distance from the centre of one cylinder to the centre of the other, - - - -	6 ft. 1 in.

APPENDIX D

4. Description of Baldwin 4-4-0 Locomotive, 1871

Taken from The Railroad Gazette,
Dec. 23, 1871, 399-400.

Standard Locomotive with 16x24 in. Cylinders

We give with this number engravingsof a standard locomotive with 16x24 in. cylinders, as constructed by the Baldwin Locomotive Works, Philadelphia, M. Baird & Co., Proprietors. We hope to give others of similar engines by the other locomotive firms in America in the next few months. The following is the specification:

Specification of an eight-wheeled road locomotive engine, having four coupled wheels and a four-wheeled swing bolster truck; four the ______ railroad company.

GENERAL DESCRIPTION. Cylinders, 16 inches diameter and 24 inches stroke. Drivers, 60 3/4 inches diameter. Gauge 4 feet 8½ inches. Fuel, wood or soft coal. Weight of engine in working order with fuel and water, about 65,000 pounds; about 41,000 on drivers. Total wheel-base, 21 feet 9 inches. Rigid wheel-base, 8 feet. General design illustrated by the engraving.

BOILER of the Pennsylvania cold-blast charcoal iron, 3-8 inch think; all horizontal seams and junction of waist and fire-box double-riveted. Boiler to be well and thoroughly stayed in all its parts, provided with cleaning holes, etc. Waist, 48 inches in diameter at smoke-box end, made straight and with two domes. Flues of iron with copper ferrules on fire-box end, 144 in number, 2 inches in diameter, and 11 ft. 5 in. in length. Fire-box, 66 inches long and 34½ inches wide inside, 63 inches deep, of best homogeneous cast steel; side, crown and back sheets five-sixteenths inch thick; flue sheet one-half inch thick. Water space three inches sides and back, four inches front. Stay bolts seven-eighths inch diameter, screwed and riveted to sheets, and not over four and one-half inches from center to center. Crown bars made of two pieces of iron four and one-half inches by five-eighths inch, bearing on side sheets, placed not over four and one-half inches from center to center, and secured by bolts screwed through crown, with nut on, and riveted over. Grates, cast iron. Ash pan, with double dampers. Smoke-stack, diamond pattern.

CYLINDERS placed horizontally; each cylinder cast in one piece with half saddle; right and left hand cylinders reversible and interchangeable; accurately planed, fitted and bolted together in the most approved manner.

PISTONS fitted with two brass rings babbited.

GUIDES of iron, case-hardened, fitted to guide-yoke extending across.

VALVE MOTION. Most approved shifting-link motion, graduated to cut off equally at all points of the stroke. Links made of the best hammered iron well case-hardened. Sliding block 4½ inches long with flanges 7 inches long. Rock shafts of wrought iron with journals 3½ inches diameter and 12 inches long. Reverse shaft made with arms forged on.

DRIVING WHEELS, four in number; 60 3/4 inches in diameter. Center of cast iron, with hollow spokes and rims, and turned to 56 inches diameter to receive tires. Tires of cast steel, all flanged, 5½ inches wide and 2 3/8 inches thick when finished. Axles of hammered iron; journals, 7 inches diameter and 8 inches long. Wrist-pins of cast steel. Springs of best quality of cast steel. Connecting rods of best hammered iron, furnished with all necessary straps, keys and brasses, well fitted and finished. Equalizing beams of most approved arrangement, with steel bearings.

FRAMES of hammered iron, forged solid. Pedestals cased with cast-iron gibs and wedges to prevent wear by boxes.

FEED WATER supplied by one No. 5 injector and two pumps, with valves and cages of best hard metal accurately fitted. Plunger of iron. Cock in feed pipe regulated from foot board.

ENGINE TRUCK. Frame, square wrought iron, with center bearing and swing bolsters. Wheels of approved pattern, 28 inches diameter. Axles of best hammered iron, with inside journals 4½ inches diameter and 7½ inches long. Springs of cast steel, connected by equalizing beams.

CAB of good pattern, substantially built of hard wood, well finished and fitted to place.

PILOT of wood.

FURNITURE. Engine to be furnished with sand box, alarm and signal bells whistle, two safety valves, steam and water gauges, heater and gauge cocks, oil-cans, etc., etc. Also a complete set of tools, consisting of two jack screws, pinch bar, monkey, packing and flat wrenches, hammer, chisels, etc.

FINISH. Cylinders lagged with wood and neatly cased with brass. Heads of cast iron, polished. Steam chests with cast-iron tops; bodies cased with brass. Domes lagged with wood, with brass casing on bodies and cast-iron top and bottom rings. Boiler lagged with wood and neatly jacketed with Russia iron secured by brass bands polished.

GENERAL FEATURES OF CONSTRUCTION. All principal parts of engine accurately fitted to gauges and thoroughly interchangeable. All movable bolts and nuts and all wearing surfaces made of steel or iron case-hardened. All wearing brasses made of ingot copper and tin, alloyed in the proportion of seven parts of the former to one of the latter.

TENDER on 8 wheels, 30 inches diameter; axles of best hammered iron; outside journals, 3½ inches diameter and 6 inches long; oil-tight boxes with brass bearing. Springs of cast steel equalized. Tank well put together, with angle-iron corners and strongly braced. Top and bottom plates of No. 6 iron; side plates of No. 8 iron. Capacity, 2,000 gallons.

PAINTING. Engine and tender to be handsomely painted and varnished.

[*The references to figures, under each title, are to the plates in the latter portion of the book.*]

STANDARD AMERICAN LOCOMOTIVE.

By the Baldwin Locomotive Works.

Figs. 1, 2 and 3.

The engravings, figs. 1, 2 and 3, represent a standard American locomotive with 16 × 24 in. cylinders, as constructed in 1877 by the Baldwin Locomotive Works, Philadelphia.

The following is the specification to which this engine was built:

Specification of an eight-wheeled road locomotive engine, having four coupled wheels and a four-wheeled swing-bolster truck.

GENERAL DESCRIPTION.

Cylinders, 16 in. diameter and 24 in. stroke.

Driving-wheels, 60¾ in. diameter.

Gauge, 4 ft. 8½ in.

Fuel, wood or soft coal.

Weight of engine in working order with fuel and water, about 65,000 pounds; about 41,000 on driving-wheels.

Total wheel-base, 21 ft. 9 in.

Rigid wheel-base, 8 ft. General design illustrated by the engraving.

BOILER

of Pennsylvania cold-blast charcoal iron, ⅜ in. thick; all horizontal seams and junction of waist and fire-box double riveted. Boiler to be well and thoroughly stayed in all its parts, provided with cleaning holes, etc.

Waist, 48 in. in diameter at smoke-box end, made straight with two domes.

Flues of iron with copper ferrules on fire-box end, 144 in number, 2 in. in diameter, and 11 ft. 5 in. in length.

Fire-box, 66 in. long and 34½ in. wide inside, 63 in. deep, of best homogeneous cast-steel; side, crown and back sheets $\frac{5}{16}$ in. thick; flue-sheet ½ in. thick. Water space, 3 in. sides and back, 4 in. front.

Stay-bolts ⅞ in. diameter, screwed and riveted to sheets, and not over 4½ in. from centre to centre. Crown-bars made of two pieces of iron 4½ × ⅝ in., bearing on side sheets, placed not over 4½ in. from centre to centre, and secured by bolts screwed through crown, with nut on, and riveted over.

Grates, cast-iron.

Ash-pan, with double dampers.

Smoke-stack, diamond pattern.

CYLINDERS

placed horizontally; each cylinder cast in one piece with half saddle; right and left hand cylinders reversible and interchangeable; accurately planed, fitted and bolted together in the most approved manner.

PISTONS

fitted with two brass rings babbited.

GUIDES

of iron, case-hardened, fitted to guide-yoke extending across.

VALVE-MOTION.

Most approved shifting-link motion, graduated to cut off equally at all points of the stroke.

Links made of the best hammered-iron, well case-hardened.

Sliding-block, 4½ in. long with flanges 7 in. long.

Rocker-shafts of wrought-iron with journals 3½ in. diameter and 12 in. long.

Reverse-shaft made with arms forged on.

DRIVING-WI

four in number; 60¾ in. in diameter.

Centres of cast-iron, with hollow sp in. diameter to receive tires.

Tires of cast-steel, all flanged, 5½ finished.

Axles of hammered-iron; journals,

Wrist-pins of cast-steel.

Springs of best quality of cast-steel.

Connecting-rods of best hammered- straps, keys and brasses, well fitted and

Equalizing-beams of most approved

FRAME

of hammered-iron, forged solid.

Pedestals cased with cast-iron gibs an

FEED WA

supplied by one No. 5 injector and two best hard metal accurately fitted. Plung- ulated from foot-board.

ENGINE TR

Frame, square wrought-iron, with Wheels of approved pattern, 28 in. di mered-iron, with inside journals 4½ in. in of cast-steel connected by equalizing-bea

CAB

of good pattern, substantially built of har place.

PILOT

of wood.

FURNITU

Engine to be furnished with sand bo two safety-valves, steam and water-gau cans, etc., etc. Also a complete set screws, pinch-bar, monkey, packing and

FINISH.

Cylinders lagged with wood and ne cast-iron, polished. Steam-chests with brass. Domes lagged with wood, with iron top and bottom rings. Boiler lagg with Russia-iron secured by brass bands

GENERAL FEATURES OF

All principal parts of engine accurat interchangeable. All movable bolts a made of steel or iron case-hardened. copper and tin, alloyed in the proportion one of the latter.

TENDE

on eight wheels, 30 in. diameter; axle journals, 3¼ in. diameter and 6 in. long ings. Springs of cast-steel equalized angle-iron corners and strongly braced. iron. Capacity, 2,000 gallons.

PAINTIN

Engine and tender to be handsome

DESCRIPTIONS AND SPECIFICATIONS.

[...e references to figures, under each title, are to the plates in the latter portion of the book.]

AMERICAN LOCOMOTIVE.

Baldwin Locomotive Works.

Figs. 1, 2 and 3.

2 and 3, represent a standard American loco-
lders, as constructed in 1877 by the Baldwin
phia.

cification to which this engine was built :

-wheeled road locomotive engine, having four
heeled swing-bolster truck.

NERAL DESCRIPTION.

r and 24 in. stroke.
diameter.

king order with fuel and water, about 65,000
ving-wheels.
9 in.

General design illustrated by the engraving.

BOILER

charcoal iron, 3/8 in. thick ; all horizontal
nd fire-box double riveted. Boiler to be well
its parts, provided with cleaning holes, etc.
er at smoke-box end, made straight with two

per ferrules on fire-box end, 144 in number,
t. 5 in. in length.
nd 34½ in. wide inside, 63 in. deep, of best
le, crown and back sheets 5/16 in. thick ; flue-
pace, 3 in. sides and back, 4 in. front.
er, screwed and riveted to sheets, and not over
re. Crown-bars made of two pieces of iron
sheets, placed not over 4½ in. from centre to
ts screwed through crown, with nut on, and

ampers.
pattern.

CYLINDERS

linder cast in one piece with half saddle ; right
rsible and interchangeable ; accurately planed,
the most approved manner.

PISTONS

abbited.

GUIDES

de-yoke extending across.

-MOTION.

otion, graduated to cut off equally at

red-iron, well case-hardened.
flanges 7 in. long.
with journals 3½ in. diameter and 12

forged on.

DRIVING-WHEELS

four in number ; 60¾ in. in diameter.

Centres of cast-iron, with hollow spokes and rims, and turned to 56 in. diameter to receive tires.

Tires of cast-steel, all flanged 5½ in. wide and 2⅜ in. thick when finished.

Axles of hammered-iron ; journals, 7 in. diameter and 8 in. long.

Wrist-pins of cast-steel.

Springs of best quality of cast-steel.

Connecting-rods of best hammered-iron, furnished with all necessary straps, keys and brasses, well fitted and finished.

Equalizing-beams of most approved arrangement, with steel bearings.

FRAMES

of hammered-iron, forged solid.

Pedestals cased with cast-iron gibs and wedges to prevent wear by boxes.

FEED WATER

supplied by one No. 5 injector and two pumps, with valves and cages of best hard metal accurately fitted. Plunger of iron. Cock in feed-pipe regulated from foot-board.

ENGINE TRUCK.

Frame, square wrought-iron, with centre-bearing and swing-bolster. Wheels of approved pattern, 28 in. diameter. Axles of the best hammered-iron, with inside journals 4½ in. in diameter and 7½ in. long. Springs of cast-steel connected by equalizing-beams.

CAB

of good pattern, substantially built of hard wood, well finished and fitted to place.

PILOT

of wood.

FURNITURE.

Engine to be furnished with sand box, alarm and signal-bells, whistle, two safety-valves, steam and water-gauges, heater and gauge-cocks, oil-cans, etc., etc. Also a complete set of tools, consisting of two jack-screws, pinch-bar, monkey, packing and flat wrenches, hammer, chisels, etc.

FINISH.

Cylinders lagged with wood and neatly cased with brass. Heads of cast-iron, polished. Steam-chests with cast-iron tops ; bodies cased with brass. Domes lagged with wood, with brass casings on bodies and cast-iron top and bottom rings. Boiler lagged with wood and neatly jacketed with Russia-iron secured by brass bands polished.

GENERAL FEATURES OF CONSTRUCTION.

All principal parts of engine accurately fitted to gauges and thoroughly interchangeable. All movable bolts and nuts and all wearing surfaces made of steel or iron case-hardened. All wearing brasses made of ingot copper and tin, alloyed in the proportion of seven parts of the former to one of the latter.

TENDER

on eight wheels, 30 in. diameter ; axles of best hardened-iron ; outside journals, 3¼ in. diameter and 6 in. long ; oil-tight boxes with brass bearings. Springs of cast-steel equalized. Tank well put together, with angle-iron corners and strongly braced. Top and bottom plates of No. 6 iron. Capacity, 2,000 gallons.

PAINTING.

Engine and tender to be handsomely painted and varnished.

APPENDIX F

Jupiter-Type Locomotive Diagrams

APPENDIX F

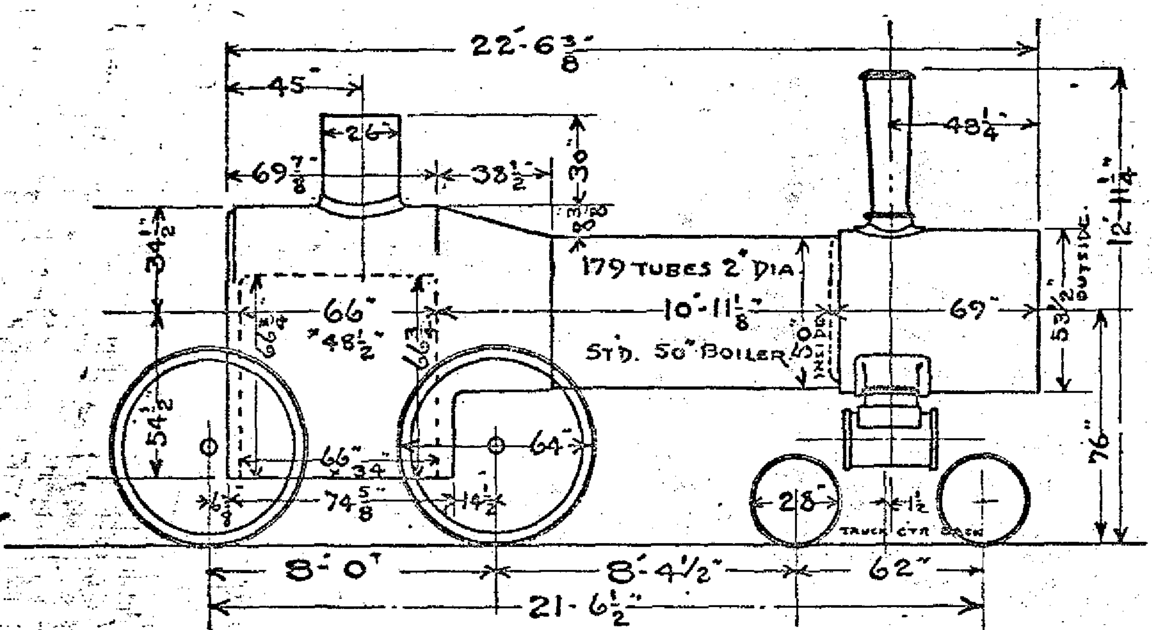
1. Diagram of Rebuilt Schenectady-built 4-4-0 Jupiter type Locomotive, SP RR, 1895.

DIAGRAM OF 16"×24" 8 WHEEL SCHEN. ENGINE 1228 REBUILT.

OFFICE SUPT. M.P.&M. S.P.CO. SACRAMENTO. SEPT. 20. 1895

1 ENGINE THIS CLASS IN SERVICE............SEPT. 1895.

ENGINE WENT INTO SERVICE..................AUG. 26. 1892.



CYLINDERS 16" DIA. X 24" STROKE. DRIVERS 64" DIA. 3 1/2"

WEIGHT OF ENGINE LOADED.	80150	LBS	
" ON TRUCK.	29550	"	
" " DRIVERS.	50600	"	
" " " PER CENT.	63	13 "	
GRATE SURFACE.	15	58 SQ.	FT
HEATING SURFACE IN FIRE BOX.	104	5 "	"
" " OUTSIDE OF TUBES.	1015	5 "	"
" " TOTAL.	1120	0 "	"
" " PER SQ. FT. OF GRATE.	71	88 "	"
" " " " IN. CYL. AREA.	2	78 "	"
CYL. AREA PER SQ. IN. OF FLUE OPENING.	0	93 "	INS
BOILER PRESSURE ALLOWED.	150	LBS	

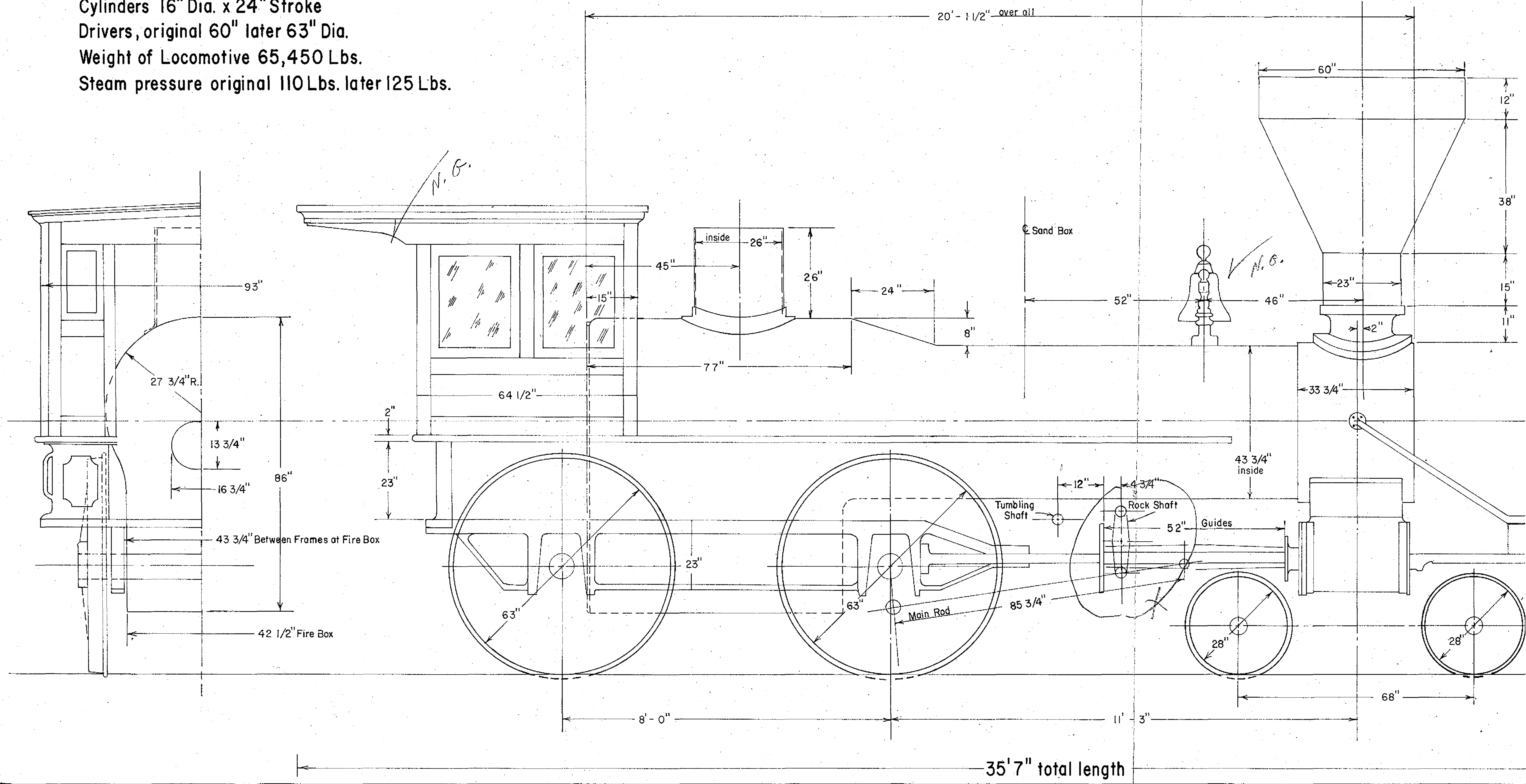
From files of Southern Pacific Co.

Joslyn Drawings

APPENDIX F

2. David L. Joslyn Diagram of Jupiter, drawn 1944, SP RR

Cylinders 16" Dia. x 24" Stroke
Drivers, original 60" later 63" Dia.
Weight of Locomotive 65,450 Lbs.
Steam pressure original 110 Lbs. later 125 Lbs.



X NOT OK AS SHOWN IN JUPITER

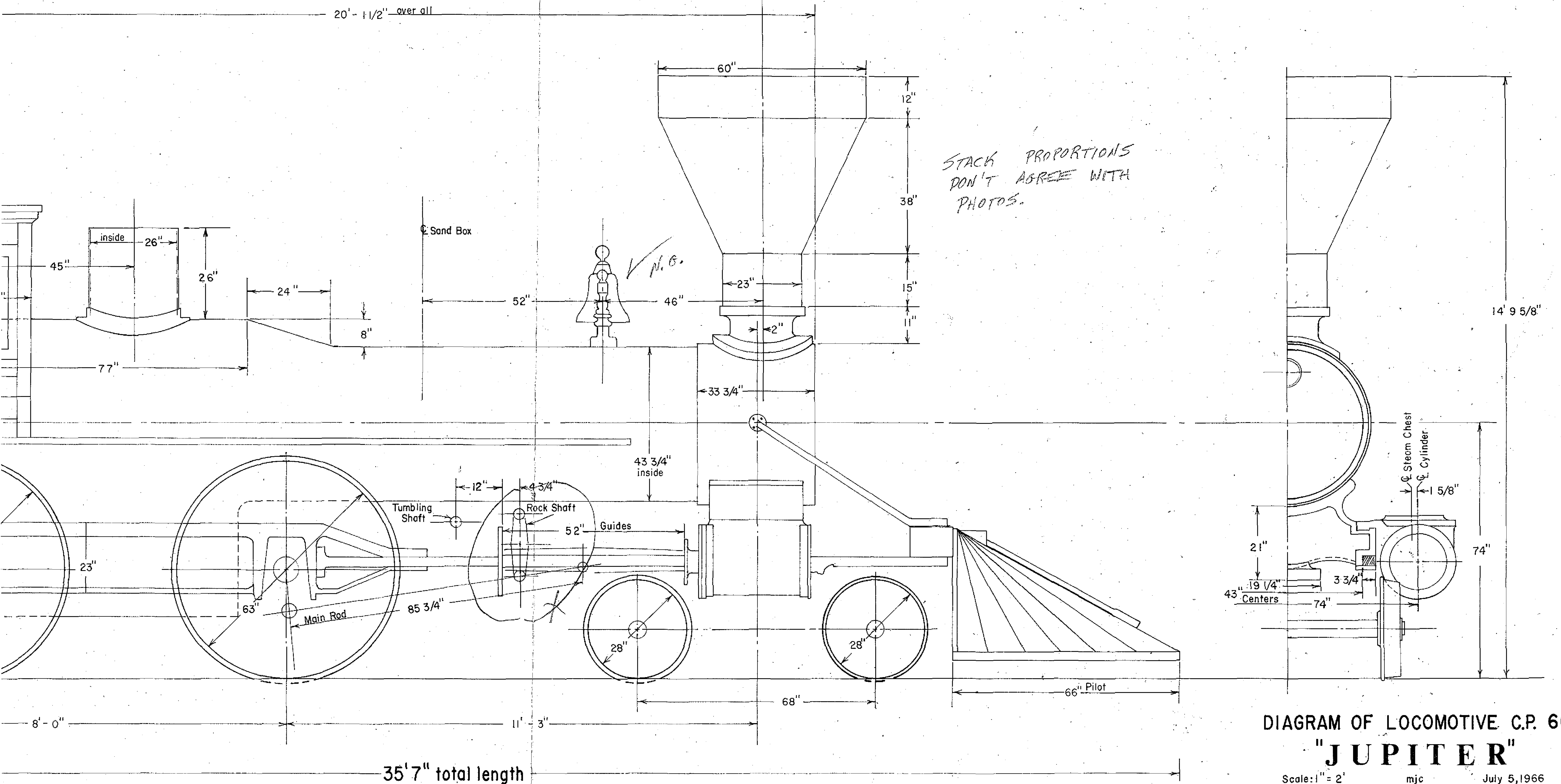
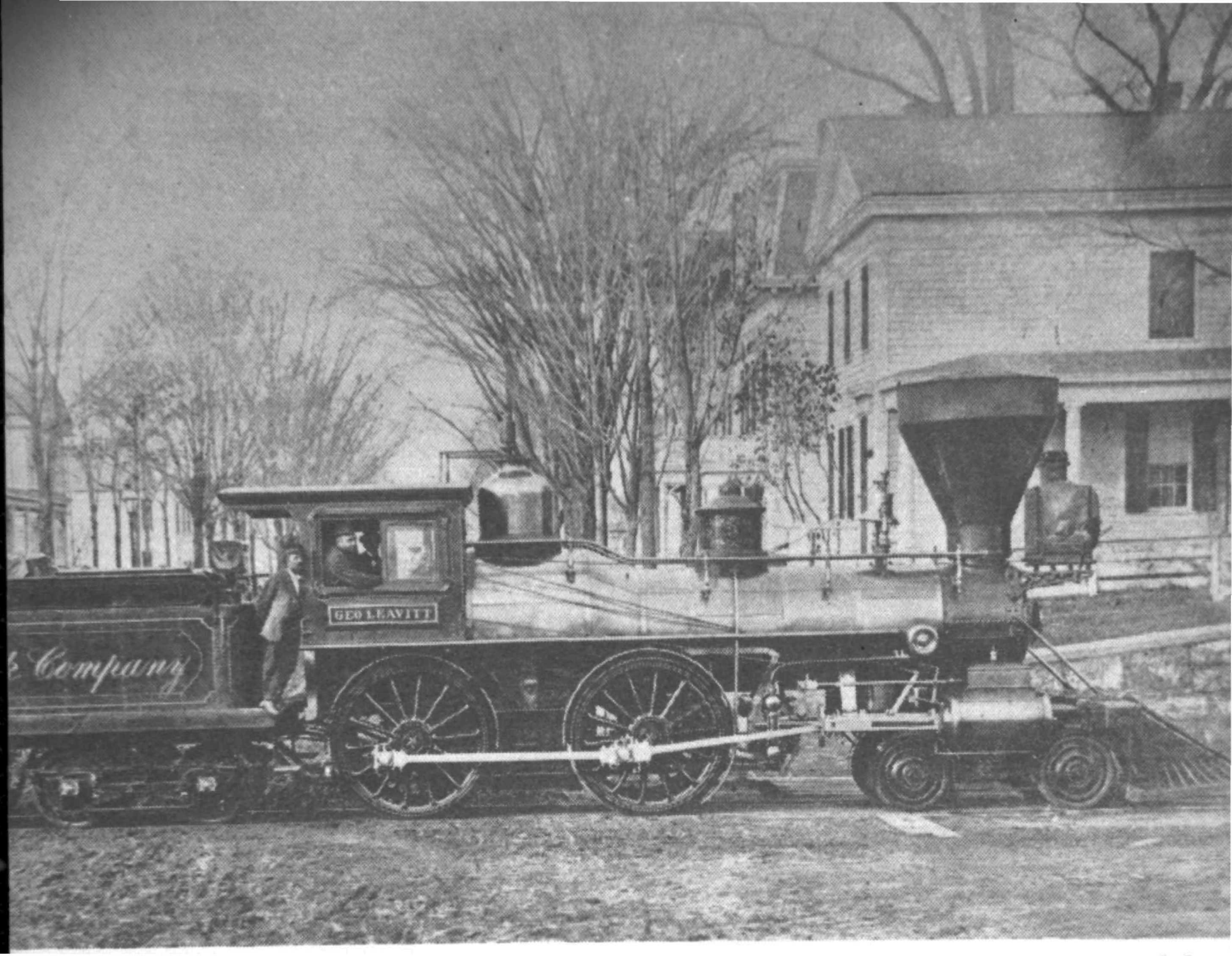


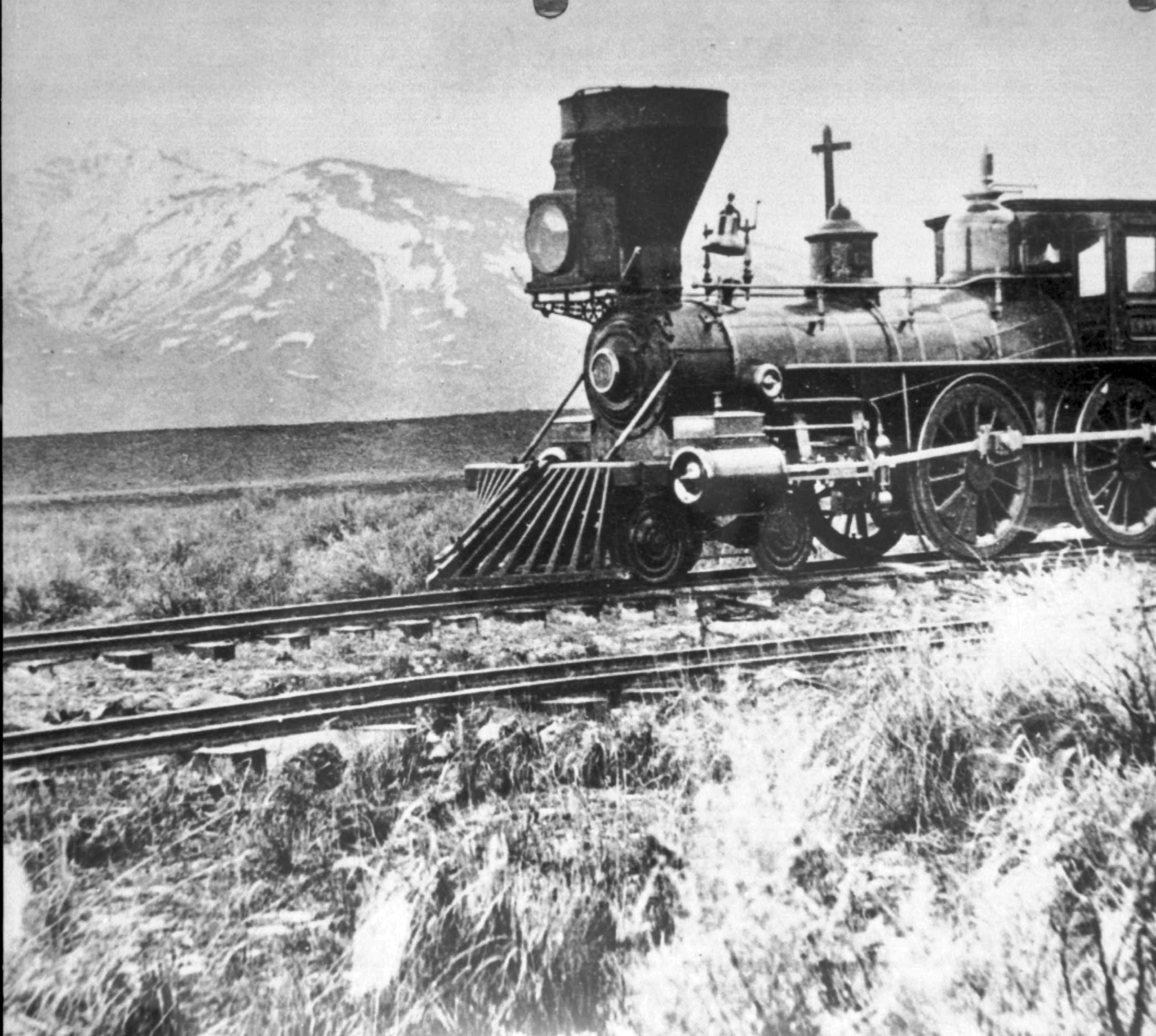
DIAGRAM OF LOCOMOTIVE C.P. 60
"JUPITER"
Scale: 1" = 2' mjc July 5, 1966

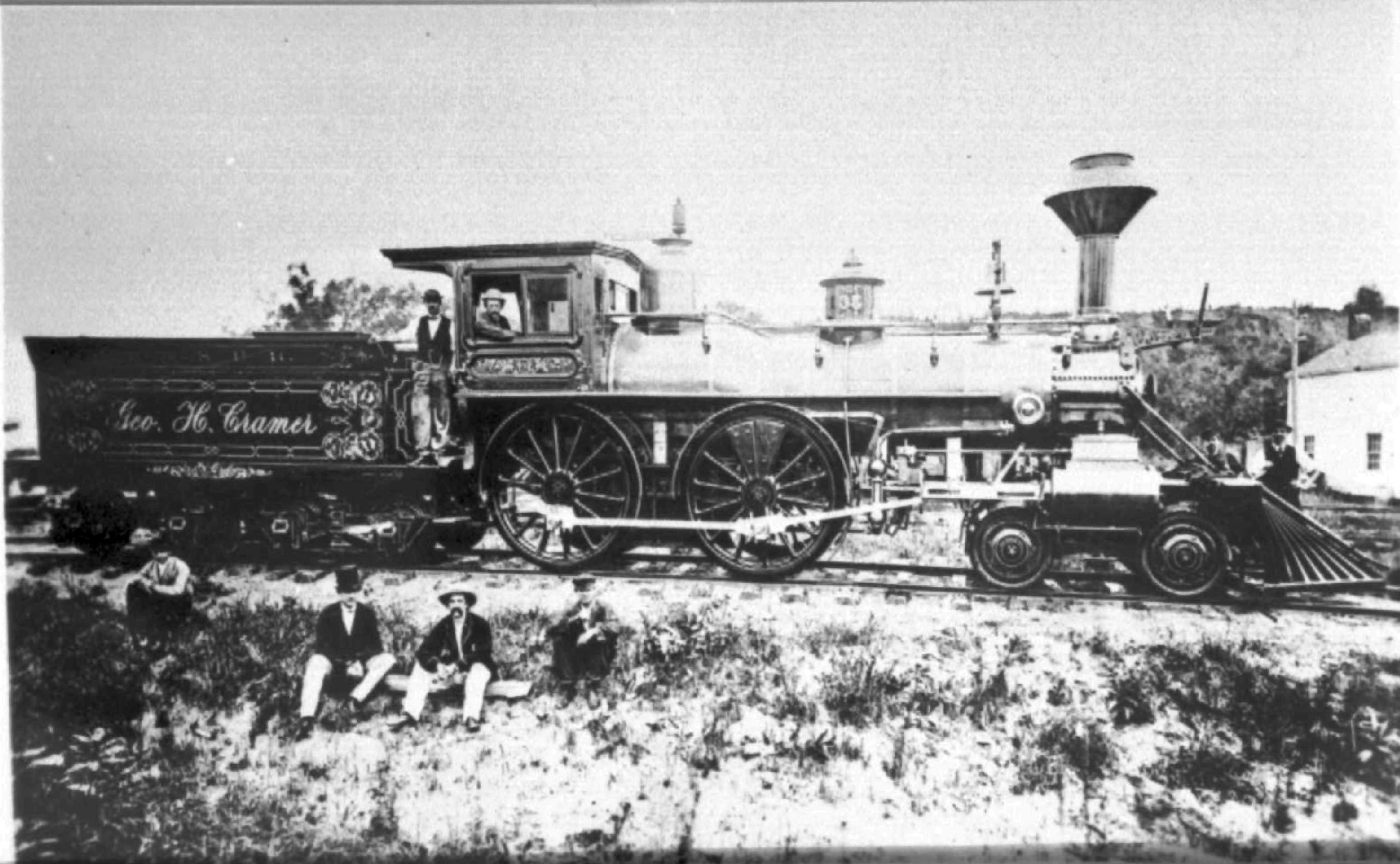
X NOT OK AS SHOWN IN JUPITER PHOTOS.

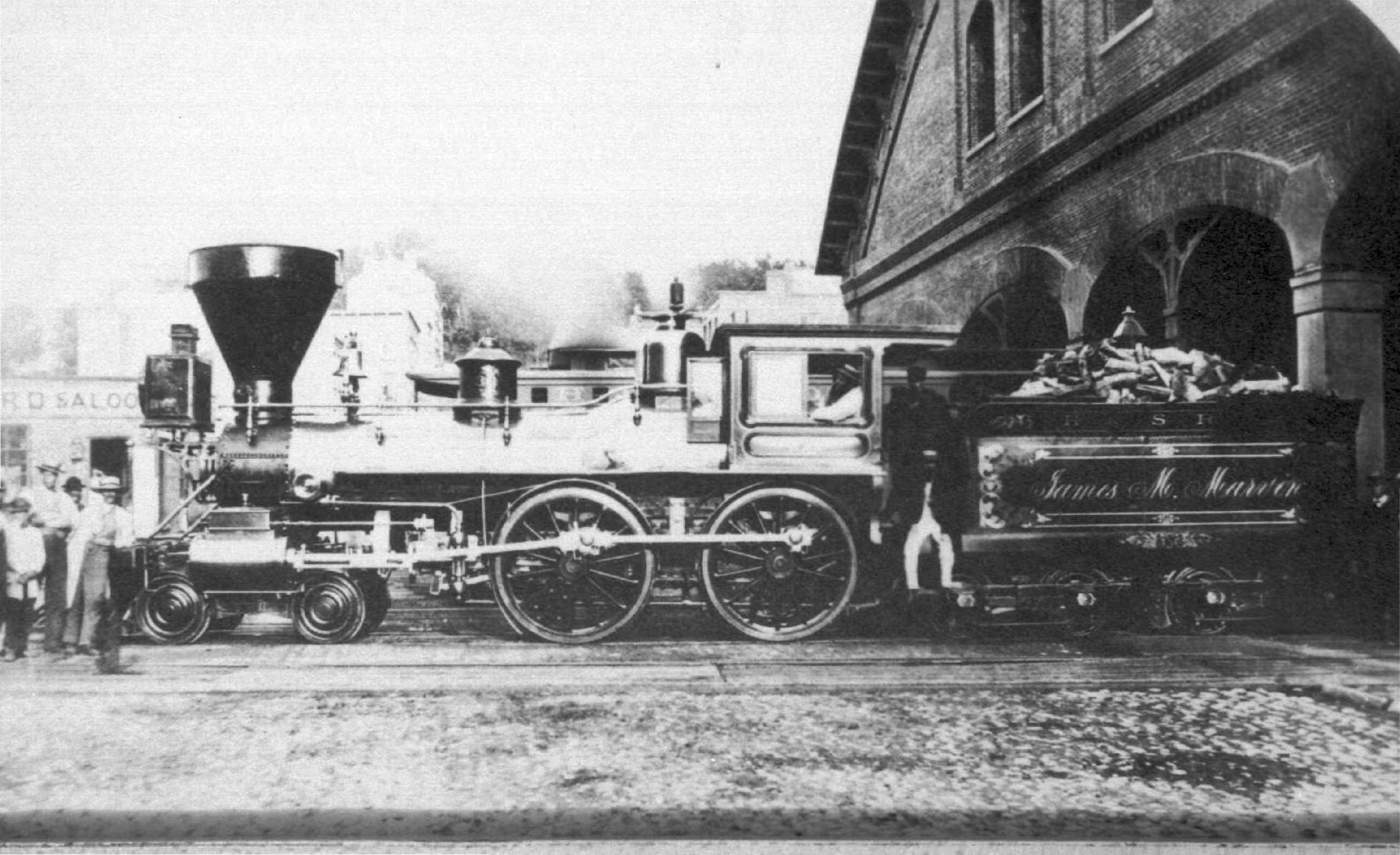
Redrawn from original print carrying initials "D.L.J. 7/5/44 Sac."

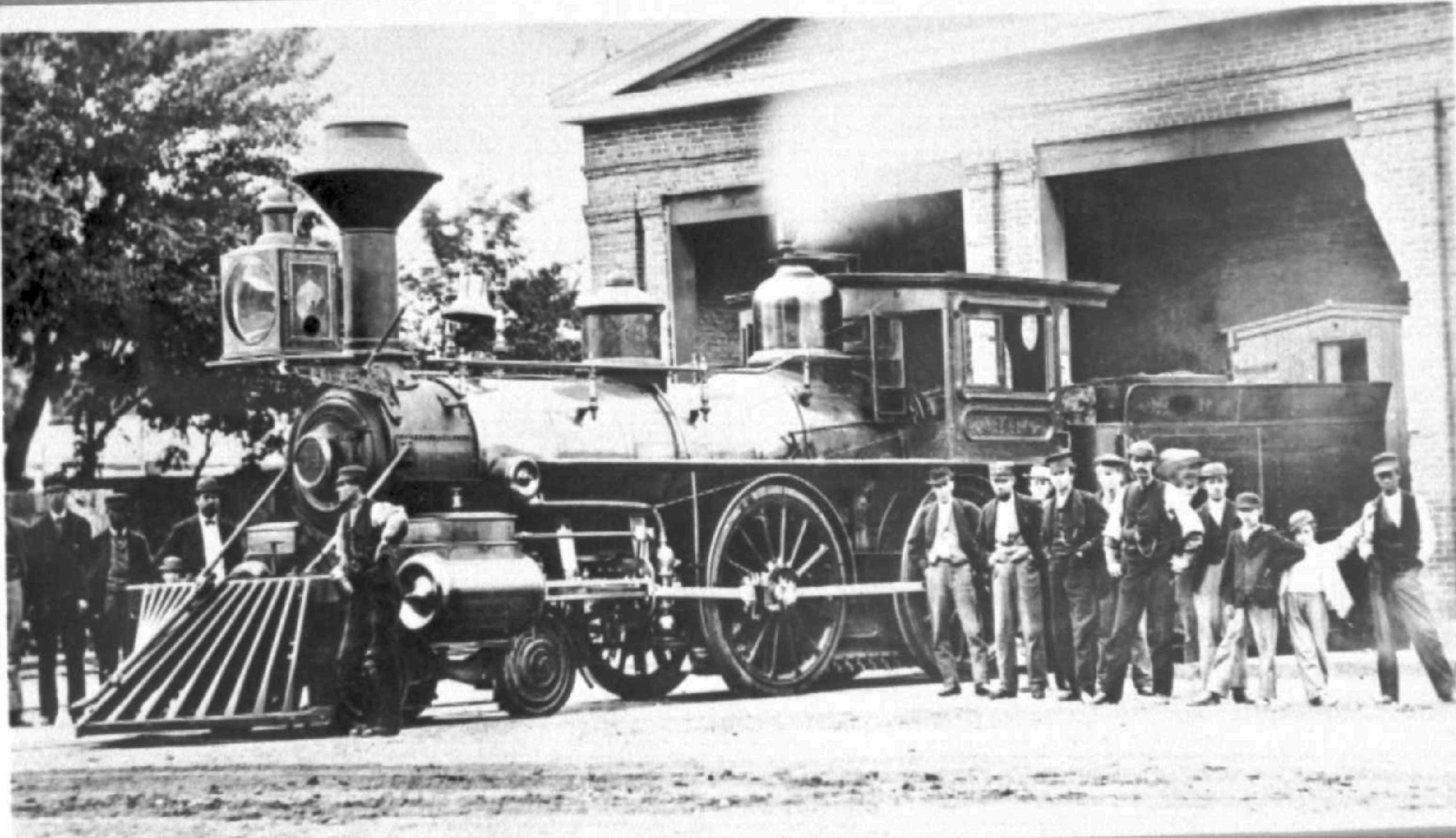
C.E. 35145 Drawer 2087

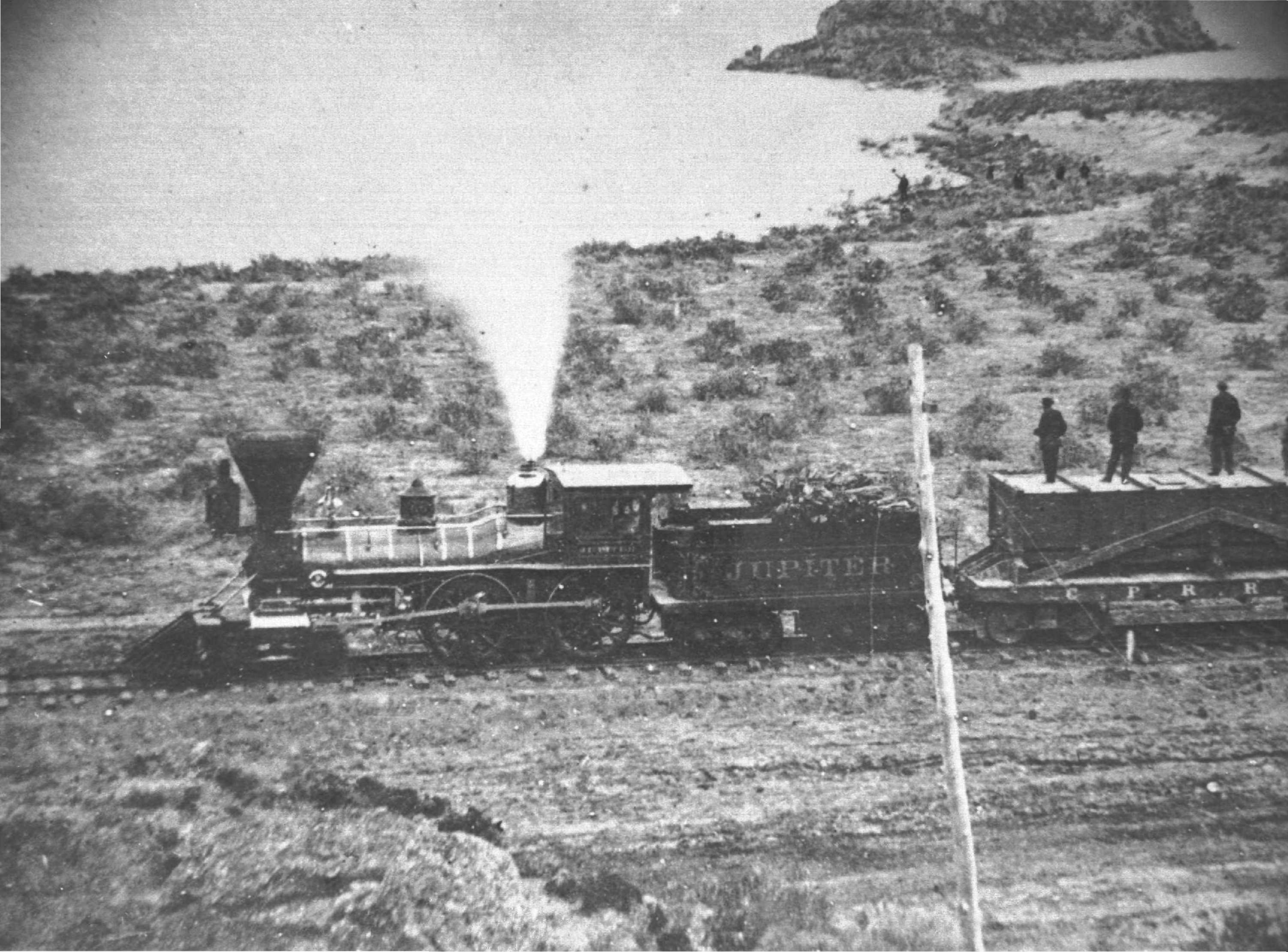

Company
GEO LEAVITT



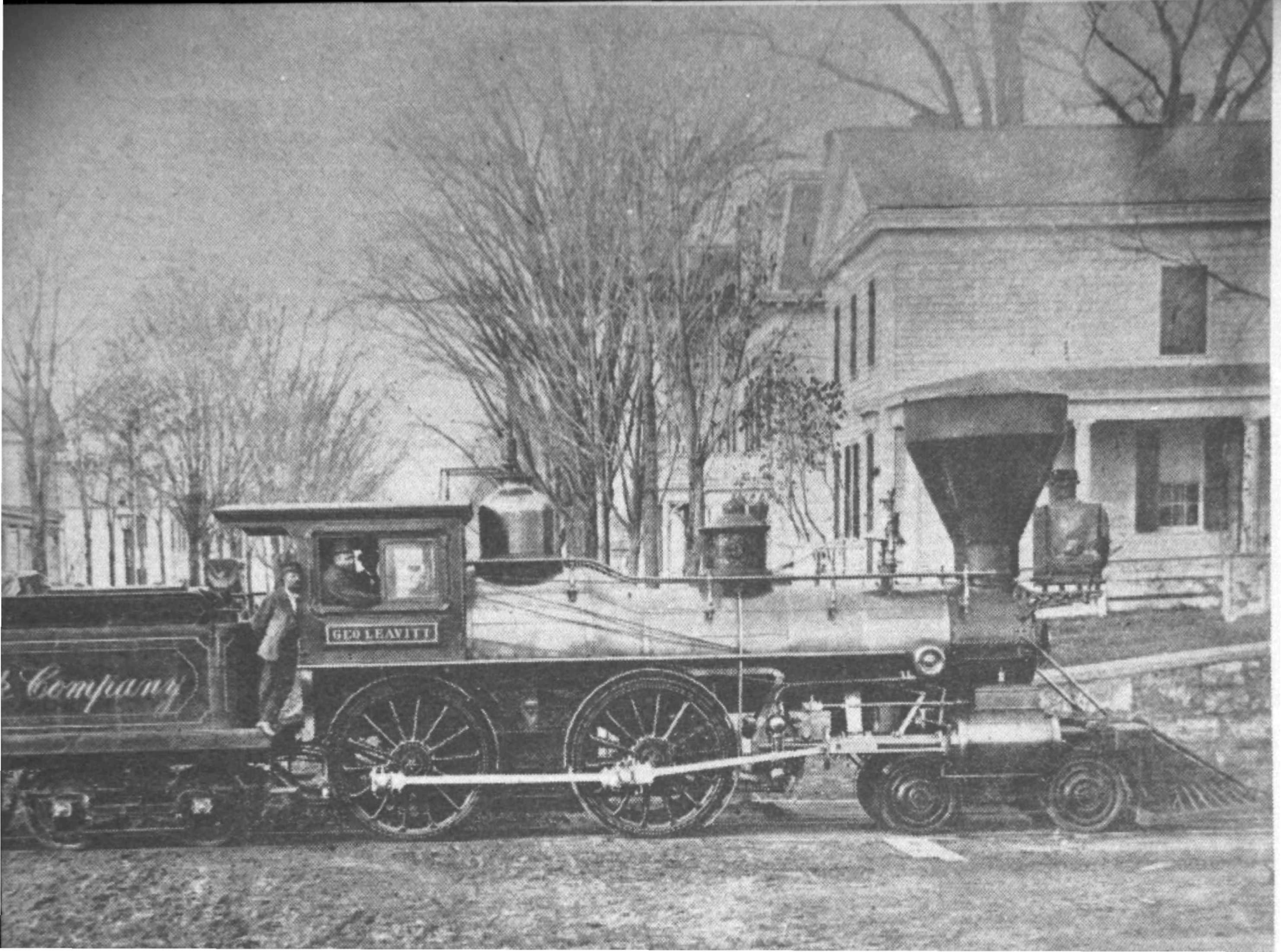

Geo. H. Cramer

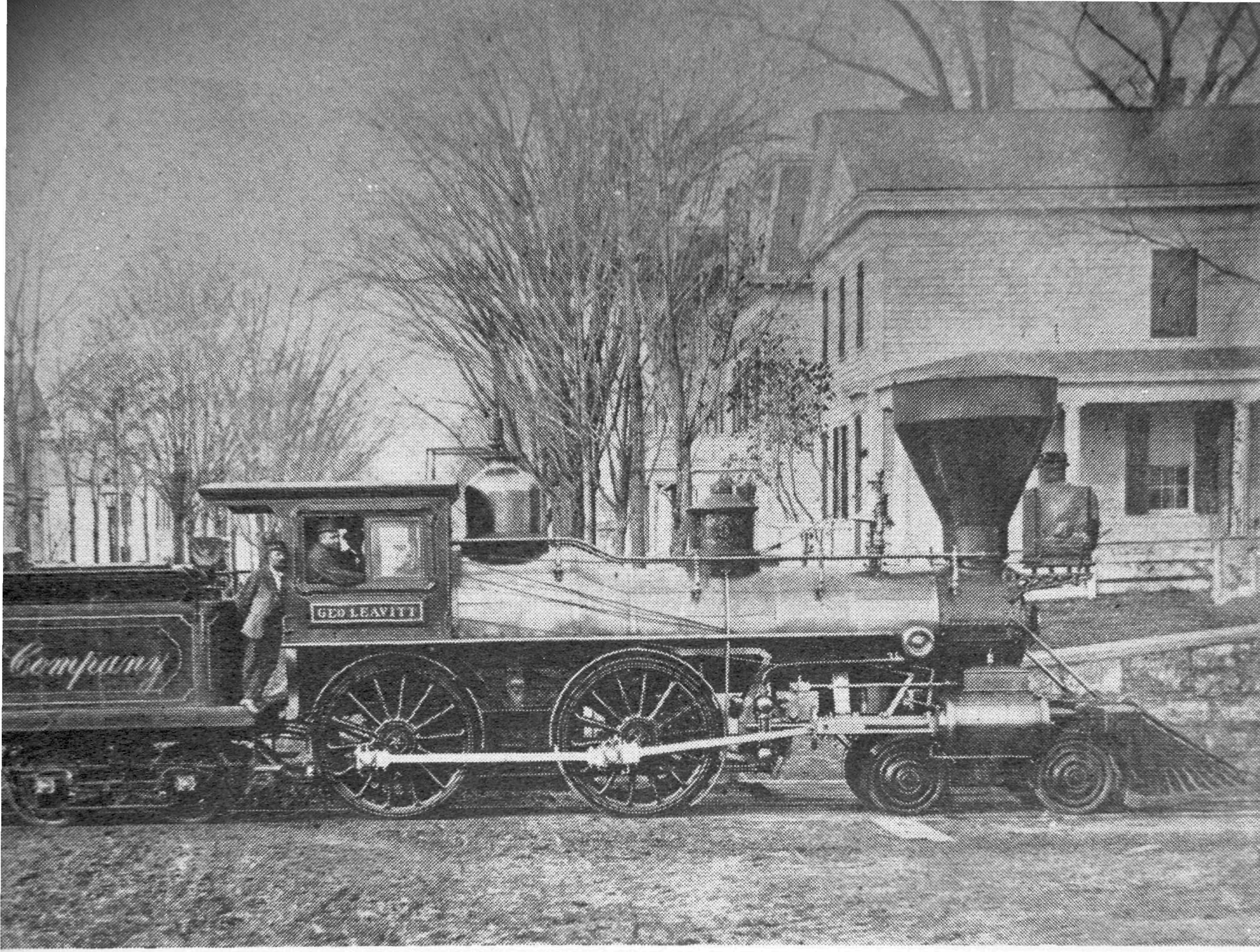

James M. Marvin





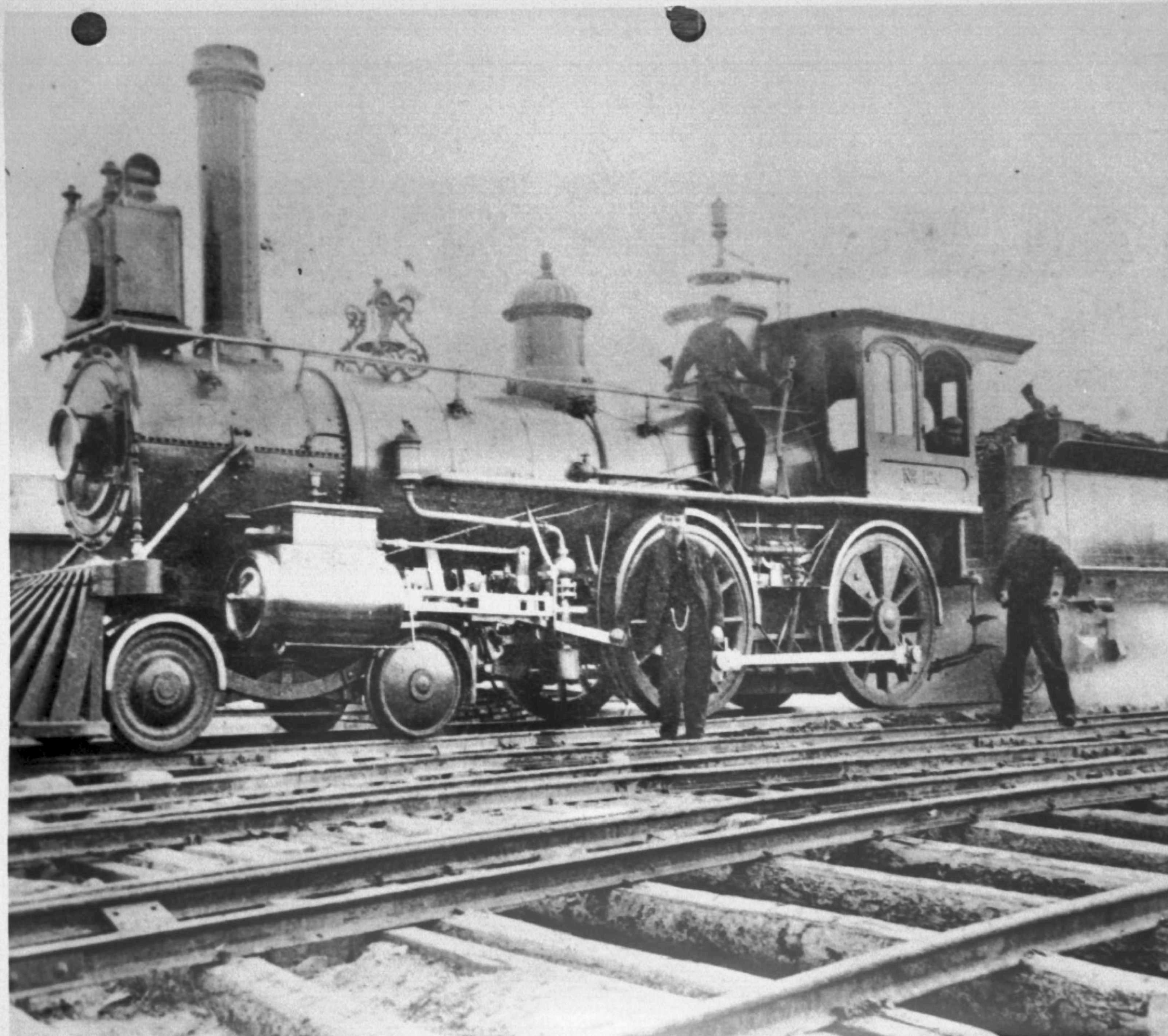
JUPITER
C. P. R. R.

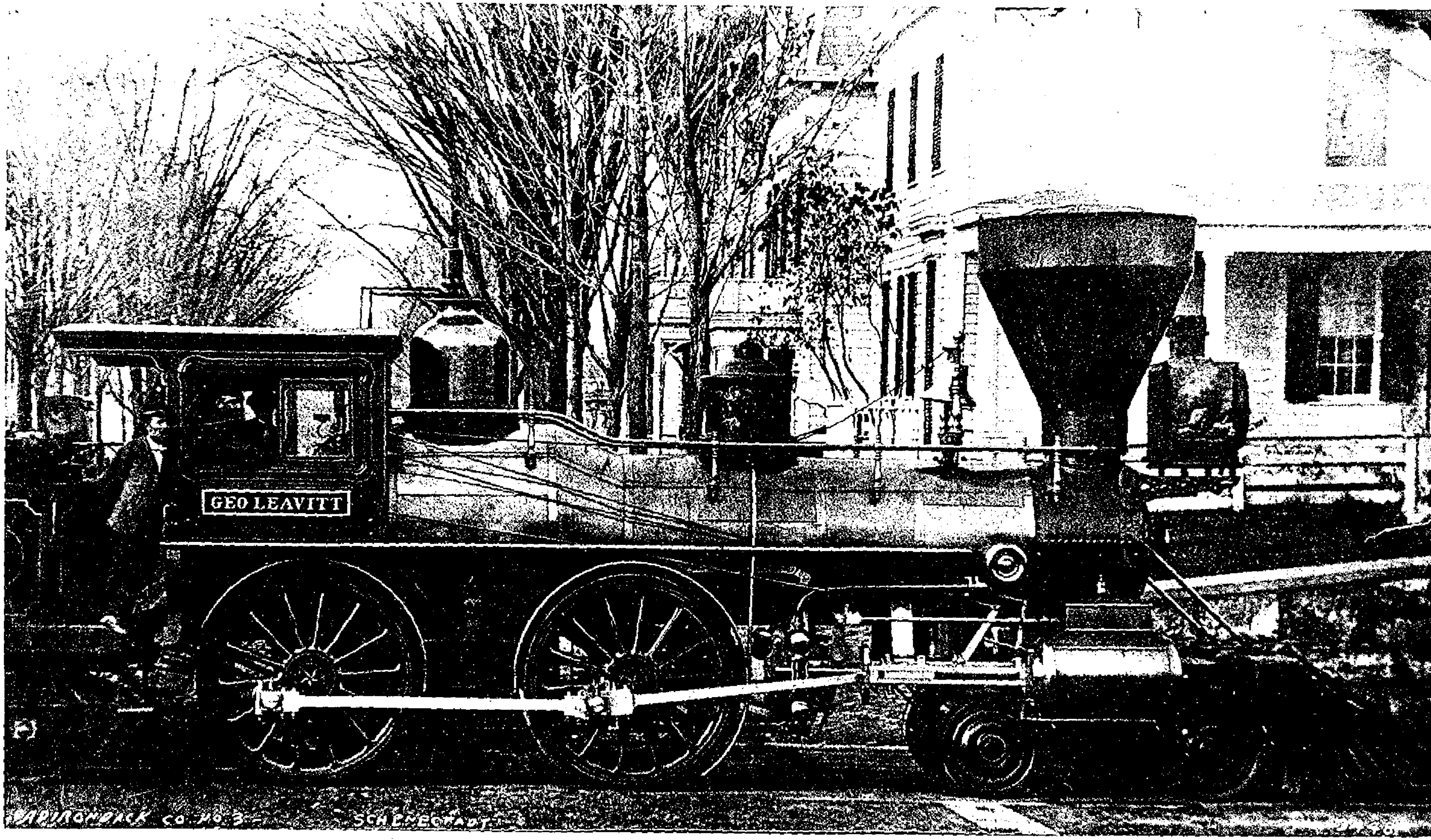

GEO LEAVITT
Company


GEO LEAVITT
Company

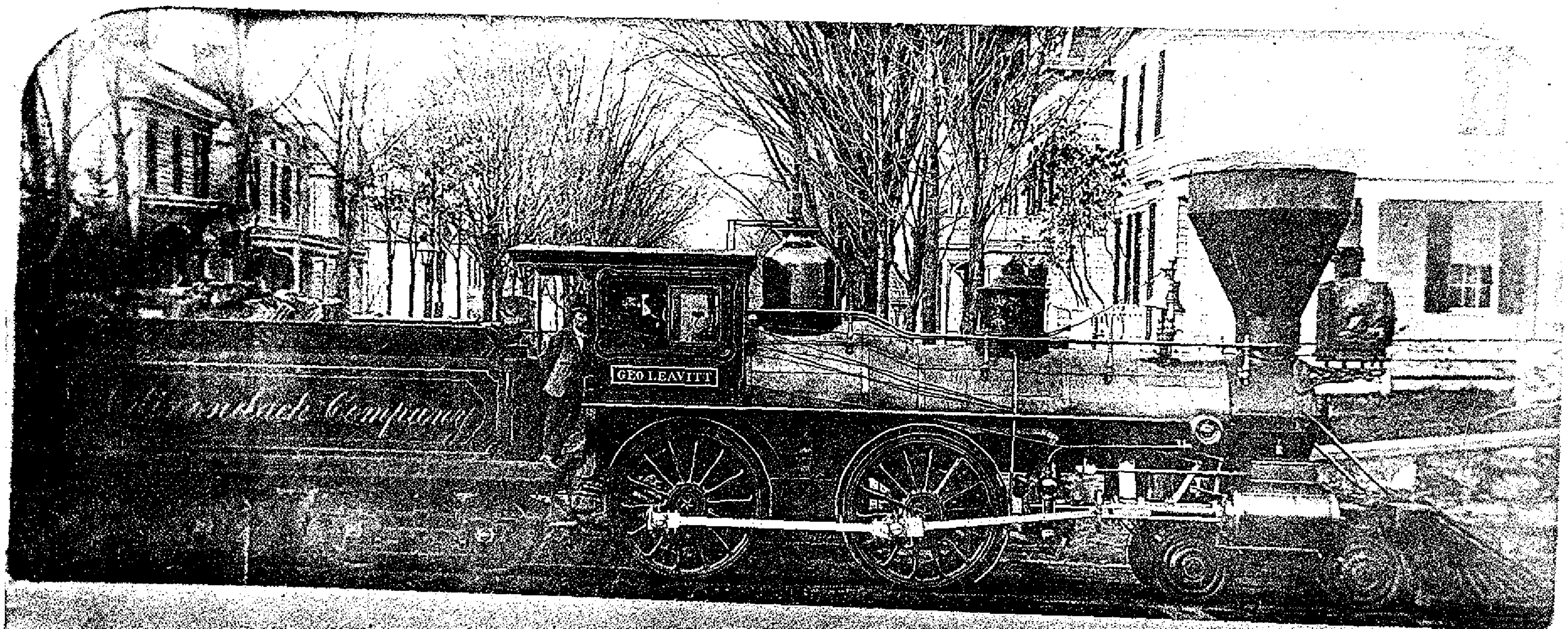

JUPITER
JUPITER


119





431 / D-62
U.P. Locomotive
Part IV



N.Y.C.
ADIRONDACK CO. No 3 - GEO. LEAVITT,
"McQUEEN"

3446

APPENDICES E AND G

PHOTOGRAPHS OF U.P. #119 AND C.P. #60 AND SIMILAR LOCOMOTIVES

Appendix E assembles all the photographs the writer has found of Union Pacific locomotive #119, sister locomotives, and engines of the same or nearly the same specifications that he thought might be useful in the preparation of construction drawings from which a replica of the original locomotive could be manufactured. Appendix G does the same thing for Central Pacific locomotive #60, Jupiter.

A given photograph may have clear delineation of some one or several features of the locomotive, others may not show these features at all but others will, and still other photographs will add details not found in any other photograph. Thus, by a close study of all the available photographs, a draftsman can determine quite accurately certain points to be shown that would not otherwise be clear from any of the other research data. These photographs are considered important. What they show cannot be gainsaid.

I have omitted all photographs of engines that have been modified or painted to represent #119 and #60 in the several railroad fairs since the 1920's. They could only be misleading and add confusion. None of them was even reasonably accurate. Likewise, I have not shown any lithographs or paintings of old engines, as their value might be questionable.

The pictures included here do not exhaust those that must be available in collections, private and public, throughout the United States. They do represent what I could find in the places I visited and the help given by some of the best authorities in this field in the country. There are several large collections of stereographic cards that I have not had a chance to examine that may have other views of these locomotives. The stereo views must be considered one of the best sources for photographs of these old historic engines. William D. Pattison has mentioned several of these larger collections in the two articles of his that I cite in the narrative part of this report.

In collecting these pictures I often found copies of certain views in different places, some cropped more than others, and in different ways varying slightly. Most of them were copied from prints located elsewhere, and in the process of endless copying most of them had lost clearness. In these cases, I used the picture that had retained most of the original exposure and was clearest. In general, I found that the stereo views had the largest area of the original exposure and were better than most of the prints in the various collections.

In arranging the photographs an effort was made to group them around the two principal objects of study, #119 and #60. In one important grouping, however, this could not be done for both. This is the group that was taken at the Promontory Summit ceremonies on May 10, 1869, at the joining of the rails. These photographs in most instances show both #119 and #60. They have been grouped in Appendix E with Union Pacific #119. It is obvious, of course, that they apply equally to Central Pacific #60, and should be used in that connection. They have not been repeated in Appendix G.

Several photographs of the Promontory site that do not show locomotives have been included here as being useful in resolving other related development problems at the historic site.

Roy E. Appleman

APPENDICES E AND G

LIST OF PHOTOGRAPHS, REPORT ON UNION PACIFIC LOCOMOTIVE #119

AND CENTRAL PACIFIC LOCOMOTIVE #60, JUPITER

Appendix E -- Union Pacific #119

a. #119 (Photos Nos. 1-6)

1. U.P. locomotive #119 at Promontory Summit, May 10, 1869
2. U.P. locomotive #119 on trestle, North Promontory Range
3. U.P. locomotive #119 with flatcars on trestle, North Promontory Range
4. U.P. locomotive #119 and tender
5. U.P. locomotive #119 and tender
6. ~~U.P. locomotive #119 and tender~~

b. Sister Locomotives to #119 (Photos Nos. 7-13)

7. U.P. locomotive #116
8. U.P. locomotive #117
9. U.P. locomotive #117
10. U.P. locomotive #117
11. U.P. locomotive #120
12. U.P. locomotive #120
13. U.P. locomotive, Seminole, 1868.

c. #119 and Jupiter at Golden Spike ceremonies, May 10, 1869 (Photos Nos. 14-31)

14. First Greeting of the Iron Horse, Promontory
15. Gap in Rail Line at Golden Spike site
16. Gap in Rail Line at Golden Spike site
17. Before Laying of Last Rail, Promontory, Utah
18. Laying Last Rail, Promontory, #119 and Jupiter
19. Jupiter and #119 at Promontory
20. Jupiter and #119, The Last Rail--The Invocation: Fixing the Wire
21. Jupiter and #119, East and West Shaking Hands at Laying Last Rail
22. Golden Spike Ceremony
23. #119 and train, Officers of U.P. Railroad at Ceremony Last Rail
24. #119 and Jupiter pilot to pilot at Promontory
25. #119 on East side of Rail Gap
26. #119 and Officials at Golden Spike Ceremony
27. C.P. Jupiter and Governor Stanford's Train
28. U.P. Vice Pres. Durant's cars and Engineers of U.P. at Ceremony
29. U.P. dignitaries at Last Rail Ceremony
30. Golden Spike site July 1869
31. Golden Spike site July 1869

APPENDICES E AND G

List of Photographs (Continuation)

d. The Golden Spike (Photos Nos. 32-34)

32. Head and Two Sides of Golden Spike and Inscriptions
33. Other Two Sides of Golden Spike and Inscriptions
34. Inscription on Fourth Side of Golden Spike

APPENDIX G -- Central Pacific #60, Jupiter

a. #60, Jupiter (Photos Nos. 35-42)

35. Central Pacific Railroad Station, Sacramento, 1869
36. Jupiter and Governor Stanford's Train at Monument Point
37. Jupiter and Governor Stanford's Train at Monument Point
38. Jupiter and Governor Stanford's Train at Monument Point
39. Jupiter and Tender at Promontory Summit
40. Jupiter and Governor Stanford's Train Enroute to Promontory
41. Ex-Jupiter, 1902
42. Ex-Jupiter, 1904

b. Sister Locomotives to #60, Jupiter (Photos Nos. 43-50)

43. Central Pacific locomotive #162, Flash
44. Central Pacific locomotive #149, Black Fox
45. Central Pacific locomotive #63, Leviathan
46. Central Pacific locomotive #158, Eureka
47. Schenectady locomotive, Factory No. 472
48. Union Pacific locomotive,#125, renumbered 368
49. Union Pacific locomotive #23
50. Rensseller & Saratoga locomotive #36, E. Thompson Gale

c. Union Pacific and Central Pacific Roadbeds (Photos Nos. 51-55)

51. U.P. Track at Carmichael's Cut, North Promontory Range
52. U.P. Track at Trestle, North Promontory Range
53. U.P. Grade, Nebraska 1866
54. U.P. Laying Track, Nebraska 1866
55. C.P. Grade and End of Track, Utah and Nevada Desert, 1869

d. Promontory Summit after May 1869 (Photos Nos. 56-62)

56. Promontory Station late 1869 or 1870
57. Eating House and Platform at Promontory
58. Temporary Post Office and Tent Town, Promontory, 1869
59. Promontory, 1869 or 1870
60. Promontory, 1869
61. Frank Leslie's Illustrated Newspaper Sketches of Promontory
62. Union Pacific Construction Camp at Promontory Range

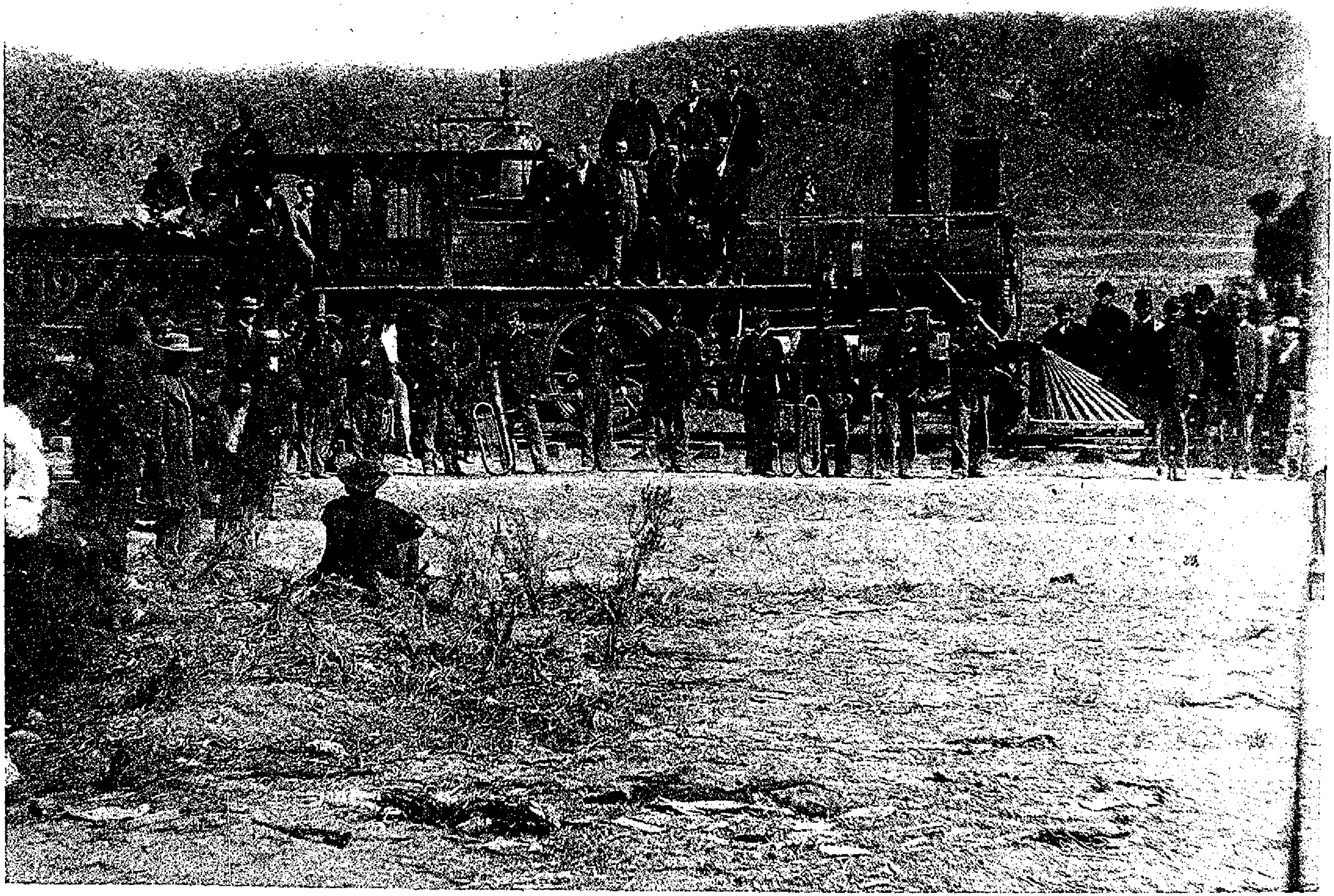
APPENDIX E

Photographs relating to Union Pacific Locomotive #119

a.	#119	Photos 1-~~6~~5
b.	Sister locomotives	Photos 7-13
c.	May 10, 1869 ceremony	Photos 14-31
d.	Golden Spike	Photos 32-34

1.

This view is from north to south and shows Union Pacific locomotive #119, on May 10, 1869, at Promontory Summit apparently after the formal ceremony had ended and the #119 had pulled over to the Central Pacific side of the rail juncture. This is evident from the fact that the locomotive is standing on track laid on Central Pacific square sawed ties. Some members of the regimental band, 21st Infantry, who had just arrived on their way west to an assignment at the Presidio, San Francisco, are posed at the side of the locomotive. Note the nature of the grade for the track, which shows clearly in the foreground of the picture. This picture was copied from a stereographic view in the Timothy Hopkins Collection, Main Library, Stanford University. It is identified as Alfred A. Hart, photographer, Stereo #359. Hart captioned this view, "The Monarch from the East." Photograph courtesy Stanford University.

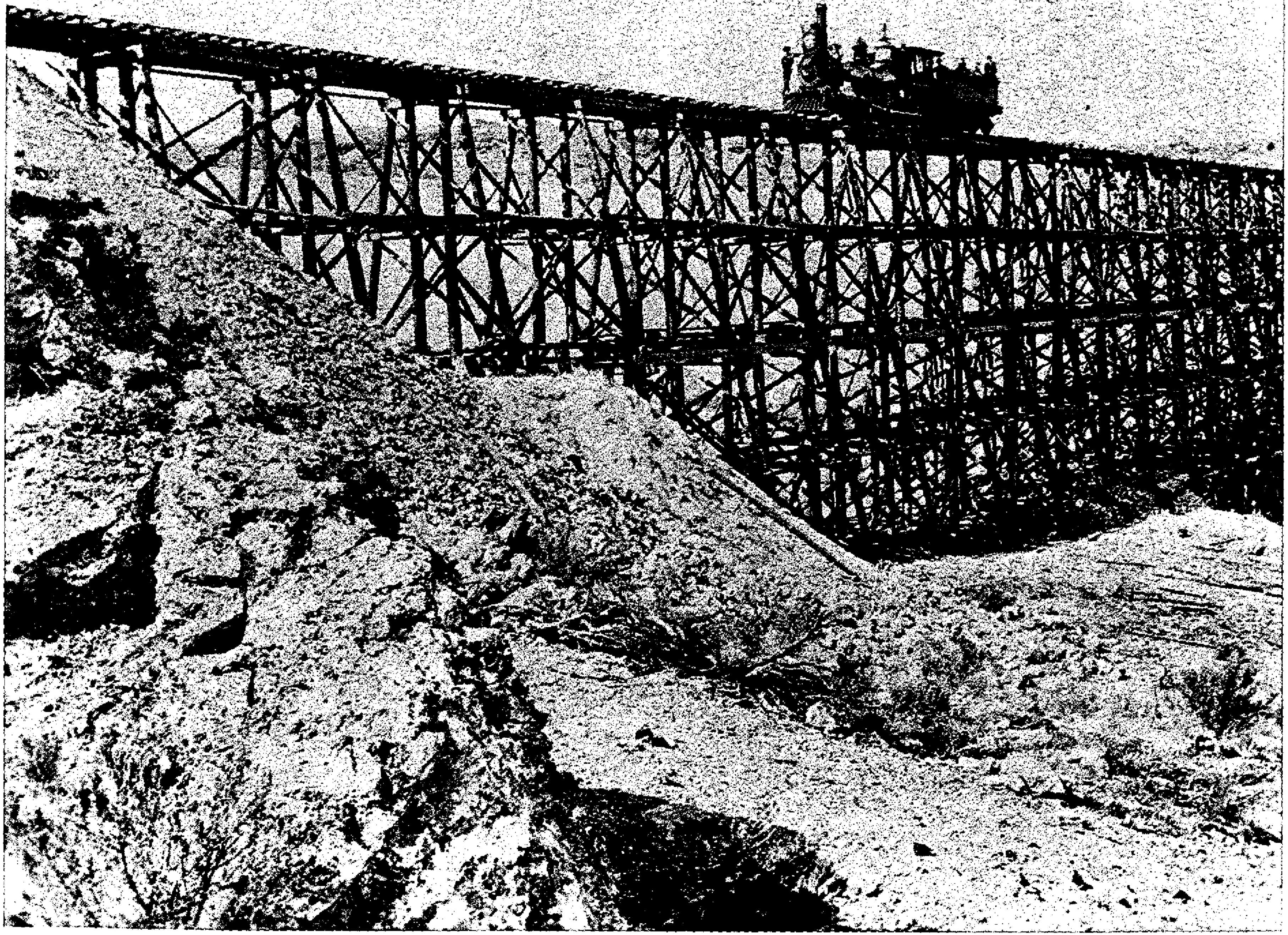


359 The Monarch from the East.
Scene at Promontory Point, May 10th, 1869.

Alfred A. Hart, photog.
21st Inf. Band & U. P. #119
Promontory. May 10, 1867

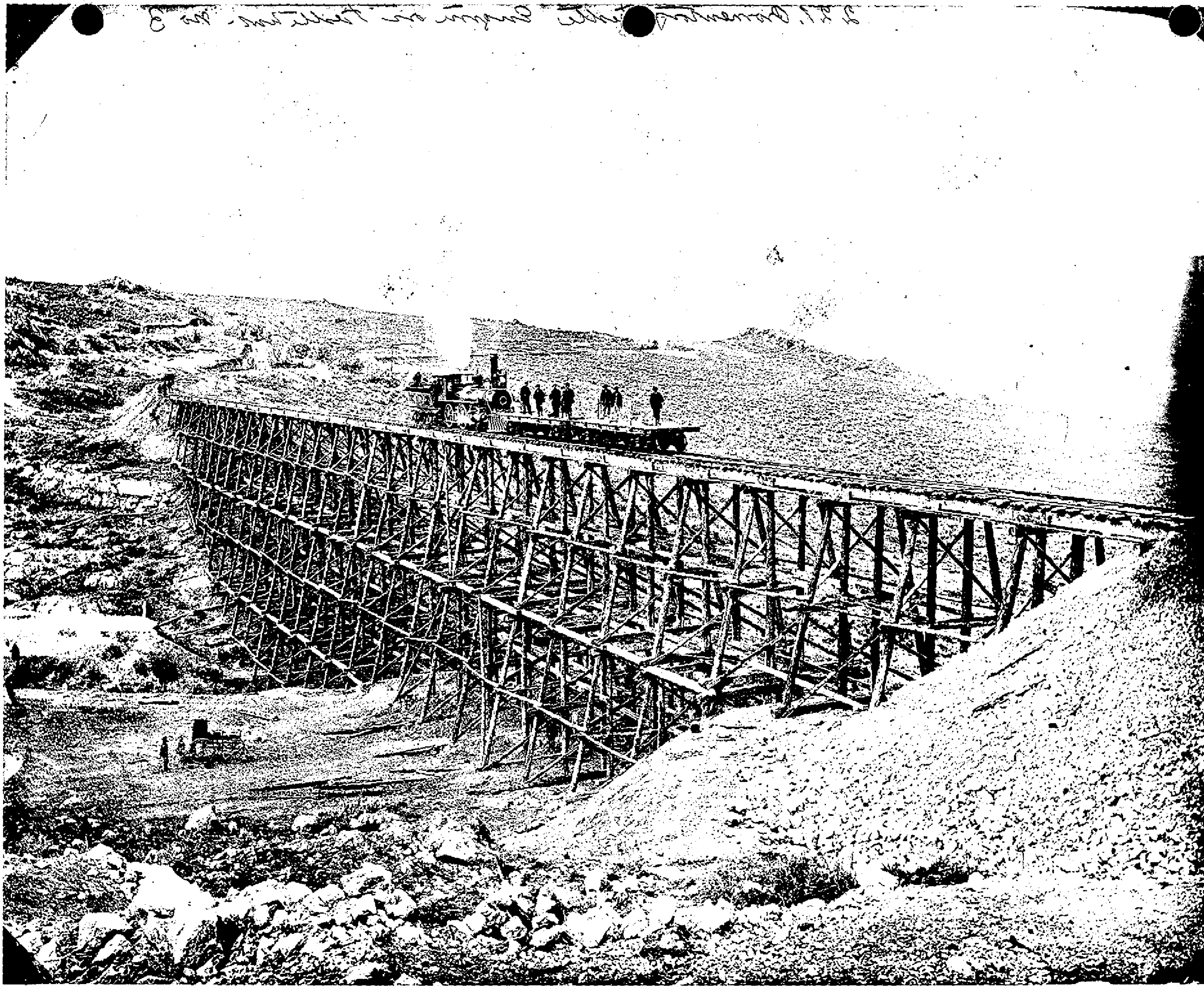
2.

This view is of #119 or a sister locomotive on the high trestle on the east slope of the North Promontory Range, a few miles east of the summit. This photograph was copied from a stereo view in the Union Pacific Railroad Museum at headquarters building in Omaha. The stereo view did not carry identification as to either the photographer, date, or place. Identification of the location as the Union Pacific Big Trestle at Promontory is easy. The photographer probably was Andrew J. Russell, and he must have taken the picture within a day or two of the May 10, 1869 ceremony at the summit. Photograph courtesy Union Pacific Railroad.



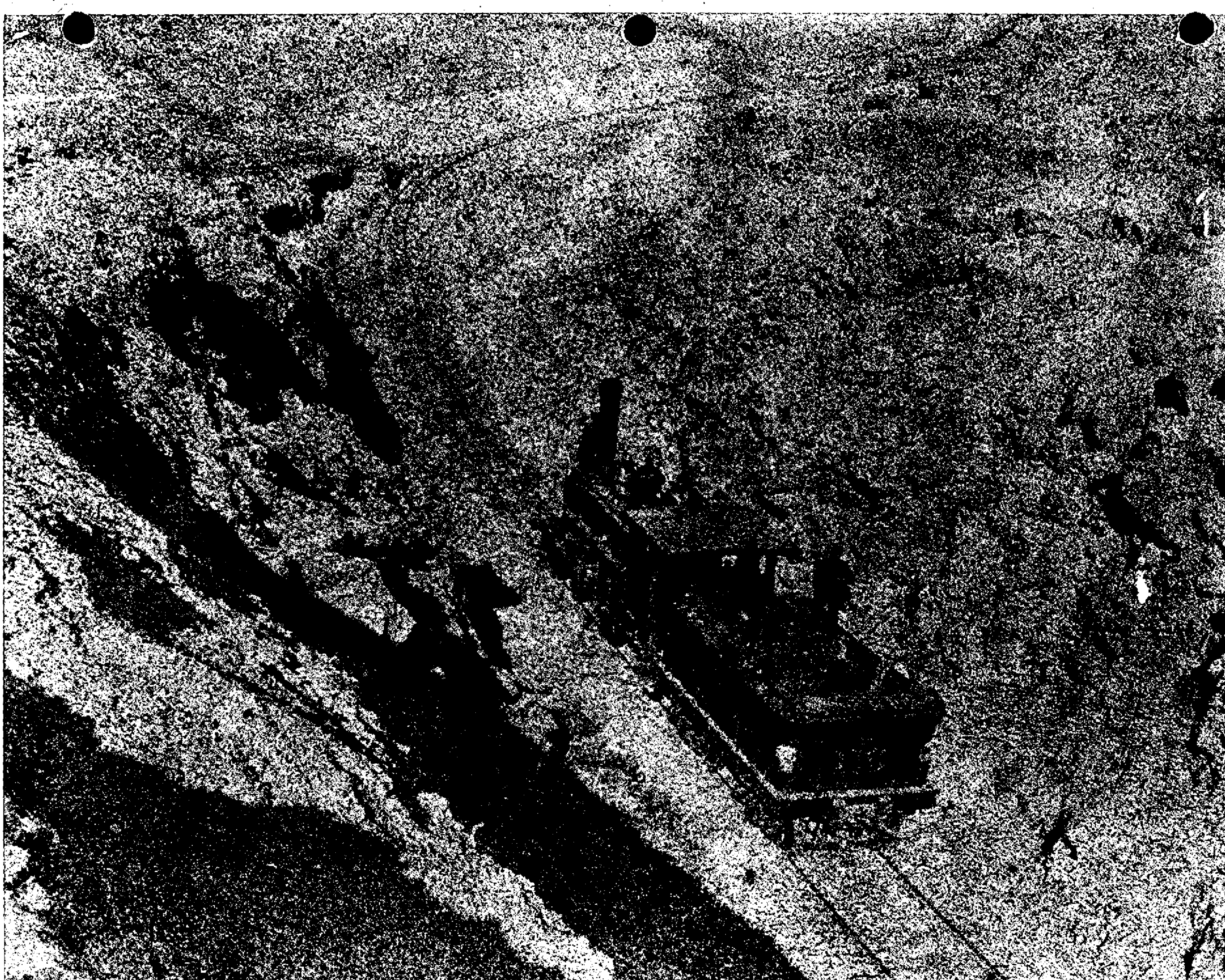
3.

This is a view from west to east of Union Pacific Locomotive #119 and its tender pushing two flatcars on the Big Trestle east of Promontory Summit. The number 119 is identifiable on the tender. The picture was taken by Andrew J. Russell on a 13 x 10-inch wet, glass plate negative within a day or two of the May 10, 1869 ceremony at the summit. Note the photographer's dark room carriage at the base of the trestle and several tents at the skyline at top right. This picture was reproduced from an original print taken directly from the original negative, No. 221, in the OCombes Collection, American Geographical Society, New York City. Photograph courtesy American Geographical Society.



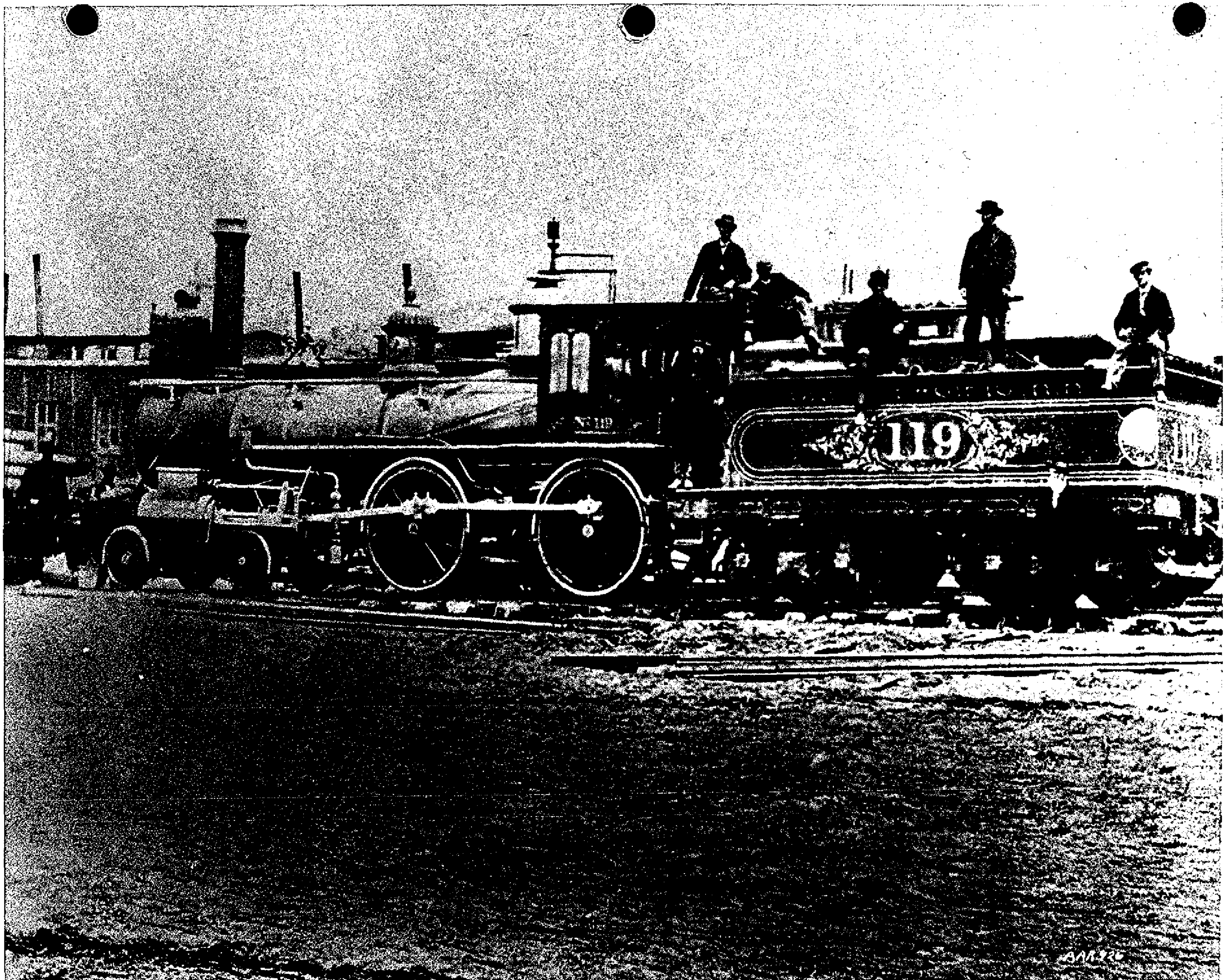
4.

This view is of Union Pacific #119 and tender. It was copied from a stereo view in the Union Pacific Railroad Museum in Omaha. The stereo carried neither identification of place and date taken nor photographer. It probably was taken by Andrew J. Russell in early May 1869 and may have been in the region of Promontory Summit. The topography suggests the place was Carmichael Cut on the east slope of the North Promontory Range. Photograph courtesy Union Pacific Railroad.



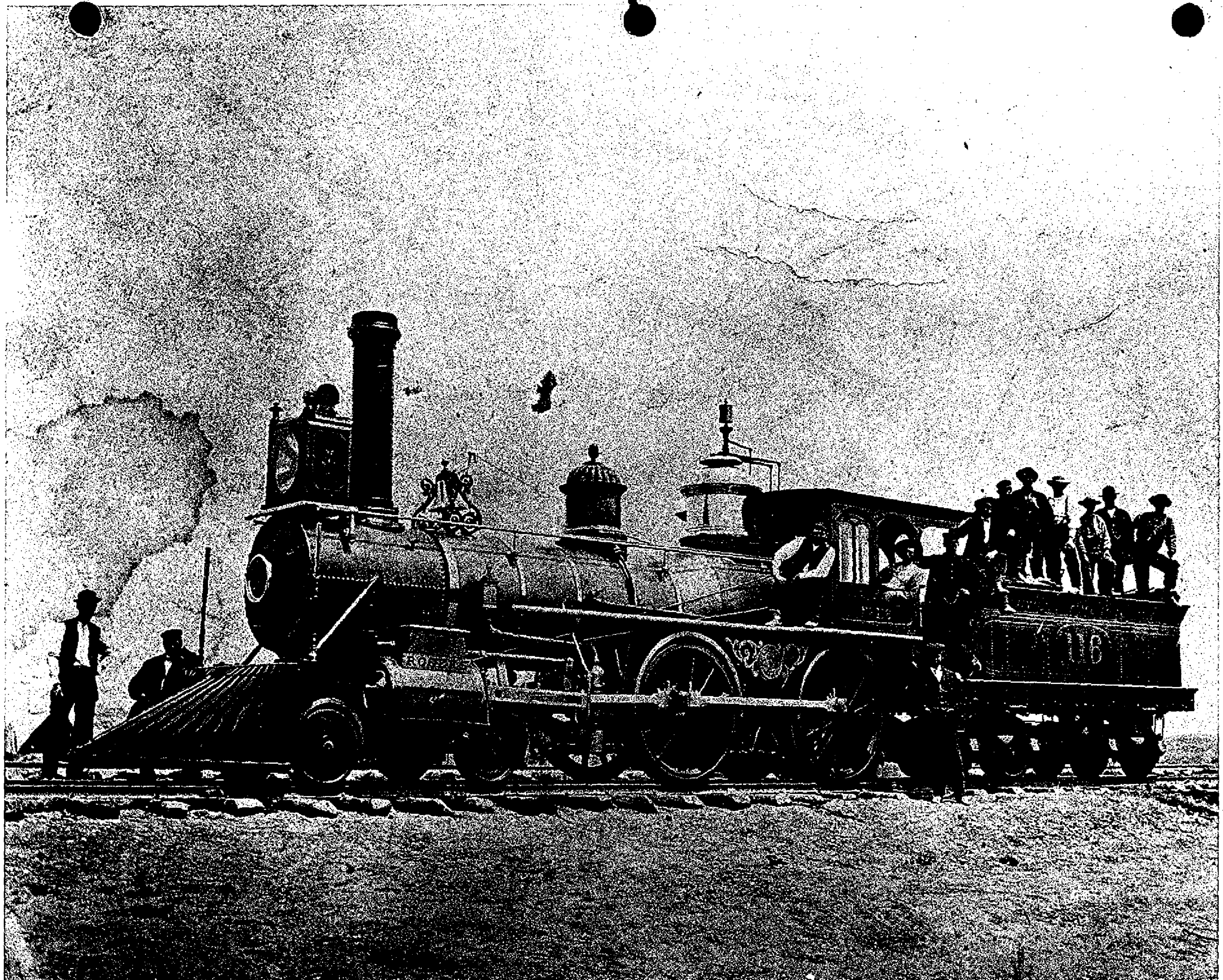
5.

This is the best picture of Union Pacific locomotive #119 we have found. It was copied from a print in the files of the Union Pacific Railroad headquarters at Omaha. That print did not have identification as to photographer or date and place taken. It appears to be an early print and to show the locomotive as it was originally. Note the detail of decoration on the tender, and particularly the ball or sphere at the corner of the tender. The figure of the plainsman is discernible on the sandbox. This photograph is valuable for the assistance it offers in preparing construction drawings of #119 and tender. Photograph courtesy Union Pacific Railroad.


119

7.

Sister locomotive of #119. This full side view of Union Pacific locomotive #116 is better than any known picture of #119 itself in showing clearly many of the details of #119 since this sister locomotive, built at the same time and to the same specifications, is identical except in very minor details of the paint decorations on the tender and possibly the sandbox. This picture is very valuable for use in the preparation of construction drawings of #119. This photo was copied from a print in the Union Pacific Railroad headquarters file at Omaha, where it carried file reference H3-56. It had no identification as to photographer or date and place taken. It obviously was taken when the engine was new or almost new, since even the paint trim on the bars of the pilot can be seen. Photograph courtesy Union Pacific Railroad.


116

8.

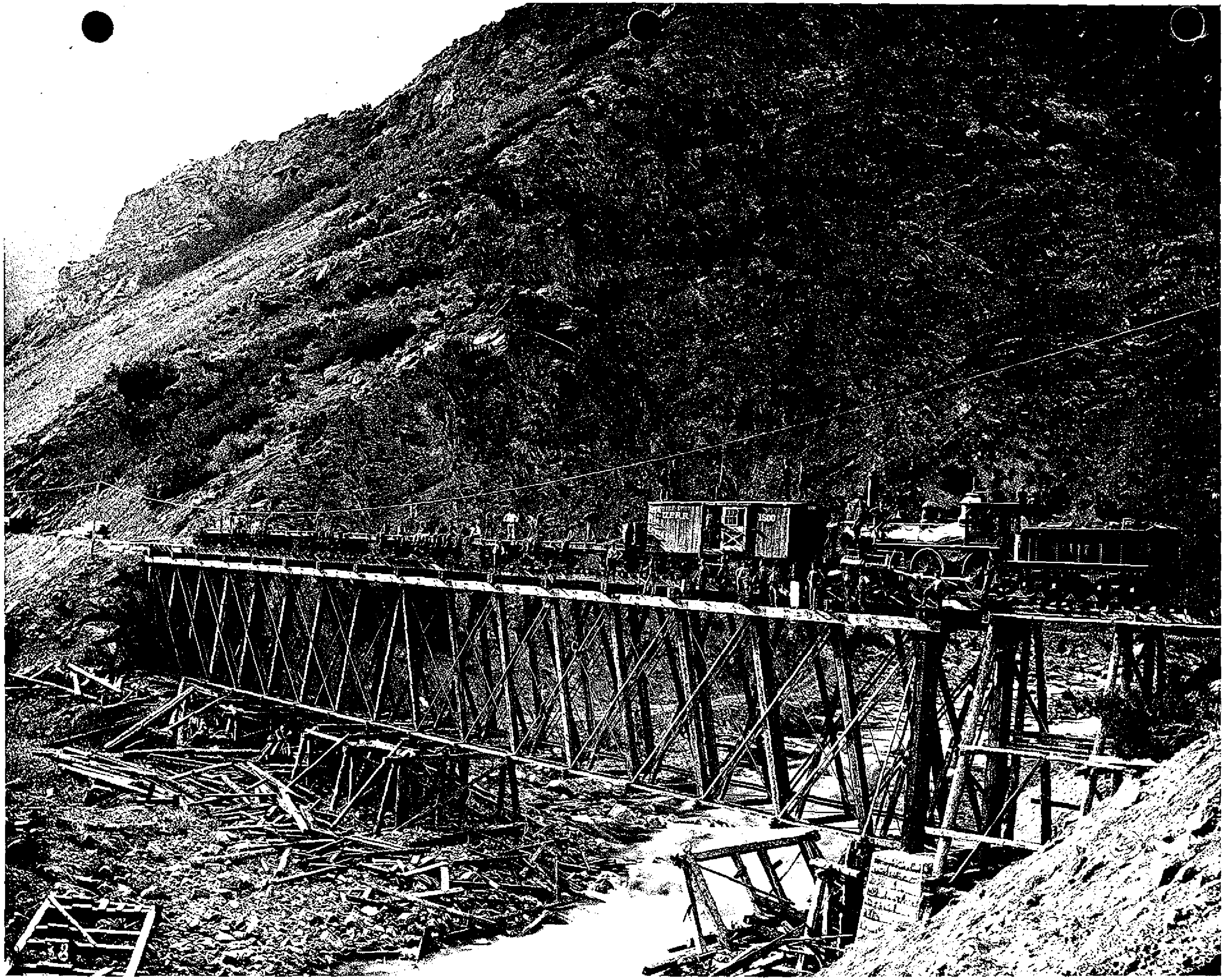
This is a picture of Union Pacific locomotive #117, a sister engine to #119. It was taken at Ogden, Utah, possibly in May 1869. We have not been able to determine the identity of the photographer. This picture was copied from a stereographic view, #364, in the Timothy Hopkins Collection at the Main Library, Stanford University. The great majority of the photos in this collection were made by Alfred A. Hart, official photographer of the Central Pacific Railroad during the period of its construction. He was present with Governor Stanford's special party for the Promontory Summit ceremonies on May 10, 1869. It is known that many of Stanford's group were taken on a special visit to Ogden and Weber Canyon area by Union Pacific officials on May 8. Hart may have taken this picture at that time. Photograph courtesy Stanford University.

364. Railroad at Ogden,

Wahsatch Range in distance.

9.

This shows a view of a Union Pacific train and work crew with Union Pacific locomotive #117 at Devil's Gate Bridge, Summit County, Utah. William Henry Jackson of Omaha took this view in June or July 1869. The significance of this photograph for this study is that #117 is a sister locomotive of #119 and is identical in every respect except numbering and painting on sandbox. This picture was copied from Jackson photograph 57-HS-38 in the Hayden Survey Collection of the Geological Survey, National Archives, Washington, D. C. Photograph courtesy of National Archives.

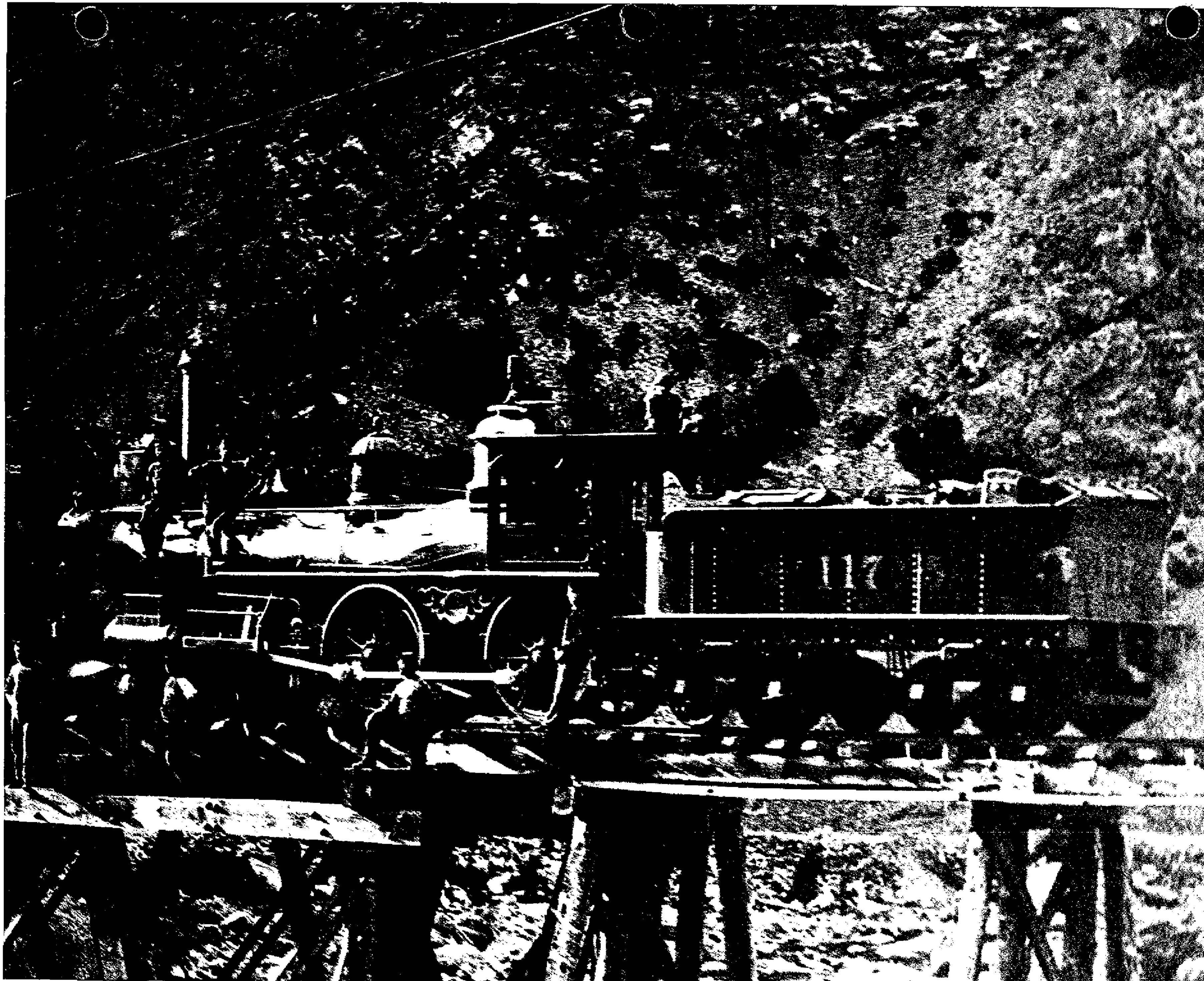


#9

William H. Jackson photo
U P # 117 at Devils Gate Bridge
Utah. June - July 1869

10.

This is an enlargement of Union Pacific locomotive #117 from the William Henry Jackson photograph of the train at Devil's Gate Bridge, Utah, shown in the preceding illustration. This locomotive was a sister engine of #119 and identical to it. Picture was taken in June or July 1869.


117

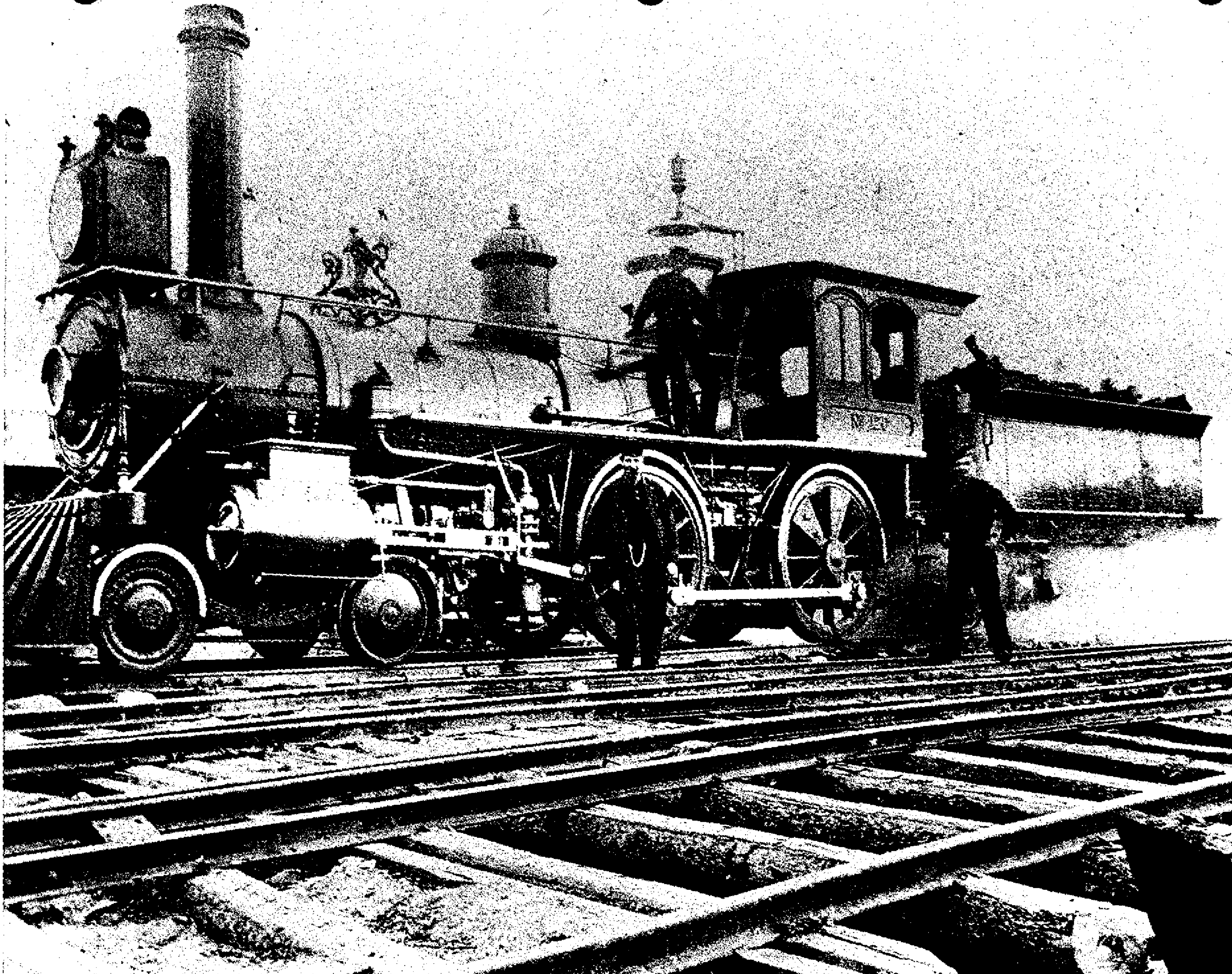
William H. Jackson, photog
U. P. #17, Devil's Gate Br. Utah
June or July, 1869

11.

Sister locomotive to #119. This view of Union Pacific locomotive #120 shows features identical to those of #119, except possible details of casting in the truck or pony wheels. Compare them with #116 where the front and rear pony wheels seem reversed from those here. Both castings may have been interchangeable types. This picture was copied from a stereo view in the Union Pacific Railroad Museum in Omaha which identified the photographer as Andrew J. Russell and the place as Wasatch, Utah. The date was not given, but most likely it was in May 1869 at the time Russell went to Promontory Summit to photograph the ceremonies there for the Union Pacific RR. Photograph courtesy Union Pacific Railroad.

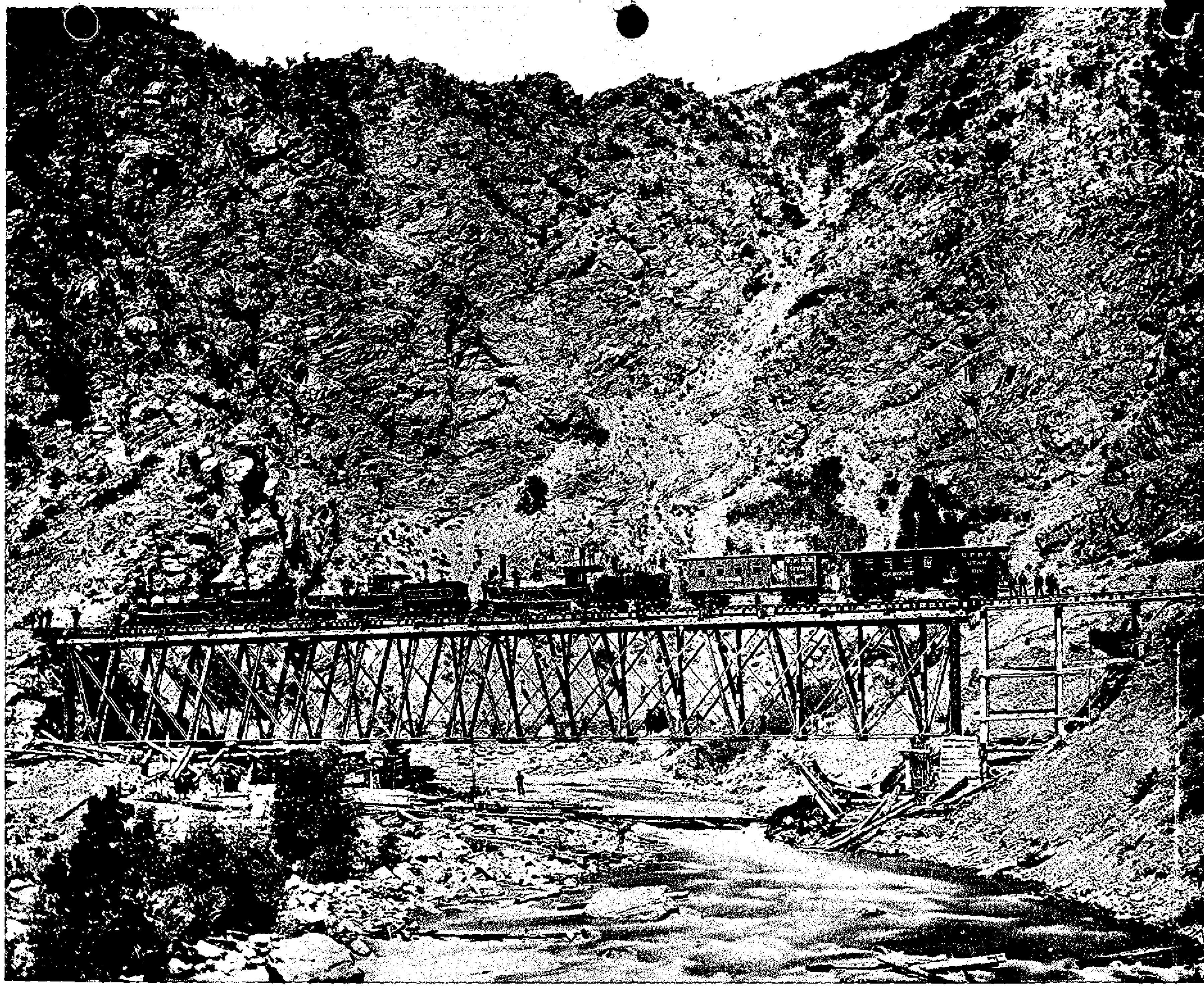
(Gerald Best says that all Rogers engines of the order of which #119 a part had the curved tie-bar between the front and rear engine truck wheels. Do not show in other photos because of shadows. Truck wheels pulled frequently for new bushings, he said, and position of two different pattern truck wheels of no great consequence.)

(John White agrees with above comment on truck wheels. Notes that builder plate missing between driving wheels-- hidden in all views of #119 and sister locomotives.



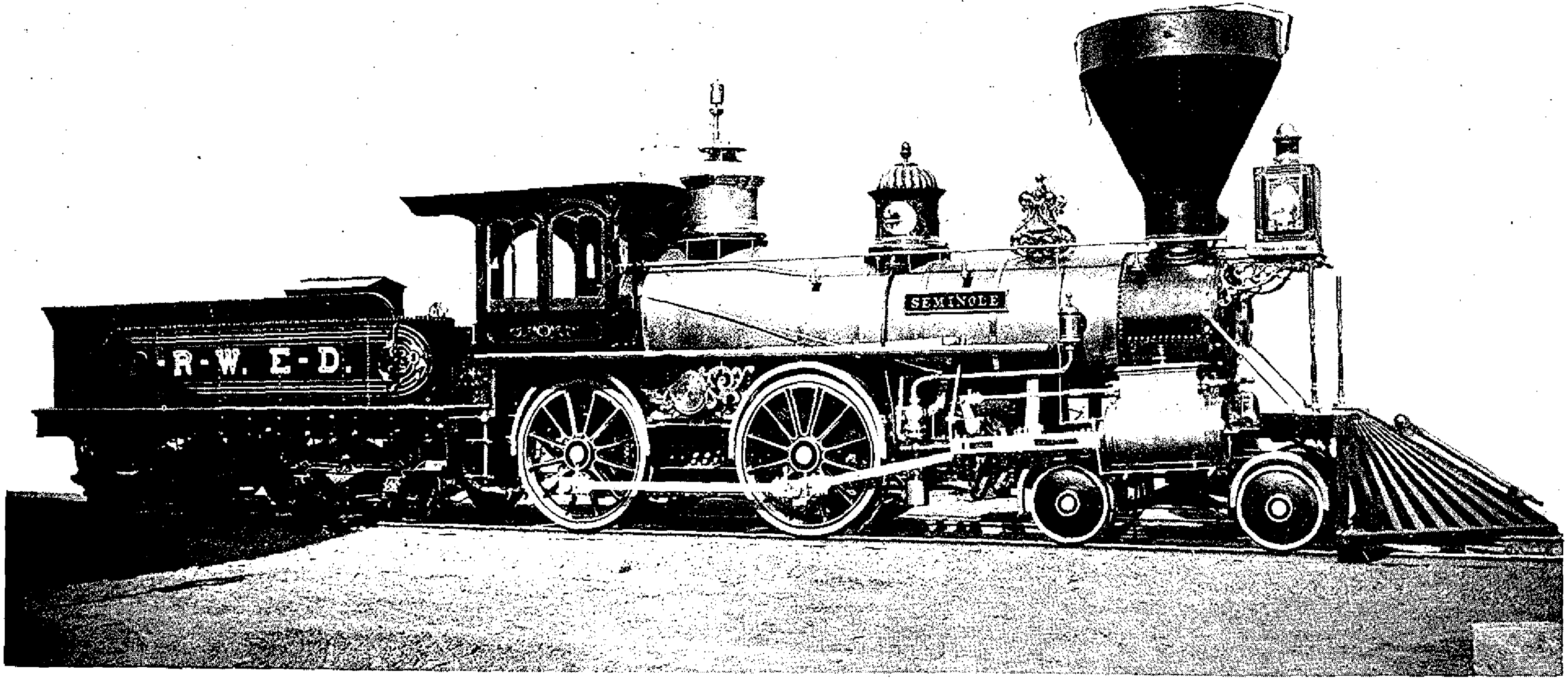
12.

The three locomotives shown in this picture appear to be either sister locomotives to #119 or of similar specifications. The third in line from the front has a tender with number 120 on it. The other two tenders, while apparently similar, are painted differently as to numbering and identification. Union Pacific locomotive #120 was a sister locomotive to #119. This picture was copied from a stereo view in the Union Pacific Railroad Museum in Omaha, identified as having been taken by Andrew J. Russell, with the caption, "Testing Devil's Gate Bridge," (Utah). Photograph courtesy Union Pacific Railroad.



13.

This is a view of the Union Pacific Railway, Eastern Division (predessor of Kansas Pacific, & not connected with UP) locomotive Seminole, built by Rogers Locomotive Works in 1867, approximately a year before Rogers built the #119. It has slightly different specifications from those of #119, having 16 x 22 cylinders, instead of 16 x 24; the driving wheels were the same--54" diameter centers, and the locomotive weighed 60,460 pounds instead of 54,000 pounds for #119. The stack is for a wood burner and differs from #119, but in most respects this engine and its tender resemble very closely #119 and its tender. This picture was copied from Alfred W. Bruce, *The Steam Locomotive in America: Its Development in the Twentieth Century*. Photograph courtesy W. W. Norton & Company, Inc.



154. Engine *Seminole*
(see pages 40, 43 for details)

14.

This view looks east at Promontory Summit over the cab of a Central Pacific locomotive of the Jupiter type, and indeed it may be Jupiter. The locomotive on the track to the right front is a Union Pacific locomotive on a siding just built by the Union Pacific (apparently on its main grade). This picture was taken by Alfred A. Hart on May 9, 1869, the day before the rails were joined directly in front of the C.P. locomotive about where the group of workers can be seen standing at the left of the track. Note that only 3 tents are in view. Both the Central Pacific and the Union Pacific locomotives are caught in this picture in the act of whistling. This led to Hart's title, "The First Greeting of the Iron Horse." This picture ~~was~~ made from a stereographic view in the Timothy Hopkins Collection, Main Library, Stanford University. The Southern Pacific Company at its San Francisco headquarters has a similar stereo view. It is identified as Hart stereo #354. Photograph courtesy Stanford University.

(Gerald Best tells me the engine is not whistling because the steam is coming from the pops in front of the whistle.)

15.

This is a view from east to west showing the gap in the rail line at Promontory Summit prior to the ceremony on May 10, 1869. This picture was copied from an unidentified print in the Union Pacific Railroad files at headquarters, Omaha. A similar print in the files of the Utah State Historical Society identifies the picture as having been taken by Charles R. Savage, of Salt Lake City. It apparently was taken on the morning of May 10, shortly before the ties were placed and the last section of rail laid. This photograph is useful for purposes of reconstructing the grade and rail line at the summit site. The Union Pacific grade at the summit site shows at left center beyond the flag on the telegraph pole and the tents. Photograph courtesy Union Pacific Railroad.

16.

This is another view of the gap in the rail line as it existed until shortly before the ceremony on May 10, 1869. The view is from the east looking west. The section of rail at right is Union Pacific. The train beyond the gap is Central Pacific. This picture was copied from a print in the files of the Union Pacific Railroad headquarters at Omaha. It is unidentified as to photographer. It was taken apparently on May 9 or early in the morning of May 10, 1869. Photograph courtesy Union Pacific Railroad.

17.

This view looking from east to west gives a close-up of the gap in the rails on the morning of May 10, 1869. Note the rough cut pine railroad ties, axe cuts on ends and only one side hewn or adzed to lay the rail on, with the bark still on the rest of the surface. This picture was copied from a stereo view taken by Andrew J. Russell in the Union Pacific Railroad Museum at Omaha. Russell captioned this view, "Before Laying the Last Rail, Promontory, Utah." A print of this same picture in the files of the Utah State Historical Society attributes it to Charles R. Savage. We assume the stereographic view identification of Russell is correct. Photograph courtesy Union Pacific Railroad.

18.

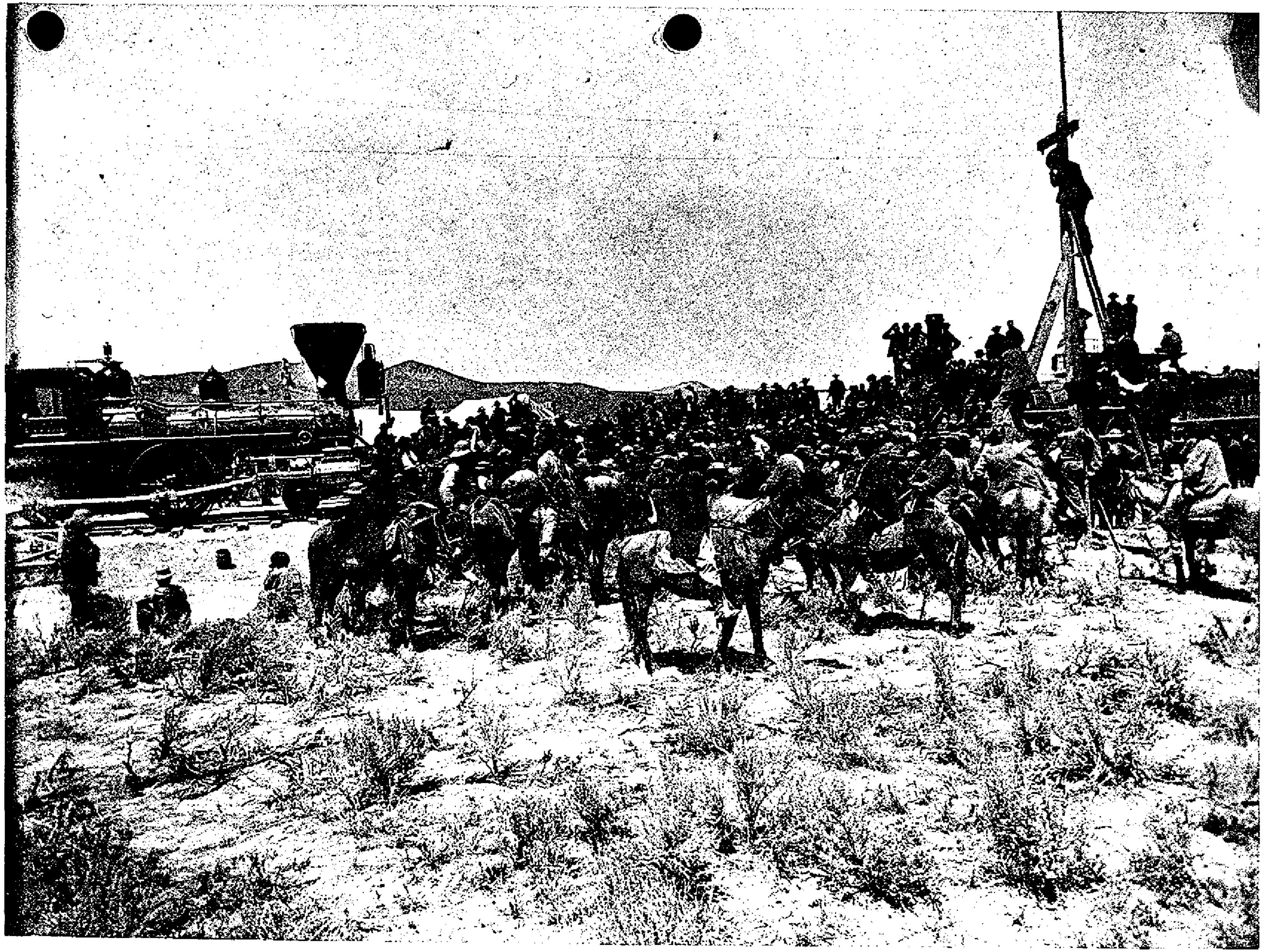
This picture was copied from a print made directly from the 10" x 13" wet, glass plate negative, No. 225, in the Combes Collection, American Geographic Society. The picture was taken by Andrew J. Russell immediately after the Golden Spike ceremony at Promontory Summit on May 10, 1869. Central Pacific Jupiter is at left and Union Pacific #119 shows partially at right. The view is from south looking north. Russell captioned this photograph, "Laying Last Rail Promontory." This is one of several fine historical photographs Russell took on this occasion. Photograph courtesy American Geographical Society.

19.

This picture was taken from nearly the same spot as No. 18, but a little closer and it does not include locomotive #119 at the right, and just the headlight and part of the stack of Jupiter at the left. There are a few more hats and hands in the air in the center of this picture than in No. 18, and the head of a mule shows at the left which is obstructed from view in No. 18. This picture was copied from a print in the files of the Union Pacific Railroad at Omaha on which a notation identified it as having been taken by Charles R. Savage. The Union Pacific print was copied from a stereo view which had printed on it, "From Professor Sedgwick's Illustrated Lectures--"Across the Continent." Photograph courtesy Union Pacific Railroad Company.

20.

This view shows Jupiter, Central Pacific, at the left, and a crowd of people covering Union Pacific #119 at the right, at the moment a workman was afixing the wire to the telegraph line from the point on the track where the driving of the last spike was to take place, and the blows thus would carry by telegraph around the Nation and to both coasts. The view is from south to north. It was taken by Alfred A. Hart, official photographer of the Central Pacific Railroad on May 10, 1869, just before the ceremony began. Note that the top of 3 tents show on the north side of the tracks at the point of the rails meeting. The horseman at the left foreground appears to be riding a mule. This picture was copied from a stereographic view, Hart #355, in the Timothy Hopkins Collection at the Main Library, Stanford University. The title, "The Last Rail--The Invocation: Fixing the Wire," apparently was written by Hart. Photograph courtesy Stanford University.



355 The Last Rail—The Invocation.
Fixing the Wire, May 10th, 1869.

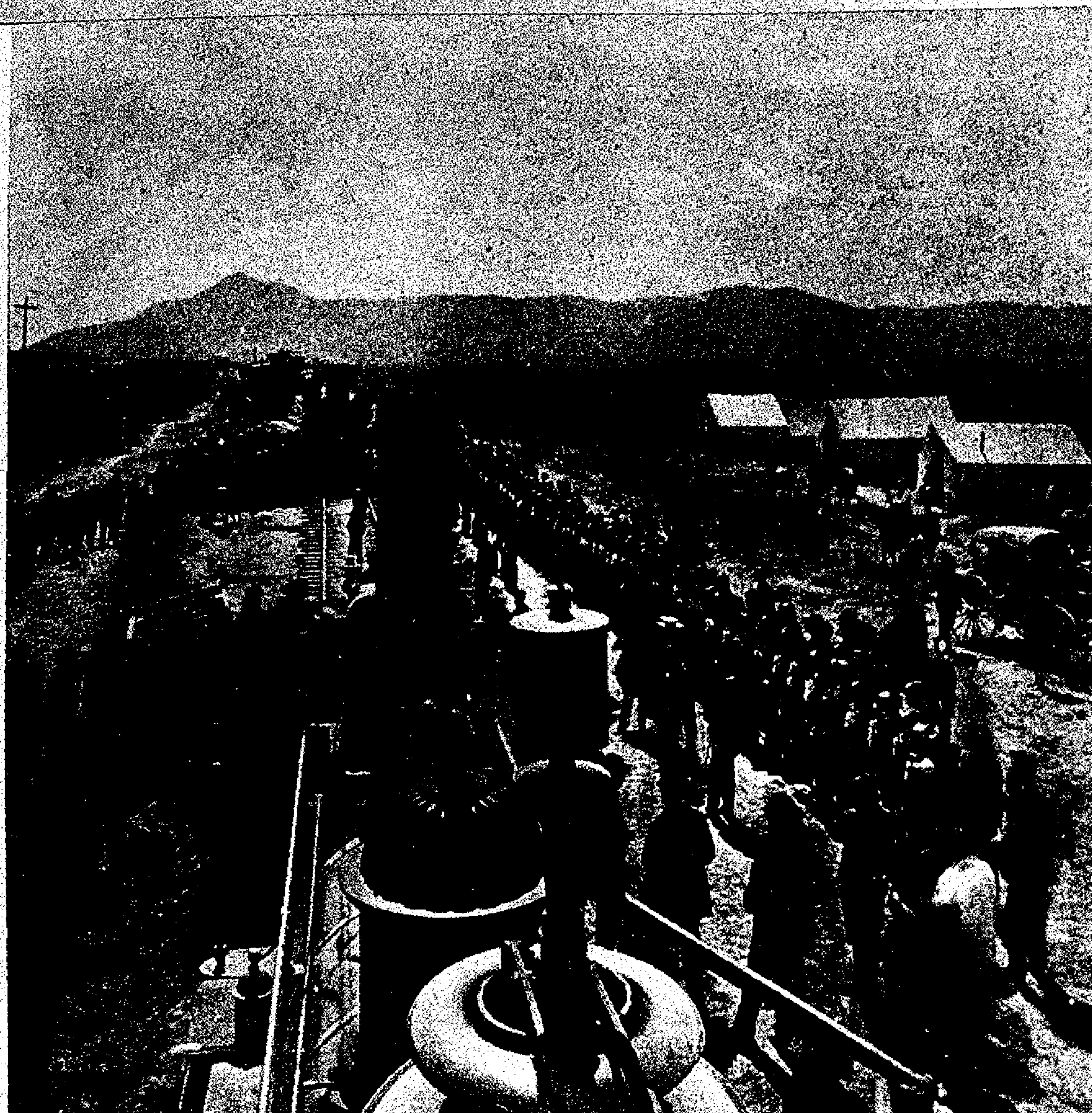
21.

This picture is probably the most famous of any taken at the Golden Spike ceremonies at Promontory Summit on May 10, 1869. It was taken by Andrew J. Russell on a 10" x 13" wet, glass plate negative that is preserved in the Combes Collection, No. 227, in the American Geographical Society, New York City. The view is from south to north. The picture in this report was copied from a 10 x 13-inch print taken directly from the original negative. Russell wrote on his glass plate negative the following caption, "East and West Shaking Hands at Laying Last Rail." The original print shows clearly the decoration of the "plainsman" on the sandbox of #119 at right and the decoration design on Jupiter's headlight. It also shows that #119 had no decoration on its headlight. The two men shaking hands in the middle foreground are Chief Engineer Montague of the Central Pacific Railroad at left and Chief Engineer Dodge of the Union Pacific Railroad at the right. This picture was taken after the ceremony of driving the Golden Spike, when the two locomotives moved up to the junction point and touched pilots, as shown here. Some lively spirits brought out their bottles and held them into view over the pilots--liquor from east and west. This Russell picture must be counted one of the great historic photographs. Photograph courtesy American Geographic Society.

22.

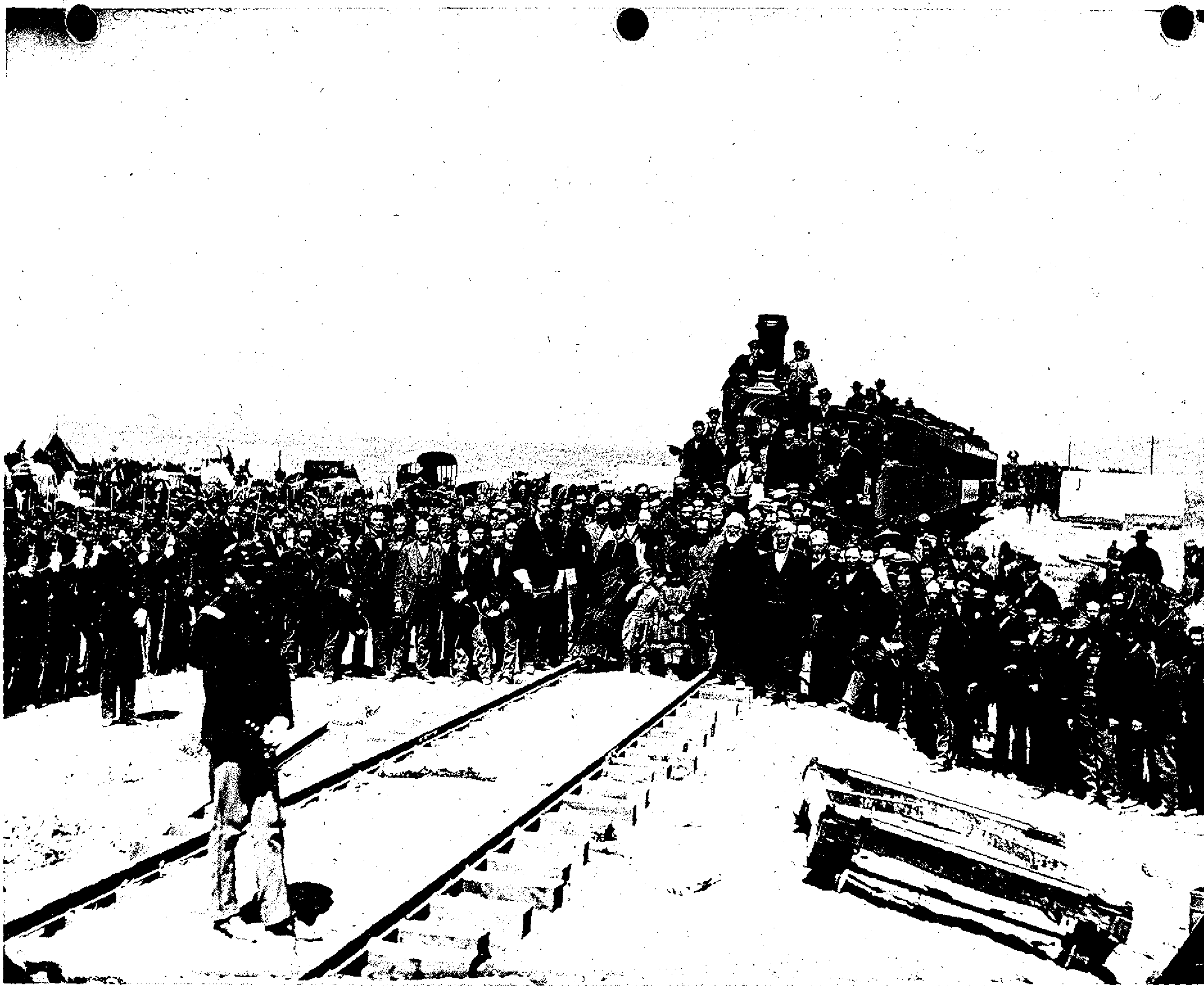
This view shows a detachment of the 21st Infantry Regiment lined up on the north side of the rail junction point at Promontory Summit on May 10, 1869, just moments before the driving of the Golden Spike Ceremony began. The view looks from east to west, and was taken from the cab of Union Pacific locomotive #119. The presence of the 21st Infantry detachment was fortuitous as it happened to arrive here at this time while on its way to a new station at the Presidio in San Francisco. Four tents show at the north side of the tracks. This picture is particularly useful for knowledge of the appearance of the site and the terrain at noon on May 10, 1869. Alfred Hart, official photographer of the Central Pacific, took this picture, which is his stereo view #357 in the Southern Pacific Company's collection at its headquarters in San Francisco. A print is also in the files of the Union Pacific Railroad headquarters at Omaha. Photograph courtesy Southern Pacific Company.

GOLD SPIKE -- "THE RIVAL MONARCH" - SCENE A PROMONTORY, UTAH, MAY 10, 1869. THIS K, TAKEN FROM THE CAB OF THE UP ENGINE WAS SNAPPED A FEW MINUTES BEFORE THE GOLDEN SPIKE CEREMONIES WERE BUGUN AT PROMONTORY, MAY 10, 1869.



23.

This is another of Andrew J. Russell's fine pictures taken on a 10 x 13-inch wet, glass plate negative of the May 10, 1869 ceremonies at Promontory Summit. This picture was copied from a print made directly from the original negative, which is No. 226 in the Combes Collection, American Geographical Society, and captioned by Russell, "Officers of U.P. Railroad at Ceremony of Laying Last Rail Promontory." The view is from west looking east and gives an excellent picture of the terrain at the summit and eastward. It also shows that there were no tent structures east of the junction point except one on the north side and two on the south side (it is possible that a few may have been hidden behind U.P. locomotive #119 and train, but other pictures of this area do not show any). Note that there are two Union Pacific trains, one with a locomotive having a flared stack behind #119. The 21st Infantry detachment is still in position on the north side of the track with one of its officers standing in the middle of the track. This section of the track in foreground was laid down by the Central Pacific as is indicated by the square, sawed railroad ties. Central Pacific Jupiter must be just out of sight to the left. The writer found a rather poor print of this same picture in the Utah State Historical Society made from a negative on which had been printed in ink "C.R. Savage Photo." This obviously is an error. The original Russell glass plate negative proves beyond doubt that Russell was the photographer. There have been in the past numerous reproductions of Promontory Golden Spike ceremony pictures taken by Russell wrongly attributed to other photographers. Photograph courtesy American Geographic Society.



Given to artist for loco art.

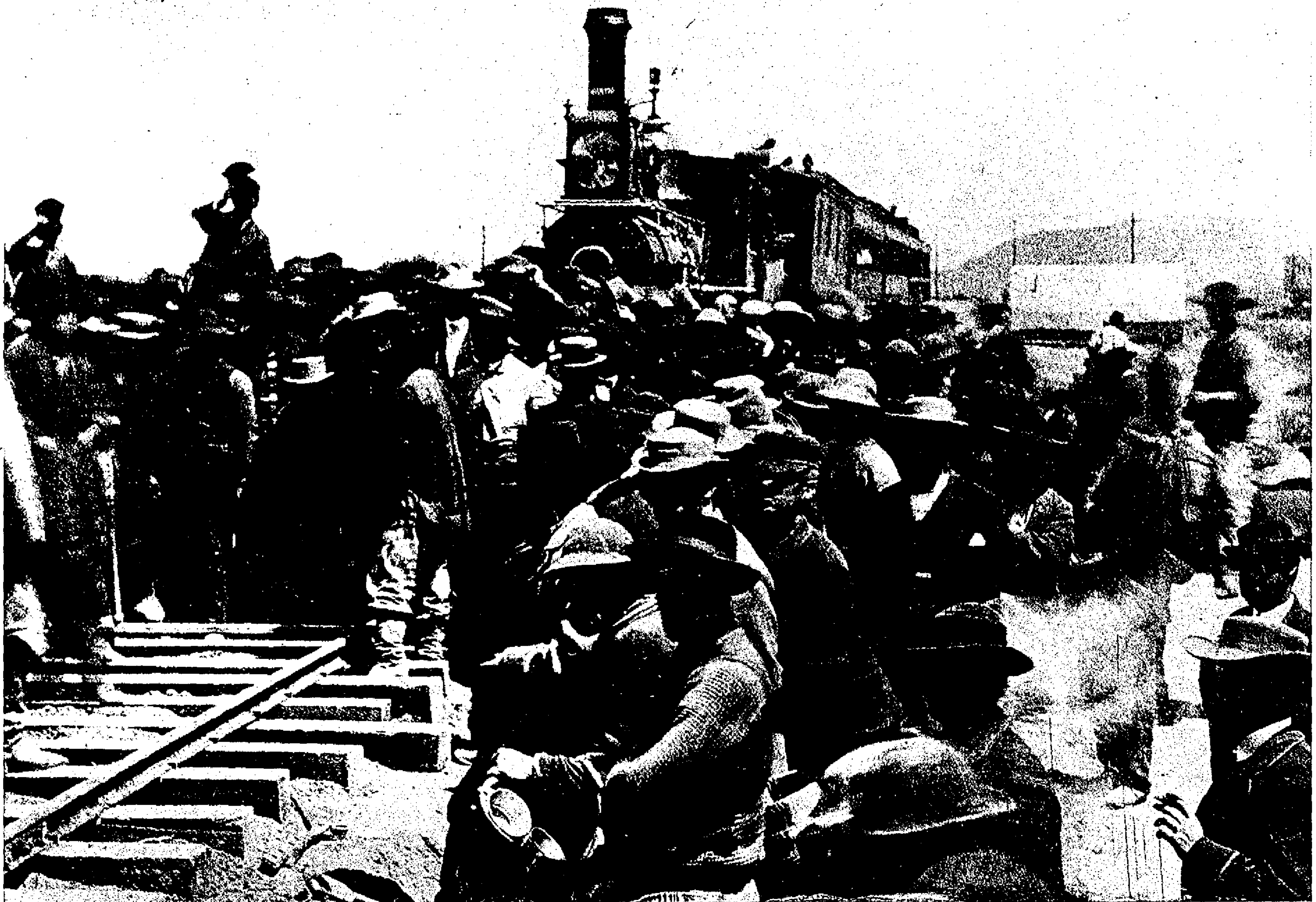
24.

This is a picture taken by Andrew J. Russell on May 10, 1869 at Promontory Summit showing the two locomotives pilot to pilot after they had moved up to touch each other after the driving of the Golden Spike. Russell captioned the negative, which is No. 225 in the Combes Collection, American Geographical Society, "Group of Officers SIH." I do not know what SIH means. The picture in this report was copied from a 10 x 13-inch print made directly from the original wet, glass plate negative. It shows clearly details of the Jupiter cab construction, including even the molding trim. The size of lettering and paint decoration on the tender is very clear. This picture will be useful in preparing construction drawings and writing specifications for the manufacture of a replica of Jupiter and its tender. The view was taken on the south side of the track and looks from west to east. I have never seen this picture reproduced. The glass negative, it will be observed, has been broken. Photograph courtesy American Geographical Society.

(John White comments that this is best view of Jupiter tender truck flat arch bar, very similar to UP 119. tender truck, but without large top leaf spring (so-called "Ohio truck".))

25.

This is a view from west to east showing Union Pacific locomotive #119 on the east side of the gap in the rail line. The section of completed track in left foreground is Central Pacific as indicated by the sawed ties. This picture apparently was taken on the morning of May 10, 1869 either just before the gap was closed or just afterward. The crowd of people in the place where the gap had been left makes it impossible to know whether the Union Pacific side of the gap had been closed when the picture was taken. This picture was copied from a print in the files of the Union Pacific Railroad headquarters at Omaha. It was unidentified as to the photographer. Photograph courtesy Union Pacific Railroad.



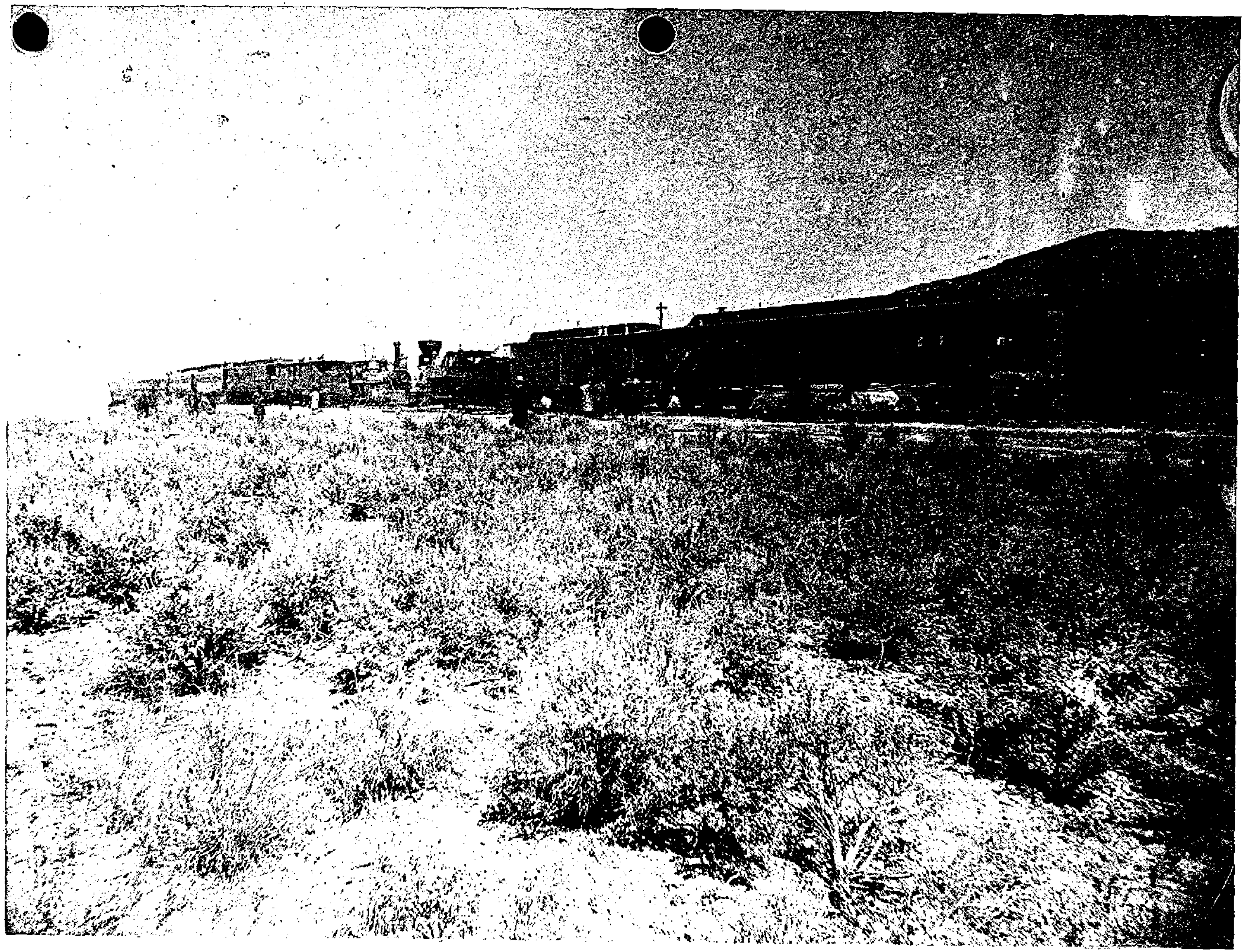
At the Driving of the Golden Spike,
Promontory Point, May 10, 1869.

26.

This picture shows the officials who participated in driving the Golden Spike and a part of the crowd of persons present at Promontory Summit on May 10, 1869. Note the sledges and shovel. The picture looks from west to east, with the stack and front of Union Pacific #119 showing in the middle top. The Union Pacific grade, with a number of cars standing on it, shows at top right, on the south side of the Central Pacific grade where the rails were joined. This is a good terrain view in the sense that, while not very clear, it does show the open unbuilt on character of the site at noon, May 10, 1869. This picture was one of several used by artist Hill in painting subsequently the stylized and also inaccurate oil painting that now hangs in the California State Capitol building at Sacramento memorializing Leland Stanford and the Central Pacific officials. This picture was copied from a print in the Union Pacific Railroad headquarters files at Omaha. It was unidentified as to photographer. It may have been taken by Alfred Hart. Photographer courtesy Union Pacific Railroad.

27.

This picture was taken by Alfred A. Hart, at Promontory Summit, on May 10, 1869 following the ceremonies of driving the Golden Spike. The view looks from northwest to southeast. The Jupiter and Central Pacific Governor Stanford's special train are at right; Union Pacific #119 and Durant's train are beyond at left. Sagebrush covers the area except for the track. A tent shows at extreme left. This picture was copied from a stereo view, Hart #360, in the Timothy Hopkins Collection, Main Library, Stanford University. Photograph courtesy Stanford University.



360 The Last Act—690 Miles from Sacramento.
Scene at Promontory Point, May 10th, 1869.

28.

This photograph was taken by Andrew J. Russell, official photographer of the Union Pacific Railroad at the May 10, 1869 Promontory Summit ceremonies. It shows a group of Union Pacific officials present at the ceremonies and was taken from the north side of the track with the view to the east or southeast. The two cars in the right foreground were part of Vice President Durant's special train with locomotive #119 to the right out of sight. The locomotive and second train behind #119 and Durant's train show at left distance. The original wet, glass plate negative is No. 224 in the Combes Collection, American Geographical Society, 10 x 13 inches in size. This picture was made from a print made directly from the original negative. Russell captioned this picture, "Engineers of UPRR at the Laying of Last Rail Ceremony." Photograph courtesy American Geographical Society.


RAILROAD
29

29.

This picture was taken by Andrew J. Russell on May 10, 1869 following the laying of the last rail ceremony at Promontory Summit. It shows Union Pacific dignitaries and their wives at Vice President Durant's car, and appears to have been taken from north side of the track with the view to the east. A few soldiers of the 21st Infantry Regiment seem to have straggled into the picture along with others not in the official party as they show at the left. The print used in this report was made from a picture made directly from the 10 x 13-inch wet, glass plate negative, unnumbered, in the Combes Collection, American Geographical Society. Photograph courtesy American Geographical Society.

30.

This is a view of the meeting of the rails site at Promontory Summit, Utah, taken by William Henry Jackson in July, 1869, about two months after the May 10 ceremonies. It is one of two he took of the place at the time of his visit. The other view is included in this report. This view is from the west looking east along the grade and track of the Union Pacific. The Central Pacific grade is on the north or far side of the flag. The grade embankment can be seen. It later became the track of the railroad after the section from Promontory Summit to a point near Ogden was transferred by Act of Congress from the Union Pacific Railroad to the Central Pacific in late 1869. This picture has much historical importance, showing as it does the situation east of the rails meeting point two months after the May 10 ceremonies. The very low and simple grade construction of the Union Pacific track shows plainly in this photograph. This picture was copied from Jackson photograph #57-HS-712 (Stereo View #712) in the Hayden Survey Collection, Geological Survey, National Archives, Washington, D. C. Photograph courtesy National Archives.

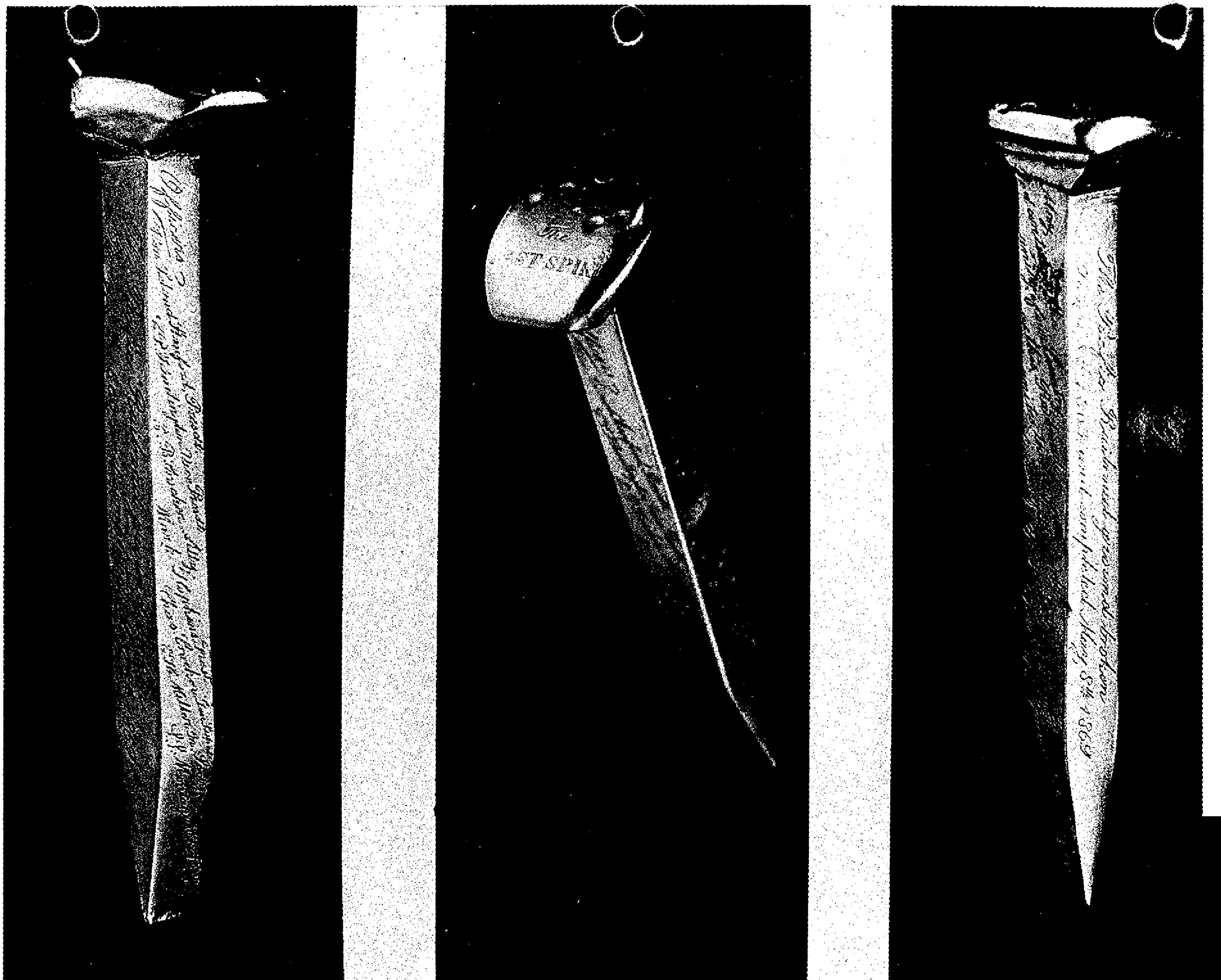
31.

This is a view of Promontory Summit, taken from the north side of the tracks and looking southeast. The Central Pacific track shows as the nearest of the two tracks; the more distant one on which the train is standing is the Union Pacific grade. This picture is interesting in that it shows the situation at the Summit about two months after the May 10, 1869 ceremonies. It was taken by William Henry Jackson of Omaha in July 1869. The American flag still flies from the telegraph pole to which it was affixed at the time of the May 10 ceremonies and, accordingly, marks the spot where the rails joined. In the period since May 10 the Union Pacific apparently extended its siding on its original grade at the Summit. The train standing there is plainly marked a Union Pacific train. The end of a Central Pacific boxcar can be seen on the Central Pacific track at the extreme right of the picture. The south side of the tracks appears to be almost free of structures in July, although a few tents can be seen at the extreme left of the picture. It is to be noted that the flag is between the two tracks. In the pictures of the May 10 ceremony it shows as being south of the track on which the two locomotives met. This is as it should be because the trains met on what can be called the Central Pacific grade. Even the two types of ties can be distinguished in this picture and this shows also where the rails met. This picture was copied from Jackson photograph #57-HS-714 (Stereo view #714) in the Hayden Survey Collection of the U.S. Geological Survey, National Archives, Washington, D.C. It and two or three other Jackson photographs relating to the railroad apparently found their way into the Hayden Survey Collection by mistake. Photograph courtesy National Archives.


C.P.R.R.

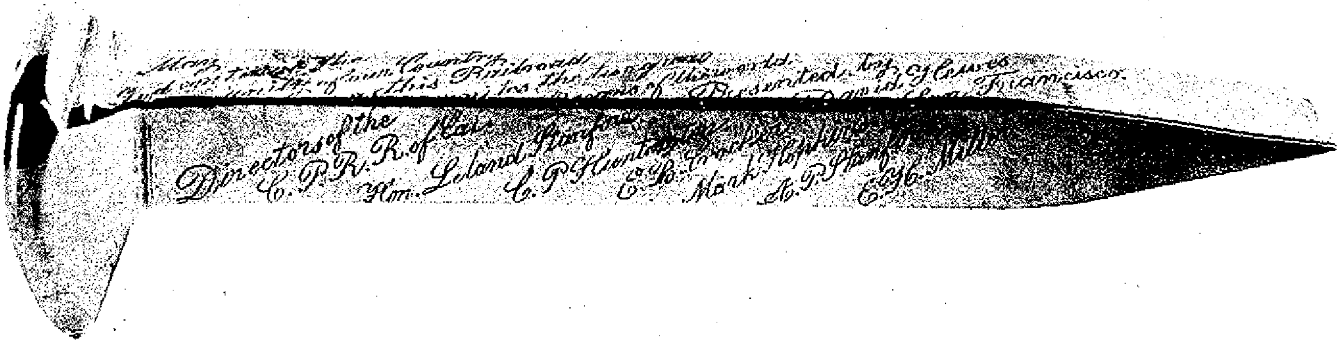
32.

This series of three photographs shows two sides and the head of the Golden Spike. The inscriptions on these two sides and the head of the spike are readable. Four indentations show on the head of the spike, but it does not seem likely that these were caused by blows of a sledge, which in any event at the time were mere touches or taps. They may have been caused by being tapped by one of the officer's sword hilt at the time of the ceremonies. This original gold spike, used at the May 10, 1869 ceremonies of joining the last rail at Promontory Summit, is now in a special vault at the Leland Stanford Museum, Stanford University, Palo Alto, California. This photograph was copied from a print in the files of the Union Pacific Railroad headquarters, Omaha. Photograph courtesy Union Pacific Railroad.



33.

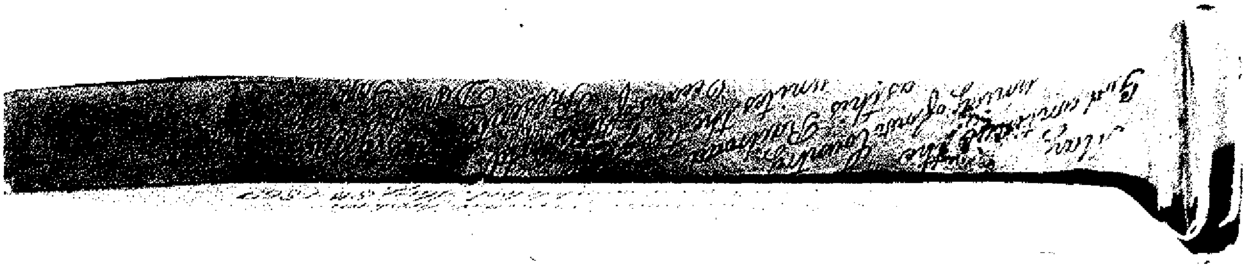
This picture shows the two sides of the Golden Spike not shown in the preceding picture. The inscription listing the officers of the Central Pacific Railroad can be read easily, but that on the fourth side recording the presentation of the spike by Mr. David Hewes of San Francisco is not so easily read. Photograph courtesy Union Pacific Railroad.

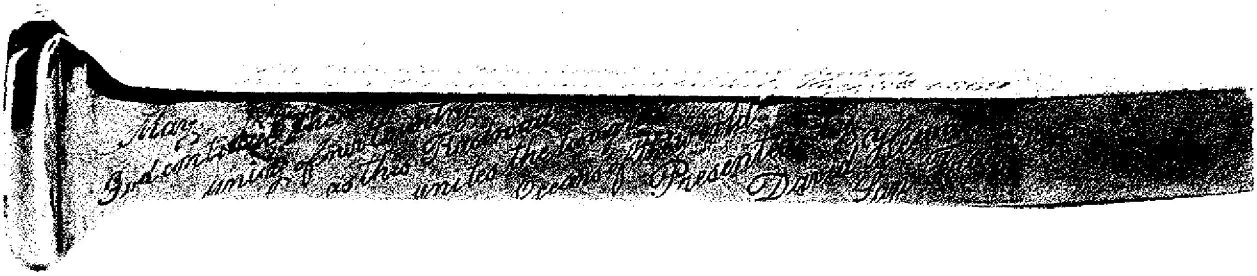


Directors of the
C. P. R. R. of Cal.

34.

This picture of the Golden Spike shows the fourth side inscription that is not entirely legible in the preceding photograph--the inscription of presentation by David Hewes. Photograph courtesy Union Pacific Railroad.





APPENDIX G

Photographs relating to Central Pacific Locomotive #60

a.	#60	Photos 35-42
b.	Sister locomotives	Photos 43-50
c.	Track and roadbed	Photos 51-55
d.	Promontory after the May 10, 1869 ceremony	Photos 56-62

35.

This picture is included here as being of interest because it shows the original Central Pacific Railroad depot on the Sacramento River bank (river at left out of picture) in Sacramento, California. It is reproduced from a stereo view in the Union Pacific Museum in Omaha. The stereo view was attributed to Andrew J. Russell. It is known that Russell continued on to the West Coast and visited Sacramento after the Golden Spike ceremonies at Promontory Summit on May 10, 1869. It may be inferred that he took this picture at that time in the late spring or early summer of 1869. Photograph courtesy Union Pacific Railroad.

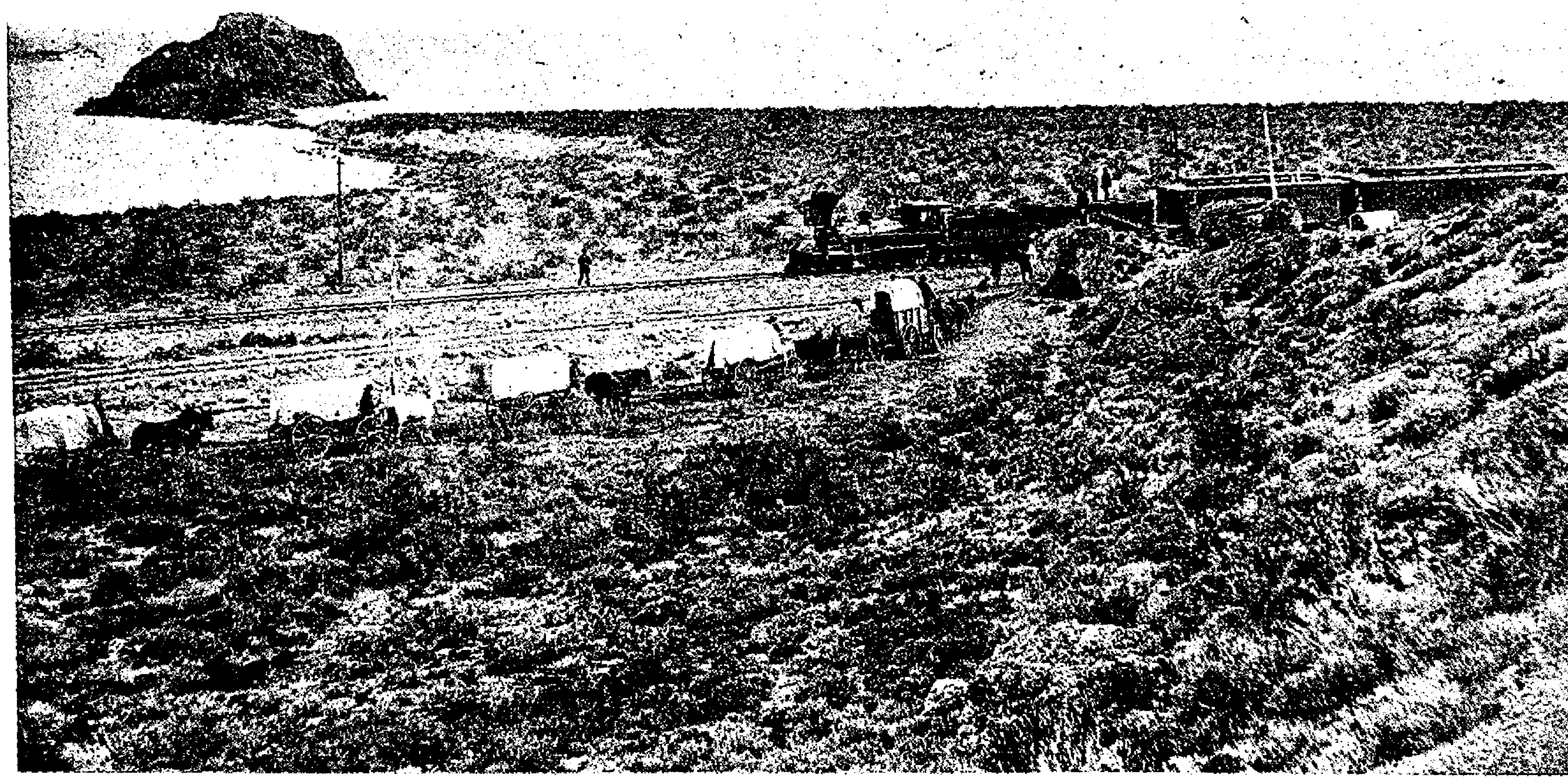
Given to artist for loco art.

36.

This picture shows Central Pacific Jupiter and Governor Stanford's special train at Monument Point, Utah, about 30 miles west of Promontory Summit. The view is from Monument Point looking south to Great Salt Lake. It was taken by Alfred A. Hart, official photographer for the Central Pacific, probably on May 9, 1869, the day before the May 10 ceremonies. We know that on the 9th, Governor Stanford's special train and party spent some time in sight-seeing in the vicinity of Monument Point. This picture was copied from a stereo view, #352, in the Timothy Hopkins Collection, Main Library, Stanford University. Photograph courtesy Stanford University.

37.

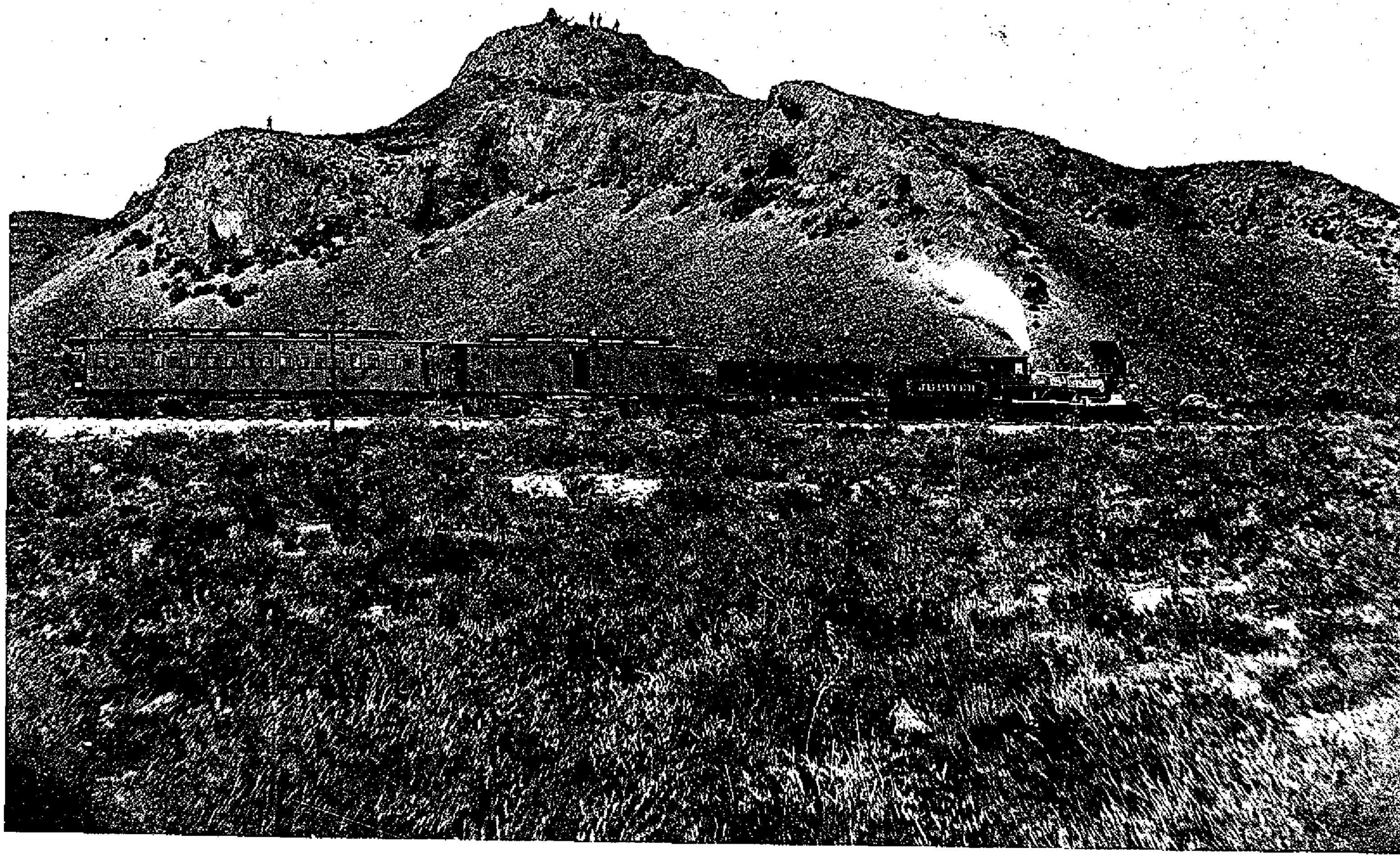
This photograph shows Central Pacific Jupiter, #60, pulling Governor Stanford's special train along the north shore of Great Salt Lake, Utah, at Monument Point, which is just out of picture at right rear. This unusual picture shows a covered wagon emigrant train headed west and waiting for the locomotive to pass. Alfred A. Hart, official photographer for the Central Pacific Railroad Company, of Sacramento, California, was a member of Governor Stanford's party, and took this picture on either 7, 8, or 9 May, 1869. Monument Point is about 30 miles west of Promontory Summit, where the rails were joined. This view was made from a stereographic picture card in an album recording the construction history of the Central Pacific RR. in the Timothy Hopkins Collection, Main Library, Stanford University. The stereo was numbered 353, and titled, "Poetry and Prose, Scene at Monument Point, North end of Salt Lake." Apparently this caption was written by Alfred Hart. The Southern Pacific Company at its headquarters in San Francisco, California, has a similar stereo view in its collection. Photograph courtesy Stanford University.



353 Poetry and Prose
Scene at Monument Point, North end of Salt Lake.

38.

This is another Alfred A. Hart photograph, probably taken on May 9, 1869, showing the Central Pacific Jupiter and Governor Stanford's special train at Monument Point, Utah, about 30 miles west of Promontory Summit. It is the only picture we have found showing the Jupiter and the full length of the Stanford Special, clearly visible. The persons standing on Monument Point probably are members of the Governor's party, since we know from several sources that the Jupiter pulled the train to Monument Point and vicinity on May 9, and the party spent several hours there and at the lake in sight-seeing and killing time while waiting for the Union Pacific party to arrive for the ceremonies at the summit the next day. This view is from the edge of the lake looking toward Monument Point, and is #351 in Hart's stereo views of the construction of the Central Pacific. His #352 was taken at the same place from the opposite direction. This picture was copied from a stereo view in the Timothy Hopkins Collection in the Main Library, Stanford University. Photograph courtesy Stanford University.



351 Monument Point from the Lake.

669 miles from Sacramento.

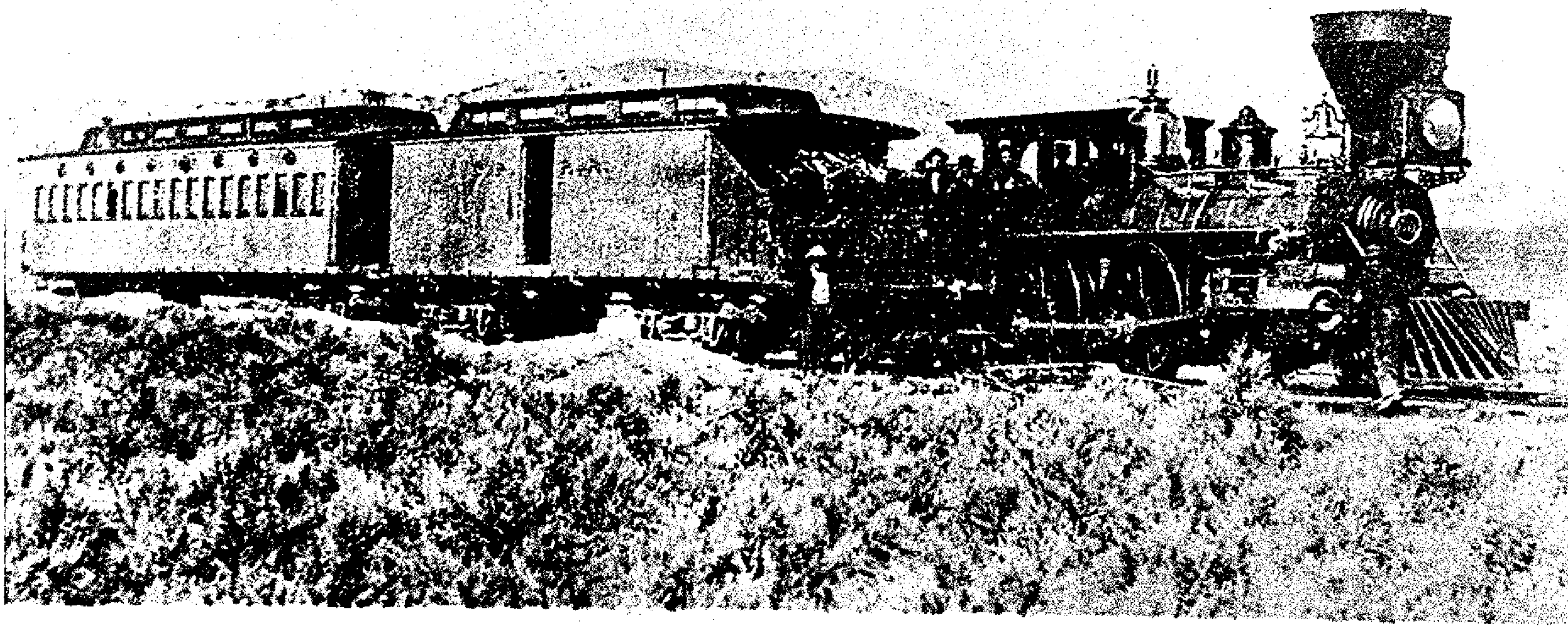
39.

This photograph shows Central Pacific Jupiter and tender at Promontory Summit on May 10, 1869 after the ceremonies of driving the Last Spike. A part of the 21st Infantry regimental band is posed alongside the locomotive. A part of the regiment was on its way to a new assignment at the Presidio, San Francisco, California, and just chanced to arrive here at this time on its way west. The view is from north to south. The pilot of Union Pacific #119 can be seen at the left edge of the picture. This picture was copied from a stereographic view made by Alfred A. Hart, in the Timothy Hopkins Collection in the Main Library, Stanford University. Hart numbered this view #358 and titled it, "Monarch from the West," as a companion to his Stereo #359, "Monarch from the East." Photograph courtesy Stanford University.

Given to artist for loco art

40.

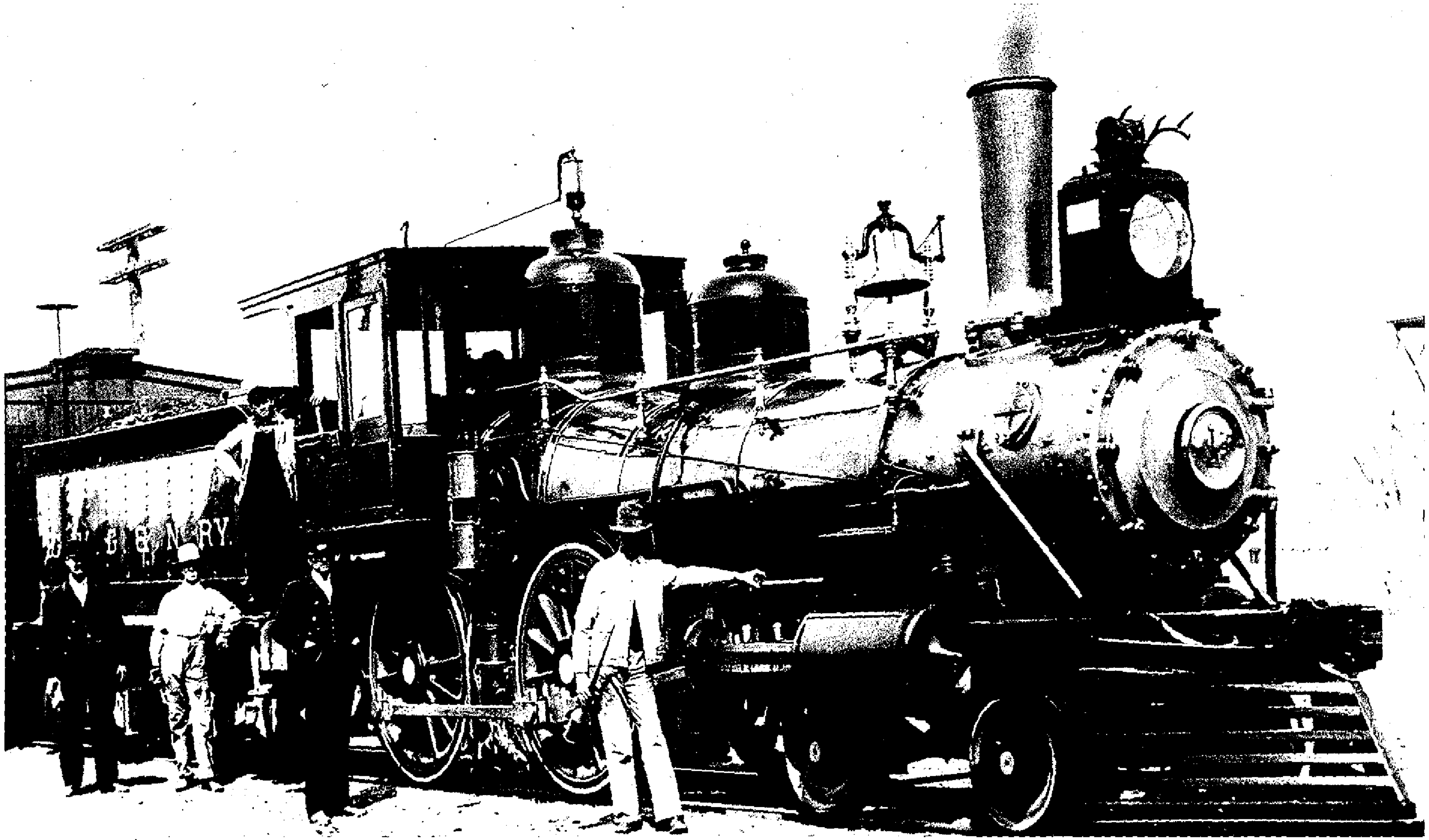
This is a view of Central Pacific Jupiter and Governor Stanford's special train enroute to Promontory Summit in May 1869. It has been reproduced from a print in the files of the Southern Pacific Company headquarters in San Francisco. It is attributed to Alfred A. Hart, date and place taken not indicated. Photograph courtesy Southern Pacific Company.



41.

Gila Valley, Globe & Northern Railroad locomotive #1, ex Central Pacific #1195, originally Central Pacific Jupiter, #60. The engine has new boiler, but chassis and tender are original. The Jupiter had been rebuilt by the Central Pacific at its Sacramento shops in 1893 and sold to the Gila Valley, Globe & Northern Railroad. It had been renumbered #1195 in 1891. The rebuilt Jupiter had an extended smokebox, side sheets and firebox were replaced, and the "Sacramento type" sandbox and steam dome covers were added. Bell, handrails, cab, and chassis original. The rebuilt locomotive burned coal on the Gila Valley, Globe & Northern. It was scrapped at Globe, Arizona, in 1906. Photograph taken in 1902. Photograph courtesy Gerald M. Best.

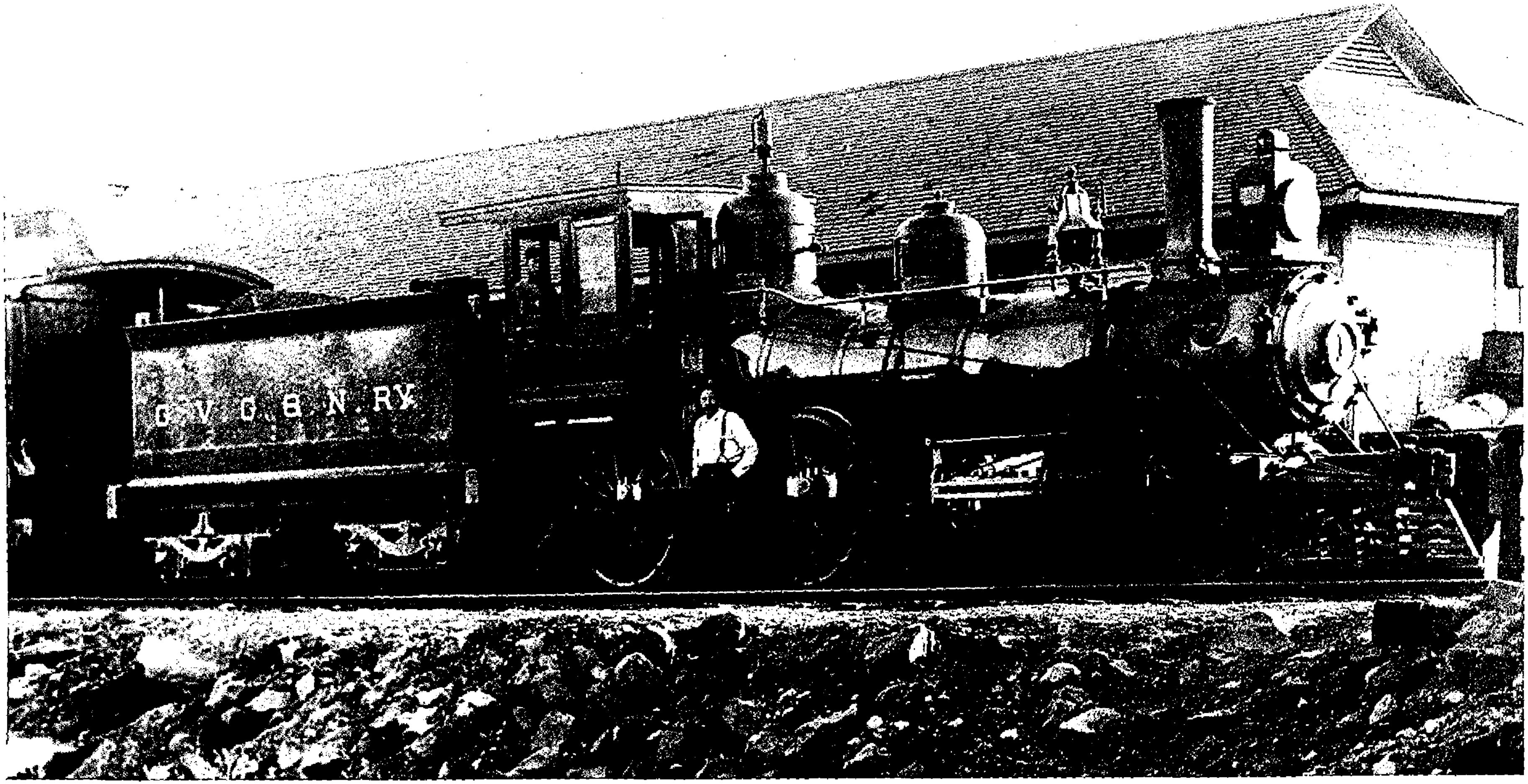
(John White comments that tender tank and frame may be original but the trucks are new.)



42.

Gila Valley, Globe & Northern Railroad Locomotive #1, ex Jupiter, in passenger service. Photograph taken in 1904. Photograph courtesy Gerald M. Best.

(John White comments that the tender tank looks high and enlraged, and notes band rivited to bottom of tank.)


C.V.G.&N.RY.

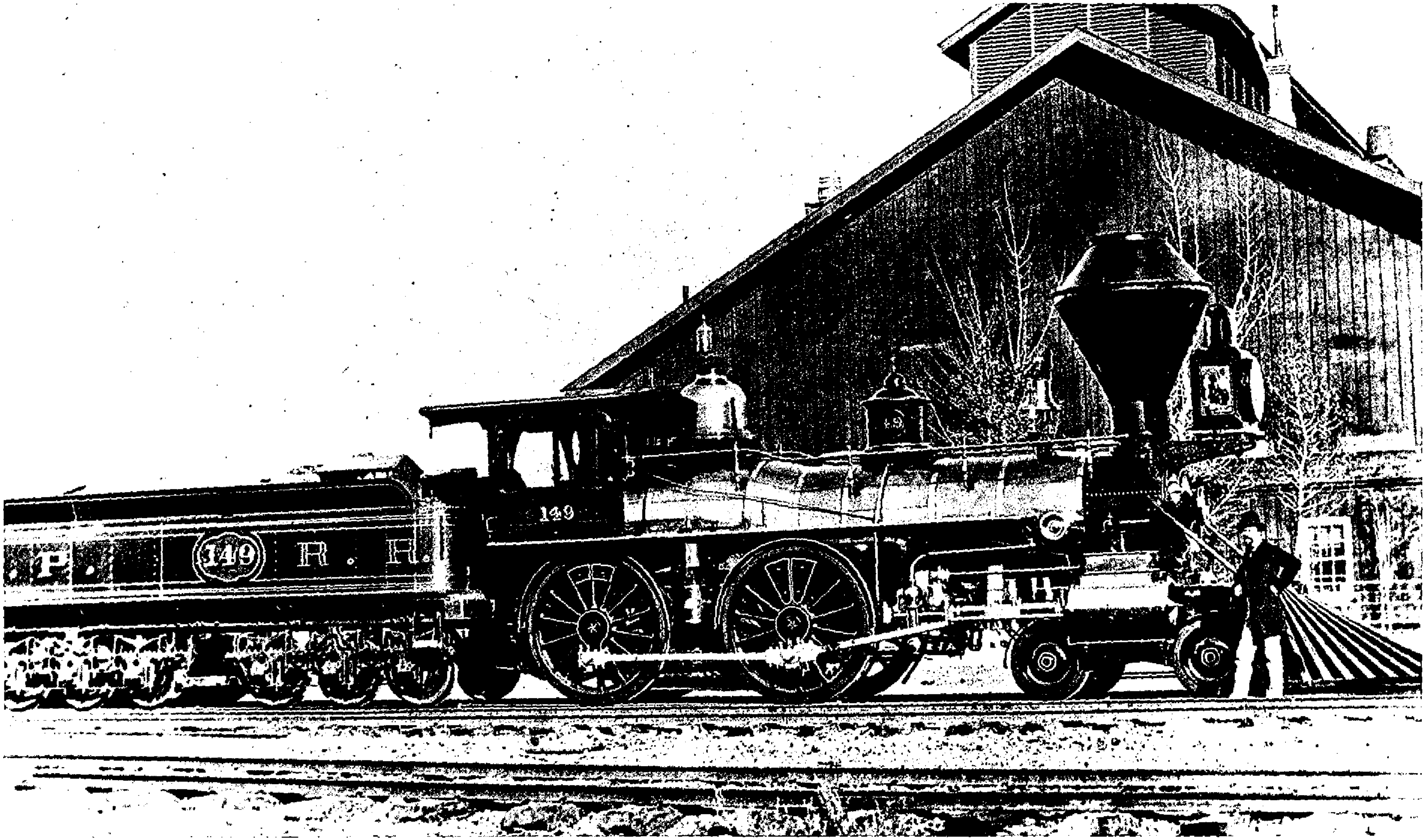
43.

Central Pacific locomotive #162, the Flash, essentially as originally built, except for counterbalance weights on the rear drivers. This locomotive was built by Schenectady for the Central Pacific to the same specifications as Jupiter, #60, and completed at the factory in July 1869, ten months after Jupiter. Factory number was 571. It was renumbered 1229 in 1891, and scrapped in December 1899. Tender is original. Date of photograph unknown, but locomotive little changed from original appearance at time. Photograph courtesy Gerald M. Best.


SKIP S

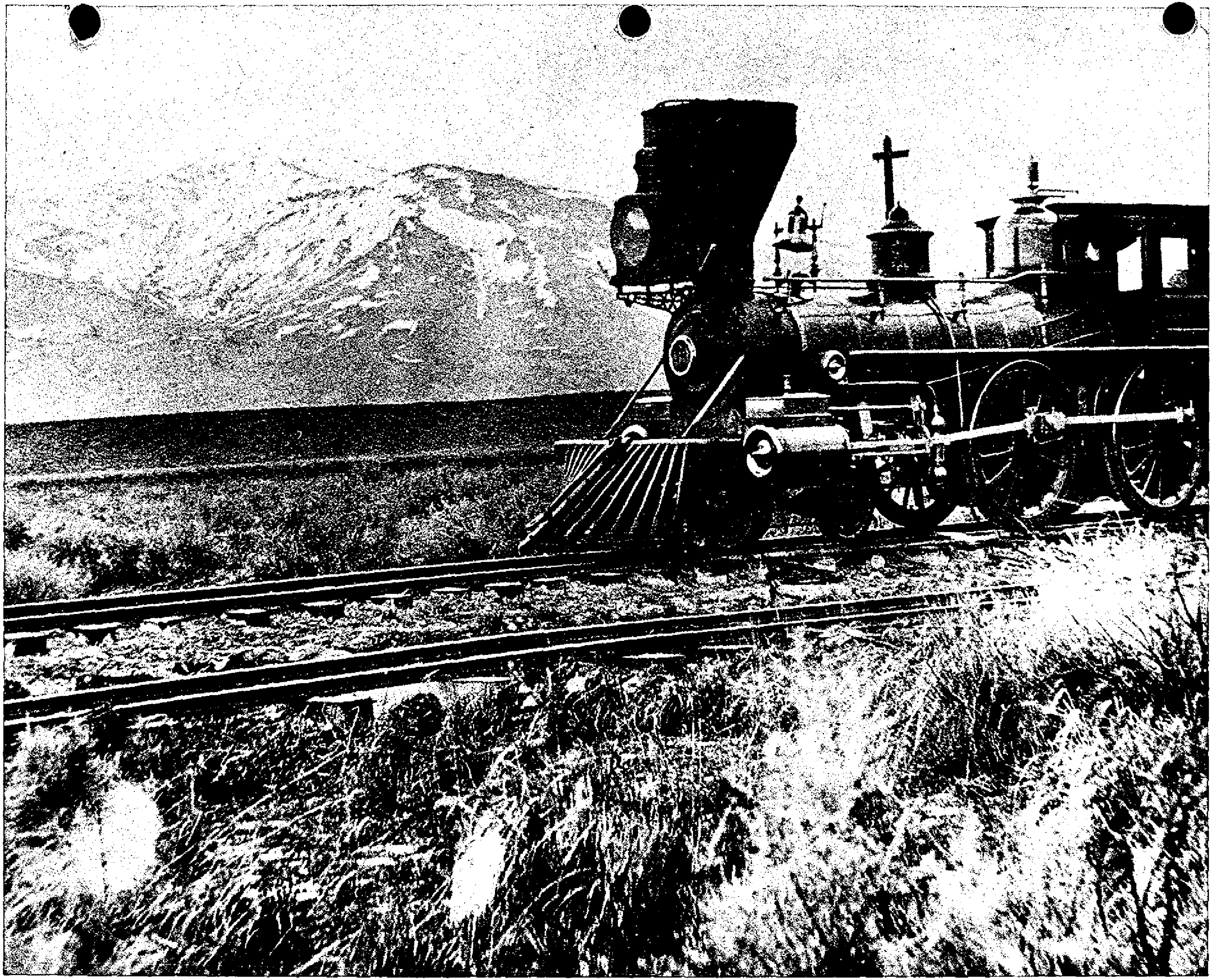
44.

Central Pacific locomotive #149, the Black Fox. This locomotive was built by Schenectady for the Central Pacific to the same specifications as Jupiter, #60, and was completed at the factory in December 1868, 3 months after Jupiter. It was factory number 531. Renumbered 1216 in 1891, scrapped in 1895. The tender is not the original one. An air compressor had been added to #149 when this photograph was made in 1876. Counterbalance weights had been added to the rear drivers. Photograph courtesy Gerald M. Best.


149
P
149
R . R.

45.

This photograph was taken of Central Pacific locomotive #63, Leviathan, a sister engine of Jupiter, near Deeth, Nevada, date unknown. Mount Halleck shows in distance. This picture was copied from a print in the Southern Pacific Company's file, attributed to Alfred A. Hart, stereo view #349. I have seen the same picture in a print attributed to a Muybridge stereo view in the California State Library, Sacramento. Photograph courtesy Southern Pacific Company.



46.

Central Pacific locomotive #158, Eureka, unidentified as to photographer and date taken. Eureka was one of several locomotives built by Schenectady Locomotive Works for the Central Pacific between November 1868 and July 1869 to the same specifications and weight as Jupiter--60-inch drivers, 16x24 cylinders, weight for engine alone 65,450 pounds. Photograph courtesy Southern Pacific Company.

Given to artist for loco art

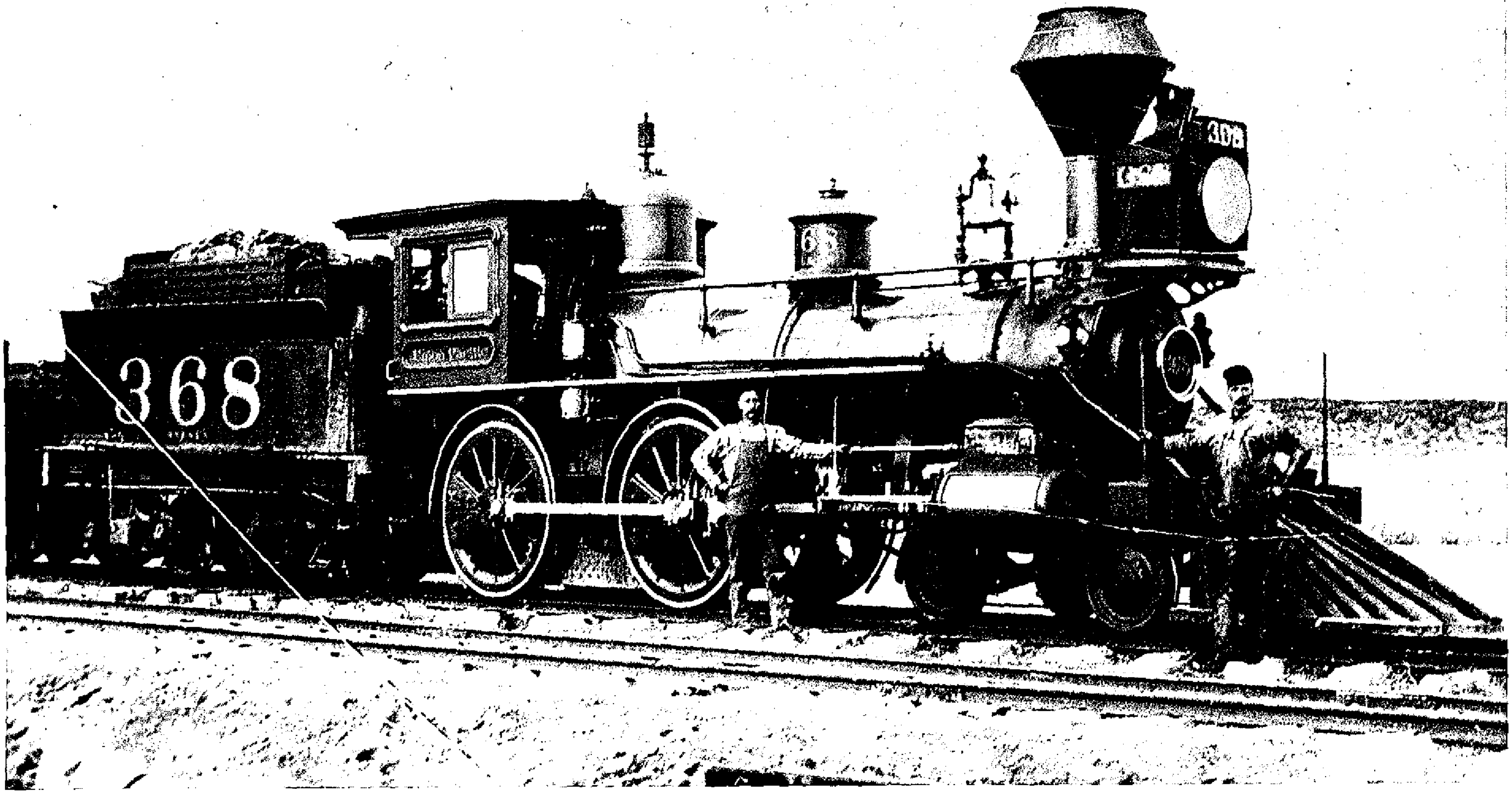
47.

This picture shows Schenectady built locomotive, factory number 472 (Jupiter was #505), completed January 1868. It is similar to Jupiter, but was built about 7-8 months earlier than Jupiter. Photographer and date of picture unknown. Photograph courtesy Smithsonian Institution.

(Gerald Best tells me this is Utica & Black River locomotive #6)

48.

Union Pacific locomotive #368, originally #125. Built by Schenectady and completed at factory December 1868. Same specifications and appearance as Central Pacific Jupiter except for smaller driving wheels, and less weight. Driving wheels 54 inches, weight 60,000 pounds. Photograph taken about 1885. Photograph courtesy Gerald M. Best.


368

49.

Union Pacific locomotive #23, completed at Schenectady March 1867, factory number 440. It is identical to Central Pacific Jupiter except for smokestack and headlight. Dimensions: Driving wheels 60 inches, 16 x 24 cylinders, 65,500 pounds weight. Date of photograph unknown, but early. Photograph courtesy Gerald M. Best.

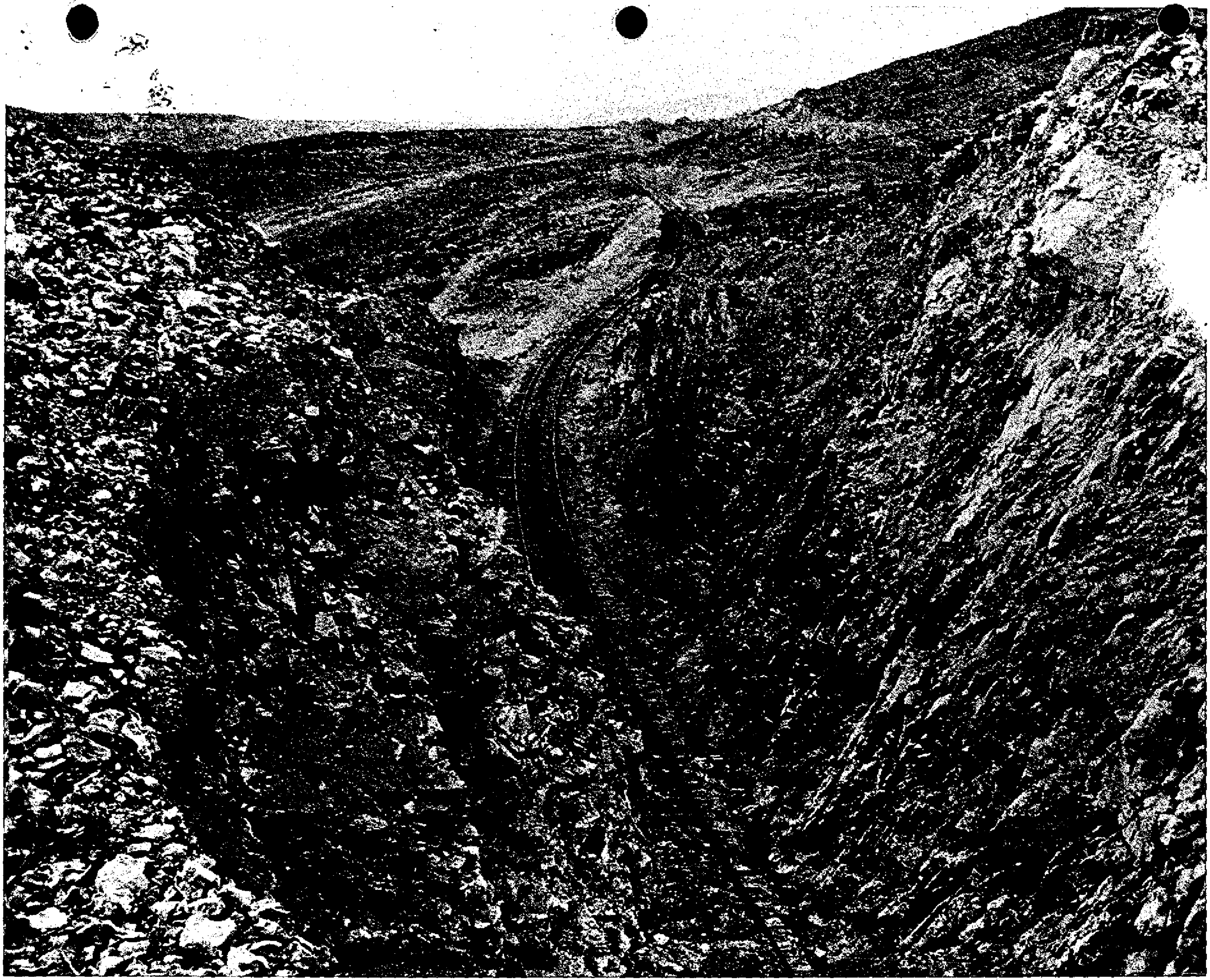
50.

This is a remarkably clear profile view of Rensseller & Saratoga Railroad (N.Y.) locomotive #36, R. Thompson Gale, built by Schenectady Locomotive Works, completed at factory August, 1869, factory number #577. It has the same specifications as Jupiter and looks similar to it. Built about 1 year later than Jupiter. Tender trucks do not seem the same as for Jupiter tender. Because of the clarity of most features of the engine and its similarity to Jupiter, this picture has much value for reproducing details in preparing construction drawings for a replica of Jupiter. Photograph courtesy Smithsonian Institution.


R. & S. R. R.
E. Thompson Gale

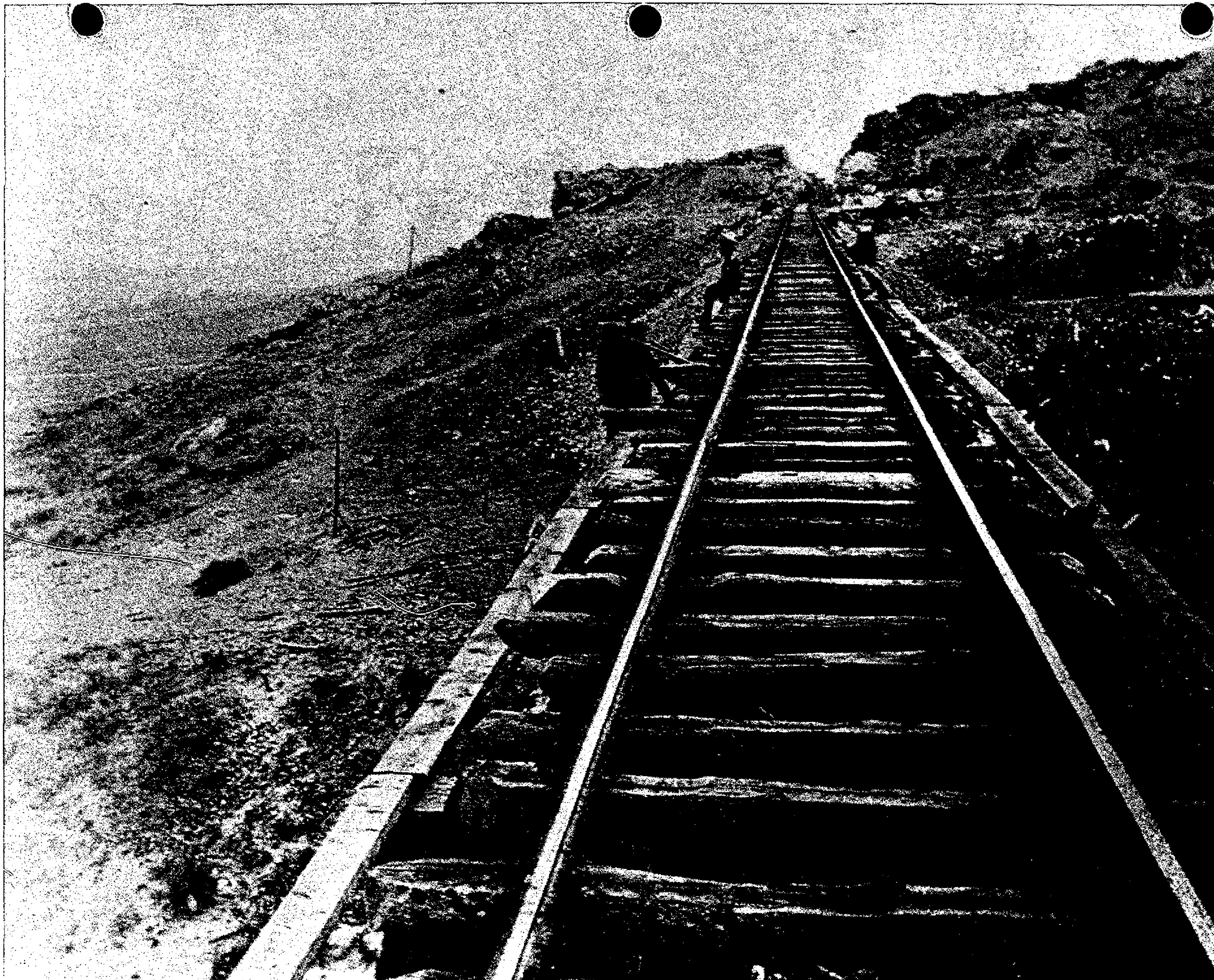
51.

This is a view of the Union Pacific track at Carmichael's Cut on the east slope of the North Promontory Range, view from east to west, taken within days, apparently, after the cut was completed and track laid. It was copied from an Andrew J. Russell stereo view in the Union Pacific Railroad Museum, Omaha. Russell must have taken this picture on or about May 10, 1869 when he attended the Golden Spike ceremonies as official Union Pacific photographer. The stereo is identified as showing "Salisbury Cut." It can be identified, however, as being at Carmichael's Cut, the term that has come down in the literature referring to this heaviest cut on the slopes of the Promontory Range and the feature that held up the ceremonies for a week or two until it could be completed and the track run through to the summit junction point of the two railroads. Photograph courtesy Union Pacific Railroad.



52.

This picture was copied from an Andrew J. Russell stereo view in the Union Pacific Railroad Museum, Omaha. It shows the Union Pacific grade and track at the west end of a trestle on the North Promontory Range. It is informative for manner of spiking the rails to the ties; the rough cut ties, adzed on one side; and the board walks on either side of the track on the trestle. Russell presumably took this picture at the time he visited Promontory Summit as official Union Pacific photographer for the May 10, 1869 Golden Spike ceremonies. Photograph courtesy Union Pacific Railroad.



53.

This picture was copied from a Carbutt stereo view #208, in the Union Pacific Railroad Museum, Omaha. Carbutt, a Chicago photographer, took this picture in October 1866 during the "Excursion to 100th Meridian," and shows a section of rough grade, ties laid, but rails still not in evidence, on the plains of Nebraska. Samuel B. Reed of the Union Pacific Railroad is the person standing on the grade. This picture is very interesting as a contemporary document showing the primitive nature of railroad grading across the plains. The ties show that they are axe cut, bark still on except for the one side that has been adzed to receive the rails. Apparently this method of preparing ties continued for the entire length of the original U.P. track to Promontory Summit because they show on pictures of the track there to be in the same condition as these laid down on the Nebraska plains in 1866, the first year of U.P. track construction. Photograph courtesy Union Pacific Railroad.

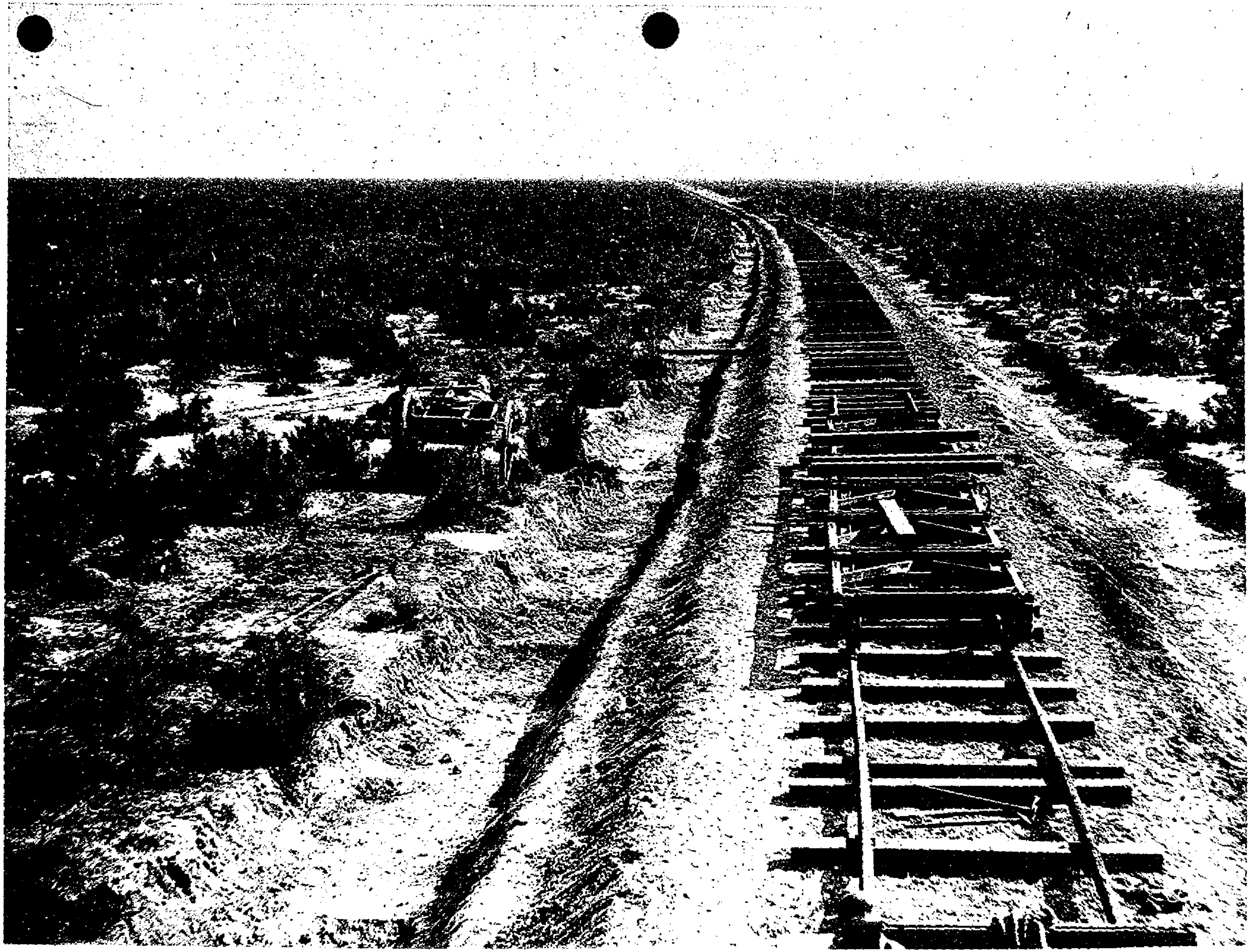
54.

This picture was copied from one in the Union Pacific files. I believe it to have been taken by Carbutt in October 1866 during the "Excursion to the 100th Meridian," and to show laying track on the Union Pacific on the Nebraska plains. The arrow points to Vice President T.C. Durant. Some evidence indicates it was reproduced from Carbutt's stereo view No. 209, but I have not seen that view to verify. The photograph is useful to show the method and quality of grade and ties and actual laying of rail in 1866. Photograph courtesy Union Pacific Railroad.

9

55.

This view shows a completed grade, ties laid, and rails going down at end of track with a track gauge on the recently placed rails. It is on the Central Pacific line in the desert west of Salt Lake and Promontory Summit. The picture is particularly informative concerning the amount and kind of grading done for the first track in the flat country of the interior basin. The earth from the two shallow ditches at either side of the track supplied the roadbed elevation, about a foot above the normal surface. This kind of grading would have been used by the Central Pacific at Promontory Summit for its part of the track. Note the square sawed ties from the Truckee Valley. This picture was made from a stereographic view in the Timothy Hopkins Collection, Album of Central Pacific Railroad Construction, Main Library, Stanford University. Apparently it was taken by Alfred A. Hart, official photographer of the Central Pacific Railroad, sometime in 1869. It is identified as Stereo View #321, and entitled "Advance of Civilization. End of Track Near Iron Point." Photograph courtesy Stanford University.

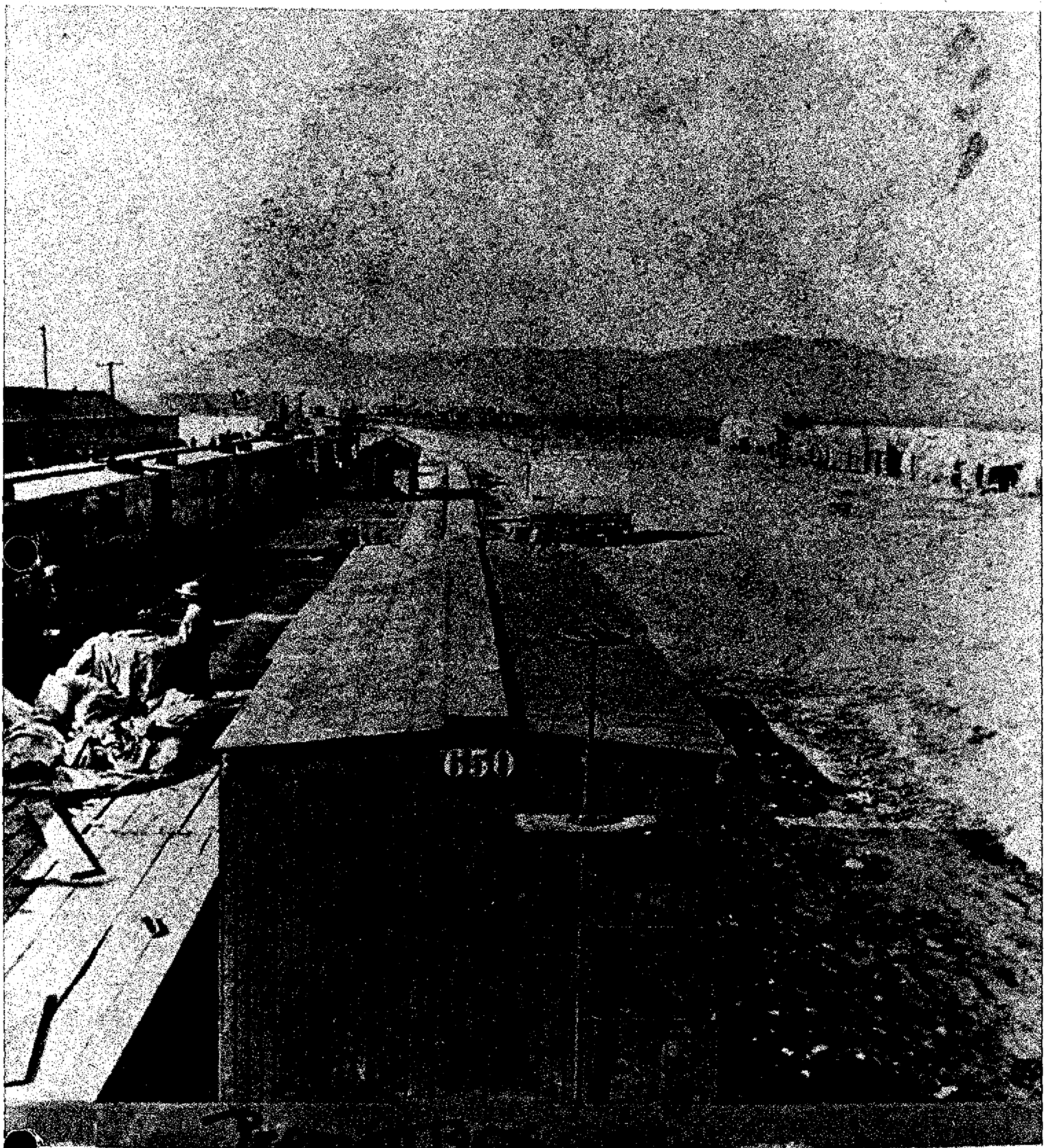


321. Advance of Civilization.

End of Track near Iron Point.

56.

This is a view of the station at Promontory Summit sometime in 1869, apparently, or in 1870, view from east to west. This picture is of great interest as it shows part of the town of Promontory at the right on the north side of the track, the depot and platform, siding, and at the left upper part of photo the long building seen partially is the dining room built immediately adjacent to the track. Both railroad workers and passengers used this facility. Another photograph will give a closer view of this structure. This picture was copied from one in the Union Pacific Railroad files at Omaha. It carried identification as being a view of Promontory in May 1869. I believe this to be wrong, as the picture most certainly was made at a later date, possibly late in 1869 or in 1870-1871. It was not identified as to photographer, but may have been taken by A. J. Russell on his return from the Pacific Coast, or during a second trip in 1870-1871. Photograph courtesy Union Pacific Railroad.

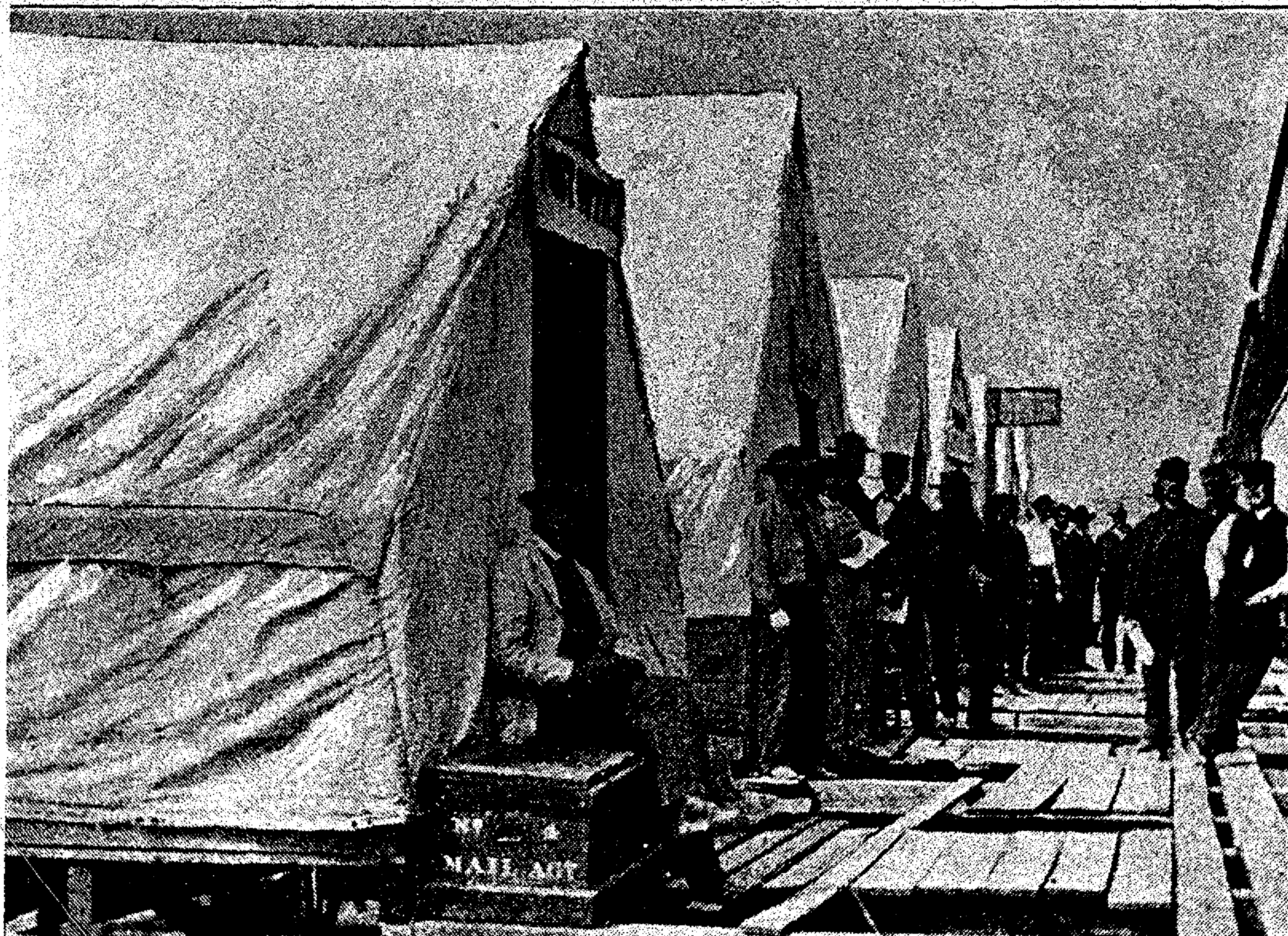

650

57.

This picture is a close-up view of the dining facility or "Eating House," as it was called, at the Promontory Summit station. The view shows a train at the right. A board platform or covering extended between the track and the building. Passengers could easily go from the train to the eating house in almost any weather. Notice at least one woman in the picture, in the doorway at left. Photographer and date of taking picture unknown. It probably dates from late 1869 or 1870-1871. Photograph courtesy Union Pacific Railroad.

58.

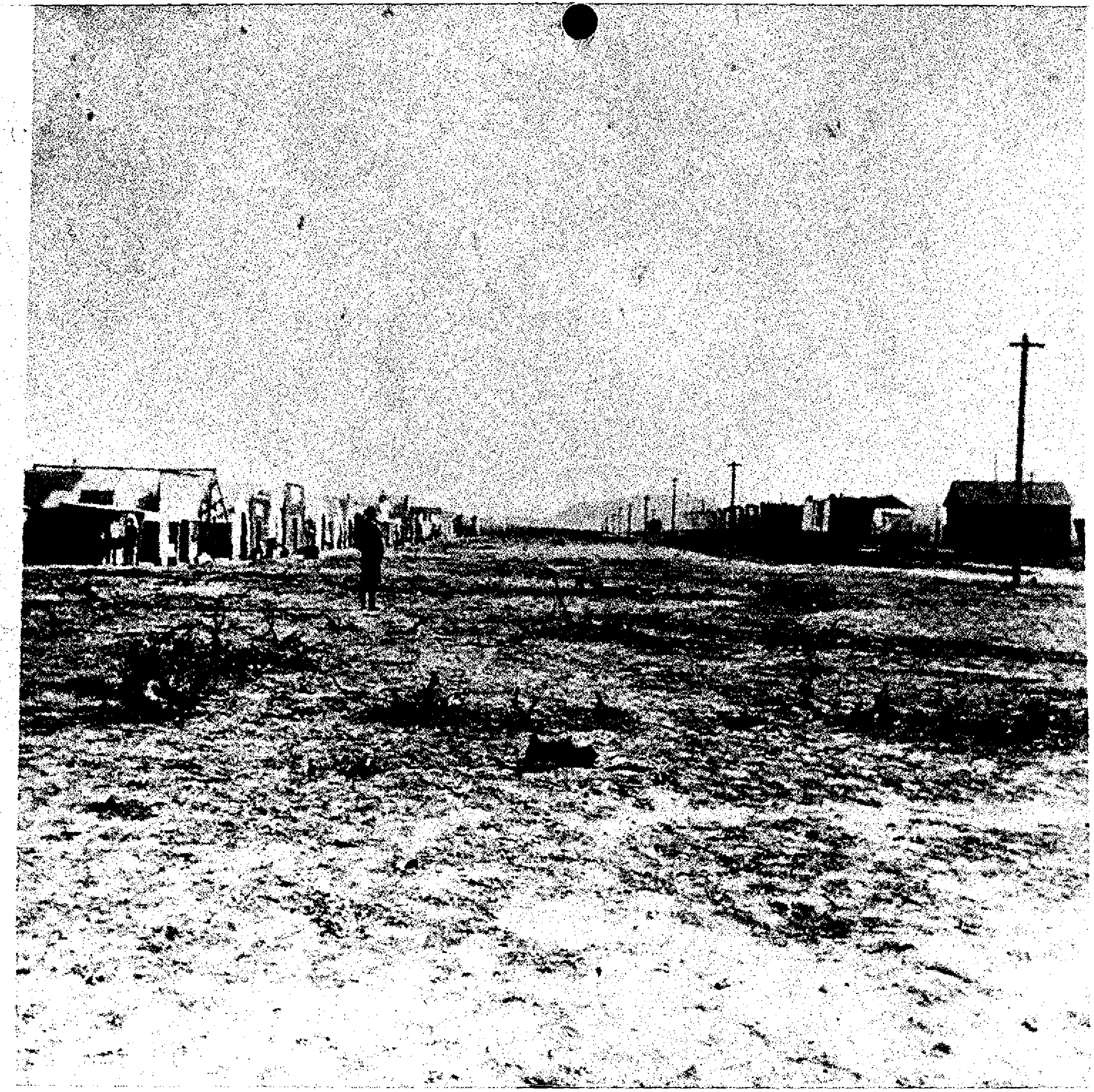
This picture was copied from an unidentified one in the files of the Union Pacific Railroad headquarters, Omaha. It shows a tent town at Promontory Summit. Note the tent at left foreground is marked "Post Office," and the man there is sitting on a chest marked, "No. 4 Mail Agt." A train appears to be at the immediate right of the loose board platform. The "Eating House" shown in preceding pictures appears to have replaced these tents at this site. This picture must have been taken soon after the May 10, 1869 ceremonies at the joining of the rails. Photograph courtesy Union Pacific Railroad.



The temporary station at Promontory Point, the junction of the Union Pacific and Central Pacific Railroads; photographed in

59.

This picture was copied from one in the files of the Union Pacific Railroad, Omaha, which was unidentified as to photographer or date taken. It shows the town of Promontory, view from west to east. A train is standing on the track just south of the line of telegraph poles. Some structures are on the south side of the tracks. The main part of the town, however, shows in part at the left. This photograph probably dates from late 1869 or 1870-1871. Photograph courtesy Union Pacific RR.



60.

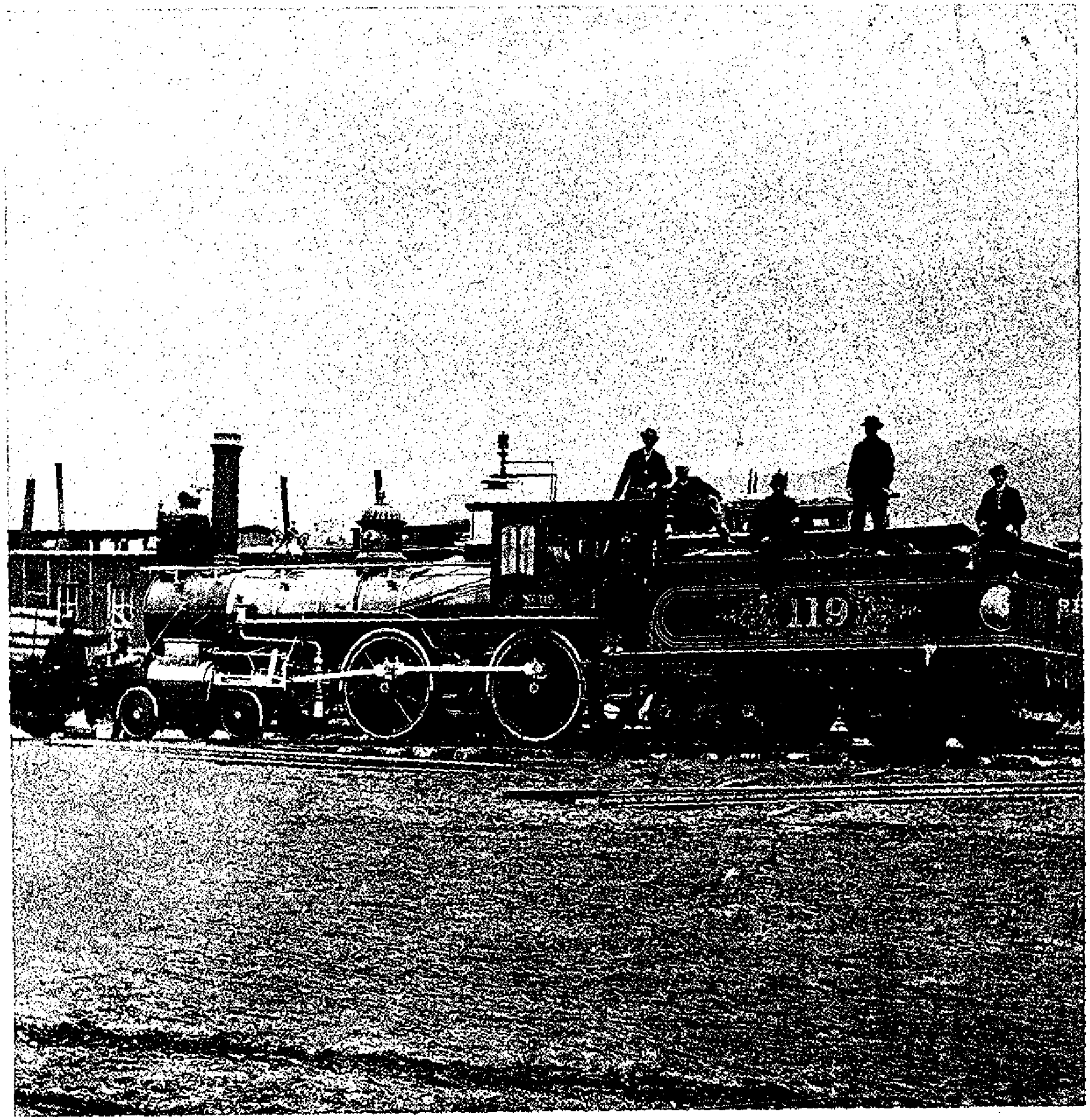
This picture was copied from one in the files of the Union Pacific Railroad headquarters at Omaha. The U.P. caption states these were buildings at Promontory, May 1869. It is in error at least concerning the date, I believe. The picture may have been taken later in 1869, in the summer or the autumn. This picture was used by Frank Leslie's Illustrated Newspaper illustrator for sketches that appeared in that publication, January 15, 1870. The frame buildings shown at the left probably had not been erected as early as May 1869. This picture is unidentified as to the photographer, but it may have been taken by Charles Savage of Salt Lake City. He is the photographer who would have been close enough to have taken views of Promontory periodically after the May 10, 1869 ceremonies. Note the number of women in front of the building at the left, "Pacific Hotel." This view looks north. The buildings are on the north side of the track. They are east of the rail joining "Golden Spike" site, as is indicated by the axe cut railroad ties of the Union Pacific section that show in the foreground. Photograph courtesy Union Pacific RR.


SODA WATER
BAKERY
ECHO RESTAURANT

61.

The bottom sketch shows the front row of buildings at Promontory Summit in the latter part of 1869 and early 1870. This sketch was based, apparently, on the preceding photograph, and possibly others, and on sketches made at the place. It shows a wider expanse of street front than the preceding picture, as a comparison of the two will show. Note that the 4th building from the left in the sketch is the Pacific Hotel, the next is the Echo Restaurant, the 6th is Clubhouse, the next Sunnyside Hotel. Shown at the right in the sketch, but out of view in the photograph are the California Hotel and a Hot coffee stand. The sketch also shows three buildings at the left that are out of view in the photograph.

In the sketch at top, the artist shows a gambling table in the dirt street in front of the California Hotel at Promonotry. Both of these sketches appeared in Frank Leslie's Illustrated Newspaper, January 15, 1870.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ACROSS THE CONTINENT. UNION PACIFIC RAILROAD.—GAMBLERS AND GAMBLING-TABLE IN THE STREET AT PROMONTORY POINT.—FROM A SKETCH BY OUR SPECIAL ARTIST. SEE PAGE [illegible]

ACROSS THE CONTINENT. [illegible] PROMONTORY POINT.—FROM A SKETCH BY OUR SPECIAL ARTIST.

From Frank Leslie's Illustrated Newspaper, January 15, 1870.

62.

This is an interesting view of a photograph taken down the middle of one of the Union Pacific Railroad construction camps on the east slope of the North Promontory Range. The picture was copied from one in the files of the Union Pacific Railroad headquarters at Omaha, where it was wrongly identified as a view of Promontory, but not otherwise identified as to photographer or date taken. The terrain shows clearly that it was near the base of the east slope of the North Promontory Range, west of Blue Creek. The railroad grade and a heavy rock cut show above the tents on the mountainside at the top left. This may be a picture of the notorious construction camp known as "Deadfall." I have not been able to make positive identification. Date of photograph is unknown, but it must have been taken in the first half of 1869 or possibly in the winter of 1868-1869. Charles Savage of Salt Lake City may have been the photographer. Photograph courtesy Union Pacific Railroad.