To his Excellency, Hon. J. W. McCurdy, Governor of Missouri:

Agreeably to a provision in section four of the act providing for a geological survey, requiring a report "on or before the first day of December," setting forth the progress of the survey during the current year, I would respectfully submit the following

REPORT:

Less than five months have elapsed since I received my commission and commenced the work. The most that I could hope to do, before making this report, was to make a hasty reconnaissance of the State, visit some of the most important and interesting mineral deposits, collect specimens for the cabinet, and for analysis, to be arranged and analyzed the ensuing winter, and also to make an examination of the specimens, field notes, maps, sections and manuscript reports made by Professor G. O. Swallow, and those acting under him, and to take measures for preserving, as far as possible, for future use, all that was found of value that had been accomplished by those engaged in

THE FORMER SURVEY.

Soon after my arrival in the State I visited Columbia. At the State University is a large collection of fossils and minerals belonging to the State. Some are in boxes, having never been opened since they were brought from the field; others are in trays where they have remained since the suspension of the survey in 1861, and others are placed in drawers and upon shelves, in the cabinet of the University.

Considering the lapse of time, during a portion of which the University building was in the possession of armed troops, it seems wonderful that they should now be in so good a state of preservation. Most of the specimens have labels attached to indicate their name, locality and the name of the collector. I think this favorable condition of things is, in a great measure, due to the watchful care and persevering efforts of Dr. J. G. Norwood, who visited the University daily when it was occupied by the soldiers.

Professor G. O. Swallow had the custody of the field notes, maps and manuscript belonging to the former survey. He informed me that he sought diligently to preserve them from destruction, taking the precaution, in time of war, to bury the manuscript and field notes, that they might be made available for future use. I found in his pos-
session most of the implements used and the maps, sections and reports brought out by him and his assistants, as follows: One ambulance; one rain gauge; one thermometer; two barometers; two geological hammers; one theodolite, tripod and target; one box paints; one protractor and scale; one pocket compass; one pocket level; also botanic specimens and the case containing them; one case of drawers for minerals; a blow pipe table, etc. Of reports, I found the following, viz.: Five reports by Professor G. C. Swallow on the counties of Morgan, Miller, Wright, Ozark and Saline. These were short and supplementary to those made by his assistants. He also showed me his description of 147 new and, as he said, hitherto undescribed fossils, many of which were found in the rocks of Missouri.

He informed me that he had memoranda of the trees, shrubs, plants, and grasses of the State, but these were not worked up into reports. He also said he had the material at hand which would enable him to bring out valuable papers on the soils and their relation to agriculture; on the physical geography of the State; on the zoology and ornithology; on hydraulic limestones, etc.

During the eight years' continuance of the former survey, Prof. Swallow had the maps of nineteen counties engraved. Of these five appeared in the geological report which was published in 1855, viz.: Cooper and Marion by G. C. Swallow; Franklin and St. Louis by B. F. Shumard and Monteau by F. B. Meek. The remaining fourteen were of the following counties, viz.: Scotland by G. C. Swallow; Cape Girardeau, Clark, Crawford, Jefferson, Lewis, Ozark, including Douglas, which was not then organized, Perry, Pulaski, Ste. Genevieve and Wright by B. F. Shumard; Warren by G. C. Broadhead, and Miller by F. B. Meek. From ten of the latter there were about ten thousand copies of maps printed, to be used in the final report. These are now in the custody of Professor Swallow. Unfortunately the engraving of these maps was on steel plates. These have become rusty, and the engraver, Mr. Kershaw, who has the custody of them, informs me that it will cost more to fix up these plates and make the additions and alteration necessary, than it will to make new engravings on copper.

In addition to the foregoing, I found in Professor Swallow's custody and at the University, township plats of nearly every town in the State. On many of these geological and topographical memoranda were noted, to be used in the construction of county maps. He also had numerous sections and manuscript maps, more or less complete, of fifty counties. Of these, four were colored and nearly ready for the engraver, viz.: Randolph, Ralls, Madison and Monroe. From the published maps, and also from those in manuscript, I think we can obtain information that will be of much service to us in our work. The manuscript reports of the assistants and their sections and field notes will also be valuable. But in no way can the latter be made so useful as in the hands of the men who made them. It seems desirable, therefore, as far as possible, that these men be engaged to finish up, or assist in finishing up, the work which they commenced.

The most complete reports which I found were those made by Dr. B. F. Shumard. They are on the counties of Crawford, Clark, Cape Girardeau, Phelps, Ste. Genevieve, Ozark, including Douglas, Perry, Jefferson, Laclede, Pulaski and Wright. The acknowledged ability and deserved popularity of Dr. Shumard are a sufficient guaranty that the reports which he made were accurate and of such value as to entitle them to a place in the final report. The geology of these coun-
ties is unchanged, but the developments of the last twelve years will demand a re-examination of the territory and a report supplementary to those of Dr. Shunnard.

Colonel G. C. Broadhead, of Pleasant Hill, made full reports on the counties of Randolph, Osage, Shelby, Macon, Maries and Warren. He also made partial reports on the counties of Montgomery, Ralls, Holt, Knox, Adair, Harrison, Sullivan, Gentry, Linn, Mercer, Grundy, Daviess, Caldwell, Nodaway, Atchison, St. Charles and DeKalb. I think it desirable and due to Colonel Broadhead that he be employed to revisit and examine these counties and make such additions and alterations to his reports as he may deem advisable and necessary.

Professor F. B. Meek, an eminent palæontologist, now in the employ of the United States Government, I believe, at the Smithsonian Institution, Washington, made reports on the counties of Morgan, Miller and Saline. These reports, good and complete when they were made, will need revision and alterations before they appear in the final report.

Other assistants engaged in the survey are doubtless in possession of material facts which they could bring out in a report, provided they could make a brief visit and a re-examination of the districts which they formerly surveyed.

Dr. J. G. Norwood, an able and experienced geologist and chemist, was in the survey two years. He never wrote his reports on the territory which he surveyed. He has copious field notes, and all the specimens of minerals and fossils which he collected, carefully preserved. By leave obtained of the Board of Managers of the Mining Bureau, I employed him to go with me and review portions of the territory that he had surveyed. Since then he has been at work arranging and classifying his specimens and writing out his reports as he found time not engrossed by his duties as Professor in the State University. I here insert

**DR. NORWOOD'S REPORT.**

*To A. D. Hager, State Geologist of Missouri:

Dear Sir: In accordance with your request, I make the following report of what I have done in relation to the State Geological Survey during the time which has elapsed since I left you at Pleasant Hill, Cass county.

While connected with the first State survey, I examined the following counties, viz: Madison, Lafayette, Jackson, Cass, Johnson, Henry, St. Clair, Pettis, the south half of Iron, the northwest townships of Benton, and a few townships of Bates. I was assisted in my work by G. C. Broadhead, in Madison county, by Edwin Harrison and P. G. Swallow in Lafayette, and by P. G. Swallow in the remainder of the counties named above.

During the part of winter and spring unfavorable for field work, the time was devoted to unpacking and labelling the specimens collected and the construction of provisional geological maps of these counties. These maps were copied by the draughtsman of the survey, and on several of them the surface geology was delineated by colors, and the localities of metallic ores, and the outcrops of coal marked by appropriate signs.

A portion of the time was also devoted to the construction of a general vertical section of the rock beds in the western counties explored by me and my assistants. This section was not completed
when I left the survey and delivered the papers in my possession into the hands of the State Geologist.

I also wrote out a description of the lead, copper, cobalt and nickel mines of Madison county, with detailed descriptions of the sedimentary and crystalline rocks in which they occur. In this I was greatly assisted by the detailed written report made to me by Mr. Broadhead of the townships assigned to him, from day to day, for examination.

Mr. P. C Swallow made no written reports of his work, merely handing me his field notes. I mention these facts, in order that you may understand clearly what I did in the former survey, together with the condition of the material of every kind collected by me, at the time I left it. During my connection with it, I was in the field from the beginning of spring until the end of December, so that I had no time for writing reports.

When you requested me to complete the work which I had begun in the counties named and report on their geology, I agreed to do it on the condition that I should be allowed to visit the various counties, as I could find time for the purpose of refreshing my memory in some things, but especially for ascertaining what new developments have been made in economic geology during the last twelve or thirteen years. This I cannot do before next summer. In the meantime, there is a great deal of office work to be done, and to this I can devote only a portion of my time.

In the first place provisional geological maps have to be reconstructed for most of my counties; those formerly made having been lost. Since they were made the rocks and fossils by the aid of which they were constructed, have been distributed through various boxes, drawers and trays, and having this way been mingled with material from distant parts of the State.

The materials belonging to each of the counties have to be brought together and examined before I can report on them, or use them for any valuable purpose. Most of the materials collected during the last year I was in the survey remained in the boxes in which they were transported from the field—never having been opened.

On reaching home in September, and examining more particularly into the condition of the collections made by me, and under my direction, I found that there was a good deal of work which could be done by using the hands of another person, under constant supervision, quite as well as if my own hands were used; in this way giving me more time to devote to matters which I alone could attend to. By the aid of an assistant, (my son,) who works in my room with me from four to six hours every day, a good deal has been done in getting together materials for the county reports, but nothing which I can readily detail in the form of a report.

All my boxes have been opened and the specimens they contained arranged in trays, and the labeling of those from one county (Pettis,) completed. A schedule of all the geological sections of Pettis county has been completed, and I shall commence entering them on the township plats in the course of this week. The schedule for Johnson county is about half done, and will be finished in the next two or three days. That for Henry county and the northwest of Benton will be made next. Before I can do much with the other counties, it will be necessary to examine all the collection stowed in the cellar under the chapel, as a number of trays containing specimens collected in those counties are supposed to be in that cellar.
It seems that most of the rocks and metallic ores from Madison county, and a number of those from Iron county, have been disseminated through the drawers and cases of the cabinet. As soon as I can find time I shall bring them together, and keep them so until the county report is written. Some of the specimens from Madison county ought to be subjected to analysis (by the blow pipe, at least,) before they are reported on.

And here it is necessary to state, that the reports of Mr. Broadhead on his explorations in Madison county, and my description of the mines of that county, both alluded to above, were not among the papers received from you when you were last here. I have requested the former State Geologist to search for them among his papers, but he has not yet succeeded in finding them.

I received from Mr. Broadhead, when at Pleasant Hill, his field notes on Madison county, in the hope that I could use them for the purpose for which his report was written, but I am sorry to say that I can make no profitable use of them. I would respectfully suggest that the notes be returned to him, with the request that he make another report of them for my use.

I must apologize for this long undigested account of what I have done and am doing, but I have been so extremely busy for some time past that I could not put it all on one page as I ought to have done.

Yours truly,

(Signed) J. G. NORWOOD.

COLUMBIA, November 29, 1870.

As considerable attention had been given in the former survey to the collection and analysis of soils, and Prof. Swallow said he was in possession of many valuable facts relating to the subject of soils and their relation to agriculture, I employed him in September last to write a chapter on this subject.

I also engaged him to select out and divide for the three cabinets specimens of those fossils which he had described as new, which were in the State collection at the University.

In order to present in this report the progress which he had made in the work assigned, I wrote, requesting him to give me statements of the condition of his chapter on soils and the fossils which he was to classify and divide. In response to this, he reported November 26th, as follows: "I have 223 pages of manuscript written on my report. I have been at work two or three hours per day on the fossils, trying to replace the labels disturbed by mice and men. I find it very slow work, and fear you will think I have made but little progress, though I know it to have been the hardest work done. I have not sorted out any fossils for the various collections, as I want the labels right first. I am compelled to compare and examine notes, which is slow work. I did not understand you to order that done until the other matters were finished, as previously directed. You must have patience with me, for I have been obliged to leave one thing unfinished and go to another several times."

Dr. A. Litton, Professor in the Washington University, one of the most accurate, reliable and experienced chemists in the country, has kindly consented to make several analyses and assays for me, and has given assurance that he will continue to do so when his other engagements will permit. It is to be hoped he will find time to perform all the labor of this kind that will be required in the survey. He was chemist in the former survey, and made about two hundred analyses that are not yet published, but they will appear in the final report.
I will say in this connection that I have not requested, and shall not desire him to make many quantitative analyses, but his principal labor will be to determine whether the specimens given him for examination contain any metal or other substance valuable in the arts, and if so, to determine the amount or percentage.

In employing these men, I have, by the consent of the Board of Managers, agreed to pay them a fair compensation for the labor performed.

Dr. Litton's bill for services, chemicals, use of laboratory, etc., was seventy-five dollars. Dr. Norwood's bill for services and expenses, since September 14th, was two hundred and fifty dollars, including the services of his son. Prof. Swallow's bill for services and expenses, was six hundred and sixty-two dollars and forty cents.

By a liberal construction of the law, I think a reasonable compensation paid to these men may well be classed as "necessary expenses of the survey," as provided in section nine of the act.

My own personal expenses, including hotel bills, horse hire, express and freight charges, fare on North Missouri Railroad, postage and stationery, amounts to three hundred and ninety-nine dollars and thirty-five cents. I have also expended for office furniture forty-one dollars and seventy cents.

In this connection I deem it proper to say a few words in relation to the

**Compensation of Assistants.**

The law provides that the principal assistant shall receive "not exceeding two thousand dollars" per annum, and each subordinate assistant not to exceed "one dollar and fifty cents per day for each day employed."

I fear the salary of two thousand dollars per annum will not secure the services of such a person as I would like to nominate for my assistant. There are but few men to be found who are qualified to fill the place, for he is required to be a chemist as well as a geologist, and such men usually command liberal salaries. A man whose salary amounts to twenty-three or twenty-four hundred dollars a year, in a permanent situation, would hardly consent to give it up for less pay, and for employment which will not probably be of long duration, however much he may like geological pursuits. A man possessing the qualifications required by the law is invaluable to such a work as we have in hand.

I can find plenty of men to take the position of assistant at the price named, but I want the best help that can be obtained. The hope of getting it has induced me to postpone the nomination of principal assistant till after I submitted this report.

If I had light manual labor to perform, or wanted a servant to wait upon me, I could doubtless find men who would become "subordinate assistants" for the price of one dollar and fifty cents per day. But I want no such service. I can wait upon myself. It is brain work not manual labor exclusively that is required. This cannot be purchased at the low price named.

In my opinion it is for the best interests of the State to employ, for a time, at least, some of the assistants connected with the former survey. But I cannot expect to secure their services, or the labor of any one worthy of taking a position in a geological corps at a price less than is usually paid for a day laborer.
GEOLOGICAL REPORT.

ANNUAL APPROPRIATION.

It may be inferred from the foregoing remarks that I want an increase of the appropriation. This is not so. The present appropriation, if continued, is sufficient. For the immediate expenses of the survey, the entire appropriation will not probably be needed during any year's continuance of the survey, but for reasons hereafter given, I would not like to have it reduced. I shall use no more money than is necessary to bring the survey to an early completion. I intend, in the final report, to have an accurate and complete MAP OF EACH COUNTY.

These will be drawn on a uniform scale of three miles to the inch, and will cover about the space of the quarto page of the report. They will be placed at the head of the chapter of each county which they represent. Upon these I propose to exhibit the extent and boundaries of the geological formations, the locality of mines, quarries, springs, streams, also the topography, villages, churches, school houses, mills, etc.

In making the survey it would greatly aid us if we could have a map of each county to take into the field. Believing as I do that the present appropriation will be sufficient to defray all the expenses of the survey, and also to pay for the engraving of all the county maps within the next four or five years, I propose, with the consent of the Board of Managers,* to have county maps engraved on copper or stone, at as early a day as practicable and a few copies struck off for use in the field upon which to note the geological formations, mark the location of mines and quarries as we visit them, and also to make any corrections or fill any vacancies that we may discover in the original draft.

By pursuing this course we shall be more likely to get correct maps to illustrate the geology, topography and other points of interest in each county than could be done if we waited till the county had been examined and the map made up entirely from our field notes. Additions and alterations can easily be made on the stone or copper plates.

STATE CABINET.

By a vote of the Board of Managers, the headquarters of the survey is established at St. Louis. Two rooms have been provided in the spacious building on the southeast corner of Fifth and Olive Streets; one for an office, the other for a cabinet. In the latter, cases are being fitted up for the exhibition of specimens which have been or may be collected in the survey. During the next month I shall endeavor to place on the shelves, the suite of specimens collected for St. Louis, and have appropriate labels attached to each. The specimens collected for the State University and School of Mines will be carefully packed in boxes and kept till suitable places are prepared for them. By having the specimens classified, labeled, and arranged under the head of the counties from which they were obtained, they will greatly aid us in writing out the geology of the State, and especially in bringing out the reports on the several counties.

* The board gave consent, the contract has been made, and the work is already begun.
Several parties owning mines and quarries have furnished specimens for exhibition in the cabinet. I would be glad to receive, from the proprietor of every mine and quarry in the State, specimens of their products for exhibition. Should any choose to send me specimens, I would suggest that they be, if convenient, about four inches square and one inch thick, or if building stone, marble or coal, I would prefer to have them in cubic blocks, four inches square. These should be carefully wrapped in paper, with a label enclosed giving the name of the donor, the county, range, township and section from which they were obtained. Due credit will be given on the labels for the donations.

It was my intention to make a hasty examination of the mineral districts, descend into and inspect the principal mines that are being worked, and examine the several quarries that are being opened, before making this report. The time has been too short to accomplish this. I have descended into more than fifty shafts and visited several quarries since I commenced my work, but I am aware that there are many valuable mines and quarries in the State which I have not seen. Evidences of mineral deposits exist in nearly every part of the State.

**THE COAL MEASURES**

Cover a large area in the northern and western portions. It is estimated that they include more than 26,000 square miles. Comparatively few openings have been made, and but little coal has been mined. Much of this has been cannel coal, and taken from deposits or "pockets" lying outside and south of the coal measures. These deposits are usually in depressions or cavernous recesses into which the coal appears to have been transported from its original deposit. They most commonly occur in encrinital limestone, but in some instances the beds repose on rocks of silurian age. They usually lie near the surface, their outcrops sometimes being visible. At other times the beds are covered with soil, but never, as far as I have observed, with regular strata except of clay or shales.

Some of these pockets are of limited extent and of no value, but several which I have visited are of great thickness. The two beds in Simpson's valuable mine, in Moniteau county, have an aggregate thickness of forty-two feet, with only a single stratum of black slate six inches thick, between them.

The beds in Fiedler's mine on the bank of Missouri river, three miles west of Boonville, are in some places forty feet thick. The beds in the Tipton coal mine are twenty-six feet thick.

Simpson's mine has been worked thirteen years, producing about two thousand tons of coal per annum. The sales are confined to Moniteau and the adjoining counties. I think Fiedler's mine has been opened about five years, but am not prepared to give the annual product. It is mostly sold to be used in steamers on the Missouri river. The Tipton mine was opened in March, 1870. From the first day of July to the first day of November, the company raised and sold 18,190 bushels.

In Callaway county there are several pockets of coal, some of great extent—the Mammoth and Mastodon mines being, as I am informed, among the largest. These I have not visited, nor the valuable mine of J. L. Stephens between Boonville and Tipton, which has produced about 120,000 bushels since January 1, 1869. The Ray County Coal
and Mining Company have a mine, opened on the 28th of August last which has produced about 10,000 bushels.

The deposits of coal in the coal measures are unlike the foregoing. They extend over much larger areas, but the beds are not nearly as thick, and, as far as I have observed, the coal is always of the bituminous variety.

The impression is prevalent with some that the bituminous coal of this State is generally of an inferior quality. I am not prepared to positively contradict this, but, as far as my observation has extended, the coal has been of fair quality. That found in one of the shafts of the Tebo Coal Mining Company, in Henry county, known as the Ogan blacksmith coal, is of superior quality.

Other points, when properly developed, will doubtless produce coal equal or superior to this. As before remarked, coal mining is but in its infancy in this State. The openings thus far made are generally at or adjacent to the outcrops, near the edge of the coal formation.

Should explorations be made with the diamond drill that cuts into the rock at the rate of about half an inch a minute, and furnishes a "core" of the rock through which it passes, it is highly probable that the same gratifying results would follow that attended the springs for lead in St. Francois county. It is not improbable that valuable mines of coal may be found to the north-west, in the central portions of the coal bed which is now worked within a few miles of this city.

I have attempted to collect coal statistics, but in this I have not been very successful. I am, however, permitted through the courtesy of E. J. Crandall, General Agent, to present statements from the company represented by him, as follows:

"Office of C. O. Godfrey and Associates,
Miners and Dealers in Coal,
St. Louis, Mo., December 1, 1870.

Prof. A. D. Hager, State Geologist of Missouri:

Dear Sir: As per your request, I send you herewith statements of coal raised by C. O. Godfrey and Associates, from the 1st day of Nov. 1869 to the 31st day of October, 1870, both days inclusive, from their mines in Missouri, as follows:

CENTRAL COAL AND MINING COMPANY—H. & ST. JOE. R. R.

Mine No. 1. 807,246 bu.
Mine No. 2. 660,160 bu.
Mine No. 3. 1,896,554

NORTH MO. COAL AND MINING CO.—NORTH MO. R. R.

Mine No. 1. 498,608 bu.
Mine No. 2. 235,138 bu.
Mine No. 4. 238,694 bu.
Mine No. 5. 901,601

11
In response to a letter asking John T. Heard, Managing Director of the Tebo Coal Mining Company, to give me the amount of coal produced at his mines, he replies by saying: "Our pits, numbers one and two, on Williamson tract, yielded from October, 1869, to October 1870, about 200 tons each, per month. Since October 1st till the present time, they yield about twice that amount—the two now giving 20,000 bushels or 800 tons per month. Pits number three and four are just fairly opened. Pit number three has yielded about 60 tons a month since October 1st, but will from this time (December 1) probably yield from 400 to 600 tons per month. (We have now a side track and can load the coal directly into the cars.) Pit number four we run almost exclusively for "smith coal," and take out about 200 tons per month. These estimates are only approximate, but I think they are substantially correct."

IRON.

I have made but partial examinations in the iron regions. These were in the counties of Iron, Phelps, Dent and Crawford, which do not include all the iron producing counties of the State. But enough was seen in these to convince me that the deposits of iron in Missouri are more numerous, extensive and intrinsically valuable than can be found elsewhere in the United States or Great Britain.

Those remarkable and unequaled deposits, Iron Mountain, Pilot Knob and Shepherd Mountain are not the only sources from which iron can be obtained. Scores of iron hills, composed almost exclusively of specular ore, or red hematite, essentially the same, and numerous beds of the carbonate of iron in the coal measures, similar to those in Pennsylvania, abound in the State, and only need properly applied muscle and money to become sources of wealth to the owners, and give to Missouri the sobriquet which it justly deserves—the iron state.

At a recent fair in Rolla, there were exhibited specimens of iron ore from over sixty different deposits in Phelps county. Of this number probably one half were red hematite or specular ore.

I will in this connection say that, as far as my observation has extended in the State, the deposits of specular ore are usually valuable and evidently extend down to great depth, but the beds of limonite—brown hematite or bog ore—are in most cases superficial deposits and of limited extent. They appear to be the results of the alteration or decomposition of other ores, principally iron pyrites. In a few instances, I have found deposits of limonite of considerable extent, which seemed to reach deep into the earth. These evidently resulted from and occupied the place of large deposits of iron pyrites, for in the center of the larger masses there was much "sulphur"—pyrites or the sulphuret of iron—as to greatly injure it or render it worthless for smelting purposes.
The question is often asked whether the ore will not be more valuable on penetrating deeper into the deposit. I think not, for the most rapid decomposition of the sulphuret, by its exposure to air, moisture, carbonic and organic acids, will be at or near the surface, therefore those limonites that result directly from pyrites will be best near the top of the deposit, but those which are formed by a precipitate from water, like the bog ore, are likely to be best near the central or bottom portions of the bed.

Limonite, when pure, makes a superior iron. If mixed with the specular ore, in moderate quantity, I think it will not only facilitate the reduction of the latter, but produce iron of a quality better than an average of the two ores taken separately. Therefore while I would dissuade rather than encourage the erection of furnaces for the smelting of limonite exclusively, or foster the belief entertained by some that they have solid hills of limonite or bog ore, I would suggest that these ores are valuable for the purposes named and there will doubtless be a demand for them when the specular ore beds are opened and being worked.

Up to this time comparatively few iron mines have been opened. It is reasonable to suppose that not half the deposits are yet discovered. It is only where a solid mass, or detached bowlders outcrop on a hill top, or where some stream of water has laid the ore bare, that iron is known to exist in most of the iron districts, for the land is mostly uncultivated and usually covered with a heavy growth of oak timber.

With plenty of wood to furnish charcoal and an abundance of good sandstone for furnace stacks and hearths, in the immediate vicinity of most of the deposits of specular ore, it may seem strange that these extensive beds of iron should remain unopened, and in many instances be considered not more valuable than good farming lands. The reason is apparent. With but a limited home market, and no means for transporting the manufactured iron from many of these deposits to market, except in wagons, over mud roads, the encouragement has not been sufficient to induce capitalists to open the mines or erect furnaces. More railroads are needed to convey the treasures from these storehouses of wealth to market. Nor is this all. Canals and slack water navigation are also needed, so that the ore may be placed in boats and remain in bulk till it reaches the furnace wharf. With slack water navigation on the Meramec and Gasconade, and a net work of canals along the base of the iron hills in the counties of Phelps, Dent and Crawford, the value of the farming lands in these counties would be, in my opinion, increased ten fold.

I will here remark that unlike the land in most mining districts, the soil is generally good and capable of sustaining a dense population.

I have intimated that but a beginning had been made towards the development of the iron interests of the State. Lest this might convey the false impression that but little ore was raised and but little pig iron produced, I will state that the thirteen furnaces in operation in the State produce about 100,000 tons of pig iron annually, which is nearly as much as the entire annual product of all the furnaces in the United States in any one year up to 1828, and about twice the annual product of all up to the year 1810.

Five of the furnaces were put in operation during the present year, and were in blast only a portion of the time.

In addition to the product of pig iron, large quantities of ore are annually raised and shipped to other States. I am not in possession
GEOLOGICAL REPORT.

of data that will enable me to give the exact quantity of ore that is sent abroad.*

Through the courtesy of the general freight agents of the St. Louis and Iron Mountain and the South Pacific Railroads, I am able to give the following reports, viz:

ST. LOUIS AND IRON MOUNTAIN RAILROAD COMPANY,
GENERAL FREIGHT OFFICE, ST. LOUIS, NOVEMBER 25, 1870.

Statement of iron and ore transported over the St. Louis and Iron Mountain Railroad from December 1st, 1668, to January 1st, 1870:

<table>
<thead>
<tr>
<th></th>
<th>Iron ore.</th>
<th>Pig iron.</th>
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<tbody>
<tr>
<td>1869</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tons</td>
<td>Tons</td>
</tr>
<tr>
<td>January</td>
<td>22,935,310</td>
<td>4,135,445</td>
</tr>
<tr>
<td>February</td>
<td>27,588,125</td>
<td>5,056,845</td>
</tr>
<tr>
<td>March</td>
<td>18,649,050</td>
<td>8,246,665</td>
</tr>
<tr>
<td>April</td>
<td>26,166,100</td>
<td>6,149,075</td>
</tr>
<tr>
<td>May</td>
<td>31,961,430</td>
<td>5,534,775</td>
</tr>
<tr>
<td>June</td>
<td>30,081,590</td>
<td>7,128,480</td>
</tr>
<tr>
<td>July</td>
<td>29,900,000</td>
<td>6,349,780</td>
</tr>
<tr>
<td>August</td>
<td>28,302,500</td>
<td>4,590,267</td>
</tr>
<tr>
<td>September</td>
<td>26,018,005</td>
<td>4,555,515</td>
</tr>
<tr>
<td>October</td>
<td>32,213,675</td>
<td>6,495,825</td>
</tr>
<tr>
<td>November</td>
<td>27,243,770</td>
<td>6,213,425</td>
</tr>
<tr>
<td>December</td>
<td>24,975,490</td>
<td>5,539,020</td>
</tr>
<tr>
<td>Total pounds</td>
<td>326,935,095</td>
<td>69,705,917</td>
</tr>
</tbody>
</table>

* Since this report was submitted, we find the following statement in the Missouri Democrat, of January 1st, 1871:

"The four companies manufacturing pig iron at Carondelet, namely, the Kingsland Iron Company, South St. Louis Iron Company, Lewis' Iron Company, and Carondelet Iron Company, have manufactured 82,075 tons of iron, the Iron Mountain Company 8,553 tons, the Pilot Knob Company 5,300 tons, the St. James furnace 2,620 tons pig iron and 810 tons blooms, and the Moselle furnace, Franklin county, 4,500 tons, making 103,340 tons of pig iron produced in Missouri during the year. The Moselle furnace was out of blast six weeks, and the Pilot Knob furnace one month.

The amount of ore mined during the year, as near as we could learn, was as follows:

<table>
<thead>
<tr>
<th>Tons.</th>
</tr>
</thead>
<tbody>
<tr>
<td>By the Iron Mountain Company 233,932</td>
</tr>
<tr>
<td>By the Pilot Knob Company 46,000</td>
</tr>
<tr>
<td>By the Hermitage Iron Mines (6 months) 4,000</td>
</tr>
<tr>
<td>Totals 283,932</td>
</tr>
</tbody>
</table>

Of this amount there have been shipped out of this city:

<table>
<thead>
<tr>
<th>Tons.</th>
</tr>
</thead>
<tbody>
<tr>
<td>By the Pilot Knob Company 30,500</td>
</tr>
<tr>
<td>By the Iron Mountain Company 153,652</td>
</tr>
<tr>
<td>Total 184,152</td>
</tr>
</tbody>
</table>

Of the new ore banks opened in this State, we may mention the Hermitage iron mine, owned by B. W. Alexander & Sons, situated on the Southwest Pacific Railroad, near Knob View, in Crawford county, Mo., 93 miles from St. Louis; opened about six months; has produced 4,000 tons of purple, or sat in ore, used as a mixture with Iron Mountain ore. The owners are now completing a railway from the mines to the Southwest Pacific Railroad, and will be able to furnish 200 tons daily after the 1st of February. The celebrated South St. Louis Iron is made from the above mixture. The Buckland ore bank, Kelley & Livsey's mine, Taylor's mine, and Wm. James mine,—all in Phelps county, near Rolla."
<table>
<thead>
<tr>
<th>Date</th>
<th>Iron ore</th>
<th>Pig iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>23,165,586</td>
<td>5,320,560</td>
</tr>
<tr>
<td>February</td>
<td>31,426,981</td>
<td>4,050,760</td>
</tr>
<tr>
<td>March</td>
<td>37,333,928</td>
<td>3,501,835</td>
</tr>
<tr>
<td>April</td>
<td>47,449,765</td>
<td>3,533,080</td>
</tr>
<tr>
<td>May</td>
<td>57,853,205</td>
<td>3,072,610</td>
</tr>
<tr>
<td>June</td>
<td>58,656,020</td>
<td>3,088,255</td>
</tr>
<tr>
<td>July</td>
<td>50,490,470</td>
<td>3,335,900</td>
</tr>
<tr>
<td>August</td>
<td>59,067,900</td>
<td>2,658,660</td>
</tr>
<tr>
<td>September</td>
<td>47,721,975</td>
<td>2,868,555</td>
</tr>
<tr>
<td>October</td>
<td>42,929,723</td>
<td>2,956,090</td>
</tr>
<tr>
<td>Total</td>
<td>456,098,155</td>
<td>36,385,405</td>
</tr>
</tbody>
</table>

Respectfully,  
S. FRINK, G. F. A.

The report from the South Pacific road is not as complete and as much in detail as the above, for the reason that the records of freight, until quite recently, were kept by other parties and not readily obtained. It is as follows:

SOUTH PACIFIC RAILROAD COMPANY,
St. Louis, Mo., Nov. 29, 1870.

A. D. HAGER, _State Geologist:

DEAR SIR: Below please find statement of traffic over our road during the current year, as requested:

Freights received at St. Louis .............. 28,564 tons.
Freights forwarded from St. Louis .......... 58,707 "
Amount iron ore received at St. Louis ...... 9,910 "
Amount pig iron received at St. Louis ...... 6,480 "

Very truly,

WM. A. PATRIARCH,  
General Freight Agent,
CHASE.

LEAD:

In none of the mineral districts which I have visited was I so agreeably disappointed as when examining the lead deposits. These extend from Newton and Jasper counties, across the State, in a northeasterly direction, nearly or quite to the Mississippi river. I have only visited the principal mines in the counties of Madison, St. Francois, Washington, Morgan, Moniteau, Newton and Jasper.

Henry R. Schoolcraft, in 1819, reported the lead product of the State about 3,000,000 pounds annually. In "Whitney's Mineral Wealth," (good authority in most respects) published about sixteen years ago, the author reiterates this statement, and adds that "all these mines have fallen off very much, and most of them are com-
pletely exhausted.” On the next page (419), as if to make the thing more positive, he says: “There is little reason to believe that they will ever again regain the importance which they once had.” These statements, coming from the source they did, have had the effect to create a false impression respecting the true condition of the lead deposits in the State. Compilers of statistics, too, have generally, I believe, made Missouri produce about 3,000,000 pounds of lead up to the present time.

After having seen the seven Scotch hearths at Granby in full blast, producing per diem nearly or quite enough to make 3,000,000 pounds per annum, I concluded that there was an error in the estimated amount of lead, and determined I would try and ascertain the actual product for 1869, and also the amount produced this year up to Nov. 1st, ten months.

I therefore called upon or wrote to the proprietors of furnaces, from whom I obtained partial returns, which I insert hereafter.

Fortunately, Mr. Ferd. F. Rozier, of this city, had anticipated me in obtaining lead statistics, but adopted a different course to reach the same result. He obtained from official sources the amount that had been received at St. Louis from all sources, during 1869, and for the current year up to November 1st, 1870, and has kindly furnished me with the following statements, viz:

<table>
<thead>
<tr>
<th></th>
<th>1869</th>
<th>Up to Nov. 1, 1870</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole amount lead from Missouri</td>
<td>172,833</td>
<td>12,963,975</td>
</tr>
<tr>
<td>Whole amount foreign lead</td>
<td>7,887</td>
<td>1,021,310</td>
</tr>
<tr>
<td>Whole amount from Galena, Illinois</td>
<td>26,775</td>
<td>2,008,125</td>
</tr>
<tr>
<td>Whole amount from Galena, re-shipped</td>
<td>15,801</td>
<td>1,185,075</td>
</tr>
</tbody>
</table>

Provided the receipts are as great for the remaining two months—and there is no reason why they should not be—the total amount of lead produced and brought to market this year will be 13,686,220 pounds,* which, at the present price of lead ($1.5 cents) will amount to $2,250 95.

In every lead-producing district in the State, the first mining was confined wholly to “surface diggings,” that is the lead was found in the clay or soil that had resulted from decomposed rock, usually magnesian limestones. Sometimes the ore would be found amid the grass roots and occasionally on the surface of the ground, where the latter had been washed. As long as lead was found in these conditions, no one cared to blast into the solid rock for it.

When the surface diggings are worked out, it is usual for some one to blast into the rock below. If he is fortunate and finds a rich lode of mineral, others flock to the spot, establish their “claims,” sink shafts, and the same ground that was “gophered” is again worked over in the first lead-bearing “opening” that is reached. And the same course is pursued in the second and third openings in the rock. It is in these openings, which are usually horizontal, that most of the valuable lodes are found.

* There were 31,950 pigs—2,396,250 pounds—received during the months of November and December, which makes the entire lead product for the year 14,128,725 pounds, which have an aggregate value of over a million of dollars.
It is not unusual in some lead-bearing districts, for twenty shafts to be going down at a time within rifle shot of one where the parties have struck a "rich opening," and perhaps one year from that time not a person will be working at these diggings, for they are supposed to be worked out.

This will apply to a majority of the lead-mining districts of the State. But when some party, with ample means, takes this "worked-out" property and sinks shafts to a deeper level, it is not uncommon for them to find lead, even more abundant than it was in the surface or more shallow diggings.

Could any one who thinks the lead interests of the State upon the wane and that they will not "regain the importance which they once had," have been with me and seen the rich "blocks" and "sheets" of mineral at Granby, or in Desloges' shaft at Potosi, one hundred feet deep, seen the masses of shining ore reflecting their bright light from the extensive pockets of barytes that inclosed them, or, at the depth of ninety feet in the St. Joseph mine in St. Francois county, have walked with me in a room seven feet high, and be told, as I was, that the whole of the material that had been taken from that open space had been crushed and the ore washed therefrom, and as an evidence of it seen the walls on every side glistening with the bright ore, I think the conclusion would have been that the mines are not "completely exhausted," but that lead mining will become one of the leading and profitable industrial pursuits of the State.

I am not prepared to give, from my own observations, the geological position and limit of the lead-bearing rock, but am forced to the conclusion that the deposits of galena ore are not, in all cases, restricted to rocks of silurian age. At Simpson's coal mine, in Moniteau county, the lead fills, in places, the fissures or cracks that occur in the cannel coal, and within a mile of this mine is a bed of lignite, in which there are also deposits of galena and zinc ore.

Below will be found a table giving the amount of lead smelted at the several furnaces from which I have obtained returns. The list is incomplete, as several failed to respond to my written request to furnish me the statistics:

<table>
<thead>
<tr>
<th>1869</th>
<th>1870</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granby Mining and Smelting Company, Granby</td>
<td>2,531,440</td>
</tr>
<tr>
<td>LaMotte Mine Company, Madison county</td>
<td>3,676,080</td>
</tr>
<tr>
<td>William Long, Old Mines</td>
<td>781,558</td>
</tr>
<tr>
<td>St. Louis Mining Company, Kingston</td>
<td>455,500</td>
</tr>
<tr>
<td>James Long, Potosi</td>
<td>550,000</td>
</tr>
<tr>
<td>Firman Desloges, Potosi</td>
<td>336,000</td>
</tr>
<tr>
<td>Missouri and Pennsylvania Lead Company, Harmony</td>
<td>325,740</td>
</tr>
<tr>
<td>John Evans, Hopewell</td>
<td>213,800</td>
</tr>
<tr>
<td>J. Teasdale &amp; Co., Potosi</td>
<td>117,758</td>
</tr>
<tr>
<td>C. B. Lumpkins, Fourche au Renault</td>
<td>96,500</td>
</tr>
<tr>
<td>J. &amp; J. Latty, Shibboleth</td>
<td>307,245</td>
</tr>
<tr>
<td>Framet Lead Company, Jefferson County, (Commenced April 14, 1870)</td>
<td>316,920</td>
</tr>
<tr>
<td>Valle Mining Company, Avoca</td>
<td>519,120</td>
</tr>
<tr>
<td>M. S. &amp; M. L. Company, Stanton</td>
<td>71,345</td>
</tr>
<tr>
<td>T. Bennett &amp; Brothers, Stanton</td>
<td>37,000</td>
</tr>
<tr>
<td>Maupin &amp; Shepard, St. Clair</td>
<td>120,090</td>
</tr>
<tr>
<td>St. Joseph Lead Company, Odell</td>
<td>681,583</td>
</tr>
</tbody>
</table>

**ZINC.**

Those who worked the lead mines at Granby, at the Valle mines and elsewhere found, in connection with the galena, a gangue or vein-
stone composed of what they called "dry bone" and "black jack. They considered these of no value, and they were "dumped" or stowed away in the mines as so much worthless rock. But now these substances are known to have value, for they are the carbonates and sulphurets of zinc. Many of the piles of earth and rock at the mouths of old shafts are being worked over to obtain these ores of zinc, and in a few instances, mines that have been worked out for lead are now being re-opened and worked for the zinc ore which they contain.

Within the last two years, two zinc furnaces have been erected in South St. Louis, and put in operation, and produce $350,000 worth of spelter or metallic zinc annually, which is more than three times the entire product of zinc in the United States ten years ago.

At the Granby lead mines the amount of zinc ore is enormous. The larger masses or veins are usually the sulphuret with a coating of the carbonate and silicate of zinc. I think it probable that the zinc now in the mines at Granby is of as much value as the lead was which has been taken from them.

The Valle and Bische's mines are rich in zinc. From the former there were shipped from June 9, 1869, to November 5, 1870, 6,205,255 pounds of zinc ore to the furnaces at South St. Louis.

When traveling in the valley of Gravois river, Morgan county I noticed a peculiar kind of magnesian limestone, and suspected from its appearance that it contained zinc. I took a specimen to Dr. A. Litton who applied chemical tests and found that my conjecture was well founded for the rock did contain zinc, but not in workable quantity. From what I have seen I conclude that the State may become as noted for the production of zinc as for lead and iron.

**NICKEL AND COBALT.**

These minerals are found more or less abundant in the Mine LaMotte diggings, associated with the sulphurets of lead, iron and copper. It is possible that these minerals may not only be found abundant at Mine LaMotte, but also in other districts in the State.* My observations were not made under circumstances that would enable me to judge understandingly of the quality of the ore or the amount likely to be produced at the Mine LaMotte diggings.

**SILVER.**

I have seen nothing which I knew to be silver ore found in the State. I, however, suspect that some of the galena at the St. Joseph and Mine LaMotte diggings may contain silver in workable quantity, and propose to have suitable tests applied the ensuing winter upon specimens which I thought argentiferous and brought home for trial. I have several times heard of "silver mines" in the State, but have not stepped out of my way to see them.

**TIN.**

It has several times been announced in the newspapers that there were rich mines of tin in the State, and recently I hear it is reported that I have made an assay of the ore at the mines, and am fully satisfied that tin exists in great quantity.

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*Specimens which I collected at the St. Joseph Mine are found to contain nickel and cobalt.*
It seems due to myself, under the circumstances, that an explanation be made. On the 19th inst. I visited the so-called tin mines of Madison county, and saw an assay of the ore, and now have a button of tin which came from the bottom of the crucible after the assay was made.

I was not able to detect any fraud or trick by which the tin was put into the crucible, still I am not satisfied that there is a trace of tin in any rock found in Madison county.

If the greenstone which was pulverized, and put into the crucible produced the tin which I found there, then the tin mines of Missouri will far excel, in value, the mines of Cornwall, for the entire base of the mountain is evidently made up of this eruptive rock. And it is abundant elsewhere.

I entered and carefully examined the four adits and the material that had been taken from them, but I saw no evidence of any vein, nor did I see any thing which, to my mind, was tin ore. I took some of the rock from which the piece was broken that was pulverized, and also some of the pulverized ore and the fluxes used in the assay at the tin mines, just equal to the amount put into the crucible, brought them away and propose to have them tested in the best possible manner as soon as the work can be properly done.

If tin is found, I shall be most happy to accept the fact and add it to the large list of valuable minerals already known to exist in the State.

COPPER.

I have not had time to visit those districts where copper is said to exist, but from specimens which I have seen I infer that copper may be found in paying quantities in several places, and shall endeavor to make an early visit next spring to the points from which I have received specimens.

OTHER MINERALS.

Numerous other substances of economical value abound, to which I can only make a brief allusion.

Barytes, heavy spar or "tiff" of the miners, is very abundant in some parts of the State. It generally is the gangue or associate of galena. At the Kingston mines it is very abundant. Considerable quantities of barytes are used as a substitute for white lead.

The agent at Cadet Station, on the St. Louis and Iron Mountain Railroad, informs me that about twenty car loads of ten tons each, were shipped from that station per month.

Glass sand, another article very abundant and apparently of superior quality, abounds in the southeastern portion of the State. I have only seen beds of it at Rolla and Franklin, but understand that immense quantities are found in Ste. Genevieve county and vicinity.

Mr. Ferd. F. Rosier, of this city, informs me that he shipped to parties in cities on the Ohio river, last year, five thousand six hundred and fifty-six barrels, or about one thousand four hundred tons. This year, in consequence of low water in the Ohio river, and the closing of the canal for repairs at Louisville, his sales have been less, amounting to only one thousand twenty-one barrels.

I am pleased to learn that some English gentlemen and others, satisfied of the superior advantages afforded for the manufacture of
plate glass from the white sand of this State, at the mouth of Platen creek, have made, or are making arrangements to commence the manufacture on an extensive plan.

BUILDING MATERIALS.

Various kinds of stone, suitable for building purposes, underpinnings, bridge piers, etc., abound in various parts of the State. These consist principally of sandstones, granites, marbles and various kinds of limestones.

Some of the sandstones are very soft in the quarry and harden upon exposure. The columns of the court house at Lexington were cut out of the quarry with axes, and readily brought into shape with edged tools.

Several outcrops of excellent granite occur in the State. Some of the granite or syenite is gray, compact and fine grained, resembling in color that found at Quincy, Massachusetts, but is much finer grained.

Other beds produce a red granite similar, and apparently equal in value to the red granites of Egypt and Scotland. Some of the red granite is now being used in the construction of the piers for the bridge across the Mississippi river at this city.

The durability of this red granite is well established in the fact that a pump made of it thirty years ago, and placed at the corner of Fifth and Market streets in this city shows no signs of decay or disintegration by its long exposure.

Several limestone quarries of considerable size have been opened to supply stone for buildings and other purposes. Many of them are in beds of magnesian limestone. In visiting some of these I could not well refrain from suggesting the desirableness of cutting out the blocks with Wardwell's channeling machine, instead of splitting them out with powder or wedges. In quarrying with a machine but very little of the rock (if sound) is wasted, and the blocks, when raised from their bed, are straight upon the edges, and square at the ends, ready to be placed in the building, as soon as the face is made ready.

I have seen beautiful specimens of marble, but have not visited the quarries, but am told that it occurs abundantly at several places in the State.

Fire clay, kaolin, and clay for the manufacture of bricks, and limestones in great variety, including those that will produce water cement, also abound. Indeed there is scarcely anything necessary for man's comfort, or useful in the arts, which may not be found in Missouri. With a soil equal to that of any State, a climate as fine and agreeable as Italy can boast of, and stores of mineral wealth unequalled in magnitude and variety, the future of our State must and will be prosperous and powerful, provided the people properly appreciate and improve these great blessings and elements of national wealth.

THANKS.

In every part of the State I have received the most flattering assurances of the hearty co-operation of the people, and their desire for the welfare and success of the geological survey.
It is customary in reports of this kind to tender acknowledgments for favors received, and give the names of those who conferred them. I cannot do this. The list would include nearly every person whom I have met since I adopted this State for my home, and entered upon my labors.

Although I may not express my thanks in words, yet I am deeply mindful of, and truly grateful for the many favors received, and only hope that my future conduct may be such as to entitle me to the same cordial reception and hearty hospitality that I have already received from those with whom I have been brought in contact.

To the managers of the several railroads in the State, I feel under obligations, and hereby tender to all (except one) my thanks for the courtesy of a free pass over the lines of their road.

To the members of the Board of Managers of the Mining Bureau, who, without solicitation on my part, gave me the position which I hold, I feel very grateful, and will endeavor, if permitted to finish the survey, to merit from them the welcome plaudit of "well done, good and faithful servant."

Respectfully submitted,

ALBERT D. HAGER,
State Geologist.

GEOLOGICAL Rooms,
INSURANCE EXCHANGE Building,
St. Louis, Nov. 30, 1870.
Since submitting the foregoing report I have by direction of the Board of Managers, visited Columbia, for the purpose of obtaining from Prof. Swallow, the former Geologist, the reports, maps, and other State property in his possession.

He kindly delivered to me all the property to which he thinks the State is entitled. He claims that his field notes and those of his assistants do not belong to the State, but are private property. He also claims eight of the reports made by the late Dr. Shumard. I here give his statement: "After the survey was stopped and Dr. Shumard returned from Texas, I hired him to make out the reports of these counties. He was to have two hundred dollars for the report of each county, one hundred down and the other hundred whenever the reports were published, or when the State paid for them, as it was agreed between us that the State should have them if it desired to do so and would pay for them the price agreed upon, if not they belonged to me. He delivered to me the reports of eight counties and was paid eight hundred dollars, according to the agreement. I now offer them to the State for two hundred dollars for each report. These counties, as well as I can remember, were Clark, Cape Girardeau, Perry, Ste. Genevieve, Jefferson, Wright, Ozark and Douglas and I think Lewis, but I do not find the report on Lewis. Perhaps Ozark and Douglas were counted as two, though made in one report. Dr. Shumard made the maps of some of these counties before he went to Texas. I have no claim on the State on account of this transaction. I did it and paid my money to save the work, lest some accident might make it impossible to get his reports, but the State is under no obligation to take them."

I had thought, out of respect to the memory of Dr. Shumard, I would insert his reports entire in the final report, and add a supplementary one to include the developments which have been made during the last decade, but as the territory must be revisited again, to do even this in a proper manner, I think under the circumstances, unless otherwise directed, I will have complete surveys made and new reports written upon these counties.

The ambulance used in the former survey is still in the custody of Prof. Swallow, at Columbia. I shall have no use for it and think it had better be sold. If it remains where it is the storage on it will be about ten dollars a year.

There are fourteen boxes of published county maps—nearly one hundred thousand copies. I have had these shipped to this city. They were struck off about ten or twelve years ago and were doubtless correct and suitable for the final report at that time, but they are not suitable to-day. Counties have been divided, county lines
changed, new towns and cities founded, new mines and quarries opened, and the country so changed, and improved that the people of the State would not be satisfied to have these old (and now imperfect) maps used to represent any of the counties for which they were originally intended. If they are not to be used it might be well to sell them also and thus save storage on them. I am not aware that any one has authority to sell the above, or any other property pertaining to the survey, and therefore shall take care of all the property, as directed by the board, until authorized to do otherwise by the proper authority.

St. Louis, December 12, 1870.

ALBERT D. HAGER.