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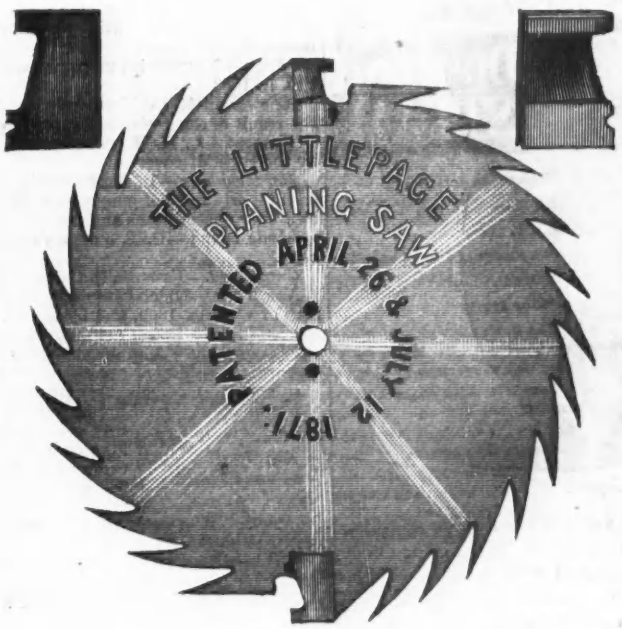
Littlepage's Planing Saw.

IN our first notice of the American Institute Fair, we spoke of a new planer known as LITTLEPAGE'S Planing Saw, and we this week give an illustration which shows how the tool is constructed. In an ordinary circular saw, two or four teeth, according to the size of the saw, are replaced by knife edges or "planing bits" as the inventor calls them. Each bit is provided with a guide at its top and bottom, the object of which is to steady the saw and to govern the thickness of the shaving taken off. The guide at the base extends across the width of the bit, and is on a plane with the dressed surface. The forward end of this guide is scarped or rounded down to the plane of the saw, as is also the bottom and rear edge. The edge of the planing bit is on a line with this guide, near up to the outer guide, where it is rounded down to a plane with the sawed surface, or plane of the upper guide. The service of this lower guide is to prevent the bit from cutting on the upward stroke of the saw, so that the planed surface may not be marked when backing the log. The upper, or outer, guide follows in, and fills the groove cut by the saw teeth before it. The forward end of this guide is made wedge-shaped, so as to compel it to follow in the groove and to keep it from abrading the surface of the lumber, and keep the edge of the bit from being carried in with the cross grain or knots. Thus arranged, these planing bits cannot be driven through the wood without planing or dressing the lumber, if kept sharp. The cutting edge of the bit has a slight clearance given it to prevent rubbing on the surface of the lumber, so that the edge only is in contact with the surface planed. These planing bits are inserted in the saws in the same way as ordinary movable teeth. They may be put in with square corners, without damage of cracking the saw, as the strain upon them is very slight, much less than upon the sawing teeth. The planing saw has been thoroughly tested on stuff from 14 inches to 60 inches in diameter, dressing the lumber and shingles neatly, and working well on hard, soft, green and dry wood.



The teeth in this saw receive no sett other than a slight up-setting, the bits planing away their own clearance. This reduces the friction of the saw disc in its kerf, and the inventor claims that the planing saw cuts and dresses lumber and shingles with less expenditure of power than the same saw cutting it without dressing. This he explains by the fact that with the ordinary saw the chips, or dust, cut by the saw-teeth can never get forward of the edge which cuts them, hence they are pressed into the angle or throat of the teeth with great force, pressing out laterally against the rough surface of the board, and require perhaps as much power to drive them out of the kerf as to cut them. The planing bits dress these surfaces smooth, presenting a smooth instead of rough surface to these chips or dust, and thereby relieving the saw of much strain and friction.

These planing bits will wear longer and retain a sharper edge than any other kind of planer, from the fact, that they encounter no grit, working always on a clean fresh cut surface, the sawing teeth projecting beyond the planing bit, encounter and drive away all grit on the outside of the log. The planing bits are readily sharpened by the the use of slip stone applied on the beveled side, merely dressing off the burr, by applying the stone flat to the outer surface of the bit. They are sharpened as quickly as one of the sawing teeth.

This invention must be considered a very important one. To produce good work it is evidently necessary to keep the planing bits very sharp, for it is impossible to get a smooth surface, with a rough tool, whether wielded by hand or run by machinery. But, when proper care is taken of the teeth, the work turned out is really beautiful, and presents a perfectly smooth and absolutely even surface. Of course the amount of smoothed surface produced in a given time, is far beyond that which the most rapid workmen can turn out, and if half the day were spent in sharpening, the other half of the day would be sufficient to smooth lumber for a whole shop. But though this planer has proved its fitness to deal with nice work, we look for a greater usefulness in a less dainty field. There is an immense demand for half dressed lumber, which serves just as good a purpose in many situations as lumber which has several hours of elbow polish put on it. By adding the LITTLEPAGE planing bits to the ordinary circular saw, a mill will turn out its whole make in this condition, and without great trouble to keep the knives sharp. Messrs. C. V. LITTLEPAGE & Co., 321 East 22nd street, are the proprietors of this invention.

The Centennial Building.

THE Committee on Plans have given the first prize of $10,000 to Messrs. VAUX & RADFORD, of New York, for their "Pavilion Plan," which was described in the JOURNAL of August 19. The awards for the second competition were made to

COLLINS & AUTENREITH, first award, $4,000
SAMUEL SLOAN, second award,..... 3,000
MCARTHUR & WILSON, third award, 2,000
H. A. & J. P. SIMS, fourth award,.... 1,000

It is therefore decided that the architecture of the American Exhibition is to be unique so far as comparison with its predecessors goes. The plan which has been selected receives the highest praise from every one. In their report the committee say that it will be necessary to erect the following buildings:

I. The Art Gallery, covering one and a half acres.

II. The Grand Pavilion, or Main Industrial Hall, covering thirty-six acres.

III. The Machinery Hall, covering ten acres.

IV. The Agricultural Hall, covering five

V. The Conservatory.

Also, from time to time, smaller buildings, for specific purposes. The Grand Pavilion, which is a temporary construction, must cover at a minimum thirty acres of ground, and be capable of extension, if required, as the work progresses; that it must be rectangular in plan and without curved corridors, and that no galleries must be constructed for exhibition purposes proper, but small balconies may be judiciously introduced for observation. It shall also allow the various offices of the exhibitors to be in the building, and comparatively near their own departments, that the interior arrangements should allow of vistas and attractive promenades, and afford opportunities for the convenient assembling of a large number of people, as at Sydenham Palace, and in the most successful English exhibition buildings; that in the construction the reduplication of parts should be an essential feature; that iron and brick should form the principal parts of the structure, in order to afford a reasonable protection against fire, and that they should be combined with such details that the material shall realize a fair price after the exhibition is closed; that vertical side-lights should preferred to overhead light; that with regard to the exterior of the building, although domes, towers, and central massive features, when effectively introduced, greatly enhance the dignity and beauty of such buildings, yet in this case, considering both the time at our disposal and the expense that great ornamentation would incur, it is

not expedient or advisable to undertake such ambitious and expensive constructions. The Grand Pavilion, being a temporary building, must trust for its impressiveness to its great size, the proper treatment of the elevations, and to its interior vistas and arrangement, and not to any central feature erected at a great expense, only to remain a few months. The main approach to the palace must be from the east side, nearest the city, and said approach shall allow of the immediate entrance into the building from vehicles direct, and shall be ample to afford a fit arrangement for the rapid reception and exit of large crowds.

A New Button Fastening.

"BUTTON gaiters"—those shoes which are fastened by buttoning instead of by lacing—have always been a favorite with ladies and gentlemen alike, although they are subject to such serious defects that it is a wonder there is any sale for them at all. Their principal fault is a surprising inability to hold on to their buttons. The spreading of the foot brings such a strain upon the buttons that either the thread with which they are sewed, or the leather to which they are fastened, must give way. When the latter accident takes place, which it infallibly does sooner or later, there is no foundation to fasten the button to, unless it is moved from its proper place; but if it is moved the shoe no longer fits. In

spite of these very serious defects, button gaiters are still the favorite of ladies, and if the annoyances above mentioned could be prevented, there is no doubt the sale of these shoes would be very much increased, and their wearers would be saved a great deal of trouble.

A remedy of this kind is found in an invention illustrated in the accompanying figure. The inventor prevents the breaking or tearing of the threads by making those threads metallic, and prevents the tearing out of the leather by distributing the strain over a large surface instead of concentrating it in a number of isolated spots. The figure represents a lady's gaiter, which has in the line of the buttons a groove or pocket, running between the leather and the lining, from the instep to the ankle. Eyelet holes open from this pocket through the leather, and the shanks of the buttons are passed through these holes. These shanks carry small, flat links, hanging loose in the eye of the button and through these links a flat strip of tempered steel or other metal is passed. The buttons, therefore, are threaded or strung upon a narrow metal, which is too strong to break, bears upon too large a surface of leather to tear out, and is so thin as to be perfectly elastic and accommodate itself to the curves of the foot. Modest as this little invention is, it is the fruit of much thought, and is loaded with an astonishing number of patents. It cannot fail to be a source of comfort to wearers of button shoes, for trials have already proved that shoes made in this way are easy to the foot, durable, and require little or no attention. In case a button breaks, which is about the only accident that can happen, the whole row of buttons can be unthreaded in a moment, and the broken member replaced. Shoes which are too tight about the ankle, can be enlarged by merely putting in buttons with longer shanks, and the shapeliness of the gaiter is not lessened in the least by the change. The inventor of this practical and useful device is Mr. I. F. EATON, who may be addressed, care of this office, by persons desirous of applying or trying the new mode of fastening.

On a Geological Map of the United States.*

BY R. W. RAYMOND.

THE map, a copy of which I have the pleasure of exhibiting to the Institute, was prepared by Professor C. H. HITCHCOCK, with the assistance of Professor W. P. BLAKE, primarily for the superintendent of the Ninth Census of the United States. I was able to render some advice and assistance in the execution of the plan, with the understanding that an edition of the map should also be issued to accompany my next report to the Government, as Commissioner of Mining Statistics. The means at our disposal were limited, and the time was very short. I think, however, that the result reflects credit upon the gentlemen who so generously gave themselves to the work, and justifies the course of General WALKER and myself in authorizing it.

The following is General WALKER's description of the Geological Map, with a few additions in the notes on the Coal Basins, which I have made on the authority of recent communications from Prof. HITCHCOCK.

For the elaborate geological map of the States and Territories, which accompanies the present volume, the Census Office is indebted to Professor C. H. HITCHCOCK, of Dartmouth College, Hanover, New Hampshire, who has, for many years, been engaged in the collection of information, both printed and in manuscripts, from the best geologists, for the purpose of constructing a complete Geological Atlas of North America. The present effort is the first-fruit of these labors. The information was designed primarily for the larger work, but, in consequence of unavoidable delays in the issue of the Atlas, Professor HITCHCOCK has felt himself justified in compiling from it, for the publications of the Ninth Census, this preliminary map, which the Superintendent submits to the country, with a confidence derived from long knowledge of the scholarly care and conscientiousness which characterize all of the author's works. The following notes from Professor HITCHCOCK, contain all the explanatory or descriptive matter which it is deemed essential to present in this place.

In the work of compilation great assistance has been rendered by Professor WILLIAM P. BLAKE, of Connecticut, who is responsible especially for the coloring of the western portion of the map. Professor BLAKE's knowledge of the Territories, both on account of personal observations and editorship of the results of other explorers' work in the reports of the Pacific Railroad surveys, enables us to present the best interpretation of the geological structure of the Territories yet offered to the public.

The following are the authorities used in the compilation of the map; only the maps employed in the compilation are cited. The special sources for the several primary maps will be given in the larger work to which reference has been made.

Maine.—Manuscript map, prepared by C. H. HITCHCOCK, for the State authorities, in 1863.

New Hampshire.—Manuscript map, prepared by C. H. HITCHCOCK in 1872, as the result of the geological survey now in progress.

Vermont.—C. H. HITCHCOCK's map, as published in the final report, corrected by the latest discoveries.

Massachusetts.—E. HITCHCOCK's map of 1844, an improvement over the one in final report, and not generally known to exist. This has been improved by his own later observations and those of C. H. HITCHCOCK.

Rhode Island.—C. T. JACKSON's map, in final report, improved by C. H. HITCHCOCK.

Connecticut.—Essentially the map of J. G. PERCIVAL.

New York.—Official survey map of 1843, improved by JAMES HALL, in Logan's map of Canada, 1869, and by others.

New Jersey.—Latest map, by Professor GEORGE H. COOK.

Pennsylvania.—Map of geological survey, 1858.

Maryland.—Map of geological survey, improved by P. T. TYSON.

Delaware.—Geological report, (no map), by J. C. BOOTH.

Virginia and West Virginia.—Map prepared, by W. B. ROGERS, in 1844, from the observations of geological survey, never published. Professor ROGERS' ill-health has prevented him from examining our copy, and any errors that may possibly exist must be ascribed to this circumstance.

North Carolina.—Manuscript map, by W. C. KERR.

South Carolina.—TUOMEY's and LIEBER's maps, revised by F. S. HOLMES.

Georgia.—Map in WHITE's *Statistics*, with improvements, especially in northwest part of the State, by J. M. SAFFORD.

Florida.—No map of this State has ever been made.

Bahama Islands.—Manuscript map of W. M. GABB.

Alabama.—Manuscript map, by Dr. G. LITTLE. Northern part, by J. M. SAFFORD.

Mississippi and Louisiana.—Manuscript map, by E. W. HILGARD.

Tennessee.—Map of final report, improved by JAMES M. SAFFORD.

Kentucky.—Manuscript map, by S. S. LYON, prepared from the results of geological survey, under direction of D. D. OWEN.

Ohio.—Latest map of J. S. NEWBERRY.

Michigan.—Lower peninsula, from map of ALEXANDER WINCHELL; upper peninsula, from map of FOSTER and WHITNEY, with improvements by LOGAN.

Minnesota.—Mostly from LOGAN's map, with suggestions from C. A. WHITE and a paper by JAMES HALL.

Wisconsin.—Manuscript map by J. A. LAPHAM, expressly prepared for the purpose mentioned above; largely from J. D. WHITNEY's report.

Iowa.—C. A. WHITE's latest map.

Illinois.—A. H. WORTHEN's manuscript, embodying results of his survey.

Indiana.—Manuscript map, by RICHARD OWEN, former State geologist.

Missouri.—Manuscript map, by G. C. SWALLOW, former State geologist.

Kansas.—Compiled from information given by G. C. SWALLOW, MEEK and HAYDEN, J. L. LECONTE, J. S. NEWBERRY and W. P. BLAKE.

Arkansas.—Chiefly from manuscript map of RICHARD OWEN, compiled from report of D. D. OWEN.

Indian Territory.—MARCY's Red River Expedition, JULES MARCON's report, and other sources; revised by J. S. NEWBERRY.

Texas.—S. B. BUCKLEY's manuscript map for the eastern portion; maps of various Government expeditions, carefully considered, by W. P. BLAKE and J. S. NEWBERRY.

New Mexico and Arizona.—Manuscript map, by J. S. NEWBERRY.

Colorado.—Parts by J. S. NEWBERRY, F. V. HAYDEN, and W. P. BLAKE.

Utah, Nevada, California and Oregon.—Complied by W. P. BLAKE, from per-

* A paper read before the American Institute of Mining Engineers, at Easton, Pa., Oct. 22, 1873.

sonal observations; Pacific Railroad reports, both for United States and railroad corporations; California reports, by J. D. WHITNEY; Geology of 40th paralell, by CLARENCE KING, and other sources.

Dakota, Montana, Idaho, Wyoming and Nebraska.—Maps by F. V. HAYDEN, (Reynolds expedition, and final report on Nebraska).

Washington Territory.—Compiled by W. P. BLAKE, from manuscript notes of GEORGE GIBBS, and other sources.

Canada.—Sir W. E. LOGAN's map, published in 1869.

The formations are arranged in nine groups, not in every respect the most natural, but the most convenient, from the material in existence. The first group of *Eozoic* includes the granites and other metamorphic rocks; both those older than Paleozoic and those more recent. In the Apalachian region there may be some Paleozoic crystalline schists. In the Territories and along the Pacific border there are many crystalline schists of Mesozoic age, a few patches of which are indicated; but their entire limits are unknown as yet. In this group is included the *Huronian System.* These are the talcose rocks of the eastern border region, referred to the Lower Silurian by W. E. LOGAN and others. They are largely developed in Maine.

The *Silurian System* is made to extend from the Paradoxides beds to the Lower Helderberg inclusive, in accordance with the general usage of American geologists. There is good reason to believe that the limits of the Silurian should be modified in accordance with the views of Professor ADAM SEDGWICK, of Cambridge, England. In the Silurian are included the "Calciferous mica-schist" of Vermont, the "Coös group" of New Hampshire, the "Merrimack group" of New Hampshire and Massachusetts, and some schists in North and South Carolina, whose precise position is not well determined.

The Paleozoic rocks in the western portion of the map are undivided, as is true, also, of the Cenozoic, save a few post-tertiary lacustral areas and deltas. The lacustral areas will be much enlarged in the future, as our information shall be more precise.

COAL MEASURES.

The most important division for giving accurate practical information is that of the "Coal Measures." With it is included in Nebraska, Kansas, and Indian Territory an inconsiderable area of Permian and Permo-carboniferous.

The following are the areas of the coal measures in the United States:

New England basin, in Massachusetts and Rhode Island, estimated to cover 750 square miles. The coal is a plumbaginous anthracite, used to advantage in some smelting furnaces. Perhaps eleven beds may exist; best seen in Portsmouth, Rhode Island. The maximum thickness is 23 feet. The whole carboniferous system is supposed to be 6,500 feet thick, of which 2,500 pertain exclusively to the coal-measures.

Anthracite basins in Pennsylvania.—This is the most important coal district in the United States. There are four basins, having an area of 410 square miles, not including the Broad-Top semi-anthracite, which amounts to 24 more. The measures are from 2,000 to 3,000 feet thick. The number of distinct beds varies from two to twenty-five, according to the depth of the basin. The maximum amount near Pottsville is given at 207 feet, while the average cannot be far from 70 feet.—(H. D. ROGERS). MACFARLANE estimates the area of the anthracite fields in Pennsylvania, at 472 square miles, which is 62 square miles more than ROGERS' estimate.

The *Apalachian field* embraces an area of 62,025 square miles, extending from Pennsylvania to Alabama.

In Pennsylvania the aggregate thickness of the measures is from 825 to 2,535 feet. The area of the bituminous coal is 12,222 square miles, with an average thickness of 40 feet of coal.—(H. D. ROGERS.)

In Maryland the area is 550 square miles, in three separate basins. The strata are 1,500 feet thick. There are thirty-two beds in all—one of 14 feet, three of 6 feet each, others from 1 to 5 feet thick.—(P. T. TYSON.)

In Virginia (chiefly West Virginia) the coal area embraces 16,000 square miles. On the Kanawha the strata are 1,250 feet thick, with twenty-four beds of coal, of which eleven have an aggregate of 51 feet thickness. The coals seem best developed on this river.—(T. S. RIDGWAY.)

In Ohio, Dr. J. S. NEWBERRY states the area to be more than 10,000 square miles, with a thickness of 1,500 feet, and 10 workable beds of coal, corresponding in number and thickness to those of Pennsylvania and West Virginia.

In Eastern Kentucky the area has been stated to be 10,000 square miles. MACFARLANE puts it at 8,983 square miles, said to have been derived from actual measurement.

In Tennessee, Professor J. M. SAFFORD states the area of the measures to be 5,100 square miles. One characteristic section gives a thickness of 14 feet. The beds vary locally in their dimensions, some of them being nine feet thick, but thinning out very rapidly.

In Georgia the area may be represented by 170 square miles.

In Alabama the area marked upon the map amounts to about 9,000 square miles.

The *Michigan basin* has an area of 6,700 square miles, with 123 feet of measures and 11 feet (maximum) of coal. In the center the coal is thickest, thinning out to nearly the thickness of paper around the edges.—(A. WINCHELL.)

The *Illinois basin*, including Indiana and Western Kentucky, covers an area of 47,188 square miles.

In Illinois the measures occupy 36,800 square miles, are 600 feet thick, and contain ten beds of coal, with an aggregate thickness of 35 feet.—(A. H. WORTHEN.)

In Indiana the measures occupy an area of 6,500 square miles, are 650 feet thick, and contain thirteen beds of coal, with an aggregate thickness of 31 feet. (E. T. COX.)

In Western Kentucky the measures are 612 feet thick, including the millstone grit, and carry eleven beds of coal.—E. T. COX.) Their area in Western Kentucky is 3,888 square miles.—(S. S. LYON.)

The *Missouri basin* extends from Iowa to Texas.

In Iowa, Prof. WHITE'S map shows an area of 18,000 square miles, which is divided into three parts, each about 200 feet thick. The two lower divisions contain the workable coal, which amounts to 8 feet in the second, but to only 20 inches in the upper. As the highest division is everywhere underlaid by the others, the whole area must be regarded as workable.

In Missouri, Prof. G. C. SWALLOW estimates the coal area at 27,000 square miles, and in Kansas at 17,000 square miles. The measures are 2,000 feet thick, with twenty coal beds, from a few inches to 6 feet thick.

In Arkansas there seem to be only two beds of coal, which lie below the coal-measures proper, beneath the conglomerate.—(LESQUEREUX) D. D. OWEN speaks of some beds from 4 to 5 feet thick, and estimates the area occupied by productive beds at 12,000 square miles.

In the Indian Territory little is known of coal. The officers of the Missouri Kansas and Texas Railway Company find good banks of coal at several places along their line, several feet thick. The area upon the map amounts to as much as 13,600 square miles. Since the completion of the map it has been ascertained that the coal-measures are covered by the Cretaceous formation for a width of about thirty miles along the valley of the Red River in Texas and the Indian Territory; and also that the Tertiary area, extending southerly from Preston, is probably of Carboniferous age. These discoveries will enlarge rather than diminish the size of the Missouri basin, since the two fields are probably connected beneath the Cretaceous beds.

In Texas, according to A. B. ROESSLER, in the "Almanac", the coal-measures occupy 6,000 square miles. A bed of coal has been reported near Fort Belknap as 4 feet thick. Estimating from HAYDEN'S map the coal area in Nebraska at 3,600 square miles, the total area of this great basin must be 97,200 square miles.

In Arizona, near Camp Apache, Mr. G. K. GILBERT, of the expedition under the immediate direction of Lieut. GEORGE M. WHEELER, reports a bed of coal belonging to the true Carboniferous series. It is probable that future explorations may develope other coal-bearing areas in the Territories.

In this sketch no notice is taken of any coals which do not belong to the Carboniferous system. Other coals of commercial importance exist, especially in Eastern Virginia, and near the Union Pacific Railway. They usually belong to the Triassic or Cretaceous formations, and there are lignites in the Tertiary.

Before proceeding to call attention to a few points of interest connected with this map, I feel called upon to notice some recent criticisms upon it. In the July number of the *American Journal of Science and Arts* this subject is treated in the following language:

The need of a geological map of the United States has been long and urgently felt by all students of the science. The admirable chart of Canada, which, through the liberality of the Canadian government, is made to embrace the northern States to Virginia, and to extend west to the 100th meridian, has supplied the place in part of such a chart. Yet its price—though small considering the size, the amount of detail, and its artistic perfection—is in the way of its general use. The map now issued by Professors HITCHCOCK and BLAKE, is a small one (34×22 in.), with no geological details beyond an indication in colors of the grander areas—namely, the Eozoic, with which all the metamorphic areas are united under one color; the Silurian—the Devonian and Subcarboniferous—the Carboniferous and Permian—the Triassic and Jurassic—the Tertiary—the Alluvium—the Volcanic. Even these subdivisions are enough to make a chart of the kind valuable to the general reader.

It is a little puzzling to us to explain why such a chart should have been compiled for "the 9th Census." There is nothing in or on it to indicate that it was intended to illustrate the geographical distribution of mineral products of economical importance. The 9th Census Reports claim to represent the known condition of the country in the year 1870, and this they do with great fullness both in the text, and the various excellent maps issued by General F. A. WALKER. A geological chart fit to be associated with such work, or to be a part of the publications relating to the 9th Census, should present to the people an exact exhibition of the present knowledge with regard to the geology of the United States, or if not for all its formations, at least for all its varied mineral materials; the agriculturist would say for all its formations with their fullest details; for only on such a map could the particular rock underlying the soil of a region be indicated. At a time when other nations, and Canada among them, are issuing national geological charts that are most admirable productions both of art and science, it is not a little discreditable to the United States, for the government to publish so meagre a production. A general United States geological chart ought to be published by the General Government, and it should combine all that is contained in the maps that have been made in the course of the various State surveys, and be issued in the best possible style. It would be a great thing for the nation's industry as well as its science, if the work could be soon begun, and the best of American art and science be engaged upon it.

The lithographer has done his part on the 9th Census map badly. The glaring colors are selected without taste, and are so unskillfully put on, that those of adjoining areas often overlap some miles, and sometimes to the obliteration of a narrow intermediate area that was in the original copy. As one example, the Connecticut River Red Sandstone formation, besides being narrowed in places, is in this way stopped off at Northampton, the remaining 25 miles to the north, which the engraving faintly indicates, being buried beneath the overlapped colors of the areas adjoining. Such careless work does not appear on the Canada geological chart, or those published abroad.

There are a number of improvements—improvements in our view—that may be made in the map in preparing it for another issue. Some of these are: Not to put the carmine color of the Eozoic over all the metamorphic areas of the country, whether Eozoic or not, that thus, positive knowledge may be kept apart from the doubtful; to take the Sierra Nevada, and some other areas on the Pacific slope, out of the Eozoic carmine, and substitute the color of the Triassic and Jurassic; to leave the metamorphic areas of uncertain age in white, as an acknowledgement of doubt or ignorance; to omit the bands of Lower Silurian around the metamorphic areas of the Rocky Mountains, except so far as specially observed facts have shown that they exist there; to take away the green color, which means Cretaceous, from the whole of the north side of Long Island, no facts making the region Cretaceous; to put no color over regions "west of the 100th meridian" where "the Paleozoic and Cenozoic systems cannot be subdivided."

I do not know whether to be glad, or sorry, that the reverence which I entertain for the eminent geologist, from whom the foregoing criticism undoubtedly proceeded, prevents my speaking as freely as I otherwise would speak my opinion concerning its character. As I have remarked, the map in question was issued by the Commissioner of the Census to accompany the volume on Industry and Wealth. It was not possible to make a map large enough and minute enough to satisfy all the demands of geologists, partly because the necessary data cannot, at present, be obtained, partly because the Commissioner had not the means to pay for an expensive map, and would not have been justified in issuing such a map to be given away as a public document. To compare this map with the "admirable chart of Canada," which is eight feet by three and a-half in size, and is sold for eighteen dollars in sheets, violates the first principle of criticism, namely, the duty of the critic to judge a work from its own standpoint, and not by some standard entirely foreign to it and different from it. The alternative presented to the Commissioner of the Census (and myself), was to prepare

a map like this one, or none at all; and the questions for fair criticism are, whether this map is better than none at all, and whether this map is as good as it could be made with the means and data at hand. Admitting that it is "valuable to the general reader," the author of the article above quoted admits a great deal; and disqualifies himself from blaming the United States Government for its publication. No doubt it would be a good thing if the Government would publish a very handsome geological map for sale; but I cannot help believing that this important work had better wait, until details of our western geology are better settled. Something was urgently called for, to serve a temporary purpose; and that which was furnished seems to me well calculated for the end in view. Indeed, it may be fairly claimed for this map, that it is as correct and as well executed as could be expected, under the circumstances. The work of the lithographer has been very well done considering the fact that the map was necessarily printed by steam, since nearly 30,000 copies of it have been, or are to be, given away. The condemnation of it, because it contains minute errors in laying on the colors, which do not appear in the expensive hand-printed geological chart of Canada, is ridiculously unjust. We are told, for instance, that twenty-five miles of the Connecticut River Red Sandstone is buried beneath the overlapping colors of the areas adjoining. This microscopic criticism is qualified by the admission that the engraving "faintly indicates" the nature of the "buried" area, and I am happy to inform the Institute that, on inspection of the copy of the map here exhibited—a copy which I did not select, but which came to me in the ordinary course of distribution of public documents from Washington—I find the Red Sandstone region referred to, amounting to the enormous area of 0.0078 of a square inch, to be not buried in the least, but clearly defined and properly shaded. It is a great pity that this copy did not happen to be the one that fell into the hands of our critic. New England would then have known that her rights were secure; and the map of the United States would not have been condemned because of a fancied Silurian or Eozoic outrage on the feeble Red Sandstone north of Northampton. The suggestions with which the article referred to concludes are, unlike its sweeping, general condemnation, legitimate in their spirit. Whether they are correct in their principles, or practicable in application, I will not here discuss. I purpose, rather, on the present occasion, having vindicated the general intention and execution of the map, to show some of the great natural features of the country which it is adapted to illustrate.

The enormous extent of coal deposits of the United States may be seen in the areas of the Carboniferous formation on the map. The Rhode Island, Apalachian, Michigan, Illinois, Iowa, Kansas, Arkansas and Texas fields are fully shown. In addition to these we have the small Triassic fields near Richmond and the vast area of coal-bearing Cretaceous and Tertiary strata, accompanying the Rocky Mountains from the British frontier to the borders of Mexico. In the Cretaceous of the Western Coast in California and Oregon, we have still another source of mineral fuel, our supply of which is thus seen to be widely distributed, as well as abundant.

This map shows, also, with considerable clearness the general geological structure of the country. There is no topography indicated in the engraving, but it is not difficult, by simple inspection of the colors, to infer the nature of the surface. The extent and trend of the leading upheavals determining the form of the Continent; the Apalachian ranges on the east; the Rocky Mountains; with the Mississippi basin and the gold plains between; the vast corrugated table-land of the inland basin; the volcanic and granitic axis of the Sierra, with the enormous Basaltic overflow of the northwest; the agricultural plain of California; the comparatively recent elevation of the Coast Range, are all made visible by the distribution of these colors representing different ages of rocks. The intimate relation between the geological structure and the topographical features of the country may thus be traced on a large scale, and to the initiated eye even the geological history of the country is graphically recorded.

As I have shown in a former paper read before the Institute, the distribution of the mineral deposits and mining districts of the United States is also connected with the great features of continental structure. Thus, as was long ago pointed out by BLAKE, and has been more elaborately shown by CLARENCE KING, the mineral deposits of the Pacific slope are characterized by an arrangement in parallel zones, running generally north and south. The quicksilver, chromic iron, copper ores, and coal of the Cretaceous coast range; the gold and the auriferous slates of the west bank of the Sierra; the silver ores of the subordinate ranges between the Sierra and the Wasatch; the galenas and carbonates of Utah and Montana; the gold of Montana, Wyoming, and Colorado—all follow more or less closely the law of distribution. East of the Rocky Mountains we have, on the other hand, a distribution in basins, rather than in zones, which has been happily described with regard to the relative positions of our coal and iron ores in the well-known report of Mr. ABRAM S. HEWITT, a member of this Institute. The nature and causes of this distribution of our mineral deposits east and west can easily be inferred from inspection of this map, and this alone is a sufficient reason for its publication, both in reports of the Census and those of Mining Statistics—documents, an important purpose of which is to display to our citizens and to the world the nature and extent of our resources.

It was intended to accompany this map, both in the Census report and in my own, with a detailed account of our mineral deposits thus far developed, or known to exist. But the doubt, which continued up to a late moment, whether the map could be prepared at all, and the lack of necessary time, both in the Census office and in my own, to complete and reduce the necessary data—a work for which the Census itself afforded very scanty material, and which I could have performed for the West only—led to the abandonment of this plan. I did not receive authority from Congress to print the map in connection with my report until after the report had been rendered. It will, therefore, be accompanied with nothing more than a brief general account in the appendix.

Blast-Furnace Slag-Cement.*

BY J. J. BODMER, LONDON.

ALTHOUGH the similarity between puzzolana, or trass, and blast-furnace slag, as seen by comparison of the analyses, is a well-known fact, blast-furnace slag has not been used commercially as a substitute for those cementing materials. The reason, the writer apprehends, lies in the fact that unless such slag is disintegrated or subdivided by rolls, the process must either be too costly, or the material is not in a fit and proper condition for the purpose. In order to produce a reliable slag-cement, the slag must be ground together with the lime into an impalpable powder. The subdivided slag must, therefore, be perfectly dry, and at the same time, friable. The stronger the hydraulic properties of the lime, the more reliable the slag cement will be, and practice has proved, that the slag from a grey-iron furnace gives the best results. The slag-cement which has given the results shown in the annexed table, under pressure tests, was composed of six parts of slag, from a blast-furnace producing No. 3 foundry iron, and one part of lime, of medium hydraulic properties.

The above described class of cement bears storing as long as most Portland cements, and the cheapness of its production is self-evident. It is applicable in the manufacture of concrete bricks, paving blocks, roofing slates, grindstones, water-troughs, cisterns, and especially in the construction of sewers and river, and sea walls.

COMPARATIVE ANALYSES.

SLAG CEMENT.

	BLAST FURNACE SLAG.					Trass.	Puzzolana.
	Cleveland District.			Wales.			
Silica	36.20	40.75	34.	49.50	45.	57.12	44.50
Alumina	26.	24.47	24.33	15.20	16.42	12.60	15.
Lime	27.	24.50	34.	19.70	26.78	2.69	8.80
Gypsum	..	..	..	..	..	..	..
Magnesia	9.	7.17	5.88	3.	0.40	1.	4.70
Protoxide of Iron	1.30	2.05	0.07	8.82	5.20	5.	12.
Potash	..	..	..	..	0.46	7.	1.40
Soda	..	..	..	..	..	1.	4.
Sulphur	0.40	0.65	1.72	1.29	..	..	..
Water	..	..	..	..	..	9.40	9.20
Protoxide of Manganese	..	..	..	..	5.64	..	..

The following are the results of some of the tests of Slag Cement as compared with Portland Cements:

Figures taken from experiments made on the strength of Portland Cements, by Mr. JOHN GRANT, M.S.C.E.			Slag Cement Experiments made by J. J. BODMER.		
Weight of Cement per Bushel. lb.	Age after Gauging.	Tensile strain sustained per 1 square inch. lb.	One part by weight of Lime, with 7 parts of Slag.	Age after Gauging.	Tensile strain per 1 square inch.
106.7	7 days.	157.6			
107.6	"	156.56			
111.75	"	201.63			
114.15	"	269.78		7 days.	271.22
119.04	"	248.03			
119.07	"	305.89			
121.0	"	409.77			
....	14 "	472.26			
....	28 "	499.51		1 month.	472.18
....	2 months.	522.44			
....	3 "	558.62			

IN drying up Italian marshes, in getting rid of the swampy districts near Paris and in using up the surplus water of the Camargue, an Australian tree (*Eucalyptus globulus*) has shown extraordinary power. In addition to the faculty of absorbing ten times its weight of water from the soil, this plant is said to possess the power of destroying miasmatic influence by the emission of antiseptic camphorous effluvia. At the Cape its effect has been magical, while in Algiers fever has rapidly receded before the conquering *Eucalyptus*. Cuba attests the validity of the Australian plant in removing moisture and fever, and it is predicted by enthusiasts that the *Eucalyptus* will make short work even of the dreaded Pontine Marshes.

* A paper read before the American Institute of Mining Engineers, at Easton, Pa., Oct. 22, 1873.

THE COAL TRADE

NEW YORK, Nov. 13, 1873.

Dealers report somewhat brisker sales and a brighter prospect in every respect for the trade. Some complain of an unusual number of requests to extend notes or take paper where cash was due, but others say that their business is not remarkable in this respect, and that buyers are paying their bills as well as ever at this season. In fact the coal business seems to have suffered in what is, after all, the best way to meet financial trouble—in loss of current sales rather than in failures to meet money obligations. This fact, throws the burden of the embarrassment upon the mining companies, who are, of course, the ones chiefly affected when the demand slackens. But the advantage of this rapid falling back upon the producer, which is an inherent part of the system by which coal is marketed, is that the remedy applied in case of financial trouble is a real one. No fictitious briskness is kept up in the face of a really dull market, but demand and supply are made to accommodate each other. This healthy state of affairs does not always exist in times of temporary trouble, but when times are so hard that manipulators of the market are afraid to commence intrigues, coal is one of the first commodities that finds its true level.

It is probable that the new activity is partly due to the fact that stocks have been worked lower, as must be the case when we remember the falling off in sales for the last month, and it is also probable that a better feeling prevails throughout the country. Some prominent dry goods dealers have succeeded in uncovering very large large stores of cash among the retailers simply by making a notable reduction in their prices, and as coal is one of the prime necessities of life it is, doubtless, called for as it is needed, and there is money to pay for it. But the generous stocks of ordinary times are not indulged in.

In the Bituminous trade, affairs remain about as they were. Work in the George's Creek mines has not been decreased, and the companies seem to have a somewhat improving demand.

Anthracite Coal Trade for 1872 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Nov. 8, 1873, compared with the week ending Nov. 9, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
Phila & Reading R.R†	87,503	4,070,234	91,053	4,459,715
†Schuylkill Canal	16,493	706 468	15.990	678,936
‡Lehigh Valley R. R.	57.927	2,857,630	45,787	2,98 .147
Lehigh & Sus. R. R.	30,172	1,460,616	37 647	1,746,686
" " Canal	21.490	725,0 6	23,066	679,280
Scranton North	20,006	697,319	17,448	830,319
" South	34,392	1,869,377	47,5 9	1,862,675
Penn. Coal Co., rail	27,915	1,049,582	21,123	1,078,040
" " canal		5,997	2 2	7.677
Del. Had C Co. Canal	32,026	1,3.9,5 7	30,936	1,388,135
" " East	7,321	402,777	6,544	366,031
" " West	11,675	7 9,872	14,195	504,230
" " South	9,047	3 8,027	1,862	166,048
Shamokin	14,161	496, 6	9,34	563,930
Trevorton	....	....	....	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	....	....	....
P. N. Y. C. & R. R. Co.	12,349	551,641	9,651	649,899
Williamstown Col'y	....	.....	....	....
Big Lick Col	....	.....	....	....
Total	388,316	16,982,6 4	372,526	17,883 150
1872	372,526			16,9 2,694
Increase				905,456
Decrease	15,790			

These figures are for the week and fiscal period commencing Nov. 30.

† Lens coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1873 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Nov. 8, 1873, compared with week ending Nov. 9, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	17,143	587,981	18,593	588,423
B. & O. R. R.	28,841	1,088,449	34,999	1,295,350
Penn. S. Line	....	.....	2.680	91,913
R. & B. T. R. R.	6,010	257,516	9,830	396,552
*Harrisburg & D	7,675	419,745	5,210	292,942
*L. V. R. R.	595	24,633	7.6	27,196
P. & N.Y.C. & R. Co.	5,142	320,764	5,545	275,381
Cumberl'd Branch Canal	4,349	193,461	3,678	123,782
" Railroad	865	20.275	2,042	77,071
Total	70,620	2,912,824	83,353	3,168,610
	....		70,620	2,912,824
Decrease	....			
Increase	....		12,733	255,786

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending Nov. 8, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	21,122 .5	1,078,040 15	27,915 09	1,049,581 16
" Canal	252 02	7,676 15	238 14	5,996 13
	21,374 17	1,085,717 00	28,154 00	1,055,578 09
Increase, 1873	30,138 11			

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, Nov. 8, 1873.

BY RAILROAD.—ANTHRACITE.

	Tons.	Cwt.
PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.		
From St. Clair	38,524	14
" Port Carbon	4,198	18
" Pottsville	3,339	15
" Schuylkill Haven	26,700	17
" Pine Grove	6,275	13
" Tamaqua	9,642	05
" Harrisburg	....	
" Dauphin	4,371	08
Total	91,043	10
FOR SHIPMENT BY CANAL.		
Passing Frackville Scales	9,478	08
" Mill Creek "	551	09
" Schuylkill Valley Scales	474	12
" Mt. Carbon	1,382	01
" Cressona "	5,426	19
" Pine Grove "	....	
" Tamaqua "	1,283	03
Total	18,596	12
SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.		
Via Catawissa & Williamsport Br.	297	04
" N. C. R. R. passing Locust Gap	452	17
" " " Shamokin	3,197	13
" " Herndon	....	
Total	3,947	14
SHIPPED WEST OR SOUTH FROM PINE GROVE		
Via Schuylkill & Susquehanna R. R.	1,574	02
" Lebanon & Pine Grove Branch	1,002	04
Total	2,576	06
CONSUMED ON LATERALS.		
From Frackville Scales	1,097	19
" Mill Creek "	277	12
" Schuylkill Valley Scales	719	17
" Mt. Carbon "	720	06
" Cressona "	873	00
" Pine Grove "	117	14
" Tamaqua "	290	13
Total	4,096	15
LEHIGH AND WYOMING COAL.		
Received via Silverbrook Junction, Sent East	6,621	04
" Cat. & Wpt. Br. Sent West	22	18
" " Rupert, Cat. & Wpt. Br.	....	
" " Allentown E. Penn'a Br.	98	10
" " Alburtis, "	26	05
" " Oreland, G. & N. Br.	748	12
" " Willow Street R. R.	505	00
Total	8,022	09
BITUMINOUS.		
From Harrisburg	5,200	03
" Connecting R. R., G. & N. Br.	....	
" Junction R. R.	10	00
Total	5,210	03
COAL FOR COMPANY'S USE.		
Anthracite	6,908	11
Bituminous	163	11
Total	7,072	02

RECAPITULATION.

	Total for Week.	Corresp'g week last year.	Increase and Decrease.
Passing over Main Line and Leb. Val. Branch	91,053 10	87 502 14	i 2,830 10
For Shipment by Canal	18,596 12	24,553 16	d 3,957 04
Shipped Westward via Northern Central R. R.	3,947 14	8,705 15	d 4,758 01
Shipped West or South from Pine Grove	2.576 06	1.623 00	i 953 06
Consumed on Laterals	4 096 15	4,542 02	d 445 07
Lehigh and Wyoming Coal	8.022 09	5,.92 10	i 2,729 19
Total Anthracite p ying freig't	128,295 06	139,219 17	d 1,926 11
Bituminous	5,210 03	7,675 00	d 2,464 17
Total of all kinds paying freig't	133,505 09	137,894 17	d 4 341 08
Coal for Company's use	7,072 02	6,340 00	i 731 19
Total Tonnage for Week	140,575 11	144,235 09	d 3,659 15
Previously this year	5937301 02	5644894 1o	i 292,406 07
Total to date	6077876 13	5789130 01	i 288,746 12
SHIPPED BY CANAL.			
From Schuylkill Haven	14,563 00	17,393 10	d 2,830 10
" Port Clinton	1,427 00	908 00	i 519 00
Total Tonnage per Week	15,990 00	19,301 10	d 2,311 10
Previously this year	662,946 07	754,126 10	d 91,180 03
Total to date	678,936 07	7?2,428 00	d 93,491 13

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending Nov. 8—Compared with same time last year.

REGION SHIPPED FROM.	TIDE. tons ct.	LOCAL. tons ct.	CANAL. tons ct.	TL WEEK tons cwt.	TL. DATE tons. cwt.
Wyoming	26472 14	8899 19	2007 16	36380 09	1555156 10
Upper Lehigh	....	2783 09	920 04	3703 13	169549 08
Beaver Meadow	1917 12	2156 02	2151 12	6225 06	284024 01
Hazleton		223 19	5692 09	5916 08	1-9208 04
Mauch Chunk	160 05	2897 15	4973 15	8031 15	475116 05
Total	27550 11	16961 04	15745 16	60257 11	2670964 17
Prev'ly reported	1245343 18	804457 01	5e0886 07	2610727 06	
Total to date	1272894 09	821418 05	576632 03	2670984 17	
Same time .1872	1021908 06	747666 17	469627 16	2235502 19	
Increase	250986 03	77491 08	107004 07	43 481 18	
Decrease					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	27550 11	21355 02	1272894 09	1021908 06
Forwarded East by Rail to Local points	8072 10	7129 19	386806 07	363449 11
Forwarded East by Rail use Central Division	2024 01	1551 08	77295 03	67761 15
Forwarded East by Rail use L. & S.		135 02	9889 12	7495 19
Delivered at and above Mauch Chunk	2406 18	1186 09	51889 11	51680 08
Delivered at Coalport & Hazard for Canal	15745 16	11148 08	510719 06	511509 15
Delivered to L. V. R. R. at Packerton	540 03	211 13	20395 19	12806 09
Delivered to L. V. R. Rd. at Sugar Notch	2927 15		84817 12	
Delivered to L. & B. R. R. at Plymouth Bridge	990 07	5637 06	136286 18	198899 16
Total	60257 11	54356 07	2670984 17	2235502 19

Report of Coal Transported over the Lehigh Canal

For the week ending Nov. 7, 1873.

REGIONS SHIPPED FROM.	TIDE. tons. ct.	LOCAL. tons, ct.	TL. WEEK tons cwt.	TL. DATE tons, cwt.
Mauch Chunk Region	1,691 01	2,83	4,530 16	200,704 08
Mauch Chunk Region Hazardville	1,09 06	175 05	1,183 11	74,340 06
Beaver Meadow Region	596 12	3,956 19	4,543 11	121,856 14
Mahanoy Region		295 05	295 05	18,593 03
Hazleton Region	823 14	5,393 11	6,2 6 05	182,077 17
Upper Lehigh Region		866 07	866 07	28,459 05
Wyoming Region	3,957 02	1,473 09	5,430 11	101,0:2 08
Wyoming Region, Hazardville				4,397 09
Total	8,064 15	14,999 11	23,063 06	679,281 16
Previously reported	234472 19	421761 05	656214 04	
Total to date	242539 14	436740 16	679280 10	
Corresponding week last year	275651 07	449415 04	725066 11	
Increase				
Decrease	33.111 13	12,674 08	45,786 01	

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR. 1873.	YEAR. 1872.
Consumed on line of Lehigh Canal	2,709 10	2,796 07	72,351 15	72,913 10
Passed into Morris Canal to Tidal Points	136 05	66 00	2,546 17	5,016 15
Passed into Morris Canal to Local Points	409 18	403 05	27,605 04	22,807 16
Passed into Del. & Rar. Canal to Tidal Points	7,930 10	6,409 19	240,092 17	373,625 13
Passed into Del & Rar. Canal to Local Points	855 11	681 01	12,327 09	13,643 13
Consumed on line Delaware Div. Canal	635 10	892 09	37,589 19	44,503 07
Passed through to Bristol	10,369 02	10,140 11	286,766 14	295,349 18
	23,066 06	21,489 12	679,280 10	725,066 11

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Nov. 8, 1873, with Totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	15,330 09	815,857 10
" Hazleton	33,260 07	2,024,294 01
" Upper Lehigh	144 11	2,723 12
" Beaver Meadow	8,855 15	602,851 07
" Mahanoy	8,493 03	473,394 02
" Mauch Chunk	99 11	3,117 19
Total	66,183 16	3,919,048 12
Same time last year	77,095 00	3,655,473 06
Increase		263,575 06
Decrease	10,911 04	
Forwarded East from Mauch Chunk by rail	45,787 06	2,985,146 17
Same time last year	67,927 03	2,852,630 09
Increase		132,516 08
Decrease	12,139 17	

DISTRIBUTED AS FOLLOWS.

Local East of Mauch Chunk	1,791 13	73,613 06
Forwarded East for use L. V. R.	1,228 03	48,809 01
Delivered to Furnaces and Manufacturing Companies	8,250 14	631,193 05
Delivered to Cat & Fog. R. R.	188 03	8 0 10
" " East Penn R. R.	75 09	8 496 10
" " North Pennsylvania Railroad	4,665 11	293,254 11
" " Port Del	4,944 03	197,586 19
" " East Amboy Railroad		
" " Morris and Essex Railroad	4,003 10	265,212 11
" " Bel. Del Railroad	15,667 05	978,170 11
" " Central Railroad	4,954 16	491,980 19
Delivered at and above Mauch Chunk for use of L. V. R.R.	1,220 02	62 723 16
To P. & N. Y. R. R.	9,136 03	455,447 16
To Northern Central R. R.	498 19	22,0 8 02
To D. H. & W. R. R.	3 3 16	20,485 14
To L. & S. R. R. at Packerton for rail	131 08	13,4 9 17
To Individuals at Mauch Chunk	82 14	2,468 01
To Individuals above Mauch Chunk	638 04	15,267 04
To L. & S. R. R., at Penn Hav., for railroad		1,541 18
Do. for canal	5,741 16	178,398 14
To Lehigh Canal Mauch Chunk	2,681 05	72,250 09
To Catawissa Railroad	20 00	95 09
To L. & B. R.R. at Lack. Junc.		79,776 15
Total	66,183 16	3,919,048 12

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Nov. 8, and during the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l Tons. Cwt	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons, Cwt	Total. Tons. Cwt
1873	18,5?2 14	34,999 14	2,679 15	56,272 03
1872	17,143 18	28,840 14	....	45,984 12
Increase	1,449 16	6,159 00	2,679 15	10,287 11
Decrease	.....	.....	.....	.....

YEAR.

1873	588,4?3 09	1295?50 02	91,912 16	1,975,636 07
1872	587,981 02	1088449 13	....	1,676,429 15
Increase	442 07	206,901 09	91,912 16	299,206 12
Decrease	....	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B. & O. R. R. Co. Tons. Cwt.	Total. Tons. Cwt.
1873	3,677 13	2,042 04	5,719 17
1872	4,349 06	865 11	5,214 17
Increase		1,176 13	505 00
Decrease	671 13	....	.....

YEAR.

1873	123,782 06	77 ?70 19	200,853 05
1872	193,469 15	20,275 09	213,736 04
Increase		55,795 10	
Decrease	69,678 09		12,882 19

Lykens Valley Coal Company.

Shipments of coal from Lykens Valley Coal Co., for week ending Nov. 8, 1873.

For week ending Nov. 8, 1873	2,459 06
Total shipment to date	45,041 06

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Nov. 8, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	30,996	1,309,185
By Railroad, East	6,544	366,034
" West	14,195	504,230
" South	1,862	166,048
Total 1873	53,597	2,345,466
Corresponding time in 1872 :		
By Delaware and Hudson Canal	32,636	1,329,537
By Railroad, East	7,321	452,777
" West	11,675	366,872
" South	9 047	338,027
Total	60,669	2,497,213
Decrease	151,767	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Nov. 1, 1873.

	WEEK.	SEASON
North	31,996 13	2,283,466 19
South	1,316 13	164,185 14
Total 1873	64,715 09	2,447,652 13
Corresponding time in 1872 :		
North	59,852 11	2,197,180 06
South	6,584 00	328,979 06
Total, 1872	66,436 11	2,516,159 14
Increase North	3,546 05	96,286 11
Decrease North		
Increase South		
Decrease South	5,267 07	164,793 12
Increase	1,721 02	68,507 01
Decrease		

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, Nov. 8, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	17,448 05	830,315 14
Shipped South	47,569 01	1,862,875 16
	65,017 06	
Total		2,693,194 02
For the Corresponding time last Year :		
Shipped North	24,005 11	697,319 01
Shipped South	39,392 03	1,809,376 19
Total	59,397 14	2,506,696 00
Increase	5,619 12	186,498 02
Decrease		

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending Nov. 8, 1873.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received :		
From Lehigh Valley R. R.	9,136 03	458 447 16
" Lack. & B. R. R.	68 04	36,143 09
" Pleasant Valley R. R.	39 10	127,096 10
" Sul. & Erie R. R.	407 08	33,212 00
Total	9,651 05	649,899 15
Same time last year	12,848 16	551,639 16
Increase		98,259 19
Decrease	2,697 11	
Distributed :		
To Lehigh Valley R. R.		24,004 13
To Lack. & B. R. R.		1,443 04
To S. Central R. R.	3,576 01	147,504 16
To Ithaca & A. R. R.	1,569 16	134,272 07
To Erie R. W. Pockets for shipm't.	1,753 00	234,372 19
To Erie Railway, Watkins direct.	207 18	11,559 12
To individuals on line of road	1,152 01	27,768 09
To points at & above Coxton for use of Co.	252 13	24,377 05
To points between Waverley and Elmira	1,049 16	44,596 09
Total	9,651 05	649,899 15
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda	5,545 03	273,081 19
Shipped south from Towanda		1,914 18
Northern Central R. R.	....	384 09
Total	5,545 03	275,381 06
Same time last year	5,142 09	329,764 09
Increase	402 14	
Decrease		45,383 03
Distributed :		
To Erie Railway	5,545 03	251,124 13
To So. Central R. R		21,346 09
To Ithaca Valley R. R.		542 01
Lehigh Valley, R. R.		1,034 13
To individuals on line of Railroad.		1,215 15
To points on line of road for use of Company	....	118 04
Total	5,545 03	275,381 06
Grand totals transported		
Anthracite	9,651 05	649,899 15
Bituminous	5,545 03	275,381 06
Total	15,196 08	925,281 01
Same time last year	17,491 05	872,404 05
Increase		52,876 16
Decrease	2,294 17	

Northern Central Railway, Shamokin Division

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending Nov. 8, 1873.

	Tons. Cwt.	Tons. Cwt.
East	....	
West	9,343 06	9,343 06
Same time last year		14,160 13
Increase		
Decrease		4817 07
Total amount shipped to date		563,930 05
Same time last year		496,563 09
Increase		67,366 16
Decrease		

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

Company Coals.

Nov. 1873.

	L.	Str.	Gra.	Eg.	Sto.	Chest
*Pittston at Newburgh	5 00	5 00	5 10	5 20	5 50	4 80
*Lackawana at Rondout	5 05	5 15	5 25	5 40	5 70	5 05
Wilk'b're at Pt. John'n	5 05	5 15	5 25	5 40	5 70	5 05
Old Co. Lehigh at Pt. John'n	6 00	5 85	5 85	5 95	5 20	—
New York Coal Exchange	5 85	5 70	5 70	5 85	5 15	—
AT PHILADELPHIA.						
Hard White Ash	4 60	4 60	4 70	4 70	5 00	3 95
Free B'rn'g White Ash Coal.	4 60	4 60	4 70	4 70	5 00	3 65
Schuylkill Red Ash	— —	— —	4 70	4 85	5 15	3 95
Alaska Red Ash	— —	— —	4 70	4 70	5 00	3 95
Shamokin White Ash	— —	— —	4 60	5 00	5 20	4 10
North Franklin	— —	— —	5 20	5 20	5 10	4 00
Lorberry	— —	— —	5 50	5 50	5 50	4 35
Lykens Valley	— —	— —	— —	6 10	6 10	4 75
SHIPPED FROM ELIZABETHPORT, HOBOKEN AND TRENTON.						
L. C. and N. Co., Newport	— —	— —	5 35	5 50	5 70	5 10
" " Plymouth Red Ash	— —	— —	5 25	5 60	5 80	5 10
" " Room Run	5 85	— —	5 70	5 70	5 95	5 15
Honeybrook Lehigh	5 90	— —	5 80	5 85	5 90	5 20
Fulton, "	6 00	— —	5 85	5 85	5 95	5 20
Scranton	4 85	5 10	5 20	5 55	5 65	5 00

For freights to different points see "Freights."
*To contractors only.

Prices at Baltimore—Nov. 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 05@5 70
Pittston and Plymouth, do	5 75@6 00
Shamokin Red or White Ash, do	6 00@6 25
*Lykens Valley Red Ash, do	@6 80
By retail, all kinds per ton of 2,240 lbs	7 50@8 50
*George's Creek and Cumberland f. o. b. at Locust Point for cargoes	4 85@5 00
West Va. Gas Coal	6 50
Youghigheny gas f. o. b. at L. Point, nominal	7 50
Kanawha Cannel, coarse	@12 50

* Freight to New York $2 15.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Tyrconnel f. o. b.	$7 00

Prices at Georgetown, D.C., and Alexandria, Va.

Nov. 1873.

George's Creek and Cumberland f. o. b. for shipping $4 60@4 75

Prices at Havre de Grace, Md.

Nov. 1873.

Wilkesbarre and other White Ash for Cargoes	$— —@5 00
Lykens Valley	— —@6 50
Shamokin Red or White Ash	— —@5 25

Bituminous Coals (Cumberland).

Georgetown, f. o. b.	$4 60
Baltimore	5 00
New York	7 25@7 50
South Amboy	6 80

Prices of Foreign Coals.

Nov. 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Caking	16 00@18 60
" " Cannel	13 00@18 00
" House "	20 00@21 00
" Orrel	20 00@— —

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$20 00@22 00
"Cannel, "	22 00@25 00

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

Nov. 1873.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y.

	Coarse Slack	
Block House, f. o. b. at Cow Bay	$2 75	$1 25
Gowrie	2 25	0 00

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal.
Pictou nett	$3 00	1 50
Sydney	3 25	1 00
Lingan	2 75	1 00
Caledonia	2 75	1 25

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm : 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale : 75 cents per ton of 28 bushels.

AMERICAN.	Nominal quo Currency.
Westmoreland f. o. b.	$6 00 @7 00
Fairmount Gas Coal Co. of N. Y "	6 50 @7 00
Despard Coal Co "	6 50 @7 00
Penn "	6 50 @7 00
Newburg Orrel Gas "	6 50 @7 00
West Fairmount Gas Coal "	6 50 @7 00
Redbank Cannel, at Pa "	12 00 @0 00
AT PHILADELPHIA	
Westmoreland	7 50 @0 00

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1 75 Shipping at Pt. R., 20c., for use at Phil., $2 18 from Pt. Carbon.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R. R., N. J., Phillipsburgh to Elizabethport	06
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 23

MAUCH CHUNK TO PORT JOHNSTON.

L. V. R. R., or L. & S. R. R. from M. C. to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	6
Shipping expenses	25
Wharfage	00
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	
B. & D. R. R.	$1
Cam. & Am R. R.	
Shipping Expenses	35
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R. R. Penn Haven to Phillipsburgh	84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 25

Freights.—Nov. 1873.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Elizabethport, Port Johnston, Weehawken, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout.
Amesbury	— —	— —	— —	— —	— —
Bangor	— —	3 25	— —	— —	— —
Bath	— —	2 75	— —	— —	— —
Boston	3 10	2 65	2 15*	2 10	2 15
Bridgeport	— —	2 35@— —	90	— —	— —
Bristol	— —	— —	1 10	— —	— —
Cohasset Narrows	— —	— —	— —	— —	— —
Derby	— —	— —	1 15†	— —	— —
Dighton	2 70	— —	— —	— —	— —
East Cambridge	— —	— —	2 15	2 10	2 15
Fall River	2 60	2 40	1 10	— —	— —
Hackensack	— —	— —	— —	— —	— —
Hartford	— —	— —	1 40	— —	— —
Hoboken	2 15	— —	45	— —	— —
Jersey City	2 15	— —	— —	— —	— —
Lynn	— —	— —	— —	— —	— —
Middletown	— —	— —	1 10	— —	— —
Mystic	— —	— —	1 15	— —	— —
New Bedford	— —	2 45	1 25	— —	— —
Newburyport	— —	2 75@2 85	2 30	— —	— —
New Haven	— —	2 35@— —	90	— —	— —
New London	— —	2 35@— —	1 00	— —	— —
Newport	— —	— —	1 10	— —	— —
New York	2 30	2 15	45	— —	— —
Norwalk	— —	— —	90	— —	— —
Norwich	— —	— —	1 10	— —	— —
Pawtucket	— —	— —	1 20‡	— —	— —
Portland	3 10	2 65	1 90	— —	— —
Portsmouth, N. H	3 20	2 75	2 30	— —	— —
Providence	2 65	2 40	1 10	— —	— —
Rockport	— —	— —	— —	— —	— —
Saco	— —	— —	— —	— —	— —
Sag Harbor	— —	— —	90	— —	— —
Salem	— —	2 70	2 15	— —	— —
Stamford	— —	— —	90	1 00	— —
Stonington	— —	— —	1 00	— —	— —
Taunton	— —	— —	1 40	— —	— —
Warren	— —	— —	1 15	— —	— —
TO RIVER PORTS					
Albany		— —			
Catskill					
Cocksackie					
Coeyman's					
Cold Spring		— —			
Fishkill					
Haverstraw					
Hudson	2 65	— —			
New York vessels					
Nyack					
Poughkeepsie					
Rhinebeck					
Rondout					
Saugerties					
Sing Sing					
Stuyvesant					
Tarrytown					
Troy		— —			
West Point					
Youkers					

+3 c. per bridge per ton in addition to freight.
† New Haven rate and towing 25 c. extra per ton.
‡ Towing from Providence and return, extra.
‖ And Towing.

St. Thomas	$— — Gold
Martinique	— — "
Demerara	— — "
New Orleans	— — "
Mobile	— — "

Foreign and Provincial Freight

Nov. 1873.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons £ Liverpool, 5 per cent primage

TO NEW YORK.

Provincial.

Sydney	
Lingan	$5 00
Cow Bay	4 00
Port Caledonia	4 00
Little Glace Bay	4 00

TO BOSTON.

Sydney	4 00
Lingan	3 50
Cow Bay	3 60
Port Caledonia	3 50
Little Glace Bay	3 50

TO MONTREAL.

Caledonia	3 75 gold

TO CUBA.

Caledonia	9 50 gold.

MARKET REVIEW.

NEW YORK, Nov. 13, 1873.

IRON—The stock of Eglinton Scotch is exhausted from importers' hands, and the price is nominal at $38. There has been considerable demand for Scotch Pig for the Boston market (stocks there being very light), but with some arrivals the demand has fallen off, leaving the market here very quiet again. Glengarnock may be quoted the same as Eglinton, $38, and Coltness $43@$45, while a small lot of Gartsherrie sold at $48, and some Eglinton at Philadelphia at $43, 30 days. American Pig is very quiet, and rates irregular; prices as a rule are weak, and, though there is no particular disposition to force goods, prices favor cash buyers; 50 tons each of Gray Forge and No. 2 sold on private terms. New English Rails may be quoted nominally $64 gold. New American are very quiet; nearly, if not all the mills have shut down for the present, while the stocks on hand are sufficient for some time to come. Old D. H. are held above the present market figures; T may be quoted nominally $35@$36—a sale of 130 tons Old Bridge and

T was made at $32,50, cash. For Scrap, there are no orders in the market; Dealers are buying small lots, from dock, at very low prices—say $25; from yard there is very little moving; $30@$32 is a fair quotation. Manufactured Iron continues dull and weak, and, though there has been no particular decline since our last, we reduce our quotations $2,50 per ton to conform to present selling prices.

LEAD—For ordinary Foreign Pig there is little or no demand; 7 cents gold is the nominal price. Domestic is freely offered at lower prices—say 6 @ 6½ cents gold, with some small parcels sold at 6 1-16 gold. Bar 9¼ cents, Sheeet and Pipe 10½, and Tin-lined Pipe 16½, less 10 per cent. to the Trade.

COPPER—Manufactured is nominally unchanged, and we retain previous quotations. It is understood, however, that prompt cash offers at lower than the card rates are not refused. The market for Ingot, after a long period of dullness and depression, has assumed a much firmer tone, and prices have a rising tendency consequent upon the purchase of two to three millions of pounds Lake, for delivery from November to March and April, on private terms. There has been besides, a pretty active business at an advance of 2@2¼ cents per lb. from the previous lowest prices; we notice sales of 250@300,000 lb. Lake, for present delivery, mostly at 22@22½ cents; 300,000 lb. for December to March delivery, 23; and 100,000 lb. different brands, for export to Europe, at 22 up to 24 cents, according to brands.

The following is from Messrs. WHITE & HASKELL'S circular of 1st inst.:—Contrary to expectation the Copper market has been extremely dull during the past month, consequent upon the continued stringency in the money market and a general want of confidence in the immediate future. The entire sales during the month have been to consumers, amounting to about 1,000,000 lb. at from 25 to 24 cents, cash, although at the close about 100,000 lb. have been sold at from 22½ down to 21¾ cents. A small parcel is still for sale at the lower figure, 21½ cents bid, although nine-tenths of the stock on spot is held at 24. No transactions worthy of note have been made for future deliveries, and there is nothing offering at the close.

SPELTER—Silesian remains quiet at previous rates; a ot of 25 tons C. G. H. sold at 7¼ cents gold. Schles Verein is held at 7½ cents gold. Domestic is in small stock, but there is not much inquiry, and Missouri can be bought at 7¼@8 cents currency.

REGULUS ANTIMONY—Is a little softer, small sales having been made at 12¼@13 cents gold.

TIN—Pig is still without demand, and prices remain nominal at—for Straits 28@28 ¼ cents, English L. & F. 26¾@27, Refined English 27¾@28, and Banca 33@33½ gold Plates are only in limited request, but the market may be called rather steady; sales have been made of 450 bxs. Charcoal Terne at $9,50@9,75; and 150 do. Coke Terne, $7,50 gold.

ZINC—Mosselmann Sheet is dull, and from dealer hands, cheaper than from the agents, whose price is 10 cents less 4 per cent. gold—a small lot sold from store at ¼ cents net gold. Manganese black oxide 3½ cents, do. ray peroxide 5½ cents.

METALS.

NEW YORK, Nov. 13, 1873.

IRON.—Duty: Bars, 1 to 1¼ cents ₩ lb; Railroad, 70 cents ₩ 1c lbs.; Boiler and Plate, 1¼ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₩ lb; Pig, $7₩ ton; Polished Sheet, 3 cts. ₩ lb; Galvanized 2¾; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ₩ ton	43 00@45 00
Gartaherrie	— —@48 00
Glengarnock	38 00@39 00
Eglinton	38 00@— —
Pig, American, No. 1	35 00@37 00
Pig, American, No. 2	30 00@31 00
Pig, American, Forge	25 00@27 00
Bar Refined, English and American	— —@— —
Bar Swedes, assorted sizes (gold	— —@137 50

	Store Prices, Cash.
Bar, Swedes, 1¾ to 5 x ½ & ⅝ 2 sq. & 6 to 12 x ½ & ¾	175 00@— —
Bar, Refined, ¾ to 2 in. rd. & sq. 1 to 6 in. x ⅝ to 1 in.	90 00@— —
Bar, Refined, 1¼ to 6 by ¼	95 00@— —
Bar, Refined, 2¾ to 2⅞ round 1 & 1¼ by ¼ & 5:16	87 50@— —
Large Rounds	90 00@105 00
Scroll	100 00@132 50
Ovals and half-round	107 00@127 50
Band	100 00@102 50
Horse Shoe	115 00@— —
Rods, ⅜ to 3-16 inch	90 00@132 50
Hoop	117 50@157 50
Railroad	6¾@8
Sheet, Russia, as to assortment (gold)	17½@18
Sheet, Singles, D. and T. Common	—5½@— 6¾
Sheet, D. an i T. Charcoal	—6¾@— 8
Sheet, Galv'd, list 15 per cent, discount	— —@— —
Rails, English (gold), ₩ ton	63 00@65 00
Rails, American, at Works in Pennsylvania, currency	70 00@75 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ₩ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₩ lb	— @— 48
Copper Bolts	— @— 43
Copper Braziers, 16oz. and over	— @— 40
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	21 @— —
Copper, Old, for chemical purposes, 14@16 oz.	— @— —
Copper, American Ingot, Cash	22 @— 22½
Copper English Pig	— @— —
Yellow Metal, New Sheathing & Bronze	— @— 25
Yellow Metal Bolts	— @— 32
Yellow Metal Nails, Sheathing and Slat'g	26 @— —

LEAD.—Duty: Pig, $2 ₩ 100 lbs.; old Lead, 1½ cents ₩ lb

Pipe and Sheet, 2½ cents ₩ lb.	
Spanish (gold)	— —@7 00
German, do.	— —@7 00
English do.	— —@7 00
Foreign, Refined	7 25 @7 50
Domestic do.	6 00 @6 12½
Bar (net)	9 25 @— —
Pipe (net)	— —@10 50
Sheet	— —@10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ₩ lb or under 2¼ cents; over 7 cents and not above 11, 3 cents ₩ lb; over 11 cents, 3½ cents ₩ lb, and 10 ₩ cent ad val. Store prices.

English Cast (2d and 1st quality) ₩ lb	— 17½@— 22
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 14 @— 18½
English Machinery	— 14½@— —
English German (2d an 1lst quality)	— 12½@— 14½
American Blister "Black Diamond"	— — @— 11½
American, Cast, Tool do.	— — @— 17
American, Spring, do.	— — @— 11
American Machinery do.	— 11½@— 12
American German, do	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 25. ad val.

	Gold ₩ lb.
Banca	33 @33½
Straits	28 @28⅝
English	26¾@27
English Refined Gold	27½@28

PLATES.

Fair to Good Brands.	Gold.	Currency
I. C. Charcoal, ₩ box	$ 9 50 @10 00	$10 50 @11 25
I. C. Coke	7 50 @ 8 00	8 50 @ 9 00
Coke Terne	7 00 @ 7 75	8 00 @ 8 75
Charcoal Terne	9 50 @ 9 75	10 50 @11 00

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100lb

Plates, Foreign (gold) p. 100 lb.	7 37½@— 7 75
Plates, Domestic p. lb.	8 @—11

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c per lb

Sheet	per lb.—9¾ @ 10

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, Nov. 13, 1873.

The following report from the San Francisco Stock Board is dated the 11th inst.: The market is very irregular; the most noteworthy feature in the list is the decline in Crown Point, the report placing it at $94 per share, being $9 lower than for our last. A dividend of $3 per share has been declared by the Crown Point Mining Co., payable on the 12th ult., and a dividend of $4 per share has also been declared by the Belcher Mining Co., payable on the 10th ult.

Savage	—	—	56
Crown Point	—	—	94
Yellow Jacket	—	—	66
Kentuck, "New Issue"	—	—	12½
Chollar Potosi	—	—	47
Gould & Curry "New Issue"	—	—	12
Belcher "New Issue"	—	—	78
Imperial	—	—	5¼
Raymond & Ely	—	—	60
Meadow Valley	—	—	15½
Eureka G. V.	—	—	20
Ophir	—	—	—
Hale and Norcross	—	—	—

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The ENGINEERING AND MINING JOURNAL, which is the Organ of the Institute, and contains its proceedings, transactions and notices of meetings, will be sent to each Member and Associate on the payment of his annual dues. Back numbers cannot, as a rule, be sent.

II. Dues are payable in advance at the annual (May) meeting. Remittances should be made, as far as possible, by P. O. Order, payable to the Secretary.

III. The first volume of Transactions of the Institute is in course of preparation and will be sent, as soon as issued, to all members not in arrears.

THOMAS M. DROWN, Secretary.

1123 Girard street, Philadelphia, Pa.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.
JOHN A. CHURCH, E. M. Editors.

PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.* It is the Organ of the American Institute of Mining Engineers, and is regularly received and read *by all the members and associates* of that large and powerful society, *the only one of the kind in this country.* It is therefore the best medium for advertising all kinds of machinery, tools and materials used by Engineers or their employees.

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CONTENTS FOR THIS WEEK.

THE last sensation in gold mining comes from Sitka. It is said that miners have "struck it rich" on the Stickeen River, in Southern Alaska. If anybody is tempted to start immediately, let him get BLAKE'S report on the exploration of the Stickeen, put his head in ice and his feet in hot water, and read it. The Stickeen presents a combination of glaciers and boiling springs, which the arrangement we have suggested will enable the reader to realize conveniently, without leaving home.

A MEETING of the American Iron and Steel Association has been called for Thursday, November 20, at the office of the Association in Philadelphia, "to consider the present critical condition of the iron trade, receive the reports of the Secretary and Treasurer, and take such action as may be necessary with regard to the future work of the Association." We hope the subject of Mr. MORRILL'S letter (published this week in our columns) will come up at this meeting, and that it will be considered and acted upon in a spirit of enterprise and far-sighted wisdom.

IT is worth mentioning that the steamer *Atlas* last week took out from Boston nearly 500 mill operatives and their families who are going back to the old world to seek the employment which they cannot obtain here until our affairs improve. This strikingly points our attention to the fact that for the time being wages are in many kinds of work nearly equal in Europe and America, and this exodus, which is likely to continue in considerable force throughout the winter, will show foreign workmen that life in this country is not always either easy or smooth. But we do not expect from this return of factory employees to their old home any real check to immigration. On the contrary, it seems to us to indicate that the working classes have recognized the radical change in their condition which the multiplication of cheap lines of transportation has brought about. If work is bad in one country they can go to another, both without great expense and without undertaking one of those formidable journeys which almost forbid a return. A transfer of this kind, applying as it does exclusively to those classes which must come upon the community for support whenever their daily pay is interrupted for any considerable time, cannot fail to be a great relief to a community embarrassed by financial distress. But it is a remedy which only the bold and adventurous will seek, and for that reason it is likely to benefit most such countries as the United States, which is filled with artisans who have wandered from home once and do not fear to start on their travels again. In many respects the result of these changes might be really good.

A great deal of the restlessness in the working classes is due to an incorrect estimate of the relations of employed and employer in other countries, and if wandering teaches them the general equality which exists in such relations all over the world, the efflux and reflux of the emigrating tide may bring at every turn renewed strength to the laboring classes. The ready means of changing their base, which cheap transportation offers, may possibly lead artisans into a modified form of that old system of "wandering" by which the German guilds formerly secured a liberal training for their members. The service which is now performed by books and technical schools, was then enforced upon every workman who, having learned the rudiments of his trade as an apprentice, was not allowed to practice until he had wandered on foot in foreign countries, asking work everywhere, and learning all that each new master had to teach.

THE brief communication on Coke from Western Lignites, sent by Mr. EILERS to the Easton meeting of the American Institute of Mining Engineers, together with specimens of the coke, was, perhaps, the most important novelty made known at that meeting. The condition of the West with respect to metallurgical fuels may be inferred from the fact that charcoal, costing 26 or 30 cents a bushel, is employed by the hundred thousand bushels at Eureka, Nevada, while in the Territory of Utah, coke from Connellsville, Pa., is used at $35 to $37 per ton at the works. Trinidad, Colorado, is some 1,400 miles nearer to these regions than Connellsville; and if the Trinidad coke satisfies reasonable expectations as to quality, it will command the Utah market as soon as the railway from Pueblo to Trinidad is completed—a consummation expected to occur within a year. Moreover, we learn that the Ruby Consolidated Co., at Eureka, has purchased a carload of Connellsville coke, as an experiment. This shipment cost at Eureka $790, or $79 per ton, at which price its use will not be profitable; but it is believed that under special arrangements for large quantities, coke from Pennsylvania could be laid down in Eureka for $50 per ton, and would be, at this price, preferable to charcoal at 30 cents. Trinidad coke ought to be deliverable at Eureka for $35 per ton at most; and, though not fully equal to the Connellsville article, it promises to be an admirable material for lead smelting. We look, therefore, to see it take the Nevada, as well as the Utah, market. In anticipation of this large and remunerative business, parties are already actively developing the coal mines of Trinidad, in advance of the completion of the Denver and Rio Grande Railway to that point.

EXACTLY why iron should fill so large a place in the business economy of the world, we believe, no one has been able to discover. The value of the iron produced in Europe and America is really insignificant when compared with the value of the crops, for instance, and yet the iron trade offers at all times a better indication of a country's condition than the cost of wheat or corn. It may be that this is due in England to the overgrown manufacture of iron while the crops there never suffice for the home consumption of food; and the prevailing notion that iron is so exact an index of trade may be a fallacy, so far as other countries than England are concerned. But there is no doubt that many business men are looking with anxiety to see how the prevailing depression in trade in this country will leave the iron business. At present it has, undeniably, suffered full as much as any branch of industry, if not more than any other, and its close dependence upon railroad custom makes this result inevitable in a crash brought on by the failure of railroad interests. If this state of things continues long, it can hardly fail to affect the price of coal, and the price of the rich iron ores which are so necessary to successful work, must be reduced from the extravagant rates of the last two or three years. The latter will be a misfortune only to the owners of the ore mines. They can make enormous reductions without affecting any other item than profits. But the coal owners cannot abate one cent of their charges without readjusting their expenses. Even at the present improved rates for coal there are too many mines which do not pay their way. If the condition of the iron business compels a reduction in the price of coal, there will have to be a reduction in the cost of labor as well as in the amount of profit. But a fall like this in wages cannot take place permanently in one industry without some compensating decrease in other industries, and this means a new level of wages throughout the country. In this way, therefore, the iron trade may be considered an index of the country's condition. It is so bound up with all other industries that the conditions which affect its prosperity must sooner or later be applied to other productive trades also.

The Last Boiler Explosion.

On Tuesday afternoon last an upright portable tubular boiler, made by A. S. CAMERON, the manufacturer of Cameron's well-known steam pumps, exploded in New York, killing seven and wounding seven persons. It was attached to a crane used on the Fourth Avenue Improvement, as the work of sinking the tracks of the Harlem railroad is called. The boiler is reported to have been certified as capable of bearing a pressure of 120 lb., and the pressure at the time of the explosion is variously put at 70 lb. and 48 lb. It is also said that the water was low. But the circumstances under which the explosion occurred do not require any such hypothesis to aid in explaining the disaster. It was found necessary to move the crane, with its boiler, to another part of the work, and the workmen attempted to do this while steam was up and a good fire on the grate. It was too heavy to move steadily, and, as it was pried along, rocked to and fro, and at this moment the explosion occurred. Whatever the immediate cause of the rupture was, whether steam was quickly made by the water dashing up on the hot tubes, or whether the shaking caused a sudden disengagement of steam held in solution by the water, there can be no doubt that the moving of a boiler over rough ground, with fire blazing and steam up, is a reckless and dangerous operation. The appearance of the boiler shows that the cause, whatever

it may have been, acted over the whole inner surface of the shell, which is completely torn away from the tubes.

The upper portion broke in four pieces, two of which fell near the boiler, killing two of the workmen engaged in moving it, a schoolboy who was looking on, and two men who were laying gas mains in a ditch about ten feet distant. The third piece killed an Italian girl who was crossing the railroad cut by a bridge, and the last piece, which weighed about 200 lb. and flew about five feet from the ground, killed a young lady, 100 or 150 feet off. All of the killed were struck in the heart, and two were completely decapitated. Little is to be learned from this occurrence of the causes of boiler explosions, for the reason that it was probably due to human intervention. There was carelessness as the first cause, and we shall probably never know enough about the circumstances to be able to decide upon the exact method in which that cause operated.

We will advert in this connection to the result of the Coroner's investigation into the explosion of a Howard Safety boiler in Bristol, England, about two months ago. The explosion killed the fireman and scalded the engineer. It was proved that the explosion was preceded by a serious leak, and that the gauge showed a fall of 27 inches in water level in one night. It was also in evidence that the boiler was built to stand 200 lb. pressure, had been sometimes worked at 220 lb., and stood at 170 or 160 lb. at the time of explosion. This explosion is the fourth which has happened to the Howard Safety boiler this year, and at the time of one of the preceding accidents the manager of the works corresponded with Mr. HOWARD, and received from him some tie bolts to strengthen the boiler. The jury found a verdict of manslaughter against the engineer, the verdict hinging upon the fact that tie bolts were not placed in all the tubes, as they should have been, to fit them to bear 170 lb. pressure. Here we have a defect in construction, which can be remedied, and the result of the inquiry is one which may be considered reassuring to the 600 users of the Howard boiler, who can have their steam apparatus put in order, if it is not already so.

The Source of Clays.

AT a recent meeting of the Boston Society of Natural History, Dr. T. STERRY HUNT gave an account of the crystalline rocks of the Blue Ridge and their decomposed condition, as seen by him at various points in the region southwest of Lynchburg, Va. We find an abstract of his remarks in a Boston paper, which, we presume, represents his views correctly. According to this authority, the rocks referred to are principally gneisses with hornblendic and micaceous schists like those of the Montalban or White Mountain series, and are completely decomposed to a depth of fifty feet, or more, from the surface, being changed into an unctuous reddish brick-clay, in the midst of which the interbedded layers of quartz are seen retaining their original positions, and showing the highly inclined attitude of the strata. In the adit of a mine, where the rocks had been penetrated to a considerable distance, the coarsely feldspathic gneiss was found completely kaolinized, but free from the ferruginous coloring of the surface, while farther in, after passing through a partially decomposed portion, the hard, unchanged rocks were met with. A similar decomposition of the gneissic and granitic rocks in Brazil, extending to a depth of one hundred feet, has been well described by Hartt, and is known in many other regions. The speaker noticed the permeable nature of the surface soil thus formed of inclined clayey strata, which afford a natural subterranean drainage and prevent the accumulation of water in pools and lakes.

The nature of these chemical changes of the gneissic and hornblendic rocks was next considered. It consisted essentially in the removal, in the form of soluble carbonates, of the alkalies, lime and magnesia of the silicated minerals and the hydratation of the residues. The iron-oxyd from these has also been in great part dissolved out by subsequent processes, and was the source of the immense deposits of hydrous iron ores which are found at the foot of the barrier range of the Blue Ridge throughout the Appalachian Valley.

Dr. HUNT next alluded to the great antiquity of this chemical decomposition of the rocks. It was, in his opinion, effected at a time when a highly carbonated atmosphere and a climate very different from our own prevailed. That this decomposition had extended to the crystalline rocks to the northeastward he did not doubt; and he ascribed the absence of decomposed rocks in these regions to a process of denudation during the successive ages, which culminated at the time of the submergence of the northeastern Appalachians at the end of the Pliocene period, when the remaining softened material was swept away by the action of water and ice, and the hard, unchanged rocks beneath were exposed and glaciated, since which time the chemical decomposition of the surface has been insignificant.

As we proceed southwestward from New York we find that the partially decomposed and disintegrating portion of these rocks which, in the Blue Ridge, lies beneath the clays, has escaped denudation, and we at length reach the region in southern Virginia and Carolina where these clays, the result of complete decomposition, are seen in nearly vertical strata forming the superficial soil. These ancient clays formed by the sub-aerial decay of the crystalline feldspathic and hornblendic rocks of the great Eozoic continental areas were, according to the speaker, the source of the argillaceous strata of the Cenozoic, Mesozoic and Paleozoic periods, and in the heights of the southern Appalachians we have still remaining a portion of that Eozoic land, which has stood throughout all these ages, undenuded, unglaciated, unsubmerged, and from its peculiar nature (being composed, as already described, of highly inclined, porous and permeable strata, supporting an abundant vegetation), but little subject to the degrading influences of atmospheric waters.

So far, Dr. HUNT. The generalization he puts forward seems calculated to throw light on many problems in American geology, especially the origin of all our clay rocks of various ages, and of the great accumulations of limonite ores along the Appalachian Valley, at the base of the crystalline range. We see the ferruginous earth from the decay of hornblendic rocks to the southwest, ready to give its iron to percolating waters, but to the northeast it is somewhat perplexing to find great deposits of these ores at low levels, associated in some localities, as at Brandon, Vt., with clays of Tertiary age. If we understand Dr. HUNT, he would say that when these deposits were formed, the New England hills were still covered with clays and soft, disintegrating crystalline rocks, like those of Virginia. This softened condition of the rocks, effected by the highly carbonated atmosphere and the climate of early time, facilitated glacial and meteoric denudation, producing deposits of débris. The lime, magnesia and soda dissolved from the once hard crystalline rocks, during the period of decomposition, played an important part in the deposits of the calcareous rocks now found alternating with the argillaceous and arenaceous strata of our Paleozoic basin.

We presume the effect of a highly carbonated atmosphere, appealed to by Dr. HUNT, would be chiefly felt in the acid character of rain-water. His proposition is that disintegration of the rocks went on more rapidly when the amount of carbonic acid in the percolating water was greater than at present; and this is, so far, self-evident. The effect of such waters now is generally proportional to their contents of carbonic acid. But does Dr. HUNT refer the period of maximum denudation to a time, when, *on other evidence*, the atmosphere may be fairly presumed to have been highly carbonated—e. g., to the carboniferous age? If so, the tertiary deposits as we now behold them, are secondary, or still more remote results, and where are the "missing links?"

The Experiments on Boilers.

WE printed last week a short account, extracted from the *Tribune*, of the opening experiments upon boilers at Sandy Hook. Some of the papers have made themselves merry over the result of the explosions which formed the work of the first day, but we do not see that they can in any sense be called fruitless. One of them indicates that a weak spot in a boiler, that is, one which is weak in proportion to the remainder of the shell, may prevent a violent explosion, by opening enough to let out the steam, and the other proved that a tube may collapse at a pressure much below the test pressure of the boiler, if the water is allowed to become low. Neither of these points is new, but the object of Congress is not to hunt up new sources of danger to boilers, but to ascertain the value of all causes of rupture, whether new or old. The Commissioners have arranged to make nine tests to ascertain the facts concerning the following points:

1. Explosions caused by gradual increase of steam pressure.
2. Explosions caused by low water, and overheating of the plates of the boiler.
3. Explosions caused by deposits of sediment or incrustations on the inner surface exposed to the fire.
4. Explosions caused by gases formed within the boiler.
5. Explosions due to electricity generated in the boiler.
6. Explosions caused by the percussive action of the water in case of rupture of the steam chamber.
7. Explosions due to the sudden generation of steam from water which has been heated above the boiling point, in consequence of having been deprived of its air.
8. Explosions due to sudden production of steam, consequent upon water relapsing from its spheroidal state and coming in contact with overheated plates.
9. Repulsion of water from the surfaces of the boiler. This is in effect the same rupturing cause as No. 8, but produced in a different way.

The trials at Sandy Hook have not yet been renewed, but the Commissioners have transferred their labors to Pittsburgh, where experiments will be made this week.

CORRESPONDENCE.

The Canal in Winter.

TO THE EDITOR—SIR:—In your issue of Oct. 28th, you give some account of a plan for keeping the Erie Canal open for navigation during the winter, by artificial heat. The possibility of such a thing is not questioned; but is it practically and economically feasible? And in considering that question, two points present themselves as of primary importance. First, what will it cost? Next, what will it pay? On looking over the highly scientific estimate of the amount of heat required in the case, it appears strange that no allowance has been made for the loss of heat by radiation from the surface of a sheet of water 70 feet wide by half a mile long. Neither is the loss by the conduction of, and currents produced in, the superincumbent atmosphere, accounted for. Again, in all calculations based upon the unit of heat mentioned, is not that unit taken as the heating of one pound of *water*, not one pound of ice. How then is the heating effect of the coal "increased" by not being put to the disadvantage of thawing ice? Is not that disadvantage rather a drawback that must be occasionally met?. The wording of

that paragraph misleads, by indicating that in this case the coal would do more work, than the number of heat units it will produce, would account for. Another omission, however little its importance, is the cost of attendance, or fireman's wages; all of these things can, of course, be easily disposed of, but not being so, the door is left open for objections.

But assuming that the figures given are correct, and that the Erie Canal can be kept open during the whole year, at a cost of $600,000, the question arises, where is the money to come from, not the first outlay thereof, but the running expenses? Will the present rate of tolls, applied during the winter months, pay that bill? Will the State pay a portion of it from its summer revenue? Are the railroads now carrying the freight in the winter at a minimum paying rate, or would they, by reducing their rates, affect the boats? And if the boats arrive at Albany during the whole winter, is it proposed to tranship there, or to keep the Hudson River open as well as the Canal? And if so, how much of the $600,000 can be spared for that purpose? Also, where are those boats to obtain their freights? is the grain grown at Buffalo? or must more of the $600,000 be taken to boil Buffalo Harbor and Lake Erie?

Chicago will probably fight shy of fires large enough to keep her harbor and river open; but, perhaps, Milwaukee and other cities would accept their share of the $600,000.

Perhaps the necessity of keeping lock-gates in working order might be mentioned, but it is to be supposed that this difficulty will be met and disposed of inside of the original estimate; and this recalls an incident that happened a few years ago, within a few miles of Baltimore, when a cotton-mill, warmed and driven by steam from a boiler-house that stood a few feet from it, found it impossible to start up one morning, because the steam would not travel through a pipe that was more than a foot under ground; that pipe was between the globe valve and the boiler, and not expected to get very cold; but the popular verdict that day was that it was "froze up."—Yours, A.

Many, or most, of our correspondent's questions are discussed by Mr. CHEESEBROUGH in his pamphlet, but we were obliged to leave out all reference to the financial side of the question, in order to bring our late article within limits.

Our correspondent is wrong in one point. Mr. CHEESEBROUGH need not fear the freezing up of his pipes, for the reason that he purposely sinks them to a depth where the water is fluid even in the hardest season, and the pipes are, therefore, necessarily free from this danger. Our correspondent hints that Mr. CHEESEBROUGH has erred in thinking that it would take less fuel to keep water from freezing, than to melt an equal quantity of ice. Let us look at that point. The temperature of 32 deg. F., is the temperature not only of solid ice, but also of entirely fluid water. Water does not become ice by virtue of lowering of its temperature *below* 32 deg., but solidifies without change of temperature, and yet, that change robs the water of far more heat than is indicated by a fall of, say, from 42 to 32 deg. If a pound of ice requires 79 heat units for its fusion alone, it is evident that the same amount of heat expended in raising water from 32 to 33 deg. would suffice to keep 79 pounds of water from solidifying.

The fact is, that a theoretical discussion of this question is entirely worthless, unless the conditions which actually obtain upon a canal in winter are agreed upon beforehand. We must consider these as two-fold: First, there is radiation from the water, which is a variable quantity. Second, there is the absorbing power of the air, also a variable. Let us make the first of these a constant, and say that radiation reduces the temperature of the water to 35 deg. Now, the question of freezing may depend entirely upon the tranquility of the atmosphere. If one and the same body of air rests upon the canal all day, its powers of heat absorption cease when its temperature equals that of the water, and let us assume that this state of affairs is reached precisely when the water marks 32 deg. F. The condition of the water is now such, that it cannot give up further heat, unless it undergoes solidification, a process by which it necessarily sets free 79 heat units. Most of this heat, probably, passes to the air, and thereby limits its heat-absorbing powers. For this reason, we find that in calm nights only a thin sheet of ice forms; because the solidification of a small amount of water gives out heat enough to warm up the body of air resting on the water. But if that body is rapidly changed, so that fresh, cold air comes in continually, to replace the air warmed by the water, a new amount of the latter will have to undergo solidification to satisfy the new demands. And this process will go on until the ice becomes so thick that it can no longer transmit the heat with rapidity enough to effect any considerable change in the state of the water below it.

One consequence of heating the water would be, that *evaporation* would continue in full force all winter, while under ordinary circumstances, it is probably very much lessened by the ice cover laid on the water surface. Evaporation consumes heat just as solidification affords heat, and Mr. CHEESEBROUGH's scheme reduces down to one thing;—he practically asserts that evaporation from a given surface in our winter climate consumes less heat than would be required to melt the ice which forms on that surface; and further, that the amount of evaporation is so small that it can be economically maintained by artificial means.

Our object in these few words is not to give a thorough explanation of the sense in which we took Mr. CHEESEBROUGH's idea, but to point out the fact that this is a question which cannot be settled without taking into consideration the real state of facts under which canals freeze in this climate. We do not know that this has been experimentally examined, and the presentation of Mr. CHEESEBROUGH's scheme seems to afford an excellent opportunity for an investigation with a practical bearing.

The American Institute of Mining Engineers.

EASTON MEETING.

[Continued from Page 315]

SESSION OF WEDNESDAY EVENING, OCT. 22.

THE Institute met at eight o'clock, President RAYMOND in the chair.

The first paper was by Mr. R. P. ROTHWELL, on

ALABAMA COAL AND IRON FIELDS.

(This paper will be published in full when the necessary diagrams are ready.)

Mr. STEARNS—Do the anti-clinals in the south part of the Cahaba field die out in the South? Could not a mistake be made in this point which would alter the geological section?

Mr. ROTHWELL—I think they die out, except a slight flattening of the dip. A mistake in this matter is not likely, since the rocks in the south part of the field, both in the upper and lower measures, are quite distinct. The beds of creeks crossing it give excellent sectional exposures, so that a change in dip could not be easily passed unnoticed.

Mr. RAYMOND—May not contents of water have something to do with the variable behavior of these coals in the manufacture of coke?

Mr. ROTHWELL—Our dryest coal in the Alabama field is very good coking coal; other coals occurring close by will not coke. One thing which may have affected my experiments, it must be confessed, is the fact that I was often unable to get freshly mined coal from the desired localities, owing to the suspension or abandonment of mining operations.

Dr. T. STERRY HUNT—I have reason to think there are allotropic differences in fuels. Some years ago, in studying bitumens, I found that certain bitumens are fusible, although bituminous coals of the same chemical compositions will not fuse. Since coking is partial fusing, this analogy is suggestive. The case is even stronger with the bitumens. I found some to be completely soluble, though chemically identical with insoluble varieties. Another instance is afforded by two silicates, one of which is attacked by acids while the other is not. This difference in behavior corresponds to a difference in density and hardness.

Mr. ROTHWELL—I should like to get the opinion of the members concerning the apparent universal increase of the proportion of the moisture in these coals, as we pass from lower to higher beds of the series. Is this fact significant and likely to be maintained throughout? I have thought that it would afford us a useful means, in conjunction with stratigraphical observations, for the identification of the beds.

Dr. DROWN—I believe it has been argued that the proportion of oxygen increases in inverse ratio to the age of coals; those of the greatest antiquity having the least oxygen.

Mr. RAYMOND—It seems to me that the variations in moisture in different parts of the same bed, would prevent the employment of this evidence in distinguishing beds.

Mr. ROTHWELL—We find our beds quite uniform in this respect.

Mr. RAYMOND—At all events, this is a feature which we could not expect to hold good on a very large scale. Within a single limited field like the Cahaba, it may offer us some ground for comparison, but it will remain at best an uncertain matter.

Dr. DROWN—Is it possible that at 110° Fahrenheit some combined oxygen would go off when the moisture was expelled from the coal?

Mr. CORYELL said he had not personally visited the locality of the fault, described by Mr. ROTHWELL as bringing the Silurian strata to the surface by a vertical throw so that the Carboniferous strata abut upon them. It seemed to him more probable that the Carboniferous strata were simply overthrown so as to have a reverse dip. He had found similar instances which, at first sight, seemed to be faults.

Mr. ROTHWELL pronounced this hypothesis inadmissible for the present case, and insisted that the features of this case are perfectly clear to any geologist who has the opportunity to examine them.

Mr. HEINRICH said he had not seen the locality described by Mr. ROTHWELL, but had no doubt that gentleman's view was correct. He was familiar with similar faults in Virginia.

A paper by Mr. W. M. COURTIS from Wyandotte, Mich.,

ON THE SMELTING OF SILVER ISLET ORES

was read by the secretary. (This paper will be published in full in our columns. It contains an exceedingly elaborate and interesting description of the Wyandotte Works, and the processes of silver reduction employed, together with full analyses of the materials, products, and refuse.

Mr. RAYMOND alluded to the concentration of nickel in the Wyandotte matte by repeated roasting, and said the experiment was made some years ago, on the Hudson, to concentrate, by kernel roasting in heaps, the small percentage of nickel contained in the magnetic pyrites of Anthony's Nose, Litchfield, Conn., and other places. The result was a perceptible concentration of nickel. He believed, however, that the percentage of this metal, in the deposits referred to, had been found too variable, as well as too small, to permit commercial operations.

Dr. T. STERRY HUNT said that Mr. THOMAS MACFARLANE, formerly manager of the Wyandotte Works, had recently visited the so-called Nickel Mines at Litchfield, and on the Hudson, and had expected to be present at this meeting. If he were he could doubtless make some interesting communications on the subject. Dr. HUNT had visited Anthony's Nose and noticed the continuations of this formation

on the west side of the Hudson. Parties engaged in the attempt to smelt the nickeliferous ores had shown him a piece of so-called second matte, said to contain eight to ten percent of nickel. He found, however, upon examination, that it did not contain more than one per cent.

The next paper was by Mr. A. EILERS, of New York, on

COKE FROM WESTERN LIGNITES.

(This paper is published in our columns this week.)

Mr. RAYMOND remarked that the subject was one of great importance to the industries of the far West, and that the information contained in Mr. EILERS' paper was extremely encouraging.

The Institute then adjourned.

SESSION OF THURSDAY MORNING, OCT. 23.

The Institute met at 9:30 A. M., President RAYMOND in the chair. After the election of members, Mr. PECHIN offered the following resolution, which was unanimously adopted:

Resolved, That the thanks of the Institute are hereby given to the authorities of Lafayette College, for the use of the rooms in which meetings have been held; to the Local Committee, for its excellent dispositions to enhance the pleasure and interest of the meeting; to the proprietors of works visited, for their ready hospitality, and to the Lehigh Valley, Pennsylvania and North Penn. Railroads, for courtesies offered.

Mr. HOLLEY offered the following resolution which was unanimously adopted:

Resolved, That the American Institute of Mining Engineers desires to add its voice to the general expression of the public gratitude to Mr. ABIO PARDEE, for his liberal and wise endowment of the Scientific and Technical School which bears his name.

Mr. F. FIRMSTONE then read a paper on

A MODIFICATION OF COIGNET'S CHARGER FOR BLAST FURNACES.

(This paper will be published when drawings are sent.)

Mr. PECHIN asked what was the advantage gained by taking off the gases in this way.

Mr. FIRMSTONE replied, that in the instance referred to, it was simply a matter of convenience, as they did not wish to cut away any of the masonry of the furnaces, which they would have been obliged to do, if they had taken off the gases in the usual way by flues in the upper part of the stack. Moreover, there was a possibility of the furnace being used part of the time as a cold blast, open-top charcoal furnace, with water power for the blast, and in that event, the charger could be entirely removed. The main advantage of this system is, that the flues are independent of the masonry. He did not attach any importance to the fact that the gases were taken off from the middle of the stack.

Mr. RAYMOND read a paper on

A GEOLOGICAL MAP OF THE UNITED STATES,

exhibiting a copy of the map.

Dr. T. STERRY HUNT remarked, with reference to the criticisms that had been made on the existence of the Cretaceous formation on Long Island, that HITCHCOCK had recently given good evidence to establish its correctness, that cretaceous rocks did exist in northern New Jersey along the north shore of Long Island, extending up into Massachusetts. In addition to the remarks of Mr. RAYMOND regarding the zonal character of the formations in the West, he would call attention to the fact that the same parallelism is noticed east of the Paleozoic region. We have, extending down from the Gulf of St. Lawrence through Vermont to Georgia, parallel series of rocks carrying the same minerals and ore-deposits. The same great laws of folding have obtained here as they are on the Pacific Slope, while between the two, a great basin exists where the deposits lack the zonal character.

Dr. T. STERRY HUNT then read a paper on

THE ORE KNOB MINE ON NORTH CAROLINA.

(This will be published hereafter.)

MR. RAYMOND—With regard to the change in the gossan mentioned by Dr. HUNT, and the explanation he gives, I think we may be helped to a comprehension of the matter by a little different statement of it which probably, after all, if analyzed, would prove to be but another way of putting Dr. HUNT'S views. Since the gossan is acknowledged to be the product of superficial agencies, and particularly of percolating waters, it is evident that the line of drainage along the vein will be likely to be the lower limit of the zone of gossan; but this line will not be parallel with the surface. It may follow, roughly, some of the inequalities of the surface, but its general tendency will be less steeply inclined. In other words, water will run under-ground in an inclination less steep than that of a hill-side. It is, indeed, by the operation of causes, among which this principle is one, that the present surface, resulting from gradual degradation of mountains, is less steep than the former surface. Disintegration and denudation continually reduce the *talus*.

With regard to the view expressed by Dr. HUNT, concerning the nature of the cupriferous deposits of Ducktown, Tenn., Mr. RAYMOND called attention to the fact that in pronouncing these deposits to be fissure veins Dr. HUNT contradicts the opinion of Professor CREDNER who, some eight or nine years ago, examined the mine and declared the deposits to be lenticular masses, merely. His description of them will be found in a report issued by the "American Bureau of Mines," for which he furnished the field-notes. He decided against the theory of fissure veins, in this case, because he found that the enclosing slates had continued unbroken at the points where so-called faults in the ore deposit occurred, bringing the thin edge of one ore body *en echelon*, as it were, to the edge of another; also, because the form of the ore-bodies is lenticular; and, finally, because, so far as he could observe, the copper pyrites in depth occurred in a central zone, of great purity and massive character, shading off on both sides to a more impregnation in the country rock. Concerning Dr. CREDNER'S competency and trustworthiness as an observer, there can be no question, but Dr. HUNT has had the advantage of the additional development of the underground working of these mines, of the light thrown upon them by the features of the Ore Knob deposit, and, finally, of explorations made across the veins by means of the diamond drill. The last item is worthy of attention. Every mining engineer knows how little we are usually able to see of the structure of a vein by passing through the underground workings. We are, for the most part, merely inspecting cavities from which the original material has been removed. The walls may not be accessible, or they may have been blasted away. The floors of the galleries may be covered with slime, or running water, or planks, and both roof and floor may consist of timbering and waste rock, giving us no view of the rock in place, except where, the vein being pinched or barren, pillars left standing present us with sections of it. The heads of new drifts and cross-cuts and the sides and bottoms of shafts, afford us, in most cases, our principal data, which we reinforce by cross-questioning workmen, to discover how the vein appeared in this or that place now empty, or inaccessible. It is evident that the cores furnished by the diamond drill constitute an important addition to the evidence upon which the mining engineer may determine the character and value of the deposit. It is from such evidence as to the cross-section of the Ducktown veins that Dr. HUNT declares them to possess a banded structure with intersticial space and vugs characteristic of deposits posterior in origin to the enclosing rocks.

Dr. HUNT desired to do full justice to Mr. CREDNER for his investigations. He thought the nature of the deposit of the fissures which contain the ore might be well illustrated by what lumber men call "shaky" lumber, where a board is filled with a number of small fissures or cracks, irregularly disseminated through it, but all in the direction of its fibres. On the other hand a regular fissure vein might be compared to a single straight crack in a board.

MR. RAYMOND said the occurence of fissures in the same belt, having the same general strike and dip, and parallel with the enclosing rocks, though not continuous with each other, is a phenomenon more common perhaps in America, than elsewhere. He believed it to be, (as Prof. BLAKE suggested at a former meeting), the result of the greater simplicity and extent of our geological formations, which are characterized by the action of similar forces throughout considerable areas. He considered, for instance, the so-called mother lode in California, to be not a continued fissure, but a series of fissures in a zone of maximum tension along the flank of the Sierra. Prof. BLAKE showed, long ago, that the Princeton vein on the Mariposa Estate in California, although having a general coincidence with the enclosing rocks, does not everywhere follow their stratification, but at certain points, for short distances at least, clearly cuts across them,—as, when we separate by force two pieces of wood which have been glued together, the new fissure may follow the former line of separation, but it is likely that in many places it will depart from that line, the wood giving way rather than the glue. That this belt along the Sierra is really a zone of tension seems to be indicated by the reverse dip of the slates, which, on the surface, may dip towards the axis of the mountain, instead of running upon the mountain, as one would naturally expect. Prof. WHITNEY'S survey has shown that, in some of the deep cañnons which intersect the Sierra on the west, this reverse surface dip of the slates can be plainly seen to change to a vertical, and, at a greater depth, to an eastward dip. If this is generally the case, throughout the belt referred to, then the slates on the surface are bent backwards like the leaves of a book, and nothing is more natural than that they should part, as leaves in that position would, in lines more or less nearly parallel by stratification.

The next paper was by Mr. OGDEN HAIGHT, of Eaton, Pa., on

THE SURVEYING OF COAL LANDS,

to be published in full in our columns. Lack of time prevented the full reading and the discussion of this paper.

Mr. RAYMOND exhibited samples of the rock in which the

SOUTH AFRICAN DIAMONDS

are said to occur, for which he expressed himself indebted to Mr. FRANZ GROEGER of Vienna, formerly an assistant of the Royal Imperial Geological Institution, whose account of the general geology of Southern Africa was contained in a recent number of the proceedings of that Institution. The rock exhibited by Mr. RAYMOND was apparently a sort of tufa, evidently of volcanic origin. Mr. GROEGER, he said, had assured him that it could be seen *in situ*, bounded by uplifted, stratified rocks; and that diamonds had been mined from it, by means of shafts, some distance below the surface. GROEGER calls it "greenstone-tufa," and says of it, in the proceedings of the Geological Institution, "it breaks through the younger members of Group III, [lower Trias and Jura] * * * and crops out in oval masses, filling fissures. * * * * The occurrence of this tufa is not locally limited, but has been traced and proved already over a large territory."

Dr. HUNT remarked that the material looked like the *trass* of the Rhine region. He thought it a new occurrence for diamonds. He believed diamonds to belong to the granite rock, although this material might be thrown up by volcanic agency, and the diamonds remain unaltered. In the volcanic region of Auvergne, crystals of sapphire, zircon and spinel are found; and yet no one supposes that these minerals have been generated by volcanic agency. He had had a conversation with DULONG on this subject, who agreed with him that these minerals being hard and resistant, had escaped the fusing action and remained in the

veins unchanged. DULONG had, moreover, noticed zircons with fused edges imbedded in a volcanic mass.

THE PRESIDENT.—Is not itacolumite considered the home of the diamond?

Dr. HUNT—Of late years doubts have been thrown upon the statement that diamonds occur in itacolumite.

THE PRESIDENT—But they certainly occur in the vicinity of itacolumite, in Brazil, Georgia, etc.

Dr. HUNT—It has been said that diamonds have been found in itacolumite, yet, on the other hand, it has been suggested that this occurrence might be accounted for by the re-cementing of a mass of sand into rock. Itacolumite has not been noticed in the Golconda and South Africa diamond fields.

Mr. ROTHWELL remembered well having seen in the collection of the School of Mines in Paris, a diamond imbedded in itacolumite.

Dr. HUNT had seen a diamond imbedded in a mass of quartz crystals from Brazil, but immersion of the mass in warm water soon caused the gem to leave its setting.

After announcements from Mr. J. C. KENT, concerning the programme for excursions for the afternoon and Friday, the meeting adjourned.

Thursday afternoon was devoted to visiting the furnaces and the magnificent new works of the Bethlehem Steel Co.

On Friday the Institute visited at Trenton, N. J., the wire-works rolling-mill, and SIEMENS-MARTIN steel works of COOPER, HEWITT & Co., and the works of FISHER and NORRIS for the manufacture of steel-faced anvils, and of the FISHER railway fish-plate. The excursion closed with a very pleasant dinner, given by Messrs. HEWITT and FISHER to the Institute, at which a number of brief and happy addresses were delivered by the hosts and the guests of the occasion.

Coke from Lignites.*

BY A. EILERS.

I PRESENT herewith for the inspection of the members of the Institute a specimen of coke, made in gas-retorts from the lignite of Trinidad, Colorado.

As far as I am aware, this is the first good coke for smelting purposes ever made from lignite alone in America. It has so far always been found necessary to mix bituminous coal from the coal-measures proper, tar, or similar materials with lignites, in order to produce a coke, which even then was in most cases only an indifferent fuel for the shaft-furnace. As you see, the coke here presented will answer for all purposes of lead and copper smelting in shaft-furnaces, and if made in proper coke-ovens it will probably be sufficiently dense to carry the high smelting column of the iron blast-furnace. The second piece of coke, in which pieces of charred coal are seen held together by a regularly coked material, is made from a mixture of 3 parts of Cañon City and 1 part of Trinidad lignite. It is sufficiently firm for use under the retorts and for household purposes, while the residuum remaining in the retorts, when Cañon City lignite alone is used, cannot be employed for any such purposes, as it does not swell at all, but retains the structure of the coal and breaks nearly all into pieces of less than a cubic inch in size. By effecting the above mixture the whole residuum has now a market value, and an excellent gas is produced at the same time. The specimen of Trinidad lignite presents, as you see, no marked characteristics which would distinguish it from a good bituminous coal.

One pound of it furnishes 4.25 cub. ft. of purified gas, without the use of an exhauster, and 55 per cent. of the coal remain as coke.

Trinidad, where this coal occurs in tertiary strata, is 90 miles south of the present end of the Denver and Rio Grand Railroad, and for that distance the lignite is now brought in wagons. This brings the cost of a ton in Denver at present up to $20, which is, of course, too high a price for metallurgical purposes. But the gas-works at Denver find it to their interest to use it even at present, together with Cañon City lignite, which costs $7, in the proportions above given. The Trinidad bed is reported to be from 4 ft. to 9 ft. thick, the extent not being stated. Mr. WM. J. FAY, Superintendent of the Denver Gas-works, reports that there is very little sulphur in this material.

The importance of this bed for the metallurgical interests of the far West cannot be overrated, when we know that, at present, eastern coke costs, at Denver, $22, and at Salt Lake City $30 per ton. It is expected that the Rio Grande Railroad will reach the locality in less than six months, when the coal can be laid down in Denver for about $8 per ton.

* A paper read before the American Institute of Mining Engineers at Easton Pa., Oct. 22, 1873.

MINING SUMMARY.

Utah.

BINGHAM MINES.

From the Utah *Mining Gazette*, of Oct. 25.

On arriving at Bingham we struck up Carr Fork, and crossed the divide at its head. This brought us in the immediate vicinity of the Clipper Mine in Tooele district, it being situated on the Tooele side of the ridge. The Clipper is owned by CROUCH, SNYDER & Co. It has an incline sunk seventy feet on a vein of high grade ore, assaying from $211 to $311 to the ton. A shipment of 36 tons sampled $106. This mine is similar to the Agnes in the character of its ore, being galena and carbonates. It is also an ore chimney, as is the Agnes. On descending the incline we found the workmen engaged in clearing away the vein matter around a huge boulder of galena. The part of the boulder exposed was about two feet long, one foot wide, and from six to eight inches thick, but was evidently much larger as its edge was traceable for two or three feet on the face of the vein. Mr. CROUCH was anxious to extract it whole, and will probably ship a few hundred pounds of the lump to Salt Lake. The present indications are favorable to a body of ore being at no great distance beyond the present excavations. That, of course, can only be proven by the prosecution of the work, as indications are often deceptive in their appearance. The Clipper is undoubtedly a very valuable prospect, and will sooner or later compensate its owners for the labor expended in its development, and leave a handsome margin to their credit. The Black Crook is situated on the same hill as the Clipper, but lower down its side. This mine is owned by REESE & Co., and has a shaft down nearly vertical 100 feet deep. Up to the present time but little ore has been taken out, but the best evidence that the owners are sanguine of ultimate success, lies in the fact of their putting in 'hard licks' on the prospect themselves. There are several other prospects in the vicinity of these mines owned by various parties, who are apparently awaiting the result of work on the Clipper and Black Crook, before expending their own means in testing the value of their claims. This may be policy, but it certainly is not enterprise.

After refreshing ourselves by a good night's rest, and enjoying the hospitality of the Miners' Home on the mountain top, we saddled up, and struck out for the Utah Works in Bingham main canyon. Our course laid in a southerly direction along the ridge of those lofty mountains overlooking Tooele Valley, and Salt Lake Valley, and looking down into Carr and Muddy Forks, Main and Butterfields canyons. On reaching the divide between the Main canyon and Muddy Fork we altered our course from south to east, and after about twenty minutes' ride down over some very steep bluffs, we came to the Rainbow, a few feet from the back bone of the ridge on the main canyon side. From this point eastward, on either side of the ridge, the mountain presents the appearance of a high pigeon box, its sides being thoroughly perforated with mining locations in every conceivable condition of development, from a gopher hole to a mine of immense wealth. The Rainbow is a true and well defined fissure vein cutting the formation, and is owned by Messrs. R. D. CLARK, of the Nixon House, Bingham; SILAS MAGUIRE, G. W. WALTON, and W. B. ELDRIDGE. On Wednesday, the shaft which is almost vertical, we found to be 110 feet deep, with a right and left hand drift running east and west, at a depth of 60 feet. The former 80 feet, the latter 30 feet in length. At the bottom of the shaft there is another drift running west, also 30 feet long. The vein at the start was about tone foot thick, but it has gradually increased until at the 110 feet level it is opened out to six feet in thickness. The shaft is not being worked at present. The workmen are engaged in the drifts on the 60 feet level stoping out ore. To what extent the vein runs, east and west, is not known, the ore having never pinched on them since the start. A tunnel is just started 400 feet down the hill side to tap the shaft at a depth of 250 feet. Five men are engaged on it, who commenced arching the tunnel on Thursday last. A building is to be erected immediately over its mouth, and work will be vigorously prosecuted all winter. The assay value of the ore from the level drifts of this mine is $115 silver, 69 per cent. lead, $15 gold. The company have about 100 tons on the dump taken from the upper parts of the shaft, which assays on an average 45 oz. silver, 30 per cent. lead, and $15 in gold. The present indications are that the vein will ultimately merge into free milling ore bearing a high per centage of gold and silver, minus lead. This idea is drawn by those in charge of the mine, from the fact of the ore for a vein of this character becoming thicker as the shaft goes down. It being at the present depth of 100 feet, four inches in thickness. This, together with the general indications of its surroundings, justifies the supposition.

Leaving the Rainbow, and continuing our tour eastward a few hundred feet, we come to the Ten Forty, situated about 100 feet from the edge on Muddy Fork side of the hill. This mine, although said to be a good one, is not working. Considerable ore is being sacked on the dump. Immediately above the Ten Forty, on the very edge of the hill, two men have made a location, and are sinking a shaft on a vein of galena and carbonates. The shaft is at present not more than twelve feet deep, as the location was made the 17th of the present month by O'BRIEN & SULLIVAN. This is is a valuable prospect, and one that bids fair to make its owners rich, if they can keep it clear of litigation, which, from its close proximity to the Ten Forty and Grizzly, makes it very doubtful.

Grizzly is a few hundred feet a little south of east from the Ten Forty, on the main canyon side, and on what is known as Jordan Hill. This mine is also shut down, from causes unknown to us. We noticed considerable galena lying on the dump, and from appearances generally, should judge that work had been suspended from other causes than lack of ore.

From this point, and looking south down the mountain side, we have before us the Neptune, Kempton, Jordan and Utah mines, all of which are very valuable. The first we come to on our way down the steep, is the Neptune, owned by ROGERS & Co., by whom it was purchased on the 27th of March, of the present year. This mine has three inclines. The main, or No. 1 incline is down on an angle of from forty to forty-five degrees, a depth of 125 feet. The other two, which are a little below, and to the east of No. 1, are down 115 feet on an angle of about thirty degrees. Inclines Nos. 1 and 2 connect by a level drift at the depth of 100 feet. There is a drift forty feet long run to the east, eighty feet from the mouth of incline No. 1, exposing an immense body of ore. At the depth of ninety feet another drift is run, also forty feet long on the vein. In this incline there is also an under cut running south, or toward the surface of the hill side, thirty feet long, on a six foot body of galena and carbonate ore. This is undoubtedly a blow out from the vein, as it appears to lay in pockets.

In inclines Nos. 2 and 3 the drifts and cross cuts aggregate 180 feet. The Neptune company have let a contract to run a tunnel from the base of the hill to tap the main body of ore, at a depth of at least 350 feet. It is already in a distance of 200 feet, and the work of excavating is still going bravely on. An average of fifty men are engaged on the company's work at this mine in various capacities, and a vast amount of work has been done since the purchase was made. Up to the present time the shipments of ore have averaged twenty tons per day. It is proposed, however, to increase this amount, as fifty tons a day, at least, will be raised from the main inclines as soon as some necessary work is completed, which will be in a very short time. There must be at the very least calculation, 5,000 tons of ore in sight. Its assay value is from twenty to twenty-eight ounces silver, and from fifty to sixty per cent. lead. The Neptune is one of those mines that meets ones views of what a mine should be. The extent of its ore deposits, although unknown, must be immense, if not boundless. The formation with which it is connected being easily worked, the excavating is comparatively trifling.

The Kempton is a few feet below and on the east of the Neptune, and a stranger

would be led to suppose from their proximity to each other, they were one and the same. In fact, in passing through the eastern part of the Neptune we noticed two holes where the Kempton inclines had broke through into the Neptune works. Both mines are undoubtedly on the same body of ore, and we understand there is a law suit pending as to which is the prior location. The Kempton claiming that the Neptune is a floated location. As to this, of course we have no means of knowing, although we heard many well acquainted with both, hold adverse opinions. The Kempton is working three inclines, and shipping large quantities of ore, notwithstanding a restraining order, we are informed, has been issued by the court to prevent further shipments pending the trial. On the Neptune dumps, both at the inclines and the tunnel, buildings are to be erected at once, and a vigorous campaign is to be prosecuted on the entire mine. The company under the superintendance of Mr. H ROGERS, one of the owners, have also secured a vast amount of wood for various purposes at the mine. This is a very important item in mining operations, especially in localities where the timber supply is so far below the demand, as is the case in Bingham Canyon.

On the way from the Neptune and Kempton to the Utah we came to the Pinto, a fine prospect situated a little above, and to the west of the Jordan. We noticed on the dump a snug pile of ore ready for shipment. A dug away was also being constructed for the purpose of conveying the ore in boats to the canyon road below. The Jordan next came in our road. This is a mine of almost inexhaustible wealth, worked by the method known as surface mining, so called from the fact of its being an open cutting. The whole of the surface strata being removed, the immediate body of ore lies exposed to the gaze of every one. The works on this mine are very extensive, the open excavations alone running for several hundred feet. There are also tunnels and drifts from which ore is being taken. The assay value of the ore is low, being, as we were informed at the mine, about from $12 to $15 silver, and from 50 to 60 per cent. lead. As to the correctness of these figures we are not certain, as we could not find the superintendent at the time of our visit. But judging from their being similar to those of the Utah, which may be called its sister mine, we have but little doubt of their being substantially correct. The Utah is situated a little east of the Jordan, but about on the same elevation on the hill side. This is another of those inexhaustible deposits of low grade ore that characterize Bingham district. The Utah is not being worked at present, as very extensive wet concentrating works on the jig principle are in course of erection, and are expected to be in operation by the first of the year 1874. It is said that sufficient ore is already in sight in the mine to keep the works running for twelve months at the rate of 100 tons per day. The ore assays from $12 to $15 silver, and from 50 to 60 per cent. lead.

Leaving the Utah we again ascended the mountain, and followed the wagon trail in a northwesterly direction down the muddy side of the ridge, until we arrived at the bottom of the gulch. Thence up the Last Chance wagon road to the mine of that name. Work on the shaft and tunnel is suspended for the present, and the energies of the miners are directed to stoping. Shipments continue to be made, however, at the usual rate up to the present time.

There are still a number of important mines still working, which for lack of time we did not visit, but shall do so in the course of a week or so. These are situated up the west fork at the head of Main Bingham Canyon, and some on the Butterfield side of the ridge.

Nevada.

THE SUTRO TUNNEL.

From the Gold Hill *News* of Oct 13.

Very few people, even professional men, are aware of the immense difficulties to be overcome in regard to projecting the lines from the surface down to the bottom of the shaft, from whence they have to be continued both east and west in order to make an accurate connection of the several drifts on the line of the tunnel. The header, it will be remembered, was started from the mouth of the tunnel, in the town of Sutro, and is being pushed rapidly ahead in the direction of Mount Davidson. The drift is being run in a perfectly straight line, rising westerly with a grade of two inches to every 100 feet.

Shaft No. 1 is located 21 feet 9 inches off the center line in a northerly directio and is distant from the mouth of the tunnel 4,885 feet. In order to start a drift from the bottom of shaft No. 1, to meet the header coming from the town of Sutro, it was found necessary to first run back 21 feet 9 inches in a southerly direction from the botom of the shaft, until the center line of the tunnel was reached, thence to turn a right angle eastwardly, and run in this course until the header is met. In order to effect an exact connection between header and shaft, extreme accuracy was necessary in surveying these lines. A serious embarrassment to correct surveying originated from the placing of a boiler on the surface just at the point where the line of the tunnel crosses the offset line of the shaft, so as to prevent placing the instrument over this very important point. It therefore became necessary to lay off the rectangular offset lines in front of the boiler past the shaft, thence to measure with offset, so as to get a parallel line over the top of the shaft, and from this parallel line to plumb down to the bottom of the shaft, 523 feet 9 inches in depth, thence take this line at the bottom and prolong it southerly 21 feet 9 inches to the center line of the tunnel, and from this point turn a right angle and start the east and west drifts. From the above mentioned statement it will be seen that the difficulties encountered in making the survey were much greater than those connected with the Hoosac Tunnel, the shaft of the latter being exactly on a line of the tunnel itself. The longest diameter of the Hoosac shaft is 27 feet and is placed in the line of the tunnel so that this line could be projected directly in the line of the tunnel and then be prolonged both ways. The longest base line that could be projected down the Sutro Tunnel shaft was six feet eight inches in length, provided that one plumb-bob is hung down the pump shaft, while the other is hanging down in the hoist shaft, but the pump shaft is almost entirely filled with steam pipe, exhaust pipe, pump column and its braces, and a ladder way. Plumbing down the shaft was not considered reliable, as the wire might touch at some point or another; the shaft also being so hot from the exhaust steam as to prevent an inspection of the plumb-bob, therefore, the hoist shaft giving a base line of three feet, one inch in length, had to be depended upon for projecting the line of the tunnel down in the bottom of the shaft. The slightest variation made, even on the surface, in this short base line, would result disastrously in throwing the east drift a long way off the true line.

Appreciating the difficulties previously enumerated, the Sutro Tunnel Company cast about for a civil engineer equal to the emergency, and eventually were fortunate enough to enlist in the enterprise Mr. H. SCHUSSLER, Chief Engineer of the Spring Valley Water Company, and still later of the Virginia and Gold Hill Water Company. Mr. SCHUSSLER entered upon his work with his usual energy and ardor. Under his careful and accurate surveying the drifts have been run straight as an arrow. He has been ably assisted by Ross E. BROWNE, a young engineer of marked ability. The driving of the tunnel is being prosecuted with the greatest vigor. Our reporter rode into the tunnel nearly a mile on a back-action car, an ill-natured mule being the propelling power. The two headers at present are only 102 feet apart, and the blasting and drill hammering can be distinctly heard in the respective faces.

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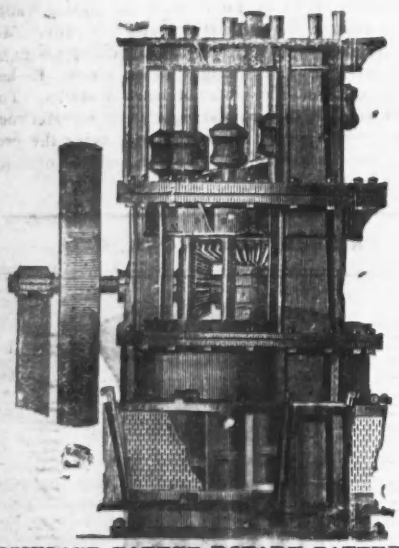

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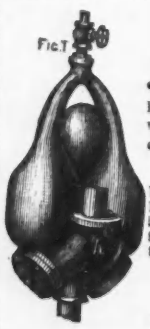

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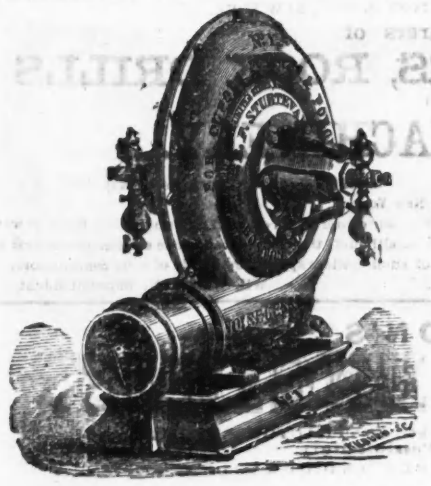

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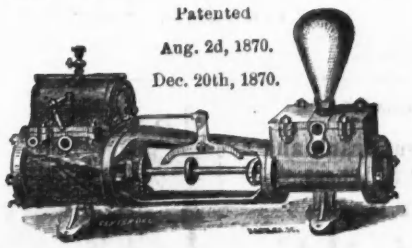

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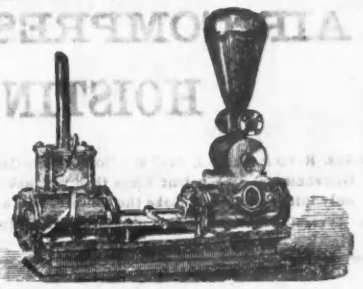

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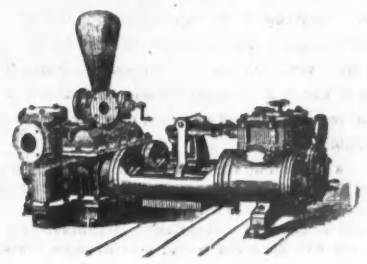

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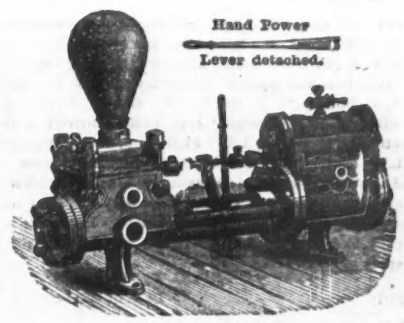

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