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FROM abroad, comes the news that an American now residing there has succeeded in perfecting a contrivance that is apparently destined to widely extend the sphere of usefulness of water-gas. He fits an ordinary fish-tail burner with a refractory attachment, made luminous by the combustion of ordinary non-carbureted water-gas, and has found, by a series of carefully conducted photometrical observations, that the water-gas will give 1.8 times the light of coal-gas in the same kind of burner and for the same volume. It is likely, therefore, that in the future water-gas will be distributed for fuel and for lighting purposes simultaneously.

We understand that it has been decided to flood the mine at Pocahontas, Virginia, at which the terrible explosion occurred a few days ago. It is

estimated that this will require thirty million gallons of water, which will be furnished by two Cameron pumps with 18-inch steam-cylinders, 12-inch water-cylinders, 16-inch stroke, 8-inch suction, and 6-inch discharge-pipes, with a head of 25 feet in a distance of 3600. The water supply will be obtained from the creek, which will be dammed. Gangs of drillers from Bradford County have arrived at Pocahontas, who have contracted to drill in 15 days three holes, 300, 250, and 200 feet deep respectively, to reach the head of the gangways. Through these holes, the water is to be pumped into the mine.

The Pocahontas explosion has been the first evidence, so far as we know, of the presence of fire-damp in the mines of that district or of those in West Virginia. Together with the recent Colorado calamity, it is a terrible warning to the operators of the many newly-opened collieries of the South and the far West.

A curious scene occurred at Pocahontas at a meeting of the miners. A motion had been carried without a dissenting voice to request the officers to open the mine and begin a search for the bodies, which, being refused, led to some wild talk; when a colored man rose and made a speech that is reported as follows:

"Suppose we opened that mine now, would any of you men go into it?" He paused for a reply, and, not receiving one, continued: "Not one of you would dare to do it. You know no man could live in these five minutes. Now, I don't know nothin' about how to put out that fire. The company says we can smother it by stopping up the drifts. If any body knows a better way to put out the fire, let him tell us. But until that fire is out, we can't go into that mine, and we might as well take the company's word for it as not. This is no fun for them, neither. It costs them heaps of money, and we ought to allow that they are just as willin' to put out the fire as we are."

This plain speech made a favorable impression on some, and the officers of the meeting, being cool, sensible men, embraced the opportunity to adjourn.

It is nearly a year since Lake copper took a sudden downward plunge, and the reports now coming in rapidly show what business the leading companies did in 1883. To a certain extent, it will be possible to arrive at an opinion whether, and to what extent, the great enterprises on the Lake are capable of facing the competition of the world. In this discussion, it will be necessary to exclude entirely the great Calumet & Hecla Company, which produces approximately one half of the entire quantity of copper on the Lake, at a cost so low that there is not, to our knowledge, a single concern in the world which can deliver so pure a material at so low a figure. The other mines, in the aggregate, make up the other half of the product—seven mines, the Quincy, Osceola, Franklin, Atlantic, Allouez, Pewabic, and Central, each of which makes more than one million pounds, turning out together over twenty-one millions of pounds. The Quincy mine, a review of whose annual report we published in our issue for March 1st, shipped, in 1883, 6,012,239 pounds of refined copper, against 5,665,796 pounds in 1882, at a gross cost of \$540,033.27 and \$541,407.58 respectively. The cost of production was, therefore, almost exactly 9 cents a pound, as against 9.55 cents in 1882 and 10.03 cents in 1881. Its net earnings, it is true, fell off from \$441,553.85 in 1882 to \$296,031.11 in 1883. The Osceola, in 1882, produced 4,176,782 pounds of ingot at a cost very close to 13 cents, paying \$250,000 dividends in that year. In 1883, it turned out about 4,260,157 pounds of copper, and reduced its dividends to one half. The Franklin in 1883 did much better in the way of output than in 1882, turning out about 4,304,615 pounds of ingot last year, against 3,264,120 in 1882, when the average cost was 13 cents per pound. It is probable, therefore, that it is in much better shape now than it has been. In 1881, the cost per ton of rock hoisted, including construction account, was \$2.32 for ore yielding 1.42 per cent mineral; in 1882, the figures were \$2.35 and 1.68 respectively; and in 1883, \$2.40 and 1.71 per cent respectively. The reports of the Atlantic and the Central are not yet at hand. Both of them, however, maintained their output; both paid dividends; and both, in 1882, turned out their copper at less than 15 cents. The Allouez produced in 1883 1,751,377 pounds of refined copper, which realized \$265,066, or an average of 15.13 cents per pound, against 17.86 in 1882. The cost, including working expenses at the mine, freight, smelting, and cost of marketing, was \$279,921.44, or 15.98 cents per pound. The Allouez has therefore lost money in 1883, in spite of the fact that the net working expenses per ton of rock mined have been reduced from \$2.2426 in 1882 to \$1.9951 in 1883, the yield of the rock mined having been respectively 0.746 and 0.725 per cent of copper only. The directors of the company have naturally taken the only step possible under the circumstances looking to a reduction of the cost, that of increasing the facilities for production, and an assessment of \$40,000 has been called for to enlarge the capacity of the stamp-mill by one half and provide for facilities to increase the output of the mine. It is accordingly putting in a third Ball head. The Pewabic, the weakest of the larger companies, sold during the year 1883 1,239,740 pounds of copper at an average price of 15.912 cents, realizing \$197,262.86. The agent reports the cost of openings, \$51,179.35, the cost of stoping \$40,774.68, and the cost of treating 57,877 tons of rock stamped at \$52,980.60; a

total of \$144,934.63. The agent's drafts were \$240,060.53, and \$19,199.53 were expended for smelting and freight, and \$6863.74 for brokerages, copper expenses, etc. At the annual meeting this week, it was decided to sell the property for not less than \$50,000, and reorganize under the laws of Michigan. The Huron produced, in 1883, 720,213 pounds of copper from 1.74 per cent rock, at a total expense of \$226,888.98, much of which we presume is due to construction account. The mine is equipped with a second head of stamps, and it is believed that, with a yield of from 125 to 130 tons per month, it can live at present prices. The reports of the younger companies, such as the Conglomerate, Wolverine, Peninsula, and Belt, are not at hand; but they have become or are just about to become large producers, and even should their expectations not be realized, the heavy outlay of capital in their equipment will probably make them heavy producers for years.

Generally speaking, the indications are, that the hard times of low prices are causing a substantial reduction in the cost of production of Lake Superior mines, and that their effect will be presumably rather an increase than a decline in the aggregate product. Any rise in values, which the first improvement in business must bring with it, would find the Lake copper mining companies splendidly equipped, and in a position to add largely to their net revenues.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

The Use of Niter in Crucible Assays.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: At my request, a number of experiments have been made by Mr. C. L. Hall, with the object of comparing the results of the assay of highly sulphurous ores—1st, by the ordinary method of roasting; and 2d, by the addition of sufficient niter to give a lead button of convenient size for cupellation. In every case, the use of niter gave results equal to those yielded by the roasting method; and with a little care, it was found easy to avoid loss from boiling over of the charge. In fact, when the ordinary charges and crucibles of the usual size are employed, this tendency to puffing up does not seem to be a serious obstacle.

As an extreme case, comparative assays were made of a sample of Frue vanner concentrates, consisting almost entirely of sulphides, which required the addition of 48 grams of niter for one assay ton of ore to bring the lead button down to 20 grams. A large sample of the ore was also treated by roasting in an iron pan, weighed, assayed, and the results calculated for raw ore. A third sample was roasted in quantities of one assay ton in small roasting dishes placed in the muffle, then transferred to crucibles and assayed as usual. The three methods gave the following results in ounces per ton:

	Silver.	Gold.
1. Niter (48 grams).....	50.2-49.2	10.50-10.55
2. Roasted in pan.....	48.3-47.6	10.37-10.41
3. Roasted in dish.....	47.5-49.0	10.70-10.60

These results show that perfectly satisfactory results may be obtained by the use of niter; and in view of the labor and close attention, as well as the risk of mechanical loss which roasting involves, the former method is certainly preferable where a large number of assays of highly sulphurous ores are to be made. The presence of arsenic and antimony would probably introduce sources of error; but these can be immediately detected with the blow-pipe, and the method of assay chosen accordingly. Very truly yours,

SPENCER B. NEWBURY,
Asst. Prof. General Chemistry.

ASSAY LABORATORY, CORNELL UNIVERSITY, March 22.

THE POETSCH SYSTEM.—This system of freezing quicksand preliminary to sinking through it is on trial on a large scale at the Max colliery Michalkowitz, Upper Silesia. The shaft is 23 feet square, and struck quicksand at a depth of 213 feet. By piling, it was put down 33 feet into the quicksand; but it proved impossible to continue the work, as almost the entire section of the shaft was filled with timber, so that there was hardly room for the two sinking pumps. Now the tubes have been got into place, and the freezing process has begun, and it is expected that in a short time the work of sinking can be commenced.

THE NATIONAL CABLE RAILROAD COMPANY.—A descriptive pamphlet has been issued by the National Cable Railroad Company, of this city, of which William P. Shinn is President, C. A. Andrews, Vice-President, and James Gamble, General Manager. The company, which was organized for the purpose of introducing the Hallidie cable railroad system, has a capital of \$2,500,000, divided into 50,000 shares. The pamphlet contains an opinion by George Harding and J. R. Bennett on the validity of the Hallidie patents; a full description of the cable system as carried out in San Francisco and Chicago; a very interesting report by the Committee on Power, presented before the Chicago meeting of the American Street Railroad Association, with the discussion following it; a statement of the comparative cost of constructing and operating cable and horse railroads at San Francisco; an opinion by Prof. E. T. Cox, late State Geologist of Indiana, and a report by Gen. Egbert L. Viele, consulting engineer of the Rapid Transit Commission, on the practical workings of the cable railroads in Chicago.

GEOLOGICO-GEOGRAPHICAL DISTRIBUTION OF THE IRON ORES OF THE EASTERN UNITED STATES.*

By John C. Smock, New Brunswick, N. J.

(Concluded from page 218.)

Leaving the Appalachian region, two world-famous iron ore districts in the West are of the Huronian period. The Iron Mountain, Pilot Knob, and other neighboring deposits in Southeast Missouri occur in porphyry rocks. These immense deposits supply nearly all the iron manufacturing which centers at St. Louis. The product of this group of mines is about 300,000 tons annually.

The other Western district is that of Marquette and the Menominee region in Michigan. Here magnetic and specular iron ores, with limonites in some localities, occur in thick lenticular masses, lying between greenstones and quartzites. The production of these ranges in 1882 amounted to 3,543,313 gross tons. Of this amount, 276,617 tons came from two mines south of the Menominee River and in Florence County, Wis. The rapid development of these iron ore regions is one of the wonders in the history of mining. In the Penokie range in Wisconsin, from Lake Gogebic to Lake Numakagon, magnetites and manganeseiferous specular ores in quartzites are developing. On account of their excellent quality, they promise well.

West of Lake Superior, the Vermilion iron range in Minnesota is opening to market by the construction of railroads, and the deposits are said to be very promising. The ore is a hard, specular variety. Farther to the north, on the Mesabic range, magnetite occurs with trap-rock and gabbro. Its associations, similar to that of the Penokie range in some respects, may be indicative of a like age. It is interesting as being the westernmost extension of the ores of this class in our Eastern and Central States.

This extraordinary development of the Huronian ores in the West and the large production of the Laurentian districts in the East are noteworthy. Specular ores mark the former; magnetites the latter. Comprehended by Archæan time, the great wealth of iron ore in these two geological periods is another index of its great length, probably equal to the combined periods of all the succeeding geological ages. Of the total product of iron ore for 1882 as estimated (from the statistics of iron manufacture) at 8,500,000 tons, at least 5,500,000 tons, or 65 per cent, came from the mines and mining districts of Laurentian and Huronian periods or of Archæan time.

Lower Silurian.—The classification of iron ores according to their geological horizon is attended with uncertainty in the case of many localities and outcrops. And in no other is there more doubt and difficulty than in the Lower Silurian or Siluro-Cambrian horizon. The ores which belong in it are mostly brown hematites or limonites. They appear to be the result of alteration, by oxidation and hydration, of other compounds of iron; and in many places, apparently, this change has been subsequent to the upheaval and solidification of the inclosing strata. It should also be stated that some of the deposits referred to the Lower Silurian may be of a much more recent age. The doubts respecting the true geological place of metamorphic strata assigned to the Lower Silurian affect the iron ores in them also.

Returning to the northeast and pursuing a southwest and west-northwest course, as outlined by the rocks of the Archæan islands of the early continent, the only beds of iron ore which we encounter in Maine that may be Lower Silurian are the extensive ones of red hematite, in calciferous slate, in Aroostook County. In Vermont and New Hampshire, there are no ores which are worked largely, unless it be the limonite of Bennington and Rutland counties. They are found in the metamorphosed or altered Lower Silurian limestones. The magnetic ore of Bernardston, in Massachusetts, has been referred to this horizon. It is of comparatively little economic importance.

The limonites of Berkshire County, Mass., of Litchfield County, Conn., and those of Columbia and Dutchess counties in New York, form a productive group, in which are the famous Salisbury and Amenia beds. They are found lying in somewhat irregularly shaped deposits between white limestone and talcose slate (Mather), and belong to the Lower Silurian. The existence of carbonate of iron in some of the deeper workings in these mines indicates that mineral as the source of the hematites which crop out and form the mass of the ore as opened. This district produced in the census year about 220,000 tons of ore.

Going southwest, the brown hematite deposits of the Great Valley from the Hudson to Alabama belong principally to the Lower Silurian. There are a few large mines in New Jersey which are worked at irregular intervals. In Pennsylvania, the numerous ore-banks in the Kittatinny Valley, from the Delaware to the Susquehanna; the mines west of the Susquehanna in York, Cumberland, and Franklin counties; the more widely scattered deposits in the Kishcoquillas, Nittany, Sinking, Canoe, and Morrison Cove valleys of the central part of the State, are in it. Generally the ore occurs associated with magnesian limestone (Formation II. of Professor Rogers). Situated as these ore-deposits are, near the anthracite coal-fields on the north and the semi-bituminous basins on the south, and yielding a large aggregate of excellent ore, they supply the Lehigh and the Schuylkill furnaces in part. No statistics of their production are accessible, but it is estimated that a large fraction of the Pennsylvania returns for iron ore is from them.

The Maryland deposits of this geological horizon are worked in Washington and Frederick counties, but not largely.

In Virginia, the Lower Silurian formations are rich in brown hematites, and numerous mines have been opened. Red hematite occurs in the lower slates of the Potsdam epoch, in Warren, Augusta, Rockbridge, Botetourt, Bedford, Wythe, and Smythe counties. Brown hematites are found in the same horizon at many points in the Great Valley and along the western foot of the Blue Ridge. They occur in the magnesian limestone also. These valley ores are the basis of a growing iron-making industry.

The Great Valley crossing Tennessee is known as the Valley of East Tennessee. It abounds in iron ore, and constitutes the eastern iron ore region of the State. The limonite is in banks or deposits in a matrix of clay, sand, chert, and debris of disintegrated rocks of the Knox group (Pots-

*A paper read at the Roanoke Meeting of the American Institute of Mining Engineers, June, 1883.

dam) and mostly in the Knox dolomite. Many localities in all the counties from the Virginia line to Georgia have been opened. Hematite in the Knox sandstone in Carter County, and at several localities in Sullivan County, is worked. It occurs in the Nashville series also (Trenton epoch), in Maury, Davidson, and Campbell counties, and is largely used at Chattanooga.

The extension of the valley into Alabama is there distinguished for its wealth in iron ore; and in the Coosa Valley, ore-banks opened at the top of the dolomitic limestone at intervals from near Columbiana, in Shelby County, northeast to the Georgia line, are supplying several furnaces; in the Cahaba Valley from near Centerville, in Bibb County, to Gadsden in Etowah County; in Roup and Jones's valleys, many mines opened in Bibb and Tuscaloosa counties; in Murfrees Valley; in Willis Valley, several mines; Brown's Valley, no openings worked. Oolitic red hematite just below the Trenton limestone is traced from Pratt's Ferry, Bibb County, nearly to Birmingham. The importance of these ores in so close proximity to coals of the Cahaba and Coosa fields is rapidly becoming appreciated.

The only Lower Silurian ores in North Carolina are in the southwest corner of the State, in Cherokee County; but they are too far from transportation lines to be valuable at present, and are not much opened.

In Georgia, the Silurian formations, which crop out in the extreme northwestern counties of the State, are in places highly metamorphosed, and red hematites are found with some of these rocks. Brown hematites also are known, but these are not yet much worked.

In consequence of the great extent of the Lower Silurian outcrop in Missouri, there are many localities in the central and southeast regions of that State where hematites are mined. Red hematites occur in the second sandstone in Crawford, Phelps, and Dent counties, besides scattering banks in Franklin, Maries, Washington, Miller, Camden, Pulaski, and Shannon counties. Limonite is found in the southeast district in Saint Genevieve, Perry, and Cape Girardeau counties in small deposits. Richer and larger beds are known in Bollinger, Madison, Wayne, Iron, Butler, and Stoddard counties. They repose on the shales of the Upper Silurian and partly on the second magnesian limestone.

In Wisconsin, in the Potsdam sandstone, red hematite and limonite are mined at Westfield and at Ironton in Sauk County, and at Cazenovia in Richland County. They supply local furnaces.

As the Lower Silurian formations linked together and surrounded the Archæan rocks, their iron ore localities are more widely scattered than those of the latter. The beds or ore-deposits are distinguished for length of outcrop rather than thickness. And there are no such thick beds as in the Laurentian areas. Another point of difference is the absence of magnetite and specular ore and the prevalence of limonite. It is so distributed that it may be regarded as the characteristic iron ore of this period. The total thickness of the ore-beds as compared with that of the rock is inconsiderable. Although they occur in sedimentary formations, the ores do not generally show any evidences of stratification, but are often irregularly shaped bodies which apparently fill cavities and hollows in the inclosing rock-matrix, and doubtless some of them are of more recent formation than the rocks about them. Others are altered carbonates which are interstratified with the limestone or other sedimentary rock.

Upper Silurian.—The Upper Silurian age includes the Oneida, Medina, Clinton, Niagara, Onondaga, Lower Helderberg, and Oriskany groups of New York, and the Formations IV., V., and VI. of Professor Rogers's Pennsylvania series. Shales, sandstones, and limestones are the prevailing rocks. Excepting the Clinton and the Oriskany (to a limited extent only), this age was not so favorable to the formation of iron ore beds as the Lower Silurian. The Clinton, however, is characterized by its peculiar oolitic, red hematite, which follows its outcrops from New York almost uninterruptedly to Alabama. In the former State, this ore, known also as *fossil ore*, is mined at Verona, Westmoreland, New Hartford, and Clinton in Oneida County; at Ontario in Wayne County; and in Madison County. These mines supply local furnaces only.

Following the Clinton southward into Pennsylvania, the largest mines on the fossil ore are near Bloomsburg and Danville in Montour County, and Danville is the center of its consumption. Thence it is traceable through Northumberland, Snyder, Mifflin, Center, Juniata, Fulton, Huntingdon, and Bedford counties to the Maryland line.

In Virginia, the Clinton is rich in ore, and mines are opened in it west of the Great Valley in Wythe, Giles, Bland, Tazewell, Russell, Scott, Lee, and Wise counties.

The fossil or "dystone ore" of Tennessee occurs on the eastern border of the Cumberland table-land almost entirely across the State—160 miles—and to the Georgia line. The ore is largely employed in the Chattanooga iron district. In 1880, 71,657 tons of it were mined.

The continuation of the dystone ridges of Tennessee into Alabama exposes the ore interstratified with shales and sandstones on each side of the anticlinal Roup's and Jones's valleys and in what are known as Red Mountain ridges. It is extensively mined at several points southwest of Birmingham; also at Attala in Hills Valley, Gadsden, Round Mountain, and Gaylesville in the Coosa Valley.

Fossil ore is reported in Lookout Mountain, in Dade County, and Iron Ridge, Walker County, in Northwest Georgia.

In the Ohio Valley, this formation carries ore in Eastern Kentucky and Western Virginia, and a few localities in Ohio. In Kentucky, the Clinton ores are recognized in the Red River iron region, and there is an immense deposit in the Slate furnace ore-bank in Bath County. Excepting this locality, it is not extensively worked.

In West Virginia, the fossil ore is known to occur in Mercer, Monroe, Greenbrier, Pendleton, Hardy, and Grant counties, and in some of these localities large bodies have been opened.

The most important deposit of fossil ore in Ohio is at Sinking Springs, in Adams County. It is known to exist at Todd's Ford, Clinton County, and near Zanesville, Muskingum County.

In Wisconsin, there is an isolated distinctive outcrop of the fossil ore at Hubbard, in Dodge County. The beds here are of unusually great thickness and are extensively worked.

Iron ore from the Lower Helderberg formation and from the Oriskany group are mined in Pennsylvania in Huntingdon, Blair, and Perry counties. These ores are limonite. The Oriskany in the Great Valley in Virginia has large deposits of brown hematite, particularly in Pulaski and Giles

counties. Extensive beds in the Oriskany and Upper Helderberg formations are opened in Point Lick Mountain, Rich Mountain, and Nye's Cove, in Tazewell County; in Clinch Mountain and Kent's Ridge, in Russell County; in Powell's Mountain, Clinch Mountain, Fossil and Big Ridges, in Scott County; and at Bowling Green Forge, in Lee County.

Some of the limonites in the central district of Missouri may be the equivalent of the Upper Silurian in age.

While the limonite and red hematite both occur in the Upper Silurian, the most persistent ore-species is the variety which is named, from its geological horizon, the Clinton or fossil ore.

Devonian.—The Devonian age in the eastern part of the country was marked by great accumulations of shales and sandstones. In the valley of the Upper Mississippi, there were limestones mainly, and there is a remarkable absence of iron ores. Iron is present in most of the rocks, giving them their color and to the formation its name of *Old Red Sandstone*. A single locality of clay iron ore is known in the Marcellus shale near Napanoch, Ulster County. In the Chemung group, fossil ores are mined in the northern part of Pennsylvania in Bradford, Tioga, and Lycoming counties. In the Yellow Creek District, in Blair County, and on the affluents of the Juniata in Juniata and Perry counties, the Marcellus shale carries ore (limonite). Carbonate ores are worked in Huntingdon, Bedford, and Fulton counties in the Devonian (Formation VIII. of Rogers).

Sub-Carboniferous.—In Pennsylvania, in the shales and sandstones of Formations X. and XI. (Sub-Carboniferous), valuable beds of both limonite and carbonate ores are known. In the Mauch Chunk, red shale carbonates occur at Scranton; at Ralston, Lycoming County; in Clearfield, Cambria, Huntingdon, Somerset, and Fayette counties.

One of the most productive districts of this age is the so-called Hanging Rock region of Kentucky and Ohio. The ores are both carbonates and limonites. In Kentucky, they are mined in Greenup, Boyd, Carter, and Lawrence counties, and in the northeast part of the State, from the Ohio River south to the southern part of Carter County. North of the Ohio River and in the southeastern counties of Ohio, carbonates are mined in Washington, Jefferson, Holmes, Summit, and other counties. They are used in the manufacture of charcoal iron, chiefly made in this region, near the mines.

The Nolin River District, in Kentucky, also belongs to the Sub-Carboniferous horizon. The ores (carbonates and limonites) are known to occur in Edmondson, Grayson, Hart, Butler, and Muhlenberg counties, near the base of the Coal Measures, but they are largely undeveloped. In the Cumberland River iron region, in the western part of the State, limonite occurs in bodies of irregular shape on chert and in clay on the St. Louis or Sub-Carboniferous limestones. The deposits are of uncertain extent, but the aggregate of ore is immense and of excellent quality.

In West Virginia, the Kanawha Valley is reported to have ores of this age, but as yet they are not much opened.

Small and unimportant occurrences of siderite (or carbonate of iron) and of limonite are known in Indiana, Illinois, and Iowa. In Missouri, limonite ore-banks in the Upper Osage District lie upon the Sub-Carboniferous.

In Arkansas, siderite is reported in Franklin, Pope, Washington, and Madison counties—all in the Sub-Carboniferous.

Carboniferous.—The ores of the Carboniferous age, like those of the preceding, Sub-Carboniferous, are mainly carbonate and limonite. The former are probably the original and unaltered beds, while the latter appear to be altered outcrops. Generally the beds are somewhat concretionary in structure and thin, and interstratified with shaly strata. The more earthy variety of the carbonate is known as clay iron-stone. The Carboniferous iron ores are confined mainly to Pennsylvania, Ohio, West Virginia, and Kentucky. In Pennsylvania, the carbonate ore occurs in all the coal-basins. Brown hematites abound also, and particularly along the outcrop of the "feriferous limestone." They are in the western part of Indiana County, in Northern Armstrong, in Clarion, Jefferson, Butler, Lawrence, and Beaver counties, and in large beds. Other localities which are worked are in Center, Clearfield, and the Coal Measures territory of the southwestern part of the State. No mines are worked in the anthracite coal-basins of the State. Black-band ore occurs in the coal measures at Pottsville and in the Snowshoe basin in Center County.

In Maryland, siderite is reported in two or three localities, in the western part of the State, in Alleghany County.

In West Virginia, there are workable beds of clay iron-stone in the Lower Coal Measures and lower barren measures at many localities, some of which are worked. Black-band ore occurs also in Wayne, Kanawha, Fayette, Nicholas, and Clay counties.

Next to Pennsylvania, the iron ores of Ohio which occur in this horizon are most extensively developed. The ores are limonite and clay iron-stone. They are opened in the eastern part of that State and in the Hocking Valley, between Monday Creek and Hocking River in Perry County; at Bessemer in Athens County; also in Muskingum, Hocking, Vinton, Jackson, Scioto, and Lawrence counties. The black-band ore is mined in the Tuscarawas Valley and in Stark and Tuscarawas counties.

The Hanging Rock region of Eastern Kentucky has some ores in the Lower Coal Measures, both carbonates and limonites and interstratified with the coal measures.

In Southern Indiana, clay iron-stone occurs in thin beds, but none of them is worked, although in close proximity to the celebrated block-coal mines.

Thin seams of carbonate of iron are found in the coal measures of Illinois, in Hardin, Schuyler, Crawford, Edwards, and Wayne counties. In Missouri, in the southwestern part of the State, brown hematite occurs in the coal measures. Other localities in the same horizon, but of carbonate ores, are found in the central and north central districts. In Kansas, spathic ores are reported near Fort Scott; on the Neosho; and in the Marais des Cygnes coal measures.

The type ore of the Carboniferous may be said to be siderite, or clay iron-stone, varying by oxidation and weathering to limonite, or, by an accession of carbonaceous or coaly matter, to black-band ore. In themselves, these ores are neither so rich nor of so good quality as the older ores, geologically considered. And often the beds are thin, and in mining them much rock also must be raised. But they are so near to the fuel that they can be used with profit, and hence are the basis of the iron manufacturing of several districts in the Ohio Valley.

Triassic.—The Triassic rocks are noted for the amount of iron oxide distributed through the mass of thin strata. But with the single exception of the black-band ore at Egypt in North Carolina, in the coal and shale series of the Deep River belt, no mines are opened in them.

Cretaceous, Tertiary, Recent.—The Cretaceous and Tertiary formations contain numerous deposits of bog-ores and limonites, but some of them may belong to the Recent period, particularly the bog-ores. In Eastern Maryland, there are large beds which were formerly worked; in the counties bordering the Susquehanna, limonite beds occur with the clays of Cretaceous age. In Delaware, in New Castle County, there are extensive deposits which are worked for local furnace supply. Throughout the Atlantic coast belt, the deposits of ore which may be of the Tertiary age are numerous, but of little economic importance. The Western iron region of Tennessee is perhaps the most remarkable of these more recent groups of iron ore, as it forms a belt fifty miles wide crossing the western counties of the State, and its ores are of excellent quality, and are continuously mined at a number of localities. They occur in irregular lumps and hollow concretions in a sandy matrix (the "ore-region gravel" of Safford). The localities of bog-ore of Recent age are common almost everywhere, throughout the Atlantic coast border and in the Gulf States. These ores are in process of accumulation and deposition to-day.

THE UTILIZATION OF BASIC CINDER.

At Schalke and at Stolberg, Germany, works have just been started to manufacture phosphoric acid from the slag obtained in the basic Bessemer process. This cinder, of course, varies in composition, according to the character of the pig and the basic additions used. The contents of phosphoric acid fluctuate between 15.5 and 20 per cent, silica varying from 6 to 11 per cent, and the lime averaging 50 per cent. The following are analyses of the basic cinder from some of the German works:

Phosphoric acid.....	16.79	17.23	19.20
Silica.....	7.35	8.60	7.20
Lime.....	50.65	53.28	49.00
Magnesia.....	7.13	2.50	3.75
Oxide of iron.....	3.98	4.40	4.83
Protoxide of iron.....	7.85	10.68	9.00
Protoxide of manganese.....	4.71	3.40	4.26
Sulphide of lime.....	1.06	1.06	0.92
Total.....	99.51	99.13	98.16

Many efforts have been made to utilize this cinder; but generally, chemists have either made the mistake of attempting to work with excessive quantities of acid, or with acid of too high a degree of concentration. With the latter, the silica is obtained in a form that prevents filtering. Prof. C. Scheibler, of Berlin, has endeavored to overcome the difficulties hitherto attending such work, modifying the process in such a manner that only the phosphates and the silicates, and small quantities of metallic oxides, are dissolved. This reduces the consumption of acid to a minimum, and the phosphoric acid may be precipitated in a very convenient form, as basic phosphate of lime, while the metallic substances in the cinder, and a part of the other bases, remain behind. The greater part of the silica is extracted. In order to prevent the solution of protoxides of iron and manganese, Professor Scheibler first calcines the cinder in an oxidizing flame, and then he steams the roasted product, in order to render the work of pulverizing it easier. In the steaming process, the lime in the cinder slakes and tends to disintegrate it. The steamed and calcined cinder is then screened, and, if it is deemed expedient, the lime is extracted with water. The residue is treated with hydrochloric acid, the quantity being so chosen that only lime, magnesia, free and combined with silica and phosphoric acid, are dissolved, the concentration being such that one part by volume of 21 Baumé acid is diluted with from 10 to 15 parts of water. In this way, the separation of silica in a gelatinous form is usually avoided. The consumption of acid is from 1½ to 1¾ liters per kilogram of cinder. The dissolving with the acid takes only a few minutes, and the residue is then allowed to settle. The phosphoric acid is precipitated with milk of lime, the precipitate being gathered in filter-presses. Samples of the residue have yielded the following by analysis:

	I.	II.
Silica.....	1.48	3.60
Phosphoric acid.....	3.00	0.60
Oxide of iron.....	49.80	68.28
Oxide of manganese.....	17.06	12.70
Lime.....	15.60	4.00
Magnesia.....	12.50	11.35

The product is very suitable for the manufacture of superphosphate, because it does not require so heavy a consumption of sulphuric acid.

STEEL VERSUS IRON GIRDERS.—Mr. C. L. Strobel, C.E., a widely known engineer, draws the following conclusions, in a paper read before the Engineers' Society of Western Pennsylvania, entitled, "Experiments on Steel and Iron Riveted Girders, and Remarks on the Tests Made by the Dutch Government":

1. Each of the steel girders showed a large increase in strength over the iron girder; the soft steel girders proved 22 per cent stronger, and the hard steel girders 66 per cent stronger, than the iron girder.

2. The greater strength of the soft steel over the iron in the specimens was fully attained, and exceeded, in the girders.

3. The hard steel girders did not show so large a percentage of greater strength over the iron girder as did this material in the specimen over the iron in the specimen. This may be accounted for as the result of punching the rivet-holes without reaming; for it was the girder with punched holes which gave way by the fracture of the tension flange, whereas the girder with reamed holes gave way in the compression flange, and probably would have stood more before fracture had taken place in the tension flange. The latter girder did not appear to bear truly upon its supports, and it was probably this which caused it to fail in the top flange when it did.

4. Punching rivet-holes without reaming did not produce any results other than an apparent loss of strength, as compared with reamed holes.

5. The strength of steel girders strained in the manner of these girders appears to be about the same for the two flanges, if they are made alike in section.

THEORIES ON THE FORMATION OF MINERAL VEINS.—III.*

By Fridolin Sandberger.

It is not my object to prove that there are sufficient quantities of baryta in monoclinic and, occasionally, in triclinic feldspars; that lime prevails in the latter, and, with magnesia, occurs in pyroxenes and hornblendes; and that there is enough fluorine in many varieties of mica, and occasionally in the hornblende of the older crystalline rocks, to furnish abundantly barytes, calcite, dolomite, and fluor-spar, while the silica from silicates must, and does, occur in great quantity. That has been fully explained by earlier work by Bischof and by myself.† In order to form gangue, all that is necessary is the segregation of baryta and lime as carbonates, which are either deposited as such, or, being precipitated by alkaline sulphates or chlorides, form barytes and fluor-spar.

There was hardly one among the large number of crystalline rocks which I have formerly † or more recently leached with distilled water either under ordinary or under higher pressure which did not contain soluble sulphates. After some experience, I feel justified in assuming their seat to be, especially in the case of the rocks of the Black Forest, certain inclosures of liquids in quartz.

These salts, like chloride of sodium and liquid carbonic acid, have been inclosed in the crystalline rocks that they were solidifying, and are therefore as much primitive substances as the silicates and the quartz in them. They play an important part, not only in the formation of those sulphates, which, being soluble with difficulty, occur as gangue, but they attain a much greater importance even as intermediaries in the process of alteration of the oxides of the heavy and precious metals contained in the silicates into sulphides. As soon as there is present a sufficient quantity of organic substance, these salts, among which sulphate of soda predominates, are reduced to sulphides that alter all the heavy and precious metals into sulphides. In many mineral veins, organic substances are even now found in quantity, and in many experience has shown that the concentration of metallic compounds, the enrichment of the vein at certain points, is dependent upon their presence; for instance, at Bräunsdorf, in the Erzgebirge, in the western part of the Schapbach vein, etc. Besides occurring in the form of solid and liquid hydrocarbons, as in Derbyshire and California, organic substance is found in the form of anthracite and graphite at Schneeberg, Bräunsdorf, Schapbach, etc., and most widely distributed in mineral veins in all parts of the world as the coloring constituent of fluor-spar, amethyst, and smoky quartz. It will probably be possible to trace it everywhere, except in those localities where it was present only in sufficient quantity to reduce the oxides of the metals to sulphides or arsenides,‡ or where it was afterward destroyed completely by water containing atmospheric air, which penetrated into the gangue after its deposition.

In the foregoing, I have purposely alluded to the formation of only such mineral veins as course through the same primitive rock and contain all the products of leaching action upon it, either in the form of a mixture or as layers of different age. This was done because it presented the simplest and therefore the clearest case, and because the largest number of mineral veins properly belong to this class.

It is generally an easy matter to obtain from crystalline rocks fresh silicates, still possessing their entire contents of metals, and along with them the products of the gradual alteration of these metallic contents to sulphur compounds. Thus, I have often been able to study the separation of sulphurets, first in the form of microscopic grains, then in the form of incrustations of cleavage planes and edges of pyroxene, hornblende, and mica in diabase, augite, porphyry, basalt, propylite, granite, and gneiss. I have often been in a position to show, not only by microscopic but also by chemical means, that such sulphurets really do form at the expense of the metallic contents of the respective silicate. I succeeded best in the case of pyroxene and hornblende, but was successful also with mica, for instance, in propylite from Schemnitz and granite from Baden. If the silicate is first suitably treated with acid, the sulphuret is dissolved, while pyroxene and hornblende are attacked but little or not at all. If, then, the residuum of the silicate is fused with carbonate of soda and potassa, exactly the same metallic constituents are obtained in both solutions, provided sufficient quantities have been employed. This not only proves that the sulphuret has been formed at the expense of the silicate in which it occurs, but it shows also that the extraction of the metals does not take place at once, but gradually—a matter of great importance for the explanation of many phenomena observed in mineral veins, notably the reappearance of the same sulphuret at different periods in its age. Naturally, the subject becomes more complicated when the same country-rock is repeatedly leached, and there is a concentration in the older veins of the products of the silicates more easily attacked, while the more recent veins contain those which are derived from silicates not so easily affected. This is the case in the Erzgebirge, and especially in the vicinity of Freiberg.‡ The matter is still more complicated when the veins cross, at short intervals, different rocks, that being the case with some of the famous veins of Schneeberg in the Erzgebirge.¶ Then the most exact chemical investigation of all the rocks cut by the veins becomes necessary, in order to arrive at any conclusion as to what substances each one has contributed to the filling of the veins. This undoubtedly causes a good deal of work; but I am convinced that it will throw so much light upon the formation of these and similar veins that it would be amply repaid.

Now there are not only mineral veins in crystalline rocks but also in

* Translation of the first chapter of *Untersuchungen über Erzgänge*. Wiesbaden: C. M. Kreidel, Publisher. 1882.

† *Berg- und Hüttenmännische Zeitung*, 1877, p. 377.

‡ *Geologische Beschreibung der Gegend von Baden*, p. 57. *Geologische Beschreibung der Renchbäder*, pp. 21, 28, 32, etc.

¶ There are ore-deposits in which aggregations of sulphide of iron and sesqui-oxide and oxide occur, for instance, at Traversella, Elba, etc. In these, either the sulphates or the organic substance has been too small in quantity, so that only a part of the iron present could combine with sulphur.

§ *Berg- und Hüttenmännische Zeitung*, 1880, p. 391.

¶ H. Müller: *Der Erzdistrikt von Schneeberg*, in *Von Cotta's Gangstudien*, III., pp. 1-222.

partly metamorphosed and unaltered sedimentary rocks, whether they be siliceous, argillaceous, or calcareous.

The ores of such veins may be derived from three sources. They may originate either in the partially decomposed residuum of the metalliferous silicates of the crystalline rocks that furnished the material for the sedimentary rocks, or in solutions of the products of oxidation of earlier mineral veins which flowed into the sea, or finally in the concentration, under exceptionally favorable circumstances, of a very small percentage of metal in the sea-water.* It is certain that, in many cases, the metallic oxides of the residuum of the original silicates accumulated in the sedimentary rocks had been altered to sulphurets, because it is likely that there were never missing in the sea-water of all geological periods the gypsum and decomposing organic matter necessary to effect this. But there are sedimentary rocks entirely free from sulphurets, and it is these which must be sought out to discover whence the main mass of the mineral veins in sedimentary formations have been derived.

The group of phyllites and semi-crystalline argillaceous shales occupies an intermediate position, though these rocks are justly regarded as having undergone an alteration brought about by hydro-chemical means. According to my experience, the phyllites of the Erzgebirge and the Fichtelgebirge are not rich in metals, though it is possible always to detect them in larger quantities of rock, after removing impregnations of sulphurets by nitric acid. In 20 grains of the dark gray phyllite of Schneeberg, I found arsenic, cobalt, and nickel; and in the same quantity of Cambrian slate, resembling phyllite, from Goldkronach, I detected arsenic, antimony, and lead. The sericite slates of the Taunus range showed a good deal of oxide of copper (from 0.05 to 0.06 per cent), and the phyllites of the Alps and of America are probably much richer.

With the exception of pure limestones, the stratified rocks of purely sedimentary origin consist partially or wholly of the *detritus* of older crystalline rocks, carried from its source a shorter or a greater distance, and being in a finer state of division, according to the distance traversed before arriving at its point of re-deposit. The greater this distance and the finer, therefore, the *detritus*, the more difficult it becomes to ascertain the character of the original rock; while, on the other hand, it is often quite easy, when the *detritus* is coarse, and even when it is coarse-grained sandstone. Thus I have repeatedly been able to determine the origin of the rocks of the Carboniferous, the Rothliegende, and the Bunte Sandstein formations of the Northern Black Forest.† The chemical and mineralogical composition, even in the former case, furnishes aid to ascertain the character of the original rock, with some show of probability, though not with absolute certainty. Thus E. Herget‡ has made it very probable that the lower Devonian sandstones and shales which, in 1847, I grouped under the name, since current, of spirifer sandstone, are the products of the attrition of a crystalline silicate rock having the character of the gray gneiss of the Erzgebirge; and I am convinced that similarly conscientious work would furnish valuable results for other localities also.

It should not be expected that the entire original contents of the primitive rocks in metals, arsenic, antimony, etc., can be found in the rocks resulting from their attrition, and less so because they were probably rarely reduced to small particles and carried off in a fresh and undecomposed state.§ On the contrary, they were derived from *detritus* partially leached and weathered. It is evident that arsenic, antimony, and the heavy and precious metals must be sought for chiefly in the argillaceous slates containing a good deal of mica, and that the work must be done with much greater quantities of material than are necessary for the pure segregated silicates of primitive rocks. Forchhammer|| found a good deal of lead and some copper and zinc in one pound of roofing slate from Bangor, Wales; Frick and G. Bischof¶ detected copper in many argillaceous shales of the spirifer sandstone group of Bendorf (from 0.18 to 0.30 per cent of oxide), Remagen, and Siegen, though they appear to have overlooked other elements on account of the small quantity of the material examined. Bischof mentions a trace of lead only in the argillaceous shale of Lobenstein. He remarks finally: "It appears, therefore, that it is possible to find copper in every slate, if the trouble is only taken to search for it." In reality, I found it in the slates in the vicinity of Holzappel, together with zinc, lead, arsenic, antimony, tin, cobalt, and nickel, and with the same elements in those of Ems which I chose as the types of the country-rock of so many Rhenish mineral veins, so nearly identical in composition. I also discovered these elements in the Posidonomya slates of the Schulenberg, near Clausthal, in which, also, baryta could be very clearly proved. Titanic acid and phosphoric acid, which Herget observed in such rocks, made their appearance in all cases, generally in quite a large quantity, 30 grams or more of the rock being always analyzed. On the other hand, it was possible to detect only arsenic, tin, and zinc in the Orthoceras shale of the Königsberg mine at Diez. The carbonates first extracted from these rocks with acetic acid contained chiefly protoxide of iron, thus confirming Herget's statements, and therefore the gangue in these rocks in the Rhenish slate formation is almost exclusively siderite and quartz, fluor-spar being always absent and barytes occurring only occasionally.

These investigations were further extended to some of the more recent sedimentary rocks, and copper, cobalt, and arsenic were found in small quantities in the Rothliegende of Aschaffenburg and Schapbach (the rocks being free from sulphurets), while copper and baryta were detected in many rocks of the Bunte Sandstein formation, for instance, at Wittichen, and Schapbach, in the Black Forest, and at Vormwald in the Spessart. Baryta has long been known to exist in the Bunte Sandstein of Göttingen, partly as a silicate and partly as a carbonate—a strong proof that there are in those rocks the *detritus* of feldspar, or possibly mica containing baryta, from which that compound has been separated

as a product of decomposition. Lead, copper, cobalt, and arsenic were found in the clays from different horizons of the lower gypsum group of the Keuper formation, and even in the ferriferous concretions of the Schilf sandstone. For the present, the investigation was not extended to the later sedimentary rocks.

Forchhammer has examined the moraine deposits resulting from the disintegration of Scandinavian crystalline rocks by glaciers, and naturally has found the same elements which predominate in them.

When passing to the investigation of marls and limestones, it is necessary to recall that, with them, as is the case with sedimentary rocks generally, the elements mentioned thus far may be present in two forms, as finely distributed sulphurets, soluble in nitric acid and aqua regia, or as silicates more or less decomposed. The latter form the products of the attrition of crystalline rocks, are not soluble in those acids, and are mechanically mixed with the carbonate of lime precipitated chemically. On various occasions, I examined the contents of metal in both forms in limestones containing more or less alumina. The results varied, because at times the greater amount of metal was found in the solution of the sulphurets, and sometimes in the residue dissolved with the aid of carbonate of soda and potassa. The latter was rich in lead and zinc, in the case of the marl of Raibl, in Carinthia, while those metals could not be detected in the preliminary extract with acid. Similarly, the residuum of the Zechstein dolomite of the Kissingen bore-hole was richer in copper, tin, and arsenic; while both solutions contained about the same quantities of arsenic, copper, cobalt, and bismuth in the Zechstein dolomite of Gräfenberg, near Feldkahl, in the Spessart. Limestones from all the horizons of the Franciscan Murchelkalk formation contained lead, zinc, and copper, in largely predominating amount in the extract with acid, the residuum being very small in quantity. These examples are quoted only to show that small mineral veins may be formed in fissures in argillaceous limestone, both by the accumulation of the products of the decomposition of the remains of primitive silicates, mixed with the lime, and by the sulphurets already contained in the rock as such. The latter was probably the case in many deposits in the Zechstein dolomite and copper slate. In such cases, true descension veins are formed, which may reach into the rocks underlying the marl, which is the source of the ore, provided the fissures extend into them. It is worthy of notice that such veins are rich, and worth working on the outskirts of mountain chains that show many older veins in crystalline rocks—for instance, along the Hartz. As noted above, it can not be doubted that the products of leaching of such older mineral veins have flowed to the ancient sea-coast, and have been reconverted into sulphurets by decaying organic matter.

All that remains is to consider those mineral veins that cut through limestone and dolomite, and the filling of which does not appear to be accounted for by the small quantities of lead, zinc, and copper shown to exist in them as sulphurets or silicates. The occurrence of such veins has, until recently, been used as the chief argument against the general applicability of the leaching theory.* It would be valid as such, if the products of the leaching of one rock could not pass into the fissures of an adjoining country-rock and be deposited there. In reality, this is the case when rich veins occur in limestone, because they are generally found only there where crystalline rocks have broken through them. The ores are therefore not associated with the limestone, but with the eruptive rock in contact with it.

The most important examples of such veins are found in South America, for instance, at such partly famous localities as Argueros, Chanarcillo, Caracoles, etc., but they are not wanting in Mexico (Tatatil), California, and Derbyshire. The association of the limestones through which the veins course with the eruptive rocks is emphasized in all cases by observers, and in some of them there is a special reference to the relations between the ore-bodies and the eruptive rock. Knowing that generally eruptive rocks contain silicates holding the heavy and the precious metals, it will be possible to assume that the ores originated in the latter. Naturally the chemical investigation of both the eruptive rocks and of the limestones of such localities is very desirable, and I shall be happy to make it, if furnished with the necessary quantity of material.

The same is the case with such limestones or dolomites as are in contact with crystalline slates, or are inclosed by them or covered by them, and which carry ores, particularly near the contact zone. When the limestone is not fissured, they concentrate in the form of beds, as at Laurion, in Greece; when it is fissured, they are formed as veins, as at Schwaz, in Tyrol; or they aggregate in cavities in the limestone, as at Raibl.

Those who desire to refute the leaching theory will find it necessary, after providing for purer material, to carry out chemical investigations extending over years. Nothing is to be gained by objections not resting upon chemical facts. All those who have impartially followed my work seem to agree on this point †

THE MANUFACTURE OF STEEL DIRECTLY FROM THE ORE WITH STRONG FUEL-GAS.

Dr. Charles J. Eames, of this city, says in a little pamphlet just issued: Having been engaged for several months in testing the practicability and economy of the new direct steel process, known as the W. W. Chipman steel process, owned by the Graphite Steel and Iron Company, of New York, and during these tests having used as fuel anthracite and bituminous coal, coke, and petroleum, for melting the ore and converting it into steel, I was desirous to ascertain the efficacy of the pure water-gas, made under the Strong patents. My attention had been called to this process about one year ago, and I had experimented very successfully with the gas on a working scale in the manufacture of glass, and had examined into the economy of the process sufficiently to satisfy me that the question was simply whether or not the gas would do the work; if it

* The latter probably hardly suffices for more than local deposits of small quantities of ore, as, for instance, the galena in the anhydride of Berchtesgaden and copper pyrites as blende and realgar in the anhydride of Hall in the Tyrol.

† Geologische Beschreibung der Gegend von Baden, pp. 26, 46. Geologische Beschreibung der Renschbäder, pp. 8, 9.

‡ Der Spiriferen Sandstein und seine Metamorphosen, 1863, p. 12.

§ The case, however, does occur quite frequently, for instance, in rocks of the Rothliegende formation and some sections of the Bunte Sandstein; less frequently in Tertiary deposits, for instance, the Flysch conglomerate, the middle oligocene calcareous sandstones of the Breisgau, at Badenweiler, etc., and in the Nagelfluhe.

|| Pogendorf's Aunalen, xcv., p. 70.

¶ Physische Chemische Geologie, 1st edition, p. 1900.

* Stelzner, Jahrbuch für Mineralogie, 1881, ii., p. 209. He speaks only in a general way of veins in "limestone," while the objection could only refer to chemically pure limestones, which, so far as I know, have very rarely or never been observed in the country-rock of mineral veins. Such veins can not be used to support the ascension theory.

† For instance, Von Groddeck, Lagerstätten der Erze, pp. 323, 326, 341. Albr. Müller, Er Diezgänge, p. 32. C. Vogt, Wiener Neue Freie Presse, December 16th, 1880.

would do it at all, I was satisfied that the cost was so low that it would do it cheaply enough to make a commercial success of the process.

It may not be out of place to say a few words here in regard to the Strong fuel-gas before going on to describe fully the Chipman process for making steel.

In manufacturing gas by the Strong process, atmospheric air is excluded from the generator during the time in which gas is made, and consequently the product consists almost entirely of combustible gas, which gives a very hot flame, and the products of combustion of which carry off so little heat that a regenerative apparatus such as is required with the Siemens gas becomes unnecessary.

The composition of the gas so produced is singularly uniform. Thus, in the *Proceedings of the British Steel and Iron Institute*, in a paper read by Mr. W. S. Sutherland (reprinted in the *ENGINEERING AND MINING JOURNAL*, New York, July 14th, 1883), upon the Strong apparatus erected at Birmingham in England, and at Essen in Germany, we find that one ton of Staffordshire coal yielded 55,000 cubic feet of water-gas, having about the following composition :

57 parts hydrogen and hydrocarbons.
35 " carbonic oxide (CO).
8 " carbonic acid (CO₂) and nitrogen.

100

While the extreme range of the analyses of the gas made at Mount Vernon and Yonkers, New York, show :

Hydrogen and hydrocarbons, from 53.5 to 56.77 per cent.
Carbonic oxide, from 34.7 to 37.11 per cent.
Carbonic acid and nitrogen, from 6.5 to 11 per cent.

The American practice has yielded larger amounts of gas per ton of coal than has been obtained in Europe. The figures for long continuous periods show as high as 60,000 cubic feet per ton of 2240 pounds. This is owing partly to more skillful management of the apparatus, and in part, perhaps, to more suitable coal.

The Chipman process for making steel directly from the ore converts raw ores directly into steel without the use of ordinary fluxes, and depends upon the action of a plumbago or graphite hearth, bottom, or crucible upon the melted ore. One of the modes of carrying out this process is to put raw iron ore, without fluxes, into a plumbago crucible, placed in a crucible steel furnace constructed for this purpose. The ore is then melted, and remains in this condition for from two and a half to three hours, when it is poured into ingot molds. In working this way, the iron is reduced entirely at the cost of the plumbago of the crucible, and it is merely necessary to heat the furnace sufficiently; the quality, purity, oxidizing or reducing action of the flame being without influence.

Another method, and one which especially interested me in connection with the Strong fuel-gas, is to form the hearth and bottom of a reverberatory furnace into a bowl shape, with a mixture of about sixty parts of plumbago and forty parts of pulverized fire-brick, slightly moistened, which mixture forms the lining for the hearth or bottom of the furnace. The furnace having been previously heated to a high temperature, the iron ore, either in lumps or in small pieces, is introduced, is melted and allowed to remain in that condition about three hours, when it is tapped off at the bottom or side of the furnace, the steel being run into ingot molds and the slag upon the ground. In working in this way, part of the reduction of the iron is due to the plumbago bottom and part to the action of the gas, which, especially in the latter part of the operation, is kept slightly in excess of the air.

Experiments upon making steel by the above process with Strong fuel-gas were begun at the works of the Westchester Company, Yonkers, New York, about June 2d, 1883, and continued until June 26th. About one hundred pounds in all of raw iron ore were used in the preliminary tests, a single ore being used in some cases, and a mixture of ores in others. All the tests gave satisfactory results. The final test was made on June 26th, 1883. The furnace hearth or bottom on which the iron ore was placed was lined to a depth of about four inches with a mixture of sixty-five parts plumbago and thirty-five parts of pulverized fire-brick, moistened to about the consistency of clay. This mixture was placed on the bottom of the furnace and formed into a bowl shape, with the lowest part in the center and connected with a tapping-hole in the front of the furnace. After the furnace had been dried and heated, a charge of fifty pounds of hematite from Sharon, New York (see analysis), and fifty pounds of magnetite from Lake Champlain (see analysis), both in the form of lumps, were charged into the furnace, and a full head of fuel-gas, coming from a three-inch pipe to the burner, was turned on, and the gas burned at the rate of about 2500 cubic feet per hour. In about one hour, the ores melted, the furnace having reached a very high temperature, which condition was maintained for about three hours, when the charge was tapped off, resulting in the production of about twenty-seven pounds of steel. This steel has been hammered and forged into a surgical knife, a cold-chisel, and samples have also been polished and broken to show the fracture and grain. The analysis of this steel is given below, and the almost entire absence of phosphorus, in spite of the quantity contained in the Sharon hematite, indicates that this process eliminates that element to a great extent, and that, for mild steels at least, ore comparatively high in phosphorus can be used.

The Sharon hematite contains :

Metallic iron 47.667 per cent.
Sulphur 274 "
Phosphorus 143 "

The Champlain magnetite contains :

Metallic iron 68.022 per cent.
Sulphur None.
Phosphorus 027 per cent.

The steel made on June 26th, 1883, by Strong fuel-gas from these ores contains :

Carbon Per cent.
Silicon 1.242
Phosphorus239
Sulphur trace
Manganese109
Iron (by difference)98008

100.000

This steel is higher in carbon than would ordinarily be the case, owing to the fact that this charge was held in the furnace at a high temperature, in order to test the durability of the plumbago surfaces. This grade of steel has a financial value of about five cents per pound in ingots.

These experiments prove that steel can be made directly from the ore by the use of Strong fuel-gas. The economy over other fuels can only be estimated by continuous operation with quantities of from one to five tons or more of ore at each operation. Still, whether the crucible or open-hearth method is used, there is a large margin of profit. For instance, an ore containing only fifty per cent of metallic iron would require about 2½ tons to produce one ton of steel, even assuming that as much as fifteen per cent of the iron were left in the slag, or 2½ tons if twenty per cent were left in the slag.

A fine grade of steel can be made from the separated sand ores of Long Island and elsewhere, in plumbago crucibles. Each crucible, holding about 60 pounds of this ore, produces about 32 pounds of a high-grade steel, having a commercial value of about 20 cents per pound. I have made several tons of this steel in this manner, using other fuels than water-gas. I do not see any reason to doubt that the Strong fuel-gas, even at the rate of 50 cents per thousand cubic feet charged by the Yonkers Company, would be far more economical than any other fuel in manufacturing steel of this grade, while a company making this steel, and generating the gas for its own use, would not have to charge the gas at one third of this price. A fine grade of concentrated ore from the Lake Champlain region can be obtained in large quantities at very reasonable prices. Two tons of this ore would produce, by the crucible method, one ton of the finest grade of steel, suitable for any uses in the arts.

My observations and experiments with the Strong fuel-gas lead me to recommend that a furnace should be constructed under my patents, and according to my plans and specifications, capable of melting and converting ten tons of ore at a charge, or two furnaces of five tons capacity each, for making steel directly from the ore by the process I have described.

The furnaces for this work are constructed with movable bottoms, which facilitate the repairing of the plumbago lining, and permit the keeping of the furnace in constant operation.

Mr. Eames estimates the cost of producing steel in a ten-ton furnace, allowing four hours for each melt, to be \$38.87, while the cost in four twelve crucible furnaces, allowing three hours for each melt, and 65 pounds in each crucible, would be, with sand ore and separated ore 14.91 cents.

BRITISH IRON AND STEEL STATISTICS FOR 1883.

The British Iron Trade Association has ascertained that the quantity of pig-iron made in the United Kingdom in 1883 has been 8,490,224 tons, which is a decrease of 3063 tons on the production of 1882. This is the first decrease of the production that has occurred since 1879, when the make of pig-iron fell 290,566 tons below that of 1878. In 1880, however, the make rose to 1,712,399 tons, or 28.4 per cent, above that of 1879; in 1881, the make was 655,531 tons, or 8.4 per cent, in excess of that of 1880; and in 1882, the production was 115,923 tons, or 1.3 per cent, above that of 1881. Details are appended :

NAME OF DISTRICT.	Total production of pig-iron in			Stock of pig-iron on			Increase or decrease on Dec. 31, 1882.
	1883.	1882.	Increase or decrease in 1883.	Dec. 31, 1883.	Dec. 31, 1882.		
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
Cleveland.....	2,760,740	2,688,650	+ 72,090	253,105	266,179	- 13,074	
Scotland.....	1,124,000	1,126,000	+ 3,000	835,900	836,000	- 1,000	
West Cumberland (hematite).....	876,410	1,001,181	- 124,771	132,796	142,582	- 9,786	
Lancashire (hematite).....	820,633	782,739	+ 37,894	111,587	48,200	+ 63,387	
South Wales.....	887,259	883,305	+ 3,954	66,668	78,519	- 11,911	
North Wales.....	39,377	48,713	- 9,336	6,382	3,740	+ 2,642	
South Staffordshire.....	394,000	392,443	+ 4,443	55,682	38,802	+ 16,798	
North Staffordshire.....	285,357	317,117	- 31,760	52,495	47,523	+ 4,972	
Lincolnshire.....	236,578	201,561	+ 35,017	13,184	60,218	- 47,034	
Northamptonshire.....	200,996	192,115	+ 8,881	31,692	18,720	+ 13,172	
West and South Yorkshire.....	284,810	279,253	+ 5,557	56,027	54,180	+ 1,847	
Derbyshire.....	371,664	372,650	- 986	23,900	33,000	- 10,000	
Nottingham & Leicestershire.....	85,400	73,085	+ 12,315	2,600	21,500	- 1,557	
Shropshire.....	71,000	80,475	- 9,475	3,200	4,757	- 1,557	
Gloucestershire, Wiltshire, etc.....	47,000	48,000	- 1,000	6,100	4,200	+ 1,900	
Total.....	8,490,224	8,493,287	- 3,063	1,693,976	1,658,120	+ 40,856	

The condition of the blast-furnaces in the United Kingdom on January 1st, 1884, is shown in the following table :

DISTRICT.	Number of blast-furnaces.		
	In.	Out.	Total.
South Staffordshire.....	39	77	116
North Staffordshire.....	24	16	40
Shropshire.....	7	17	24
Cleveland.....	117	41	158
Yorkshire, West Riding.....	24	21	45
Derby, Notts, and Leicester.....	40	18	58
Northamptonshire.....	17	9	26
Lincolnshire.....	17	3	20
Lancashire and Cumberland.....	64	42	106
Gloucestershire.....	1	7	8
Hants, Wilts, and Somerset.....	2	6	8
North Wales.....	4	6	10
South Wales.....	40	92	141
Scotland.....	101	43	144
Totals.....	506	328	904

The diminished make of hematite in 1883 is shown alike in the reduced

imports of foreign ores into the United Kingdom in that year, in the decreased make of pig-iron in the districts of Cumberland and Lancashire, taking them together, and in the reduced production of Bessemer steel. The imports of iron ore in 1883, aggregating 3,178,310 tons, were 104,186 tons less than the imports for the previous year. This corresponds roughly to a diminished make of hematite iron to the extent of 52,000 tons. In Lancashire and Cumberland together, the make of pig-iron in 1883 has been 1,697,043 tons, or 86,877 tons under the make for the previous year. These two items unitedly show a decrease of 133,877 tons in the make of iron from hematite ores, the total of which for 1883 may be put at 3,287,000 tons.

The total make of spiegel-isen and ferro-manganese in the United Kingdom in 1883 was 179,500 tons, of which the following proportions were contributed by the districts named: South Wales, 71,200 tons; North of England, 50,400 tons; North Wales, 23,300 tons; Cumberland and Lancashire, 27,455 tons; Sheffield, 7145 tons; total, 179,500 tons.

THE EXTRACTION OF SULPHUR.*

Sulphur is found either in superficial deposits, the result of volcanic emanations, constituting the *sofataras*, or else at a considerable depth underground, associated with calcareous and bituminous marls, gypsum, celestite, etc., forming the sulphur mines, which are the most important sources of this material.

The principal mines are in Sicily and in continental Italy.

The ore is got out with picks, and is transported from the mine on the backs of men. Its extraction is effected by the partial combustion of the sulphur. This causes heat enough to fuse the remaining portion, which then flows into a hollow in the ground from which it is collected. In Sicily, the sulphur is treated in a kiln, termed the *calcaroni*. It consists of a wall inclosing an inclined circular area, on which the ore is placed. The heap is covered with a layer of spent material thick enough to keep the combustion from proceeding too rapidly, and spaces are left here and there for the insertion of fagots of wood. The *calcarone* ready, the fagots are lighted, and the access of air so regulated as to avoid active combustion and too high a temperature. After the operation has been in progress a certain length of time, the operatives begin collecting the sulphur, and continue it until the ore is exhausted. In this operation, considerable quantities of sulphur dioxide are produced, and in consequence of the difficulty of regulating the draught, much sulphur is wasted. Great damage is caused to the surrounding country, and any cultivation of the ground within a certain radius of the burning places is prevented. So great is this nuisance that the government of Italy forbids "burning the ore" between the first of July and the thirty-first of December.

The *calcaroni* yield but 50 per cent (at most 60 per cent) of the sulphur contained in the ore, the rest serving as the fuel, and thus producing torrents of sulphur dioxide. The imperfections of this process have for a long time given rise to numerous attempts to devise a more rational and less costly method of extracting the sulphur by the employment of some other kind of fuel. Heated air, steam under pressure, superheated steam, and carbon bisulphide to dissolve the sulphur, have in turn been proposed for the purpose of obtaining the greater part of the sulphur without the production of sulphurous acid fumes.

In the first of these methods, a chamber of masonry is filled with the ore, and a current of warm gas, from a hearth fed with wood or coal, is sent into it. This prevents in great measure the production of sulphurous acid, but the action is slow and the mass of ore is irregularly heated. A large amount of fuel is used and the number of hands is increased, so that the economy over the old method is very small.

The use of steam seemed at first sight to offer the best solution of the problem; for its action is very simple and rapid, and the sulphur obtained of good quality. The yield is better than in the *calcarone* process, and no sulphur dioxide is produced.

But the advantages of this method are counterbalanced in great part by the extra expense of purchasing and maintaining the equipment, as well as furnishing the fuel. The apparatus necessary are the boilers for heating the water tanks to receive the ore, and other accessories. The water available for supplying the boilers is bad, rapidly forming crusts, which increase materially the cost of maintenance. Besides, the proportion of fuel used is considerable, in consequence of the large amount of steam necessary to heat the ore, as well as the loss of heat due to radiation from the uncovered surfaces of boilers, tanks, etc. This process can not be applied in all cases, for the increased yield will not compensate for the greater cost of operating.

The treatment by carbon bisulphide, though very rational *a priori*, presents inconveniences that make its use impracticable. This solvent volatilizes very rapidly, making it difficult and dangerous to work with, besides causing a considerable loss of material.

These difficulties have prevented the various processes from being used to any great extent, so that the old method of the *calcarone* is the one still generally employed.

In 1805, Thomas proposed immersing the ore in salt solutions heated to a suitable temperature. Balard, in 1867, thought the water from the salt marshes, which is rich in magnesium chloride, might answer. And finally, in 1863, D  p  rais took out a patent in Italy for the extraction of sulphur by the immersion of its ores in a liquid heated 10 degrees or 20 degrees above its fusing-point. By this means, it is separated from the earthy materials associated with it. He used a solution of calcium chloride. The apparatus consisted of a spherical boiler of 2000 liters capacity, furnished with a stop-cock for drawing off the liquid sulphur, and surmounted by a vertical cylindrical part, into which, with the aid of a pulley, a basket of perforated iron, filled with the ore, can be let down upon a grate.

The apparatus is placed in a furnace and heated directly, while the cylindrical portion is surrounded by the warm gases passing up the chimney. The basket of ore is let down into the solution of chloride of calcium heated to 130 degrees. The sulphur melts, collects in the bottom of the boiler, and is drawn off by the stop-cock and poured into molds. When the ore is exhausted, the basket is raised and immediately

immersed in water contained in another boiler heated in the same furnace. This was used to supply the place of that lost by evaporation in the first.

At that time, chloride of calcium was comparatively dear, so that the patent could not be worked successfully, and was soon abandoned.

Very recently, this process has been taken up by MM. de la Tour and Dubreuil, and put into practice by them with success.

Chloride of calcium is now very cheap, in consequence of the rapid development of the soda industry (the ammonia process). It can be put down at the sulphur mines in Sicily at 9 francs per 100 kilos.

The apparatus of MM. de la Tour and Dubreuil consists of two rectangular tanks, holding about two cubic meters each (2 m. by 1.30 m. by .75 m.). The bottom of the tanks is inclined $\frac{1}{10}$ th. They are placed in the same furnace and heated alternately by the same fire, which is fed with coke, lignite, or coal. The ore is placed in one of these tanks, in which is also placed a solution of calcium chloride boiling at 120 degrees. Heat is then applied, the sulphur melts gradually, and is drawn off directly into molds by means of a spigot.

The whole operation lasts about two hours. The end is reached when the sulphur ceases to flow. The calcium chloride solution is then drawn off into the other tank previously charged with ore. Half of the liquid flows through a communicating tube; the rest is received in a vat built in the ground, and is raised by a pump. The gangue is washed to regain the salt which it has absorbed, and this dilute solution is used in filling the tanks as occasion demands. The heat is then directed upon the second tank, and the first is cleared and recharged. There is no interruption in the work, and the heat from the fire is all utilized. The sulphur obtained contains only .1 per cent or .2 per cent of impurity, whereas that obtain from the *calcaroni* contains from 2 per cent to 3 per cent. There is left in the gangue but 4 per cent or 5 per cent of the sulphur originally contained in the fresh ore.

In this treatment, certain ores are completely disintegrated, in consequence of the fusion of the sulphur, which is then mixed with earthy matter. MM. de la Tour and Dubreuil, in order to overcome this great inconvenience, were compelled to change completely the plan of their apparatus. The new plan which they adopted is applicable to the treatment of ores of all kinds.

The tanks are built horizontal, and are divided longitudinally through the center by a gutter with inclined sides, which collects the sulphur, and from which it is drawn. On its two sides, iron gratings are built vertically to keep the ore from falling into it. These gratings are made of bars of sheet-iron 2 mm. thick and 25 mm. wide, placed 3 mm. apart. By this new arrangement, they can treat ores of all kinds, even the fine powder formed in mining the ore. This powder is very rich, and is known in Sicily as *sterri*. It was formerly left at the mines. This *sterri* is always richer than the average of the mined ore; for in getting the ore out, the rock breaks and divides along the lines of least resistance, which in this case are the veins of sulphur. On account of its friability, the sulphur is reduced partially to dust and forms a large part of the mixture.

At the Tronica mine, in the province of Caltanissetta, in Sicily, the ordinary ore gives 21 per cent of sulphur when treated by the calcium chloride method, while the *sterro* yields 72 per cent. The average yield of the Sicily ore, treated in the *calcarone*, is from 12 per cent to 13 per cent. In some few cases, it reaches 17 per cent.

On comparative treatment, the same ores yielded from 10 per cent to 12 per cent by the *calcarone* process, and from 19 per cent to 23 per cent by fusion in chloride of calcium bath.

It has been known for a long time that ores very rich in sulphur acted badly in the *calcarone*. The combustion is too rapid, and the sulphur, browned and viscous from overheating, is hard to draw off. In order to treat such ores, it is necessary to mix them first with inert material when the yield is not in accordance with the primitive richness of the ore. These rich ores are, on the contrary, treated advantageously in the chloride of calcium bath.

After the treatment of a large amount of *sterri*, MM. de la Tour and Dubreuil estimated the cost of extraction of a ton of sulphur at 12 fr. 75c. in the case of a mean yield of 33 per cent of the weight of the ore.

The cost of treatment of one charge (about 1000 kilos.) in their apparatus, is as follows:

	Francs.	C.
35 kilos. fuel (coal mixed with lignite) at 30 francs per ton	1	5
14 " chloride of calcium, 2 per cent carried away by gangue	1	25
after washing, at 9 francs for 100 kilos.	1	25
Labor	1	25
Unforeseen general expenses, 20 per cent		70
Total	4	25

Thus, in order to obtain a ton of sulphur, three charges must be worked, making the cost of extraction 12 francs 75 centimes per ton.

An operation with *sterri* requires an hour and a quarter for fusion, a quarter of an hour for drawing the sulphur, and an hour and a half for washing the gangue and letting it drain, clearing the tank and putting the movable gratings back in place.

MM. de la Tour and Dubreuil have already introduced a number of their tanks in the sulphur region, principally for working up the *sterri*. There are three at the Tronica mine, in the province of Caltanissetta; two at the Grottarossa mine, in the same province; two at Pernice, near Recalmuto, and two at the mine Crocca.

The method just considered presents great advantages over the older methods:

- 1st. It allows the extraction of the greater part of the sulphur from ores of every kind, at a minimum cost for fuel.
- 2d. The extraction is effected regularly, protected from atmospheric influences.
- 3d. Work is carried on throughout the year, as no sulphurous acid fumes are formed.
- 4th. It permits the treatment of the ores according to the demands of the trade.

CARDIFF COAL FOR THE GREELY EXPEDITION.—The Secretary of the Navy has made an arrangement for the shipment of 500 tons of coal from Cardiff to Littleton Island, for the use of the vessels to be sent to the relief of Lieutenant Greely's party. The vessel carrying the coal is under orders to be at St. John's, N. F., not later than May 5th.

* Translated from the American Chemical Journal from a paper by M. Camille Vincent in the Bulletin de la Soci  t   Chimique.

THE GEYER SLIME CONCENTRATOR.

In crushing and dressing ores, slimes carried in a varying quantity of water are made, which are passed through flumes, sumps, or a series of spitzkasten, from which they are delivered to percussion-tables or puddles. The size of the plant depends on the quantity of water by which the ore is carried in suspension. Thus, if 1000 liters of slimes are delivered per minute, with an available head of 10 millimeters (see Fig. 1), the velocity of the current would be 17 meters; and if the settling-tanks had a width of 6 meters, they would have to be made at least 17 meters long, thus requiring an area of 102 square meters, and nevertheless the losses in the tailings would be great. Mr. E. Geyer, of Bad Ems, Germany, recognizing the fact that these losses come from the constant agitation due to steady flow, has started, in devising an improvement of existing methods, with the idea that all that would be necessary would be to give the slimes a period of rest to allow for the settling of the heavier particles. His apparatus is shown in the accompanying engravings. The slimes are delivered continuously to the tank R, from which they flow in to the spitzkasten T¹, T², T³, and T⁴ in turn when the valves r¹, r², r³, and r⁴ are opened. After the slime has been in each box at rest for a sufficiently long time, the valves t¹, t², t³, and t⁴ are opened by suitable mechanism, and the tailings allowed to flow off, while the concentrates flow off continuously through the pipe g, the opening of which is regulated by a cock. The size of the boxes is dependent on the quantity of slimes and the length of the period of rest that is deemed advisable to give for settling. Their size, as compared with ordinary settlers, is indicated by dotted lines in Fig. 1. Thus, if the quantity of slimes delivered were 1000 liters per minute, and the settling period were 20 minutes, the boxes would have a diameter of three meters, and the discharge-openings would be one meter below their upper edge. Mechanically, the action of the apparatus is as follows: Through the driving-pulley m, the size of which is chosen to suit the requirements of each case, a tappet D¹ is moved, which presses down the long lever H¹, which opens the valve r¹ in the reservoir R, thus filling the box T¹ in 7.5 minutes. Shortly before the tappet D¹ has ceased acting upon the lever H¹, a smaller tappet d¹ depresses a lever h², opening the valve t², through the agency of a slender wire rope carried on pulleys. Thus, the box T² is emptied in 2.5 minutes. Then a tappet D² gradually depresses H² and opens r², allowing T² to be filled again, while almost simultaneously a tappet d² has set the mechanism for emptying T³ into motion. The other boxes are filled and emptied in the same manner, the flow of slime from the main reservoir R therefore going on continuously, while in every box the slime has 20 minutes of absolute rest to settle.

"HYDROGEN AMALGAM."

English inventors appear to be throwing a good deal of energy into the question of improving the methods of amalgamating gold. The latest in this direction is the process of Mr. Bernard C. Molloy, M.P., whose work the *Engineer* refers to as follows:

This process has the advantage of producing not only a hydrogen amalgam, but also at will an amalgam of hydrogen combined with any metal electro-positive to this latter. Thus hydrogen-potassium or hydrogen-sodium amalgam can be obtained, as will be seen by the following description:

Mr. Molloy's effort appears to have been, in the first place, directed to a system which could be adapted to any existing apparatus, and, in certain cases where water was scarce, to avoid altogether the use of that element, which in some districts is an uncommon one. For the purpose of explanation, we select an ordinary amalgamating-table fitted with mercury riffles. The surface of the table is in no way interfered with or disturbed. The bed of the riffle, however, is constructed of some porous material, such as leather, non-resinous wood, or cement, which

serves as the diaphragm upon which the mercury rests, and separates the fluid metal from the electrolyte beneath. Running the full length of the table, is a thin layer of sand, supported and pressing against the diaphragm, and lying in this sand is the anode, formed preferably of lead. A peroxide of that metal is formed by the action of the currents, and may be readily reduced for use over and over again after working for from one to three months. The peroxide of lead, as is well known, is a conductor of electricity, and this fact constitutes an important

advantage in the working of the process. The thin layer of sand is saturated with an electrolyte, such as dilute sulphuric acid ($H_2SO_4 + 20H_2O$) to give a simple hydrogen amalgam; ($Na_2SO_4 + xH_2O$) to give a hydrogen sodium amalgam; or ($K_2SO_4 + xH_2O$) to give a hydrogen potassium amalgam. Numerous other electrolytes constituted by acids, alkalis, and salts can be used to form an amalgam permanently maintained in a condition of "quickness" and freed from all liability to "sicken," whatever the components of the ore may be. The mercury is connected with the negative pole of the voltaic battery or other electro-motor, and the lead made with the positive pole of the same source. When the current passes, there is formed, according to the nature of the electrolyte, a hydrogen amalgam, or an amalgam of hydrogen with a metal electro-positive to hydrogen. The electrolyte, which, it will be understood, is distinct and apart from the body of the water passing over the table, will last almost indefinitely, there being no consumption of any of its constituents, excepting hydrogen and oxygen from the water of solution. The quantity of acid or saline material contained in the electrolyte is so very small that there can be no difficulty in finding a supply in any district. The question of the supply of electricity is one which in many mining districts involves considerations of practical importance, since a large supply would necessitate water or steam power. It has been found that two cells having an electro-motive force of about two volts each will in this process suffice; if preferred, however, a very small dynamo machine can be used. In connection with the electro-motive force it is requisite to use, it may be observed that an amalgam of sodium containing only a small quantity of this metal would, when constituting a positive element in conjunction with a lead negative and on an aqueous electrolyte, give an opposing electro-motive force of less than three volts. Such an amalgam could therefore be obtained under an electro-motive force of about four volts. The electrical resistance in the circuit constituted by the apparatus being very small, no electrical power is wasted.

When water constitutes the electrolyte, as in Barker's system, then the electro-motive force required to obtain a given current would be very much greater than that above specified. The conditions assured under this process appear to be all that can be required, while the amalgams obtained are those most calculated to preserve the "quickness," and prevent the "sickening" of the mercury.

Mr. Molloy has designed a special form of amalgamating machine to be used in conjunction with the above process, and with or without the aid of water. By the employment of this machine, each particle of the ore is slowly rolled in the quickened mercury for from fifteen to thirty or more seconds.

We shall wait patiently to hear of the successes of this "hydrogen amalgam," which the *Engineer* promises at an early date. Until then, we prefer to remain mildly skeptical.

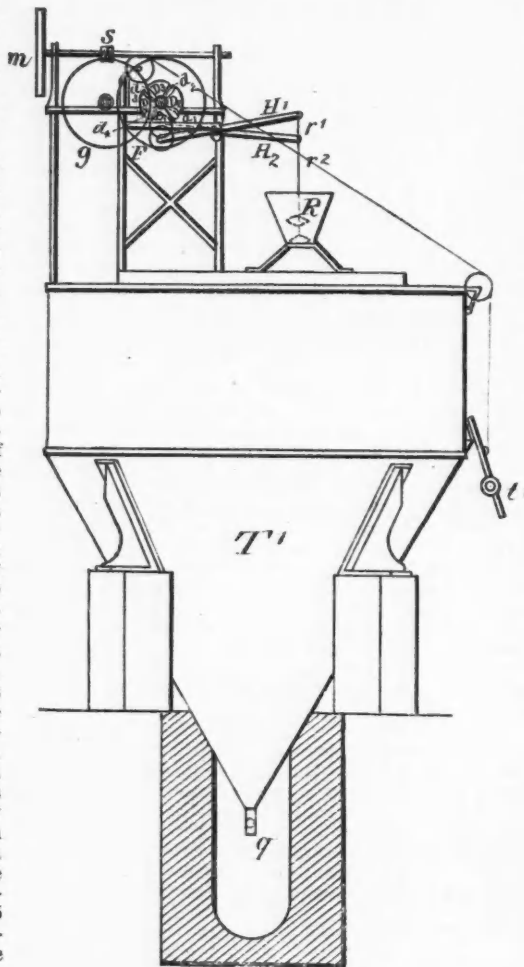


FIG. 4.

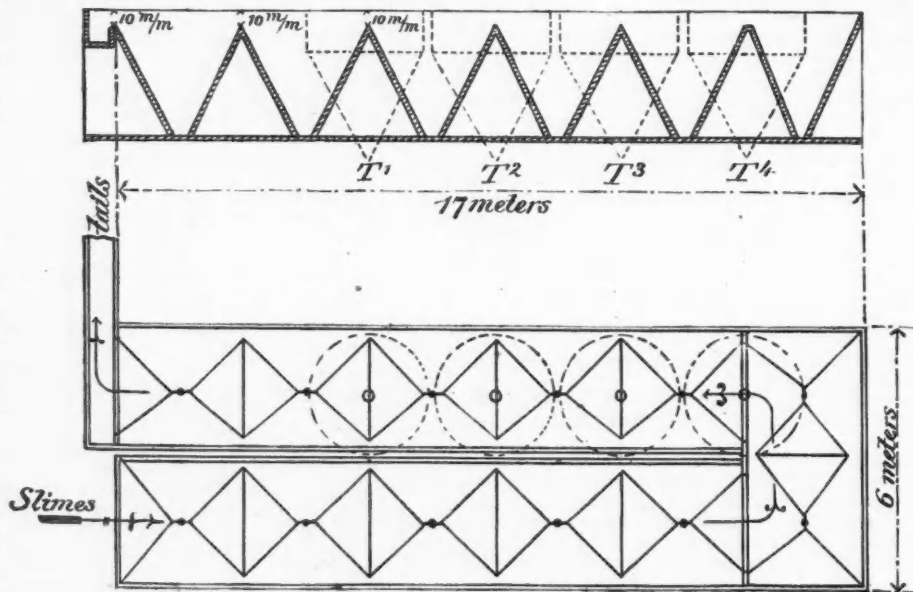
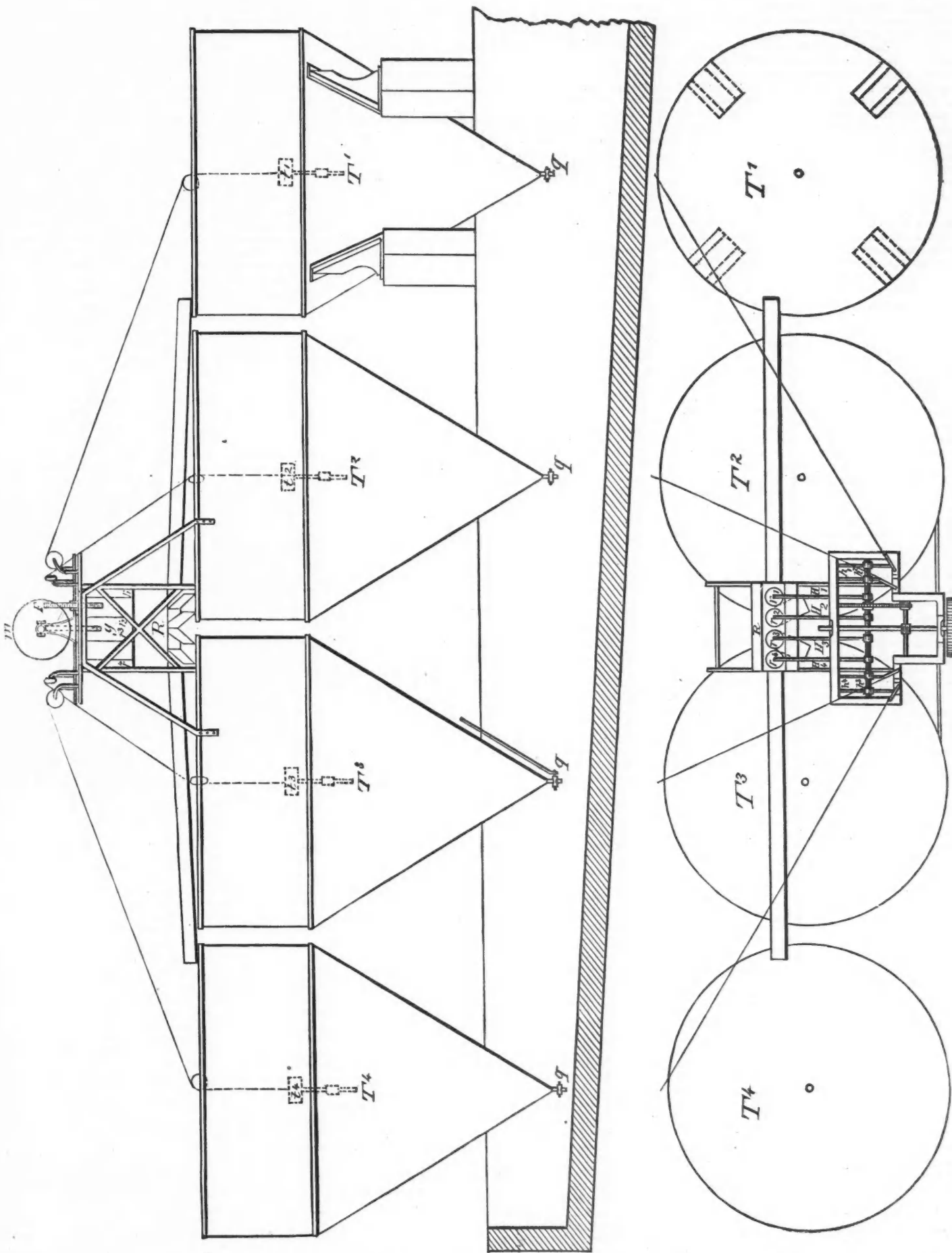


FIG. 1.

PITTSBURG GAS COMPANIES.—The stubbornly contested legal fight among the natural gas companies at Pittsburg has been definitely settled by Judge Stowe, who has decided that the "Fuel-Gas Company of Alleghany County" has the exclusive right to supply the public of the city of Pittsburg with heat, either from natural or artificial gas, until the company has paid five per cent dividends.



THE GEYER SLIME CONCENTRATOR.—FIGS. 2 AND 3.

MODERN PROGRESS IN MINING ENGINEERING.—III.*

By H. Bramall, M. Inst. C.E.

The increased depth and size, and consequent cost, of modern colliery windings, necessitates the working of larger areas, and the drawing of greater quantities through a single shaft than were ever contemplated in former days, and so the winding-engines recently erected are in many cases of extraordinary size and power, coupled cylinders of from 30 to 40 inches diameter being by no means unusual, while those at Harris's Navigation are 54 inches diameter, capable of lifting 6 tons of coal, or, including ropes, cages, etc., a total load of 15½ tons at a speed of 32 feet per second. In a modern plant, the speed of the load in the shaft reaches perhaps 35 miles per hour, and to enable the engine-driver properly to control his engine, the help of steam-driven or steam-aided starting and reversing gear and powerful steam-brakes has necessarily been invoked. In England, the strap-brake is very general; but on the continent, clip-brakes, consisting of massive jaws clipping a brake-wheel and brought into action by a system of levers, are used and are very effective.

Economy in the consumption of fuel becomes also an important question in deep winding, and the advantages of expansive working of high-pressure steam and a nicer proportioning of the power expended to the work done have been gained by the application of automatic cut-off gear. There seems no reason why the benefits of condensing should not also be made available where the requisite supply of water is procurable.

In the deep pits, the unbalanced weight of the winding rope, amounting, it may be to 25 or 30 per cent of the gross load, becomes an important question, entailing a large increase in the size of the engines necessary to start the load, and to meet the difficulty many plans have been proposed. Many years ago, some degree of compensation was gained by the flat hemp ropes coiling upon themselves, which were in general use, and similar ropes of aloes fiber are still preferred in Belgium and France, but they are almost entirely displaced in England, Germany, and America by round ropes of iron or steel wire coiling upon a plain cylindrical drum. To counterbalance the rope in these cases, heavy chains attached to a secondary drum, or weighted levers, have been used. The drum has been made conical, the first lift being taken at the smallest diameter; but the extent to which this can be carried is limited, and it is scarcely safe to make the pitch of the cone more than an angle of 30 degrees with the horizon. By adding a spiral groove in which the rope can lie, this angle may be increased so as to make the drum almost strictly compensating, and this scroll-drum (the principle of which was patented as long ago as 1776) is the one now in course of adoption at most of the largest modern winding plants. Round ropes coiling upon themselves in a vertical groove between two iron disks are in use at Clifton colliery, near Manchester, and are giving satisfaction, as the ropes are found to retain their form and to wear well. With a plain cylindrical drum, the empty winding rope may be effectually counterbalanced by attaching a rope of similar weight underneath the cage. Herr Koepe, of Hannover colliery, Westphalia, has revived a system of winding by which the usual drum may be dispensed with, and its place taken by a simple sheave of large diameter, which may be fixed over the shaft (No. 2, Hannover pit). The main rope from one cage passes partly around this sheave, and is attached to the other cage, while a secondary rope of light weight hung beneath the cages serves as a counterpoise; or the winding rope may be an endless one passing through the cages which are attached to it by clamps. This system is now at work at Bestwood colliery, near Nottingham.

It has already been mentioned that round wire ropes have in England almost entirely displaced those of hemp, and this result of practical experience would seem to be fully justified by the careful experiments recorded in Germany, from which it appears that, taking the cost per ton lifted by a charcoal iron round rope as the unit, the cost by round steel is 1·6, by flat iron wire 2·4, by flat steel 4·0, and by flat aloes fiber 3·8. The life of a rope, however, will greatly depend upon the good condition and accurate adjustment of pulleys and drums, and the care taken to grease the rope, and guard against corrosion and undue friction, the duration of a similar rope having in my experience been doubled by the mere changing of an ill-made pulley, all other conditions remaining the same.

The fracture of a winding rope may be, and often has been, accompanied by a lamentable sacrifice of life; and to provide a safeguard against this, many have been the contrivances designed to arrest the descent of the cage. A few of them are now in use, among the best being Calow's, Owen's, and King & Humble's. Except Calow's, which is a neat example of the application of the principles of gravity of falling bodies, all these contrivances depend on the strain of the winding rope for keeping the catches or grips out of contact with the guides, and on the removal of this strain at the top and bottom of the pit the grips are brought into action by springs. The risk that a momentary check to the moving load, owing to an irregularity in the engine, may cause the grips to bite, and so lead to a serious accident, has prevented many eminent engineers from adopting them. Should the winding engine fail to stop his engine at the proper moment, the cage may be carried over the head-gear pulley; and to prevent this, many ingenious disengaging hooks have been contrived; and as several of these are efficient for the purpose, and free from the risks attendant upon safety-cages, they have been widely adopted, and are in use at almost every well-managed pit. Those of Ormerod and King & Humble have found most favor, both consisting of flat tapered plates held in position by a copper rivet. A plate or tube is fixed in the head-frame below the pulley, on passing through which the plates shear off the rivet and liberate the rope, at the same time throwing out projections by which the cage remains suspended by the hook to the plate or tube. Provision should be made by auxiliary catches to prevent the cage falling back in case the suspending chains below the hook should part. At various times, apparatus have been brought forward intended to cut off steam and apply a brake in case the cage should pass a given point, but not with much success.

The basket and trolley formerly used to bring out the coals from the miner to the surface are now superseded by boxes or tubs of wood, iron,

or steel running on wheels, and these are placed in cages often of several stories or "decks," to be wound out of the pit. The same method is largely adopted in the metalliferous mines of the continent and in America. The shafts are fitted with guides of wood, iron wire, or rigid iron bars. Wood is least costly, is very durable, safe, and, in case of accident, is easy to repair. Wire ropes are quickly put in, but are liable to oscillation. Several fatal and many serious accidents have arisen from this cause, while in case of break-down the consequent damage is usually very great. Iron bars of channel or "vignolle" section cost more in the first installation than either wood or wire, and are less easily repaired than wood, but they have not yet been sufficiently long in use to enable us to decide whether they will offer any ultimate advantages over wood.

HOW A GREAT FRENCH COAL MINING COMPANY HELPS AND HOLDS ITS PEOPLE.

Alluding to the various provident societies that have been recently holding their annual gatherings in Paris, a Montreal *Herald* correspondent says that the great coal mining company of Anzin purchased a considerable tract of land in the neighborhood of its mines, for the purpose of promoting the well-being of its people by the erection of excellent dwellings, which are rented to their occupants, or sold to them by a series of monthly payments, at prices no higher than sufficient to reimburse the company for the cost of construction. A village, built and tenanted thus, has been established by the company in the neighborhood of each of its principal centers. The houses thus built consist of good, airy rooms, with every necessary convenience, and a garden; some of these houses contain but a single family, none contains more than two, and, when two families inhabit the same house, one is on the ground floor and one above. The two lodgings are entirely separate, each having its own entrance and its own garden. About six hundred of these houses have already become the property of their inmates; while the workmen are gradually purchasing others.

All the work people have an abundant supply of coal for nothing. Bakeries, breweries, groceries, and butchers' shops, managed by the company, supply goods of the best quality at cost price. Tobacco is also supplied at a rate much lower than it could be procured for elsewhere. All the shops of the company are kept by the wives or the widows of the miners, who are paid by the company. The latter gives to its people a fixed minimum of wages and supplies of all kinds at fixed prices; no matter how much the market price of wages and of goods may rise, the company maintains its rates, sustaining the pecuniary losses thus incurred. In 1867, these losses amounted to nearly £5000. The company gives to each miner his complete working suit; a complete suit for each of his children on arriving at the ecclesiastical "high tide" of first communion; a sum of 48 francs on the birth of each boy, and of 36 francs on that of each girl; an allowance of 15 francs a month for each child too weak to gain his own livelihood; and an extra piece of ground for a vegetable-garden to families having several members able and willing to cultivate it.

Twelve physicians, among whom are several specialists, paid by the company, attend the miners and their families gratis. An excellent pharmacy in each village supplies medicines at cost price or for nothing, as the case may be.

Free schools, libraries, mutual aid societies, a savings-bank, baths, etc., have been established by the company. In case of children giving evidence of special talents, the company sends them to the public schools for the fuller development of their aptitudes, and gives them, on the expiration of the special studies, the superior posts in its employ for which they have thus become fitted.

Up to a very recent period, the most perfect harmony existed between the mining population and the company. Agents of the various associations formed for the organization of strikes recently fomented discontent among the people, who struck for higher wages, while protesting against the imputation of any ill-will against the company or its director. The strike speedily came to an end, and the vast establishment has resumed its normal condition.

The same writer says that an association that has taken the appropriate name of *La Fourmi* (The Ant) is also an interesting "sign of the times," and might be imitated everywhere with advantage. The aim of this society being to enable the poorest to become possessed of capital, it began with a group of some fifty workmen, who agreed to pay into a common coffer the minimum sum of one penny per week, these contributions to be allowed to accumulate for ten years. The society was to employ the funds thus collected in buying up whatever property came into the market under favorable conditions for the buyer—houses, land, goods, etc.; the whole to form a common property, and to be divided among the members in the proportion of their contributions, at the end of the ten years. The society is managed by a director and committee, who give their services without salary, and will take their share at the appointed times, on the same basis as the other members. Six secretaries, working at a small salary, are the only paid agents of this novel association. The association has only been in existence four years; but it already numbers many thousands of members, including statesmen, bankers, artists, authors, actors, as well as members of the laboring classes for whose benefit the scheme was first devised. Three other societies of the same nature, affiliated to the parent association, are already formed and prospering, and others are in the course of formation. Members can pay down at once, if they choose, the ten years' subscription for a child, for example, paying, in such cases, a trifle less, and securing for the beneficiary a right to all the interests and gains to come. These anticipated payments are of great importance to the society, which thus obtains at once increased means of taking up whatever favorable bargains may fall in its way.

FURNACE, MILL, AND FACTORY.

The Gill Car Manufacturing Company, of Columbus, Ohio, shows nominal assets to amount to \$490,000 and liabilities of \$259,000. From the character of the assets it is thought that the shrinkage and expense of closing up the business will reduce the amount nearly to a level with the liabilities.

The Yale Manufacturing Company, of New Haven, Conn., manufacturer of fire-proof safes, vaults, and iron work for buildings, suspended operations March

* President's Annual Address to the Liverpool Engineering Society.

18th. James English was appointed receiver. The company is largely indebted to New Haven parties. The property is mortgaged for \$18,000, and there is an outside indebtedness of \$17,000.

Mine Inspector Mauchline, of Shenandoah, is the inventor of a new style of safety-lamp. It is of the dark-lantern pattern, although it throws the light over a larger surface than the latter. It was recently tried at Facker colliery, No. 2, and was pronounced satisfactory. It is a long-range lamp, and is said to dissipate darkness at a distance of thirty feet, and to render objects visible at a much greater distance. It weighs two pounds.

The cost of running the Edgar Thomson Steel-Works at Braddock, Pa., last year is stated to have been \$1,800,000, the cost of running the furnaces alone being \$700,000.

The rolling-mills at Joliet, Ill., have started up on single turn. The company has made a settlement with the men. The roof on the blast-furnace building, recently destroyed by fire, is nearly completed, and the direct process will be started next week.

The numerous barb-wire factories at Joliet, Ill., are working night and day, and the product is in active demand and finds a ready market at higher prices than have been realized at any other time for over a year past.

The nail factory of the Etna Iron-Works in New Castle turned out in one week 3474 kegs of nails.

At West Middlesex, Pa., the works have not been doing very well for some time. Only one of the two furnaces is at work. The rolling-mill for the past month has been running single turn.

The Colorado Iron-Works, of Denver, Colo., are building a fifty horse-power crusher for the Colorado No. 2 mine, Leadville.

Messrs. Hendey & Meyer, of Denver, Colo., are building one of their large automatic engines for the Colorado & Montana Smelting Company, of Butte, Montana. They are also building a copper furnace for the Detroit Copper Company, of Clifton, Arizona. Recently they shipped the fourth lead furnace for the Colorado Smelting Company, of Pueblo; and also water-jackets for the Harrison, American, and Arkansas Valley smelting-works at Leadville; while they are making water jackets now for the La Plata smelting-works.

The forge department of the iron mills of Painter & Co., at Pittsburg, were closed March 24th on account of depression in business. Two hundred and sixty-eight men are thrown out of employment.

The white lead and lead-pipe works of the Germania Smelting Company, Salt Lake City, Utah, keep in operation, and are turning out large quantities of these two articles.

A report is current in Allentown that the Glen rolling-mill, near the Lehigh Valley depot, which has been idle for several years, is to be converted into a sheet-iron mill, to be operated by a number of Reading capitalists.

The Frankford Steel-Works have recently made an extension, and with the increased facilities are turning out large quantities of steel forgings, "Anvil" tool steel, "Nonpareil" special steel, etc. The last-named steel is made specially for cutting hard metals, such as chilled rolls, hard castings, steel tires, etc.

The Bethlehem Iron Company is turning out steel rails that weigh 76 pounds to the yard, for the Lehigh Valley Railroad Company.

The annual report of the Omaha Smelting Company shows that the product for 1883 was \$12,700,000, an increase of 33 per cent over that of 1882. The company paid \$750,000 to the Union Pacific Railroad for freight.

LABOR AND WAGES.

The miners of the district held a mass-meeting at Brazil, Indiana, on the 14th inst., to hear from the delegates, who reported that the operators declared they would not give more than 75 cents a ton; and that, if the men would not dig the coal for that sum, the mines might lie idle all summer.

The State engineers of New York have been organized into a union called the Eccentric Association. The agitation for licenses and better examination of boilers will be continued. A boiler at Stokes & Thetford's coal-yard, at Fifty-fifth street and North River, has been reported six times, but has not yet been examined.

At a meeting of the Central Labor Union, held in New York, March 23d, it was decided to have the eight-hour bill brought before the Legislature. The bill is a proposed amendment to the act passed April 26th, 1870. The principal section is the fifth. It was also moved to have a bill to legalize trades unions introduced in Congress, under the charge of Senator Blair, Congressman Foran, and Assemblyman Hoolley.

The strike of the coal workers at Anzin, in the Department du Nord, France, continues, and acts of violence are beginning to occur.

A press dispatch from Port Richmond says that a number of notorious outlaws, who are supposed to be in league with the Mollie Maguires that find a safe refuge in this region, have formed an oath-bound brotherhood, and, under the guidance of blacklisted miners, formerly employed in the Monongahela Valley, will visit the disturbed portions of the coal-fields in Western Pennsylvania, to perpetrate a series of Mollie Maguire outrages.

There is great dissatisfaction in the region around Mahanoy City among the miners and laborers on account of the half-time policy of the coal companies, and threats to reorganize the Miners' Union are openly made. In some localities, steps in that direction have already been taken. That there is great uneasiness among the workmen is easily seen, and many are blaming the companies for sending in, to take their places, Polish and Hungarian immigrants, who have been coming here in droves every few days during the past winter. One of the early trains on the Bound Brook route took to New York on March 25th about 100 miners, who had quit work in the Dryland coal mines, in the northern part of Lehigh Valley, because they were dissatisfied with the contract that they had made with the superintendent of the mines.

The Clearfield coal operators posted a notice, March 27th, that on April 1st the price of mining would be reduced from fifty to forty cents per ton of 2240 pounds, and all other wages on the same basis. A majority of the miners say they will not accept this reduction unless the operators will pay twice a month, make a ton of coal 2000 pounds net, as the law directs, and do away with store orders. Unless the operators concede this, a long and determined strike is probable.

The jury in the case of the union molders' patrol were discharged at Troy, March 27th, having been unable to agree upon a verdict. They were out twenty-four hours.

RAILROAD NEWS.

On March 25th, the twenty-five cars of a Jersey Central coal train were scattered and piled upon both tracks at Annandale by a broken wheel. So many trains were held that all the wrecked cars were thrown over an embankment.

The Philadelphia North American says that the Cincinnati, Hamilton & Dayton road is desirous of obtaining the Toledo, Cincinnati & St. Louis Narrow-Gauge as an inlet into the Ohio coal-fields, and especially the Dayton division, while the Cincinnati, Van Wert & Michigan road is equally anxious to secure it for a Cincinnati route. The New York, Pennsylvania & Ohio Railroad is said to be only awaiting the decision of a law case to swallow up the Cincinnati Northern division, thus giving it an important connecting link between Dayton and Cincinnati. In any case, the road would be made a standard gauge.

The Norfolk & Western Railroad Company has issued a preliminary report for the information of stockholders, prior to the annual meeting to be held at Roan-

oke on the 7th of May. From it, we take the following statement, showing the growth of the mineral traffic during the year 1883:

	1882. Tons.	1883. Tons.	Increase. Tons.
Iron ore.....	1,399	51,915	50,516
Pig-iron.....	13,372	24,611	11,239
Coal.....	4,735	54,532	49,797
Coke.....	none.	33,792	33,792
Slate, stone, and marble.....	5,027	19,584	14,557
Salt.....	1,214	11,482	10,268
Plaster.....	1,020	4,214	2,594
Totals.....	27,367	190,120	162,753

The Shenandoah Valley Railroad, controlled by the Norfolk & Western Railroad Company, carried during the year:

	1882. Tons.	1883. Tons.
Iron ore.....	9,435	87,212
Manganese.....	1,619	5,484
Pig-iron and blooms.....	3,617	32,597
Coke.....	2,621	38,846
Fire-brick, clays, etc.....	4,513	11,472
Stone and marble.....	3,400	57,106
Other minerals.....	21,123	18,920
Total minerals.....	46,328	231,537

There was a largely attended meeting of the Northwestern Anthracite Coal Association March 25th, at the Gilsey House, New York City. Representatives of the Pennsylvania, Erie, Lackawanna, New York Central, and other railroads, shippers, and anthracite coal producers were present. Joseph Stickney, of the Pennsylvania Railroad, presided. After a long discussion, the association adjourned without taking any action on the questions before it. Another meeting will be held April 1st, when a sub-committee appointed at a previous meeting will make its report.

A further reduction in freights from Chicago to Montreal has been made by the Grand Trunk and Canadian Pacific railroads.

The Rochester & Pittsburg Company has completed arrangements for a large coal business by water between Buffalo and New York. The shipments will be made almost entirely from Buffalo, that route being cheaper than the Rochester line.

Commissioner Fink has issued the following notice: In accordance with the demand made for a reduction of tariff rates to the basis of the lowest cut rate, notice is hereby given that, taking effect Wednesday, March 28th, rates on bulion base in car-loads, the value not to exceed \$100 a ton, the rates will be 20 cents per hundred pounds, and on pig-lead in car-loads 20 cents for 100 pounds from Chicago to New York. These reduced rates apply only on the articles named, and are not guaranteed for the calendar year, but may be advanced on ten days' notice.

The Philadelphia & Reading Railroad and Coal and Iron companies have created another car-trust loan for \$2,000,000. The loan has been taken by the Union Trust Company at six per cent, and over one third of the amount has been placed.

The annual meeting of the stockholders of the Chesapeake & Ohio Railroad Company was held at Richmond, Va., March 20th. The report of President C. P. Huntington was submitted and approved. It shows: Gross earnings for 1883 in round numbers, \$3,906,000; operating expenses, including taxes, \$2,600,000; net earnings, \$1,306,000. Directors were elected as follows: C. P. Huntington, A. A. Low, A. S. Hatch, Elias Higgins, John Castree, Isaac E. Gates, A. E. Orr, Ezra Wheeler, and E. T. Towmire, all of New York, and William C. Wickham and John Echolz, of Virginia.

COAL TRADE NOTES.

CANADA.

The annual report of the Department of the Interior states that the existence of coal in practically unlimited quantities in Southwestern Manitoba, in the valleys of the North and South Saskatchewan, and indeed more or less throughout the whole of the territories west of the second meridian, had already been satisfactorily proved; but not until the season of 1883 did coal mining become an established industry in that new country. During last summer, however, operations were commenced at several points, but particularly, and with most success, on the South Saskatchewan, where that river is crossed by the Canadian Pacific Railroad, from which place, at one period, there was an average daily output of from 300 to 400 tons, and this coal, even at Winnipeg, a distance of some 600 miles from the pit-mouth, was procurable at from \$8 to \$11 per ton. The effect of this was to produce a very marked decrease in the cost of fuel of all kinds throughout Manitoba and the territories, the price of anthracite in Winnipeg having fallen from \$15.75 to \$14 per ton. The deposits on the South Saskatchewan and its tributaries consist of a superior class of lignite, equal to much of the bituminous coal consumed on this continent. The product of one mine in the Belly River country has been tested by the locomotive department of the Canadian Pacific Railroad, with so much success that the company has contracted for a large annual supply of it for the next five years. Contrary to the expectations of the most sanguine, a valuable deposit of anthracite has been discovered close to the line of the Canadian Pacific Railroad, on the Devil's Head Creek, a tributary of the Bow River, about forty miles east of the summit of the Rocky Mountains and sixty miles west of Calgary. The importance of this discovery can hardly be overrated, particularly as the deposit is already known to extend over a considerable area. The prospects of successful mining for the precious metals on the eastern slopes of the Rocky Mountains are very encouraging. A large number of practical miners, drawn from various parts of the world, expended a good deal of time and capital in prospecting at different points in the course of the past summer. Some discoveries of rich ores are said to have been made, and there is every reason to anticipate that there will be an extensive movement of population toward the mining regions. On the Upper North Saskatchewan and its tributary streams flowing out of the mountains, there has as yet been no discovery reported of quartz or other gold-bearing rock in place; but this section of country is rich in promise of remunerative employment for the class of miners who, with primitive appliances and inexpensive outfit, make the development of alluvial and subaqueous deposits their business. The mining regulations recently adopted have been prepared after careful consideration of the special requirements of the country and the mining laws of other nations. They will be found to be exceedingly liberal.

PROVINCE OF QUEBEC.

The coal dealers at Quebec are getting up petitions to the government against Mr. Costigan's bill now before the House about the weighing of coal.

ILLINOIS.

But \$53,000 were paid out at the Braidwood mines on March 15th—the smallest pay that has been distributed among the miners for five years. The Westry Coal Company, of Peoria, has been incorporated with a capital of \$35,000.

MARYLAND.

Mining in and around Frostburg is, according to the Pittsburg Telegraph, somewhat improved, but as yet is far from being what it might be. The new Hope mine, which has been idle for a year, has resumed, and the miners are getting full work. The Midlothian mine started up again March 15th, after

several weeks' idleness. Blaen Avon mine is working about quarter-time. Borden shaft is working full-time, and all its miners at work with the exception of those employed at the Drift, which will also be at work in a week or ten days. The latter place ships altogether by canal. All the mines of the Consolidation are running slack, and making about half and quarter time, not including the New Hope. It is said that the canal will be ready for operation March 24th, when it is thought that the boatmen will refuse to haul coal, as it is said a reduction of from ten to fifteen cents will be offered them. Several of the mines began work on the twelve-hour system Saturday morning, the 15th inst., the winter custom being ten hours and the summer twelve. A bill is pending in the Legislature that is now in session, making ten hours a lawful day's work in the mines of Alleghany and Garrett counties. The bill has passed the lower House, and is awaiting the action of the Senate. A bill to amend the present mining law of the above counties is also under consideration. The latter bill, if adopted, will give far more protection to the miners than the law now on the statutes of the State.

Archibald McDonald, for over nineteen years past superintendent of the Swanton Coal Company's mines at Barton, has resigned that position and has been succeeded by Paul S. H. Lee, nephew of Stephen S. Lee, president of the company.

OHIO.

At Chapman, the mining of coal is slow. Many of the miners supposed that, when the reduction took place, there would be more purchases at the low rate; but as has been before, so it is now—there is no better work. The Wilson No. 5 is idle. Sippo is doing very little, but the Mountain has had full-time this week, which has not happened for a long time. Selway & Macfarlane, who opened a mine last year on the old Crawford Coal Company's territory north of here, are doing fairly and driving another new slope in the Foltz farm.

At Buchtel, there has been almost no work this month. This is a natural consequence, as mining came down to seventy cents a ton on the 1st of March.

PENNSYLVANIA.

ANTHRACITE.

Two miners lost their lives March 23d by a cave-in at Kirk's mine near Pottsville. Both bodies have been recovered.

An explosion caused by fire-damp is reported to have occurred in the coal mines of the Cambria Iron Company, at Johnstown, March 24th. Three men and a boy were slightly burned.

The Buck Mountain vein, 9 feet thick and of good quality, has been cut at Gilberton colliery by the Philadelphia & Reading Coal and Iron Company.

Girard colliery is still flooded.

Mr. B. F. Fillmore has leased the several tracts of land east from the Gypsy Grove breaker of the Pennsylvania Coal Company, Dunmore, and all the coal and timber on them. The tracts comprise some eighteen hundred acres, carrying two veins of workable coal, which have been bored and tested, and lie between three railroads, so that shipping facilities can be easily expedited. The improvements for mining, preparing, and shipping the coal will be commenced soon.

The following reports have been made by the mine inspectors for the month of February:

Pottsville District—Samuel Gay, Inspector: Accidents, 6; killed, 0; injured, 6. Total number of employes, 6836; average number of days employed, 12; number of tons of coal shipped, 90,190-18.

Shenandoah District—Robert Mauchline, Inspector: Accidents, 13; killed, 3; injured, 10. Total number of employes, 12,936; average number of days employed, 11½; number of tons of coal mined, 236,972-09.

Shamokin District—James Ryan, Inspector: Accidents, 17; killed, 6; injured, 11. Total number of employes, 14,235; average number of days employed, 18-5-9; number of tons of coal mined, 266,219-17.

The Stanton mines of the Lehigh & Wilkes-Barre Coal Company, employing in and around the mines about 600 hands, are again idle by the flooding of that colliery. It is stated that it will take three weeks or a month to clear the water before work can be resumed.

Three men were killed by an explosion at the Enterprise Colliery, at Mount Carmel, March 21st.

COKE.

The coke trade, says the Connellsville *Courier*, presents the same old story of dull times, poor prices, and slack orders. The past fortnight has developed nothing new. There is as yet no increase in the demand. Things seem to be in *statu quo* pending the starting in motion of the coke pool machinery on the first of April. Of the 9749 ovens in the region, 788 are idle because of dull trade, while 319 are still in the iron grasp of the law; in all, there are 1107 idle ovens against 977 two weeks ago, and 780 a month ago. Of the 8642 active ovens, many are running but five days in the week. This gradually increasing idleness has not been accident, but is partly due to a declining demand. The output, which two weeks ago reached 700 cars daily, has fallen to 625 cars daily. The decrease has come almost wholly from Eastern furnaces, the Western trade holding its own. Cars and labor are plenty. J. A. Strickler, agent of the coke pool, is busy getting matters in shape for receiving and forwarding the pool coke, and our next report promises to see the law of supply and demand strictly observed and a corresponding stiffness in the market.

A re-charter was granted March 20th to the Connellsville Gas-Coal Company, the business office of which is in Philadelphia. The capital stock is \$500,000. The directors are all from Philadelphia, and are C. W. Trotter, Samuel Coffin, H. Nelson Burroughs, J. K. Wheeler, Theodore Kitchen, W. Henry Trotter, Edward J. Till. The company was first chartered in 1864.

The Connellsville Coke and Iron Company has given a mortgage of \$1,000,000 to the Fidelity Insurance, Trust, and Safe Deposit Company, of Philadelphia. The two Leisenring Coke-Works, at one of which the recent mine explosion occurred, are owned by this company. The mortgage covers the eight thousand acres of coal and 800 ovens owned by the company, and was given to secure the bonds issued, which were taken by the Fidelity Company. The bonds bear six per cent interest, and are redeemable either in five or fifteen years. There remains against the Coke Company the mortgage records for purchase-money, nearly \$200,000, and this amount is to be set aside for payment of these mortgages as soon as they become due. It was executed in Philadelphia March 14th, and signed by J. L. Leisenring, of Mauch Chunk, and Stephen A. Caldwell, of Philadelphia, president of the two corporations.

The following properties were recently sold by the sheriff at public sale: All the property of the Mahoning Coke Company, in Dunbar township, consisting of 100 coke-ovens, a large number of tenement-houses, a railroad a mile and a quarter in length, connecting with the Southwest and Baltimore & Ohio railroads, store building, machinery, etc., to John K. Ewing; consideration, \$30,000. The coal used in manufacturing coke at these works belongs to the James Paull estate, and is worked on royalty. To Abram H. Sherrick the interest of A. O. Trustman in the Pennsville Coke-Works; consideration, \$15,040, subject to a mortgage of \$54,000, that Mr. Sherrick himself holds.

WASHINGTON TERRITORY.

A dispatch from Tacoma says that a fire is raging in the Newcastle coal mine, the most valuable of those belonging to the Oregon Improvement Company. The mine has been on fire for eighteen months. The fact that the fire had obtained the mastery over the management had been concealed. It is believed that it will now be necessary to shut down and flood the mine.

WEST VIRGINIA.

The complaint of hard times and little work at the mines is general throughout the Lower Kanawha coal-field. Such dull times have not been experienced since

the panic of 1873. Little or no work has been done at many of the mines this winter. However, since the breaking up of winter weather and the subsiding of the floods, better prospects have dawned. All the river mines are again at work, with nearly their full quota of men, and hopes of a steady run during the spring. The Campbell's Creek Coal Company at Malden has both its mines running, putting out the usual amount of coal. The Dana Brothers' mine is running with its full quota of men, and doing well. The Pioneer Coal Company is also running its No. 1 and No. 2 mines, but has abandoned No. 3 mine. Rumor says that these two mines will be exhausted in three or four months, and that the company will have to cease operations in this field should it succeed in finding more coal about five miles farther up the creek, where it has been prospecting for some time.

After a long dull time and but little work, the mines of the Robinson Coal Company at Coalburg have again started up with good prospects of continuing loading coal both on the river and railroad. Bucks mine is doing very little. The Winifred mines, up Field's Creek, are running steadily. The Straughan mines, opposite Coalburg, are still idle. The Kanawha Cannel Coal Company's mine at Paint Creek is now in full operation, getting out a respectable amount of cannel coal, which is rapidly building up a reputation in the Eastern markets. Heretofore the greater part of the products from this mine has gone West by river. Its introduction in the Eastern market will insure a steady market the year through. Some important changes are making in the management of the works. A stone wall is building to cut off the old portion of the mine that has been on fire for some years from the part in which they are now working, and securing it from future danger. Many improvements will be made to enable them to get out the coal more rapidly as the orders increase. The mine is five miles from the village, on the Paint Creek narrow-gauge road, which company transports the coal at a set price to the river and to the Chesapeake & Ohio Railroad. About 60 men are employed, which force will be increased as trade improves. The company has a fine vein of this cannel coal running from three to four and a half feet, covered with a good vein of splint coal, which is not taken out except in the entries. The Crown Hill Coal Company's mine has again got to work fairly, with prospects for a good spring's run, both by rail and by river.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY—TOMBSTONE DISTRICT.

It is rumored that several of the mines in the vicinity of the Empire and Girard will consolidate and put down a large working and pump-shaft. This would be a good move, as all that ground lying between the Head Center and Tough Nut could easily be drained with one set of pumps.

The pump in the Grand Central mine started up again on the 18th instant, and drained the shaft in five hours. The work of sinking has begun. No further trouble is anticipated in either the Grand Central or the Contention from a flow of water.

GILA COUNTY.

OLD DOMINION.—There are 325 tons of coke en route for the smelters. As the smelters have been shut down for the want of coke, a number of improvements will be made, and the company will prepare for a long and steady run.

GRAHAM COUNTY.

DETROIT.—The foundation-walls for the new plant of this copper company, at Morenci, are about completed, and machinery and pipe are arriving every day. The machinery comes from the well-known Chicago house of Fraser & Chalmers.

YAVAPAI COUNTY.

The coming summer and fall promise, says the *Miner*, to be the most prosperous that Prescott has ever enjoyed. Several new and extensive enterprises are under way, and will, before the close of 1884, be accomplished facts. Of these, two alone—the Walnut Grove placers and Copper Basin—will give employment to hundreds of men for years to come.

CALIFORNIA.

INYO COUNTY.

The late storm has interfered with the mining interests of this county very materially. At Cerro Gordo, the storm was so severe that work on the mines had to be suspended, and much damage was done to other property. The snow on the summit prevents ingress or egress to Deep Springs, Cottonwood Creek, Beveridge, and other districts, thereby stopping a great many mines from working, as no supplies can be got to the mines.

MONO COUNTY—BODIE DISTRICT.

Work at the different mines continues, and since the last report no new developments have been made. The secretary of the Standard Consolidated telegraphs that the indebtedness of the company March 1st, with every thing paid to that date, including dividend paid March 12th, was \$2260.

NEVADA COUNTY.

MAGENTA.—A strike in this mine, which adjoins the Empire, has created great excitement in Grass Valley. For years, the Magenta, like many other mines in this vicinity, lay idle for want of capital to develop, and the present company has been at work about four months.

NORTH STAR.—Arrangements are now under way to reopen this mine, which was one of the best mines at one time, but for eight years has been idle, owing to lack of funds to do the great amount of dead-work necessary.

PLUMAS COUNTY.

PLUMAS-EUREKA.—The Eureka and Mohawk tunnels have been connected. This is said to be important, as it will make a large reduction in working expenses, and will bring the works, to some extent, down the mountain. The Eureka tunnel is now very nearly one mile in length.

SAN BERNARDINO COUNTY.

BONANZA KING.—A telegram from the superintendent states that the west cross cut opposite the shaft on the fifth level has cut a vein of high-grade ore from winze fourth intermediate slope; the northeast end of the same level has developed an extensive body of ore. Four bars of bullion, valued at \$8100, have been shipped.

CANADA.

PROVINCE OF QUEBEC.

A Liverpool cable has just been received in Montreal, announcing the sale of a lot of 1000 tons of Canadian apatite, guaranteed 75 per cent, at 1s. ½d. per unit without rise, to be delivered at Newport. The above figure was offered to a Montreal shipper last week, but he declined to accept it, believing that the order could not be filled at such a low figure.

QUEBEC ASBESTOS COMPANY.—A gold medal has been received by this company as a first-class prize for the finest specimen of crude and manufactured goods shown at the late Boston Exhibition. The manufacture of asbestos is steadily increasing.

COLORADO.

ARAPAHOE COUNTY.

OMAHA & GRANT SMELTING COMPANY.—The company is erecting new brick additions to its present plant for roasting and calcining purposes, and for complete sampling apparatus. These improvements will render this the most complete and extensive smelting plant in the country, and prepare the company to handle refractory as well as desirable smelting ores. So well arranged and varied have been the sources of supply by this company that, notwithstanding the snow blockade, fully two thirds of the amount of ore necessary to keep the works in full blast have been received during the winter, and there is now on hand not less than three months' supply of ore and flux material. The artesian well affords the necessary volume of water for the water-jackets, but as its temperature is not sufficiently low, one pump is kept supplying cooler water to the main tank, from which the jackets are supplied.

CLEAR CREEK COUNTY.

CLEAR CREEK.—This mill, situated at Georgetown, which has been closed for three years, is overhauling and fitting with numerous improvements, calculated to fit it for the concentration of the low-grade ore from the Corry mine. The Krom concentrating machinery is to be used, and the mill will probably be ready to start up in three months.

MATTIE.—It is stated that this mine has at last fallen into the hands of leasers, all but the main shaft, which is worked by the Hoosic Company. The shaft will steadily be sunk one hundred feet below the present level before another level is started.

PAY ROCK.—The building of a tramway from this mine, at Georgetown, has just been commenced. The Hudson patent will be used. The tramway is to be 2181 feet in length, will have a carrying capacity of sixty tons in ten hours, and is to be completed by May 1st. With the completion of this work, Georgetown will have six tramways, all of good dimensions. The first was built in 1868 by Joseph W. Watson.

PELICAN-DIVES.—In the lowest level of the Unicorn lode of this property a fine showing is reported. A large amount of ore is on hand which appears to be of excellent quality.

GUNNISON COUNTY.

CHRONICLE.—This mine has been sold for \$40,000.

LAKE COUNTY.

The *Leadville Herald* reports the following:

CHRYSOLITE AND LITTLE CHIEF.—There is a possibility of a bonanza for both the Chrysolite and Little Chief mining companies, in the large tract of partially explored ground along the line of these properties, and a short distance north of their principal working-shafts.

DENVER CITY VS. ALLEGHANY.—The jury in this case returned a verdict in favor of the defendant for the possession of the ground in conflict. The plaintiff gave notice of a motion for a new trial, and all proceedings were stayed until the hearing of the motion.

FLORENCE.—This mine, on Printer Boy Hill, has opened another ore-body on the same old body in another place. The mine shows at least three thousand tons of fine smelting ore in sight—all carrying considerable gold in addition to its contents of silver and lead.

IRON SILVER.—Bids are solicited by this company from tribute-workers who desire to sort over the south waste-dump of the Iron mine, which is supposed to contain a great deal of paying ore.

MAID OF ERIN.—Since arrangements have been made for working this property through the shaft on the Big Chief, operations have been actively conducted and nearly 200 tons of sand carbonate ore have been extracted. The mine at one point shows sixteen feet of solid sand ore. The horizontal dimensions of the ore body are unknown, although opened for over a hundred feet. There is a streak of ore in the main body, about two feet in thickness, which averages from \$250 to \$300 per ton. A drift is driving along the contact, with the length of the claim, and another also across the claim, from the upper Henriett shaft. When these two drifts are connected, the mine will be worked through the upper Henriett shaft.

MORNING STAR.—Exploration-work has been resumed at the bottom of the McHarg shaft.

SEGUIN.—The litigation that has so long kept this mine idle has been amicably settled, and the mine is now worked under a lease. It is expected that a sale of this property will now be made to Eastern parties. The present owners are Messrs. Tabor, Boettcher, and Hammond.

SILVER CORD.—The production for this month, it is estimated, will reach 2200 tons. The ore that is extracted runs fairly well in lead, and ranges in value, above smelting expenses, from twelve to thirty dollars per ton. A fair idea of the value of the ore now disclosed in the mine may be obtained from the settlements made with smelters during the past three or four weeks. The bulk of the ore shipped during this period was extracted in driving exploration-drifts through existing ore-bodies, and is, therefore, a correct average of what remains. The average is based on fifteen lots of about one hundred tons each, and is \$17.50 per ton above the cost of smelting. The working of the mine will be continued as now until April 1st, when, if no satisfactory understanding is arrived at with the smelters, it will be closed down entirely, and even exploration-work will be stopped. By that time, the company will have all the newly-purchased territory paid for, and about \$20,000 in its treasury, so that it can remain closed for a year if need be without becoming financially embarrassed.

SMALL HOPES.—The Forest City mine, of the Small Hopes group, situated on the lower portion of Yankee Hill, is shipping forty-five tons of ore daily. The first-class ore runs from 95 to 125 ounces in silver to the ton, and the second-class from 59 to 70 ounces.

PITKIN COUNTY.

Reports from Alpen state that, while the mining interests of that section are suffering on account of the snow, the depression will be of short duration. In four weeks, work can be generally resumed. The Louise mine has been forced to shut down, being unable to get timbers to the mine or to ship the ore extracted.

The owners of the Vallejo mine have, it is stated, had an offer of \$75,000 for the property, which they refused. The mine is showing a great deal of high-grade ore, and assays are obtained running up to 17,000 ounces. The property was offered a year ago at \$200, and found no takers. The shaft then was only thirty-two feet deep. Since then, it has sunk an additional depth of forty feet, and encountered the large body of ore now giving it such great value.

SAGUACHE COUNTY.

Several mines have been bonded during the past month—the Arkansas for \$20,000, the Arnedra for \$40,000, and the Wabash for \$50,000.

SAN MIGUEL COUNTY.

SHERIDAN.—This mine, in Marshall Basin, has been sold to a syndicate of English and American capitalists living and doing business in Shanghai, China, \$400,000. The Sheridan mine was one of the early locations in the San Juan country. Its location was made in 1872. The mine is four miles from Telluride and eight miles from Silverton, and has an altitude of about 12,000 feet. Very little development, however, has been done on the property, the total amount

not reaching over 300 feet. The vein is unusually large and very rich. The ore carries on an average 225 ounces in silver, and from one to six ounces in gold. Operations to develop the mine will begin the coming summer, in a vigorous manner. No expense will be withheld to show up the resources, and it is quite likely that works for reducing the ore will be built by the company in close proximity to the mine.

SUMMIT COUNTY.

In addition to the resumption of work at the Vulcan smelter, Kokomo, the concentrating mill and also a sampling mill are to start up early in the spring.

DAKOTA.

FATHER DE SMET.—The report for the week ended March 15th shows ore extracted from the first, second, and third levels, 2090 tons. Ore milled, 2100 tons. Golden Gate south header, third level, advanced 7 feet. Header in 97 feet.

GOLDEN SUMMIT.—The assessment that has recently been levied has not been paid, and consequently work has been stopped at the mines. The developments made have shown favorable results.

MINERVA.—The forty-stamp mill will probably start up the beginning of April.

IDAHO.

ELKHORN.—The lessees of a portion of the Elkhorn ground have begun a suit against I. I. Lewis, manager of the Elkhorn mine, for alleged violation of his contract with the lessees, and for unwarranted interference with them in working the ground which he leased to them. Damages claimed, \$100,000.

VIENNA.—This mill, since it started up last July, has shipped 147 bars of fine bullion, worth on an average \$1500 per bar—or a total of \$220,500 worth of bullion.

MAINE.

The company owning the iron mine at Webb's Mills, Casco, has lately made a large purchase of lumber for building purposes. Active operations will be resumed this spring.

DEER ISLE.—A rumor states that parties in Portland are trying to secure control of this silver mine, for the purpose of working it. The mine has been idle since December, 1882.

DOUGLAS.—The mine is reported to be in good condition; the ore is constantly growing better, and the vein improving toward the west. It is expected that 2000 tons of ore will be taken out this month.

EDGEComb.—This mica company has recently purchased a large tract of land, adjoining its property.

WEST LUBEC.—Work on the new mill at these silver mines is rapidly pushed. Two powerful engines are to be put in, one for hoisting purposes and the other to run the heavy crushing machinery. A large part of the heavy machinery is in and nearly ready to be set in motion. Work on the shaft was to be resumed the present week, giving employment to some forty men, the force to be increased as occasion requires.

MASSACHUSETTS.

MILFORD GOLD MINES.—The mineral belt upon which the present openings are making extends north and south through the towns of Hopkinton, Milford, and probably in other towns. The belt appears to be a little over one mile in width and ten or more miles in length. The ore is a free gold quartz, easily milled, and can be recovered to a large percentage of the assay value in an ordinary stamp-mill. It may be considered of low grade, running from six to twelve dollars per ton, averaging nine dollars per ton. This estimate has been made in the ordinary way of prospecting, namely, by grinding the ore in a mortar and panning it out. Some twenty-five or more pannings have been made by Dr. Rae at No. 7 Exchange place, Boston, and every panning except three has shown gold varying in value from six to twenty dollars per ton. Quite a quantity of the ore is now in Boston. There are from 25 to 30 tons of ore now on the dumps at the mines. A ten-stamp mill will be erected as soon as a sufficient amount of the treasury stock is sold. A company will be incorporated this week.

MICHIGAN.

CENTRAL.—The legal organization of this company expires this year. When the new corporation is formed, it is said the capital shares will be increased from the present number, which is 20,000, to 40,000.

DEER LAKE.—A quartz vein similar to the Ropes has been found two hundred feet west of the line of the latter company's lands.

NATIONAL VS. MINNESOTA.—The *Houghton Mining Gazette* states that the National Mining Company, Ontonagon County, has begun suit against its adjoining neighbor, the Minnesota Mining Company, charging trespass and laying damages at \$100,000. Among the items in the complaint are encroachment on the vein in the mine and injury from water, etc.

NEGAUNEE CONCENTRATING COMPANY.—The indebtedness is said to be \$160,000.

PEWABIC.—At the annual meeting, held at Boston, March 26th, resolutions were introduced authorizing the sale of the mine for a sum not less than \$50,000.

REPUBLIC.—An analysis of ore taken from the incline shaft, which has just been made, gives the following result: Metallic iron, 72.02; phosphorus, .014. This ore being the richest in metallic iron and lowest in phosphorus ever produced by any mine in the district.

MONTANA.

DEER LODGE COUNTY.

CLARA.—The company has contracted for a ten-stamp quartz mill, which will be erected during the present summer. An incline is down 141 feet upon the Last Chance lead, and on the dump are 125 tons of ore that will run from \$50 to \$100 per ton in free gold.

LEWIS & CLARKE COUNTY.

HELENA MINING AND REDUCTION COMPANY.—The increasing output of ore from the mines has made necessary the addition of ten stamps to the mill and one or more water-jacket furnaces to the smelting equipment of the works. The Comet is turning out from the 200-foot level galena ore so rich that it is shipped just as it comes from the mine.

SILVER BOW COUNTY.

ALICE.—Work on the North Star claim is progressing satisfactorily. The shaft is down about 65 feet. Hoisting machinery will be placed on the mine at once and sinking continued until a depth of 400 feet is reached, stations being cut every 100 feet. The ledge is said to be 40 feet in width at the workings.

BELL.—The smelter is making an excellent run on good ore, with sufficient on hand to last for some time yet. At the mine, every thing is progressing favorably, although a full force of men is not worked on account of insufficiency of ventilation and consequent lack of pure air. An uprise from the 400 foot level to connect with the winze from the 300 is prosecuted. As soon as connection is made, thorough ventilation will be procured and a full force of men will be put on. A fine body of good ore is developed for 150 feet on the 400, which preserves its quality and quantity as work progresses.

NEVADA.

EUREKA COUNTY.

ALBION.—Work has been carried on very quietly of late. Several tributaries have been working the mine, and considerable ore has been extracted, and the property has more than paid the working expenses of the company.

BERTRAND.—The mill will be started up in about two months.

EUREKA CONSOLIDATED.—During the last few weeks, several small bodies of ore have been encountered that have produced in the aggregate large quantities of ore. Since the opening up of the ore-body on the 7th level of the K. K., belonging to the Eureka Consolidated, arrangements are making to resume work on the lower levels. The ore-body is developing finely.

STOREY COUNTY—COMSTOCK LODE.

The San Francisco *Bulletin* gives the following table, which is made up from the quarterly returns to the assessor, and shows the output of each mine in 1883:

Mines	Tons.	Average.	Bullion.
Andes	123	\$14	\$1,063
Belcher	12,250	18	219,902
Crown Point	40,474	13	553,622
Chollar	1,008	14	14,026
Confidence	217	13	3,039
Consolidated Imperial	554	14	7,795
Kentuck	11,094	23	267,328
Lady Bryan	300	6	1,800
Monte Christo	931	12	11,379
Ophir	4,680	10	45,040
Potosi	22,058	13	292,708
Savage	118	11	1,358
Union Consolidated	1,164	18	23,821
Yellow Jacket	29,558	15	445,107
Totals	124,599	\$15	\$1,875,547

The only dividend ore in the above mines is from the Kentuck, which paid seven dividends of \$3000 each last year. The total output for the year of all the Comstock mines is in strange contrast with the yield of a single mine eight or nine years ago.

Nothing of importance is to be reported from these mines. The work of opening a station on the 2800 level of Combination has begun. At Gold Hill, the several leading mines are taking out a sufficient amount of ore to keep the mills on the Carson River in constant operation. Plenty of ore will be found to keep the mills going all summer.

HALE & NORCROSS.—The matter of the most importance that the superintendent presents in his report, read at the annual meeting, recently held in San Francisco, is upon the work that has been done and is now doing on the 2800 level, and the prospects there. He says: On the 2800 level, we opened a large working station, sunk 23 feet below it for a sump, and started a double drift southeasterly to connect with the main adit of the combination shaft. The face of the drift is 65 feet from the station, and is in very dry ground. No water has yet been encountered on this level. It is expected that, within the next two weeks, the connection of these two spacious drifts will have placed this level (2800) in corresponding and as favorable a condition as that throughout the 2600 level, and enable us to thoroughly prospect that portion of the ledge, which we already know contains some ore of excellent quality on the 2700 level, with an exceedingly promising appearance of existing in a greater extent on the 2800 level. The new hydraulic pump below the 2800 level is handling the water with ease, and gives satisfaction in every respect. The secretary's report shows a balance on hand of \$896.

WHITE PINE COUNTY.

SWEETWATER.—Eugene N. Robinson has returned from New York prepared with funds to do thorough work on the company's mining property near Hamilton. The Wheeler tunnel has already been driven within the old Hidden Treasure limits.

NEW JERSEY.

DICKERSON.—The Denver *Iron Era* states that a new and promising vein of ore has been discovered on this property, Mine Hill, upon the hill about the old mine. The new discovery has not been fully investigated as to its extent, but the indications point to the belief that the new vein is about sixteen feet wide.

NORTH CAROLINA.

PENNSYLVANIA & NORTH CAROLINA.—This gold mining company has been reorganized. The company owns an extensive tract of land near Charlotte City. The work of development will begin about May 1st, and will be vigorously prosecuted.

UTAH.

FRISCO CONSOLIDATED.—This company has been incorporated for the purpose of purchasing mines in Utah, and operating them; also, for smelting and refining ores and metals. The capital stock is placed at \$2,500,000, in shares of \$10 each. The principal office of the company is at Chicago, Illinois.

BOX ELDER COUNTY.

NORTHERN CHIEF.—This mine is shipping ores regularly. Grading for the mill is about completed, and work is pushed on it.

SUMMIT COUNTY.

EMPIRE.—According to the *Park Mining Record*, operations will be resumed. Mr. Sampson, one of the former owners, and four other capitalists, have put in \$25,000 each, making \$125,000 with which to begin work. This amount of capital is put up for the purpose of fully developing the property, and if more is needed it will be forthcoming. The mine is at present almost entirely free from water, and the cost of pumping, which heretofore was one of the greatest expenses, will be very light. The water which stood in the mine for a long time did very little damage, as there are only two small caves resulting from it, and they can be fixed up at a small cost. Work will be commenced immediately.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

GRANTED FEBRUARY 5TH, 1884.

- 292,781. Hoisting-Machine. William L. Beatty, Harvey L. Beatty, and Alvin O. Beatty, Welland, Ontario, Can.
 292,788. Apparatus for Deoxidizing Iron Ores. John Bridgford, Albany, N. Y.
 292,814. Hydraulic Air-Compressor. Charles Horace Hill, Scranton, Pa.
 292,822. Steam Generator. Thaddeus C. Joy, Titusville, Pa.
 292,828. Mechanical Movement. Michael J. Lawlor, Poughkeepsie, N. Y.
 292,888. Machine for Operating Drills. Morris Cutler Baker and Clarence Edward Baker, Mitchell, Dak.
 292,898. Rotary Steam-Engine. Louis d'André, Riga, Russia, Assignor to himself and Ludwig Loewe & Co., Berlin, Germany.
 292,943. Rolling-Mill. David B. Oliver, Alleghany, Pa.
 292,944. Desulphurizing-Furnace. Henry E. Parson and George V. Northey, New York City, Assignor, by mesne assignments, to Thomas J. Powers, Truette.
 292,957. Apparatus for Producing Compressed Air. Jakob Schweizer, Soleure, Switzerland.

- 292,968. Reversing Mechanism for Rolling-Mills. Thomas A. Weston, Stamford, Conn., Assignor to the Yale & Towne Manufacturing Company, same place.
 293,002. Roasting-Furnace. Newman A. Foss and John M. Gray, Clendenin, Mont.
 293,023. Coking-Furnace. Arthur Richard Baldwin Hiltawski, Zaborze, Upper Silesia, Germany.
 293,047. Milling Apparatus. Frank M. Mackay, La Porte, Ind., Assignor to himself and Edward Morf and Gustav B. Morf, both of Chicago, Ill.
 293,084. Furnace-Blower. Philip Richards, Wilkes-Barre, Pa.
 293,103. Pneumatic Coal Cleaner. Amour Sottiaux, Strey-Bracqueguies, Belgium.
 293,107. Gas-Retort Furnace. Ira N. Stanley, Brooklyn, N. Y., and William A. Steadman, Newport, E. I.
 293,131. Metallurgical Furnace. Jacob Altmeyer, Benwood, West Va.
 293,157. Process of Roasting and Amalgamating Gold and Silver Ores. Ernest Otto Franck, Tupiza, Bolivia, and Carl Francke, Cassel, Germany, Assignors of one third to Charles Adams, Manitou, Colo.
 293,165. Rolling-Mill. Philip M. Haas, Youngstown, Ohio, Assignor of one half to Andrews Brothers & Co., same place.
 293,166. Metal-Drawing Dog. Philip M. Haas, Youngstown, Ohio, Assignor of one half to Andrews Brothers & Co., same place.
 293,167. Machine for Drawing Metal Bars. Philip M. Haas, Youngstown, Ohio, Assignor of one half to Andrews Brothers & Co., same place.
 293,172. Preventing Incrustation in Steam-Boilers. Edward J. Hoffman, Sioux City, Iowa, Assignor of two thirds to William H. Freed, same place, and William H. Ransom, Missouri Valley, Iowa.
 293,176. Metal-Screw Machine. Allen Johnston, Ottumwa, Iowa.
 293,189. Metallic Rod Packing. Edwin Pear Monroe, New York City, Assignor to the United States Metallic Packing Company, Philadelphia, Pa.

GRANTED FEBRUARY 12TH.

- 293,236. Machine for Treating Middlings. James Jones Faulkner and Eliza Taylor Faulkner, McMinnville, Tenn.
 293,243. Direct-Acting Duplex Pumping-Engine. Robert W. Hamilton, Hartford, Conn., Assignor of two thirds to Marshall T. Davidson, Brooklyn, N. Y.
 293,246. Drilling-Machine. Lewis Herrick, New Haven, Conn.
 293,273. Furnace-Grate. John A. Price, Scranton, Pa.
 293,274. Furnace-Grate. John A. Price and Duncan Wright, Scranton, Pa.; said Wright Assignor to said Price.
 293,286. Rotary Fan. Charles E. Tanelus, Chicago, Ill.
 293,289. Metal-Planing Machine. Edward P. Walter and Henry C. Walter, Bridgeport, Conn.
 293,292. Drill-making Machine. Edwin O. Williams, Taunton, Mass., Assignor to himself and Byron L. Dwinell, same place.
 293,360. Driving Mechanism for Fan-Blowers. John R. Rowlands, New York City, Assignor, by mesne assignments, to the J. G. Hoffman Manufacturing Company, same place.
 293,371. Steam Rock-Drill. Amos Stevens and Arthur L. Stevens, Philadelphia, Pa.
 293,378. Ore-Furnace. George B. N. Tower, New York City, Assignor of one half to Edward L. Lambie, Washington, D. C.
 293,405. Pig-Iron Breaker. Theodore A. Blake, New Haven, Conn.
 293,436. Apparatus for Consuming Smoke in Furnaces. James Elliott, Montreal, Quebec, Can.
 293,450. Machine for Drawing Bars. John S. Griffin, Cleveland, Assignor to himself and Mathew Boleyn, Newburg, Ohio.
 293,461. Pump. Nathan Hemenway, Napa City, Cal.
 293,511. Rotary Engine. James H. Phelps, Sharon, Wis.
 293,518. Means for Electrically Locating and Following Veins of Metal in the Earth. Jerome Prince, Milford, Assignor, by direct and mesne assignments, to August P. Lighthill, Boston, Mass.
 293,529. Cutoff-Head. George J. Shiner, Freemansburg, Assignor to Samuel J. Shimer, Milton, Pa.
 293,534. Guard for Molding-Machines. John O. Squires and Joseph K. Shriver, Baltimore, Md.
 293,541. Machine for Making Molds for Castings. Eleazer Thomas, Pawtucket, R. I.
 293,543. Dampier. Robert L. Walker, Boston, Mass., Assignor to the Walker Smokeless Furnace Company, same place.
 293,544. Steam-Boiler Fire-Box. Robert L. Walker, Boston, Mass., Assignor to the Walker Smokeless Furnace Company, same place.
 293,560. Hydrocarbon-Furnace. William H. Brooks, New York City.
 293,585. Oscillating Steam Pumping-Engine. Frank D. Maltby, New York City.
 293,600. Lead Ribbon for Metallic Seals. Elisha C. Sloan, Boston, Mass., Assignor to Joseph H. Chadwick, agent, same place.
 293,611. Feed-Table for Hammering-Machines. W. Dewees Wood, Pittsburg, Pa.

GRANTED FEBRUARY 19TH.

- 293,641. Hydraulic Machinery. William Donaldson, Ambleside, County of Westmoreland, England.
 293,654. Steam-Boiler Furnace. Perry John-on, Cincinnati, Ohio, Assignor of one half to Augustus G. Bofing-r and Lewis G. Hopkins, both of same place.
 293,676. Revolving Cylinder for Furnaces. Sherman Gardner Sackett, Leaver, Colo.
 293,708. Metal-Mold Lubricating Material. Charles F. Brush, Cleveland, Ohio.
 293,709. Process of Casting Metals. Charles F. Brush, Cleveland, Ohio.
 293,710. Mold for Casting Metals. Charles F. Brush, Cleveland, Ohio.
 293,711. Apparatus for Manipulating Molds in Casting. Charles F. Brush, Cleveland, Ohio.
 293,712. Device for Extracting Castings from Molds. Charles F. Brush, Cleveland, Ohio.
 293,752. Covering for Steam-Boilers, Pipes and other Heated Surfaces. Edward Krahenbehl and Paul Rice, Alleghany, Pa.
 293,765. Smoke-Consumer. Thomas J. McLaughlin, Chicago, Ill.
 293,770. Puddling-Furnace. Richard H. Oates, Port Clinton, Pa.
 293,786. Machine for Reducing Ores, etc. George Raymond and Albert Raymond, Chicago, Ill.
 293,787. Machine for Reducing Ores, etc. George Raymond and Albert Raymond, Chicago, Ill.
 293,821. Furnace for Burning Garbage, Roasting Ores, etc. George B. M. Tower, New York City, Assignor of one half to Edward L. Lambie, Washington D. C.
 293,827. Alloy for and Process of the Manufacture of Siliceous Copper and Siliceous Bronze. Lazare Weiller, Angoulême, France.
 293,832. Placer-Mining Machine. Richard V. F. De Guinon, Chicago, Assignor of one half to John W. Parmelee, Englewood, Ill.
 293,880. Alloy for Coating Metals. John B. Jones, Brooklyn, N. Y.
 293,887. Rotary Steam-Engine. Thomas E. Jones, Fairfield, Iowa.
 293,904. Turbine Water-Wheel. William M. Mills, Dayton, Ohio.
 293,933. Boile-Furnace. Absalom Beckus, Jr., Detroit, Mich.
 293,938. Amalgamator. Theodore H. Becker, Central City, Colo.
 293,953. Mold. John T. Copithorn, Boston, Mass., Assignor of one half to Edward H. Studley, same place.
 293,966. Furnace. Kingsbury M. Jarvis, Malden, Assignor to the Jarvis Engineering Company, Boston, Mass.
 293,990. Roller-Mill. Edward Rush Turner and Frederick Turner, Ipswich, County of Suffolk, and James Harrison Carter, London, England.

GRANTED FEBRUARY 26TH.

- 294,002. Apparatus for the Manufacture of Ingot Iron and Steel. John Francis Bennett, Pittsburg, Pa.
 294,003. Hot-Blast Apparatus for Blast-Furnaces. John Francis Bennett, Pittsburg, Pa.
 294,007. Smoke and Gas-Consuming Furnace. Henry M. Brady, Dalton, Ill.
 294,021. Magnetic Iron-Ore Separator. Charles Faber, Brooklyn, N. Y.
 294,123. Tuyere-Pipe. Frederick W. Gordon, Pittsburg, Pa.
 294,130. Hardening and Straightening Iron and Steel Rods. J. Henry Helm, Alleghany, Pa.
 294,157. Ore-Drier and Separator. Albert Senoff, Laramie City, Wyo., Assignor to himself and Francis Mulhern, same place.
 294,192. Milling Cutter. Sidney Broadbent, Scranton, Pa.
 294,223. Brick-Kin. Willis N. Graves, St. Louis, Mo., Assignor of one half to the Hydraulic Press Brick Company, same place.
 294,247. Mining-Machine. James H. McDonald, Worden, Ill.
 294,263. Amalgamator. Austin B. Paige, Chicago, Ill.
 294,284. Amalgamator. Austin B. Paige, Chicago, Ill.
 294,282. Ratchet-Drill. John E. Sinclair, Worcester, Mass.
 294,283. Apparatus for Treating Steel Ingots. George James Snelus, Workington, England.
 294,302. Expandible Drill. Orren Allen, Denver, Colo.
 294,314. Regenerative Hot-Blast Stove for Blast-Furnaces. Benjamin Ford, Middlesborough-on-Tees, and John Moncur, Distington, England.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, March 28.

There was a large falling off in the amount of business transacted in the mining market this week, and there are few items of interest in connection with it. Among the more prominent features was the strong advance in Hall-Anderson and also in Horn-Silver in odd lots. Standard was stronger than last week and closed somewhat firm today. Bulwer was also strong. On the other hand, Bonanza King was somewhat weak, and all the low-priced stocks were on the decline with the exception of Lacrosse. Robinson and Sonora were exceptionally weak, especially the former. To summarize the market, it may be said that it was very dull and almost featureless. The total number of shares sold aggregates 88,036, as against 143,588 last week.

The Comstock shares were quite weak, and were but moderately dealt in. California was quiet, selling from 10@5c. Consolidated Virginia sold at weak prices, under a small business; it was quoted from 13@9@10c. Sierra Nevada declined from \$2.75@2.50, with small transactions. Union Consolidated was moderately dealt in at weak prices, selling at \$2.50 assessment paid, and from \$1.75@1.60 assessment unpaid. Best & Belcher sold at \$2.60. Sutro Tunnel was irregular, under a moderate business, selling from 13@16@14c.

The Bodie stocks were quiet and weak. Bodie Consolidated sold from \$7.89@7.50 under a small business. Standard recorded a fair business, and was very irregular in price; it sold from \$2.30@2.75@2.65. Bulwer rallied slightly and sold at strong prices, with a fair business; it was quoted from \$1.25@1.65@1.50. Goodshaw was strong at 35c., and Tioga sold at 15c.

The Leadville stocks were generally steady in price, but were only moderately dealt in. Amie sold from 8@9c., with a small business. Chrysolite was quiet and weak, declining from 88@82c. Dunkin was steady, selling from 20@23c., with a small business. Hibernia sold from 3@5c. Brece records a small business at steady prices, selling from 24@22c. Iron Silver suffered a slight decline under a small business; it sold from \$1.35@1.25@1.30. Leadville sold at 45c. Little Chief was quiet and steady, selling from 51@50c. Little Pittsburg sold from 36@35c. and was very quiet.

The Tuscarora stocks were very quiet, and prices ruled weak. Grand Prize sold at 5c., assessment unpaid. Argenta sold at 5c. Belle Isle was weak, under a small business, selling from 12@11c. Navajo declined from \$2.90@2.80, and was but moderately dealt in.

In the miscellaneous list, Alice was quiet and strong, selling from \$2.25@2.40. Eureka Consolidated advanced from \$4.50@4.75 with a small business. Father de Smet sold at \$3. Green Mountain was a little weak under a moderate business; it sold from \$2@1.90. Hall-Anderson continues to advance, and this week was quite strong; it was fairly dealt in, and rallied from \$1.40@1.65, closing to-day at \$1.60. Horn-Silver sold at strong prices under small transactions; it was quoted from \$7.25@7.63. Robinson was quite weak and but moderately dealt in; it sold from 29@18@19c. Sierra Grande sold on Saturday last at 75c. Bonanza King was moderately dealt in at irregular prices, selling from \$10@10@10@10.

Central Arizona sold from 21@20c. with a small business. Durango was quiet and steady at 3@5c. Eastern Oregon sold at 4c., under a small business. Harlem was quoted from 6@5c. Lacrosse shows an improvement in price, and was actively dealt in; it advanced from 10@14c. Oriental & Miller sold from 10@11c. Rappahannock was quiet and steady, selling from 17@18c. Sonora Consolidated was very actively dealt in at weak prices; it declined from 9@8@7c.

The following mining companies have been struck from the list at the Mining and Petroleum Exchange: Moose and Elko Consolidated, and those companies suspended from the call were Cherokee, Findley, Gold Stripe, Rising Sun, and Sierra Grande. The reason for the suspension of the latter was, that the company had recently closed its transfer-office in this city.

Some forty-six members of the New York Petroleum Exchange withdrew from that organization this week,

in order to join the Mining and Petroleum Exchange. This, of course, has had the effect of weakening the former and somewhat strengthening the latter; but at the New York Exchange, it is said that new members are taking the place of those who have withdrawn. There is said to be a movement on foot to consolidate the Electric and Manufacturing Stock Exchange with the Mining and Petroleum Exchange, and we hear that petroleum will shortly be dealt in at the former body.

MEETINGS.

The following mining companies will hold their annual meetings for the election of trustees at the times mentioned:

The Franklin Mining Company, No. 19 Congress street, Rooms 11 and 12, Boston, Mass., April 16th, at twelve o'clock M.

The Huron Copper Mining Company, No. 19 Congress street, Rooms 11 and 12, Boston, Mass., April 2d, at twelve o'clock M.

The New River Mineral Company, No. 49 Cliff street, New York City, April 8th, at three o'clock P.M.

Pelican & Dives Mining Company, No. 197 Broadway, New York City, April 1st, at two o'clock P.M.

The Peru Steel and Iron Company, No. 115 Broadway, New York City, April 5th, at three o'clock P.M.

The Total Wreck Mining and Milling Company, No. 18 Broadway, New York City, April 8th, at three o'clock P.M.

The Westmoreland Coal Company, No. 224 South Third street, Philadelphia, Pa., April 2d, at twelve o'clock M.

DIVIDENDS.

The Delaware, Lackawanna & Western Railroad Company has declared a dividend of two per cent upon the capital stock, payable April 21st.

The Derbec Blue Gravel Mining Company, of California, has declared a dividend (No. 2) of ten cents a share, payable March 15th.

The Hope Mining Company, of Montana, has declared a dividend (No. 12) of one dollar and fifty cents a share, payable April 1st, to shareholders of record March 28th.

The Kentucky Mining Company, of Nevada, has declared a dividend (No. 44) of ten cents a share, payable March 19th.

The Mount Pleasant Mining Company, of California, has declared a dividend (No. 5) of ten cents a share, or \$15,000, payable March 31st.

DIVIDENDS PAID BY MINING COMPANIES DURING THE MONTH OF MARCH AND FROM JANUARY 1ST, 1884.

NAME OF COMPANY.	Location of mines.	Paid during month of March.	Since January 1st, 1884.
Atlantic, c.	Mich.		40,000
Bassick, g. s.	Colo.	100,000	100,000
Bodie Consolidated, g.	Cal.	50,000	10,000
Bonanza King Cons. s.	Cal.	50,000	150,000
Bulwer Consolidated, g.			10,000
Calumet & Hecla, c.	Mich.		500,000
Central, c.			40,000
Copper Queen, c.	Ariz.		100,000
Derbec Blue Gravel, g.	Cal.	10,000	20,000
Father de Smet, g.	Dak.	20,000	20,000
Hecla Cons. s.	Mont.	15,000	45,000
Homestake, g.	Dak.	25,000	50,000
Hope, s.	Mont.	12,000	12,000
Horn-Silver, s. L.	Utah		300,000
Idaho, g.	Cal.	15,500	46,500
Iron Silver, s.	Colo.		100,000
Jocuitita, s.	Mex.		50,000
Kentuck, s.	Nev.	3,000	9,000
Lexington, s.	Mont.		80,000
Little Chief, s. L.	Colo.		20,000
Mount Pleasant, g.	Cal.	15,000	15,000
Ontario, s.	Utah	75,000	225,000
Original	Mont.	3,000	9,000
Oro Grande	Cal.		6,000
Osceola, c.	Mich.	25,000	25,000
Oxford, g.	N. S.	5,000	10,000
Plymouth Cons., g.	Cal.	50,000	150,000
Quicksilver, Pref., q.			120,000
Quincy, c.	Mich.		50,000
Small Hopes Con.	Colo.		50,000
Standard, Con., g.	Cal.	25,000	75,000
Syndicate, g.	Cal.	10,000	20,000
United Verde, c.	Ariz.	60,000	60,000
		\$568,500	2,796,500

G., gold; S., silver; L., lead; C., copper; Q., Quicksilver.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows for the week:

The market opened last Saturday at \$1.01½ and

closed at that figure; Monday, it opened at \$1 and closed at 99¾c.; Tuesday, it opened at 99¾c. and closed at 99¾c.; Wednesday, it opened at \$1 and closed at 99¾c.

Thus it will be seen that the market was dull at about 99¾c. to \$1, and was apparently supported at those figures. On Thursday, "they" took out the peg, and the market went down with a crash to 96¾c. at the close, having opened at 99¾c. On Friday, it opened 95¾c. and closed 94¾c., having sold down to 93¾c. The market has been very panicky during these two days, and margins have been swept away. The feeling is not yet composed, and lower prices may yet be attained, but short selling at these figures we would regard as rather hazardous.

There is no news from the field and no thought of it or care for it.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
March 22....	\$1.01½	\$1.01¾	\$1.00½	\$1.00¾	2,300,000
24....	1.00	1.00½	.99¾	.99¾	2,980,000
25....	.99½	1.00½	.99¾	.99¾	2,575,000
26....	1.00	1.00½	.99¾	.99¾	3,063,000
27....	.99½	.99½	.96¾	.96¾	5,905,000
28....	.95½	.96¾	.93¾	.94½	11,195,000
Total sales....					28,027,000

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS.					
	Mar. 21.	Mar. 22.	Mar. 24.	Mar. 25.	Mar. 26.	Mar. 27.
Albion.....	..	..	..	..	..	..
Alpha.....	..	..	..	..	..	..
Alta.....	1½	1½	1½	1½	1½	1½
Argenta.....	..	..	..	..	..	..
Bechtel.....	..	..	..	..	..	..
Belcher.....	.90	..	..	..	..	1
Belle Isle.....	..	..	..	..	..	..
Best & Belcher.....	2¾	2¾	2¾	2¾	2¾	2¾
Bodie.....	7½	7¼	7¾	7½	6¾	7¾
Bullion.....	..	..	..	..	..	..
Bulwer.....	..	..	..	..	..	..
California.....	..	.10	.10	..	.05	.05
Chollar.....	1½	1½	1½	1½	1½	1½
Con. Pacific.....	.40	.40	.45	.45	.40	.40
Con. Virginia.....	.15	.15	.10	.15	.10	.10
Crown Point.....	..	..	1½	1	1½	1½
Day.....	..	..	..	2	..	..
Elko Cons.....	4	..	..	..	..	..
Eureka Cons.....	4	4	4½	4½	4½	4½
Exchequer.....	..	..	..	..	..	..
Gould & Curry.....	1½	1½	1½	1½	1½	1½
Grand Prize.....	..	..	..	..	..	..
Hale & Norcross.....	1½	1½	1½	1½	1½	1½
Independence.....	..	..	..	..	..	..
Martin White.....	..	.65	.75	..	.65	.65
Mexican.....	1½	1½	1½	1½	1½	1½
Mono.....	..	..	..	..	..	..
Mount Diablo.....	..	..	..	..	..	..
Navajo.....	2¾	2¾	2¾	2¾	2¾	2¾
Northern Belle.....	..	..	..	..	..	..
North Belle Isle.....	..	..	..	..	..	..
Ophir.....	1½	1½	1½	1½	1½	1½
Overman.....	..	..	..	..	..	..
Potosi.....	.90	.90	.85	.75	.70	.75
Savage.....	.95	.90	.95	.80	.85	.80
Scorpion.....	..	..	..	..	..	..
Sierra Nevada.....	2¾	2¾	2¾	2¾	2¾	2¾
Silver King.....	..	..	..	..	..	..
Tip Top.....	..	..	..	..	..	..
Union Cons.....	1½	1½	1½	1½	1½	1½
Utah.....	1½	1½	1½	..	1	..
Wales Cons.....	..	..	..	..	..	..
Yellow Jacket.....	2½	2½	..	2	2	2

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, March 27.

The market for copper stocks continues dull, and, with the single exception of Calumet & Hecla, prices are unchanged. There is no speculative activity, and about all the business doing is confined to the two or three leading dividend-paying stocks, and they fluctuate in price according to the law of supply and demand. Last week, Calumet & Hecla was dull and heavy, and a small lot of stock put upon the market, in the absence of orders, caused a decline of \$9 per share. This week, there has been a better demand, and in the early dealings it fully recovered the decline, selling at \$236, but later sales were made at \$235, and it is now offered at that price. About 100 shares were sold at these figures. Franklin declined \$½, with sales of small lots at \$11@11½. Quincy was very steady at \$45, but there is no activity. Osceola declined from \$16½, March 13th, to \$15½ on sales of less than 25 shares. A small lot of Pewabic sold at \$1½@1½. The annual meeting of this company occurred yesterday, and resulted in the re-election of the present management by a vote of about

four to one. The opposition labored under considerable disadvantage in not having access to the stock-books. The charter of the company having expired, it will be reorganized as the Pewabic Copper Company, with the same share capital as at present, namely, 40,000 shares. Allowances sold at \$1½. Huron, \$1½. Ridge, 50c. The rest of the list was entirely neglected.

In silver stocks, Catalpa advanced from 35 to 40c. Bonanza Development sold at \$1½. Silver Islet, at 10c.

At the Mining Exchange, there is no improvement to note in mining stocks, but rather a tendency to depress prices. Bowman sold at 14c., with 13 bid. Empire was offered at 19c., no takers. Dunkin, 22 @ 24c., no sales. American Electric Light and Illuminating Company is firm at \$4½ @ \$4¼, sales, with \$4 bid for large amounts. The Water Meters are a little off from the highest prices. Standard sold at \$1½, but is now offered at \$1¼. New England sold at 60 @ 65c., but later at 40c., and is offered at 50c. Much higher prices are promised for these stocks in the near future.

3 P.M.—At the afternoon Board, Calumet & Hecla declined to \$234. Huron sold at \$1½. The rest of the list was unchanged, the market closing dull and lifeless.

BULLION MARKET.

NEW YORK, Friday Evening, March 28.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 3 per cent. During the week, the bank lost £229,000 bullion, and the proportion of its reserve to its liabilities was raised from 47 1-16 per cent to 47 3-16 per cent, against 38½ per cent at this date last year. The weekly statement of the Bank of France shows an increase of 8,650,000 francs gold, and an increase of 110,000 francs silver.

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of February.	Year from Jan. 1st, 1884.
*Alice, g. s.	Mont.	\$110,540	\$209,296
*Belmont	Mont.		8,081
Bodie, g.	Cal.	32,683	62,683
*Bonanza King, s.	Cal.	42,039	48,317
*Boston & Montana, g.	Mont.	25,498	76,699
*Chrysolite, s. l.	Colo.	10,285	16,255
*Consolidated Bobtail, g.	Colo.	8,242	16,411
*Contention, s. o.	Ariz.	59,853	140,292
*Deadwood-Terra, g.	Dak.	42,483	89,679
*Derbec Blue Gravel, g. s.	Colo.	6,045	19,668
*Father de Smet, g.	Dak.	31,082	56,177
Grand Prize, s.	Nev.		25,000
*Hecla Cons., g. s. l.	Mont.	\$77,063	162,178
*Homestake, g.	Dak.	96,356	200,587
*Hope, s.	Mont.	15,433	15,433
Horn-Silver, s. l.	Utah.	150,060	324,000
*Iron Silver, s. l.	Colo.	66,887	125,882
*Kentuck, g. s.	Nev.	4,223	8,033
*Lexington, g. s.	Mont.	90,956	201,402
*Little Pittsburg, s.	Colo.	9,377	17,965
Moulton, s.	Mont.	60,000	122,000
*Mount Diablo, s.	Nev.		24,820
*Navajo, g. s.	Nev.	43,033	71,843
*Ontario, s. l.	Utah.	174,902	338,478
*Oxford, g.	N. S.	3,500	7,160
*Plymouth Consolidated, g.	Cal.	84,063	186,501
*South Yuba, g.	Cal.		2,040
Standard Cons, g.	Cal.	3,818	3,818
*Syndicate, g. s.	Cal.	14,624	29,859
*Tombstone, s. l.	Ariz.	49,713	122,756
Total amount of shipments to date.....			\$2,783,343

* Official + Assay value ‡ Not including value of lead. G. Gold; S. Silver *L. Lead.

METALS.

NEW YORK, Friday Evening, March 28.

Copper.—To-day, there is a slightly better feeling, and it would probably be difficult to obtain small lots at less than 14½c. for Lake, which has been slightly shaded in one or two instances during the past two weeks. We quote Lake 14½ @ 15c., though it should be stated that the quantities available at the lower figure are probably small. They represent merely the Lake copper sold by consumers who have bought other brands to cover a part of their needs. A rumor is current that 50,000 tons of Lake copper have been placed abroad at 13½c., but we are unable to trace it to any authoritative source.

The latest English cables are slightly more favor-

able, Chili Bars being £54. Best Selected was quoted last by cable £61.

The January returns of our Bureau of Statistics show the following figures:

Imports of Copper, January.		
In ore, pounds.....	1884.	1883.
	222,748	?
Pig and ingot, pounds.....	4,370	72,175
Exports of Copper, January.		
Ore, tons.....	1884.	1884.
	1,265	468
Ingot, bars, and old sheets, pounds	{ 115,409 }	205,007
	{ 2,066 }	

Tin.—The market was fairly active, and at one time during the week went up as high as 18½c. for jobbing lots. It has however, since receded to 18'30c. for large lines, spot Straits. England cables last £83 5s.

Lead.—The market has been dull, the only transactions being a few hundred tons of hard Missouri lead at 4'10c., which came in in consequence of the reduction of freights. There is some lead seeking buyers at 4'10c., though the principal holders are still firm are at 4'15c. Consumers appear to be quite well supplied for the immediate future.

From St. Louis, Messrs. John Wahl & Co. telegraph us as follows to-day:

Our market is sluggish, the demand being extremely light and prices almost nominal. We may quote both Hard and Soft Lead 3'85 @ 3'90c. Receipts during the week foot up to 320 tons. Freight from East St. Louis to New York are 23 cents.

Messrs. Everett & Post, of Chicago, telegraph us:

Our market is quiet and dull, with prices unchanged at nominally 3½ @ 3'90c. The demand is moderate only, and there is very little doing.

Spelter.—This metal continues in a strong position, being firm at 4'60c. for ordinary Domestic, though little is done. English cables £14 10s. for Silesian spelter, equivalent, including commissions, to 4'95 @ 5c.

The January imports of spelter were 753,466 pounds, against 1,116,740 pounds in January, 1883.

Antimony.—With a full visible supply, the market continues quiet, with quotations at 11c. for Hallett's, 11½c. for Cookson's, and 10½c. for Pontifex.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, March 28.

According to the British Board of Trade returns, the shipments from England to this country in February were as follows:

ARTICLE.	Month of February		
	1884.	1883.	1884.
Pig	Tons. 10,969	Tons. 18,907	Tons. 10,670
Bar, angle, rod, etc.	233	1,197	457
Railroad, all	3,766	5,017	1,845
Hoops, sheets, plates, etc.	493	2,646	614
Tin plates	17,274	14,660	15,796
Cast or wrought	302	235	244
Old	3,626	2,190	2,102
Steel, unwrought	896	4,349	1,267
Steel rails	3,621	3,037	1,713

The Bureau of Statistics has published its January figures, according to which the imports of iron and steel were as follows:

Imports of Iron and Steel in January.		
	1884.	1883.
Iron ore, gross tons.....	52,676	40,549
Pig-iron, ".....	15,631	26,693
Wrought and cast-iron scrap, gross tons.....	2,416	10,127
Steel scrap, gross tons.....	1,350	?
Bar iron, net tons.....	3,839	4,062
Hoop, band, and scroll, net tons.....	31	189
Sheet, plate, and taggers, ".....	602	490
Tin-plates, net tons.....	16,703	18,920
Cotton ties, ".....	603	?
Steel hoops, bands, strips, sheets, and plates, net tons.....	149	?
Wire rods, round, in coils, iron, or steel, net tons.....	8,760	?
Wire and wire rope, net tons.....	395	?
Anvils, axes, and forgings, ".....	86	?
Chains, net tons.....	146	?
Steel rails, gross tons.....	26	6,400
Steel ingots, blooms, billets, and bars, gross tons.....	2,060	?

American Pig.—We can not trace any growing buying movement, though any concession would probably bring into the market large orders now withheld. Business is still restricted to the absolute daily wants. On the other hand, there is no anxiety to sell, and consumption and production appear to be so closely balanced that any increased demand would

stiffen prices, though the reserve capacity would not admit of any pronounced movement.

We quote No. 1 Foundry at \$20.50 @ \$21; No. 2, \$19 @ \$19.50; and Gray Forge, \$17.50 @ \$18.50. There have been no sales of Bessemer pig, which remains quiet at \$20, and 20 per cent Spiegel has sold in round lots at \$28.50 @ \$29 ex ship. Ferro-manganese, 45 per cent, is worth \$45.

At the Metal Exchange, the following transactions were recorded: Saturday, 500 tons pig-iron certificates, June, \$18.50; and to-day, 100 tons No. 1, short notice, \$19, and 100 tons April, \$19.

Scotch Pig.—The market is very quiet, and very little business is doing. Importers are firm, though occasionally small lots on the dock are placed at lower figures.

We quote ex ship and to arrive: Coltness, \$22.50 @ \$23; Langloan, \$22.25 @ \$22.50; Summerlee, \$21.50; Dalmellington, \$20.75; Gartsherrie, \$22 @ \$22.50; Eglinton, \$20.25; and Glengarnock, \$22 @ \$22.25.

At the Metal Exchange, the following cable quotations have been received: Coltness, 57s. 9d.; Langloan, 54s.; Summerlee, 52s.; Gartsherrie, 52s. 6d.; Glengarnock, at Ardrossan, 51s. 6d.; Dalmellington, 48s. 6d.; and Eglinton, 46s. Warrants are quoted 42s. 5d.

Rails.—There have been sales of round lots at concessions.

Old Material.—The market has been a little more active. We quote \$21 @ \$21.50 for Ts.

Philadelphia.

March 28.

[From our Special Correspondent.]

Pig-Iron.—Comparing the movement in pig-iron for the past week with that of other weeks since the 1st of February, a decided improvement is to be observed, especially in gray forge. More inquiry has been developed for Southern irons especially, and several contracts have been placed for future delivery. Prices are \$17.50 @ \$18. Much more Southern iron could be sold if it could be had; but the general position is unchanged. Mill-owners are more willing to buy a little ahead now than they have been. There is no possibility of any further weakening in prices. The demand for refined iron is not very heavy, but there is a heavier movement, especially in the standard brands of forge. Inferior brands have been offered, in a few cases, at very low prices. The best brands are in moderate demand. Inquiries are in the market for 1000-ton lots and for a few larger lots. Most of the sales made are in from 100 to 500-ton lots. There is a probability of an improving demand throughout April, but leading brokers say that they have no hopes of better prices. Production is very carefully gauged to the market requirements. No more furnaces will blow in than blow out, as there is no inducement to increase production. Two or three speculative inquiries have been heard of, but sales have not been made, as the offers were below cost. Most of the producers are strong, and are pursuing a conservative course, not being obliged to crowd the market to get money. The tariff agitation in Congress has had its weight in an indirect way. But for this, production would have been slightly increased long ago. As soon as makers are satisfied that there is no danger of a reduction, an increase will be made in the output. Foundry irons are likely to remain where they are for some time to come. Prices are \$20 @ \$21, with \$20.50 as an average selling price. No. 2 is very dull and hard to move at any price. The usual price is \$19; some has sold at \$18; and the tendency is downward.

Foreign Irons.—In foreign irons, there is very little to report; \$20.50 is the lowest quotation for Bessemer. A good deal of Bessemer would sell at \$19.75 and \$20. There are inquiries in the market, and offers which, if accepted, would lead to sales of 20,000 tons, and perhaps more. Spiegeleisen is fluctuating. There is a good deal of inquiry, but sales aggregate very little. The ordinary quotations are \$29 @ \$30 for 20 per cent ferro-manganese, \$45 for 45 per cent.

Muck-Bars.—Sales of Muck-Bars have been made as low as \$31.50 for ordinary and as high as \$33 for best. Offers for 1000 or 2000 tons are in hand, but are very low.

Blooms.—Charcoal blooms are very dull at old prices.

Merchant Iron.—Manufacturers in the city are

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DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (March 22-28), SALES. Lists various mining companies like Alice, Annie, Argent, etc.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (March 22-28), SALES. Lists various mining companies like Albion, American Flag, Barcelona, etc.

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 47,861. Non-dividend shares sold, 40,175.

BOSTON MINING STOCKS.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (March 21-27), SALES. Lists various mining companies like Allouez, Amie, Atlantic, etc.

PHILADELPHIA MINING STOCKS.

Table with columns: NAME AND LOCATION OF COMPANY, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (March 21-27), SALES. Lists various mining companies like Amer. Cons., Argent, Arizona, etc.

doing a quiet business, and representatives of country mills give a similar report. There is nothing in the market to induce consumers to buy much more heavily than they have been doing since the opening of the year. Small lots, 2c. Large lots can be had at 1.90c. and 1.80c. has been accepted where the quality was not assured. Store lots have sold at 2.10c. Common iron has sold at from 1.65@1.90c., according to quality. The latter price has been paid for good Common in one or two country mills. There is an improving machine-shop demand for iron and steel.

Plate and Tank Iron.—Leading plate makers report a better demand, made up of trifling orders. No large orders have been placed, but there are offers in hand which will probably lead to business, if buyers' offers are accepted. A good many large requirements are in sight, but consumers are not disposed to place them, except at concessions which makers are not disposed to make at present. But the probabilities are, that the plate-mills will have enough work to keep them busy throughout the spring and summer. Negotiations are pending for deliveries to be made in this State and New York.

Sheet-Iron.—Galvanized iron is stronger, in view of the heavy season demand now due. Thin sheets have been moving slowly at concessions on large lots, but firm prices for small lots. A large amount of sheet-iron will be wanted in April, especially of heavy, as consumers are very short of material.

Structural Iron.—Although structural mills are not fully employed, having considerable capacity disengaged, yet several mills farther West are preparing to put up machinery to make shapes. This has been done in the American Iron-Works at Pittsburg.

Steel Rails.—Quotations are unchanged. Buyers are taking small lots at \$35, and large lots could be had at \$34. The Bethlehem Iron Company is making 76-pound rails. The Pennsylvania Steel Company is making 70s. Good authority states that there are inquiries in hand for about 75,000 tons of rails, but there is no immediate probability of their being placed. The rumors of sales having been made at \$33@33.50 have not been verified.

Old Rails.—Small lots of old rails have been selling at \$22.50@23. Large lots are wanted at \$22, and \$22 shaded; \$21.50 would sell large lots of foreign, and that figure has been bid for American. Double-head rails are quoted at \$23.50@24; no sales.

Scrap.—Crop-Ends, \$20 bid; No. 1 Wrought Scrap is in light stock, and commands \$24 for best. Cargo is nominally \$22; no sales.

Pittsburg. March 27.

[From our Special Correspondent.]

The iron trade of this section has shown a slight improvement in activity within the past three or four days. Only small lots of material are called for, and prices have not improved, but the movement is livelier and inquiry is increasing. Neutral mill irons have sold more freely than other kinds of pig at \$17.25@18. Foundry grades are quoted as usual, at from \$18@21 for Nos. 2 and 1. Bessemer pig has sold in small lots only, and is quoted at \$20@21. Muck-Bars can be bought all the way from \$31@32, with the latter figure held firmly for good makes. There is nothing new in steel rails. The mills are busy, but are not booking any large orders. Prices are still nominally \$35 at mill. Old rails would sell in large lots at \$23, but \$23.50@24 is asked, and sales are very light. Merchant steel, nails, bar, sheet, wrought pipe, and rail, road track supplies are moving more freely, although large orders are still withheld. Nails have been quoted at \$2.40@2.50, with one or two sales reported at \$2.35.

Wages have been reduced in a number of the pits of the first and second pools of the Monongahela, and some of the men are at work at the reduction, and all will probably accept. The railroad coal trade tribunal met on Monday, and decided on a sliding scale to govern the wages of miners during the coming six months. The long-talked of coke pool has at last been arranged. All the operators are now united, and production is to be regulated and prices advanced to about \$1.50. It is predicted that, before very long, all the ovens in the Connellsville region will be at work.

The striking puddlers at the Elba iron-works have resumed. The troubles at Singer, Nimick & Co.'s

mill have not been settled, and a strike will probably be inaugurated.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, March 28.

Anthracite.

We are passing through the usual lull following the announcement of opening prices, and, so far as we can learn, the only business doing is that forced by concessions. The market is very quiet, and is temporarily laboring under the uncertainty of what is to be done in the near future. There is a strong feeling that half-time work should be continued during April; and if the condition of the trade alone is made to guide the decision of the companies, we are convinced that they can not help acknowledging its necessity. A decision on this point is expected to-morrow. Should those prevail who desire to run the collieries full-time, then there seems no other prospect but a decline in values, as the market has all it can do to absorb the present tonnage. How matters will shape after the opening of navigation, when the "boundless West" is ready to take the predicted heavy amounts of coal, is quite another matter, but until then, half-time work should be the order of the day. Prices are about \$3.90@4 on board for stove coal.

Bituminous.

The struggle for the steamship business has begun, and promises to be fierce. We understand that the coal shipped via the Rochester & Pittsburg Railroad and Erie Canal is making a sharp struggle for recognition, and is offered at \$3.30 on board, while Clearfield coal is quoted \$3.35@3.45. In the Clearfield region, a reduction of wages from 50 to 40 cents per ton has been posted, which may lead to a temporary suspension of mining. It does not seem to affect the market in any way, the low prices named being the basis of contracts for season delivery.

Philadelphia. March 28.

[From our Special Correspondent.]

It is too soon after the announcement of spring prices to expect a very heavy demand for anthracite coal. The only business that is coming to hand now is in small lots for immediate shipment. The large consumers are purchasing in a small way, being unwilling to place heavy requirements at present prices, for the reason that they expect a decline in price; or so it is given out. The representatives of the coal interests think otherwise, and are satisfied that consumers, large and small, will find it to their interest to come in and purchase in a short time. A good many inquiries for large lots have been received, and stocks in consumers' hands are light. Most of them will be obliged to purchase, at least for current requirements, even if they do not anticipate heavily. Freights are very irregular, for the reason, it is said here, of the competition of barges at New York, which, being unable to find business in grain, are carrying coal at nominal rates and competing with the steamers, which can not carry coal to New England at such low prices. This matter will be settled in a few days. This fluctuation in freight rates, besides the uncertainty as to the permanency of prices, has had a good deal to do with the backwardness of demand. It is definitely given out that there will be full-time for the present; but it is not known how long it will last. The Reading is willing to make full-time for a month. The other companies have not announced what plan they would prefer to follow. The fact that the requirements of the country are very heavy is a strong feature in the market, and the most conservative in the trade regard prices as likely to remain where they are. There is some shading and cutting in prices of inferior coals. The manufacturing demand of Eastern Pennsylvania is still backward, owing to the belief among consumers that prices will break. But the operators say that the trade is in excellent shape. A great deal of complaint has been made by the miners, who have suffered considerably from their partial idleness. The employment of foreigners recently arrived has furnished occasion for some complaint among the old miners. Steps have been taken for the formation of a union of some sort, but managers believe that the present discontent will disappear as

soon as full-time is resumed. Some of the larger manufacturers in Eastern Pennsylvania have been making inquiries for summer supplies, but no large contracts will be placed for a week or two.

Bituminous operators are making very unfavorable reports of the present and prospective condition of the trade. More or less inquiry is received from Eastern consumers, and negotiations are pending, through Boston agents, for bituminous deliveries through the spring, but nothing definite can be said regarding them at present. The Clearfield operators are unable to meet the cutting competition of the Cumberland miners, and say that something must be done to protect the Pennsylvania coal interests. The line trade shows some signs of revival, consumers of bituminous coal being low in stocks. The opening of the Schuylkill Canal has not resulted in any large business as yet. All the canals will be opened by April 1st.

Pittsburg. March 27.

[From our Special Correspondent.]

The chaotic state of the trade at this point, referred in my last, is fast coming to an agreeable end. The present week has been a notable one in respect to the adjustment of labor difficulties that a few days ago threatened to seriously affect both the river and railroad coal trade here.

In the first place, the railroad miners on Tuesday, through their representatives in the Trades Tribunal accepted a 3 per cent rate and a sliding-scale. This scale begins with \$5.75 per 100 bushels on the wall at Union Depot (the present selling price), at which price mining is to be 3 cents. To this decision, a minority of both miners and operators objected, and as no umpire will be called upon, there may be some trouble, but not a general one. The new rates go into effect May 1st, and give the railroad operators something tangible to work upon in making lake and other contracts. These gentlemen are now busy on this agreeable work; but as yet I learn of no contract secured. Prices remain nominally 6 cents on the wall; but in reality 5½ cents is the price at which most transactions are made. Mill demand is good in districts where natural gas has not yet penetrated. The new fuel is really a serious matter for some operators. In one mill, devoted to the manufacture of railroad supplies, a coal bill representing from \$30,000 to \$35,000 is absolutely wiped out; for not a pound of coal is used in the establishment, even the office fires being supplied from the Murraysville gas-main. The product of the mill is meanwhile increased in quantity and quality, and the wages of a score of firemen, ash-haulers, etc., dispensed with. At the Edgar Thomson Steel-Works, the use of gas has done away with coal in the furnaces under 94 steam-boilers, and the rail product increased 20 per cent by reason of steady, reliable steam pressure, no burning of boilers, stoppage for repairs, etc.

On the river, the change for the better is equally satisfactory. At a mass-meeting held yesterday at West Elizabeth, second pool, the miners accepted the reduction to 3¼ cents, and work is now going on in nearly all the pits, except one in the second pool where the diggers are out against a reduction to 3 cents. Present rates for river digging are now in the first, second, and third pools, 3¼ cents; in the fourth pool, 2¾ cents; the latter being due to the thicker vein, purer coal, and increased lockage on coal to the open river at this city. Prices along the river are very unsatisfactory, sales at Cincinnati of second pool at 7 per cent four months being reported equal to 6¾c. for cash, or thirty days. The same depression exists at all lower ports, due to large stocks and a continuance of good shipping stage of water. There is little coal afloat here, as it is shipped as fast as tow-boats return from below.

Coke as yet is unchanged as to price, but the outlook is encouraging, and operators, having agreed on the mutual plan already referred to, look for an advance of from 10 to 15 cents a ton on or about the 1st prox. Present demand, 700 cars daily, with prices steady at the old figures, \$1@1.25 per ton, free on board.

Buffalo. March 27.

[From our Special Correspondent.]

The mild weather and heavy rains have had a good effect on the ice, and the prospects are promising for an earlier opening than was at first expected.

Belvidere-Deiaware Railroad Report for the week ended March 22d:

	Week.	Year. 1884.	Year 1883.
Coal for shipment at Coal Port (Trenton)	389	423	4,359
Coal for shipment at South Amboy	8,440	114,814	172,404
Coal for distribution	12,939	180,110	186,619
Coal for company's use	2,813	43,475	37,013
Total	24,581	338,822	400,395
Increase			
Decrease		61,573	

Comparative Statement of the Production of Bituminous Coal for the week ended March 22d, and year from January 1st:

	1884.		1883.	
	Week.	Year.	Week.	Year.
<i>Cumberland Region, Md.</i>				
Tons of 2240 lbs.	49,022	393,348	44,013	403,051
<i>Barclay Region, Pa.</i>				
Barclay RR., tons of 2240 lbs.	9,567	81,479	5,832	80,463
<i>Broad Top Region, Pa.</i>				
Huntington & Broad Top RR., of 2240 lbs.	3,937	42,322	2,600	52,628
<i>Clearfield Region, Pa.</i>				
Snow Shoe	4,830	57,217	4,536	61,974
Tyrons & Clearfield, 56,937	606,785	61,788	635,177	
<i>Alleghany Region, Pa.</i>				
Gallitzen & Mountain	4,054	101,712	7,873	133,187
<i>Pittsburg Region, Pa.</i>				
West Penn RR.	5,025	78,951	10,715	117,642
Southwest Penn. RR.	2,279	37,394	2,303	31,176
Pennsylvania RR.	4,611	61,654	12,205	122,984
<i>Westmoreland Region, Pa.</i>				
Pennsylvania RR.	22,960	276,992	26,906	326,342
<i>Monongahela Region, Pa.</i>				
Pennsylvania RR.	3,285	39,453		
Total	168,507	1,775,207	178,708	1,964,624
Decrease		189,417		

Comparative Statement of the Transportation of Coke over the Pennsylvania Railroad for the week ended March 22d, and year from January 1st:

	1884.		1883.	
	Week.	Year.	Week.	Year.
<i>Gallitzen & Mountain (Alleghany Region)</i>	2,629	30,441	2,475	27,821
<i>West Penn. RR.</i>	323	23,355	1,881	23,680
<i>Southwest Penn. RR.</i>	43,399	478,732	38,874	433,684
<i>Penn. & Westmoreland Region, Pa. RR.</i>	3,758	45,736	4,385	56,139
<i>Monongahela Penn. RR.</i>	2,135	16,381		
<i>Pittsburg Region, Pa. RR.</i>		102		230
<i>Snow Shoe (Clearfield Region)</i>	513	5,874	305	3,375
Total	52,757	600,621	47,920	545,029
Increase		55,592		

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