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A RECENT dispatch from Philadelphia indicates that a lively war between Messrs. GOWEN and BOND is probable at and previous to the next annual election of the Reading Company.

THE advocates of bi-metalism, who have wisely kept very quiet after the Monetary Conference fiasco, are now beginning to stir abroad, and in the journals devoted to this cause are loudly proclaiming the adoption by all civilized nations of a fixed ratio between gold and silver to be the only remedy against such dangers as the recent gold drain to this country. We fear that they clamor in vain.

AS FORESHADOWED by earlier dispatches, the Scotch iron-masters have concluded at a meeting at Glasgow recently to reduce the make 12½ per cent for six months. As telegrams from Scotland announce, the price of pig there has gone up, and in sympathy with it holders here are asking more. The step of the Scotch makers is a significant one, and the movement there will no doubt give some relief to our own producers.

THE contest between the miners of the Connellsville coke region and the colliery owners is full of significance. The former carried their point of increasing the rate of wages from 3½ to 4 cents per bushel, but professed to be exceedingly indignant when the latter ran up the retail price to 11 cents. The miners' threat of asking more if the selling price was not carried back to former figures was met with the reply that if forced to pay more the collieries would demand 14 cents from consumers. The latter will probably look upon this noble championship by the one party

and the savage determination of the other party with a feeling of help-less mortification.

WE begin in this issue the publication, monthly, of a SUPPLEMENT, in which particular attention will be given to all matters directly or indirectly affecting our growing coal trade. We shall follow closely any developments in its various branches, and shall endeavor, with the aid of our special correspondents, to present at regular intervals as full and exhaustive a review of the local trade movements of the various sections as possible. The prosperity of our collieries is so closely dependent upon the welfare of our various industries, and the latter are so much influenced by the fortunes of the former, that consumers as well as producers have a strong interest in obtaining a clear insight into the situation of the trade.

THE position of the manufacturers of Bessemer pig is rather a difficult one. In the East, they must meet the severe competition of their English rivals, who do not pay more duty on the higher grade of metal than the makers of ordinary Cleveland or Scotch pig. The English producers largely get their ore from the same sources, while it enters their ports duty free. In the West, makers pay toll to the mine-owners of Lake Superior, who apparently extort all that the trade will bear, and something more occasionally. To complicate the matter, consumers are very exacting in their requirements as to quality. Many or almost all of the Bessemer steel works make a large portion of the pig they use themselves, and it is stated that they are not very particular as to the quality of the ores they use, so that the phosphorus will run higher in their own metal than they dare use. In order to bring their mixtures within safe limits, they insist upon high quality in the pig they purchase. On the whole, therefore, the Bessemer pig manufacturer's "lot is not a happy one."

AMONG the many schemes resorted to in Great Britain to prevent litigation under the Employers' Liability Act, the mutual assurance societies of employers are of considerable interest, as they are formed by them alone for their own protection. The two most prominent societies of this kind organized are those of the Iron Trades Employers' and the Master Builders' Association, both of whom have based a system of premiums for a mutual assurance fund upon what appear to be very careful and accurate calculations. The first-named body has founded its rates given below upon a consideration of returns of accidents in the three years from 1877 to 1880, obtained from members who in the aggregate give work to nearly 30,000 men in the engineering, ship-building, iron founding, and machine trades. There were 39 fatal accidents, or 13 per annum, and 2002 minor accidents, or 667 per annum, among employés numbering 29,430. It has been concluded to fix a premium of 2s. per cent upon the amount of wages paid annually to machinists, 3s. per cent for engineers generally, founders, millwrights, tool-makers, locomotive-makers, boiler-makers, etc., and 4s. per cent upon the amount of annual wages paid to ship-builders, the average wages of these classes per week being 22s., 25s., and 25s. respectively. It is estimated that as much as 75 per cent of the accidents reported are directly attributable to the carelessness of the workmen, and would not fall within the Employers' Liability Act, and the premiums noted above have been scaled accordingly.

AN important step is to be taken by the various trades-unions of the country. A call has been issued for a trades-union congress to be held at Pittsburg on the third Tuesday of November. As an additional movement in the direction of a consolidation of labor, it possesses more than ordinary interest. Some of the organizations which are to take part in the proceedings have already shown how much power for good or evil they possess, and there has been a noticeable improvement in their tone of late years. Still much remains to be done, and probably much suffering will have to be gone through before the trades-unions, their leaders and their members, come to a realizing sense not only of their powers, but of their responsibilities. That they do not as yet appreciate either, their course in many instances recently has shown, and therefore, there is an element of danger to industry in the formation of a powerful organization which it would otherwise not possess. On the other hand, the representatives of the laboring classes will be able to prove how much they have done of late in organizing; and if it does nothing more, the congress may show to many engaged in industrial pursuits, and to the public in general, the fruits of a movement that has been gaining strength steadily and rapidly. If it is the intention of the congress to foster a war-like spirit, it has mistaken its mission at the outstart, and is likely to complicate troubles that even now are serious enough. Let it try to teach the workmen of the United States their responsibilities as well as their power, and it will obtain the recognition instead of feeling the antagonism of the public.

WE print elsewhere a letter from Mr. W. A. SWEET, which is of interest, particularly as it represents a side of an old controversy which is

rarely heard from. In explanation of his communication, we may briefly recite the facts in the case to which he alludes. Some time since, a jury of the United States Circuit Court, after hearing elaborate expert testimony, decided that certain mild open-hearth metal imported into Boston should be classified as iron, as claimed by the importer, and not as steel, as held by the custom-house officers, and that the amount of duty levied should be determined accordingly. As the difference between the amounts is very large, considerable manufacturing interests are therefore dependent upon the settlement of the question how this metal ought to be classified. From what has been elicited in regard to the Boston case, the jury has been chiefly swayed by the consideration that the mild metal did not "temper" or "harden," and did not therefore exhibit what is popularly regarded as one of the chief characteristics of steel. Producers have been accustomed to call the product of the open-hearth furnace "steel," irrespective of its mechanical properties. Mr. SWEET insists that it is iron, and from the consumer's stand-point it practically is. But we fear that when it comes to drawing the line between iron, as not hardening, and steel which hardens, Mr. SWEET will find that his test based upon the applicability of the metal to various practical purposes will desert him. What may be "steel" for one purpose, because it hardens enough, may be "iron" for a worker in another branch of manufacture. It is a fact, too, to which attention ought to be called, that if a change in tensile strength and ductility be regarded as determining where open-hearth metal does or does not harden, scarcely one instance could be found where such a change could not be distinctly traced, and the record of the admirable experiments of the Swedish Iron Board on the mildest Swedish open-hearth metal plates will bear us out in this. The Boston decision, against which, by the way, an appeal has been taken by the government, again shows how indefinite our present tariff laws are, and it proves also how necessary for a future revision some fair classification will be.

As in every other branch of technology, there is a growing tendency in mining and metallurgy toward a division into special fields; and though many circumstances tend to retard that movement toward the development of distinct specialties, it is still growing rapidly in our own country. Abroad, this is so distinctly understood that an engineer will generally follow a certain branch in his early training, and when he has once chosen a career in either coal mining, iron smelting, steel manufacture, or the mining or metallurgy of the precious or base metals, he will devote all the energies of his life to becoming proficient in that specialty. Very few would think of running a blast-furnace one year and of taking charge of a silver mine in the next, nor would it be likely that such an opportunity would be offered. In this country, it is quite a different matter, and although we are evidently tending in the same direction, instances of such sudden changes are by no means rare. They naturally stimulate engineers to take an interest in matters which apparently have no direct connection with their present duties, and make them versatile. While their number is still great, we note that there is a growing tendency to concentrate effort upon one specialty, and with it the interest in kindred or allied branches seems to flag. We note that in newspaper discussions, and in the proceedings of technical societies, the "iron and steel men" hardly disguise their *ennui* when topics relating to coal mining, or the metallurgy of copper, lead, or silver come up; while a person who is interested in spelter will care little for what is going on in the manufacture of pig-iron or Bessemer steel. We believe that this is a serious error, as those who cultivate one specialty can learn much from following the course of development in another. We remember having heard one of the most successful lead-smelters in this country say that he owed many valuable suggestions to a close study of what blast-furnace men were doing; and we know that, on the other hand, miners of iron ore and the precious metals could learn much by watching the work in our collieries. Of course, what may be good practice in one branch may not do in another without such modification and adaptation as special circumstances may demand, and a direct copying would probably lead to failure. But still it remains a fact that it is profitable and suggestive to follow progress in apparently remote branches, and therefore narrow-minded specialists, whose number is apparently increasing, lose much that is valuable.

THE WASTE OF ANTHRACITE.*

This subject has been for many years the topic of desultory lament and suggestion. It was the first important theme to which the Institute of Mining Engineers turned its attention, a decade ago; and the failure of the famous Standing Committee of that society to produce a report has

* SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA. VOL. A2. *A Special Report to the Legislature upon the Causes, Kinds, and Amount of Waste in Mining Anthracite.* By FRANKLIN PLATT. With a Chapter on the Methods of Mining, by JOHN PRICE WETHERILL. Illustrated by 35 Figures of Mining Operations, a Plan of an Anthracite Breaker, and a Specimen Sheet of the Work of the Geological Survey in the Anthracite Coal-Fields. Harrisburg. 1881.

been the occasion of much good-natured ridicule among its members. But it must be admitted that the discussion of the matter thus aroused has borne some fruit. Several important papers in the Institute *Transactions* owe their origin to it, and no doubt many investigations outside have been stimulated by the interest thus aroused. Mr. GOWEN, himself a member of the Institute, and the engineers of the Reading Company, the Girard estate, the Lehigh Valley and Lehigh and Wilkes-Barre companies, and other large anthracite mining enterprises (all, or nearly all, members of the Institute) have done much in the way of careful observations and records to determine the extent of the waste of anthracite in mining and preparation—a necessary preliminary to the cure of the evil. Professor LESLEY, a member, has instructed Mr. PLATT, also a member, to prepare a special report on the subject; and Mr. PLATT, with the cordial assistance of his fellow-members, has produced the volume now before us, in which one of the most important chapters, Mr. WETHERILL'S description of anthracite coal mining, is a revised edition of a paper read in 1876 before the Institute. We find thus at every step the traces of the influence of the Institute; and we can scarcely resist the impression, as we turn these pages, that we have before us the long-delayed Report of the Committee. But, putting aside this maddening thought, let us give some account of the contents of this volume.

A brief preliminary chapter, *How Anthracite Coal Lies in the Rocks*, is followed by Mr. WETHERILL'S chapter, *How Anthracite Coal is Mined*, which, together with its numerous and admirable illustrations, constitutes a manual of actual practice, as good as any with which we are acquainted. The next chapter presents a similar account of the usual preparation of the coal, accompanied with a drawing of the breaker of the Hammond Colliery, from the report of H. S. THOMPSON, Mem. A. I. M. E., the engineer of the Girard estate. The fourth chapter discusses the waste in mining, and the fifth the waste in preparation. In these chapters are gathered the testimonies of experience from many different engineers. The opinion of Mr. ECKLEY B. COXE we condense as follows:

Mr. COXE says the circumstances influencing the waste in mining are (1) the thickness of the vein, which, after 6 to 8 feet, increases waste; (2) the nature of the roof, which, if bad, requires coal to be left, or falls and buries coal; (3) the pitch of the vein, which usually augments waste, if steep; (4) the amount and nature of slate and bony coal in the vein, the removal of which involves loss of good coal; (5) the nature and market of the coal, which wastes the more, the smaller the sizes in which it is sold; (6) the nature of the coal as to breaking, and the kind of breaking machinery employed; (7) the system of mining; (8) the cost of labor, timber, and transportation, which affects the degree of care profitably practicable in mining. Mr. COXE also notes that all coal lost or stolen from the mine-cars, between the colliery and the railroad scales, moreover, all the railroad deductions for alleged waste, and finally, in many cases, the coal used at the colliery or by the employes, are charged to wastage. He says that in his experience, upon a vein not exceeding 10 feet in average thickness, the shipments of coal have been over 2,000,000 tons from a little less than 200 acres worked out. This is an average yield of at least 1000 tons per foot per acre, or 1 ton for 43½ cubic feet. But Mr. COXE adds that in the 200 acres referred to there are many breasts unfinished, some even unopened; and that much coal remains to be robbed. As the specific gravity of the coal is 1.6, a ton would be 22.4 cubic feet; hence the above yield is a little less than 50 per cent.

Mr. T. D. JONES, the mine inspector of the Lehigh region, gives from 55 to 90 per cent as the proportion now actually won by the collieries in that region. Here is his list:

No. and Region.	Vein.	Average thickness, feet.	Inclination.	Percentage won.	No. and Region.	Vein.	Average thickness, feet.	Inclination.	Percentage won.
1 L	M	28	45°	60	8 L	B	12	45°	70
2 L	M	23	H	70	9 L	B	12	V	80
3 L	M	28	V	70	10 N	P	16	V	85
4 L	W	8	H	90	11 N	M	50	V	70
5 L	W	8	45°	80	12 N	M	28	45°	70
6 L	W	8	V	90	13 S	M	60	45°	55
7 L	B	12	H	80					

NOTE.—In condensing, we employ the initial letters as follows: L, Lehigh Region; N, Nesquehoning; S, Summit Hill; M, Mammoth vein (E); W, Wharton vein (D); B, Buck Mountain vein (E); P, Primrose vein; H, horizontal; V, vertical.

These figures certainly seem rather high in many cases; but Mr. JONES claims that improved methods and greater care, practiced of late years, have brought the yield of coal up to this relatively satisfactory point. It will be seen that the lowest figures are from the thickest vein, standing at 45°, and the highest from an 8-foot vein, where it is either vertical or horizontal, the working of the same vein at 45° being attended with 10 per cent additional loss.

We shall continue in another article an analysis of the contents of Mr. PLATT'S report.

THE TOMICHI DISTRICT, COLORADO.

Special Correspondence of the Engineering and Mining Journal.

The Tomichi Creek, from its conflux with the Gunnison River at Gunnison City, takes a direction a little south of east through a fertile "bottom," dotted along its course with ranches and farm-houses, until, near its head, it separates into several branches finding their sources in the hills and mountains in the region of Marshall's Pass. Distant about fourteen miles west of Marshall's Pass, its largest tributary turns northward at right angles: this is the Little Tomichi, near the head-waters of which the mining camp bearing the title of this article is situated.

In the early spring of 1879, a couple of prospectors crossed the range and located several claims in the environs of the present town-site. Not, however, until the summer of 1880 did these discoveries create any excitement or solicit investigation. The value of surface ore from one or two of the best properties, when exhibited, produced the usual effect, and prospectors began to scour the adjacent country, until now the hillsides are covered with stakes and ten-foot holes. The camp is situated at an elevation of about 10,000 feet, directly in the valley at the foot of Buckhorn Gulch, which runs nearly east and west. From the valley, the mountains rise abruptly, and just above the town turn westward, forming almost a cañon. At the time of my visit, the inhabitants numbered some two hundred or more.

THE MINES.

As in every other camp, there are one or more prospects remarkable for their richness, that give to it more than ordinary interest. At Tomichi, these happened to be among the first upon which a pick was thrown. The Lewiston and Sleeping Pet claims are not confined to local celebrity, but the knowledge of their richness is widespread, and is a subject of discussion in adjoining districts. The Lewiston, which claims the priority of location, is situated half-way up Buckhorn Gulch. The vein strikes N. 38° 22' E., or directly across the gulch. The claim was located in the summer of 1879, and consists of a full property, according to the Revised Statutes, or 300×1500 feet. It was recently purchased by Mr. Samuel G. Field, of Chicago, who is looking after his interests in person. At this writing, a shaft 35 feet in depth has been sunk upon the foot-wall of the vein, which dips slightly from the vertical toward the west. This shaft is the only development that has as yet been done upon the property; the exact width of the deposit has, therefore, not been ascertained. The vein is a true fissure, one of the many that break through the fine country syenitic granite in all directions, trending principally northeast and northwest, however. The vein-matter is composed of a crystalline quartz, with intervening bands of decomposed granite. Zincite, sphalerite, stephanite, gray copper, and pyrites are more or less distributed through the whole body; but what has given this vein its great prominence are the beautiful specimens of native gold and silver occurring in the druses and cavities of the quartz. I selected a specimen from the dump which had several well-developed octahedral crystals of silver, and fine filiform varieties are brought up in every bucketful. Mr. Field has on exhibition in his cabin near the mines a collection of specimens, including some eight or ten ounces of wire-gold, and large amounts of silver in the same state, many sponges being as large as a hickory-nut. About three tons of first-class mineral had been sacked up at the time of my visit, and specimens taken indiscriminately from them showed native gold and silver under the microscope. All this had been extracted while sinking the shaft upon the foot-wall. What lies above can only be conjectured.

Adjacent to the Lewiston, with a common end-line, is the Sleeping Pet, an extension northward upon the same vein. More extensive operations have been prosecuted upon this property than upon the Lewiston. Mr. Charles H. Cramp, head of the firm of Cramp & Sons, of Philadelphia, is the chief owner. Mr. Benjamin Cramp, his son, who was one of the first to cross the range and prospect the district, has had charge of the mine from its beginning. The shaft is not more than 30 feet from that on the Lewiston, but has attained a depth of nearly 100 feet, sunk also upon the foot-wall. From the bottom, a cross-cut has been driven to prospect the vein. This opened up several fine streaks of native gold and silver.

On the day of my departure, the engine for the Sleeping Pet was erected. It is the first one used for mining purposes in the camp. The mineral, of course, is identical with that found in the Lewiston shaft. Assays may be obtained of any desired value almost: but an average will probably not exceed \$250 to the ton.

Other properties of prospective value in the gulch belonging to much the same parties are the Gray Copper, Buckhorn, Treasury, and Brittle Silver, from which claims assays as high as \$1000 have been obtained. In the valley are also many claims which, considering their development, are very promising. Among others are the Fort Scott, Uncle Sam, San Juan, Helvetia, Wanderer, Peace & Plenty, and Charles H. Cramp. The Cramp is suffering for want of a market for the ore; but things are looking better this fall. It being but ten miles to the railroad, and the grade up to the town being comparatively small, it is more than probable that a branch will be run up next year. It was also rumored that Mr. Webb, of New York, intended to erect a smelter in the fall, I presume on the strength of a large body of galena at White Pine, a mile farther down the creek. Twenty-two feet of solid galenite, running as high as 70 ounces of silver to the ton, are said to have been exposed, and several thousands of tons are on the dump, waiting for the advent of the smelter. Notwithstanding this, a good chlorinator and amalgamator would be a great acquisition to the camp. The creek having here a width of eight or ten feet, with considerable fall, has sufficient water to furnish power and supply several such establishments, and wood may be obtained for the trouble expended in cutting it. A saw-mill is in active operation just out of the town. When such desiderata are supplied, there will be no question of the camp's future well-being. Its proximity to the line of the Denver & Rio Grande Railroad, and its comparatively central position, give it many advantages not enjoyed by more remote districts. There are still many localities that have as yet received but little investigation, notably the West Tomichi, in which, from all accounts, the present camp will find a strong rival.

IDAHO SPRINGS, COLO., Sept.

TRO.

THE NOMENCLATURE OF MILD OPEN-HEARTH METAL.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: It has been urged, in the recent discussion of the question whether certain grades of open-hearth metal are "iron" or "steel," that its settlement depends upon the establishment of the question whether this metal is known so commercially or not. I hold that the question is one of fact only, and not one depending upon what the metal is called. At the time of the first introduction of the product of the Bessemer and Martin processes, undoubtedly a very large percentage of all the metal first turned out was steel; that is, it contained manganese and carbon enough to enable it to take what is known as a temper. Since then, by experience, those manipulating these furnaces have been able to produce a metal so low in carbon and manganese that it can be heated to what is known by the workers of such metal as a "proper heat," and then plunged into a bath of salt water, without hardening enough to prevent the metal from bending over double. Now I, for one, declare that any metal which does this, it makes no difference what the process is by which it is produced, is iron; and any metal that will harden to a degree sufficient for practical purposes, by the worker or by the user, is steel, whatever process it is made by.

I have seen ends of Swedish bars, made by the charcoal process, or what is known as "bloom iron" in the Catalan forge, that would harden completely through. They were used for cold-chisels, and were, in my estimation, good steel; that is, they did the work and answered the purpose for which the man wanted them. I have also seen metal made in the crucible by accidentally leaving out the charge of charcoal, that was nothing more when cast and forged and drawn out than a first-class iron; in fact, would not harden at all. Steel made in the puddling furnace before the Bessemer or the Martin process had originated (that is, as far as my knowledge extends) had all the characteristics of steel, and was used for the purposes for which steel was required.

Why, therefore, was not the recent decision of the Boston jury, which has been so much assailed, right? Yours, W. A. SWEET.

SYRACUSE, N. Y., Sept. 21.

THE UTILIZATION OF THE CINDER FROM THE BASIC PROCESS.

Early in the course of the development of their invention of the de-phosphorization of iron in the Bessemer converter, Messrs. Thomas and Gilchrist turned their attention to the question of utilizing the cinder obtained during the process. A portion of this waste material is available as an addition to the blast-furnace charges when it is desired to increase the percentage of phosphorus in the pig; but as phosphorus is a valuable material, other means were sought to utilize it. The specification of a patent recently taken out in Germany gives some idea how it is proposed that this should be done, and from it we take the following data: Briefly the aim of the invention is to transform the product obtained by dissolving the cinder in hydrochloric acid and precipitating with lime into phosphate of soda and oxide of iron by smelting it with sulphate of soda and carbon in the form of coal or coke, crude salt being added or not, as the circumstances may demand. The process, which, so far as we know, has not been carried out on a working scale, is to be conducted in the following way: The cinder, which may contain as much as 9.2 per cent of phosphoric acid, is first ground in any suitable manner, and, in order to render this more easy, the cinder is dropped into water while still hot. When the quantity of granules of steel entangled in the cinder is large, they are separated by screening or with the aid of magnets. The crushed cinder is dissolved in hydrochloric acid in large vats, and the insoluble silicates formed are filtered off by means of a press or a centrifugal apparatus. The solution thus obtained is worked by one of two methods, the choice depending upon the quantity of manganese in solution.

If it contains little manganese, so that it is not the intention to separate it, quicklime, or a mixture of it with magnesia, is added in such quantity that all the phosphoric acid is precipitated as phosphate of lime mixed with phosphate of magnesia, if that substance has been present. After filtration, the precipitate is dried and is intimately mixed with sulphate of soda in such quantities that there are at least three equivalents of soda for each equivalent of phosphoric acid. To this, powdered coal or coke is added, and the whole is exposed for several hours to a high temperature on the hearth of a furnace, care being taken that an excess of air is maintained for the purpose of having an oxidizing flame. As soon as the mass is fused, it is agitated by introducing into it a jet of air, or a mixture of air and steam. This blowing is continued until the reaction is completed, and nothing remains but oxide of iron and sulphate of soda. The fusion may be accelerated by the addition of sea salt. The sulphuric acid, or its mixture with chlorine or hydrochloric acid, or both, if formed, may be gathered and utilized. The fused mass drawn from the furnace is then washed with water until the phosphate of soda is entirely extracted and nothing remains behind but marketable oxide of iron. The solution is boiled down, and any sulphate of soda in it is separated by crystallization. Carbonate of soda or caustic soda may be used to replace the sulphate in the process.

When the cinder holds so much manganese that it will pay to extract, the process is modified in the following manner: After dissolving the crushed cinder with hydrochloric acid, and filtering off the insoluble silicates, peroxide of manganese is added with the object of oxidizing all the iron in the solution, which is then heated to boiling. Powdered chalk or dolomite is added in sufficient quantity nearly to neutralize the solution, and the boiling is continued until the phosphate of lime is precipitated. This is then worked in the manner already indicated, and the mixture of oxide of iron and manganese obtained is used after adding a little lime for precipitating.

ILLINOIS COAL PRODUCTION.—The output of the coal-fields of Illinois was 3,763,162 tons in the year ended June 30th, 1880, and it is estimated by the Chicago *Tribune* that for the year following it has been 6,000,000 tons. In the absence of any details as to how this estimate was arrived at, it is impossible to accept it without hesitation.

ORE-DRESSING AT PRIBRAM, BOHEMIA.*

The gangue of the veins of Pribram, Central Bohemia, is quartz, calc-spar, brown-spar, dolomite, heavy-spar, and spathic iron ore, while the chief minerals are argentiferous galena and zinc-blende, accompanied by fahlerz, bournonite, native and ruby silver, and silver-glance. The galena contains 0.07 to 0.094 mint pounds of silver, and 75 to 83 lbs. of lead per 100 lbs., while the zinc-blende usually runs 0.087 mint pounds of silver in 100 lbs. Although the principal lode, the Adalbert, has been worked 2400 feet along its dip, it has not shown any indication of decreasing in richness, or any particular change in the materials contained in the lode. At the close of the year 1878, enough ore remained in the upper levels to keep the existing mills going for 33 years. The output of ore from all the mines in 1879 was 66,957 tons, from which 26,751 tons of galena were obtained, yielding 156,940 lbs. of silver and 12,696 tons of lead. The ore is dressed in twelve mills, which together have 28 sets of rolls, 261 stamps, 58 jigs, 113 Salzburger and 17 Ritinger percussion-tables, stone-crushers, revolving screens, and other machinery. Mr. Clark does not give any reasons for the existence of this large number of establishments, nor of the somewhat curious distribution of machinery in them. He takes up one establishment, the Anna ore-dressing house and stamping-mill, and describes the processes through which the ore passes, and the machinery by which they are carried out. Lack of space prevents our following him through all the intricacies of the movement of the various middle products and their manipulation in the various machines. We choose from his account the following details of some of the apparatus used, as likely to prove of interest to American engineers:

ROTARY PICKING-TABLE.
The rotating picking-table, of which

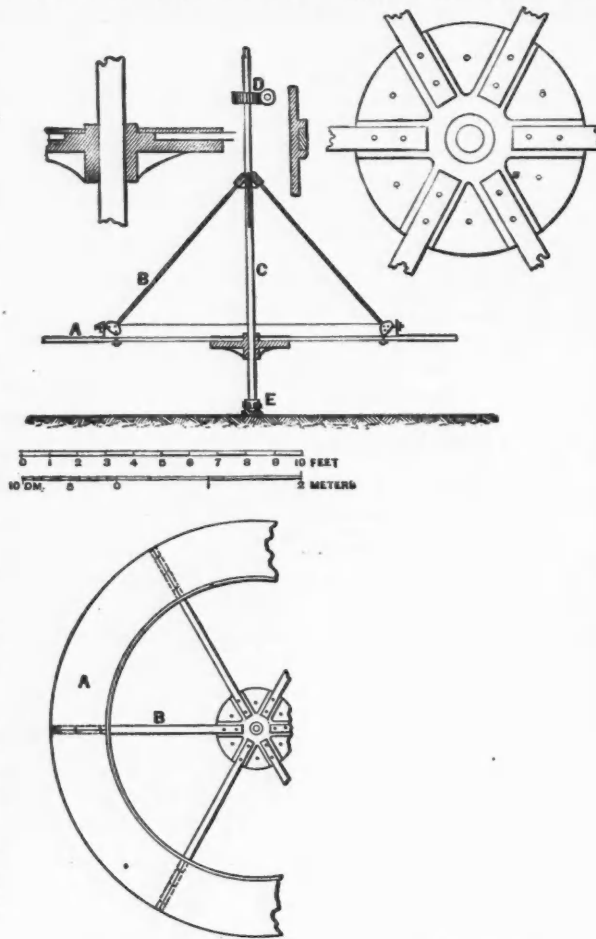


Fig. 1.—REVOLVING PICKING-TABLE.

is secured by six arms of bar iron *B* to an upright shaft *C*, moved by a screw and pinion-wheel *D*, and working in a foot-block *E*. The ring is cast in segments, which are bolted fast to the arms extending from the center-plate. The holes are 10 mm. (0.4 inch) in diameter on the top, and are made a little larger at the bottom, so as to prevent pieces of material from being lodged in them. The table takes three minutes to make a revolution, and requires 0.064 horse-power. Just before passing on to the picking-table, the material is still further washed by means of a shower of water. The pickers, boys from 8 to 15 years of age, stand around the rotating-table and sort the rock.

A portion of the ore is crushed in Cornish rolls, which, however, do not possess any features of novelty or interest. The only fact worthy of mention here is, that a pair of 18.4-inch rolls, 12.4 inch face, require two horse-power when running at a speed of 36 revolutions a minute on 0.47-inch stuff, and that for 1.02 to 1.53 inch material they consume five horse-power. The ore and water from the sorting-house are sized into 0.35, 0.47, and 0.63 inch stuff by a revolving screen, and that below 0.35 inch is divided into 0.23, 0.16, and 0.08 inch material on a second screen, which, like the first, is 3.28 feet in diameter and 10.83 feet long. Making from 18 to 20 revolutions a minute, and set at an angle of 2½ degrees, they require together 1.17 horse-power.

The description of the jiggging machinery presents nothing that is new, except the statement that the three-screen middle jigging machine (0.12-inch mesh) working 0.16-inch stuff with 160 one-inch strokes per minute, and 0.46-inch stuff, with 160 one and one half inch strokes per minute, both require 0.75 horse-power. In the former case, the production is 17 cubic feet of concentrated products per hour, and in the latter 27 cubic feet. In the former, the quantity of water pumped is 3.4, and in the latter 6

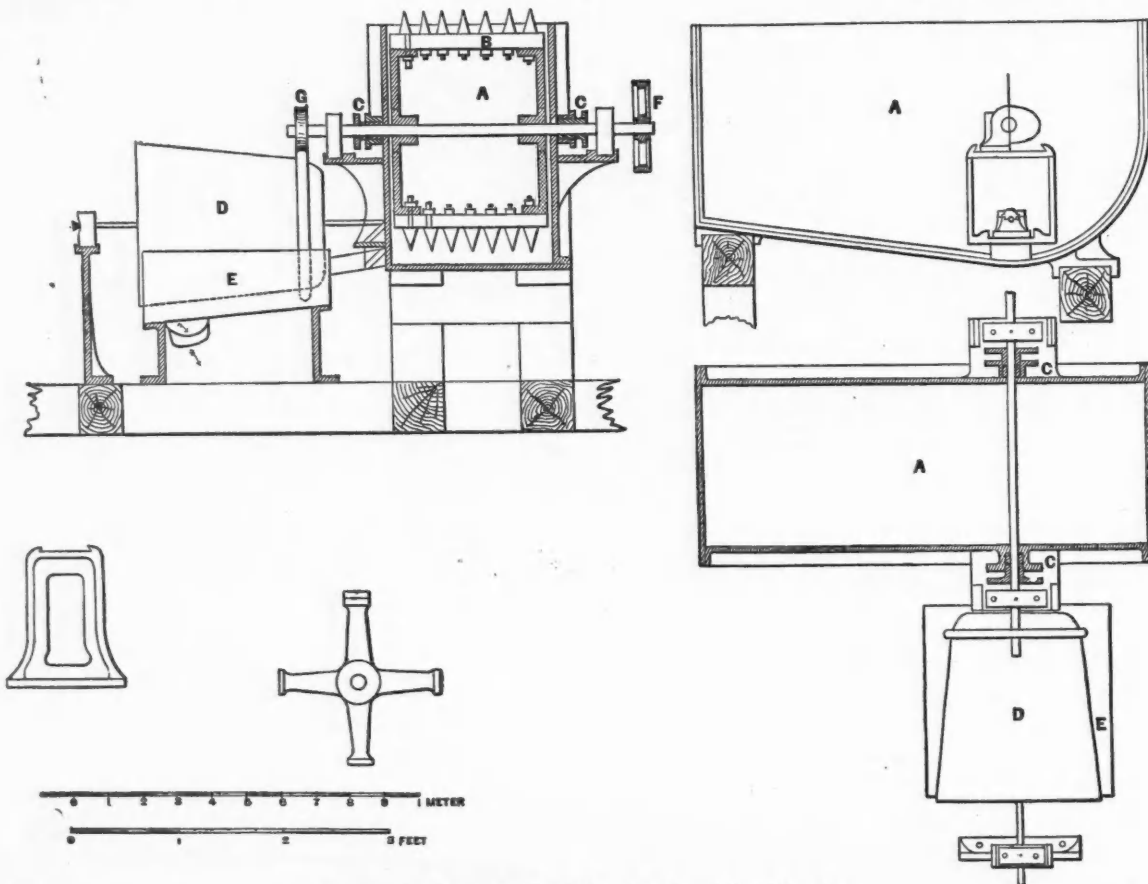


Fig. 3.—APPARATUS FOR WORKING SLIMES.

the details are shown in Fig. 1, consists of a cast-iron perforated ring *A*, 4.4 meters (14.4 feet) in diameter and 0.6 meter (23.6 inches) wide, which

* Abstract of a paper read by Ellis Clark, Jr., of Philadelphia, before the American Institute of Mining Engineers, at the Philadelphia Meeting, February, 1881.

cubic feet per minute, the waste being from 0.75 to 1 cubic foot. The sieve area is 18 by 36 inches. The sterile material which passes away from this jig is exceedingly poor, containing only from 0.25 to 0.37 per cent lead, and 0.004 to 0.005 per cent silver. In the case of the 0.16-inch

stuff, the concentrated material from the discharge-pipe of the first sieve contains 0.567 per cent silver, and 81.62 per cent lead; that from the discharge-pipe of the second sieve, 0.046 per cent silver and 8.12 per cent lead. In the case of the 0.46-inch stuff, the concentrated material from the discharge-pipe of the first sieve contains 0.61 per cent silver and 72.75 per cent lead; that from the discharge-pipe of the second sieve, 0.05 per cent silver and 4.37 per cent lead. The 0.46-inch stuff, before concentration, contained 0.042 per cent (13½ ounces to ton) silver and 4.25 per cent lead.

The stamps used are inferior to our own, and experiments made with a California battery have shown its superiority. The stamped ore is run over 10 *spitzkastens*, 15 feet long, 8 feet wide, and 9 feet 2 inches deep, by means of which the ore and water are concentrated to one third of the original volume. The concentrated product from the *spitzkastens* passes for classification into an apparatus called a *spitzlutte*, the construction of which is shown in the accompanying engravings.

SPITZLUTTE.

Its essential features consist of a wedge-shaped box, suspended by two hand-screws, by means of which it can be raised or lowered in the cavity of a similar wedge-shaped box, thus leaving a space between the parallel sloping sides of the wedge, the ends of the wedge fitting closely against the perpendicular sides of the box. The interior of the outer box is brought to an apex near its bottom by means of two small triangular blocks of wood fitting against the sides of the wedge. This apex is connected by means of an iron pipe *Q*, with a so-called foot-piece *R*, which consists of a wooden pipe, one end of which communicates with the pipe *G*, for the admittance of clean water, and the other end with a similar wooden pipe *N*, for the discharge of the heavier particles entering the foot-piece. The concentrated product from the *spitzkastens* entering at *A* flows down the space *B*, comes in contact with the ascending column of water from the foot-piece

and heavier division of the material coming from the *spitzlutte* passes directly to a four-sieved jigging-machine. The heavier material from the second *spitzlutte* are also jigged, and the material from them further concentrated. The heavier particles from the third, fourth, and fifth *spitzluttens* are treated on Rittinger's percussion-tables, well-known in this country. It may be of interest to give Mr. Clark's drawings and description of those at Pribram.

RITTINGER PERCUSSION-TABLE.

Owing to the thick and viscous condition of the slime, it must be agitated with water, in order to obtain the regular and constant flow that is necessary for the proper working of a percussion-table. For this purpose an apparatus (*rührgump*), as shown, is used. The slime to be concentrated on the percussion-tables is shoveled into the oblong iron box *A*, into which water is admitted, and the mass is thoroughly agitated by the revolving rake *B*; the shaft to which the rake is keyed is provided with stuffing-boxes *C*, in order to prevent a loss of material. In connection with the agitating-box there is a rotating sieve (*trommel*) *D*, which has for its object a separation of the

slime from all foreign material, such as chips, grass, etc., which, by coming on the table, would tend to produce an uneven surface, and therefore an imperfect separation of material. The slime passing through the meshes of the sieve is collected in a semi-cylindrical sheet-iron trough *E*, from which it is conducted through a gutter to the distributing-board, situated at the head of the percussion-table. The power is transmitted to the shaft of the revolving rake by a belt and pulley *F*, and from this shaft to the sieve by a cog-wheel or friction-bearing *G*. The rake makes about 15 revolutions a minute. One of these "gumps" supplies two percussion-tables, weighs 1315 pounds, and costs \$158. Ten percussion-tables are supplied with "gumps" like the one described, for the working of the raw material from the sump. Eight percussion-tables have "gumps"

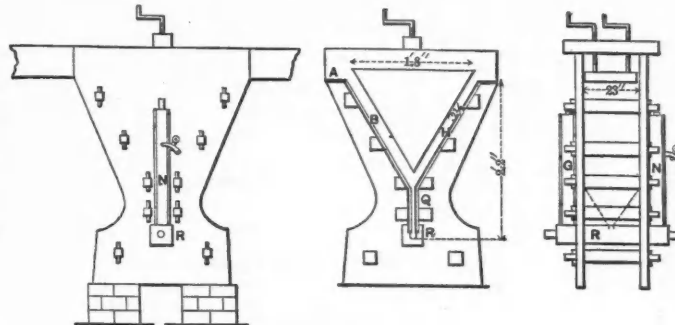


Fig. 2.—PRIBRAM SPITZLUTTE.

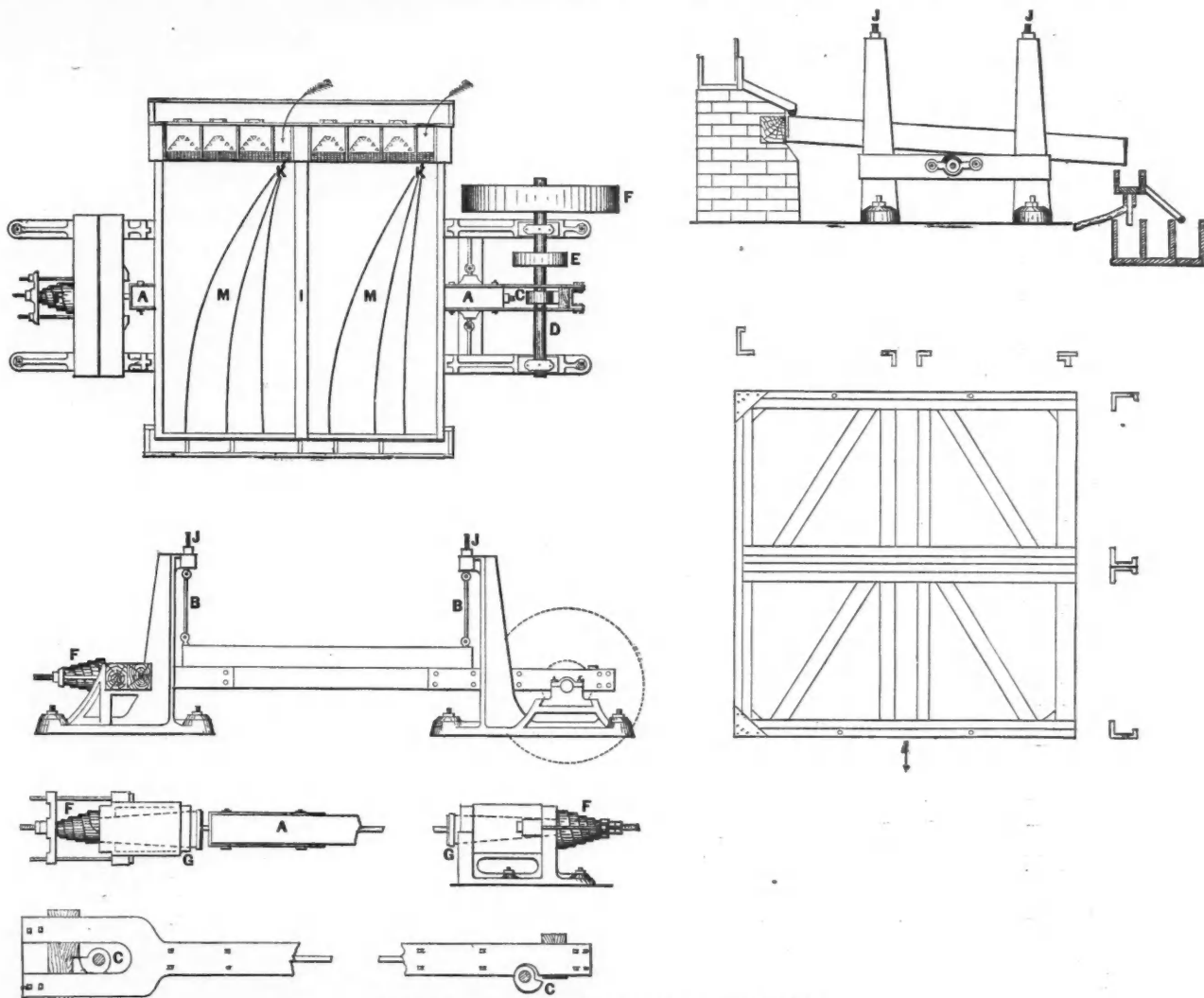


Fig. 4.—RITTINGER PERCUSSION-TABLE.

through the iron pipe *Q*, so that only the heaviest particles find their way into the foot-piece. The lighter particles, aided by the ascending flow of water, pass up the side *H*, and are conducted through a gutter to another *spitzlutte*, similar in construction to the one just described. The coarser

without revolving screens; while seven are simply supplied with boxes, into which the material is shoveled and washed on to the distributing-board by a stream of water. These fifteen are used for the second concentrating of the slime after it has been worked on the first ten percussion-tables.

By each operation on the percussion-table, three products are obtained, namely, first, second, and third; these products are collected separately and reworked on adjoining tables, giving as before three grades; the first of which, in this case consisting of pure *bleischlich* (galena finely divided), is delivered to the smelting-works; while the second and third are treated a third time, giving again a product for the smelting-works. The number of times the resulting products are treated, the inclination of the tables, the number of blows a minute, and the amount of water required, naturally depend upon the original condition of the matter under treatment. The overflow from the percussion-tables is conducted through a trough immediately in front of them, extending the length of the building. The deposit in this canal is collected and sent to the smelting-works, while the water is used over again.

Fig. 4 represents the Rittinger continuous, lateral working, percussion-table. The frame of the table is substantially constructed of angle or cast-iron, and may be covered with either wood, marble, slate, or cement. When wood is used, a further covering of rubber cloth is necessary. This latter method, that is, wood and rubber cloth, is most common. A heavy beam of wood (*zung*) *A* is bolted to the middle of the under side of the frame, projecting some distance beyond it on each side. The table is suspended from four iron standards by means of iron hooks *B*, and has a motion imparted to it by means of a steel spring *F*, and a cam *C*, which is keyed to the power-shaft *D*, which carries also a fixed pulley *E*, and a heavy rimmed fly-wheel *F*. The spring and cam are shown in detail on a larger scale in the same figure. The shock necessary for the working of the machine is given by the striking of the heavy wooden beam against the wedge-shaped block of hard wood *G*. The table is divided into two parts by means of a strip of wood *I*, similar strips being placed on the sides to prevent the overflow of the material, and can have its slope regulated by means of the screws *J*. The material to be concentrated is admitted at the right hand corner *K*, to the table, through a small zinc box, the object of which is simply to prevent wear by the constant attrition of the particles of ore. The water distributors are provided with small triangular blocks of wood, for the purpose of giving an even and regular flow to the clean water supply. On account of the inclination of the table, and the lateral percussion it receives, the heavier particles of ore form themselves into the curved lines *M*; the lighter and more sterile portions pass in a straight line directly off the table, while the middle products form a series of lines of greater or less curvature, according to the richness and specific gravity of the material.

At the foot of the table, troughs are placed for the reception of the separated material; these are provided with small zinc boxes, which are movable, so that their positions can be changed to correspond with the lines of division of the material. This arrangement is a decided improvement over the former method, in which short strips of wood were secured to the foot by means of a thumb screw, and which could be turned at various angles so as to correspond with the curves of the material. In the working of these tables, the observation of several essential points is necessary. The proper inclination of the table, the amount of clear water to be admitted, the tension of the spring, the amount of stuff admitted to the table, the velocity of the current over the table, and the proper position of the small zinc receivers at the foot, are all circumstances which depend entirely upon the nature of the material to be treated. As previously mentioned, various methods for obtaining a smooth surface have been resorted to. In the spring of 1879, experiments were made with percussion-tables constructed of iron, after the pattern of the Humboldt Manufacturing Company in Kalk, bei Deutz, am Rhein. They consist of two cast-iron plates 8'3 feet long, 3'97 feet wide, and 0'79 inch thick, joined together by bolts, and strengthened by ribs on the under side, weighing 1700 pounds. The heavy beam of wood is bolted to flanges cast on the under side of the plates. The smooth surface required is obtained by the planing of the plates on the upper side, they being subsequently painted white, in order to make the curves of the material more apparent. Their cost is \$408.

A thin piece of sheet-iron is placed between the two plates, with the object of dividing the table into two parts, as was done by the strip of wood when the table was made of other materials. Raised edges of wood, 1'02 inches square on the cast-iron table, prevent the material from working off at the sides. The object in making these plates 0'79 inch thick is, that they may be planed once or twice when the surface is worn.

Previous to the trial with planed iron plates, experiments were made with angle-iron frames covered with wood, on which marble slabs 8'3 feet long, 4'15 feet wide, and 1'57 inches thick, were laid. The iron frames weighed 702 pounds, costing \$176; the marble plates weighed 696 pounds, costing \$200; their setting cost \$34, making the complete cost of a percussion-table with marble plates \$410. The weight, when ready for working, is 1910 pounds. A comparison of the working of the marble and iron tables is shown in the following tables:

MARBLE TABLE.

	Weight dry, lbs.	P. ct. Ag.	P. ct. Pb.	Holding silver, lbs.	Holding lead, lbs.
Schlich.....	936	0.318	63.0	2.976	590
Middle product.....	1956	0.097	8.5	1.897	106
	2892	0.415	71.5	4.873	756

IRON TABLE.

	Weight dry, lbs.	P. ct. Ag.	P. ct. Pb.	Holding silver, lbs.	Holding lead, lbs.
Schlich.....	834	0.317	64.0	2.644	534
Middle product.....	1830	0.129	13.0	2.360	238
	2664	0.446	77.0	5.004	772

In each case, 24,000 pounds of the same material were used. By this careful experiment, the advantage of the iron tables over those of marble was made apparent. The less effective working of the marble tables was owing in a great measure to the too smooth surface. Another advantage of the iron tables is their great strength and diminished liability to

fracture. They also have a value as old metal when too much worn to be further used, while the marble when broken has a value of only \$6. If the surface of the table be too smooth, and the current of water improperly regulated, an imperfect working of the material results, causing the rich particles to pass off with the middle and waste products.

By the working of these tables, three products are won: an exceedingly fine galena, which goes to the smelting-works; a second more or less enriched product, which, according to its quality, is passed over the percussion-table a second time, or sent directly to the smelting-works; and a third product, which is generally so impoverished as to be thrown on the waste-dump.

The *Salzburger percussion-table* consists of a framework of 0'79-inch angle and plate-iron, covered by a water-tight wooden planking, 1'26 inches thick, with three low wooden sides, and open at the foot. It is suspended at its corners by iron rods and chains from iron bars between four iron standards bolted to heavy pieces of timber resting on masonry. A heavy piece of timber extends along the entire length of the under side of the table; this timber is held in position by two pieces of angle iron, to which it is bolted. At the upper end of this timber a U-shaped piece of iron with slotted bolt-holes is firmly secured, by means of which the length of the stroke can be regulated. This piece receives the blow from a cam-wheel, keyed to a shaft. The shock (*stoss*) is imparted by the striking of the table in its retrograde movement against the block of hard wood set in an iron casting, which is bolted to a heavy timber secured in an iron framework. The intensity of the shock can be increased or diminished by means of a nut and screw at the end of a rod secured to the back of the table, which regulates the elasticity of the involute steel spring. In order to cause a regular and uniform flow of material over the table, a distributing-board, provided with small triangular blocks of wood, is placed at the head. A wooden trough at the foot of the table receives the overflow. Motion is communicated to the cam-shaft by means of a belt and pulley, and regulated by a heavy-rimmed fly-wheel. The tables are generally arranged in sets of two. A set of such tables requires the attendance of one boy, and costs complete in round numbers \$1800. The iron work in each table, including standards, etc., weighs 4040 pounds, and costs \$708. The tables work generally at an angle of 2° with 70 to 80 strokes of 0'52 to 0'79 inch a minute, and require from 0'7 to 1'1 horse-power. A single table is capable of working 800 pounds of coarse stuff an hour, requiring about one half a cubic foot of water a minute; of middlings, 400 pounds an hour, requiring 0'33 cubic foot of water a minute; of fine material, 200 pounds an hour, requiring 0'25 cubic foot of water a minute; and of the very finest product, 60 to 100 pounds an hour, requiring 0'125 cubic foot of water a minute. Working at 150 strokes of 0'5 inch a minute, the cast-iron tables require 0'9 horse-power. Two methods of fastening the cam-wheels to the power shaft are used. The first necessitates the taking of the shaft from its bearings, when the cam-wheel is slipped into place over one of its ends and keyed in position; in the second method, the cam-wheel is cast in such a manner that after turning and truing it may be broken longitudinally in two pieces by a sharp blow from a hammer, and in that condition be placed on the shaft, being subsequently secured together by two rings of wrought-iron, thus obviating the necessity of taking the shaft from its bearings.

The *Salzburger percussion-table* possesses several decided advantages over the Rittinger continuous-working percussion-table, among which may be mentioned an increase in the percentage of metal, increased working surface, a diminished amount of water for the same grades of material, and less dependence upon the attention of the workman. By careful experiments, it has been shown that coarse stuff yields 20 per cent more silver and 30 per cent more lead when worked on a *Salzburger percussion-table* than when worked on a Rittinger table. In the case of middlings the results were about the same, and by working a fine stuff there was 30 per cent more silver, and 20 to 30 more lead. In the case of the very finest material, there was 69 per cent more silver and 60 per cent more lead. By reason of the parabolic curves formed by the heavier materials on the Rittinger table, only two thirds of its surface are brought into requisition, while in the *Salzburger table* the entire surface is covered with the material worked. The Rittinger table requires two to three times as much water as the *Salzburger*, and on account of the use of so great an amount of water, the particles of ore are more liable to be carried away and lost, especially in cases where the finer varieties of slime are treated. The attention of the workman is a much more important factor in the working of continuous tables than in the *Salzburger*, as the curves formed by the material in the former require constant watching, and the zinc boxes at the foot must be frequently moved to correspond with their changes. This inattention at *Pribram*, though noticeable by day, becomes painfully apparent at night, when there is less probability of the higher officials making a sudden and unexpected appearance. From the previous comparison, it would appear that although the *Salzburger tables* give better general results in the working of the coarser grades of material, their superiority becomes far more apparent in the working of the finer grades, such as slimes.

THE MANUFACTURE OF MINERAL WOOL.

The idea of utilizing blast-furnace slag by manufacturing from it a fibrous product called mineral wool in this country, originated in Germany, where *Lürmann* first arranged a plant at *Osnabrueck*. For a number of years, it has been made on a working scale at a small blast-furnace at *Greenwood, N. J.*, and the demand having grown, a second plant has been put in operation at *Stanhope, N. J.*, which furnace delivers 20 slag cars per day to the parties making the wool. In many respects, present practice differs in detail from that first adopted and at the time described; and it may not be without interest to give some details, for which we are principally indebted to *Mr. R. D. A. Parrott*. The length and fineness of the fiber obtained by blowing steam across a stream of molten cinder depend largely upon the composition and temperature of the fluid material, a very liquid and hot cinder furnishing a larger percentage of very fine fiber, which it is the principal aim to produce. At *Stanhope*, steam under pressure of 45 to 60 lbs. is allowed to escape from a crescent-shaped

aperture $1\frac{1}{2}$ inches by $\frac{1}{2}$ inch, and it strikes a stream of molten slag about a finger thick flowing from the cinder car over a gutter which controls the stream. The steam divides the slag into innumerable shot-like bodies, which, in becoming detached, pull out a thread or fiber. The conversion is due entirely to the mechanical force of the particles of steam, which it is estimated travel at a speed of about 2000 feet per second. They strike against a brick wall built up in a large chamber for collecting the wool. The shot are broken off from the fiber and lie imbedded in the wool as it has settled upon the floor of the chamber. At Stanhope there are two of such chambers, into each of which four jets, arranged in pairs, deliver. While one of the chambers is in use, the other is being cleaned up, it having been allowed to cool off after blowing for half a day. The wool which is in these chambers and which is intermixed with shot is carried out of the chambers by a conveyer, run by a small engine to a riddle. It requires considerable agitation to get rid of the shot, and as much as six pounds to the cubic foot is got out. A conveyer takes away the riddled wool to the storehouse. About 80 per cent of it is termed the ordinary grade of mineral wool, weighing about 25 pounds per cubic foot, while the other 20 per cent is what the United States Mineral Wool Company call their "extra" grade, which is free from shot and weighs 15 pounds per cubic foot. The currents of air created in the chamber by the steam jets carry the lightest fibers over the brick wall to a back chamber, where they accumulate and constitute the material for this finest grade. The riddle is a simple contrivance, consisting of a box about 8 feet long, 3 feet wide, and 2 feet high, the top being covered with wire cloth having a $\frac{1}{4}$ -inch mesh. The box is suspended from above so that the surface of the screen is a little inclined, and it is moved backward and forward rapidly by means of an eccentric wheel. Air is blown up through the screen by a Sturtevant fan, thus carrying away the fine dust. At present, only a part of the cinder is utilized, as it chills. It is suggested that the building of a reverberatory furnace, into which the molten cinder from the blast-furnace is charged to be kept there until wanted, would give more regularity to the working, as it would act as a stock upon which it would be possible to draw at any time, and at the same time the cinder could always be made to have the proper temperature. The capacity of the present plant at Stanhope is about 2000 lbs. per day, and additional quantities could be made at the Greenwood furnace, Orange Co., N. Y., if wanted.

Mineral wool is used chiefly as a non-conductor of heat, and the following tests made by Mr. C. E. Emery, and published in a paper read before the American Society of Mechanical Engineers, at their Hartford meeting, may be quoted to show its utility:

He recorded the results of a number of careful experiments on different non-conducting materials, the same acting as protectors of steam pipes. The experiments were made so as to present as nearly as possible the condition of steam pipes and their covering in practical use. Mr. Emery found that hair felt was the best non-conducting material. Taking the value of this at 100, he estimates the value of the other materials experimented with as follows:

Mineral wool, No. 2, 2 inches thick.....	83.02
Sawdust, 2 inches thick.....	68.00
Mineral wool, No. 1, 2 inches thick.....	67.60
Charcoal, 2 inches thick.....	63.20
Cross-cut pine, 2 inches thick.....	55.30
Loam, 2 inches thick.....	55.00
Asbestos, 2 inches thick.....	36.30
Air-space, 2 inches.....	13.60

Mr. Emery, in commenting upon the above results, calls attention to the poor showing of an air-space, a result quite contrary to current popular opinion. He attributes the slight value of an air-space to the fact that connection of circulation takes place; that the air is cooled on one side of the space, descends and rises on the other, and it is necessary to break up the air-spaces, and that undoubtedly accounts for the efficiency of these different materials. He continues: "It is the air, probably, that is the non-conductor; but it should be kept quiescent instead of being allowed to circulate. The air-space itself is of very little value, until the circulation is prevented."

SILICON AND MANGANESE IN BESSEMER STEEL.

The *Revue Universelle des Mines* contains a note by A. von Kerpely, on the effect of silicon and manganese in Bessemer steel, the conclusions of which differ materially from the ideas generally prevalent among metallurgists on the subject. Among the rails recently analyzed by the scientist referred to was one the composition of which was found to be:

Carbon.....	0.082
Silicon.....	0.902
Phosphorus.....	0.042
Sulphur.....	0.064
Copper.....	trace
Manganese.....	1.277
Cinder.....	0.016

It was remarked that, when taking a sample for analysis, the drillings were not obtained in the form of a powder but as one shaving, thus showing that the metal was extremely mild. It was learned that mechanical tests proved the steel to be so soft that it did not come up to specifications. A second rail from the same mill yielded by analysis:

Carbon.....	0.136
Silicon.....	0.432
Manganese.....	0.821

This rail was noticeably harder and resisted the tests better. The following analyses are from harder rails, which yielded better results:

Carbon.....	0.313	0.314	0.218
Silicon.....	0.078	0.047	0.068
Phosphorus.....	0.071	0.046	0.080
Sulphur.....	0.076	0.064	0.035
Copper.....	trace	0.336	0.123
Manganese.....	0.515	0.165	0.317

These analyses, Herr von Kerpely contends, show that silicon and manganese do not sensibly harden very mild steels, and their hardening action, even if both silicon and manganese are present in large quantities, is decreased the more the quantity of one of them approaches that of the other. As long as the carbon is not below 0.15 and as long as the percentage of silicon is not much higher than one half the quantity of manganese present, it is beyond doubt that these elements harden steel.

PROGRESS IN GEOLOGY.*

By Sir John Lubbock.

In geology, the formation of our Association coincided with the appearance of Lyell's *Principles of Geology*, the first volume of which was published in 1830 and the second in 1832. At that time, the received opinion was, that the phenomena of geology could only be explained by violent periodical convulsions, and a high intensity of terrestrial energy culminating in repeated catastrophes. Hutton and Playfair had indeed maintained that such causes as those now in operation would, if only time enough were allowed, account for the geological structure of the earth; nevertheless the opposite view generally prevailed, until Lyell, with rare sagacity and great eloquence, with a wealth of illustration and most powerful reasoning, convinced geologists that the forces now in action are powerful enough, if only time be given, to produce results quite as stupendous as those which science records.

As regards stratigraphical geology, at the time of the first meeting of the British Association at York, the strata between the carboniferous limestone and the chalk had been mainly reduced to order and classified, chiefly through the labors of William Smith. But the classification of all the strata lying above the chalk and below the carboniferous limestone, respectively, remained in a state of the greatest confusion. The year 1831 marks the period of the commencement of the joint labors of Sedgwick and Murchison, which resulted in the establishment of the Cambrian, Silurian, and Devonian systems. Our Pre-Cambrian strata have recently been divided by Hicks into four great groups of immense thickness, and implying, therefore, a great lapse of time; but no fossils have yet been discovered in them. Lyell's classification of the Tertiary deposits, the result of the studies which he carried on with the assistance of Deshayes and others, was published in the third volume of the *Principles of Geology* in 1833. The establishment of Lyell's divisions of Eocene, Miocene, and Pliocene was the starting-point of a most important series of investigations by Prestwich and others of these younger deposits; as well as of the post-tertiary, quaternary, or drift-beds, which are of special interest from the light they have thrown on the early history of man.

As regards the physical character of the earth, two theories have been held: one, that of a fluid interior covered by a thin crust; the other, of a practically solid sphere. The former is now very generally admitted, both by astronomers and geologists, to be untenable. The prevailing feeling of geologists on this subject has been well expressed by Prof. Le Comte, who says, "The whole theory of igneous agencies—which is little less than the whole foundation of theoretic geology—must be reconstructed on the basis of a solid earth."

In 1837, Agassiz started the scientific world by his *Discours sur l'Ancienne Extension des Glaciers*, in which, developing the observation already made by Charpentier and Venetz, that boulders had been transported to great distances, and that rocks far away from, or high above, existing glaciers, are polished and scratched by the action of ice, he boldly asserted the existence of a "glacial period," during which Switzerland and the North of Europe were subjected to great cold, and buried under a vast sheet of ice.

The ancient poets described certain gifted mortals as privileged to descend into the interior of the earth, and have exercised their imagination in recounting the wonders there revealed. As in other cases, however, the realities of science have proved more varied and surprising than the dreams of fiction. Of the gigantic and extraordinary animals thus revealed to us, by far the greatest number have been described during the period now under review. For instance, the gigantic Cetiosaurus was described by Owen in 1838, the Dinornis of New Zealand by the same distinguished naturalist in 1839, the Mylodon in the same year, and the Archaeopteryx in 1862.

In America, a large number of remarkable forms have been described, mainly by Marsh, Leidy, and Cope. Marsh has made known to us the Titanosaurus, of the American (Colorado) Jurassic beds, which is, perhaps, the largest land animal yet known, being 100 feet in length, and at least 30 in height, though it seems possible that even these vast dimensions were exceeded by those of the Atlantosaurus. Nor must I omit the Hesperornis, described by Marsh in 1872, as a carnivorous, swimming ostrich, provided with teeth, which he regards as a character inherited from reptilian ancestors; the Ichthyornis, stranger still, with biconcave vertebrae, like those of fishes, and teeth set in sockets.

As giving, in a few words, an idea of the rapid progress in this department, I may mention that Morris's *Catalogue of British Fossils*, published in 1843, contained 5300 species, while that now in preparation by Mr. Etheridge enumerates 15,000.

But if these figures show how rapid our recent progress has been, they also very forcibly illustrate the imperfection of the geological record, and give us, I will not say a measure, but an idea, of the imperfection of the geological record. The number of all the described recent species is over 300,000, but certainly not half are yet on our lists, and we may safely take the total number of recent species as being not less than 700,000. But in former times, there have been at the very least twelve periods, in each of which by far the greater number of species were distinct. True the number of species was probably not so large in the earlier periods as at present; but if we make a liberal allowance for this, we shall have a total of more than 2,000,000 species, of which about 25,000 only are as yet upon record; and many of these are only represented by a few, some only by a single specimen, or even only by a fragment.

The progress of paleontology may also be marked by the extent to which the existence of groups has been, if I may so say, carried back in time. Thus I believe that in 1830 the earliest known quadrupeds were small marsupials belonging to the Stonesfield slates; the most ancient mammal now known is *Microlestes antiquus* from the Keuper of Würtemberg; the oldest bird known in 1831 belonged to the period of the London Clay; the oldest now known is the Archaeopteryx of the Solenhofen slates, though it is probable that some at any rate of the footsteps on the Triassic rocks are those of birds. So again the Amphibia have been carried back from the Trias to the Coal-measures; Fish from the Old Red Sandstone to the Upper Silurian; Reptiles to the Trias; Insects from the

* From the President's (Sir John Lubbock's) address before the York Meeting of the British Association.

Cretaceous to the Devonian; Mollusca and Crustacea from the Silurian to the Lower Cambrian. The rocks below the Cambrian, though of immense thickness, have afforded no relics of animal life, if we except the problematical *Eozoön Canadense*, so ably studied by Dawson and Carpenter. But if paleontology as yet throws no light on the original forms of life, we must remember that the simplest and the lowest organisms are so soft and perishable that they would leave "not a wrack behind."

THE LAW AS AFFECTING MINING AND METALLURGICAL INTERESTS.

1. Lateral Support in Mines.
2. Damages for Taking Gold from Mining Claim.

In *Hendricks, appellant, vs. Spring Valley Mining and Irrigating Company, respondent*, decided by the Supreme Court of California on August 17th, 1881, the plaintiff and defendant owned adjoining claims. It did not appear which was the prior location. The claims were "deep diggings," and were worked by the hydraulic process, and in mining its own ground the defendant washed away the gravel to a point distant, in one place, 70 feet, and at other places from 100 to 150 feet from the plaintiff's claim. At these points, the bank was deep, and the result was that it caved; and in doing so, a portion of the plaintiff's claim gave way, and fell on the ground of the defendant. This portion contained a small amount of gold-bearing gravel, a part of which the defendant washed away; but the value of the gold extracted therefrom was much less than the necessary cost of extracting it. Some time after the defendant ceased to work its ground near the plaintiff's line, large portions of the surface of the plaintiff's claim caved and fell upon the adjoining ground of the defendant, where it still remains. All of the caving was caused by the mining done by the defendant; but it is not claimed that the defendant's work was performed in a careless or improper manner. The plaintiff was defeated and appealed. In deciding this case, Judge Ross, in the opinion, said: "The question in the case is, whether the doctrine of lateral support applies to cases like the present. We think not. The very purpose of locating the ground, both on the part of the plaintiff and the defendant, was to tear it down and to wash it away. Its only value consisted in the gold it contained. To apply the doctrine contended for by the appellant to ground of this character would, therefore, to a great extent, defeat the very purpose for which it was located. Defendant would be liable for the amount of gold taken from the gravel that fell from the plaintiff's claim, but for the fact that its value was less than the plaintiff's cost of extracting it. *Maye vs. Tappan*, 23 Cal. 306; *Goller vs. Fett*, 30 ib. 481. H. E.

Negligence—Mining—Master and Servant—Condition of Roof.

A miner was injured by the falling of the roof of a portion of the mine, and brought suit against the company for damages, on the ground of negligence, in *Mooney vs. Lower Vein Coal Company*, in the Supreme Court of Iowa. The court, in April, 1881, decided, that the rule as to the liability of the mine owner was, that if the plaintiff knew, or by the exercise of ordinary care might have known, the unsafe condition of the roof, and he continued to work in the dangerous place without protest or complaint, and without being induced to believe that a change would be made, he assumed the risk, and can not recover. H. E.

LIGNITE AS A FUEL FOR IRON-MAKING.

The wealth of lignite in Austria, and the scarcity of mineral fuel of a higher grade, have long since induced the iron-masters of that country to turn to its utilization. During the last thirty years, eminent men, like Tunner, have studied the subject, and practical experiments have been conducted on a small scale and in actual working at various Austrian furnaces. Since 1874, lignite has been substituted for charcoal in iron-making to the extent of 40 to 50 per cent at Zeltweg, and at Kalan it is reported that as high as 70 per cent has been reached of late. Professor Franz Kupelwieser, of Leoben, is again agitating the subject in the *Zeitschrift des Vereins für Steiermark und Kärnten*, discussing the questions whether theoretically the production of pig from lignite is possible or not, and whether it can be practically carried out. Starting with the proposition that the fuel used ought not to contain more than 2 to 5 per cent of ash, and the coke made from it should range from at the highest 10 to 12 per cent in ash, he reaches the conclusion that theoretically there is nothing to prevent the use of charred lignite, nor is the employment of raw fuel of this class impossible, provided that the upper portions of the furnace are capacious enough to allow the charring process to be carried out there. As for the practical points involved, it is necessary to study the behavior of lignite when heated, and its action in the furnace. Lignite contains so much hygroscopic water and so large a percentage of volatile substances that the volume of the residue is materially decreased by heating, so that the larger lumps fall to small pieces, and it would be a great advantage if this tendency could be checked. It causes the materials in the furnace to have more density, and runs up the pressure of the gases in the furnace, choking it and gradually leading to the cessation of combustion. The main difficulty of using lignite in shaft furnaces of any kind is the size of the particles of fuel, and this trouble is increased if the ore and fluxes themselves are in a finely-divided condition. Many attempts have been made with more or less success to counteract this by special methods of charring or by balling the fuel into briquettes. A high pressure of blast has a loosening tendency, but there is a limit induced by the formation of channels in the charge through which the blast passes without any action. There is some advantage in charging the lignites in a raw state, carefully screened, so that only medium sizes are used, and the furnace, which must be low under all conditions, must be so constructed that its upper portions are ample in size. It would be an advantage, too, to charge the ore in a hot condition.

The miners of the Duquesne mines, Wilkesburg, Pa., were notified recently that the price paid by the New York & Cleveland Gas-Coal Co. would be four cents per bushel.

FUEL CONSUMPTION IN MAKING PIG-IRON.

Messrs. Taws & Hartman, engineers, of Philadelphia, have given the following data on the fuel consumption in a number of furnaces to Mr. James M. Swank, Secretary of the American Iron and Steel Association, in response to an inquiry from him. It embraces a period of six consecutive weeks of best running:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.
Bosh, feet.....	18	11	13	20	18	16	15	17	20
Height, feet.....	78	60	65	75	70	70	56	70	80
Fuel to ton of pig, lbs.....	2,227	2,264	2,314	2,900	2,087	2,822	2,603	2,357	.....
Carbon in fuel, per cent.....	85	94	85	82	88	85	87.4	83	85
Ore to ton of pig, lbs.....	2,610	4,816	4,099	2,481	4,480	4,239	3,413	3,920	3,741
Rolling-mill cinder to ton of pig, lbs.....	1,030	.....	.....	1,230	.....	.....	488	.....	.....
Limestone to ton of pig, lbs.....	1,546	1,355	1,815	1,756	2,240	1,815	1,050	983	1,366
Pig-iron, tons (2268 lbs).....	1	1	1	1	1	1	1	1	1,358
Quality of pig, Nos.....	1, 2, 3	3, 4	1, 1, 2, 3	1, 2	2, 3, 4	2, 3, 4	3	3	1
Heat of blast, degrees F.....	1,150	750	1,050	1,150	1,100	1,348	870	1,371	1,080
Fuel used.....	Coke.	Coke.	Coke.	Coke.	Anth.	Anth.	Anth.	1/2 Coke.	Coke.
								3/8 Anth.	

In the case of Nos. 1, 6, and 8, a Siemens copper ball pyrometer was used to ascertain the heat of the blast. The figures given are of interest as far as they go; but there are some points which might have been added, among which we would cite cubical capacity of the furnace, nature of the ores, whether hematites, magnetites, and what proportions. Mr. Swank's question referred particularly to best Lake Superior ores, but Messrs. Taws & Hartman do not state specifically whether the furnaces given worked those ores exclusively or in part, nor do they give the percentage of the various grades of pig made. In the case of No. 9, the weekly output is placed in the table, but the fuel consumption is withheld. It is evidently one of the "fast drivers," running on Bessemer pig with rich hematite ores. It would be of much interest to know how much the other furnaces make per week, so that the table would possess some value in affording a means of judging the effect of "fast driving" upon the fuel economy. We trust that these data are available and will be forthcoming.

WAGES PAID TO COLLIERY HANDS IN ANTHRACITE COLLIERIES IN 1880.

Mr. T. D. Jones, Inspector of the South District of Luzerne and Carbon counties, in his report gives the following figures on the rates of wages paid to colliery hands in the Wharton eight-foot vein and the Mammoth, 30 feet thick, in 1880, the inside wages advancing and declining at the rate of 10 per cent on every dollar rise and fall in coal above or below five dollars at tide. From April to August, both included, the price remained the same, as it did also from September to December, both included.

WHARTON VEIN.

PRICES.	Basis rates.	January and February.	March.	April to August.*	September to December.*	Mean.
Price of coal in market.....		\$3.50	\$4.10	\$4.30	\$4.50	\$4.2166
Rate per cent added or deducted.....		15 off	.09	.07	.05	.0783
Gangway, per yard.....	\$4.50	3.90	4.18	4.27	4.36	4.23
Air-way, per yard (25 sq. ft.).....	3.06	2.60	2.78	2.85	2.91	2.82
Cross-cut, per yard.....	2.30	1.96	2.09	2.14	2.19	2.12
Opening breast.....	8.50	7.23	7.74	7.91	8.08	7.84
Gangway, p. yard (B vein, 12 ft. thick).....	4.05	3.87	4.14	4.23	4.32	4.19
Price per 2 1/2 ton car (B vein).....	.944	.803	.861	.878	.897	.871
Price per 2 ton car (D vein, 8 ft.).....	.97	.825	.883	.903	.922	.894
Price per ton, Wharton vein.....	.415	.413	.441	.451	.461	.447

* Both inclusive.

MAMMOTH VEIN.

PRICES.	Basis rates.	January and February.	March.	April to August.*	September to December.*	Mean.
Price of coal in market.....	\$5.00	\$3.50	\$4.10	\$4.30	\$4.50	\$4.2166
Rate per cent added or deducted.....		15 off	.09	.07	.05	.0783
Gangways, timbered, per yard.....	6.12	5.20	5.57	5.69	5.81	5.64
Gangways, not timbered, per yard.....	5.34	4.54	4.87	4.98	5.07	4.92
Chutes, per yard.....	2.87	2.44	2.61	2.67	2.73	2.64
Chutes, per yard.....	1.91	1.62	1.74	1.78	1.81	1.76
Air-ways, per yard (25 sq. feet).....	3.25	2.76	2.96	3.02	3.09	3.00
Cross-holes from gangway to air-way.....	3.83	3.26	3.49	3.56	3.64	3.53
Price per ton (48 cub. feet to ton).....	.425	.36	.385	.395	.405	.392
Miners, per week.....	12.60	10.71	11.47	11.72	11.97	11.62
Miners' laborers, per week, 1st class.....	10.80	9.18	9.48	10.04	10.26	9.95
Miners' laborers, per week, 2d class.....	9.90	8.42	9.01	9.21	9.41	9.13
Gangway laborers, per week.....	11.53	9.80	10.49	10.72	10.95	10.62

* Both inclusive.

Miners working in flat places are paid from 5 to 6c. per ton for "buggying" the coal from the breast to the gangway. They get the coal they mine with the yardage.

THE DAVIS VALVE.—Among the recent efforts to increase the time of service of valves, which are often subject to much wear, is the Davis valve, which is so constructed that when one seat is worn beyond repair, the steam cover and disk are reversed, and when the disk alone is injured, it is reversed. Provision is also made to convert it into an angle or a three-way valve.

THE COAL TONNAGE OF SOME OF OUR RAILROADS.

In Poor's well-known Manual, for the year 1880, we find the following data of general interest relating to the coal tonnage of some of our railroads, with which we compare the quantity of merchandise carried, to give some idea of the importance of a trade which is often underrated. The total freight moved by the Pennsylvania Railroad was 16,341,568 tons, of which 7,494,723 tons were coal, including 1,560,206 tons mined by the company. Of the total freight, only 2,067,360 tons were through, while 15,364,788 tons were way freight, and 976,780 tons were the company's own material moved. The average distance per ton of the freight carried was 149.6 miles, the average rate being 0.880 cent per ton per mile, while the average expenses were 0.474 cent. The coal, owing to the low cost of handling it, is known to be the most remunerative freight the company has, although we do not possess the details to prove the statement by figures.

The Philadelphia & Reading Railroad moved 5,144,044 tons of merchandise at an average rate per mile of 1.997 cents, and 7,179,409 at a rate of 1.22. While 253,309,495 tons of merchandise were moved one mile, 542,852,074 tons, or more than double, of coal were moved a mile.

The Baltimore & Ohio, for the year ended September 30th, 1880, had a total tonnage of 9,849,891, of which 1,980,397 was through merchandise freight. On the main stem it carried 1,831,890 tons of paying coal and coke, and 423,356 tons of company supply, a total of 2,255,146 tons of coal and coke. Of the paying coal 1,584,315 tons were delivered at Locust Point, 57,244 tons at places in Baltimore, and 190,331 tons at way stations. Besides this, there were transported on the Pittsburg Division 1,821,526 and on the Trans-Ohio Division 312,454 tons, making a grand total of 4,388,856 tons carried.

The details given for the New York, Lake Erie & Western Railroad for the year ending September, 1880, are as follows: General freight moved, 4,648,318 tons; coal, 4,067,574 tons; a total of 8,715,892 tons. While the quantity is thus nearly one half, the mileage somewhat changes the aspect. Of general freight 1,283,782,256 tons were moved one mile, while of coal 432,326,839 tons were transported over the same distance. For general freight, the rate per mile was 0.869 cent, against 0.738 cent for coal. A classification of the general freight shows that among it were 386,551 tons of products of the forest, 509,948 tons of products of animals, 1,470,933 tons of vegetable food, and 224,013 tons of other agricultural products.

For the Central Railroad of New Jersey we have only the following data: Earnings from merchandise, \$2,037,342.95, compared with earnings from coal of \$4,741,956.93, the total freight moved having been 6,118,302, and the tons transported having been 518,117,193, at an average rate of 1.308 cents.

The New York Central & Hudson River Railroad transported during the year ending September 30th, 1880, in all 10,533,038 tons of freight, of which 4,111,689 was through business. It moved 2,525,139,145 tons one mile, of which 1,524,721,302 tons were through freight, the average rate being 0.88 cent. Classified, its freight was 570,410 tons of products of the forest, 584,197 tons of products of animals, 3,261,402 tons of vegetable food, 491,526 tons of other farm products, 1,586,367 tons of manufactures, 671,630 tons of merchandise, 1,639,506 tons of coal, 607,306 tons of live stock, 430,975 tons of petroleum and other oils, and 119,719 tons of other articles. The coal, it will be noted, forms a considerable portion of the traffic of this line, whose great business is that of carrying Western produce. In this connection, it will be of interest to examine the record of the Lake Shore & Michigan Southern Railroad. The total freight carried was 8,350,336 tons, 1,851,166,018 tons being moved one mile, in the year ending December 31st, 1880. Of this, 1,239,093 tons, or 14.84 per cent, was coal; 1,727,645 tons, or 20.69 per cent, was grain; 308,039 tons, or 3.69 per cent, were agricultural products, except grain; 367,718 tons, or 4.40 per cent, was flour; 314,468, or 3.77 per cent, were provisions; 314,587, or 3.77 per cent, were manufactures; 736,647 tons, or 7.62 per cent, was iron; and 1,471,668 tons, or 17.67 per cent, was merchandise, and other articles, not including stone and lime, petroleum lumber, or animals. The receipts per mile per ton were 0.750 cent, the cost 0.435, and the profit 0.315 cent. Here, too, therefore, we see what an important item the coal traffic is.

Taking another Western road, for which Poor's Manual gives the data, the Chicago & Alton Railroad, which moved 3,071,788 tons of freight, of which 805,879 tons were through and 2,265,909 tons were local freight. It transported 481,474,730 tons one mile for an average rate of 1.206 cents. Of the total freight, 989,145 tons were coal and 229,255 tons iron. Another Western road which may be quoted is the St. Louis, Alton & Terre Haute Railroad, which carried 373,002 tons, or 11,357,352 tons one mile at an average rate of 2.20 cents, while it transported in the same year, to December 31st, 1880, 262,511 tons of general freight, or 14,558,004 tons one mile, at 2.06 cents. Its coal earnings were \$248,233.60, against \$299,999.65 for general freight.

The Delaware & Hudson Canal Company transported, during the year 1880, 2,674,754 tons from its own mines, and 372,899 tons for other parties—a total of 3,047,594, of which 1,531,951 tons were distributed from Honesdale via canal and railroad, 59,390 south from mines, 480,576 east and west, 402,785 by Albany & Susquehanna Railroad, and the remainder by local sales. The average rate on the railroad was 1.51 cents for freight moved.

The Delaware, Lackawanna & Western Railroad moved in all 5,269,359 tons of freight, including 4,160,923 tons of coal. The total movement was 316,893,691 tons one mile, at an average rate of 1.41 cents.

The Lehigh Valley Railroad moved 3,038,710 tons of freight, taking 166,178,752 tons one mile, at a rate of 1.131 cents. It transported also 5,159,408 tons of coal, moving 426,190,727 tons one mile, at an average rate of 1.256 cents. The Pennsylvania & New York Canal and Railroad, the northern outlet of the Lehigh Valley Railroad, carried 911,468 tons of freight, moving one mile 78,662,805 tons, at an average rate of 0.909 cent, while it transported besides 705,464 tons of anthracite and 435,516 of bituminous coal, or 1,140,981 tons of coal in all, equivalent to moving 60,278,613 tons of anthracite and 11,086,376 tons of bituminous coal one mile, the average rate being 1.106 cents.

The Northern Central Railroad during the year 1880 moved 461,904,456 tons of freight one mile, at an average rate of 0.894 cent. Out of 9,460,329 tons of freight carried, 4,196,715 tons were coal.

The Huntingdon & Broad Top Railroad transported 564,942 tons of freight, of which 417,330 tons were coal. Its earnings from merchandise were \$61,321.02, and those from coal \$180,003.62.

THE CONSUMPTION OF SMOKE.

There has been much agitation of the subject of smoke consumption during the past few years, both in this country, notably at Cincinnati, and in England, where Dr. C. W. Siemens has taken a very active part in the discussion.

It is remarkable that the smoke nuisance was the first subject which engaged the attention of the Royal Society two hundred years ago. Charles the Second, who loved to dabble in science and was greatly annoyed by the smoke of Whitehall, strongly backed up John Evelyn in his efforts to prevent the nuisance, and Evelyn produced his "Fugifumium," an essay on the subject, but no successful effort was made; and it was the mixture of smoke and damp which, a few years later, caused William the Third peremptorily to refuse to reside at Whitehall, and angrily reply to a minister who urged him to do so, "Do you wish to kill me?" About twenty years ago, an act was passed compelling manufacturers of all kinds in London, even bakers, to consume their smoke, and from the date of that act coming into operation the gardener of the Temple, which abuts on the Thames, has been able to raise fine chrysanthemums. Since then, nothing has been done until now, but there is every prospect of an improvement. An exhibition of smoke-consuming apparatus, fuel, etc., is to be held at South Kensington from October till November 26th, and in accordance with an official declaration of the Board of Trade, protection is given all inventions exhibited during the time of exhibition and for six months afterward. The Admiralty, through its Secretary, Mr. Trevelyan, has expressed its readiness to make special trials of the apparatus exhibited. It is hoped that this will do much to aid progress in this matter, and Americans will watch developments closely.

DISTANCES TO MARKET FROM POINTS IN THE ANTHRACITE COAL-FIELDS.

Accompanying a map drawn for the report of the Inspectors of Mines for 1880, by Mr. A. B. Cochran, of Pottsville, Pa., is the following table of distances to market in miles, which will prove of much value:

FROM	NEW YORK.							PHILA-DELPHIA.			BALTIMORE.		
	RAILROAD.			CANAL.				RAILROAD.	CANAL.	ERIE.	RAILROAD.	RR. and Canal.	Canal.
	Port Johnston.	Elizabethport.	Perth Amboy.	RR. and Canal.	Morris.	Del. & Rar.	Del. & Hud.							Newburg.	Roadout.
Pottsville.....	.....	.....	.....	196	226	.....	.....	93	106	.....	.....	.....	.....
Schuylkill Haven.....	.....	.....	.....	192	222	.....	.....	89	102	.....	.....	.....	.....
Port Clinton.....	.....	.....	.....	181	211	.....	.....	78	91	.....	.....	.....	.....
Tamaqua.....	.....	.....	.....	201	231	.....	.....	98	111	.....	.....	.....	.....
Pine Grove.....	.....	.....	.....	204	234	.....	.....	101	114	.....	.....	.....	.....
Shamokin.....	.....	.....	.....	169	228	.....	.....	125	138	306	158	200	.....
Mahanoy City.....	149	145	142	222	182	242	.....	109	122	.....	.....	.....	.....
Lykens.....	.....	.....	.....	240	.....	.....	.....	157	.....	331	128	170	.....
Mauch Chunk.....	114	110	107	.....	147	172	.....	89	124	.....	.....	.....	.....
Hazleton.....	138	134	131	.....	171	196	.....	113	148	.....	.....	.....	.....
Wilkes-Barre.....	168	164	161	.....	201	226	.....	144	179	349	203	260	246
Pittston.....	.....	.....	.....	172	173	.....	.....	137	.....	.....	.....	.....	.....
Scranton.....	132	128	125	143	.....	.....	.....	208	116	124	.....	.....	.....
Carbondale.....	.....	.....	.....	132	.....	.....	.....	.....	.....	366	320	277	263
Honesdale.....	.....	.....	.....	136	.....	.....	.....	.....	.....	381	335	239	278
Hawley.....	.....	.....	.....	128	.....	.....	.....	.....	.....	.....	.....	.....	.....

In addition we give the following distances for some of the other coal fields of the country to prominent points:

From Cumberland to	Miles.
Georgetown (canal).....	184
Alexandria (canal).....	191
Philadelphia (rail).....	242
Clearfield " ".....	240
Westmoreland " ".....	332
Blossburg " ".....	300
Kanawha " Richmond ".....	325

OUR ANTHRACITE COLLIERIES.

From Prof. Raphael Pumpelly's preliminary census report for the year ending June 1st, 1880, we take the following data on our anthracite collieries. We have given the weights in tons of 2240 lbs., as the trade is more familiar with that basis than with the tons of 2000 lbs., adopted by the census:

Total number of separate establishments or collieries.....	273
Average yearly capacity of production, tons.....	132,453
Average actual product in census year, tons.....	89,721
Per cent of maximum capacity attained.....	67.28
Average capital, leased, employed, and invested.....	\$550,041
Average number of hands employed.....	250
Average amount of wages paid yearly.....	\$79,414
Average value of materials used yearly.....	\$23,588
Average number of acres of coal land attached to colliery.....	604
Ratio of value of yearly product to total capital, per cent.....	26.86
Number of company stores.....	69

The "capacity of production" referred to means the probable output with present force and appliances.

COAL SHIPMENTS.—Owing to scarcity of cars, only 45,785 tons of coal were sent over the Tyrone division of the Pennsylvania Railroad, during the week ended September 10th, from the Clearfield Region. Total shipments for the year to date, 1,656,451 tons, an increase over same period of last year of 551,547 tons. The coal shipments from the George's Creek, Maryland, regions, for the week ending September 10th, were 43,908 gross tons. Total for the year, 403,939 tons, a decrease over same period last year of 43,646 tons.

THE IRON TRADE AS A COAL AND COKE CONSUMER.

Mr. James M. Swank, in his preliminary report on the census statistics for 1880 of the American iron trade, gives the following data on the consumption of anthracite and bituminous coal and coke by the iron mines of the country, all the figures being net tons:

	Anthracite.	Bituminous coal.	Coke.
Blast-furnaces.....	2,615,182	1,051,753	2,128,355
Rolling-mills.....	536,126	3,915,377	14,834
Bessemer and open-hearth steel-works	140,458	465,655	104,980
Crucible steel-works.....	40,392	224,657	22,791
Forges and bloomaries.....	340	1,613	6,695
Total.....	3,322,498	5,659,055	2,277,555

Nearly all the anthracite, and fully two thirds of the bituminous coal and coke were purchased from independent producers.

COAL-DUST IN COLLIERY EXPLOSIONS.

The influence which may be exerted by deposits of coal-dust in mines upon the magnitude of fire-damp explosions, to which attention appears first to have been directed by the observations of Faraday and Lyell in 1845, was made the subject of some experiments in France, in 1867, by M. Verpilloux, who came to the conclusion that coal-dust plays an important part in coal-mine explosions. The subject was further and more fully examined into in France by the aid of experiments on a small scale by M. Vital in 1875, in connection with an inquiry into the nature and cause of an explosion which occurred the preceding year in the Champagnac Colliery, and in a part of that colliery where no fire-damp had ever been detected. Soon after M. Vital's investigation of the subject, Mr. W. Galloway commenced a series of valuable experiments upon a larger scale, with the view of investigating the influence of coal-dust in colliery explosions, and the results were communicated by him to the Royal Society in two papers in 1876 and 1879. The conclusions to which Mr. Galloway was led by the experiments described in his first paper were to the effect that a mixture of air and a particular coal-dust which had been made the subject of chemical examination and practical experiment, was not inflammable at the ordinary pressure and temperature, but that the presence of a very small proportion of fire-damp in the air, the existence of which could not be detected with the Davy lamp by the most experienced observer, rendered this dust inflammable, and caused it to burn freely with a red, smoky flame. From this it was inferred that an explosion, when originated in any way whatever in a dry and dusty mine, may extend itself to remote parts of the workings, where the presence of fire-damp was quite unsuspected.

In his second paper, Mr. Galloway demonstrated that the return air of a mine in which a considerable quantity of fire-damp is emitted by the coal, as in the Llwynypia Colliery (where the air-return was estimated to contain approximately 2 to 2½ per cent), may be rendered inflammable by the addition of coal-dust. He also described experiments by which it appeared to be demonstrated that the flame developed by an explosion of fire-damp in a particular part of a mine might be propagated, at any rate to some extent, by coal-dust raised and suspended by the explosion in the air traveling through a mine, even in the complete absence of fire-damp in this air.

Experiments are now being carried out by a committee of the Chesterfield and Derbyshire Institute of Engineers, at Harton Colliery, and by others. The most recent investigation, however, is that made by Professor F. A. Abel with a view to determining specially the question whether coal-dust played a part in the Seaham Colliery explosion, and in a general way under what conditions such disasters are precipitated. In an exhaustive report, from which we have also taken the above summary of earlier efforts in this direction, he gives the details of elaborate chemical and microscopical tests of the dust, and the results of a series of experiments. We have not the space to refer to these in detail, and will content ourselves with giving broadly the additional facts elicited by them, as they are of direct practical interest to those engaged in the coal trade.

Professor Abel confirms Galloway's conclusions that coal-dust in mines promotes and extends colliery explosions, but that it will operate even as an exploding agent through the medium of a proportion of fire-damp in the air of the mine, the existence of which, in the absence of the dust, would not be attended by any danger. Professor Abel has discovered the important fact, by direct experiment, that dust in coal mines, quite apart from any inflammability which it may possess, can operate in a distinct manner as a finely-divided solid, when only a small quantity of coal-gas is present, in determining the ignition of mixtures of only small proportions of fire-damp and air, and consequently developing explosive effects. He has found that perfectly non-combustible powders may be a serious source of danger when the air contains 3 to 3½ per cent of fire-damp. Though the explosion which may occur through its agency may be of a very mild character, it may be almost at once increased in magnitude and violence by coal-dust which the first ignition raises. Mr. Galloway, in recently reviewing the subject before the British Association at York, attributed the high percentage of fire-damp in Professor Abel's experiments, 2½ to 3½ per cent, to the coarseness of the dust employed. Mr. Galloway holds that coal-dust forms an inflammable mixture with pure air, and states that if water is sprinkled on the floor from time to time, and always before blasting-shots, disastrous colliery explosions would not occur.

PILLARS ON THE DIVIDING LINES OF COLLIERIES.

Mr. W. R. Jones, Inspector of the Eastern District of Luzerne and Carbon counties, takes a strong position in his latest report against the prevailing practice in the anthracite coal-fields of working collieries indiscriminately through into each other. He urges that a strong, unbroken pillar should be left on the dividing lines between all collieries, so that in case of a fire a mine may be flooded at once without interfering with the working of adjoining mines, as in the case of the Kehley River mine. He advocates, even, that the successive lifts in the same colliery ought to be kept distinct and separate as far as possible. Another danger

besides that of fire threatens the collieries on other flat veins which are now working, as in the Lackawanna and Wyoming regions, under the beds of the Lackawanna and Susquehanna rivers. As there is every reason to fear that sooner or later caves will occur which will inundate the workings beneath their beds, and all the workings adjoining them, he particularly advocates a system of separation of the collieries. The only objection raised, that it would prevent the passage of air from one colliery to the other, Mr. Jones disposes of by condemning that practice of ventilation as objectionable, nor does he believe that the leaving of pillars would be the cause of loss.

LABOR IN OUR ANTHRACITE COAL MINES.

A summary of the data collected by the Census Bureau on the labor in our anthracite collieries is as follows:

Number of men above ground.....	15,564
Number of men below ground.....	36,952
Number of boys above ground, under 16 years of age.....	11,921
Number of boys below ground, under 16 years of age.....	3,802
Total employes.....	68,239
Of whom miners number.....	19,585
Of whom laborers number.....	47,410
Of whom administrative force number.....	1,244
Per cent of total force, miners.....	28.7
“ “ “ boys.....	23
“ “ “ laborers and boys.....	69.5
“ “ “ administrative force.....	1.8
Total wages paid.....	\$21,680,120
Average yearly income of man.....	\$359.08
Average monthly income of man.....	\$42.33
Total number of months worked by one man.....	512,204
Total number of months of enforced idleness.....	207,090
Total number of months lost in strikes.....	5,234
Per cent of year worked.....	70.96
Per cent of year lost by stoppage, etc.....	28.60
Per cent of year lost in strikes.....	0.72

The wages given above signify net wages, being the figures on the payroll less the sum the miners are obliged to spend for powder, oil, etc.

THE ANTHRACITE PRODUCTION OF PENNSYLVANIA.

The following brief table taken from the preliminary census report gives a number of valuable facts; the tons being 2240 lbs:

Merchantable product for year ending June 1st, 1880, tons.....	24,494,036
Value of product delivered for transportation.....	\$40,331,981
Average value of same per ton for transportation.....	\$1.65
Amount of coal washed, tons.....	1,247,237
Ratio of value of product to capital, per cent.....	26.86
Ratio of actual output to capacity, per cent.....	67.28
Tons raised yearly per man.....	405.7
Tons raised daily per man.....	1.90
Maximum yearly capacity of all collieries reported, tons.....	36,403,571

The number of tons raised yearly per man is calculated by taking the total number of laborers, miners, and administrative force, and reckoning two boys to be equivalent to one man.

In addition to the merchantable product given above, 83 collieries, with a production of 18,121,722 tons, report the production of 6,303,971 tons of impure coal and dust, under the head of "culm." This would be 34.8 per cent of the product, and would indicate a total production of 8,376,862 tons of unmerchantable coal during census year, to which no value is assigned. The best procurable estimate would show that 810,937 tons of this was used in making steam at the mines. A small unascertained portion is used in locomotives on the coal roads, and another unascertained portion is sold, for use under boilers, at the cost of transportation.

COAL TRADE NOTES.

COLORADO.

The Gunnison Improvement Company is now shipping its coal into Gunnison, where it commands \$15 per ton, and arrangements are now in progress for sending the product as far east as Denver.

It is reported that veins of coal, showing a width of from six to eight feet, within ten feet of the surface, have been found in the Elk Mountain District. They are located about twelve miles from the line of survey of the Denver & Rio Grande Road.

MARYLAND.

The Cumberland Times has the following under date of September 23d: "Since the rise in the river, there has been considerable trouble among boatmen on the canal, they asking \$1 per ton, but the companies declining to pay it. Owing to the rise in feed and the number of idle days when the season should be the busiest, some boatmen have disposed of their stock and left their boats down the canal, while others demand \$1 per ton and refuse to go out. Yesterday, there was quite a commotion at the basin. Some of the boatmen on company boats, who were paying \$30 per trip for their boats, left in a body, and took charge of other boats abandoned by their crews, the owners agreeing to take \$20 per trip. Some of the companies and individuals have reduced trippage to \$20 and pay 80 cents per ton; others pay 90 cents, but demand \$30 per trip; while boatmen who can be independent have refused to go out for less than \$1 per ton. It will thus be seen that every thing is unsettled. Although there was plenty of coal, quite a small number of boats left this port yesterday. It is to be hoped the differences will all be settled very soon."

OHIO.

OWING to the scarcity of cars at Palmyra, and at East Palestine, the mines in the vicinity of these places have only been running part of the time recently.

THE Youngstown News of September 21st states that the Leadville Coal Company is repairing the engine-house, and rebuilding the hoisting-house and chutes, and expects in a few days to be ready to ship coal.

THERE are seven shafts and two drifts shipping coal at Corning, and one more shaft and two drifts will be ready in a short time.

PENNSYLVANIA.

ANTHRACITE.

ACCORDING to the Scranton Republican, a large number of shafts is

now being put down in that vicinity. The Delaware, Lackawanna & Western Company is sinking one in Kingston; Waddell another at Mill Creek; the Lehigh & Wilkes-Barre Company another in South Wilkes-Barre, and still another on Rolling Mill Hill; the Susquehanna Coal Company is sinking its No. 1 in Nanticoke to the red ash vein; Sharp & Wise are preparing to sink a shaft near Wanamie; another is going down at Wyoming; Waddell & Walker are sinking another at Mill Hollow; the Kingston Coal Company another in Kingston. Three other shafts from which no coal is yet taken have lately been completed: No. 11, of the Wilkes-Barre Coal Company at Plymouth; the Gaylord, which has been extended to the red ash vein; and the new shaft sunk by the Kingston Coal Company in Kingston.

THE Scranton *Republican* reports that ground was broken recently on the Von Storch property, at Green Ridge, for a new shaft and coal-breaker, of 150,000 tons capacity annually.

IN the Locust Spring mine, at Locust Gap, Northumberland County, the mammoth vein is getting worked out, according to the *Shenandoah Mining Herald*. Until recently, they have hoisted from 260 to 280 wagons a day. Now, they find a great deal of trouble to load within 100 of that number. They have run as low as 155 wagons, and never load more than 180 wagons.

THE recent additions to the breakers of the Pennsylvania Colliery of the Mineral Railroad and Mining Company will double its former capacity.

IT is stated that the Northern Central Company intends to sink a new shaft within a mile of Mount Carmel.

PARKER'S *Record* reports that the mammoth vein at the Elmwood Colliery was struck by the new tunnel in course of driving recently. The first piece of coal got out of the vein was secured by Mr. Rowbotham, coal and iron police, and shipped to the headquarters of the company. The Elmwood Colliery has heretofore been rated as one of the poor-paying collieries of the company; but this striking of the mammoth vein places it in a better position.

THE *Hazleton Sentinel* says that the work of hoisting the water, at the Kehley Run Colliery at Shenandoah, with which the mine has been flooded for months, began a couple of weeks ago. Since that time, the water has been lowered about four feet, on the pitch, per day. At this rate, the working in which the fire existed, and which was closed in, will be emptied about the middle of November. The other workings are also flooded, and contain more water than the one in question. These, however, can be cleared of water in a comparatively short time. The water is hoisted in tanks which have a capacity of 1800 gallons. It is now an assured fact that the fire is extinguished, and the colliery will soon be put in working order.

THE Ebervale Coal Company, which has recently completed its new No. 3 breaker, is using four Clark jigs with success.

THE *Minersville Republican* says that Mr. J. B. Church, superintendent for the Alliance Coal Company, is busy having surveys made on the lands of this company near New Philadelphia, for the purpose of locating the Mammoth vein, preparatory to the erection of a large colliery there. The coal will be shipped to Tamaqua over the Philadelphia & Reading, and thence over the Central of New Jersey.

FROM several points in the Schuylkill coal-field, says the *Pottsville Miner's Journal*, comes the intelligence that unless rain falls within a short time the water supply will have taken its departure. The rain of last week did very little good. It merely prevented, for a period of about forty-eight hours, a decrease in the water supply from evaporation and other natural causes. It failed to increase the supply. The water in Mud Run dam is down to a very low ebb. Its capacity is 50,000,000 gallons. Over twenty collieries in the region are supplied by railroad and team, and this supply is about to be cut off. At several collieries, mine water is in use. Few operators care about using it under any circumstances.

NO. 11 shaft of the Lehigh & Wilkes-Barre Company, Plymouth, is now in course of sinking to the lower or red ash vein. Temporary pumping-works, to supply the shaft with water for the engines, are being put up on the bank of the river.

BITUMINOUS.

FROM the *Connellsville Keystone Courier* we gather the following items on that region: Sixty new ovens have been fired at the Standard mines. Quite a number of the ovens built at Morewood this summer have not been charged, owing to the amount of stock coke on the yards. During the recent dry weather, the Chicago & Connellsville works were compelled to drown out their ovens with pit-water for a couple of weeks. The fifty new ovens in course of construction at the Chicago & Connellsville works will be completed by the first of October. This will make 200 ovens in blast at these works. During the past week, the Penn Gas-Coal Company has been compelled to haul water from the Youghiogheny River in cars built specially for the purpose, for supplying its engines near Irwin. The cars hold 5000 gallons each. Pittsburg capitalists are looking after the Pleasant Unity coal now that a railroad is to be built to that place. As soon as the road is as far as the Simon Fisher farm, coke-works will be erected thereon and shafts sunk. Most of the coal in this locality will have to be shafted for. The old story of scarcity of cars continues. From furnaces all over the country comes the cry of shortage of fuel, and coke manufacturers fear they may have to face suits at law for damages arising from non-fulfillment of contracts, unless the railroads help them out very soon. With few exceptions, works are running on 72-hour coke; but though the production is thus reduced, the supply of cars is far from being adequate to move the daily output, and, as reported last week, some shippers are actually burning their coke away in the ovens. During the past week, but about 1150 cars have been sent here by the Western roads, a shortage of 1600 cars for those lines for the period named. As the Fort Wayne road gets most of the shipments going West, they are the heaviest losers, but proportionately, the Panhandle is shortest in its supply, not more than one third enough cars coming here to supply shippers to that line. Even individual cars have been short the past week, and they are from one to two days longer in making round trips than has been their past average.

COAL was struck at the new shaft of Phillips & Forker, Mercer County, a few days ago. Part of the machinery for hoisting is already in place, and the railroad leading to the shaft is graded.

DURING the year 1880, twenty-three mines were in operation in Mercer County, Pa., and gave work to 955 miners, of whom 815 were men and 140 boys. The other employes numbered 202, making the total at work in the mines 1157. There were mined during the year 262,780 tons of coal, an average of 277 tons to each miner. The Pardoe mine produced 60,996 tons, the largest output of any mine in the county. Five mines were worked out and abandoned, and four new ones were opened in 1880.

TEXAS.

A VEIN of semi-bituminous coal has been opened on the east bank of the Rio Grande, about twenty miles above Laredo. A branch road is building.

VIRGINIA.

THE *Virginias* reports that the Crescent coal mines of Capt. W. R. Johnston, on the Great Kanawha, Crescent station, of the Chesapeake & Ohio Railroad, 78 miles east from Huntington, sent to market about 80,000 tons of "Kanawha coal" in 1880—the largest output, so far as we know, of any mines on the Chesapeake & Ohio. The output for the first six months of 1881 has been about 50,000 tons from the three Crescent mines that are now in operation; so we may look for 100,000 tons from the "Crescenting" operations this year. The Great Kanawha coal-field has a well-assured future, one that will soon become a present reality when it has a hundred mines producing as the Crescent, and others we will mention hereafter, now do.

LABOR NOTES.

AT Wampum, Pa., the miners are getting 99 cents for 2100 of coal.

FOR mining block coal at three shafts in the vicinity of Carbon, Clay County, Indiana, \$1 per ton is paid.

THE miners of Leechburg, Pa., who asked for an advance of 10 cents per ton seven weeks ago, are still out.

IN the Hocking Valley, the miners are to receive an advance to 80 cents per ton for digging.

THE strike at the Horse Creek Valley, Jackson, O., mines terminated recently. Eighty-five cents per ton is now paid for mining.

THE drivers in the Cleveland, Iowa, mines have asked for an advance of 25 cents per day.

THE miners of the Monongahela District are making strong efforts to prevent any evasion of the store-order act.

THE Tuscarawas Valley Coal Company, of Pike Run, Tuscarawas County, O., pays 80 cents per ton for digging.

THE Nelsonville *News* has the statement that the Ohio Central Coal Company of that district will pay 80 cents per ton after October 1st.

THE following scale of prices for the Peterton District, Osage County, Kansas, for next year, was accepted by a majority of 186 votes: For September and October, 8½ cents per bushel; November, December, January, February, and March, 9 cents per bushel; April and May 8, cents per bushel; June, July, and August, 7½ cents per bushel.

COAL TRADE REPORTS.

We print the following special reports from our correspondents, on the coal trade of the various sections of the country:

BALTIMORE, Sept. 28.

The anthracite trade for September has been very quiet. The greater number of consumers have purchased and received their coal before the beginning of the present month, and as a portion of our population have not returned to the city and opened their houses, in consequence of the continued exceptionally hot weather, and the smaller buyers are kept back by the same cause, sales during the month have been very light. The movement that has taken place has been mainly to fill orders taken earlier in the season. With the absence of frost, or more reasonable weather, and the mercury not standing at from 85° to 90° in the cool places, we must necessarily have a brisk retail demand.

Stocks by rail are very light, and by water only fair, canal transportation having been impeded somewhat by low water. The supply by rail, though, has dwindled to most insignificant proportions, and the whole trade is clamoring for coal. The stereotyped answer is, No cars. The Pennsylvania coal-hoppers that bring coal here are loaded with Spanish ore, or other freight, for Pittsburg, Harrisburg, Johnstown, or some other point, instead of returning directly to the mines; while box cars are used for grain storage at different points instead of returning to the mines to load for lake ports, and coal-hoppers must be sent West at the expense of the Eastern trade. There is no immediate prospect of improvement as far as can be ascertained. The monthly meeting for the magnates takes place in Philadelphia on Friday, the 30th. If any advance is ordered, it is thought it will be small.

ANTHROS.

Wholesale prices per 2240 lbs.

ANTHRACITE COAL.

Hard White Ash, Free Burning, and Shamokin.

	In cars at N. C. RR. depot.
Lump and steamboat	\$5.15
Broken	4.35
Egg	4.50
Stove	4.65
Chestnut	4.35

Lykens Valley Red Ash.

Broken	\$5.45
Egg	5.45
Stove	5.45
Chestnut	5.15

Afloat, per cargo, 15c. less than car rates; to trade in yard or wharf, 75c. additional.

BITUMINOUS.

George's Creek, or Cumberland, f. o. b. Locust Point..... \$3.60@3.75

BUFFALO, Sept. 28.

[Specially reported by Messrs. LEE & LOOMIS.]

Our market for last month has been characterized by extreme quietness, not from lack of inquiry, but from the lack of transportation. This element may, however, have been an important one in sustaining the prices, and hence we hear but very little of cutting schedule. Undoubtedly, as transportation facilities become more plentiful and the winter advances, we shall again hear that "concessions are made," especially as by the action of the companies yesterday, in advancing prices, there is just that much more margin from which to concede.

There is still a large amount of coal here to be moved West by Lake, and rates have again advanced from the prices to which they had receded some time since. Rates quoted are to Detroit, 50c.; Chicago and Milwaukee, \$1.30; Racine, \$1.50; Duluth, \$1.63. These

rates seem high; but, in view of the amount there is to move, it is not likely that they will be lower. All coal for interior points south and west of Chicago had better go by rail; first, because it is cheaper, taking all expenses into account, and secondly, because the coal reaches destination in better condition.

Taking the whole season together, the trade has been far from satisfactory to miners or shippers. During the fore part of the summer, orders were held back in the hope that the rates would break. This in a measure caused concession from circular rates in the shape of "a commission off."

In bituminous coals, the prices have stiffened up, and miners are asking and obtaining an advance of ten cents per ton, and at that are hardly able to keep customers going, owing to lack of cars. There would be no difficulty in obtaining all the coal needed, were there plenty of transportation.

The Cameron Coal Company has been experimenting with a view of coking the surplus of its coal, and with that view has got up an oven. Its first car came here a few days ago.

The coke is well spoken of, but has yet to undergo the test of practical trial. Connellsville coke has receded in price a little, sales being made at \$5.35 on cars here. Many of those who left off using it when the new and cheaper coals came to this market have returned again, their complaint being that the new coals were not uniform quality nor free from sulphur, and that with Connellsville they felt safe and sure.

CHICAGO, Sept. 27.

[Specially reported by Messrs. RENO & LITTLE.]

The receipts of anthracite coal during the month, by both lake and rail, have been only fair. Vessels are scarce and freights for coal from Lake Erie ports have been higher than usual, and the last charters at Buffalo show an advance of 15 cents a ton, quoted now at \$1.30, free in and out.

The demand for coal has been good, and the deliveries to consumers are large, and would be much more so if not restricted by the sickness and deaths among the work-houses of the city.

The quantity of coal upon the docks here is not too large for the season, and judging from the present demand for vessels in the iron-ore and lumber trade, the market is not likely to be overstocked this fall. The stock of bituminous coal is light. The demand for the cheaper grades of steam coal is large, and the supply constantly too small. There is no change in prices to report. We quote:

Stove, Chestnut, and Egg	.....	\$7.50 @	\$7.75
Grate	.....	@	7.50
Erie and Brier Hill	.....	7.00 @	7.50
Wilmington and Illinois	.....	@	5.00

St. LOUIS, Sept. 27.

[Specially reported by JOHN T. HESSER & Co.]

The coal trade during present month has been highly satisfactory. The demand has been good and prices remunerative to the operators. The quantity sold of some local coals is limited only by the amount that the railroad pools will permit the operator to ship. A considerable quantity of Indiana block coal is sold here for furnace and domestic use, and gives excellent satisfaction. Sales of anthracite are ahead of any former year.

Below we quote you present prices on coal and coke per ton, 2000 pounds, on cars at St. Louis:

ANTHRACITE COAL.	
Grate	..... \$7.25 | Stove..... \$7.50
Egg	..... 7.25 | Chestnut..... 7.50
BITUMINOUS COAL.	
Equality (Ill.)	..... \$2.65 | "Big Muddy"..... \$3.50
Bellville (Ill.)	..... 2.25 | Blossburg (Cumberland)..... 5.25
Indiana Block	..... 3.25
COKE.	
Equality (Ill.)	..... \$5.00 | West Virginia..... \$6.75
Connellsville	..... 7.50

CINCINNATI, Sept. 27.

[Specially reported by the CONSOLIDATED COAL AND MINING COMPANY.]

The stocks of soft coal in this market have been reduced to very small proportions on account of the continued drought and low water in the Ohio. Prices have, consequently, advanced to 15 cents per bushel for Pittsburg coal, in the river, at wholesale; other grades, according to their quality.

The uncertainties of Ohio River coal transportation have been made greater this year than usual by a dam that is building by the government across the river a few miles below Pittsburg. When this dam shall be completed, it is expected that it will facilitate coal shipment; but for the present it stops navigation, except as it can be passed through one lock. This is likely to compel high prices for Pittsburg coal during all the coming fall.

The shipments of anthracite have been very light during the month of September, but the warm weather has postponed the special demand that always comes with the first frost. All the dealers have good stocks in their yards, and there will be small chance for any considerable inconvenience consequent upon the small receipts of this month. Prices of all kinds of coal may be reported as steady, as follows:

	Afloat.	Delivered to consumers.
Youghiogheny	..... 15 cts. per bush.	18 cts. per bush.
Kanawha River	..... 14 "	17 "
Ohio River	..... 10 "	15 "
Muskingum Valley	..... 12 "	16 "
Anthracite—Wilkes-Barre	..... \$7.00 per ton, " on cars	\$8.00 per ton del.
Lehigh	..... 7.50 "	8.50 "

CLEVELAND, Sept. 27.

[Specially reported by F. A. BATES.]

The demand for shipping coal is very large and far exceeds the supply, which is restricted by want of cars. Several strikes have taken place in the Hocking Valley and adjoining sections, and the operators have practically made concessions of ten cents per ton for discharging. At present the miners are at work, but it is likely that further demands will be made by the miners.

	F. o. b. vessel, 2000 lbs.	Retail price.
Brier Hill Lump	..... \$3.75	\$4.00
Straitsville	..... 2.85	3.75
Hocking Valley	..... 2.85	3.75
Carbon Hill	..... 3.00	3.60
Montour Run	..... 3.00	3.60
Massillon	..... 3.00	4.00
Salineville	..... 2.60	.....
Tuscarawas Valley	..... 2.50	6.25
Anthracite—Egg and Grate	.....	6.25
Stove and Chestnut	.....	6.50

NEW ORLEANS, Sept. 27.

[Specially reported by C. A. MILTENBERGER & Co.]

The coal market has been fairly active during this month, caused by the advance in prices of Pittsburg coal, the scant supply, and the cutting off of the prospect of any addition to the stock by the low condition of the upper rivers. This market depends almost entirely on Pittsburg for its coal supply, all of which is towed to this port whenever the river reaches a sufficient stage to permit the navigation of coal boats and barges. It has now been several months since any tows of coal have reached this city, during which time the stock has been rapidly depleted. We now quote:

PITTSBURG COAL.		ANTHRACITE COAL.	
At wholesale	..... 50@52 1/2 c. per bbl.	At wholesale	..... \$7.00 @ 8.00 per ton.
To steamboats	..... 65c. "	" retail	..... 9.50 @ 10.00 "
" factories	..... 65c. "	ALABAMA COAL.	
" families	..... 75c. "	At retail	..... 60 @ 75c. per bbl.
In hhds. (for shipment)	..... \$7.00 per hhd.		

RICHMOND, Sept. 26.

[Specially reported by S. H. HAWES.]

There is no change in quotations. The bulk of soft coal used in this market is brought from West Virginia by the Chesapeake & Ohio Railroad. The New River steam coal from that section has in a great measure driven other steam coals from this market. It is a formidable competitor to the Cumberland, as many tests have proved, but is not shipped to any great extent from this to other ports, because of the depressed state of the bituminous market. Splint and cannel of fine quality are also brought from West Virginia to this market, and a considerable quantity is shipped from this to other ports. Anthracite coal shippers have held their orders later than usual this season, hoping for cheaper coal and lower vessel freights. They are now convinced that neither will decline and are shipping quite rapidly. Stocks are light.

HAMILTON, ONT., Sept. 28.

[Specially reported by Mr. H. BARNARD.]

A fairly active trade is being done for the season of the year, but prices are lower than they should be. There would be no difficulty in advancing them if shippers' circular rates were advanced, and something like stability shown in maintaining them. Business, generally, is good, and good wages are earned. As the demand for coal will, no doubt, be very much increased this winter, it is likely that a large quantity will yet have to reach this market for this season's supply, and we look forward to a good example from those who send their coal to this market, in order that we may advance on prices as the demand increases.

Prices are as follows:	
Grate, per ton of 2000 lbs.	..... \$6.25
Egg " " " "	..... 6.25
Stove " " " "	..... 6.50
Nut " " " "	..... 6.50
Lehigh Lump, per ton of 2000 lbs.	..... 8.00
Bloss, per ton of 2000 lbs.	..... 5.50
Brier Hill, per ton of 2000 lbs.	..... 6.50
Reynoldsville Lump, per ton of 2000 lbs.	..... 5.00

TOLEDO, Sept. 27.

[Specially reported by Messrs. GOSLINE & BARBOUR.]

The demand for anthracite coal for interior shipments is far in excess of the supply of cars, and the prospect for relief is not flattering. Shippers are obliged to decline many orders for this reason, and retailers are chafing under the delay in filling their orders; a state of things which they themselves bring about annually by deferring their purchases until the coal is wanted for use.

The temporary suspension of production in most of the Ohio mines, by reason of miners' strikes, has made a brisk demand for bituminous coal, which the lack of cars makes it close work to supply. We quote:

ANTHRACITE.		Gross.
Chestnut and Stove	.....	\$6.50
Egg and Grate	.....	6.15
Retail delivered, all sizes, net ton	.....	7.00
BITUMINOUS.		
F. o. b. vessel at Sandusky.		
Shawnee lump, per net ton	.....	\$2.70
nut	.....	2.10
Shawnee, Straitsville, and Hocking, wholesale, on track at Toledo.		
Lump, net ton	.....	\$2.70
Nut, net ton	.....	2.10
Massillon, lump, net ton	.....	3.15
Retail Delivered.		
	Lump.	Nut.
Shawnee, Straitsville, and Hocking, net ton	..... \$4.50	\$4.00
Massillon	..... 4.75	4.00

MILWAUKEE, Sept. 28.

[Specially reported by Messrs. R. P. ELMORE & Co.]

The supply of coal is good and the demand equal to the supply. It is estimated the consumption will be larger than last year, and the outlook is considered favorable for further advances in prices.

Blossburg	..... \$5.00	Brier Hill	..... \$7.00
Cumberland	..... 5.50	Straitsville (steam)	..... 5.50
Lehigh lump	..... 8.50	Illinois (steam)	..... 3.75
Prepared (all sizes)	..... 7.50		
Per ton net. Terms cash.			

LOUISVILLE, Sept. 26.

[Specially reported by Messrs. BYRNE & SPEED.]

In consequence of the high prices, business continues very dull. Consumers are delaying their purchases for the winter, until we have a run from Pittsburg. Our prices are as follows:

Wholesale, Pittsburg	..... 15c.	Retail, Pittsburg	..... 18c.
" Kentucky	..... 11c.	" Kentucky	..... 14c.
Anthracite, \$8 per ton.			

PROGRESS IN SCIENCE AND THE ARTS.

Polyhalite.—Dr. E. Pfeiffer has, according to the *Chemiker Zeitung*, examined the polyhalite found in the famous Strassfurt salt deposit, and has found it to consist of $K_2SO_4, MgSO_4, 2CaSO_4, 2H_2O$. It occurs as a compact mineral with crystalline fracture, and is generally colored gray by organic substances, although it is occasionally found white or reddish in color. It is translucent, has a density of 2.784, and a hardness of 3-5.

A Use for Strontianite.—A process recently introduced in German beet-sugar manufactories has created a demand for strontianite, and it is reported that mining for it is going on quite extensively in Westphalia, Germany, notably at Dasbeck and Drensteinfurt, near Münster. About 4000 to 5000 cwt. are now gathered, and there has been some excitement among peasants, who, ignorant of the value of the mineral, were led into unfavorable concessions of mineral rights by outside speculators. Possibly it might prove worth the while of some of the owners of the deposits in this country to inquire into the possibility of supplying the German markets.

The Geological Congress at Bologna.—The press dispatches announce the assembling of this body, on the 27th ult., in the Salle Rossini, at Bologna. The King of Italy was represented by Signor Berti, Minister of Agriculture. Professor Seller, the honorary president, resigned the chair to Professor Capellini, and in doing so paid a compliment to Professor Hebert, the eminent scientist, who was president of the first Congress, which was held in 1879, at Paris. America is represented by Prof. James Hall, of Albany, and Prof. T. Sterry Hunt, of Montreal, whose departure for Italy was announced in a recent issue of the JOURNAL.

Wrangell Land.—The New York *Herald* of September 28th has a long dispatch dated San Francisco, September 27th, giving an account of the landing of a party from the Corwin on Wrangell Land, on the 12th of August last. Formal possession was taken of the island in the name of the United States. It is claimed that the Corwin has completed Captain Kellett's discovery, provided the Jeannette never landed there. New Columbia is the name proposed, "unless it can be proved that some one else landed previously and took formal possession. The southeastern part is to be called Cape Wrangell, and the northeastern Cape Kellett." With regard to the Jeannette, there is nothing but conjecture.

The Life of a Gold Sovereign.—Whatever may be said of the uncertainty of "the head that wears a crown," the Deputy-Master of the English Mint estimates the average life of a gold sovereign at eighteen years: that is about the length of time in which this coin loses three quarters of a grain in weight, when it ceases to be legal tender. It is said that of the one hundred millions sterling of England's gold coinage, forty per cent is in this condition. The Bank of England sends yearly a million to the mint to be recoined; and the Deputy-Master urges the re-

coining of all the gold coins of light weight, an operation which would require about four years. The last calling in of the gold coin was in 1842.

Preventing Water from Freezing in Hydraulic Apparatus.—The growing use of hydraulic machinery for riveting, flanging, etc., in our iron-works, and for elevators, hoisting-machinery, cranes, etc., makes the question of avoiding the danger incident to the freezing of water in the pipes an important one. The *Engineer* states that in England there is no generally adopted method. An admixture of methylated spirits, salt, or glycerine has been tried, and Mr. Tweddell, well-known in connection with hydraulic machinery, made some experiments on the effect of the addition of glycerine. In open vessels at a temperature of 18 degrees, when pure water froze rapidly, only a lump of rotten ice was formed when one per cent of glycerine was present, less still with two per cent, the ice formed not being sufficiently solid not to flow, especially with a pressure of 1500 lbs. per square inch. One firm found that in adding one gallon of glycerine to 300 gallons of water no trouble whatever was experienced, while another firm uses 25 per cent, although they believe 10 per cent to be enough for ordinary purposes. Salt is much cheaper, but while glycerine rather preserves leather packings than otherwise, common salt destroys them, especially when in cast-iron.

Immigration Statistics.—The Chief of the Bureau of Statistics furnishes the following:

During the month of August, 1881, there arrived in the customs districts of Baltimore, Boston, Detroit, Huron, Minnesota, New Orleans, New York, Passamaquoddy, Philadelphia, and San Francisco, 65,278 passengers—of whom 56,744 were immigrants, 6225 citizens of the United States returned from abroad, and 2309 aliens not intending to remain in the United States. Of this total number of immigrants, there arrived from England and Wales, 9018; Ireland, 5391; Scotland, 1599; Austria, 1643; Belgium, 169; Denmark, 800; France, 562; Germany, 19,431; Hungary, 413; Italy, 641; Netherlands, 816; Norway, 2817; Poland, 206; Russia, 694; Sweden, 3889; Switzerland, 871; Dominion of Canada, 5746; China, 1785; and from all other countries, 253. The total number of immigrants arrived in the above-named customs districts from the principal foreign countries during the month of August, 1881, and the two months ended the same, as compared with the same periods of the previous fiscal year, was as follows: August, 1881, 56,744; August, 1880, 50,504; two months ended August 31st, 1881, 113,351; two months ended August, 1880, 100,359.

Water-Gas for Gas Motors.—At the recent meeting of the British Association at York, Mr. J. Emerson Dawson, of London, described an apparatus for producing water-gas, and gave some notes on its use for gas-engines, a field which is destined to become a very large one, notably for small powers. Mr. Dawson's generator does not appear to possess any particular features of novelty, nor does it approach the perfection of American plans in this direction. The generator consists of a vertical cylindrical iron casing, which is lined with ganister. Under the grate is a closed chamber, into which a jet of superheated steam plays, carrying with it by induction a continuous current of air. Mr. Dawson states that the comparative explosive force of this gas and coal is, by calculation, as 1 to 3.4, and careful trials made with it with a 3½ horse-power nominal Otto gas-engine—diagrams being taken every half-hour for nine consecutive days in one instance—showed that, without altering the cylinder of the engine, it is possible to admit enough of the Dawson gas to give the same power as with ordinary coal-gas. Taking the average cost of his gas, in generators of various sizes, at 3¼d. per 1000 cubic feet, and considering 5000 cubic feet equal to 1000 cubic feet of coal-gas worth 3 to 4s., he calculates a saving of about 50 to 60 per cent. As the first instance on record of an earnest attempt to utilize what may be termed water-gas, Mr. Dawson's experiment deserves notice; but it would be unfair to form any judgment of the applicability of water-gas for power upon his test.

GENERAL MINING NEWS.

ARIZONA.

The stoppage of work, caused in the Globe District by the Apache outbreak, has given way again to active work, and it is the opinion expressed in various quarters that there is very little danger for the present. On the other hand, the complaints about the "cow-boys" grow more numerous, and there is some agitation looking toward a settlement of this nuisance. In the various camps, considerable activity seems to prevail.

GLOBE DISTRICT.

As already noted above, work has been resumed in this district. The Globe mill has started, and the machinery of the Old Dominion Copper Company has reached San Carlos and will soon be in Globe. The Mack Morris mill has received supplies and has started up again. It is noticed by our Arizona exchanges that the Mack Morris mine is being rapidly developed and that good ore is opened out and hoisted. The Tacoma Copper Company has sent a larger sample of ore to San Francisco to be submitted to working tests.

TOMBSTONE DISTRICT.

There appears to be much activity in this district in the principal mines. The Grand Central has started its new hoisting-works and the Flora Morrison has followed with its hoister. The work of grading the site for the new Girard mill has commenced. From the Sulphuret shaft of the Tombstone Water Company, now 530 feet deep, a stream of clear water is pumped, and it is stated that, as soon as arrangements for its use by the mills can be completed, tanks will be built for collecting it. Work on the Grand Central South has been suspended, and the Empire mine still remains closed. The following details on the progress in various prominent mines are gathered from our Tombstone exchanges:

ANCHOR.—The *Arizona Citizen* says: The owners of this property, lying north of Prompter and nearly opposite, are engaged in running a tunnel to connect with the shaft, which is located on the top of the hill and is now 1600 feet deep, with a good body of ore at the bottom. The tunnel is in 120 feet, with about 100 feet more before the connection is made. As soon as the work is completed, they will build an ore-dump, start a winze, and commence stoping.

FLORA MORRISON.—The shaft is down 290 feet, and at a depth of 245 feet drifts have been begun to connect with the north and south shafts. Sinking in the main shaft will be pushed as rapidly as possible. The work in the north and south shafts is confined principally to drifting.

GENTLE BELL.—Sinking has been discontinued at a depth of 150 feet. The walls of the ledge are clearly defined and have straightened up in good shape. It is three feet wide, with an ore-streak of 18 inches. A station was put in at 110

feet, and drifting has commenced east and west on the ledge. Sinking will be resumed as soon as better facilities for hoisting are provided.

GRAND CENTRAL.—Sinking in the main shaft has been resumed. This shaft is already connected with the 200-foot level, and will be connected on the 300 level as soon as that depth is reached.

TOMBSTONE.—The Tombstone *Epitaph* has the following: The feature of the most interest this week in these properties is the continued improvement in the Goodenough workings. No. 2 incline is now down about 400 feet. The new hoister at this shaft is being set, and will be ready for operation in about eight days. The donkey engine now used there will be set up at No. 6 shaft, on this side of the gulch. Work in the main shaft on the Tough Nut is confined to drifting for connections. No. 1 shaft, on the West Side, is down 60 feet, and No. 2 shaft is now 107 feet in depth, with east and west drifts, 120 and 150 feet respectively. Combination shaft is down 107 feet, and the miners are now drifting to No. 6. This drift shows a steady improvement in the quantity of the ore, which is in some places sixteen feet in thickness. This shaft produces the highest grade of ore in the camp, the wagon assays running from 100 to 300 ounces.

VIZINA.—It is officially reported that the main shaft is down 364 feet, and that 30 tons of ore are shipped to the mill daily from the 100-foot level. The Tombstone *Epitaph* prints the following extract from a letter of President Sumner: In view of the proposed erection of our own mill, as soon as its most advantageous location can be determined on, it has been deemed advisable, in the interim, to take out only such amount of ore as may be necessary for current expenses. You will therefore reduce our working force to such extent as will bring our output down to, say, 500 tons per month, which I think will be ample for all present requirements.

CALIFORNIA.

CRESCENT COPPER MINE.—This mine, located in Del Norte County, has been incorporated. It is stated that it consists of two claims, each 1500 feet in length by 600 feet in width, making a total length of 3000 feet by 600 feet in width. Developments consist of one shaft 30 feet deep, one open cut, and tunnel 28 feet on the ledge, one shaft 100 feet on north ledge, one shaft 40 feet deep with level running 30 feet north on the ledge, and five prospect-shafts from 5 to 10 feet deep. The copper ore consists of green carbonates.

HITE.—The Hite mine and mill, says the *Mariposa Gazette* of September 17th, are idle at present. Extensive improvements are making. A 140 horse-power compressor, with a 64-inch cylinder, is being put in. The power is obtained from the Sand-mill, about 4000 feet below on the river. The dam is also being repaired. A new shaft is sinking from the lower level, which produces better ore than has been taken from the mine for some time.

STANDARD.—Under date of September 7th, the following is officially reported: The shaft is down 1072 feet, the bottom being hard ground. The east cross-cut, 1000 level, is in from the shaft 403 feet, and the west cross-cut, same level, 317 feet. The total length of the south drift from the east cross-cut, 700 level, is 175 feet. The total length of the west cross-cut from the south drift, 500 level, is 143 feet; the ground here is very hard. Uprise No. 2 from the south drift, 500 level, is up 97 feet, showing the ledge 5 feet wide. South drift No. 2, 385 level, is in from the east cross-cut 149 feet, showing a five-foot ledge of good ore. The south winze to connect with the 500 level is down 45 feet. On the 385 and 550 levels, the ledge in the stopes continues from 15 to 25 feet wide.

CANADA.

DUNCAN.—The *Miner* states that it is rumored that the machinery at the Duncan mine is for sale, which would look as if the company had at least some idea of abandoning work.

PHOSPHATE MINES.—The *Montreal Herald* publishes the following dispatches: Fourteen new shows of phosphate have been discovered on the Haldane lot during the past two weeks, and only about twenty-five acres of the lot has been explored yet.

The phosphate mine recently opened on lot 6 in the 11th range of the township of Templeton, the property of the Estate Perkins, is said to be one of the richest yet discovered in that district.

COLORADO.

CUSTER COUNTY.

SILVER CLIFF.—The Silver Cliff mill has been shut down for repairs, which may require thirty days to complete. Work at the mine will be continued with a smaller force than usual, until the mill is in shape to start up again.

GUNNISON COUNTY.

Among the mines doing work in the Independence District, is the Independence, Mount Slope, Shanley, and American Flag. A new 30-stamp mill, it is expected, will be in operation at an early date.

PARK COUNTY.

MOSQUITO DISTRICT.—The Little Corinne mine, above the head of Big Evans Gulch, has, according to the *Leadville Herald*, about 200 tons of ore now out at the mine, and shipments to the La Plata smelter of this city were commenced recently.

LAKE COUNTY.

Outside of the report of regular work, there is little to state in reference to the Leadville mines. A number of mines, among them the Miami, Sliver, and Bangkok, are idle, awaiting the starting up of the pumps on the Lee and Dunkin mines, which it is expected will help to drain their territory. The Pennsylvania mine, on Breece Hill, will start up at an early date. The *Leadville Herald* denounces the Olathe Silver Mining Company, of London, supposed to be located on Fryer Hill, as a swindle.

AMIE.—The pump has been stopped, it being found the capacity was not sufficient to drain the mine and allow sinking. The shaft reached a depth of 330 feet, but the lower part is now filled with water. At present, but little is doing on the mine, a small force only working in the upper drifts and taking out a small amount of ore and iron.

CLIMAX.—This mine, on Fryer Hill, is almost absolutely idle, as in fact it has been for a long time. From the north shaft, a few prospectors are at work, but are taking out but little ore.

CHRYSOLITE.—Some work has recently been done in the old workings of this mine, in order to ascertain whether the fire was entirely out, and it has been satisfactorily demonstrated that it is all out. Work is pushed in the new workings. A force is now employed in stoping in the fourth and fifth sets in the old workings. There is also a considerable force employed in the fourth and fifth sets above the first level, west of the Roberts shaft. Work is also doing north of the Roberts shaft. In the third set over the first level, a drift has been driven into a body of sand carbonates and galena, with some hard carbonates and galena, but the main body seems to be sand carbonates. Some stoping is also going on in the same vicinity. The mine has now about 250 men engaged at work and is shipping from 80 to 90 tons of ore per day, worth seventy dollars per ton. The principal part of the work now in progress lies north of the Roberts shaft.

CLONTARF.—The *Leadville Democrat* states that in the Clontarf a great ore-body has been struck, and drifting upon it was begun yesterday. The Clontarf property, as it is usually called, consists of two claims and belongs to the St. Bernard Mining Company. The property is just above the Morning Star and north from the Big Chief. It extends across Stray Horse Gulch to the territory of the Denver City. The ore is found at a depth of 530 feet, and has opened out into a solid body of sand carbonates. It has for a long time been almost a certainty that the same ore-chute found in the Morning and Evening Star mines

would exist through the territory of the Clontarf, only sufficient depth being required. This was made more apparent when the Big Chief opened a fine ore-body

DENVER CITY.—In this mine, a sump is sinking on the discovery-shaft 313 feet deep. They have got down about 28 feet with the use of a steam pump, and are now putting in a double-acting ten-inch Cornish pump. In the Wright shaft, 210 feet deep, they are ready to commence sinking, the water being about all out. The quadrilateral shaft is 320 feet deep. They are still sinking, using two Cameron steam pumps to keep the water down.

DUNKIN.—The new leasers are doing exceedingly well, and are mining some very rich ore.

FOREPAUGH.—This shaft, located on East Fryer Hill, is down 325 feet, and has struck contact, but the water has driven them out, and the work had to be stopped until this difficulty could be remedied. It is thought the obstacle will be overcome soon, as they have two eight-inch Cornish pumps at work, and have just put in a three-inch Cameron steam pump, but have not yet got it started.

IRON MINE.—The Leadville Herald says that the properties of the Iron Silver Mining Company are looking unusually well, and the ore-shipments continue to keep up an average of 200 tons a day. Of this amount, about 125 tons are taken from the Iron mine workings and 75 from the Rock and Dome.

LITTLE PITTSBURG.—The shaft on the New Discovery No. 6 is down to a depth of 275 feet. At that point, it was found the machinery was not strong enough to manage the water, but is only able to hold it where it is for the present. The company is now drifting on the contact toward the Henriette, having commenced only two or three days ago. The recent developments in the Henriette, Big Pittsburg, and Olga are such that the management of the Little Pittsburg think the south end of the Discovery must contain valuable mineral. The principal part of the work being done is on the Discovery No. 1, which was closed so long on account of the Chrysolite fire. About fifteen tons of ore are shipped per day by the old workings.

SUMMIT COUNTY.

ROBINSON.—It is reported that the Robinson has contracted with the Boston & Colorado Smelting-Works for 30,000 tons of ore. A former one of 10,000 tons has been already filled. It is stated also that large shipments of ore are made to the La Plata works at Leadville.

TEN MILE DISTRICT.—The Denver Republican has the following items: A 10-stamp mill is soon to be erected on Taylor Hill, to treat the ores of the El Capitan and other mines. A strike of sand carbonates, dipping 45 degrees into the hill, is reported in the Pittston tunnel.

WARRIOR'S MARK.—It is reported in the Leader that this mine, situated near Breckenridge, has made a strike of gray copper ore recently.

IDAHO.

BONANZA DISTRICT.

A correspondent of the Butte Miner has written a long letter on the mines of this district, from which we take the following: The Custer Company's mill crushes from 23 to 25 tons of rock per day with 20 stamps from the Custer mine, the unsorted ore yielding from \$140 to \$170 per ton. The Unknown mine adjoining has a large quantity on the dump, and work has been suspended pending the arrival of hoisting-works. The Montana mine, on Mount Estes, has shipped 136,098 pounds of ore taken out last winter. The assay value of the lot is given at \$73,170.46. The Dickens mine is taking out ore that is worked in an arrastra.

SAWTOOTH DISTRICT.

The Wood River Times of September 14th states that a ten-stamp mill is building for the Columbia and Beaver mines. It is expected that it will be in running order by the beginning of November. The ore is to be treated by a breaking process. The country-rock is granite, the numerous ledges cutting this formation from east to west. The veins are well-defined, and crop out on the sides of the mountains. The ore is slightly refractory, being principally black sulphurets of silver, ruby silver, silver-glance, stephanite, and wire silver. The two claims worthy of the name are the Columbia and the Pilgrim, the latter situated about a mile beyond the former. On both there has been some development, which, it is reported, gives encouraging results.

WOOD RIVER DISTRICT.

There is considerable activity in this district. The following ore-shipments are reported by the Wood River Times: Jay Gould, June 1st to September 15th, 150 tons; Homestake, July 1st to August 1st, 12 tons; Eureka, for the same period, 38 tons; Mayflower, May 10th to September 15th, 725 tons; Wood River G. & S. M. Co., June 1st to September 15th, 436 tons; all of which is reported to be first-class ore.

MICHIGAN.

The following are the products of the mines as far as reported for the month of August:

Mine.	Tons.	Pounds.
Calumet & Hecla.....	1704	105
Quincy.....	347	.....
Franklin.....	130	59
Pewabic.....	91	475
Mass.....	.....	.....
Allouez.....	77	1580
Hancock.....	39	1800
Huron.....	10	.....
Atlantic.....	157	953
Osceola.....	.....	.....

MONTANA.

Work in the various districts appears to be going on satisfactorily, notably near Butte. The Intermountain reports that active operations have been resumed in the Highland District, and notably on the Only Chance, where a two-stamp Huntington mill is in course of erection. The Miner states that great discoveries have been made near Devil Cañon, Yankee Doodle Gulch.

BUTTE DISTRICT.

ALICE.—The Butte Miner reports that a large force of men are taking high-grade ore out of the 700-foot level.

BELLE OF BUTTE.—The Belle of Butte mine has recently been bonded to John Longmaid, representing English capitalists, for \$150,000; but the work of extracting ore from the mine still goes on. The ore hoisted comes from the west level and the stopes therein. It is estimated that there are now on the dump-pile 1200 tons of good-grade ore.

GAGNON.—The Gagnon, says the Intermountain, under the new management is worked with a force of 30 men, and its monthly production averages 300 tons. Of this amount, about one half is low grade, assaying \$40 in silver and from 10 to 15 per cent copper, but the remainder is high grade, assaying well in both metals. The work of development is principally confined to the extension of the 325-foot east drift, which has approached to within 40 feet of the end-line of the claim.

MAGNA CHARTA.—The new hoisting-works have been started up.

MOULTON.—The Intermountain of September 17th says: The main shaft to-day reached a depth of 510 feet, and sinking hereafter will progress with the Jagersoll drills, the break in the machinery having been repaired. Nothing is doing at present in the south 200-foot south cross-cut. The 300-foot cross-cut has been advanced to a point 213 feet from the shaft, and the appearance of the rock indicates that the main ledge is not far distant. In the mean time, uprisings have been started in the east and west drifts, and considerable ore is stoped. The face of the 400-foot south cross-cut has been forwarded 100 feet from the shaft, and is still driven vigorously ahead, though the rock is too hard for very quick work.

STEVENS.—The Butte papers announce that a strike was made in the foot-wall of the south ledge of the Stevens in a shaft sunk on it 80 feet deep. The ledge is from 6 to 7 feet wide, and shows native silver and sulphurets.

VULCAN.—A double-compartment shaft has been started and machinery has been purchased having a capacity to sink 800 or 1000 feet. The latter has arrived and is now being placed in position. The Vulcan is an east extension of the Star West.

NEVADA.

THE COMSTOCK LODE.

The hot weather has interfered with advantageous working in many of the mines, and notably in the Consolidated Virginia and California. A large fan is erecting in the old Consolidated Virginia shaft, which, it is expected, will be running at an early date. The mines principally benefited by it will be the Ophir, Consolidated Virginia, California, and Best & Belcher. There is nothing new from the Sierra Nevada or Yellow Jacket. In the Aita, the 2150 pumps were started on the 17th of September.

EUREKA TUNNEL.—According to the Ruby Hill Mining News, the tunnel now has a length of 1932 feet. The developments are spoken of as follows: At a distance of 920 feet from the mouth of the tunnel, a two-foot vein of ore is followed in a northwesterly direction 30 feet, then a slight uprise is made and the ore pursued for a short distance to the northeast. Recently a straight drift, run from the tunnel, tapped the ore after going 33 feet; 175 feet farther in the tunnel, an uprise is made from the tunnel in another ledge, which has a width of seven feet and is rich in lead. About 1100 feet in from the tunnel's entrance, a drift is run due south 44 feet, at which point a strike is made. Where this drift left the tunnel, the ore-seam now followed lay horizontally upon manganese, about four feet from the floor of the tunnel, and varied from the thickness of a card-board to an inch in depth. After drifting but a few feet in the vein, its rapidly-swelling appearance warranted its thorough development; and in running a distance of only 44 feet, it has exceeded all expectations and hopes. The dip of the ore from the tunnel to the end of the drift is about 16 degrees, at which point the rich chloride covers the entire lower face of the drift and has gained in thickness three feet in the 44 feet run. At the end of the drift, the ore commences to dip at an angle of about 45 degrees.

ORIENTAL.—The superintendent reports, September 16th, that the timbering of No. 1 shaft of the Hillside mine has been finished and sinking resumed. The ledge is solid and increasing in size. A cross-cut at the bottom of the Ellis shaft shows a vein over seven feet wide between the walls, two feet of which, on the hanging-wall, are very rich. No change in South Dip.

STARR-GROVE.—A Battle Mountain dispatch to the Mining Associated Press says: Levels Nos. 1 and 2, south of the Starr-Grove mine, are pushed ahead with excellent results, No. 1 advancing 19 feet and No. 2 21 feet during the past seven days. The incline shaft is down 85 feet, and is in fine ore. It is now running on top of the vein, which it has uncovered for a considerable distance. The railroad to the Starr-Grove is graded to within a quarter of a mile of the mine, and the company is only waiting for ties and iron to complete the work. This road will do away with all the teams in use in the camp.

NEW MEXICO.

REBEL CHIEF, AND VIRGINIA.—The Cimarron News and Press prints a report that Mr. S. F. Clouser has begun to make preparations to work the ores from these mines in a mill by his process.

SHAKESPEARE DISTRICT.

A correspondent of the Arizona Citizen says the following on the mines of Shakespeare, Grant County: Though not what could be called a new mining camp, it was not until recently that the importance of Shakespeare began to be realized, or that Eastern capital came in. Among the more wealthy companies working mines in this neighborhood are the New Haven Company; Good Hope Company, of Evansville, Indiana; the Indus Company, managed by St. Louis capitalists, and the Pyramid Mining Company. All of these companies are at present pushing the work in their mines with the exception of the Indus Company, which has just been organized and has not yet begun to work, and will not probably begin for a month or two. The New Haven Company has been pushing things on its Atwood mine lately, working night and day and turning out much fine ore. The Good Hope Company has been doing a good deal of work on its Last Chance mine, and is well satisfied with the quality of its ore. Colonel Green, of the Pyramid Company, has just received machinery from the East, which he intends to put up on the Viola mine. The smelter that is erecting here was formerly put up in Silver City by Mr. Vaux, a Philadelphian; but finding that there was not enough smelting ore found around Silver City to pay the expenses of running it, Mr. Vaux concluded to move it to Shakespeare, and it is now on a fair way to completion.

UTAH.

ONTARIO.—The Salt Lake Herald of September 22d has the following: A new shaft is sinking on the Last Chance claim of the Ontario group. It is to be of three compartments, two hoisting compartments $4\frac{1}{2} \times 5$ feet, and one pump compartment 6×7 feet; making the total length over 21 feet and the width over 8 feet. In this shaft will be placed the heavy machinery, which is now nearly all on the ground. The castings, including the pump and pumping engine, weigh over 500 tons; and the hoist-engine for handling the pump machinery, also the powerful hoisting-engines for raising ore, will weigh over 100 tons, making a grand total of over 400 tons of machinery. The rock work to sustain this powerful machinery will be thirty-eight feet in depth by forty-six feet in length, part of which is five feet and the balance eight feet of solid cut masonry, cemented together with the best of Portland cement. The two hoisting-engine pits are fifteen feet deep by forty feet in length, and will be filled with solid rubble masonry. The shaft is now down a depth of 160 feet, and is sinking as rapidly as possible. It is the intention to carry it so that it will connect with the 600-foot level, which is driving west. The drain tunnel driving to connect the mine with the mill is now in a distance of some 280 feet. When finished, it will be nearly one mile in length, and it is the present intention, if possible, to finish it within two years.

SILVER REEF.

BARBEE & WALKER.—The Silver Reef Miner states that the developments made in the north lower workings of this mine have been gradually improving in width, until the extreme north stope on the fourth level north shows a face 14 feet thick in ore. The mill is again running.

CHRISTY.—The California has increased its output considerably since the new hoisting machinery has been completed. The north lateral drift running to connect with the Maggie workings is advanced at the rate of twenty-five feet per week. The foundation is laying for the new hoisting-works at the Maggie, and the machinery is all on the ground or at the company's shops. So soon as this can be put in place, sinking will resume upon the main incline. At present, the work of extracting ore continues from the upper levels only.

LEEDS.—Work continues at the mine with a moderate force, principally upon ore. There is upward of five hundred tons ready to be landed on the mill floor as soon as the repairs are completed, which, if the castings arrive on time, it is anticipated will be done about the first of October.

STORMONT.—The Miner says that the ore-bodies recently encountered in the fourth level north of the Buckeye mine have developed considerably. The winze just completed connecting the third and fourth levels shows a continuous vein of ore at that point, and the entire distance is now being stoped. The different stopes on the second and third, both north and south, are producing as well as at any time heretofore. In the Stormont mine, a strike is reported in the third north drift. The face of the winze now sinking to connect the third and fourth drifts south shows a strong 2-foot ledge with rich ore.

DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, Feet on vein, Capital Stock, SHARES (No., Par Val), ASSESSMENTS (Total levied to date, Date and amount per share of last), DIVIDENDS (Total paid to date, Date and amt. per share), HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Sept. 24-30), SALES.

g. Gold. s. Silver. L. Lead. c. Copper. * Non-assessable. † The Deadwood mine paid in dividends, previous to the consolidation, \$275,000, and the Golden Terra paid \$75,000. Total shares of Dividend-Paying stocks sold during the week, 234,325.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Sept. 30.

Monday was observed as a day of mourning by the mining exchanges, and thereby reduced the transactions of the week to five days. There is now a great interest shown in mining, and there are indications that it will increase. The Comstocks are closely watched, and another deal is looked for there; but the great features at the present time are the Leadville stocks. The sales amount to 688,951 shares in all mining stocks during the week.

The Tuscarora stocks have been quiet and without feature. Grand Prize shows a business of 5600 shares at 15@14c.

The Comstock shares have been very active and irregular, following the reports from San Francisco. California has ranged between \$1 1/4 @ \$1, with sales of 15,960 shares. Consolidated Virginia has been very active and irregular, at one time reaching \$3.30 with assessment paid, and at another \$2, assessment unpaid; the sales aggregate 68,312 shares. There are some great predictions as to the future of this mine, but we can not trace any facts as a basis. Sierra Nevada records sales of 2900 shares at \$2 1/4 @ \$2 3/4 @ \$2 1/2. Union touched \$1 3/4, and declined to \$1 1/4 on a business of 1230 shares. Suro Tunnel has had a moderate business at steady prices. The remainder of the list has been without large dealings, and in sympathy with those stocks already quoted.

The Bodie stocks have been very quiet and, excepting the decline of Bodie to \$7 on small sales, are without feature.

Amie has been moderately active at 28@31c.

Chrysolite has been the feature of the market, recording sales of 13,145 shares at \$7 1/4 @ \$9 @ \$8 1/2. Hibernia has been moderately active at 31@37c. Horn-Silver, under moderate sales, has been a little weak, selling down to \$14 1/2 to-day. Iron Silver has been fairly active and steady. Leadville has commanded considerable attention at \$1.70 @ \$1.45. Robinson Consolidated, although recording the largest amount of business of any stock on the list, has attracted less attention, and it is surmised by some of the brokers that there is some "washing" being done; the sales amount to 28,777 shares at \$14 @ \$13 1/4.

Barcelona has been a little weak under a moderate business. Big Pittsburg has been active and strong, with sales of 13,300 shares at \$1.10 @ \$1.40. Bradshaw has been active and advancing. The sales aggregate 16,400 shares at 70c @ \$1.05. Bull-Domingo has had moderate attention, with a slight weakness in the later dealings. Cherokee has become very active and strong; the sales aggregate 20,600 shares at \$1.45 @ \$1.70. Oriental & Miller shows about the usual business, but at declining prices; the sales amount to 62,500 shares at 90 @ 78c. Silver Cliff, under a moderate business, is but little changed from a week ago. The State Lines have not been so active or strong. Nos. 1 and 4 record sales of 52,600 shares at 93 @ 83c., and Nos. 2 and 3, 26,850 shares at \$3.95 @ \$3.65.

Mr. James Bailey has been elected a director of the Old Dominion Copper Mining Company. The board is at present composed of the following gentlemen: George W. Dunn, James Bailey, Jay Cooke, G. W. Hughes, and Charles E. Brooks.

Richard J. Morrison succeeds John E. White, resigned, in the presidency of the Brittenstene Silver Mining Company.

The stock of the Calaveras Water and Mining Company was listed at the New York Mining Stock Exchange on the 23d inst.

When Chrysolite was selling at about \$6 per share, or \$1,200,000 for the mine, our readers were advised that the mine was looking very well, and that there were prospects of several dividends, but that the condition did not warrant a movement in the stock either way. At that writing, we were aware that there was an outside movement to advance the price of the stock. This movement has been so successful as to put the price up to \$9 this week, or at the rate of \$1,800,000 for the mine. It is the policy of the management of this company to take out ore when it is opened, and whenever there is a surplus in the treasury to declare dividends. The production and the dividends are both large at the present time; but the public should be aware that this is an uncertain mine, and that suddenly the management may be compelled to reduce the output or perhaps cease all production, owing to the exhaustion of ore-bodies, or for the purpose of timbering or doing necessary dead-work. In case of any of these possibilities being realized, that portion of the public which has been paying high prices for the stock under the advice of brokers should not blame the management. During the latter part of June, this stock sold at \$4.85 @ \$5. On improved prospects, it advanced to about \$6, and, under dividends, it has reached this week \$9, or an advance of \$4 per share, equal to eight dividends. The company has paid two dividends and declared another. It must be remembered, however, that when these are paid the property has just that much less, instead of that much greater, value, as many who purchase mining stocks seem to think. It is very possible that the company, with a good fund for making developments, may give dividends at times for a long period to come; but no

NON-DIVIDEND PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, NUMBER OF SHARES, Par, ASSESSMENTS, HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Sept. 24-30), SALES.

Boston. Quotations and Sales of Mining Stocks for week ending Sept. 28th. Monday, the 26th, being a legal holiday, there was no session of either Board.

Table with columns: NAME OF COMPANY, Opening Sept. 22, Highest during the week, Lowest during the week, Closing Sept. 28, Total shares sold.

Philadelphia. Quotations and Sales of Mining Stocks for week ending Sept. 28th.

Table with columns: NAME OF COMPANY, Opening Sept. 22, Highest during the week, Lowest during the week, Closing Sept. 28, Total shares sold.

Total shares of Non-Dividend Paying Stocks sold during the week, \$51,628. Total shares sold at all the Exchanges during the week, 685,951.

one can make a positive assertion as to what is to be discovered.

UNLISTED QUOTATIONS. Mr. L. V. Deforest, No. 70 Broadway, under date of September 30th, 3 P.M., reports the current quotations of unlisted stocks as follows:

REVIEW OF THE SAN FRANCISCO MARKET. This market has continued in a state of expectancy throughout the entire week. The present prices of the north end stocks and the expected movement in them rest on the belief that a good ore-body has been found at the bottom of the joint Sierra Nevada and Union Consolidated mine; but as only Mr. Fair and a favored few are admitted to the mine, and they are very reticent, no authentic news can be obtained.

There is a strong flow of water, which is interfering materially with the work, and it is probable that there will shortly be calls for more money, in the shape of assessments. The old bonanzas are higher, on more encouraging reports from the mines. Belcher has assessed 50 cents.

Mining meetings are called as follows: Booker Con., September 26th; Belle Isle, October 2d; Day, September 20th; Flowery, September 20th; Golden Gate Con., October 8th; Grand Prize, September 20th; Hillside, September 19th; Jupiter, September 19th; Mint, September 26th; North Bonanza, September 20th; Tellurium, September 29th.

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, Sept. 29. The market has ruled exceedingly dull during the past week, and prices have, in consequence, declined somewhat, although there is no apparent disposition to sell the

copper stocks at present prices. The market for ingot copper is firm. The latest advices from England indicate an advance in Chili bars of \$1 per ton, and this will naturally strengthen the market on this side of the water. The silver stocks have also shared in the general dullness, without any material change in prices.

In coppers, we note a decline in Calumet & Hecla from \$22 3/4 to \$22 1/2, just why it would be hard to say, unless the report of an extra dividend this fall is unfounded. Franklin has held its own well, and is quite steady at \$13 sales and bid. Quincy is still bid firm at \$39. Pewabic declined from \$14 1/2 to \$12 1/2, a forced sale of 50 shares at the later price being made yesterday; to-day \$14 was bid for the stock without bringing any out. Osceola also declined from \$30 to \$29, but there is but little of this stock in the market, and \$29 is bid for it to-day. Atlantic declined from \$16 to \$14 1/2 on sales of less than 50 shares; later, it sold at \$15, and closed at \$14 1/2 bid, \$15 asked. Copper Falls sold this week at \$6 1/2, assessment of \$4 paid, an advance of 25c. per share. Huron declined from \$4 1/2 to \$4, closing \$3 3/4 bid, \$4 asked.

The speculative list was entirely neglected, and but few sales are recorded. We note sales of Dana at 45c.; Allouez, \$3 1/2; Atlas, 25c.; National, \$2 1/2. Brunswick Antimony sold at \$7 1/2, closing \$7 bid, \$8 asked. In silver stocks, Bonanza Development advanced from \$5 to \$5 1/2, on the announcement of a dividend of 15c. per share. At the Boston Mining and Stock Exchange, there con-

SAN FRANCISCO MINING STOCK QUOTATIONS. Daily Range of Prices for the Week.

Table with columns: NAME OF COMPANY, CLOSING QUOTATIONS (Sept. 23-28), Opening Sept. 29, Opening Sept. 30. Lists various mining companies and their stock prices.

tinues to be a good degree of activity in the leading specialties. Milton holds steadily the advance noted last week, and buyers' options sixty days are in great demand at \$1.13@ \$1.15...

Deer Isle, of Maine, has maintained considerable prominence the past week, and, under steady buying, has advanced from 75c. @ 87c. regular, and 98c. buyer 60; sales over 50,000 shares.

3 P.M.—The market this afternoon was dull, without any special features. Pewabic sold at \$1.14; Quincy, \$39; Silver Islet, \$31; Huron, \$37.

Coal Stocks.

NEW YORK, Friday Evening, Sept. 30.

Prominent among the transactions at the Stock Exchange this week have been this class of shares, which has ruled steady on a very respectable business. At the present time, the interest centers on Reading, and many are the surmises accounting for the present activity of the stock. The sales this week in this market have amounted to 122,710 shares, and in Philadelphia 79,591 shares.

Rumors are again circulating that New Jersey Central is about to be taken out of the hands of the receiver, and an officer of the company is reported by the World as saying that preliminary steps have been taken to get possession of the road, and it is expected that it will be turned over to the company before January 1st.

President Bond, of the Philadelphia & Reading Railroad, states that the Board of Managers of the company will make a report to the annual meeting of stockholders in January next, covering the history of the corporation for a year.

COAL STOCKS.

Table with columns: NAME OF COMPANY, Capital Stock, SHARES (No., Par Val., Last Dividend), Rate per Annum, Quotations of New York stocks (Sept. 24-30), Philadelphia prices (Sept. 24-30), Sales from Sept. 24 to Sept. 28th inclusive.

The Indicator gives the following explanation of recent activity in Reading:

Mr. Vanderbilt has secured control of the Philadelphia & Reading. This has been rumored. Now it is an accomplished fact. To connect this road with the Central he will build sixty miles of road, connecting Reading with the Syracuse, Geneva & Corning, which runs to Lyons on the Central road.

BULLION PRODUCTION FOR 1881.

We give below a statement showing the latest bullion shipments. These are officially obtained from the companies, where that is possible; and where official statements can not be procured, we take the latest shipments published in those papers nearest to the mines reported.

The shipments of silver bullion are valued at \$1.29 '29 per ounce, Troy; gold at the standard \$20.67 per ounce, Troy. The actual value of the silver in the following table is therefore subject to a discount, depending on the market price of silver.

BULLION MARKET.

NEW YORK, Friday Evening, Sept. 30.

Nothing worthy of comment has occurred for some time past in the silver market abroad or here. It is evident, however, that, with the limited eastern and continental demand for silver for two years past, the market price would fall materially if our government did not utilize nearly the whole of our own product in the coinage of the silver dollar, and thus keep the bullion of the European market.

DAILY RANGE OF SILVER IN LONDON AND NEW YORK, PER OZ.

Table with columns: DATE, London (Pence, Cents), N. Y. (Pence, Cents). Shows price fluctuations for Sept. 24, 26, and 27.

MISCELLANEOUS.

The bullion in the Bank of England has decreased \$241,000 during the past week. The weekly statement of the Bank of France shows an increase of 1,200,000 francs gold, and a decrease of 6,825,000 francs in silver.

Bullion Receipts at New York.—The bullion received from the mines at the various offices in this city during the week ending September 29th, as compiled from various sources, amounted to \$465,195.12, as against \$162,534.22 reported for the previous week, and \$12,708,075.76 from January 1st, 1881, to date.

Exports of Gold and Silver from New York.

Table with columns: Description (Week ending Sept. 24th, etc.), Amount (\$). Shows export values for Sept. 24th, 25th, and the week ending Sept. 24th.

The production of precious metals on the Pacific coast, for the first half of the year 1881, according to Wells, Fargo & Co.'s report, is as follows: Gold, \$9,418,378; silver, \$22,826,400; total, \$32,244,778.

METALS.

NEW YORK, Friday Evening, Sept. 30.

There has been a fair business, with prices well maintained or advanced. The outlook still continues to be encouraging for a large business at very satisfactory prices.

Copper.—The market for this article is very firm at 18 1/2c. The sales for the week at this price amount to almost 500,000 lbs. The market is in the hands of the Lake combination, as the outside producers find it difficult to fill their contracts made previously.

MINES.

Table with columns: MINE, States, For the week, Month of Septem'r, Year from Jan. 1st, 1881. Lists various mines and their production statistics.

Total amount of shipments to date..... \$18,376,218

* Official. † Net. G. Gold. S. Silver. L. Lead.

The Production of Coke for the week ending Sept. 10th, and year from Jan. 1st :

Table with 3 columns: Tons of 2000 lbs., Week, Year. Rows include Penn. RR. (Alleghany Region), West Penn. RR., Southwest Penn. RR., Penn. & Westmoreland Region, Pa. RR., Pittsburg, Penn. RR., Show Shoe (Clearfield Region), and Total.

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(NONPAREIL MEASUREMENT.)

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WANTED.—GOOD, WIDE-AWAKE, PRACTICAL MEN for introducing and selling Blast- ing Powder, etc., through the country. Address, THE HECLA POWDER CO., 57 Broadway, N. Y.

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DIVIDENDS.

OFFICE OF THE GREEN MOUNTAIN GOLD MINING COMPANY, of California, No. 18 Wall Street, New York, September 13th, 1881.

DIVIDEND NO. 27.

The Trustees have this day declared a dividend of SEVEN AND ONE-HALF CENTS per share on the capital stock of this company for the month of August (being the 27th consecutive monthly dividend ; and making a total to date of \$193,625), payable on the 26th inst.

Transfer-books close on the 19th, and reopen on the 28th of September. J. JAY PARDEE, Secretary.

OFFICE OF COPPER QUEEN MINING COMPANY, 36 Thomas Street, New York, Sept. 23, 1881.

The Board of Directors of this company have this day declared a monthly dividend (No. 4) of Twenty-five Thousand Dollars, being 10 cents per share on the capital stock, payable to stockholders of record on and after October 1st, 1881.

Transfer-books close September 29th, and reopen October 4th. L. ZECKENDORF, Secretary and Treasurer. A. A. HAYES, JR., President.

NEW YORK, Sept. 2, 1881.

THE STANDARD CONSOLIDATED MINING COMPANY to-day declared its regular monthly dividend of

SEVENTY-FIVE CENTS PER SHARE,

payable Sept. 12th, 1881, at the Farmers' Loan and Trust Co., 26 Exchange Place, New York.

Transfer-books close Sept. 5th, and open on 13th inst. M. R. COOK, Vice-President.

OFFICE OF THE STORMONT SILVER MINING COMPANY, 2 Nassau Street, cor. Wall, New York, Sept. 13, 1881.

DIVIDEND NO. 4.

The Board of Trustees have this day declared a monthly dividend of FIVE CENTS a share, payable on the first day of October, at this office.

The transfer-books will close on the 15th inst., and reopen October 3d. WILLIAM S. CLARK, President. JOHN R. BOTHWELL, Secretary.

OFFICE OF THE CHRYSOLITE SILVER MINING COMPANY, 18 WALL ST., NEW YORK, Sept. 15, 1881.

THE BOARD OF TRUSTEES HAS THIS DAY declared a Dividend (No. 9) of One Hundred Thousand Dollars, being fifty cents per share of the capital stock, payable to stockholders of record on the 10th day of October, prox.

Transfer-books will close September 30th, at 3 P.M., and open October 11th. HENRY C. COOPER, Secretary.

ROBINSON

CONSOLIDATED MINING COMP'Y.

DIVIDEND NO. 6.

New York, Sept. 1, 1881.

The Board of Trustees have this day declared the regular monthly dividend of Fifty Thousand Dollars, also an extra dividend (No. 1) of Fifty Thousand Dollars, making one hundred thousand dollars, payable on and after September 15th, 1881, at the office of the company, 18 Wall street.

The transfer-books will be closed from 3 o'clock P.M. of the 9th until 10 o'clock A.M. of the 16th inst.

JAMES K. SELLECK, Secretary.

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