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UNDER MINING NEWS, we print this week an interesting letter by Mr. J. TROWBRIDGE BAILEY, of Idaho Springs, on the present status of the mining enterprises of that vicinity.

WE would call attention to the details published in our department of "PROPOSALS" of a contract for a hoisting-engine for the Gartfield shaft of the New Almaden quicksilver mines in California.

MR. JOHN FRITZ, one of our best-known metallurgical engineers, makes the shells of his cupolas and blast-furnaces of a basket-work of hoops and bars, instead of sheathing them in plate-iron. This practice, which is generally adopted in lead furnaces in Spain, for instance, possesses very considerable advantages in admitting easy repairs, and offering economies in the first cost and the transportation of materials, points which are of particularly great importance for the copper and lead furnaces of our Western mining camps.

To those who have indulged in the prophecy that the limit of the output of our steel mills had been reached, the record of the Edgar Thomson Works for the first six months of the year, as printed in our last issue, must have taught the necessity of waiting longer. Capt. W. R. JONES is not, however, content to rest on his laurels, and though his rivals may push him hard, they will find it difficult to catch up to him. As it now stands, the record of the Edgar Thomson Steel-Works is the following :

Product for Ten Months, ending Oct. 31, 1881.—Ingots, 129,284 gross tons, 1140 pounds; rails, 112,835 tons, 1919 pounds; forgings, 1226

tons, 1424 pounds. The largest runs made in these ten months were as follows: Best 24 hours, 654 gross tons, 1880 pounds of ingots, and 578 gross tons, 859 pounds of rails; best month, 14,461 tons, 1880 pounds of ingots, and 13,246 tons, 285 pounds of rails. In the week ending November 5th, 1881, these works made 3580 tons, 1340 pounds of ingots, and 3112 tons, 187 pounds of 56-pound rails.

A STRIKING instance of the tendency in manufacturing to the concentration of a variety of allied and associated industries in the hands of strong companies is afforded by the consolidation of coal and iron interests at St. Louis. The matter has been pending for some time, but has finally taken the form of a consolidation, under the title of the St. Louis Steel and Ore Company, of the Grand Tower Coal and Transportation Company, the Pilot Knob Iron Company, and the Vulcan Steel Company. Thus it will be seen that one great concern is to mine ore and coal, smelt pig-iron, make Bessemer steel for rails and other merchantable shapes. Such a concentration of vast interests in the hands of a few has undoubtedly very many and very great advantages, so far as economy of manufacture and administration is concerned, but it involves also the grave responsibilities which vast power brings with it, and contains the elements of danger of an unwise or unscrupulous exercise of it. There are many who look upon this movement, which is becoming more pronounced in our manufacturing industries, with much distrust.

FROM the meager telegraphic dispatches which we have concerning the doings of the National Labor Congress held at Pittsburg, it appears that a permanent national organization has been effected after considerable discussion. The "platform" is comprehensive, and while it advances claims the justice of which will be conceded by every fair-minded person, it contains some demands which savor most unpleasantly of the demagogism which labor organizations more than any other should shun. The platform insists upon the right of labor to organize in defense against "the aggressions of concentrated capital." It demands the abolition of contract convict labor, the prohibition of Chinese immigration, the abolishing of the truck system, the preference of mechanics' liens for wages to the claims of contractors, the enforcement of the national eight-hour law, and compulsory education of all children under fourteen years of age. Among other reforms asked are the framing and enforcement of legislation in regard to ventilating work-shops, mines, etc., and providing means for fire-escapes for factories and mills. The creation of a Bureau of Labor Statistics by the national government is also urged.

THE Holly system of distributing steam for heating and power from a central station is in process of introduction on a large scale in this city, and as a step in the direction of a more economical, more healthy, and less dangerous method, its advent will be welcomed. That it is the last and most promising effort in this direction we do not believe, because the possibilities, we might almost say the probabilities, in the future of the distribution of a heating and fuel gas are certainly great. Still it is undoubtedly better to substitute steam taken from mains for that from boilers, hidden away in cellars under the pavements, which constitute a standing menace to safety of life and property in this city, and which are especially dangerous because they are rarely in charge of competent men. The handling of considerable quantities of coal, and the use of elaborate, costly, and unclean heating apparatus are done away with. The company, which is now laying large mains in many of the principal thoroughfares of the lower part of the city, has been putting sixty-four boilers, having an aggregate of 15,000 horse-power, into one large central boiler-house; and after drying the steam, conveys it through large pipes coated with mineral wool and a wooden jacket to the houses, taking the condensed water back to the boiler-house by a smaller return pipe, similarly protected against the radiation of heat.

DURING the course of the week, the Chicago Tariff Convention, a sort of forerunner of the National Convention to be held in this city at the end of the month, met, passed a series of cut and dried resolutions, and adjourned. To those who may have looked forward to any indication of a broad and more liberal policy, the work of the Convention will prove a disappointment. Professedly the agitation now going on has been started for the purpose of urging the necessity of tariff reforms, and pointing out the direction which they ought to take with due consideration of the rights of the many interests involved. The present tariff all agree can not be allowed to stand as it is. Some of its provisions are outrageous, and their continuance affects injuriously a policy which is otherwise so popular in this country. It was thought that in a gathering like the Chicago Convention some effort would be made to serve the cause of protection by insisting upon the reduction of excessive rates; that some slight concession to public opinion would be made. Nothing of the kind has been done. No protest has been raised against present

enactments or decisions except when they happened to be unfavorable to some special industry. We do not mean to say that those protests were unjust; on the contrary, the points were well taken; but we do urge that it is time to begin to think of going over some of the figures in the tariff. If there had been a duty of fifty dollars apiece on pins, we doubt whether a voice would have been raised against it in the Chicago Convention. This sort of thing may be satisfactory to the extreme wing of the protectionist party; but it is not likely to impress the great body of business men and manufacturers of this country, who, while firmly believing in the necessity of protection, do not favor excessive rates of duty.

THE RAILROAD PROBLEM.

Perhaps the most widely discussed subjects during the year which is now drawing to a close have been those bearing upon the relations of our railroads to one another, to internal commerce, and to our navigation on rivers and canals. While this discussion has not as yet led to any definite proposals to remedy existing evils, much good has been done in throwing light upon the many and complicated questions involved in defining the relations which the various parties interested now bear to one another, and in indicating where at least a part of the responsibility for the present state of affairs lies. Public opinion undoubtedly will have much to do in shaping future policy; and the first step toward reform, which all agree must soon come, ought to be to make our business communities fully conversant with the present state of affairs. It is of course out of the question to do justice to so vast a question in a few paragraphs; but a few leading points may be profitably presented.

In a new country, the occupants of the territory, holding a portion of the soil and of the mineral resources, clamor for transportation facilities, which alone can aid them in developing their property. They often make sacrifices to obtain them, and rarely question in what manner those facilities are provided. They do not profess to care whether they are built by speculators merely for the purpose of making great profits by manipulation of stock or by running up the cost of construction to fictitious figures. But when the country so tapped has been opened out and the business hoped for is beginning to be developed, and the traffic is made by excessive rates to bear high interest charges or is forced to sustain fancy prices of stock, the former ardent advocates of railroads and those new-comers upon whom land and mineral property have been unloaded begin to cry monopoly! In those sections of the country where nature bars competition by new roads, the railroad company has full possession, and the agricultural, mining, commercial, and industrial interests of the section controlled are made to feel the full weight of the operation of rates fixed according to what "the traffic will bear." Those who are acquainted with the state of affairs in some of our Western States and territories well know that oppression does not stop there, and that often personal interests and preferences lead to virtual prohibition of the transaction of business by others. For such evils, the remedy lies alone with the people of the section, and their experience ought to induce those of other districts in which the same course is being prosecuted to provide for the future by timely safeguards. The fact, however, that the majority of the early intelligent holders look upon their stay as only a temporary one, to be ended as soon as they have accumulated a competency, operates strongly against such provisions and their enforcement.

The subject becomes a much more complicated one where rival lines compete for traffic, and interest centers chiefly in the great trunk lines, because it is with them that existing evils have become more generally apparent, and remedies have been tried on the most extensive and elaborate scale. Whatever differences of opinion may exist concerning the methods and agencies by which a controlling or restraining influence may be exercised, those who have at heart the best interests of the country at large hold, and justly, that there should be no discrimination of rates, either with respect to persons or to localities. This has been one of the grievances against which complaint has been loudest and redress has been asked more emphatically. Though occasionally directly traceable to personal preferences, it is mainly the outgrowth of a system of fixing rates which confessedly lies at the bottom of many abuses. As at present organized, each railroad employs soliciting agents who have the power, and, at the slightest indication of an inroad by a competitor, freely use that power, of cutting agreed rates. A simple statement on the part of a shipper that he is able to obtain better rates elsewhere is often considered sufficient to make contracts ahead, extending over months. The managers of railroads appear to have no means of controlling these men, and thus the harmony of large interests is virtually in the hands of a body of irresponsible subordinates, who are easily swayed by rumors. It may be urged that the harmony of competing lines of transportation is rather to be feared than to be desired, that uncontrolled rivalry opens to clever shippers possibilities of great gains, and that the loss of the railroads is so much more profit to them. By a certain class of producers, railroad

wars are therefore hailed with joy, and much satisfaction is expressed by some business men when these "monopolists" are at loggerheads. While individually a few may for the time being profit by such contests, the interests of the country must, on the whole, severely suffer from them. It introduces an additional element of uncertainty into affairs which without it are changeable enough, and the producer or merchant who has to-day outwitted the freight agent, and believes that he secured an advantage over his competitors, may find to-morrow that the latter are doing far better than he. He may discover with disgust that others, hundreds of miles away from his markets, are triumphantly carrying off his old-established trade. The experience of the business community in general has been that in the long run fixed rates, which secure a reasonable profit to the carrying companies, are by far preferable to alternate seasons of war and times of peace, when empty treasuries must be filled by round charges.

The history of railroad confederations or pools has, therefore, been followed with close attention; and their failure thus far has been the subject of much comment and speculation. Their aim to prevent strife by apportioning traffic among members and to establish and maintain rates has been so repeatedly defeated by jealousy and lack of faith that even the belief of the strongest advocates in their efficacy has wavered and many are anxiously casting about for other means of preventing disastrous wars on the one hand or exorbitant rates on the other. Experience has taught that unrestricted competition must always lead to that end, the laws of supply and demand which are relied upon in ordinary transactions to regulate the value of services performed failing to secure a proper adjustment. There are those who still claim that pooling is the best method, the most prominent, authoritative, and cautious advocate being Mr. ALBERT FINK. It is urged by them that defects in organization and limited scope have caused a temporary failure, and that the system is capable of coping successfully with many of the existing evils. With the general public the feeling is gaining ground that, by reason of the lack of stability of any arrangements made by the railroad confederations themselves, some external power should be evoked; either to take entire charge of the regulation of competitive traffic, or to devise measures to give fuller authority to voluntary agreements.

The government has been naturally looked to; and while public opinion is decidedly adverse to the exercise of power from that quarter, the fact that it is the only source from which legislation that will effectually guard public interests can flow has induced many to view favorably the proposition to make the regulation of railroad traffic the subject of government investigation and action. In a recent pamphlet, Mr. JOSEPH NIMMO, Jr., Chief of the Bureau of Statistics, has taken up this momentous question. Let it be assumed, for the sake of the argument, that the evils connected with the railroad system of the United States which injuriously affect the public interests are of such magnitude as to demand governmental interference; the question arises whether the good results of such interference would more than counterbalance the administrative difficulties. It has been suggested that the government assume the functions which pools have hitherto exercised. Mr. NIMMO points out that the determination of both the absolute and the relative rates would in many ways subject the government to responsibility for the condition of the commercial interests of sections and localities as well as of the whole country. He urges, furthermore, that the government would be compelled to set territorial limits to the traffic operations of rival roads, and says: "An apparently insuperable difficulty with respect to the assignment of such territorial limits would arise from the fact that the lines of the various companies interlock and compete with one another at hundreds of points, and under an almost infinite variety of conditions with respect to the railroads and the water lines; and with respect also to the commercial, agricultural, manufacturing, and mining interests of the country."

Notwithstanding the admittedly great obstacles that lie in the way of governmental regulation on the basis of pool arrangements, it seems difficult to escape the conclusion, from a general survey of the present state of affairs, that some such expedient is the only one available. Mr. NIMMO suggests that a commission of experts make a full inquiry into the subject, and that their report be used as the basis for the discussion of the propriety and expediency of legislative action and the form it ought to take. He urges for early and prompt consideration, as desirable and feasible, that the government require that all rates shall be made public, and that they shall not be changed without due public notice; and he advocates the passage of a law compelling railroad companies to furnish cars to shippers equitably in proportion to the orders received. These suggestions are strikingly good so far as they go, if some system could be devised by which the published rates, duly scaled in proportion to quantities shipped, could be made *bona-fide* rates, without being subject to private drawbacks or discounts, and by which the delivery of cars could be satisfactorily arranged. Even such minor reforms are beset by difficulties which furnish some indication of the troubles in store for those who urge governmental regulation on a large scale and embracing large and varied interests.

Some of the advocates of a continuance of the present state of affairs have, on the other hand, pretended to understand the present movement in favor of governmental regulation to aim at a complete transfer to the government of our whole railroad system in some such manner as that contemplated and partially carried out in a few European countries. They take much pains to show the absurdity of such a movement, probably in the expectation of creating a prejudice against any interference whatever. Public opinion will not take that course; it is, on the contrary, opposed on general grounds to such interference; but we believe the movement now on foot in that direction has the support of many thoughtful men, and is at least deserving of careful consideration.

THE PARIS EXPOSITION REPORTS.—II.*

The first volume, which formed the basis of our remarks last week, contained the report of the Commissioner-General, with accompanying papers, lists of exhibitors and awards, etc. The remaining volumes contain the reports of the Additional Commissioners, as follows:

Second Volume: *Fine Arts*, by W. W. STORY; *Education*, by JOSHUA L. CHAMBERLAIN; *Political Education*, by ANDREW D. WHITE; *Manual Training-Schools*, by ELIOT C. JEWETT; *Wood-Carving*, by JOHN TREADWELL NORTON; *Textile Fabrics*, by HENRY HOWARD.

Third Volume: *Iron and Steel*, by DANIEL J. MORRELL; *Ceramics and Glass*, by WILLIAM P. BLAKE; *Forestry*, by FLOYD P. BAKER; *Cotton Culture*, by P. M. B. YOUNG.

Fourth Volume: *Chemical Processes*, by THOMAS E. JENKINS; *Mining Industries*, by JAMES D. HAGUE; *Steam and Gas Engines*, by ANDREW D. SWEENEY; *Machines and Machine-Tools*, by WILLIAM T. PORTER; *Clocks and Watches*, by EDWARD H. KNIGHT; *Railway Apparatus*, by WILLIAM A. ANDERSON.

Fifth Volume: *Agricultural Implements*, by EDWARD H. KNIGHT; *Agricultural Products*, by JOHN J. WOODMAN; *Live Stock*, by SAMUEL DYSART; *Horticulture*, by GEORGE W. CAMPBELL; *Pisciculture*, by THOMAS B. FERGUSON.

This list of authors includes all the regularly appointed "Additional" except Messrs. F. A. P. BARNARD, ORESTES CLEVELAND, DONALD G. MITCHELL, and ARISTIDE GERARD. Mr. CLEVELAND did not attend the Exposition; Dr. BARNARD has been prevented by illness from preparing his report; and Messrs. MITCHELL and GERARD *non sunt inventi*, so far as this evidence of their activity goes; nor is any excuse offered for them. On the other hand, there are reports from Dr. KNIGHT, Professor BLAKE, President WHITE, and Mr. NORTON, who, though not among the select "Additional," contributed reports. It is particularly noteworthy that the joint resolution of Congress prescribed that the Additional Commissioners should include three practical artisan experts, three skilled representatives of commerce and manufactures, four practical agriculturists, and nine scientific experts; yet out of all these, nobody was found to discuss the very important and peculiarly American subject of agricultural machinery; and this report, one of the longest and most valuable in the series, was furnished by Dr. KNIGHT. It looks a little as if the "practical agriculturists" provided by law had proved to be either gentlemen farmers, not anxious to show "what they knew about farming" or else so very "practical" that they did not comprehend any body's practice but their own, and were unable to write reports of other people's achievements.

We can not give more than a general account of the reports above enumerated. They are of various types and of unequal value. Some of them are mere superficial summaries, made up to fill a gap with the least practicable labor; some are laborious and voluminous compilations, without special intelligence in arrangement or in discussion; some are admirable surveys of the field they attempt to cover; and some are impressed, besides, with the individual genius of their authors. The last is the case pre-eminently of the report on the *Fine Arts*, by W. W. STORY, which is a wise, eloquent, and witty review of the different national schools of art and their products exhibited at Paris. The great fashionable painters get fearlessly handled; and while some are freely praised, there are many upon whom Mr. STORY visits a keen, biting satire or an outright scorn and wrath which we are glad to have so high an authority express. Mr. STORY's rank as an artist entitles him to be heard; but his power as a writer would secure him a hearing anyhow. His fiery essay is unusually lively reading for a "Pub. Doc."

Gov. CHAMBERLAIN's account of education as represented at Paris seems to be well intended—and dry. There is more real suggestiveness in President WHITE's report on *Political Education*. The course which he recommends has been followed in the establishment by Columbia of a school of Political Science. Whether Cornell has formally done the same, we are not aware. But there is plainly a tendency among American colleges to give, or pretend to give, special attention to political education. And we think this tendency would be stronger, but for the unfortunate

circumstance that tariff, bank, and currency questions are among us also party questions; and many of our weaker colleges do not wish to take sides on them, for fear of losing patronage. Poverty and competition—the fishing for students with one hand and for gifts and legacies with the other—have demoralized, for a time at least, many an American college.

Mr. JEWETT's report on *Manual Training Schools* is not a very important contribution to the literature of technical education. The Exposition appears to have furnished but little material (chiefly from Russia and France), and Mr. JEWETT simply gives it an "honorary mention," rather than a discussion.

Similarly meager is Mr. NORTON's report on *Wood-Carving*, which is redeemed, however, by some pretty pictures. The report on *Textile Fabrics*, by Hon. HENRY HOWARD, of Rhode Island, on the other hand, is almost equally brief, but exhibits a grasp of the subject which redeems it from the character of a mere catalogue or anthology.

Mr. MORRELL's report on *Iron and Steel* contains nothing of technical importance, being devoted wholly to the commercial and business aspects of the iron and steel industries. It is, therefore, historical and statistical to a considerable degree—and for this part of it due acknowledgement is made to Mr. SWANK. It is a pity that no one competent to report on the progress of the art itself was available. This Mr. MORRELL in his introductory remarks politely "leaves to others," while he takes up the somewhat familiar trail which leads via "pauper labor" to a high tariff. But the "others," who were to do the most important work, do not appear; and so it comes to pass that, in the period of most rapid progress in the metallurgy of iron and steel, the report of a representative expert, sent abroad by the government to gather facts, contains not a word on that subject. We are not now objecting to Mr. MORRELL's and Mr. SWANK's well-written and well-worn arguments in favor of protective tariffs. But we do object to having them substituted for something newer and more appropriate.

Professor BLAKE, who has already distinguished himself as a connoisseur and critic in ceramics, contributes an excellent and beautifully-illustrated report on ceramics and glass. Mr. BAKER's report on *Forestry* amounts to little. The best thing about it is the paper in the appendix, by Hon. G. C. M. BIRDWOOD, on *Forest Conservancy in India*. Mr. YOUNG's report on *Cotton Culture* is short, but interesting and useful. It is the work of a man who apparently knows a good deal about the subject, but has not taken much pains.

This concludes the third volume. We shall speak again of the other two.

THE TREATMENT OF QUICKSILVER ORES IN SPAIN.

Though known from remote times, the date of the first opening of the famous mines of quicksilver of Almadén has not been precisely determined. Almost all the writers on the subject agree that cinnabar, from Spain, was already known in the times of Theophrastus, three hundred years before the Christian era, although there is evidence in the writings of Vitruvius that they were worked at a still earlier date, Spanish ore being sent to Rome for the manufacture of vermilion. Such ore constituted a part of the tribute which Spain paid to Roman emperors, and there are records of its receipt until the first century after Christ. The history of Almadén during the reign of the Moors is so much involved in doubt that some writers deny altogether that the Arabs worked the deposit; still the very name it now bears, which means "the mine," and many of the technical terms still in use, give evidence that they knew and worked that famous deposit. As for their Christian conquerors, there are stray indications that they extracted mercury during the twelfth and thirteenth centuries. In 1417, Almadén was given the privileges of a city, and from 1525 to 1645 the working of mines was contracted for by the wealthy family of Fugger, of Augsburg, Germany. Since then, the mine has been worked by the state, though the Rothschilds have controlled the sale of the product.

According to Vitruvius, the works for manufacturing vermilion from Spanish ores in Rome were situated between the temple of Flora and Quirino. The ore was dried and treated in furnaces, to remove the native mercury it contained, and was then ground in iron mortars and washed. In addition, small quantities of quicksilver and vermilion were made at Almadén. The ancients describe other methods, among which Theophrastus speaks of using vinegar; which, however, appears from modern investigations to have been an erroneous account. Nothing definite is known concerning the methods of the Moors; we possess only as a proof that they produced mercury, an account of a quicksilver fountain in the marvelous palace of Abderahman III., at Medina-Zahara, and the works of Rasis, an Arab. The Moors probably extracted mercury at Almadén, from the eighth to the twelfth century by the use of furnaces called "xabecas," which later, in the fourteenth century, were still employed by the Christians, who continued them till the seventeenth century, when German workmen replaced them by "reverberatory" furnaces, which in turn were superseded in 1646 by aludel or Bustamente furnaces. There is an anonymous description of the working with xabecas as practiced at Almadén in 1543, and later accounts in 1557 and 1565. The ore was put into egg-shaped vessels with a lid, the mineral being covered over with ashes. The vessels were packed in a furnace heated with wood, about 60 pounds being used per pound of quicksilver made. This system was also applied at the Guancavelica mine, discovered in Peru in 1566, where the xabecas were abandoned in 1633, being replaced by the furnaces invented by Lope Saavedra Barba, which there were called "busconiles," while in Spain they were named Bustamente furnaces, and elsewhere aludel furnaces. They were

* REPORTS OF THE UNITED STATES COMMISSIONERS TO THE PARIS UNIVERSAL EXPOSITION, 1878. Published under Direction of the Secretary of State by Authority of Congress. Washington. 1880. 5 vols. 8vo.

introduced at Almadén thirteen years after their first use in Peru by Juan Alfonso de Bustamante, Barba and his son having been lost at sea on their way to the Peninsula. In 1876, there were at Almadén, at the works at Buitrones, twenty such aludel furnaces and two Idria furnaces. D. Luis de la Escosura y Morrogh, from whose work we take the above notes, has followed the historical details of the growth of Almadén closely, and from his account of the method of working in 1878 we take some data :

It is not an easy matter to explain the classification of the ore at Almadén. *Metal* is there called the richest mineral, composed of quartz impregnated with crystalline cinnabar. *Requiebro* are middlings of medium richness, *China* are smalls, and *Vaciscos* the finest ore. Besides native mercury, which the ores of Almadén contain in greater or smaller quantity, the most abundant mineral is cinnabar, which is always crystalline and is often crystallized. The ores have besides a small quantity of selenium and iron pyrites intimately mixed with the cinnabar. The gangue is quartz, occasionally argillaceous and bituminous. The following are assays of some of the ores made by Escosura :

	Metal.		Requiebro.		Vaciscos.		China.	
	1.	2.	3.	4.	5.	6.	7.	8.
Cinnabar.....	29.1	21.2	13.3	10.2	5.1	2.8	1.2	0.86
Iron pyrites.....	2.2	2.0	2.0	1.9	12.3	1.5	2.1	2.80
Bituminous matter..	0.6	1.0	1.0	1.2	4.6	0.7	3.4	0.90
Gangue.....	67.5	74.8	82.1	76.5	77.5	93.3	90.2	93.50
Total.....	99.4	94.0	98.8	98.9	99.5	98.3	98.7	98.06
Quicksilver.....	25.05	18.28	11.47	8.64	4.40	2.41	1.03	0.75

It appears to be a difficult matter to determine the average percentage of the various grades of ore. In 1872, a commission classified and sampled a lot of 300 tons with the following results :

Grade.	No.	Quantity, kilos.	Per cent mercury.	Average of grade.
Metal.....	1.	81,890	23.86	24.80
	2.	14,970	22.65	
	3.	12,240	15.20	
	4.	17,000	10.50	
Requiebro.....	5.	31,890	3.84	12.47
	6.	32,360	1.17	
China.....	7.	28,960	0.10	1.75
	8.	78,320	9.24	
Vaciscos.....				9.24

This general average of 12.28 per cent of mercury is pronounced higher than the usual run of the ore, which, it is stated, does not go above 7 to 8.50 per cent.

The furnace in which the ore is treated is cylindrical, 2 meters in diameter and 3.70 meters high from a brick grate, supported by three arches to the arched roof. At the level of the grate is a charging orifice, and near the roof are openings into two chambers, from the bottom of which extend 12 lines of aludels, clay vessels, open at both ends, the middle being expanded. The mouth of one fits into the back end of the one following, a channel being thus formed, through which the fumes to be condensed are passed. The lines of aludels which are laid on the ground terminate in a chamber, and for half the distance between the furnaces and these chambers the ground slopes downward, while for the other it slopes upward. Two furnaces are always placed side by side, and the pair have from 1100 to 1150 aludels.

The operation is as follows : A layer of poor quartz is spread over the brick grate ; this is followed by a layer of smalls, and then by a layer of still finer stuff, all of it being low-grade ore. On top of this are piled two thirds of the *china* of the charge on which the *metal* is put. Then follows a layer of *requiebro*, another lot of *china*, and finally the *vaciscos*, shaped into balls, the whole charge amounting to about 11½ tons, which is put in in from one hour and a half to two hours by three men. The charging orifice is then closed, the aludels are luted, and every thing made tight. The fires under the brick grate are lighted and kept going for twelve hours, during which time furnace, charge, and condensing apparatus are heated up. During this period, the temperature in the condensing-chamber at the end of the line of aludels runs up 40 or 50 degrees Celsius, and some mercury, evidently part of the native quicksilver, is noticed in it. The temperature of the aludels in the immediate vicinity of the furnaces is about 140 degrees C. During this period, the consumption of fuel is four parts to every part of quicksilver produced. At its close, the fire is drawn, and the second period begins. The air entering through the brick arch is heated to from 200 to 300 degrees by contact with the layer of poor stuff, the cinnabar is ignited, and its sulphur oxidized, and the quicksilver vaporized, and, condensing in the aludels, flows toward the depression in the central portion of the line. The temperature goes on increasing, until, twelve hours after the beginning of this period, the thermometer shows 212 degrees C. at the first aludels. This lasts for 18 hours, and then the third or "cooling period" begins, which takes from 24 to 26 hours, and during the beginning of which the temperature in the furnaces still rises. It is then opened and cooled down. A very elaborate series of observations made on the temperatures of various parts of the condensing apparatus of the Almadén furnaces has shown that at the aludels nearest to them the heat increases steadily until it reaches 249 degrees C., 44 hours after the beginning of the operation ; that in the middle of the line, at the depression, the maximum is 50 degrees 50 hours after starting the fire ; and that at the end it does not surpass 39 degrees. In the final condensing-chamber, the temperature varied, running downward from 40 degrees during the heating period to 14 degrees, rising again to 29 degrees toward the close.

The loss of the quicksilver during the operation has been very variously estimated, some stating that it is 50 per cent and more, while others place it at 30 per cent. Escosura, in his work, gives the details of an operation checked by a royal commission in 1872, according to which the loss in working ore running 9.55 per cent was only 4.41 per cent—a loss which he considered inevitable. In 1806, two Idria furnaces were put up at Almadén, but the engineers are not favorably impressed with them. The first cost is stated to be more than ten times greater than that of an aludel furnace, while the capacity is only 50 per cent greater. One pair of Idria furnaces in five years produced 120,000 kilograms of quicksilver, against 843,000 kilogram made by eight sets of the Bustamante furnaces, the cost per kilogram of quicksilver being respectively 0.121 and 0.056 pesetas.

THE IMLAY ORE CONCENTRATOR.

We show in the accompanying illustration a percussion-table, called, after its inventor, the Imlay Concentrator, which is neatly designed and well constructed. It consists of an inclined table 4 feet wide and 7½ feet long, covered either with rubber cloth or copper. This rests upon four vertical arms attached to two horizontal rocker-shafts, of which the one at the lower or discharge end can be raised or lowered, thus affording an opportunity to vary the inclination of the table within certain limits, and adjust it to the nature of the ore to be worked. The table is given a longitudinal motion by the following mechanism : Power from the main line shafting of the mill is transmitted by belt to two cone-pulleys located under the table, and by them a fly-wheel shaft, the lower one at the upper end of the table, is driven. By means of eccentric gearing, the eccentric shaft above it is given a variable motion ; and through eccentrics on this shaft the percussion of the table is effected. The forward stroke, about one half-inch, is much more rapid than the back stroke, so that heavy articles will travel upward from the tailings discharge end to the upper head. The average speed is 200 oscillations per minute ; but by shifting the crossed belt on the cone-pulleys under the table, it can be varied to suit the nature of the ore. The connecting-rods between the eccentric shaft and the table, too, are adjustable, so that supporting arms on the rocker-shafts can be made to vibrate either wholly or in part to one side of a vertical line. At the upper end, the table is divided into four parts by three tongues projecting forward. Into each of these a stream of water controllable by a valve is directed, and behind each of them is an orifice, through which the concentrates are conducted into a hopper. When dry ore is to be treated, it is charged into the hopper shown, which, we may add, is hinged so that it can be readily removed. By a feed-screw it is conveyed forward until it drops upon a distributor. For wet ore, of course, the pulp is simply run on the latter in the ordinary way. Falling upon the table, the lighter, poor gangue is swept downward by the water toward the tailings discharge end, while the heavier particles slowly travel upward by the percussion action until they reach the head, when, after being subjected to the washing of the stream of water, they pass through the orifices spoken of, and are discharged.

Besides using this percussion-table as a concentrator, it is employed as an amalgamator, to a certain extent. In that case, the surface of the table is made of copper, and it is claimed that the plate, becoming amalgamated, acts as a check upon the battery. We understand that it has been doing good work in recovering sulphurets, quicksilver, and free gold from the tailings of stamp mills, and has proved successful in working a large variety of ores.

NOTE ON CURRENT DEPHOSPHORIZING PRACTICE.*

By S. G. Thomas and P. C. Gilchrist.

It being now just three years since the first detailed communication on the subject of the technical possibility of a complete and direct dephosphorization being effected in the Bessemer and Siemens processes was offered to the Institute, and nearly two years since the first working on a large scale was commenced, it has been intimated that it would be interesting to many members to know in what position the matter now stands.

The more strictly scientific aspects of the question having been already treated of at various times, it is only proposed at present to give a very brief résumé of the technical results obtained at some of the leading dephosphorizing works, with the view of affording members the necessary data for drawing their own conclusions as to the technical and economical status of the dephosphorizing process, and giving some materials for forming a judgment on the relative advantages of manufacturing iron by the fluid or ingot processes as compared with the puddling or piling process. It is to be premised, however, that, as there are at present in operation only three works in which the plant has been specially arranged to meet the requirements of the new process (none of which is as yet entirely completed), it is obvious that the average results here given are very far indeed from representing the economical practice likely to be obtained in new or specially adapted plant.

The data here given are based on the results obtained in the present current manufacture of dephosphorized steel, which amounts to between 27,000 and 29,000 tons a month. It may be added that the make for November, and probably for October, will considerably exceed 30,000 tons, or say at the rate of 360,000 tons a year ; while in the course of the next few months, twelve more converters, now nearly finished, will come into operation, bringing the yearly make up to considerably over half a million tons.

With regard to the question of production, it may be noticed : 1. That at present, in the modified Bessemer process, the production of steel per lining is considerably less than in the old process, and that therefore the vessel plant, or facilities for changing the vessel, should be increased for a given make. 2. That the make per unit of blowing and hydraulic engine power (and in consequence per unit of boiler and crane capacity) is substantially the same for both processes, and that therefore no increase in engine, boiler, or crane power is required for the dephosphorizing Bessemer process.

As an illustration of the actual present productive capacity of old works modified for the new process, it may be mentioned that there are now at work in Germany two three-vessel basic pits, each regularly turning out twenty-four or more charges per twenty-four hours, which probably equals the full average of English practice with two-vessel hematite pits. This is the more remarkable as one at least of these pits is a very old and contracted two-vessel pit into which a third vessel has been squeezed. At another German works, with an old two-vessel basic pit, which works on day turn only, the average basic output is eleven charges in the twelve hours ; while at a fourth works, with an old two-vessel pit, twenty-two casts are regularly obtained per twenty-four hours.

The interest and redemption of the cost of a third vessel and its adjuncts would amount to a charge of about three half-pence per ton of steel produced. With the Holley system of removable shells, there would seem to be no reason for anticipating any difficulty in obtaining

* A paper read at the meeting of the Iron and Steel Institute.

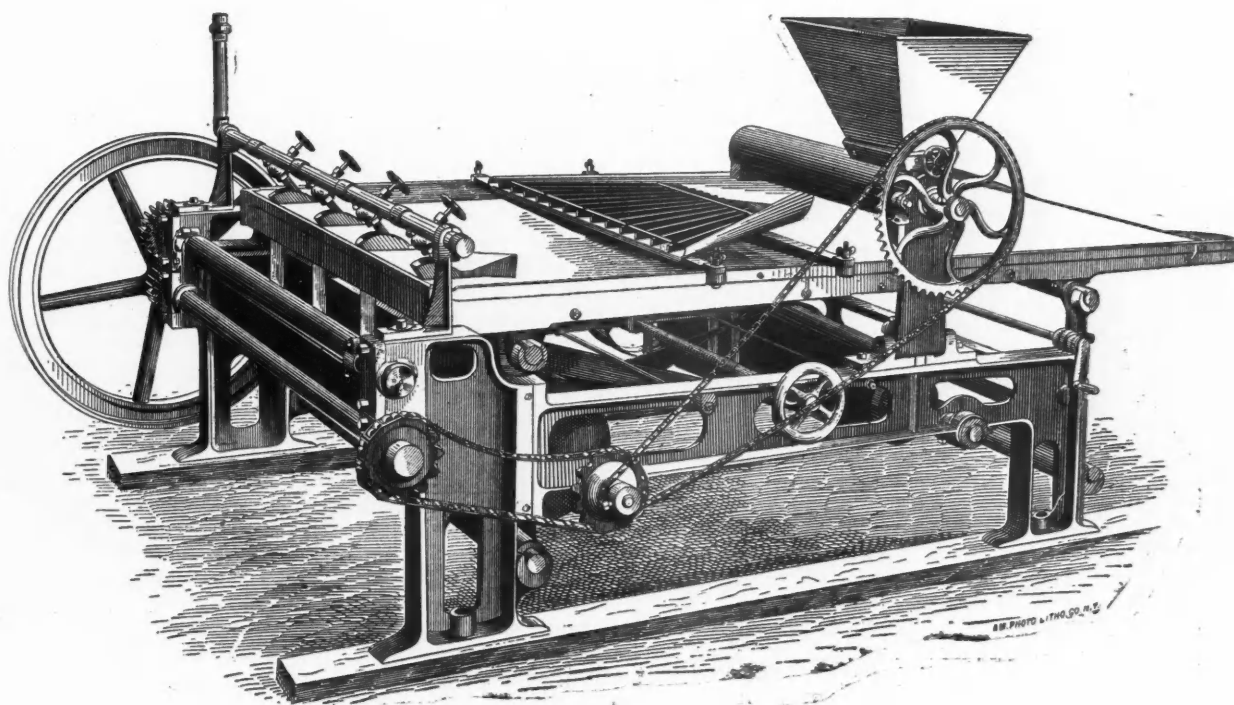
from a single two-vessel basic pit any amount of steel that could be handled, or say at least fifty charges per double shift. In America, a still larger production is expected from the new basic works. The durability of linings is intimately connected with the subject of productive capacity. In present practice, the necessity for considerable repairs to the lining arises after from thirty-five to ninety blows. Thus it appears from the returns from various works that more or less extensive repairs are required on an average after seventy, sixty, forty-five, forty, and sixty charges respectively, or say an average of fifty-six charges.

Practice varies much as to the mode of conducting these repairs. There are very important advantages in the system worked by Mr. Richards of performing them with liquid lime-tar without cooling the vessel. This enables a badly-worn lining to be made as good as new in less than fifteen hours, as a maximum, after the last blow. In some works, when a vessel is badly worn, the whole lining is knocked out and replaced: in most, however, the more economical mode of merely renewing the worn portion is employed, and an absolutely new lining is only put in after many months' working.

Not less important than the durability of linings is that of durability of bottoms. The average number of blows per bottom as reported by ten works is as follows: 8½, 21, 13, 14, 18, 12, 14, 15, 12, or an average of over 14 blows. In nearly all cases, only pin bottoms are used, so no tuyeres are replaced. The average would be higher if only the results of the past few weeks were taken. In many cases, lime bottoms have run

The slag produced in conversion is in all new works allowed to run directly into a slag bogey, so that there is no handling of slag at all. The composition of the slag, that is, its content of iron, manganese, lime, magnesia, and phosphorus, is such as to give it in the blast-furnace rather more than the value of an equal weight of limestone.

The loss of metal, including re-melting (when practiced), varies considerably, being in all cases in excess of the loss obtained in the hematite process. The absolute loss reported from eleven works is 14, 13, 16½, 16, 16, 15, 15½, 11, 13½, 17, and 19 per cent respectively, or an average of 15 per cent. There is, however, reason to believe that 17 and 19 per cent losses reported are abnormal, and the latter, reported by a new work for the first few months' working, is probably incorrect. The loss from shots of metal being entangled in a somewhat cold slag is always exceptionally large at the commencement, owing to slow, and therefore cold, working, as well as to bad cupola working. The average loss in conversion in English hematite practice is probably about 12 per cent. The duration of the blow, including the after-blow, varies from 13 to 25 minutes, averaging about 18 minutes. This does not include sampling, which, when practiced, usually occupies three or four minutes more. The sampling period would in America be doubtless utilized in blowing the second vessel. Blast-power sufficient to finish a blow in about fifteen minutes is desirable. The average pig used in various works varies in composition as follows: White iron is generally preferred; at Eston, however, Mr. Richards blows white, gray, and mottled indifferently, all



THE IMLAY ORE CONCENTRATOR.

for 24 heats, and even over. The average duration of silica bottoms in England would appear to be under 11 blows, the best average being 14, and the lowest 9, besides replacements of tuyeres. Perhaps, however, the best criterion of the relative durability of basic lining material is afforded by the consumption of refractory basic materials for linings and bottoms per ton of steel produced. Unfortunately, reliable figures on this head are not always obtainable. The following represents the total consumption of basic refractory material (in the only works in which trustworthy account seems to be kept), in kilograms per thousand kilos. (one ton) of steel: 45, about 40, 38, 70, or a mean of 48 kilos., or rather under one cwt. per ton of steel. The 70 kilos. being in a new work not yet in regular work, it may be assumed that 48 kilos. is more than the actual mean, which is probably under 45 kilos. The consumption of ganister and tuyeres in the hematite process is probably about 30 kilos. The consumption of coal in the burning and shrinking of the calcareous refractory lining and bottom material varies very greatly, being now considerably less than in early practice. Thus, for the production of a ton of prepared refractory basic material, the consumption of coal varies between 17 cwt. and 3½ tons at different works, being 2 tons, 3 tons, 3½ tons, 17 cwt., 20 cwt., and 22 cwt. At three works, where the cupola mode of preparation is adopted, the consumption of coke is 21 cwt., 18 cwt., and 15 cwt. With good firing arrangements and regular work, there seems no difficulty in obtaining a ton of lining material with a consumption of considerably less than 24 cwt. of coal, or say 16 cwt. of coke.

At the average cost of limestone and coal or coke in English steel-making districts, the maximum average cost of basic lining material would be considerably below 27s. a ton; in some cases it would be below 20s. The cost has been reduced already very much below the first figure in several existing works. Taking as an average 1 cwt. of basic material (including tar) per ton of steel made, the cost of material would be about 1s. 8d. per ton of steel produced. Should it prove practicable to commercially produce magnesia at a very low figure, this may prove a useful material. The consumption of lime for addition varies between 13½ and 17½ per cent on the weight of the pig used—say, an average of rather over 15 per cent on the steel, or 3 cwt. per ton. The result of recent trials makes it probable that a little over 2 cwt. may perhaps prove sufficient.

directly from the furnace. Only direct working is carried on at Eston and Creusôt, and mixed direct and cupola working at two other works.

	1	2	3	4	5	6	7	8	9	10	11
Phosphorus.....	1.75	2.00	2.50	2.5	2.50	2.00	2.20	3.00	2.00	2.0	1.00
Silica.....	1.20	1.00	.50	.5	.70	.80	.50	.70	1.3	1.00	
Manganese.....	.35	1.00	2.00	1.7	1.00	....	1.20	2.00	1.00	1.7	1.60
Sulphur.....	10 to	20									

All these varieties, which are the average of the charges used at the several works, work well, but considerably wider limits of composition are actually employed.

As to the quality of the steel produced, the rapid extension of its employment for every purpose for which Bessemer steel has ever been used (excepting, perhaps, the manufacture of Bessemer tool-steel) is the best evidence.

That dephosphorized steel is even superior to hematite steel for certain purposes, such as boiler and other plates and wire, is now pretty well agreed. The total number of converters at present regularly working on phosphoric iron is thirty-six, of which, however, eight or nine are of less than four tons' capacity. Thirty more converters specially designed for the process are now under construction. Several Siemens furnaces have been in regular work for some time, but details of their operations must be reserved for the present.

Zinc-Bearing Clay from Virginia.—Among the notes of work done by students in the laboratory of the University of Virginia we find the following analysis of clay from a seam several inches in thickness, which overlies the deposit of calamine in the neighborhood of the Bertha zinc mine, Virginia:

	Per cent.
Silica.....	37.38
Alumina.....	24.67
Peroxide of iron.....	6.34
Oxide of zinc.....	12.10
Magnesia.....	0.27
Potassa.....	0.47
Soda.....	17.04
Water.....	
Total.....	98.54

STATISTICS OF QUICKSILVER.

From an elaborate table on the production of quicksilver for thirty-one years, compiled by Mr. J. B. Randol, manager of the New Almaden mine, California, we take the following figures, which are of much interest. Beside California, Spain and Austria, Italy, and some other countries have an average estimated output of 2000 flasks annually.

YEAR	New Almaden mine.	Total yearly production of California mines.	Exports from San Francisco by sea and rail.		Price in San Francisco per pound.		Production of the Idria mine. (Austria.)	Production of the Almaden mine. (Spain.) In periods of 5 years.	Price in London per flask.	
			Highest.	Lowest.	Highest.	Lowest.			Highest.	Lowest.
1850.	Flasks 7,723	Flasks 7,723	Flasks 6,467	cts. 150	cts. 110	Flasks 110	Flasks 4,171	£ s. 13	£ s. 25	
1851.	27,779	27,779	17,791	100	75	4,092	18,905	13	13	
1852.	15,901	21,000	21,358	89	72½	4,085	101,517	11	9	
1853.	22,284	22,284	18,830	72½	72½	4,400	.....	12	12
1854.	31,004	31,004	21,963	72½	72½	4,061	.....	15	15
1855.	39,142	39,142	27,165	72½	72½	4,416	.....	17	17
1856.	27,135	30,013	27,740	67½	67½	5,915	18,001	9	10	
1857.	28,214	28,214	27,362	70	61	11,068	11,068	6	10	
1858.	25,761	31,000	24,412	65	61	4,977	.....	10	5
1859.	1,291	13,099	3,339	106	65	8,231	.....	5	.....
1860.	7,081	10,000	9,488	75	61	4,911	180,011	.....	.....
1861.	34,429	31,000	31,965	65	45	6,103	122,117	.....	.....
1862.	39,071	42,100	28,717	51	45	4,712	.....	.....	.....
1863.	32,803	40,331	26,014	61	50	5,878	.....	.....	.....
1864.	42,489	47,439	36,927	60	61	7,263	.....	.....	.....
1865.	47,194	53,021	42,460	69	61	4,936	.....	.....	.....
1866.	35,130	46,559	31,247	75	61	5,827	186,701	.....	.....
1867.	24,161	47,000	28,853	61	61	7,532	153,224	.....	.....
1868.	25,623	47,723	44,506	60	61	8,253	.....	.....	.....
1869.	16,898	33,811	24,415	61	61	9,179	.....	.....	.....
1870.	14,423	31,077	14,249	91	51	10,745	.....	.....	.....
1871.	18,598	31,696	16,339	91	55	10,914	187,001	.....	.....
1872.	18,571	31,621	16,740	87½	85	11,116	165,008	.....	.....
1873.	11,042	27,642	11,161	121	91	10,939	.....	.....	.....
1874.	9,084	27,556	11,750	157	130	10,789	.....	.....	.....
1875.	13,618	32,210	37,829	155	65	10,717	.....	.....	.....
1876.	21,549	75,074	49,046	70	43	10,791	187,801	.....	.....
1877.	23,998	79,396	52,697	57½	49	11,020	208,200	.....	.....
1878.	1,857	63,881	41,477	47	33	1,413	.....	.....	.....
1879.	20,514	73,084	62,845	45	31	12,153	.....	.....	.....
1880.	23,465	59,926	46,294	45	36	12,516	41,643	.....	.....
Total	710,729	1,197,065	848,017	1.55	38	229,834	902,361	26	5 17½	

PRODUCTION OF CALIFORNIA MINES FROM 1870 TO 1880.

YEAR	New Almaden.	New Idria.	Redington.	Sulphur Bank.	Guadalupe.	Great Western.	Pope Valley.*	Napa Con.	St. John.*	Altoona.	Oceanic.*	Oakland.*	California.*	Great Eastern.
1870	14,423	9,888	4,549	.....	.....	1,220	.....	.....	.....	.....	.....	.....	.....	.....
1871	18,598	8,180	2,128	.....	.....	1,970	.....	.....	.....	.....	.....	.....	.....	.....
1872	18,571	8,171	3,046	.....	.....	1,839	.....	.....	.....	.....	.....	.....	.....	.....
1873	11,042	7,735	6,294	.....	.....	1,955	.....	.....	.....	.....	.....	.....	.....	.....
1874	9,084	6,911	6,678	.....	.....	1,122	1,645	.....	.....	.....	.....	.....	.....	.....
1875	13,648	8,432	7,513	5,372	3,312	3,984	1,940	.....	1,743	.....	.....	.....	.....	.....
1876	20,549	7,272	9,183	8,367	7,381	4,322	300	573	1,633	1,979	2,338	2,151	965	387
1877	23,998	6,316	6,389	10,493	6,241	5,836	1,066	2,229	1,463	1,317	2,575	1,339	1,516	515
1878	15,872	5,133	6,683	2,467	9,072	4,993	1,075	3,049	.....	1,534	1,679	1,615	1,610	1,366
1879	20,514	4,425	4,516	9,249	15,540	6,334	1,325	3,605	1,291	1,919	779	1,593	1,110	1,435
1880	23,465	3,209	2,139	10,706	6,670	6,442	275	4,416	492	245	.....	166	422	1,270
Total	710,729	116,199	89,768	54,725	48,248	32,762	18,097	13,872	8,598	7,527	7,301	6,831	5,638	5,404

YEAR	Sunderland.*	Cloveland.	Abbot.*	Manhattan.*	Buckeye.*	Mc. Jackson.*	Bacon.*	Bella Union.*	American.*	Porter.*	Wall Street.*	Battlesnake.*	Kentuck.*	Various mines.
1870	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	840
1872	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1873	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,270
1874	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1875	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1876	1,571	1,028	1,436	976	467	128	.....	.....	.....	.....	65	66	.....	3,560
1877	735	1,291	836	459	466	268	150	.....	.....	100	.....	.....	.....	250
1878	472	116	.....	.....	.....	158	.....	.....	.....	.....	.....	.....	.....	.....
1879	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	.....	.....	.....
1880	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	84
Total	2,777	2,453	2,272	1,415	873	597	300	271	251	200	139	65	54	59,701

* Not in operation in 1881.

In regard to the production of the Guadalupe, estimated at a total of 20,000 flasks; the Altoona, estimated at 1000 flasks; and the Manhattan, estimated at 3574 flasks, figures for every year previous to 1875 were not available. They are included in the production of "various mines." The figures given under total represent the whole production since 1850.

It may be of interest to add in this connection that according to official returns, the exports of quicksilver from Spain for the last three years were: in 1878, 1,371,552 kilograms, or 2,023,914 pounds; in 1879, 2,100,351 kilograms, or 4,720,329 pounds; and in 1880, 1,099,117 kilograms, or 2,425,367 pounds.

CHARCOAL CONSUMPTION IN LEADVILLE.—The amount of charcoal used in Leadville is simply enormous. Over 500,000 bushels are used every month. Grant's works alone use about 125,000 bushels per month. Three other smelters each consume nearly 100,000 bushels, and the other smelters are not far behind. The price of charcoal ranges from 12 to 14 cents per bushel.

THE BULLION PRODUCTION OF NEVADA.

The Gold Hill News prints the following table showing the gross yield of the mines in the State of Nevada, by counties, in gold and silver, for the six months ended December 31st, 1880:

	Tons.	Gross yield.		Tons.	Gross yield.
Elko.....	5,224	\$291,180.83	Lyon.....	29,612	\$175,286.97
Esmeralda.....	19,178	818,957.50	Nye.....	12,151	273,881.37
Eureka.....	41,040	1,600,783.17	Ormsby.....	43,404	234,913.11
Humboldt.....	10,753	110,338.15	Storey.....	92,863	1,478,774.34
Lander.....	2,884	349,187.53	White Pine.....	26,578	257,897.08
Lincoln.....	5,888	98,123.38			
Totals.....				289,578	\$5,680,323.25

The fractions of tons, amounting to 3½, were omitted from the above columns, but appear in the total.

Net bullion product—		
Quarter ended Sept. 30th, 1880	.....	\$865,470.24
Quarter ended Dec. 31st, 1880	.....	709,005.85
Total	.....	\$1,625,476.09

The following table shows the gross yield in gold and silver for the six months ended June 30th, 1881:

	Tons.	Gross yield.		Tons.	Gross yield.
Elko.....	2,488	\$122,193.21	Lyon.....	39,700	\$146,778.61
Esmeralda.....	19,436	749,521.83	Nye.....	6,551	188,908.45
Eureka.....	38,824	1,612,774.51	Ormsby.....	7,075	35,321.07
Humboldt.....	5,017	45,631.16	Storey.....	48,887	861,731.10
Lander.....	3,976	491,235.37	Washoe.....	2,640	18,588.87
Lincoln.....	6,625	80,559.61	White Pine.....	5,056	189,283.28
Totals.....				186,339	\$4,542,507.67

The fractional tons omitted in the above columns amount to a little less than five, and are added in the total.

Net bullion product—		
Quarter ended March 31st, 1881	.....	\$670,748.99
Quarter ended June 30th, 1881	.....	628,873.11
Total	.....	\$1,309,622.10

The gross yield of gold and silver bullion for the twelve months ended June 30th, 1881, was:

	Tons.	Gross yield.		Tons.	Gross yield.
Elko.....	7,713	\$413,374.04	Lyon.....	69,372	\$322,065.40
Esmeralda.....	38,614	1,568,479.33	Nye.....	18,702	\$462,789.82
Eureka.....	79,865	3,213,557.68	Ormsby.....	50,479	270,234.18
Humboldt.....	15,770	155,949.31	Storey.....	141,750	2,340,505.44
Lander.....	6,860	840,423.50	Washoe.....	2,640	18,588.87
Lincoln.....	12,514	178,682.99	White Pine.....	31,634	447,180.36
Totals.....				475,918	\$10,241,830.92

Fractional tons were omitted from the above column, but added to the total.

Total net product (taxable), after deducting cost of extraction and reduction, for the year ended June 30th, 1881, \$2,925,098.19.

THE BUILDING OF THE PYRAMIDS.

The height of the great pyramid, the tomb of Knufu or Cheops, of the fourth dynasty, was originally 480 feet 9 inches, and the base 764 feet. It is virtually, says Mr. R. G. Poole, in the *Contemporary Review*, a mass of solid masonry; for the rock must take up but a small proportion of the interior, and the chambers and passages have no appreciable relation to the whole bulk. The material chiefly employed is the limestone on which the structure stands, which was in part cleared away to make a level platform; but the finer quality, used for the casing stones and lining of passages, was quarried on the other side of the river nearly ten miles away; and the red granite, also used for inner casing and for the sarcophagus, was quarried at Syene, at the extreme south of Egypt, nearly 550 miles away by the course of the river. We must remember that the third pyramid, now 203 feet high, was cased in part or wholly with granite of Syene. How did the Egyptians contrive to transport and raise these vast blocks of stone? Let us look at the whole process.

First, the labor of quarrying, without any of the modern aids of blasting, must have been enormous, especially when the hard red granite, which turns the edges of our modern steel tools, and yet was cut by bronze ones, had to be hewn out and shaped into accurate blocks. The transport to the river was not difficult, and the descent on rafts during the high Nile would have met no risks but from sand-banks. At this period of the year, the rafts would have been brought by a canal very near the site of the pyramid. A causeway, of which there are remains, would have made the land transports less difficult. But it must be remembered that the only mode of moving great masses on land was by means of sledges drawn by men or oxen. So far, we see only a vast expenditure of almost unaided labor; how vast we do not appreciate; for it is beyond imagination to master the tremendous work; we are constantly confused by our being unable to cast away the modern notions of facility to which we are accustomed. All this preliminary labor was followed by the actual work of building. The great pyramid is not a mass of piled-up stones; it is a model of constructive skill. A sheet of paper can not be placed between the casing-stones, and we can scarcely imagine that any mortar was spread on their sides. The passages present no roughness that could arrest the sarcophagus. Every thing was exquisitely finished. Allowance was made for the pressure of the vast mass. The great chamber of the sarcophagus has no less than five small chambers above it to lighten the superincumbent weight; over the first passage two great stones are placed in a vaulted position for the same purpose. In consequence, nothing has given way. Our real difficulty begins when we endeavor to explain any mode by which the great blocks of which the pyramid is built were placed in position at their various heights until the top stone was put upon the summit, and the work of casing completed the wonder. It would be easy to find a method if it did not entail as much labor as the building of the pyramid itself. Rejecting any such view, the most reasonable conjecture that can be offered is, that inclined planes ran along the sides of the giant steps in which the pyramid was built, and that the stones were dragged up them by the workmen. It is necessary here to note that when the mummy of the king had been placed in the sepulchral chamber, the entrance passage was permanently closed, and heavy portcullises lowered at intervals

this needing great mechanical skill. The chapel attached to each pyramid for the sepulchral rites was built at a suitable distance in front of it, contrary to the practice in the tombs of subjects around, in which the chapel was constructed in the mass of the masonry or hewn in the rock. The final closing of every pyramid, which was the universal custom, is an important fact, which is in itself enough to disprove a scientific heresy, according to which deep secrets were concealed in the heart of the great pyramid for the enlightenment of remote generations.

PROGRESS IN SCIENCE AND THE ARTS.

The Edison Light in New York.—The Edison Electric Light Company has, as already announced, begun to lay the wires for the illumination of a district in this city, bounded by Spruce street on the north and Nassau street on the west, the whole, when completed, containing fourteen miles of conductors. These are laid insulated in pipes which are cemented into boxes in which there is an expansion joint for the conductors, consisting of a copper loop. The conductors are half round in section, and are also made of copper. Pipes and their contents are buried about two feet below the ground.

Pure Lead.—The *Oesterreichische Zeitschrift* publishes the following analysis of Pribram soft lead:

Lead.....	99.9886
Silver.....	0.0010
Copper.....	0.0021
Bismuth.....	0.0025
Antimony.....	0.0010
Zinc.....	0.0013
Iron.....	0.0086
Cobalt and nickel.....	Trace.
Total.....	100.0000

Iodine in West Virginia Brines.—An examination of the mother liquors of salt-brines from various salt-works of West Virginia showed Mr. A. L. Baker, of Baltimore, that not alone iodine is present, but also that a considerable portion of it is in a free state. The following are the results, as printed in the *Chemical News*:

	Spec. gravity.	Free iodine.	Iodine in iodides.	Total iodine.
Snow Hill.....	1.305	4.14	4.14	4.14
Daniel Boone.....	1.270	0.13	2.67	2.80
Newcastle.....	1.300	0.85	2.80	3.65
Hartford City.....	1.285	0.87	1.82	2.69

The figures are given in grains per imperial gallon.

Assay of Cupriferos Blende.—The *Chemical News* gives the following method for assaying cupriferos blende by R. Monger, of Swansea: 1/2 gm. of the blende is taken and treated with aqua regia and evaporated; it is re-moistened with hydrochloric acid, and re-evaporated, dissolved in water with a drop or two of hydrochloric acid, 10 to 20 c.c. of ammonia added, and the iron filtered off and washed. The filtrate, which is now about 200 to 250 c.c. in volume, is acidified with hydrochloric acid, heated and placed in a porcelain dish ready for buretting with ferrocyanide of 0.01 strength. To the solution of zinc and copper, enough sodic sulphide solution is added to precipitate the whole of the copper and leaving a little excess; then the buretting with ferrocyanide and uranium acetate as indicator is proceeded with. In some experiments, he took a non-cupriferos blende and weighed out six samples into three, to which some sulphate of copper solution equal to 2 1/2 per cent copper in the blende was put. Proceeding with them as above explained, perfectly concordant results were obtained.

The Growth of Barbed Fence Wire Manufacture.—In a pamphlet published by the Washburn & Moen Manufacturing Company, of Worcester, Mass., the following brief history of the barbed fence wire industry is given: In the year 1873, a practical man in Illinois patented the first defensive armor for wire fence. This consisted of strips of wood carrying at short intervals sharpened points of wire. This strip he attached to the old-fashioned, plain wire fence. The device was taken up with avidity, and widely used in the Northwest. This barbed strip, suspended upon the upper wire of an old-fashioned, plain wire fence, transformed it instantly into a barrier to be respected by the most venturesome animal. A little later, an Illinois citizen realized the Glidden barb fence, far better than the first rude barb contrivance, by attaching the barbs directly to the fence wires. It was the achievement of a practical farmer who knew what he himself needed. His first constructed line of barb fence is still in use in De Kalb County, Illinois, and from this small beginning dates the era of barb fencing. Here is the short business history of barb fencing since that time:

- In 1874, there were 10,000 lbs. made and sold.
- In 1875, there were 600,000 lbs. made and sold.
- In 1876, there were 2,840,000 lbs. made and sold.
- In 1877, there were 12,863,000 lbs. made and sold.
- In 1878, there were 26,655,000 lbs. made and sold.
- In 1879, there were 50,387,000 lbs. made and sold.
- In 1880, there were 80,500,000 lbs. made and sold.
- In 1881, the estimate is for 120,000,000 lbs.

A Modern American Steel Plant.—In a recent issue of *Engineering*, Mr. Alexander L. Holley has described the new Bessemer steel plant of the Bethlehem-Iron Company. It has two converters 8 feet in diameter, the body and nose of which are completely lined with natural mica schist, roughly trimmed to shape. Excepting some slight repairs to the nose, this lining is good for 20,000 to 30,000 tons of ingots. The vessel bottoms have 17 fire-brick tuyeres with 12 holes 3/8 inch each, these bottoms standing 12 to 14 heats quite uniformly. The vessels stand high, 12 1/2 feet to center of trunnions. At first Mr. John Fritz, the engineer and manager of the works, having observed certain advantages of the long straight pit and ladle car as used in various German works, and with special success at Bochum, determined to give that system a trial. He therefore started the new plant with two straight pits fitted up with every convenience, and worked it in this way for some months, but he was quite unable to pour and remove the normal output of the two vessels. A single ladle crane in the old pit was doing more work. In order to secure greater convenience and slower and consequently

better casting when the vessels blow alternately, Mr. Fritz finished the plant with two ladle cranes, one for each vessel. For melting the pig, an average of 1 pound of fuel is required for 10 pounds of iron. There are four iron and four spiegel cupolas, the shell of which is a basket-work of hoops and bars instead of a continuous casing of plate metal. The output of the two converters averages about 3000 tons of ingots per week of twelve shifts.

RAPID TRANSIT IN NEW YORK.—But few persons who have not been in New York since the construction of the elevated roads, and witnessed their equipments and operations, can have any adequate idea of the extent of them, and of the people, machinery, and appurtenances required in working them. A recent inventory discloses the fact that there are 32 miles of roadway, 161 stations, 203 engines, and 612 cars, while 3480 trains a day are run. There are 3274 men employed on these roads, 309 of whom are engineers, 258 ticket-agents, 231 conductors, 308 firemen, 395 guards or brakemen, 347 gatemen, 4 road-inspectors, 106 porters, 33 carpenters, 27 painters, 69 car-inspectors, 140 car-cleaners, 40 lamp-men, and 470 blacksmiths, boiler-makers, and other mechanics employed on the structure and in the shops. Most of the ticket-agents are telegraph operators, but there are 13 other operators employed. There are four double-track lines in operation. The aggregate daily receipts vary from \$14,000 to \$18,000; and as many as 274,023 passengers have been carried in one day. Engineers are paid from \$3 to \$3.50 per day; ticket-agents, \$1.75 to \$2.25; conductors, \$1.90 to \$2.50; firemen, \$1.90 to \$2; guards, or brakemen, \$1.50 to \$1.65; and gatemen, \$1.20 to \$1.50. The above items do not include machinists and other employes in the workshops, or the general officers, clerks, etc.

GENERAL MINING NEWS.

ARIZONA.

CAVE CREEK DISTRICT.

PHOENIX.—It is reported that a 100-stamp mill is to be built at this gold mine by Eastern capitalists, who bought it recently.

EMPIRE DISTRICT.

JOHN MADDEN.—The *Journal* reports that this group of mines has been sold for \$20,000.

TOTAL WRECK.—The new water-works are rapidly approaching completion—pumping machinery is being put in at the base of supply, half a mile from the mine and town—pipe is laying, and the reservoir on the hill above town is preparing for the reception of the water which is to supply not only the village but the Total Wreck mill, which will be erected in the town, much of the material for which has already reached Pantano, and will shortly be on the ground selected for a mill site.

GLOBE DISTRICT.

OLD DOMINION.—An official report states that the hoisting-works and the remainder of the machinery arrived at the mines on November 9th, and that the smelting-furnaces will be completed and running before December 1st. The superintendent says that every thing is in proper shape for a steady run for years.

STONEWALL No. 1.—This mine, says the *Silver Belt*, is developing. The vein is never small, and at times widens out to 12 feet, all of it milling ore. It is remarkably free, working up to 996 fine without refining. The main shaft is down 250 feet, and the developments are eminently satisfactory.

MYERS DISTRICT.

GUNSIGHT.—The following is a description given by the *Citizen*: This mine is now opened on three levels, with an incline shaft sunk 200 feet in depth. At this depth, a cross-drift is running to find the west wall of the vein, or the Silver Girt vein. The distance it will be necessary to run from bottom of shaft is 90 feet, if the vein continues to pitch as on the surface. The Gunsight has a dip easterly, and the Silver Girt westerly. The course of the Silver Girt is west of north ten degrees, and the course of the Gunsight north of east fifteen degrees. The intersection of these veins will be about 100 feet west of the present shaft in Gunsight mine. The cross-drift on the 200-foot level has been run 40 feet, all in vein except four feet. Thirty-two feet of solid ore of good grade was found at this point; a porphyry horse was encountered which was four feet across, then ore was again found. The face of the cross-cut is now in fine ore, which carries horn-silver, bromide of silver, sulphurets of silver, chloride of silver, with streaks of black metal which is base, carrying a large percentage of silver. In all these ores is found a small percentage of gold. The ore now extracted is free-milling. It is estimated that the ore now opened in the mine and on the dumps will run a forty-stamp mill two years, and the ore-body is as yet but little opened up. The company now has hoisting-works on the way from Philadelphia, capacity thirty horse-power. They are also commencing a large vertical treble-compartment working-shaft, which will intersect the vein at the depth of about 500 feet. A mill of forty stamps will be sent on from Philadelphia.

ORO BLANCO DISTRICT.

WARRIOR.—News has been received that a strike was recently made in this mine, belonging to the Orion Company. At a depth of 75 feet, a vein three feet wide was found, which gave an average assay of \$600 per ton. The mill of the company, which has been repaired, will begin crushing on this rich ore. On Sunday, a 4-foot vein, averaging \$150 per ton, was struck in a 45-foot prospect-shaft on the Alaska mine, belonging to the same company.

CALIFORNIA.

THE BODIE DISTRICT.

From the local press we cull the following:

BODIE CONSOLIDATED.—During the past week, the mill crushed 115 tons of ore, which yielded \$6198.07. The assay value was \$53.63 per ton. The pulp assayed \$62.41 per ton and that of the tailings \$11.98. There were 70 tons of ore hauled to the mill. On the foot-wall of the north drift, rich ore has again come in, showing free gold in the quartz through a stratum about three inches wide. There is no change in the stopes, excepting that the gold is in a finer state of division.

BODIE TUNNEL.—Eighty-four tons of ore were extracted from ledges 7, 20, and 21. The average assay of the ore was \$25 per ton. During the week, progress was made north on ledge No. 7. There are 18 inches of good ore in the face of this drift. Hauling to the Miners' mill has been discontinued, as there is sufficient ore on hand to keep that mill running until the new mill is completed. On the 4th, 300 ounces of crude bullion were shipped to San Francisco.

STANDARD CONSOLIDATED.—During the past week, 657 tons of ore were extracted from the 300, 385, 500, and 550-foot levels. The average pulp-assay for the week was \$47.85 (much higher than usual); crude bullion received, 4205 ounces, and the amount shipped to the company in San Francisco was \$39,662.43. The stopes are looking well. The ledge on the 385 and 550-foot levels is from 12 to 25 feet wide of good ore.

GREEN MOUNTAIN.—The superintendent officially reports steady development

and improvement in the mine. The No. 5 tunnel is now in over 2300 feet, and has run through the main ore-body about 500 feet, and gives an unusually long body of pay ore. An uprise is running from No. 5 through the ore-body to connect with the winze from No. 4. This connection will give excellent air and open a reserve of ore with 400 feet of backs.

IDAHO.—The yield for five weeks ended October 20th was, in round numbers, gold to the value of \$67,000. November 1st was dividend day, when not less than \$7.50 per share of capital stock were declared. That made the 147th dividend.

INYO CONSOLIDATED.—The superintendent has telegraphed: Have 500 tons high-grade ore at mill. All needed supplies are shipped from San Francisco, and I commence milling the ore this week. Had to shut down mill for repairs.

SPRING VALLEY.—The superintendent has telegraphed as follows under date of the 5th inst.: Will have to make partial clean-up this month. Just finished flumes below under-currents, as they needed repairs and repaving. Will have over 60 pounds amalgam unusually good general clean-up, by first of January. It was announced officially under date of the 9th that the new tunnel was advanced 101 feet for the week ending October 29th, leaving 1000 feet still to be run.

CANADA.

SHERBROOKE.—For the month of October, these mines gave 182 ounces 3 dwts. of gold from 364 tons of quartz.

DOMINION CONCENTRATING-WORKS.—The works at Montagu have commenced to extract the sulphurets from the quartz-mill tailings.

COLORADO.

CLEAR CREEK COUNTY.

THE IDAHO MINING DISTRICT

We have the following letter from Idaho Springs: The Idaho District comprises, roughly speaking, that portion of the county in the immediate vicinity of the town of Idaho Springs. At the time of the great gold fever in the early '60s, very extensive operations in gold placer mining were prosecuted along the line of Clear Creek. To this industry then, the present flourishing town owes its being; but, unlike many other places of like origin, has maintained its permanency. In those early days of gulch or placer mining, little or no attention was given to the mineral occurring in lodes or veins. The first work of any moment in this direction was prosecuted upon the Seaton vein by Dr. Seaton, in 1861. The limited knowledge of mineralogy and metallurgy, together with the vague and crude ideas of the art of mining this class of deposits that existed at this period, had much to do with the signal failure of the enterprise. The ore, the character of which is typically a smelting one, was crushed under stamps and run over amalgamating plates. It contained varying amounts of silver, from 20 to 200 ounces, and small amounts of gold. A small proportion of the pure gold present was obtained; the remainder, together with the argentiferous galena, zinc-blende, and other silver-bearing sulphides, passed out of the mill, and to-day repose peacefully in the body of the creek. From 1831 until 1870, followed a period of inactivity, brought about by the non-occurrence of gold in paying quantities by such treatment in the fissures and the partially worked-out state of the placers. This gap practically ended the gold craze. About 1870, a new impetus was given to lode mining. The smelting facilities of the State enabled the hitherto refractory sulphides to be mined and reduced with profit. The Seaton passed into the hands of a stock company; but, owing probably to bad management, the results were any thing but satisfactory. The property was now leased and re-leased, each lessee gouging and robbing the mineral, leaving the barren vein-matter and rock lying in the shafts and levels. This, accompanied with insufficient and bad timbering, has placed a fine property in such a condition that large sums of money must be expended before it can be worked by its old shafts. The partial success attending the smelting treatment of the ores led to the development of many new and valuable properties in the camp. The Crystal lode, from which probably the richest mineral in the camp has been extracted, was bought in by a syndicate of Mauch Chunk capitalists, and worked for some time. Of late, however, the mine has been shut down, owing to some disagreement among the stockholders. The Queen, Veto, and Santa Fé were opened up, showing quantities of valuable mineral. Assays from the latter mine ran as high as 1600 ounces silver to the ton. The Franklin, which was also unsuccessfully worked by a stock company, is at present showing up a fine streak of mineral to lessees. The Tropic, from a small, insignificant streak of mineral on the surface, has, upon sinking, yielded an independent fortune to its owner. The Kangaroo, Metropolitan, and Casino are all properties of unquestionable value. The Metropolitan has been worked with profit from the start, and very recently the lessees upon the Casino have struck a magnificent body of high-grade mineral. The Dove's Nest has from one to three feet of solid galena, averaging about 50 ounces of silver to the ton. It is one of the largest fissures in the camp. The Bell Tunnel property, recently purchased by Philadelphia parties, consists of five or six locations and three veins; and is, considering the development, one of the most promising enterprises on the line. The mineral consists of galena and gray copper, carrying from 100 to 800 ounces of silver to the ton. The Beaver, Seven-Twenty, Donnellson, and Domingo start up this month after a long period of inactivity. Lastly, the Victor, which has been worked for years with profit, requires no especial mention.

All the veins of this district are characteristically true fissures, breaking through the country-rock, which is a highly metamorphosed, foliated gneiss, at angles varying from 30° to 80°, and all lodes, with but one or two exceptions, tend N.E. and S.W. It is a remarkable fact in the lithology of this district that Clear Creek and in part Virginia Cañon—a tributary of the former, skirting the base of Seaton Mountain—form a distinct line of demarcation between the mineralized and non-mineralized sections of the district. To the south of this line, no mineral to speak of has been discovered. The mineral belt of which Seaton Mountain is a part, is traceable northward into Boulder County, and southward toward Georgetown, Breckenridge, Leadville, Gothic, Ruby, etc. Seaton Mountain is the vault or storehouse for almost all the valuable deposits of Idaho. Upon it are situated the mines already referred to, and many others of less importance. The main or mother vein is the Seaton, which strikes along the ridge, and parallel to it are the lodes mentioned above. The character of the mineral in all these veins is naturally very similar. It consists of argentiferous galena, zinc blende, and gray copper, usually carrying a high percentage of silver. In some localities, native copper and silver, as in the Mamie lode, a portion of the Bell Tunnel property, from which, at the time of the war, pieces of native copper, weighing several pounds, were extracted.

There are at present two enterprises on foot well calculated to develop to a great extent the resources of the mountain. First, the Idaho Tunnel, which is situated in Virginia Cañon, has already been run 1300 feet into Seaton Mountain, cutting several veins with large ore-bodies. Some distance still remains before its intersection with the Seaton, for which they are driving. This Chicago enterprise and its interests are looked after by the President, Gov. Thomas Bryan, in person. Second, the Foxhall Tunnel, situated in Seaton Gulch, a short distance above the Bell Tunnel lode, will cut the Seaton vein at a depth of 450 feet. The company has just been organized, and 250 feet have already been driven; but no work is done at present, as they are awaiting the advent of an air-drill plant recently ordered from the Rand Company, of New York. Never, since the days of the gold fever, has the camp had the encouraging outlook of to-day. Few appear to realize the advantages arising from its geological position, its close proximity to Denver, distant but 37 miles, and directly connected by the Colorado Central Railroad, which also gives us direct communication with the smelters of Golden and Argo, furnishing rapid and cheap transportation, and, above all, cheap labor

and supplies. But, notwithstanding all the desiderata at hand, the idea that "distant fields are verdant," draws many from these districts situated within the pale of civilization to more remote and less productive fields. Nowhere, to-day, can capital be invested to more advantage than in the districts of this locality, as for instance at Central, Georgetown, and Idaho. J. TROWBRIDGE BAILEY.

LAKE COUNTY.

Several mine owners, says the Leadville *Chronicle*, are complaining that the charge for milling on low-grade ores is more than they can afford to pay. There are but two custom-mills in Leadville, and the managers of these are somewhat reticent about their doings. It is believed, however, that ordinary milling ores are paying something like \$12 a ton for treatment, and allowing something very large indeed for loss. Report states that, at these rates, the mills are making a great deal of money. Some of our miners who have had experience in the northern mining districts seem to think that most of our milling ores ought to be treated at a cost not to exceed three dollars per ton, and would still leave a profit to the mill. The remedy would seem to be for some of these parties to combine together and set up a custom-mill. There is any quantity of ore within 15 miles of Leadville which would come here, even in the winter, if it could be converted into bullion at a cost of \$3 or \$4 per ton, 25 per cent off for loss.

DUNKIN.—The statement that the lessees of this mine are profiting largely is contradicted. The *Democrat* prints the following as the result of an interview. On the 23d day of last August, the Dunkin Mining Company leased the No. 2 shaft of that mine to Messrs. Reynolds, Ward, Slockett, and Burns, until the 23d day of next March, at the rate of \$2500 per month. In the mean time, the lessees of the mine took in a Mr. Smitham, who was formerly foreman of the Matchless, and Mr. Smitham made some arrangement with Mr. Leonard, by which he became interested in the leased property. What that arrangement was Mr. Reynolds did not know. In reference to the output for October, Mr. R. stated that he did not know exactly what it was, but that it was not far from 1000 tons of low-grade iron, and four tons of galena that would run 450 ounces of silver to the ton. A considerable quantity of the iron, he stated, carried silica; that the gross output of the property for the month of October was not over \$16,000; and that after paying \$2500 rent and the working expenses of the mine, the lessees had made a net profit of about \$3000 and no more. The ore was shipped to the American smelter and to Taylor & Brunton's stamp-mill. He also stated that the profits of September had been greatly overestimated. On being questioned as to the probable result of November's work, Mr. Reynolds stated that it would not be far from that of October. There are from 60 to 70 men employed on the mine. The shaft is down about 125 feet, and the ore is taken from a drift running west and southwest from the shaft. Mr. Reynolds stated that the Robinson shaft is down about 200 feet, and the men are still sinking on it. The force at work on the Robinson shaft consists of about 15 men.

BRECE HILL.—A cave occurred in the Brece some time ago by which about five thousand tons of debris fell, impeding work and causing a great deal of trouble. Workmen are at present engaged in removing the rubbish, and hope to have it all cleared off in a few days, when drifting will be resumed.

CUSHING.—A strike of high-grade ore has been made in the Cushing mine, on Yankee Hill, adjoining the Adelaide. The ore is said to be of a higher grade than any yet found on the property, and will run \$50 to the ton, 68 per cent lead, and 21 ounces in silver. It is an irregular streak from two to five feet in thickness. The mine has just shipped 20 tons of ore to the Myers Reduction-Works.

HIGHLAND CHIEF.—Ten men are employed at the Highland Chief, and about 12 tons of ore a day are taken out, running about 40 ounces in silver. A new shaft will be sunk a short distance west of the old one, and the machinery transferred to the latter. Considerable ore is on the dump, but none has been shipped lately.

SILVER CLIFF.

PLATA VERDE.—The *Gazette* says: We have repeatedly expressed the opinion that grossly exaggerated statements concerning the Plata Verde mine had induced investors to purchase the shares of the company. Indeed, the writer's attention was called to one statement of that character, which was published in the journals of New York City, eighteen months ago, and stated over his own signature at the time, that the mine did not contain any considerable quantity of ore that would mill one half the stated amount, which was about 40 ounces per ton. The capacity of the Plata Verde mill is less than one ton per stamp per day, while the daily cost of operating it equals if it is not greater than that of the new Silver Cliff mill, which handles easily three tons per stamp per day. In other words, ores which are treated in the Silver Cliff mill at a cost of four dollars per ton, can not be treated in the Plata Verde mills for less than twelve dollars per ton, hence the machinery of the latter is good for nothing more than it will bring when sold as old iron. Good reasons exist for pronouncing the Plata Verde mill a repetition of the somewhat common mistake of erecting costly plants of machinery without other than mere superficial exploration of mining properties.

SUMMIT COUNTY.

ROBINSON CONSOLIDATED.—The following is a dispatch from Denver, dated the 15th inst.: A report this morning from the superintendent to the manager states that the uprise from No. 6 level is looking splendid, and that No. 7 level is looking better than ever before. Ten tons of first-class ore were hoisted from No. 8 level, from driving the drift last night. No bottom has yet been found to the ore here; the entire face and sides of the drift are in ore. The gross yield of the mine in six months was \$1,200,000.

IDAHO.

WOOD RIVER REGION.—The Philadelphia Mining and Smelting Company has during ten days' work, got from one smelter over 100 tons of bullion, valued at over \$32,000, which is now on its way to Philadelphia. There being no feed in the country for cattle, and transportation being impossible, owing to fall of snow, the smelter will have to stop now, but will begin working again early in the spring, when arrangements will be made to smelt all the year round. The company is building a new smelter, which, with the one it has now, will produce 600 tons a month at least. Work is now going on in the mine.

MICHIGAN.

IRON ORE SHIPMENTS.

The following table exhibits, in gross numbers, the total lake shipments of iron ore the present season, up to and including November 9th, together with the amount shipped during the corresponding period last year:

Where From.	1880.	1881.
Escanaba	1,120,742	1,383,855
Marquette	633,294	673,403
L'Anse	53,095	53,061
Total	1,807,042	2,110,319

An increase of 303,277 gross tons.

CONGLOMERATE.—The following is from the official report of the president of this Lake Superior copper mine: We have had unusually rich ground in No. 1 shaft west; adit west; 1st and 2d levels west; and 1st level east. In the 1st level east, we have cut the same run of rich ground cut in No. 1 shaft above the adit level, again cut in the adit east, and now showing on the 1st level, 150 feet deeper. Many other points in the mine are rich, and the openings taken as

whole will show a steady increase in the area of rich ground. The west end of the mine at present looks the best, but I am personally satisfied that as soon as our work will permit our breaking into the hanging-wall of the east end of the mine, we shall find as rich runs of ground there as we now have on the foot-wall in the west end. In our mine work, we are ahead of estimates made in May last. Our surface work is so far completed that no anxiety need be felt at the near approach of winter. The total of feet driven during the two months was 1205 feet.

QUINCY.—An explosion of a high explosive powder occurred some time since, killing three men.

MONTANA.

BUTTE DISTRICT.

We take the following from the columns of the *Butte Miner*:

ALICE AND MAGNA CHARTA.—Operations are progressing steadily in both of these mines, an amount of ore being taken out from the two amply sufficient to keep both the Alice mills going. In the aggregate, 80 tons per day are taken out; stopping going on in all the levels of the Alice and of the Magna Charta.

ANSELMO.—In the last forty-five days, some 240 tons of first-class and about 100 tons of second-class ore have been taken out, the former keeping steadily up to the average of 100 ounces or more to the ton.

MOULTON.—The *Miner* has the following concerning the workings in this mine: As the descent is made in the safety-cage, no cross-cut is encountered at the 100-foot level; but just above the 200-foot level, the north vein is pierced by the shaft and cross-cut on the north at a distance of ten feet. All operations on the north of the shaft are in this vein, which is again cross-cut at the 300-foot level at a distance of 40 feet from the shaft, and on the 400-foot level at a distance of 26 feet from the shaft, which measurements give an idea of the dip of the vein. On the south side of the shaft, two large veins are encountered and cut at the 200, 300, 400, and 500-foot levels. Between the 400 and 500-foot levels, a smaller branch vein or spur has been struck, dipping north at an angle not very different from the inclination of the north vein. At the 200-foot level, the center vein is cross-cut at a distance of 129 feet, and at the 300-foot level at a distance of 142 feet. At the 400-foot level, the same vein is cut at a distance of 196 feet south from the shaft, showing that it dips south at a very decided angle between the 300 and 400-foot levels. The main or south vein is the largest of all. On the 200-foot level, it has not been cut at all. On the 300-foot level, the cross-cut south cuts the main vein at a distance of 312 feet from the shaft, and has already been advanced into it 24 feet. The observer will draw the inference from the apparent direction of this main vein at this point, and from its croppings under the mill, on the surface, that it dips greatly to the north below the 300-foot level. Finding the center vein dipping quite as greatly to the south between the same levels, the natural conclusion is, that these two veins come together at some point near the 400-foot level, on which a tremendous body of water was recently struck, and which is now bulk-headed at a distance of 90 feet from the shaft, awaiting the operations of the new Cornish pump. Besides these main veins, there are two other smaller streaks or veins of ore, which have already been pierced, one dipping north from a cropping at the southwest corner of the mill, and another dipping north from a point under the hoisting-works, from both of which very rich ore has been taken. Allusion has already been made to the spur running off to the north from the center vein at a point near the 300-foot level. Stopping is done now principally at the sections indicated on the 200 and 300-foot levels, some 25 tons of ore being extracted daily. The shaft is now full of water up to a point a short distance below the 400-foot level, and the bulkhead on the cross-cut from the 400-foot level stops operations on that level until the Cornish pump can be operated, as before stated.

STEVENS.—Since the finding of gold wire in this mine, some two weeks ago, no very extraordinary developments have taken place, but operations have continued steadily in both the east and south shafts.

WABASH.—The new hoisting-works at this fine piece of property are now about ready for the continuance of its development. The shaft is now down about 70 feet, and is going down on the vein at a slight angle to the north. The ledge was originally only a few inches wide, but has gradually increased in size and richness until now, at a depth of 70 feet, it shows two and a half feet of pay-ore, averaging from 300 to 500 ounces to the ton. The new boiler, of 40 horsepower, Knowles pump, and hoisting-engine are now in place and ready for work.

NEVADA.

COMSTOCK LODGE.—The following is the usual weekly summary of the Gold Hill News: The north end mines are doing the usual work. The joint Union Consolidated and Sierra Nevada winze is to-day 248 feet deep, which makes it 48 feet below the 2700 level. The material encountered in it has undergone no change since last reported. There are occasional streaks and bunches of ore. The circulation of air in the Bonanza mines is daily improved by the opening of the old drifts and air-passages on the upper levels. By the time the suction-fan over the Bonner shaft is in operation, the machinery for which is delivering to-day, work can be resumed at all points in the mine. The cross-cut of Gould & Curry and Best & Belcher is passing out of hard ground into soft vein material. The Savage folks are driving their drift from the Combination shaft with all possible speed to connect with their incline. The connection, when made, will permit of work in the lower levels. The ore-bins are full, and no more will be raised to the surface until the Santiago mill is ready to receive shipments. In the mean time, the ore is piled up underground. The repairs to the Hale & Norcross shaft and incline will be completed this week, which will be the signal for active operations in that mine again. The Yellow Jacket is cross-cutting on the 2828 and 3000 levels. Of the latter level, a drill is running west in quartz giving low assays. The Imperial and Alpha mines will resume prospecting as soon as the new air-pipes are in place. Preparations are making at the Crown Point and Belcher joint shaft to handle all the water from those two mines, instead of sending it to the Yellow Jacket.

OPHIR.—The new pipes for compressed air are in place on the 2500 level. The work joint with California and Mexican makes usual progress. About forty tons of ore are daily extracted from the croppings on Summit street.

SAVAGE.—An improvement is reported in the face of the eighth station drift, and the ore in the stopes gives better assays as progress is made. There were 191 car-loads of ore extracted last week. The drift from the Combination shaft is advanced 50 feet per week by six-hour shifts.

NORTHERN BELLE.—Eighty-six tons of ore are extracted and sent to the mills daily. Both mills are running steadily; mill No. 1, on half-time. Bullion shipments for week ending November 21, \$22,090.13. Total shipments on October account, \$86,724.22.

STARR-GROVE.—A Battle Mountain, Nev., dispatch to the Mining Associated Press says: The new strike in the Starr-Grove mine, made two weeks ago, has caused considerable excitement in Lewis, and has increased the valuation of adjoining claims ten-fold. In sinking the new incline shaft, to connect the upper and lower levels, a magnificent body of ruby silver was struck on the hanging-wall of the main ledge. This has now widened to about thirty inches, and will assay about \$200 to the ton. It is one of the most important strikes made this season, being in a portion of the mine which has not as yet been much prospected. The incline shaft has been sent ahead with increased speed during the past week, as the ground has become easier to break. Drifts Nos. 1 and 2, south, are both in good ore, of which there is an unlimited quantity in sight. Drift No. 1, north, has encountered hard quartz, but is pushed vigorously. The vein there tapped by this drift shows increased width, and the ore taken out goes above average assays. About thirty-five tons of good ore are sent to mill daily.

NEW MEXICO.

LORDSBURG DISTRICT.

A correspondent of the *Arizona Citizen* gives the following description of this camp, which is in close vicinity to Shakespeare: Lordsburg is located out on a flat plain, and there is not the slightest superficial indication of mineral. The discovery of ore was made last summer while the railroad company was boring an artesian well. At the depth of 98 feet, the drill struck rock, and at 130 feet found low-grade ore carrying \$3, \$12, and \$15. At 170 feet, sand carbonates were struck, going \$50 and upward. The drill-hole was sunk to the depth of 425 feet, at which point a body of water was struck, forcing up black sand which gave eight colors of gold to the pan. The ground upon which the drill-hole was located was taken by the Wall Street Consolidated Mining and Milling Company, and the work of sinking was commenced about 70 feet from the original drill-hole. This shaft, double-compartment, 6 x 10 feet, has now reached a depth of 140 feet. They have encountered a stringer of ore running into the shaft, and indications are favorable. About the same time, work was commenced on the Lordsburg and Golden State claims. These two claims are parallel with and adjoin each other, and lie across the railroad track. On the Lordsburg claim, a shaft 5 x 7 feet has been sunk to a depth of 151 feet. This shaft is on the south side of the railroad track and about 600 feet from it. At 117 feet, ore was struck, the first assay giving \$4.68, the next \$22, and the next \$172. An assay at the bottom of the shaft yielded 78 ounces. The formation is peculiar, and the rock has no mineralized appearance. Simultaneously with striking ore in this shaft, water was encountered, which has become too strong to work successfully with the present hoisting apparatus. Work has therefore been temporarily suspended, but will be resumed when new hoisting-works are provided. The character of the ore already found is free-milling, but it is expected that the final character of the ore will be smelting.

NORTH CAROLINA.

NORTH STATE.—The prospectus of this new company, which is a consolidation of the Copper Knob and the Crowell mines, contains the following by Professor Kerr, State Geologist, on the former deposit: "This is a quartz vein, or rather group of veins, the principal ones carrying variegated copper, with a little chalcoprite, malachite, chrysocolla, specular iron pyrite, together with free gold and silver. The vein is in a large body of horn-blende slate; the prevalent rock of the section is a gray gneiss, with a strike N. 60° E., and dip southeast 40°. The vein is a true fissure, with a direction N. 35° W., dip northeast 45°. The width is variable, being 18 inches at the surface, and from 12 to 14 inches below ground." The same authority is quoted as follows on some deposits of magnetite which the new company controls: Professor Kerr, State Geologist of North Carolina, refers to this property in his report to the State in 1875, on page 167, Vol. I, as follows: "In Ashe County, in the northwest corner of the State, there are some important ore-deposits, on the North Fork of New River. They lie chiefly north and northeast of Jefferson, on Horse Creek and Helton Creek. On the former creek, there are two beds of ore: both coarse, granular, highly magnetic, and polaric, in gneiss and syenite. The gangue is largely pyroxene and epidote. One is on a high mountainous ridge, some 500 feet above and on the west side of the creek, and two miles from the river at Hampton's. The other on the east side at Graybills. Both are traceable many rods by numerous surface fragments which indicate beds of considerable extent. On Helton, six miles east of the last, are still larger deposits of very pure magnetic ore, which has been long used in the forges of the neighborhood. The ore is a coarse-grained and very pure magnetite. One of the beds is eighteen feet in thickness, and another nine feet. This is manifestly an iron region, and worthy of thorough investigation." The prospectus referred to does not contain any convincing evidence that such a "thorough investigation" by one who is familiar with the charcoal-iron industry of the South has been made.

UTAH.

SILVER REEF DISTRICT.

From the *Silver Reef Miner* of October 29th we take the following items about the mines of this district. That journal says that much inconvenience is experienced by the different mining companies on account of the scarcity of wood, which has heretofore been the principal fuel used at the mills and mines. The deadlock seems to be occasioned by the demand on the part of the contractors for an advance of from \$1.50 to \$2 per cord over ruling prices.

CHRISTY.—The daily output is about fifty tons. Rich developments have been made in the Tecumseh mine, in shaft No. 3, within the past ten days.

BARBEE & WALKER.—The ore-bodies recently encountered, and which were previously run over, are now extracting and found of high grade and very considerable extent. Only the regular amount required to supply the mill-stamps, which have a capacity for about forty-five tons per diem, is raised. Different portions of the mine were found to be insecure on account of injudicious working and timbering under the former management, and retimbering and walling have been resorted to at considerable cost, which will permit a large amount of valuable ore to be secured at otherwise trifling expense.

STORMONT.—The Buckeye alone is recording a yield of about fifty tons per day. A recent strike in the third south level is developing finely, and is of very considerable importance as showing a continuation of the rich ore-body in that portion of the mine.

PROPOSALS AND SALES.

For the benefit of many of our readers, we compile weekly such proposals and solicitations for contracts, etc., as may be of interest. The table indicates the character of proposals wanted, the full name and address of parties soliciting, and the latest date at which they will be received:

A new shaft is sinking at the Quicksilver Mines of New Almaden, Cal., which is called the Garfield Shaft. It is desired to make it a model piece of mining work in every respect, including the machinery for operating it. We therefore beg you to submit, for our approval, your plans and estimates for an Engine or Engines, with Steam Generators, all so designed as to do the required work in the best and most perfect, economical manner, bearing in mind that fuel (coal a ton of 2240 pounds, \$12; wood, \$7 per cord) is expensive, and that it is desirable to work steam to as great a degree of expansion as practicable. Data for Hoisting-Engine: Skip, weight 1700 pounds; ore, weight 3000 pounds; round steel rope, 1800 inch, 2900 pounds; speed of skip, per minute, not less than 600 feet; number of loads daily, 200; of which 140 may be taken as ore and 60 as men and materials; 100 loads of ore to be raised in twelve hours. Greatest depth of shaft, 1800 feet: a level at every 100 feet, commencing at 600 feet from surface. Engine to combine, so far as possible, maximum of expansion, maximum equality of motion, and the greatest compactness, strength, and cheapness; not only as regards the Engine itself, but with regard to the engine-house and foundations. The Hoisting Gear to be such as to employ Engine to best advantage, and to be perfect in every respect. Drums and pit-head pulleys to be not less than 10 feet diameter. Price to include every thing but rope and skip. Machinery to be delivered at the Railroad Depot in San Francisco, and the time mentioned within which work will be delivered on receipt of order if given: J. B. Randol, Manager, P. O. Box 1078, San Francisco, Cal.
Improvement of Wilmington Harbor, Delaware: United States Engineer's Office, 1125 Girard street, Philadelphia, Pa. Nov. 28, 1881.
Constructing a Double-Track Railroad Tunnel under the St. Lawrence, between the north and south shores of the River; Robert Watson, Secretary South Shore Railroad and Tunnel Company, Montreal, Can. Dec. 10, "

per share, payable December 1st. Transfer-books close on the 21st inst.

The Green Mountain Gold Mining Company, of California, has declared a dividend of 7 1/2% per share (being the 29th consecutive monthly dividend), payable on the 26th inst. Transfer-books close on the 19th.

The Homestake Mining Company has declared its regular monthly dividend of 30c. per share, payable on the 25th inst. Transfer-books close on the 19th.

The Inyo Consolidated Company has declared its 5th dividend of 5c. per share, and an extra one of like amount. Transfer-books close on the 25th inst.

The Tip Top Silver Mining Company has declared dividend No. 5, of 20c. per share, payable on the 26th inst. Transfer-books closed on the 17th inst.

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

Table with columns: NAME OF COMPANY, CLOSING QUOTATIONS (Nov. 11-18), and Open ing. Nov. 17, 18. Lists various mining companies and their stock prices.

REVIEW OF THE SAN FRANCISCO MARKET.

The Comstocks are decidedly below the quotations given in our last; Sierra Nevada, for example, showing a decline of \$4 1/4 a share. Union Consolidated is quoted at \$10, as against \$13 3/4 a week ago. It is given out as an explanation of the weakness of the list that Fair and Flood have quarreled, and future Comstock operations will be inharmonious thereby. The probable explanation, however, may be found in the necessity for the inevitable assessment, over \$1,000,000 being required for November alone. With the exception of April and August, this is the largest amount thus far delinquent any month this year. This amount is distributed as follows:

Table listing company names and their respective shares of the \$1,000,000 assessment, such as Belcher (\$104,000), Benton Con. (\$27,000), etc.

The Comstock mines will receive of this amount about \$916,000; California mines, \$266,500; and Arizona mines, \$4500.

Copper and Silver Stocks.

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

The market for copper stocks the past week, with the exception of Quincy, has been dull and inactive. The advance in Quincy is due to the increased production of the mine, and with an improvement in ingot copper the stock would sell at much higher figures. The silver stocks dealt in at the Boston Stock Exchange show no special activity, and prices generally have a declining tendency.

NON-DIVIDEND PAYING MINES.

Large table with columns: NAME AND LOCATION OF COMPANY, NUMBER OF SHARES, Par, ASSESSMENTS (Total levied to date, Date and amount of last), and HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE (Nov. 12-18).

SALES.—Albion, 300; Alta, 100; Alta-Montana, 67; Barcelona, 190; Bechtel Consolidated, 190; Best & Belcher, 700; Big Pittsburg, 900; Black Jack, 70; Boston Consolidated, 190; Boulder Consolidated, 350; Bradshaw, 320; Buckeye, 180; Bull-Domingo, 135; Butte, 130; By-and-By, 511; Calaveras, 80; Calaveras W. & M. Co., 340; Carbonate Hill, 1430; Central Arizona, 4190; Cherokee, 151; Consolidated Imperial, 510; Crowell, 3610; Dahlonega, 100; Dunderberg, 10; Durango, 800; Enterprise, 2611; Gold Placer, 2500; Goodshaw, 6100; Lacrosse, 10,100; Legal Tender, 6500; Leviathan, 1300; Mariposa, Common 1000; Mexican, 1840; Mineral Creek, 19,100; Miner Boy, 14,000; North State, 10,200; North Horn-Silver, 1500; Oriental & Miller, 55,650; Rappahannock, 5700; Red Elephant, 3000; Silver Cliff, 1000; Silver Islet, 12,950; Sonora Consolidated, 6300; South Bulwer, 1000; South Hite, 1600; South Pacific, 31,700; State Line No. 4, 100; Nos. 1 and 4, 52,750; Nos. 2 and 3, 219,300; Sutro Tunnel, 7200; Taylor-Plumas, 6100; Tioga, 100; Tuscaraora, 100; Unadilla, 2800; Union Consolidated 410; Vandewater, 18,100. Non-dividend shares sold, 564,900. Total shares sold at all the exchanges, 784,714.

& Hecla holds firm at \$224@225, but transactions are light. Quincy declined early in the week from \$41 1/4@40, but the good reports from the mine caused a buying demand and advanced the price rapidly to \$44, at which it sold at the first Board to-day. Franklin is a little stronger, but there is very little doing in it. Sales at \$12 1/2, which is an advance of \$4. Pewabic lower, with sales at \$12 1/2@12 1/4. In silver stocks, Catalpa has been weak at \$34@33 1/2; Silver Islet declined from \$40@37 1/2, but was stronger to-day at \$38. Napa Quicksilver advanced from \$7 1/4@7 1/2, and is desired.

At the Boston Mining and Stock Exchange, there has been a fair amount of business transacted, and the leading stocks show considerable firmness. Milton continues to steadily improve, but the transactions for both regular and buyer stock are quite limited, owing to the scarcity of cash stock, which has advanced from \$1.19@1.22 and buyers sixty-day options to \$1.34@1.35. Twin Lead has ruled dull but steady at 47@50c. Deer Isle has, under the persistent hammering of the bears, declined from 83@85c, but was a little firmer to-day and advanced to 68c. Hopewell has advanced from 70@76c. regular, and 84c. buyer 60. Edgemoggin, a new mine in Maine, was put in the regular list this week, and is quite active, with sales at 42@46c. regular, and 50@52c. buyer 60. Cop. peropolis, steady at \$2.15 regular and \$2.28 buyer 30. Massachusetts & New Mexico seems to have touched bottom for the present, and is in better demand at 20@21c. The rest of the market calls for no special comment. 3 P. M.—At the afternoon Boards, there was no special change in prices. Allouez sold at \$3 1/4; Harshaw, \$5; Sullivan, \$3 1/4; Huron, \$3 1/4; Napa, \$7 1/4; and Quincy, \$44. Silver Islet, \$37 bid. Franklin offered \$13; Pewabic,

COAL STOCKS.

Table of Coal Stocks with columns for Company Name, Capital Stock, Shares, Last Dividend, Rate per Ann., and Quotations for Nov. 12, 14, 15, 16, 17, 18. Includes companies like Am. Coal Co., Cameron C.I., Col. C. & L., etc.

Total Sales..... 159,723
*Of the sales of this stock, 11,312 shares were in Philadelphia and 6400 in New York.

BOSTON MINING STOCKS.

Table of Boston Mining Stocks with columns for Company Name, Quotations for Nov. 10, 11, 12, 14, 15, 16, and Sales. Includes companies like Adrie Con., Allouez, Ariz. Queen, etc.

published in those papers nearest to the mines reported. The table gives the amount shipped for the week up to the date given, as well as the aggregate shipments to such date, from the first of January, 1881.

The shipments of silver bullion are valued at \$1.29-20 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.

Table of Mines with columns for Mine Name, State, For the week, Month of November, and Year from Jan. 1st, 1881. Includes mines like Alice, g. s., Barbee & Walker, s., Belle Isle, g. s., etc.

Total amount of shipments to date..... \$22,111,583

* Official. † Net. G. Gold. S. Silver. L. Lead. ‡ Assay value.

The market has been without any feature worthy of note, abroad or here.

Table with columns for Date, London, N. Y., Pence, Cents, and another set of Date, London, N. Y., Pence, Cents. Shows exchange rates for various dates.

Bullion Receipts at New York.—The bullion received from the mines at the various offices in this city during the week ended November 18th, as compiled from various sources, amounted to \$307,476.09, as against \$359,767.47 reported for the previous week.

Exports of Gold and Silver from New York.

Table showing Week ending November 12th, Corresponding week last year, Since January 1st, and Corresponding period last year with associated values.

Foreign Bank Statements.—In London, the weekly statement of the Bank of England shows a loss of £46,500; the proportion of reserve to liabilities, however, is 39 3-16 per cent., against 38 1/2 per cent. last week.

Contention Mining Company.—The secretary reports officially that the production of this company for the month of October has been: Gold, \$19,613.30; silver, \$73,650.10; total, \$93,263.40.

\$12 1/4 bid: Atlantic, \$14 bid: Milton, sales, \$1.22, with \$1.21 bid: Deer Isle, sales, 66c. seller, 67c. regular; Twin Lead, 50c., buyer 60; Hopewell, 77c.; Massachusetts & New Mexico, 21c.

Coal Stocks.

NEW YORK, Friday Evening, Nov. 18. There has been but a small business done in these stocks the past week, while the prices have been fairly maintained. The bulk of the business in this market has been in Delaware, Lackawanna & Western, the sales amounting to 79,100 shares at \$128 1/2 @ \$126 1/2. Delaware & Hudson records sales of only 4550 shares

at \$110 1/2 @ \$109 1/4. New Jersey Central has had 19,900 shares at \$96 1/2 @ \$95 1/2. Reading has sold in this market to the extent of 6400 shares at \$68 @ \$66 1/2.

BULLION MARKET.

Friday Evening, Nov. 18. 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

METALS.

NEW YORK, Friday Evening, Nov. 18.

While, on the whole, current transactions in metals are on a limited scale, there is an undercurrent of excitement in many of them, the outlook for the early future giving rise to many and varied shades of opinion. One feature that is becoming more and more apparent, and that is calculated to affect our markets somewhat, is the report of a growing consumptive demand abroad, accompanied by hardening prices.

Copper.—The market has continued to develop more strength, the lake companies continuing firm. As heretofore repeatedly noted, the principal consumers are nearly all supplied until the close of the year, and the market is now watched chiefly for indications pointing to its course after that time. There is an indication that smaller consumers are beginning, in a limited way, to lay in a store beyond their present wants. During the week, from 400,000 to 500,000 pounds of Lake copper were sold at 18 1/2 c., and now 18 1/2 c. is asked by holders, under which figure little or nothing can be had. Baltimore copper is quoted at 18 1/2 @ 18 3/4 c. We are informed that in London prices are higher, some reporting Chili Bars at £65, while others give as high as £66 10s.

Our London advices by mail include November 4th, from which we take the following:

Nov. 2d. Chili Bars opened with a quiet market, and a moderate trade done in cash metal at £63 1/4; a few parcels of g. o. bs. with three months prompt selling at £64 1/4. A good demand sprung up, £63 1/2 @ £63 3/4 being paid for named brands.

Nov. 3d. Late yesterday and this morning, there was a strong demand for spot bars, business being done in good named brands up to £63 1/2 usual cash terms, best marks selling at £64 1/2 same conditions. This afternoon, buyers' wants appeared to be satisfied, and we had a quieter market.

Nov. 4th. The Chili Bar market has been rather quiet to-day. The quotations rule as follows: G. o. bs., £63 1/2 @ £63 3/4; best marks, £64 @ £64 1/2; Wallaroo Cake, £69 1/2 @ £70; Burra Cake, £68 1/2 @ £69.

Tin.—The week has been one of some excitement, in sympathy with a strong upward movement in London, which it is said is merely speculative. It has been as high as £104 10s. there, but the latest cables at hand give £103 10s., and we may note the fact, as likely to affect that market, that 200 tons Straits are now in course of shipment thence from here, with the possibility of the shipment of further parcels. Here, \$22 1/4 is now quoted. The future of the market in London seems to hinge upon the demand for America in East India. Under date of November 3d, Messrs. Vivian, Younger & Bond, of London, say: The deliveries from London warehouse of 1645 tons are again a remarkable feature. From Holland, 820 tons. If consumption is really enlarging on the scale indicated by the deliveries of the last three months, prices may very well go higher; but on the other hand, it seems that America has been steadily accumulating supplies, now representing more than seven months' consumption, and may not continue to compete so eagerly in the Straits market, while with the season of heavier supplies coming on and the rise in values, statistics may probably now be approaching their most favorable point.

Our London advices include November 4th, from which we take the following:

Nov. 2d. Has been exceedingly quiet, a few transactions taking place at 97 1/2 s. down to 97 1/8 s. sharp cash; 97 1/2 s. fourteen days; with a warrant at 99s. three months prompt.

Nov. 3d. We have still to report a quiet and somewhat irregular market. Sharp cash stuff went at 97 1/2 @ 97 1/8 s.; fourteen days at 97 1/8 s. down to 97 1/4 s., the lower figure being accepted in one instance only, and a small quantity with one month's prompt was disposed of at 98 1/2 s.

Nov. 4th. Continues dull, and transactions small. A moderate quantity changed hands to day at 97 1/4 s. sharp cash; 97 1/2 s. fourteen days; 98 1/4 s. three months prompt, and rather buyers than sellers at the close at said rates.

Tin Plates.—Though quiet in a large way, they are quite strong. We quote per box as follows: Charcoal tins, Melyn grade, 1/2 cross, \$6 1/4; Allaway grade, \$5 1/2 @ \$6. Charcoal Roofing, Dean grade, \$5 1/2 for 14 x 20, and \$11 1/2 for 20 x 28; Allaway grade, \$5 1/2 for 14 x 20, and \$11 @ \$11 1/4 for 20 x 28. Coke Roofing, B. V. grade, \$5.15 @ \$5 1/2 for 14 x 20, and \$10 1/2 for 20 x 28. Coke tins, B. V. grade, IC, \$5.20; and ICW, \$4 1/2 @ \$5.

Messrs. Robert Crooks & Co., of Liverpool, under date of November 3d, says of tin and terne plates:

These show a further reduction on the week; but considerable business having been done at 16s. for B. V. grade coke tin, close again rather firmer. Stamping plates can now be bought most favorably, either for delivery prompt or during the early months of next year, and these, in view of increased cost of material, are well worth attention.

Lead.—Though quiet and dull, so far as transactions go, the market is firm; much more so, indeed, than the usual state of the trade during the present season would naturally warrant. There is a remarkable scarcity of metal, even very small lots for prompt delivery being difficult to obtain—a fact which is partly attributed to active business in St. Louis on the basis of 4 1/2 c., and partly to the circumstance that the shipments to our Eastern refiners of base bullion have been comparatively small. On the other hand, the requirements of consumers here are limited. Lead is now coming regularly by steamer from San Francisco, the total receipts by rail and steamer during the present month from that quarter footing up to 1400 tons, while the receipts of foreign lead have been about 500 tons. Sales during the week were limited to jobbing lots at 5c. for Richmond, and 5-15c. for Newark lead. Refined is quiet at 5 1/2 c., little business being done.

Spelter and Zinc.—There is a great scarcity of spelter, some of our Western works having practically suspended operations, while the Carondelet works will commence to roll sheet-zinc at an early date. With a strong demand, the market closes at 5 1/4 @ 5 1/2 c. for ordinary Western; abroad, the prices are advancing, London cabling £19. Foreign spelter here is worth 5 1/4 @ 5 1/2 c. Sheet-zinc is quoted at 7 1/2 @ 7 3/4 c.

Antimony.—With a fair demand from consumers, Cookson's sells at 14 @ 14 1/2 c., Hallett's at 13 1/4 @ 13 1/2 c., and American at 13c.

Quicksilver.—We are indebted to our correspondent in San Francisco for the following interesting table, giving the total receipts of quicksilver at San Francisco, including direct shipments from the mines by rail, since January 1st, 1881, up to October 31st, 1881:

Table with 3 columns: Item, Month of October, Year from January 1st, 1881. Rows include New Almaden Mine (1,920), Other mines (2,442), and Total shipments to date (4,362).

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Nov. 18.

The transactions reported this week do not aggregate a large quantity, but prices are assuming greater strength. The outlook indicates that there will be a scarcity of nearly all kinds of iron in 1882, and that prices must rule higher all around. The iron industry never had a more prosperous look than to-day. Prices are not so high nor profits so large as they have been, but now they are legitimate, and likely to continue until some misadventure disturbs the general prosperity of the country. At present, we are happy to say that the sky is cloudless, and no indications of trouble in 1882 at least.

American Pig.—There has been but very little business made public, but there are rumors of some pretty large transactions for next year's delivery, the particulars of which are withheld. There is no pressure on the part of makers to sell; in fact, many of them find great difficulty in filling the contracts already on their books. Some, indeed, are several months behind in their deliveries. Prices are nominally unchanged, yet special brands are not obtainable at our quotations for immediate delivery. We quote No. 1 Foundry at \$25 1/2 @ \$27; No. 2 Foundry, \$23; and Forge, \$20 1/2 @ \$21.

Scotch Pig.—Prices are fairly steady. Consumers, however, are not taking the iron promptly on arrival, and there is a disposition shown by importers to make a slight concession rather than permit the iron to go into store. Glasgow prices are a little higher, while freights are fully as strong as they have been. We note a sale of 300 tons of Glengarnock at \$24 1/2 @ \$25; Gartsherrie, \$25; Eglinton, \$23; Coltness, \$25 1/2 @ \$26; and Summerlee, which is very scarce, at \$26.

English iron is quiet and scarce at \$21 1/2. Bessemer for next year's shipment has been sold at \$26. On spot, a few small lots are held at \$25 1/2.

Messrs. John E. Swan & Brothers, of Glasgow, under

date of November 4th, report 106 furnaces in blast, as against 119 at the same time last year. The quantity of iron in Connal & Co.'s stores was 609,745 tons, an increase of 2317 tons for the week. The shipments show a decrease since Christmas of 93,085 tons, compared with the shipments to the same date 1880. The imports of Middlesbrough pig-iron for the same period show an increase of 34,481 tons. Th following were the quotations of the leading brands of No. 1 pig-iron: Gartsherrie, 58s.; Coltness, 58s. 6d.; Langloan, 61s.; Summerlee, 58s.; Carnbroe, 53s.; Glengarnock, 51s. 6d.; Eglinton, 50s. Middlesbrough pig-iron was quoted as follows, f. o. b.: No. 1 Foundry, 46s.; No. 2, 44s.; No. 3, 42s.; No. 4, 41s. 6d.; No. 4 Forge, 41s.

Rails.—We note a sale of steel rails at about \$60 for next year's delivery. There are negotiations for large quantities of rails going on, which will probably result in business at an early day. Prices are unchanged from a week ago.

Old Rails.—Although these are not active, they are very strong, with an upward tendency. We note a sale of 1000 tons of Ts. ex store at \$29, and a hypothecated lot of 1500 tons at \$28.75. D Hs. to arrive are quoted at \$31 1/2, and on spot at \$32.

Wrought Scrap.—A sale of 500 tons for shipment is reported at \$31. Yard scrap is held at \$32 1/2, with not much inclination to sell at even this price.

We publish the following from our regular correspondents:

Baltimore, Nov. 14. [Specially reported by R. C. HOFFMAN & Co.] The iron market continues active, without any material change in prices. We continue last quotations:

Table with 2 columns: Item and Price. Rows include Balt. Char., Va., Anth. No. 1., and Anth. No. 2.

Cincinnati, Nov. 16. [Specially reported by TRABER & AUBERY.] The demand for all kinds of pig-irons continues fairly active at the following quotations:

Table with 2 columns: Item and Price. Rows include No. 1 Hanging Rock Charcoal, No. 2, No. 1 Tennessee, No. 2, No. 1 H. R. & Va. Coke, No. 2, Jackson Co. Stone Coal, H. R. C. B. Car-Wheels, all Nos., and Southern C. B. Car-Wheels, all Nos.

Louisville, Nov. 15. [Specially reported by GEORGE H. HULL & Co.] Hot-blast irons have experienced another advance, and are ruling at from one to two dollars per ton higher than ten days ago. We revise quotations accordingly. Nearly all iron sold in this market is for cash, and our quotations are on this basis.

The market continues very strong and active.

FOUNDRY IRONS.

Table with 3 columns: Item, No. 1, No. 2. Rows include Hanging Rock Charcoal, Southern Charcoal, H'n'g Rock, Ste'l & Coke, Southern Stonecoal & Coke, Amer. Scotch, and Scotch Iron.

MILL IRONS.

Table with 2 columns: Item and Price. Rows include No. 1 Charcoal, cold-short and neutral, No. 1 Ste'l & Coke, cold-short and neutral, No. 2 Ste'l & Coke, cold-short and neutral, No. 1 Missouri and Indiana, red-short, White & Mottled, cold-short and neutral.

CAR-WHEEL AND MALLEABLE IRONS.

Table with 2 columns: Item and Price. Rows include Hanging Rock, cold blast, Alabama and Georgia, cold blast, Kentucky, cold blast, and Hanging Rock W. B.

Pittsburg, Nov. 15. [Specially reported by A. H. CHILDS.] The demand for all grades of pig-iron continues active. Prices are firm with advancing tendency.

Table with 2 columns: Item and Price. Rows include No. 1 F dry, No. 2, and Gray Forge.

Richmond, Nov. 15. [Specially reported by ASA SNYDER.] The iron market for past week has been strong at following quotations:

Table with 2 columns: Item and Price. Rows include Scotch Pig-Iron, Anthracite Pig-Iron, Virginia Coke Pig-Iron, Va. Charcoal C. B. Wheel Iron, Old Rails, Wrought Scrap No. 1, Cast Machinery Scrap, Richmond Refined Bar-Iron, and Horse-Shoes (Tredegar).

St. Louis. Nov. 14.
[Specially reported by HOFFER, PLUMB & Co.]
The market is quiet but firm; the cash quotations are:

HOT BLAST CHARCOAL.

Missouri.....	\$27.00@28.00
Southern.....	27.00@ 28.00
Ohio.....	29.00@ 30.00

COKE AND COAL.

Missouri.....	\$26.00@27.00
Southern.....	26.00@ 27.00
Ohio.....	27.00@ 28.00

MILL IRONS.

Cold short.....	\$23.00@24.00
Red short.....	25.00@ 26.00

CAR-WHEEL AND MALLEABLE IRONS.

Missouri.....	\$28.00@34.00
Southern.....	35.00@ 38.00
Ohio.....	32.00@ 40.00

Philadelphia. Nov. 18.
The inquiries which were answered last week at \$21 resulted in large orders this week at that figure, but most of the deliveries are for February and March. Good-sized lots of Lehigh iron sold at \$20.50 on cars at furnace, and any thing above this price is conceded reluctantly. Buyers are not as anxious as they were a month ago, because so much is bought ahead. Mill iron is in good demand at these figures, and it is daily more difficult to place orders for good round lots. Foundry is slightly weaker. Sales were made to-day at \$25 for good iron, but some few companies with special brands are quoting \$27, without effecting sales. Special mill brands are not to be had under \$22. English and Scotch are unnoticed. Total stocks in bond, 7500 tons; \$21 asked for English, and \$30@30.50 offered. There was a sale of 350 tons muck bar to-day at \$45.50, but \$45 is the prevailing price, at which there is an active demand for all offered. Blooms are quiet, and demand is beyond capacity. Bessemer pig is inactive because of high figures; a few hundred tons were called for at \$25.50; and at \$24.50 large sales could be made. Bar mills report the demand steady. In a general way, mills are not taking orders, although, manufacturers are anxious to load up heavily at 28c under the belief that pig would not advance or decline for a long time to come. The average consumption has been increased over last summer; and with the addition of as many as a half-dozen mills in Eastern Pennsylvania, the output will be materially increased. Still, demand is very strong, and prices will remain firm. Stores are selling at 29@3c. The most prominent feature of the market this week is inquiries for spring deliveries. The British market has not yielded the supplies which were anticipated, and hence buyers are obliged to look to domestic sources. The effect is seen in firmer quotations for spring deliveries, although there are those who profess to see a decline in January as inevitable. Railroad material is very firm. Very few contracts were entered this week. Foreign shipments are insignificant. Ocean freights are unfavorable. Several inquiries are in hand, but purchasers are disposed to defer negotiations. The usual amount of business was done in plate and structural mills, and at old prices.

John H. Austin & Co.'s Special Market Report.

LONDON, E. C., Nov. 2.
STEEL RAILS.—£6 6s. @ £7 6s. per ton for usual weights and sections. Makers generally are still cautious about committing themselves very deeply into 1882.
IRON RAILS.—£5 10s. @ £5 15s. per ton for ordinary section, 35 lbs. per yard and upward. Market firm, although there is not much inquiry.
BAR IRON.—Very steady, and a large business doing for India, and a fair amount for the United States, on the basis of £5 10s. f. o. b. Wales.
OLD RAILS.—Still in strong demand, for prompt and forward shipments. O. D. Hs. are 92s. 6d. @ 95s., c. i. f., but very little offering. More attention is now devoted to flanges. Old bridge sections are very scarce; 90s., c. i. f., bid.
HEAVY WROUGHT SCRAP IRON.—85s. @ 87s. 6d. per ton, c. i. f. United States ports.
OLD RAILROAD LEAF SPRING STEEL.—£6 @ £6 5s. per ton, with a good inquiry.
STEEL BLOOMS, 7" X 7" AND UPWARD.—£5 15s. @ £6 per ton. Most of makers full of work. Inquiries for 5½ inch do not meet with any encouragement.
BESSEMER PIG-IRON, Nos. 1, 2, and 3.—Very steady at 60s. for prompt, and 62s. 6d. per ton forward. Disturbances are expected with the men, who are agitating for an advance.
SCOTCH PIG-IRON.—50s. 4d. @ 50s. 7d. per ton, cash.
MIDDLESBROUGH PIG-IRON, No. 3.—41s. 6d. @ 42s. per ton.
FREIGHTS.—We are unable to report any steamer charters to America since October 26th, and owners continue to refuse such business in the entire absence of return freights. Meanwhile some parcels of rails for the Gulf ports are pressing on the market, and merchants are inviting offers against their freight contractors. Our quotations must, therefore, be considered nominal. We name, per ton: New York, 13s. 6d.; Philadelphia, 15@16s.; Bal-

timore, 16@17s.; the Carolinas and Georgia ports, 20s.; New Orleans, 16s. 6d. @ 17s. 6d.; Galveston Bay, 22s. 6d.; Galveston Wharf, 27s. 6d. @ 30s.; Corpus Christi, 30s. @ 32s. 6d.; Vera Cruz, 30s. @ 32s. 6d. Freights by sail to Philadelphia, 14s.; Mobile Bay, 14@16s.; San Francisco, 15s.; New York, 12@13s.; Galveston Wharf, 17s. 6d.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Nov. 18.

Anthracite.

Every thing is moving well and smoothly. The output is exceedingly large. Our statistics for the last week are slightly incomplete, and with all the reports in would probably aggregate about 660,000 tons, or at the rate of over 34,000,000 per annum. With even this large production there is not enough coal to supply the demand, and, as a consequence, prices for all classes of coal are exceedingly firm. The coal trade has seldom, if ever, been in a more satisfactory condition than at the present time. Vessels are not abundant and freights are high. The shipments by the Erie and Champlain canals have about ceased, and the demand that will come from sections which they enter will be of only the most pressing character for delivery by rail during the winter months. There is a very great demand from the West as well as from the East. From present appearances, there will be but little if any change for the worse previous to the middle of December, and many think that even then, with the facilities that are now offered for carrying coal during winter months by rail, there will be a demand nearly equal to the ability of the companies to produce coal during cold weather. The official report of the companies shows that the shipments of anthracite coal for the month of October were 2,686,054 tons, against 2,378,810 tons for the corresponding month of last year, and that the total shipments for the first ten months of this year were 23,047,418 tons, against 19,065,720 tons for the same period of last year, showing an increase this year of 3,981,698 tons. A very encouraging feature in this report also exists in the reduction of stocks by 139,054 tons, the total stocks having been reduced to 474,904 tons at the end of the month. The supply of water at the mines is now sufficient, although we are informed not excessive. The miners show no indications of demanding an increase of wages. The steady work, however, which they have had for some months past, must have put them in a very much stronger position for enforcing demands than they have been in for many years, and it would not be surprising if some movement was developed during the winter.

Bituminous.

The situation in this trade has changed but little from what it has been for several weeks past. The demand is far in excess of the supply. Prices are quite irregular and depending largely upon the necessities of buyers. About \$5 alongside is as near a fair price as we can name, although we have heard of as high as \$5.75 having been paid. Owing to the immense amount of freight coming from Europe, the steamship companies are compelled to take much larger supplies of coal in this country than they were doing some months past. There is a much better supply of water in the Chesapeake & Ohio Canal; but boatmen and boats are scarce, and the movement by this route is not nearly so large as it should be. The George's Creek & Cumberland Railroad is not getting the supply of cars from the Pennsylvania Railroad that its necessities demand. There is a fair supply of cars on the Baltimore & Ohio Railroad, but not sufficient to meet the requirements of the trade. The Clearfield region still continues to make great complaint of its supply of cars. There is a great indisposition on the part of the coal companies to make future contracts. Early in this year, very large contracts were made at low prices, delivered. The scarcity of transportation prevents many of these orders being filled, and is causing many operators great annoyance and loss. In addition to the scarcity of railroad transportation, vessel rates have materially advanced, also to the injury of the operators. The prospects of the demand for next year are very encouraging, and it appears to us that there should not be so much anxiety shown by the companies to force sales at low prices early in the year. There is no reason why 1882 should not furnish a very large and prosperous business to the bituminous companies which have been running for years at little or no profit.

STATISTICS OF COAL PRODUCTION.

Comparative statement of the production of anthracite coal for the week ending Nov. 12th, and years from January 1st:

Tons of 2240 lbs.	1881.		1880.	
	Week.	Year.	Week.	Year.
<i>Wyoming Region.</i>				
D. & H. Canal Co.	86,040	3,099,829	79,550	2,594,370
L. & W. RR. Co.	95,154	3,689,082	87,050	3,036,203
Penn. Coal Co.	36,633	1,220,231	33,403	869,472
L. V. RR. Co.	18,751	977,776	.....	841,414
P. & N. Y. RR. Co.	3,361	88,278	1,177	34,201
C. RR. of N. J.	51,663	1,994,166	46,983	1,418,856
Penna. Canal Co.	.....	403,630	17,022	441,923
	291,631	11,472,992	265,185	9,336,139
<i>Lehigh Region.</i>				
L. V. RR. Co.	112,911	3,888,396	.....	2,880,356
C. RR. of N. J.	53,836	1,883,782	56,319	1,848,361
S. H. & W. B. RR.	.....	10,426	.....	9,015
	166,747	5,782,604	56,319	4,737,732
<i>Schuylkill Region.</i>				
P. & R. RR. Co.	164,949	5,994,051	165,631	5,193,523
Shamokin & Lykens Val.	110,565	871,360	24,586	781,381
	175,514	6,865,411	190,217	5,974,904
<i>Sullivan Region.</i>				
St. Lue & Sul. RR. Co.	1,580	55,663	1,417	41,013
Total	635,472	24,176,670	513,138	20,089,788
Increase.....				
Decrease.....				

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

* This report was not received this week.
+ This report is not full.

Total same time in 1876.....	15,763,767 tons.
" " " " 1877.....	17,290,515 "
" " " " 1878.....	14,799,919 "
" " " " 1879.....	22,735,602 "

The decrease in shipments of Cumberland Coal, over the Cumberland Branch and Cumberland & Pennsylvania railroads, amounts to 170,254 tons, as compared with the corresponding period in 1880.

The shipments of Cumberland Coal, over the George's Creek & Cumberland RR., by the Maryland and the American Coal companies, for the week ending Nov. 12th, amounted to 9423 tons, making a total of 164,958 tons since the beginning of transportation.

The Production of Bituminous Coal for the week ending Oct. 29th was as follows:

Tons of 2000 lbs., unless otherwise designated.

	Week.	Year.
	Tons.	Tons.
<i>Cumberland Region, Md.</i>		
*Tons of 2240 lbs.	58,419	1,872,220
<i>Barclay Region, Pa.</i>		
*Barclay RR., tons of 2240 lbs.	7,185	361,924
<i>Broad Top Region, Pa.</i>		
Huntingdon & Broad Top RR.	3,943	164,938
East Broad Top.....	1,811	68,826
<i>Clearfield Region, Pa.</i>		
Snow Shoe.....	2,737	98,413
Tyrone and Clearfield.....	55,024	1,948,434
<i>Alleghany Region, Pa.</i>		
Pennsylvania RR.	5,366	230,006
<i>Pittsburg Region, Pa.</i>		
West Penn RR.....	5,819	235,878
Southwest Penn. RR.....	975	23,123
Leun & Westmoreland gas-coal, Pa.		
RR.....	23,424	760,320
Pennsylvania RR.....	14,303	549,565
* For the week ending Nov. 12th.		

The Transportation of Coke over the Pennsylvania Railroad for the week ending Oct. 29th, and year from Jan. 1st:

Tons of 2000 lbs.	Week.	Year.
	Tons.	Tons.
Penn. RR. (Alleghany Region).....	1,884	80,504
West Penn. RR.....	3,730	101,536
Southwest Penn. RR.....	27,001	1,142,476
Penn. & Westmoreland Region, Pa. RR	4,860	162,131
Pittsburg, Penn. RR.....	5,325	468,775
Show Shoe (Clearfield Region).....	329	10,007
Total	43,326	1,965,449

Horsford's Acid Phosphate

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6	1/4	\$1.50	\$4.23	\$11.04	\$20.00	\$28.39	\$34.35
9	1/4	2.25	5.84	15.84	27.65	37.71	47.17
12	1/4	3.00	7.46	20.04	34.70	47.08	60.00
15	1/4	3.66	8.28	24.45	37.49	47.35	60.00
18	1/4	4.33	10.78	28.95	50.14	67.96	86.70
21	1/4	5.00	12.44	33.41	57.86	78.42	100.05
24	1/4	5.67	14.10	37.87	65.59	88.89	113.40
27	1/4	6.25	15.58	41.85	72.48	98.25	125.32
30	1/4	6.88	17.07	46.89	79.38	107.58	137.25
33	1/4	7.45	18.55	49.81	86.28	116.93	149.17
36	1/4	8.05	20.04	53.80	93.18	126.28	161.10
39	1/4	8.58	21.37	57.39	99.38	134.68	171.82
42	1/4	9.12	22.70	60.97	105.58	143.09	182.55
45	1/4	9.66	24.03	64.55	111.78	151.49	193.27
48	1/4	10.20	25.37	68.14	117.99	159.90	204.00
51	1/4	11.17	27.79	74.04	129.27	175.19	223.51
54	1/4	12.15	30.22	81.15	140.55	190.48	243.00
57	1/4	13.05	32.46	87.16	150.90	204.58	261.00
60	1/4	13.95	34.70	93.18	161.37	218.69	279.00
63	1/4	14.84	36.81	98.84	171.17	231.97	295.95
66	1/4	15.74	38.92	104.50	180.97	245.26	312.90
69	1/4	16.51	40.85	109.96	190.42	258.03	329.25
72	1/4	17.38	42.90	115.42	199.87	270.81	345.61
75	1/4	18.25	45.01	120.85	209.28	283.55	361.75
78	1/4	18.90	47.08	126.28	218.69	296.29	377.90
81	1/4	19.72	49.07	131.77	228.19	309.19	394.45
84	1/4	20.55	51.12	137.26	237.70	322.15	411.00
87	1/4	21.41	53.20	143.02	247.48	335.67	428.25
90	1/4	22.27	55.41	148.78	257.67	349.19	445.51
93	1/4	23.15	57.68	154.87	268.19	360.65	462.77
96	1/4	24.03	59.95	160.87	278.65	372.15	480.00
99	1/4	24.95	62.22	167.14	289.48	384.00	497.25
102	1/4	25.87	64.55	173.41	299.87	395.87	514.51
105	1/4	26.80	66.88	179.81	310.00	407.65	531.77
108	1/4	27.72	69.22	186.14	320.00	419.40	549.00
111	1/4	28.65	71.55	192.41	330.00	431.15	566.25
114	1/4	29.58	73.88	198.68	340.00	442.90	583.50
117	1/4	30.50	76.22	205.00	350.00	454.65	600.75
120	1/4	31.43	78.55	211.37	360.00	466.40	618.00
123	1/4	32.35	80.88	217.70	370.00	478.15	635.25
126	1/4	33.28	83.22	224.00	380.00	489.90	652.50
129	1/4	34.20	85.55	230.37	390.00	501.65	669.75
132	1/4	35.13	87.88	236.70	400.00	513.40	687.00
135	1/4	36.05	90.22	243.00	410.00	525.15	704.25
138	1/4	36.98	92.55	249.37	420.00	536.90	721.50
141	1/4	37.90	94.88	255.70	430.00	548.65	738.75
144	1/4	38.83	97.22	262.00	440.00	560.40	756.00
147	1/4	39.75	99.55	268.37	450.00	572.15	773.25
150	1/4	40.68	101.88	274.70	460.00	583.90	790.50
153	1/4	41.60	104.22	281.00	470.00	595.65	807.75
156	1/4	42.53	106.55	287.37	480.00	607.40	825.00
159	1/4	43.45	108.88	293.70	490.00	619.15	842.25
162	1/4	44.38	111.22	300.00	500.00	630.90	859.50
165	1/4	45.30	113.55	306.37	510.00	642.65	876.75
168	1/4	46.23	115.88	312.70	520.00	654.40	894.00
171	1/4	47.15	118.22	319.00	530.00	666.15	911.25
174	1/4	48.08	120.55	325.37	540.00	677.90	928.50
177	1/4	49.00	122.88	331.70	550.00	689.65	945.75
180	1/4	49.93	125.22	338.00	560.00	701.40	963.00
183	1/4	50.85	127.55	344.37	570.00	713.15	980.25
186	1/4	51.78	129.88	350.70	580.00	724.90	997.50
189	1/4	52.70	132.22	357.00	590.00	736.65	1014.75
192	1/4	53.63	134.55	363.37	600.00	748.40	1032.00
195	1/4	54.55	136.88	369.70	610.00	760.15	1049.25
198	1/4	55.48	139.22	376.00	620.00	771.90	1066.50
201	1/4	56.40	141.55	382.37	630.00	783.65	1083.75
204	1/4	57.33	143.88	388.70	640.00	795.40	1101.00
207	1/4	58.25	146.22	395.00	650.00	807.15	1118.25
210	1/4	59.18	148.55	401.37	660.00	818.90	1135.50
213	1/4	60.10	150.88	407.70	670.00	830.65	1152.75
216	1/4	61.03	153.22	414.00	680.00	842.40	1170.00
219	1/4	61.95	155.55	420.37	690.00	854.15	1187.25
222	1/4	62.88	157.88	426.70	700.00	865.90	1204.50
225	1/4	63.80	160.22	433.00	710.00	877.65	1221.75
228	1/4	64.73	162.55	439.37	720.00	889.40	1239.00
231	1/4	65.65	164.88	445.70	730.00	901.15	1256.25
234	1/4	66.58	167.22	452.00	740.00	912.90	1273.50
237	1/4	67.50	169.55	458.37	750.00	924.65	1290.75
240	1/4	68.43	171.88	464.70	760.00	936.40	1308.00
243	1/4	69.35	174.22	471.00	770.00	948.15	1325.25
246	1/4	70.28	176.55	477.37	780.00	959.90	1342.50
249	1/4	71.20	178.88	483.70	790.00	971.65	1359.75
252	1/4	72.13	181.22	490.00	800.00	983.40	1377.00
255	1/4	73.05	183.55	496.37	810.00	995.15	1394.25
258	1/4	73.98	185.88	502.70	820.00	1006.90	1411.50
261	1/4	74.90	188.22	509.00	830.00	1018.65	1428.75
264	1/4	75.83	190.55	515.37	840.00	1030.40	1446.00
267	1/4	76.75	192.88	521.70	850.00	1042.15	1463.25
270	1/4	77.68	195.22	528.00	860.00	1053.90	1480.50
273	1/4	78.60	197.55	534.37	870.00	1065.65	1497.75
276	1/4	79.53	199.88	540.70	880.00	1077.40	1515.00
279	1/4	80.45	202.22	547.00	890.00	1089.15	1532.25
282	1/4	81.38	204.55	553.37	900.00	1100.90	1549.50
285	1/4	82.30	206.88	559.70	910.00	1112.65	1566.75
288	1/4	83.23	209.22	566.00	920.00	1124.40	1584.00
291	1/4	84.15	211.55	572.37	930.00	1136.15	1601.25
294	1/4	85.08	213.88	578.70	940.00	1147.90	1618.50
297	1/4	86.00	216.22	585.00	950.00	1159.65	1635.75
300	1/4	86.93	218.55	591.37	960.00	1171.40	1653.00
303	1/4	87.85	220.88	597.70	970.00	1183.15	1670.25
306	1/4	88.78	223.22	604.00	980.00	1194.90	1687.50
309	1/4	89.70	225.55	610.37	990.00	1206.65	1704.75
312	1/4	90.63	227.88	616.70	1000.00	1218.40	1722.00
315	1/4	91.55	230.22	623.00	1010.00	1230.15	1739.25
318	1/4	92.48	232.55	629.37	1020.00	1241.90	1756.50
321	1/4	93.40	234.88	635.70	1030.00	1253.65	1773.75
324	1/4	94.33	237.22	642.00	1040.00	1265.40	1791.00
327	1/4	95.25	239.55	648.37	1050.00	1277.15	1808.25
330	1/4	96.18	241.88	654.70	1060.00	1288.90	1825.50
333	1/4	97.10	244.22	661.00	1070.00	1300.65	1842.75
336	1/4	98.03	246.55	667.37	1080.00	1312.40	1860.00
339	1/4	98.95	248.88	673.70	1090.00	1324.15	1877.25
342	1/4	99.88	251.22	680.00	1100.00	1335.90	1894.50
345	1/4	100.80	253.55	686.37	1110.00	1347.65	1911.75
348	1/4	101.73	255.88	692.70	1120.00	1359.40	1929.00
351	1/4	102.65	258.22	699.00	1130.00	1371.15	1946.25
354	1/4	103.58	260.55	705.37	1140.00	1382.90	1963.50
357	1/4	104.50	262.88	711.70	1150.00	1394.65	1980.75
360	1/4	105.43	265.22	718.00	1160.00	1406.40	1998.00
363	1/4	106.35	267.55	724.37	1170.00	1418.15	2015.25
366	1/4	107.28	269.88	730.70	1180.00	1429.90	2032.50
369	1/4	108.20	272.22	737.00	1190.00	1441.65	2049.75
372	1/4	109.13	274.55	743.37	1200.00	1453.40	2067.00
375	1/4	110.05	276.88	749.70	1210.00	1465.15	2084.25
378	1/4	110.98	279.22	756.00	1220.00	1476.90	21

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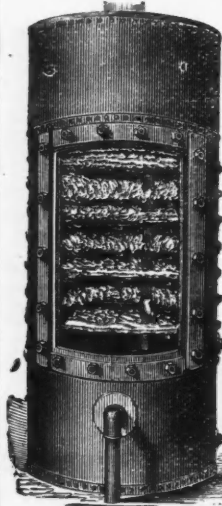
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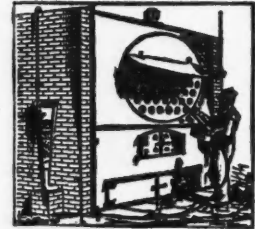
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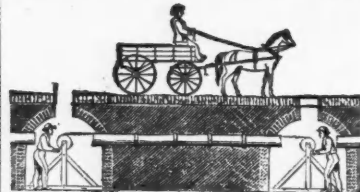
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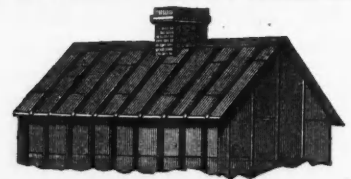
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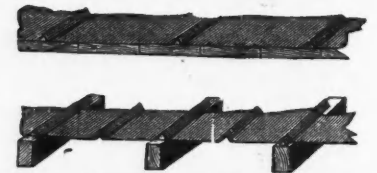
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