



lateral lode-right affecting the case at bar must be a vertical plane, drawn at right angles to the local course of the vein at that point, was explicitly declared to be independent of the course of the vein through the claim. The language used in my paper already cited does no injustice to the scope of Judge De Wolfe's ruling: "Whether the lode crosses two side-lines or one side-line and one end-line, there must be new boundary planes placed at right angles across the apex."

But, as stated by the Supreme Court of Montana, there is no such ambiguity in the situation. The court considers it beyond doubt that the Amy lode-apex crosses obliquely two opposite parallel side-lines of the Amy claim; and the only question to be decided is, How shall the end-planes bounding the extra-lateral right be drawn across it?

In the decision before me the court states and discusses three different theories on this point:

1. The theory of the court below that the end-planes are to be drawn at right angles to the local strike of the lodes, without reference to the lines of the surveyed location.

2. The theory of the plaintiff-appellant that the so-called side-lines of the Amy location are, under the circumstances, its true end-lines, and cut off its extra-lateral rights on the strike of the lode.

3. The theory of the defendant that the vertical boundary plane should be drawn through the points where the apex leaves the claim, and parallel to the surveyed end-lines of the location.

The third of these is adopted by the Appellate Court, and made the basis of its judgment. It seems to me that the reversal of the ruling of Judge De Wolfe is undoubtedly correct, for reasons which I have given at considerable length elsewhere. But it is not so clear that a correct view has been substituted.

The decision is remarkably clear at most points, and has evidently been prepared by some one familiar with the facts and terms of mining. Indeed, the author has been betrayed by this familiarity, perhaps, into some irrelevant discussions. There is, for example, an elaborate explanation of the three senses in which the term "dip" may be used, which is rather ingenious than helpful. We are told that the dip may be contemplated first, as to its amount, as a dip of so many degrees; secondly, as to its direction, as a dip northeast; and thirdly, as the lower portion of the vein itself, encountered in descending from the apex, even though such descent be not on the true compass-dip. All of which is quite unnecessary, because the word dip does not occur in the statute. What it says is in one place "course downward," and in another place "downward course." Other definition there is none; and while the court's subtle analysis of "dip" has brought it at last to the true view of the law, the short and simple way to that goal was, that the text of the statute clearly implies that the "downward course" is not necessarily the true dip. And the conclusive *reductio ad absurdum* of Judge De Wolfe's proposition is this: That if it be correct, then, even in the case of a perfectly regular, though not rectangular claim, the two end-lines of which cross somewhat obliquely the apex of the located lode, the planes through these end-lines would not be the true boundaries, but new ones would have to be drawn. In short, every mining location, patented or not, in the whole country, with a few rare exceptions, in which by accident the end-lines crossed the apex exactly at right angles, would have to be judicially rectified, and this in spite of both the spirit and the letter of the law.

But the arguments by which the court justifies its rejection of the second and adoption of the third theory above set forth deserve further examination. I quote the following passage, lest I should do injustice by an attempt to condense it.

"If the Amy people go down upon their dip (using the word in any of its significations, and especially as to the compass-dip) from any point on the apex, they will at greater or less depth, depending upon the distance from the point where the apex crosses the north side-line, encounter the vertical plane of that line, and if that plane is to cut them off upon the dip and be the end-line, the provisions of the statute and the universally accepted construction of the mining law are plainly subverted. Counsel holds that if the strike cross a side-line such side-line becomes an end-line for all practical purposes. A better illustration of the revolutionary character of the theory could scarcely be presented than the one at bar. But if it be correct, we must not shrink from its necessary results. Side-lines are frequently not parallel."

Then follows an argument to show that when side-lines are not parallel, they would, if employed as end-lines, give to the claimant a section of the lode either constantly increasing or constantly diminishing with depth—which is clearly true and conclusive to the effect that such side-lines cannot be so employed. But the side-lines of the Amy location are parallel; and the case is thus brought within the simple and positive principle of the Flagstaff case, which is in substance that when the apex crosses two parallel opposite surveyed boundary lines, these are the real end-lines of the location; and the mere circumstance that another pair of lines has been called end-lines by the surveyor or draughtsman does not make them so. If an apex crossed two side-lines which were not parallel, it is likely that the location (according to the principle of the Elgin decision) would lose its extra-lateral right altogether.

It is difficult to see what revolutionary result follows in a case of parallel side-lines, from the application of the Flagstaff principle. The court says this case is a strong instance. But in this case the result would be neither more nor less than what would have followed if the Amy location had

been laid properly on the lode and its nominal end-lines had been its true end-lines. The lode-claimant would have had at all depths a length on the lode equal to the length of the apex within his claim. His downward course would have run in a different compass course from that which the court now gives him—that is all.

At all events, unless the U. S. Supreme Court should essentially retreat from its position in the Flagstaff case, this Montana decision goes to pieces upon that rock.

The reasoning by which the court, after rejecting the second, adopts the third theory above mentioned contains one excellent argument, namely, the proposition that the surveyed end-line of a claim really determines the boundary of an apex-right, when that boundary is made parallel to it. This seems to me to be fair and forcible, and applicable to all cases in which there are surveyed end-lines in reality. For instance, in the case of a location upon a lode which passes through those two end-lines, the apex rights on all other lodes discovered within it will be properly fixed by planes parallel to the end-lines, whatever be the cause of such other lodes. In the case in which a located lode crosses one end-line and one side-line, thus giving to the location no two, true, parallel and valid end-lines, either

1. the one valid end-line will determine the direction of the other boundary-plane; or

2. the location will lose its extra-lateral right. The latter is, strictly speaking, the literal force of the Elgin decision of the Supreme Court. But whether it would be so held in a simpler case than that of the "horse-shoe" Stone location, I will not be so presumptuous as to say.

To conclude: this latest Montana decision has laid down some principles which may be useful in other cases, but applied thus mistakenly, I think, to the case at bar. Nevertheless, its view has the merit of being applicable, comprehensible, and not inherently inequitable. If it were the law, it would not be a very bad one, as things stand. R. W. R.

#### NEW PUBLICATIONS.

ILLUSTRATIONS OF THE CHALCOPYRITE DEPOSITS AT KITZBUHEL AND THE SULPHUR DEPOSITS AT SWOSZOWICE. By F. M. VON FRIESE. Published by authority of the Imperial Minister of Agriculture. Government Printing Office, Vienna, 1890. Large 8 vo., 78 pl., with 34 pp. of descriptive text.

This collection of plates, showing the mode of occurrence of copper and sulphur ores in the Kitzbühel and Swoszowice districts, is a most interesting one. The drawings bear on their face evidences of very careful work, and appear to be faithful representatives of nature, not ideal sections taken to illustrate any particular theory. The amount of detail furnishes material for study which would be entirely absent in generalized sections. Work of this kind is much needed, if it is desired to reach conclusive results in the study of the theories of ore deposits.

THE STRAINS IN FRAMED STRUCTURES, ETC. Fifth Edition. By A. JAY DU BOIS, C. E., Ph.D. Published by John Wiley & Sons, New York, 1890. Cloth, 4to, 430 pp.; 28 pl. and numerous diagrams. Price, \$10.

The first edition of this well-known work appeared in 1883, at which time, and since, it was favorably received by the profession. The author is professor of civil engineering at the Sheffield Scientific School, of Yale, and in the regular course of instruction has had exceptional opportunity to understand the needs of students and to accumulate material for such a comprehensive treatise as this.

The work contains numerous practical applications to cranes, bridge, roof and suspension trusses, braced arches, pivot and draw spans, continuous girders, etc. Its scope is very wide, but the chief interest naturally and properly attaches to the theory and construction of iron and steel railway bridges.

The present (fifth) edition has in large part been re-written and much new matter has been added. It is, of course, impossible in a manual for students to keep up with engineering progress—which in the matter of bridge work has taken unexpectedly great strides since the appearance of the first edition. The fundamental principles do not change; it is in the extension of methods and in the advances made possible by the better material constantly being made available by metallurgical progress, that construction is being constantly carried to points which, a few years previous, might have seemed visionary.

The methods of analysis adopted are both purely mathematical and graphical, and in all cases the author gives concrete examples. In designing, both general and in detail, the method is eminently practical, and prepares the student for the regular operations of shop work.

As a rule, the author has not erred in the direction of omissions. On the contrary, he has been at pains to insert discussions of a great variety of forms not in common recent practice, in order to give a wide view of the whole subject, thus making the book a work of reference as well as a text book; and by separating matter of different degrees of importance by using distinguishing sizes of type, the main body of the text is in no way obscured.

The arrangement is excellent and progressive, and this is especially demanded in the treatment of a subject so intricate and having such a variety of detail. It seems invidious to complain of anything in a work already so thorough; but one could wish that the author, in making the new additions, had entered a little more minutely into the consideration of the present and prospective development of the cantilever, and the great advances recently made as to magnitude and boldness of design. The question of material, too, is one of great moment just at present, in view of metallurgical improvements. The author does not perhaps sufficiently point out that the bridge of to-day and of the future is the steel bridge, and that specifications which would have been stringent a few years ago are now under the standard of current practice. But it is an admirable treatise as it stands.



**THE METALLURGY OF STEEL:** By Henry Marion Howe, A. M. (Harvard), S. B. Published by the Scientific Publishing Co., 27 Park Place, New York, 1890. Cloth, royal quarto, 380 pp. Illustrated. Price, \$10.

Since Percy's classic work on iron and Sir Lowthian Bell's "Chemical Phenomena of Iron Smelting" and "Principles of the Manufacture of Iron and Steel," no important work on iron metallurgy has been published in our language, except the treatise from the pen of Mr. H. M. Howe which has just appeared. Bauerman has published a short treatise, and acquitted himself so well as to excite the wish that he had attempted a more ambitious work.

The reasons for the poverty in this branch of our technical literature are not far to seek. The magnitude of the task, the difficulties to be overcome, and the severe requirements which these impose on the adventurous author, who may essay to attack them with any prospect of success, sufficiently explain it.

Such a writer must be a scientific man, well trained in the processes of thought, employed in the search for truth by scientific methods, and familiar with the latest developments of the fundamental sciences of metallurgy, such as mechanics, physics and chemistry, in general as well as in their special applications to the smelting, casting and forging of iron, and to its employment in construction. The keenness and the breadth which are the effects of such a training upon a mind of sufficient native strength are essential for the discussion of many an abstruse question involved in the proper treatment of the subject.

It is almost as important that the writer should have a considerable experience in the practice of some branch of iron metallurgy or, at least, that he should have had practice as an engineer in the use of iron in construction, as in this way he can best acquire the sound, practical common sense, the feeling of the relative importance of the details of processes, and the judgment as to what is trustworthy in the information given by others, which are such valuable elements of his equipment for this work. In this way, too, he can most readily gain the confidence of those who are actively employed in the direction of metallurgical works, so that he may be in touch with all that is best in modern practice, so chameleon-like in its changes.

A certain degree of literary skill, and an acquaintance with French and German sufficient to unlock the stores of information accumulated in the numerous technical publications in those languages, are acquirements more readily obtained, but not less necessary, than those previously mentioned. There are not many who possess these combined qualities, and of those a very large proportion is deterred by the difficulties of the undertaking, or is unable to command the time necessary for its accomplishment.

The chief difficulties are two-fold, and of opposite kinds, although they are both due chiefly to the same cause, namely, the magnitude of the subject. First, there is the insufficiency of our knowledge. The investigation which has been so actively carried on in the latter part of this century over the whole field of iron metallurgy has widened the circle of our light, but has thus increased the extent of the boundary line between knowledge and ignorance. If it has rendered clear much that was before obscure, it has also brought into the twilight of hypothesis and controversy many a point that previously lay in the outer regions of Cimmerian darkness. Then, there is much information which must be inaccessible to any individual writer, many investigations conducted at the expense of individuals or private corporations for their own instruction, the results of which have not been published.

The other main difficulty is the immense amount of information and misinformation which has already accumulated, and is continually accumulating, at an increasing rate in periodical technical literature. The mere compilation of this material would have been a work of no mean labor, but, if such a work had been undertaken, the unfortunate reader would have been almost smothered under the mass thus pitchforked together and discharged upon him. The correlation, discussion, and digestion of this mass of material, the weighing of evidence, the elimination of errors, are a work of quite another order, truly a labor of Hercules!

The task is also in some respects a thankless one. The rapid progress of science and arts soon leaves behind any such landmark as a work like this. Thucydides could with reason claim for his history that it would be a "possession for ever." Horace prophesied for his poetic fame a duration as great as that of the religion of the Romans, and it is a trite saying how events have more than justified his prophecy. Ages have passed since for the last time, "the priest went up to the Capitol with the silent virgin," and still the monument which the poet erected endures, "more lasting than brass and higher than the royal structure of the pyramids." The writer of a work upon applied science, however, resembles one who builds upon a sinking shore. The advancing tide of progress soon overflows his edifice. He has, however, the consolation that his work, if well done, will not be lost to future generations, but will serve as a solid foundation, to be built upon by those who come after.

When the publication of Mr. Howe's work in serial form was announced, those who were acquainted with his contributions to current technical literature had good cause to believe that in him would be united to an unusual degree the qualities essential to success. His convincing but alas! ineffectual arguments against the misuse of the term steel are a model of cogent reasoning expressed in terse and vigorous English. If the question had been decided on its merits, or by the weight of argument on either side, he would have won his case; but popular usage is often deaf to the voice of reason. Mr. Howe's papers on other topics, and his contributions to the discussions at meetings of the American Institute of Mining Engineers, manifest a marked capacity for close and searching analysis of processes old and new, and a disposition to apply the test of cold reason to the enthusiastic or interested claims of their promoters, with an effect as startling as that produced by the touch of Ithuriel's spear. No reader who is both candid and competent to judge will refuse to admit that in the present work Mr. Howe has fully justified the expectations thus aroused.

The greater portion of this work, Chapters I. to XIV., inclusive, consists of a discussion of the chemical, physical and mechanical conditions which affect the properties of iron and steel. At the risk of wearisome iteration I will repeat that the amount of labor involved in this discussion can be appreciated only by one who knows the complex nature of the subject, the immense quantity of material bearing upon it which has accumulated since a similar exhaustive treatment of it has been at-

tempted, and the number of points still obscure which present themselves, admitting much discussion and the invention of hypotheses, but needing further investigation for complete elucidation.

All recent investigation has emphasized the fact that in malleable iron, whether ingot metal or weld metal, we have an aggregate of chemical compounds. Chemical analysis reveals in a fairly satisfactory manner the ultimate composition of this aggregate, but of the manner in which the various ingredients are combined together we have as yet but an imperfect idea. The tendency to segregation of certain compounds, their various solubility in certain solvents, their thermo-chemical reactions and the structure of the metal, as revealed by the microscope, throw some light upon this subject, but there is much that remains unknown. We know that very minute proportions of certain elements markedly affect the properties of the metal, that when several occur together, their effects are sometimes cumulative, sometimes mutually counteracting; that the same element may occur in several states in the metal, exerting in these various states very different effects; and that the temperature to which the metal is or has been subjected, and the rate at which the temperature has been varied, may have also a profound influence upon its properties, either through a change thus induced in the nature of the chemical compounds which compose it, or in its structure, or through certain internal stresses which may have been developed.

Mechanical pressure also has a powerful effect in some cases in modifying the properties of iron, and this effect varies with the mode of applying the pressure, whether sudden or gradual, and with the temperature at which it is applied.

With regard to carbon, the most energetic of ingredients in its effect on the properties of iron, the old classification into graphite and combined carbon has been found inadequate since the researches of Abel, Rimman, and Müller, and we have now a provisional classification into graphite, cement and hardening carbon.

Recent investigation has in the main only confirmed and rendered more definite the previously existing theories with regard to the conditions for the separation of graphite from iron. The investigations of Abel, however, completed by those of Brinnell and of Sorby, have opened up an entirely new field, showing the effect of the temperature upon the state of combination of what had hitherto been known simply as combined carbon, and thus throwing much light on the manner in which the processes of hardening, tempering and annealing produce their well known effects on the properties of the metal. Brinnell has shown that the heating of a bar of steel to a low yellow heat causes the sudden conversion, at that temperature, of all cement into hardening carbon, accompanied by a complete change of structure, but that long continued heat throughout a certain range of temperature below that point causes a gradual conversion of hardening into cement carbon.

The phenomenon of recalcence, as investigated by Barrett and others, and the researches of Osmond and Werth upon the rate of cooling of various kinds of iron, point to a heat development accompanying the change from hardening to cement carbon. Other heat phenomena have been observed, however, the causes of which are still obscure. These results and the observations of Chernoff, Brinnell, Coffin and Metcalf on the effects of heat upon the structure of iron and steel are clearly and fully set forth and discussed by Mr. Howe and supplemented by the results of experiments of his own.

The formulas of Deshayes, Thurston, Gatewood, Bauschinger, Salom and Weyrauch, for the calculation of the effect of different proportions of carbon upon the tensile strength of iron, are given and accompanied by an instructive diagram of the curves representing these formulas and of the plotted results of about 1,500 tests. Similarly, with regard to the effect of carbon upon the elongation of the metal at the point of rupture, a diagram upon which are plotted the results of more than 1,000 tests brings out very clearly the varying rate at which that property is affected by a given variation in the content of carbon, and enables the author to construct formulas to express the elongation for a given percentage of carbon.

Both diagrams show considerable discrepancies in certain cases, which is not a cause of wonder when we consider the many influences, besides the actual content of carbon, which affect the mechanical properties of iron.

It would be interesting to review in detail the discussion of the effects produced upon iron by each of the numerous ingredients which may exist in it, but time and space are lacking.

We have throughout the same painstaking collection of evidence and thoughtful discussion of its teachings. Incidentally the reactions by which the various ingredients may enter, or be removed from, the metal are discussed, so that we have light thrown upon points scattered here and there over the whole field of iron metallurgy.

A striking instance of the rapid strides now making in our knowledge of the various alloys of iron is the necessity for the addition of the supplementary Chapter, in which are given the recent and startling communications of Hadfield on Manganese Steel and of Riley on Nickel Steel.

The whole subject of the evolution of gases from molten, solidifying, and solid iron, upon which there have been recently so much investigation and controversy, is subjected to a broader and fuller discussion than it has ever before received. With regard to the formation of blowholes in castings, Mr. Howe gives his adhesion to the solution theory which was so ably supported by Müller, at first almost single-handed. It is difficult to escape from the same conclusion upon the evidence here so well presented, and yet there are still some mysterious points which indicate that the last word has not been said upon this subject.

The structure of iron, as manifested under the microscope, and made known by the masterly investigations of Sorby, supplemented by those of Martens, Wedding and others; the effect upon structure of crystallization in the process of solidification, of the disengagement of gases, and of the contraction of ingots in cooling, as observed by Chernoff, Walrand, Müller and others; the effect upon structure of temperature below the point of fusion, as investigated by Chernoff, Brinnell, Metcalf and others; the effects of forging and other mechanical treatment at various temperatures of incandescence, at a blue heat and in the cold—all such points as these are fully discussed and their vital connection with practice illustrated by the discussion of such subjects as the various methods proposed for preventing blowholes and pipes in ingots; the proper temperature for finishing forgings, the effects of blue working, wire drawing, cold drawing and



cold rolling; the burning of iron and steel, annealing, hardening in lead, in oil, in water, tempering, etc. Besides these we have the treatment of such subjects as the effects of greater or less work at different stages of the manufacture of forgings from ingots, in which still further triumphs are indicated for the foundry in its long and hitherto successful contest with the forge; the rusting and corrosion of various varieties of iron and steel; the welding of iron, with a description of the recent processes of electric welding, etc., etc.

In Chapter XV., devoted to the direct processes of manufacture of malleable iron from the ore, Mr. Howe begins with a discussion of the possibilities of future development of such processes, comparing them with the combination of the blast furnace and a refining process by which almost all malleable iron and steel are now manufactured. In this comparison he states very clearly the chief defect of the direct processes in the waste of iron which they entail, and limits the field for their future development to the manufacture of blooms for the open-hearth process.

We think that the comparison he draws between the possible economy of fuel in a direct process and in the blast furnace is somewhat too favorable to the former. He shows that the chief advantage of the direct process in this respect is that the temperature need not be so high as in the hearth of the blast furnace, so that a large part of the heat required by the latter to supply what is carried out in the molten products, may be dispensed with in the furnace where direct reduction is effected. He admits, however, that in the case of the slag this advantage may be (we should be inclined to say: must be) more apparent than real, for the gangue of the ore charged into the furnace must be eliminated in some way, either as a part of the slag squeezed out of the ball in forging, when it must be hot enough for the slag to be fluid and for the iron to weld, or as a part of the slag of the open-hearth furnace, where it is hotter than that which flows from the blast furnace. In the case of the metal also, if, as is now the case with the direct Bessemer process, the pig iron is taken molten to the converter, the heat, thus carried from the blast furnace, is utilized. It is not unlikely that the difficulties encountered in the use of molten pig iron from the blast furnace in the open hearth may be overcome, and thus the heat of the iron saved when that process of refining is employed. Hardly enough weight is given, in the comparison, to possible improvements in the indirect processes. It is true that the margin for further economy of fuel in the blast furnace itself is a narrow one, as, owing to the very conditions of the process, it will not be possible to produce pig iron with much less fuel than some modern furnaces now employ; but there is room for improvement in the utilization, accompanied possibly by the regeneration, of the waste gases, and in the various accessory operations in the treatment of the resulting pig-iron. When we consider the various improvements which have been effected in the blast furnace and Bessemer processes, it will be evident that, where such improvements are combined, there will be a very narrow margin for possible economy in the substitution of a direct process. Take the case of a modern, rapidly driven blast furnace, from which the iron is tapped out less than 12 hours after it is charged as ore into the furnace. The pig iron is taken molten to the converter, and is transformed, say in 10 or 15 minutes, into ingot metal. The ingots are put into soaking pits, and after 20 or 30 minutes rolled into blooms, and these, in some works without re-heating, into rails or bars. In point of time this seems sufficiently direct. It is said that in one establishment in France the heat developed by the combustion of the waste gases of the blast furnace is sufficient to supply the power for the blast of the converter, as well as of the blast furnace, besides heating the blast for the latter. In this case the production of the ingot from the ore is accomplished at the expense of no other fuel than that charged into the blast furnace, except what is needed for certain accessory operations whose requirements are small. The introduction of the soaking pit and of direct rolling permits the production of the finished bar from the ingot with very little fuel beyond what is required for the mechanical work performed on the iron.

The yield of iron in these combined processes leaves little to be desired. Except when making white pig, the loss of iron in the blast furnace rarely exceeds, and sometimes is less than, one or two per cent. The apparent loss in the converter is chiefly due to the elimination of foreign ingredients, such as carbon and silicon, to shots of iron mechanically entangled in the slag, and to various forms of scrap. Recently the recovery of the metallic iron in the slag has been introduced in some works, and thus that item of loss has been reduced. The final loss, or the weight of iron actually slagged off as silicate of iron, is very small, and can be shown to be less than one per cent. in some cases. Of course, the iron recovered as scrap and from the slag is of less value than in the ingot, and thus there results a pecuniary loss, not only from the expense of recovering the iron, but also from that of converting it into ingot metal; but this loss is much less than the total value of the metal, which would otherwise be thrown away.

With regard to economy of labor, few processes are so effective as the blast furnace and Bessemer processes, and by far the largest item in the labor account is that involved in the mere handling of the materials, which would be necessary with any process.

With regard to the expense for plant, it is true that a modern blast furnace or Bessemer plant is usually a very costly affair, and superficial observers are apt to adduce this expense as a disadvantage of these processes. So it may be in certain cases, but the larger expense is chiefly due to the great size of the works and their arrangements for a large output. It is especially this large output, characterizing the modern American blast furnace and Bessemer mill, which renders this item of expense per ton of product comparatively small.

The only defect of the blast furnace which it seems impossible to remedy, is the restriction as to the nature of the fuel which can be employed in it, and this, as Mr. Howe points out, may give a field for the development of a direct process in such localities as are so fortunate as to possess supplies of natural gas, or so unfortunate as to lack fuels which can be used in a blast furnace.

Following this discussion are a classification of direct processes in general, and a description of many of them, from the ancient Catalan forge to the modern processes of Blair, Siemens, Husgafvel and Eames.

In Chapter XVI. we have a description of the chief charcoal hearth processes for the production of malleable iron from pig iron, which are still in existence.

In Chapter XVII. we have an admirable description of the manufacture

of crucible steel, which might serve as a model for such descriptions. That such a model is needed will be admitted by any one who is obliged to wade through the ill arranged, diffuse, inaccurate and obscure descriptions which are too frequent in technical literature.

Finally, in Chapter XVIII., we have a description of the apparatus for the Bessemer process, and an analysis of the best modern types of plant. Here a marked difference may be observed between a treatise like this and the older works on iron metallurgy, as Percy's, for example. Percy looked at his subject from the point of view of the philosopher and the chemist. He gave the greatest weight to the discussion of the chemical and physical aspects of a question. In Mr. Howe's work these aspects are not neglected, but processes are discussed also from the standpoint of the practical designer and engineer.

Mr. Howe's style is fresh and vigorous throughout, a good vehicle for his keen reasoning and clear impressions. There are a certain boldness and off-hand directness in his use of terms, such as the "freezing" of iron, "Britain," for Great Britain, "calculamus," etc., and a certain lightness of tone, as in the references to Prof. Ehrenwerth's mirth, the work of Russian train despatchers, and Pearse's bold deductions, which some may consider blemishes, as hardly comporting with the serious nature of such a treatise.

If blemishes they are, however, they are too slight to detract materially from the great merit of the work. Mr. Howe may have the assurance that he has well performed an arduous task of which there was pressing need, and that he has won for his name the right to be enrolled with such names as Karsten, Berthier, Plattner, Grüner, Percy, Bell, Ledebur and Akerman in the short list of the foremost metallurgical writers of the world.

#### BOOKS RECEIVED.

[In sending books for notice, will publishers, for their own sake and for that of book buyers, give the retail price! These notices do not supersede review in another page of the Journal.]

*Pavements and Roads, their Construction and Maintenance.* By E. G. Love, Ph.D. Published by *The Engineering and Building Record*, 1890. Pages 410. Price \$2.50.  
*The Wherewithal, or New Discoveries in Cause and Effect.* Published by the Wherewithal Publishing Company, Philadelphia, Pa. Price \$1.

#### CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

All letters should be addressed to the MANAGING EDITOR.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Paris Mining Company, of Colorado.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Can any of your readers give me any information concerning the Paris Mining Company, of Colorado, which was organized some time ago with a capital stock of \$5,000,000; also the New York Mexican Mining Company, which was organized with a like capital.

Yours truly, UNFORTUNATE INVESTOR.

The National Nickel Company.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Can you give me any information concerning the National Nickel Company of your city, whose president is Mr. H. D. Winsor, and whose mines are said to be in Churchill County, Nev.? Can you tell me whether the mines are really of value, what condition they are in, and whether there is any prospect of their becoming profitable?

If some of your readers can supply this information I shall be very greatly obliged. Yours truly, NICKEL MONEY. LONDON.

[We have made inquiry at the office of the company in this city, but the officers of the company decline to give any information. Will some of our readers who are acquainted with the property or the concern kindly write us?—ED. E. AND M. J.]

[Is Magnetic Oxide Electro-Positive to Metallic Iron?]

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: I am much surprised to note on Page 709 of your issue of June 21st, that magnetic oxide,  $Fe_3O_4$ , is said, by Mr. W. Spring, to be electro-positive to metallic iron, and plays a part like that of zinc in preventing oxidation. It has repeatedly been found that magnetic oxide is electro-negative to iron, and I supposed it one of the most widely recognized facts that iron scale, which consists chiefly of magnetic oxide and others of nearly the same composition, accelerated rusting very greatly. My own experiments with Bower-Barffed iron, which is coated with what has been supposed to be magnetic oxide, showed that while the coating, where intact, prevented oxidation by keeping oxygen away from the iron; yet wherever the coating was broken, exposing the iron to the air or water, rusting went on at a greatly accelerated rate, indicating that magnetic oxide here played a part diametrically opposed to that of zinc. Mere contact with zinc hinders the oxidation of iron, even though the coating of zinc be imperfect, and the iron naked in spots.

It may, indeed, be true that magnetic oxide is less strongly electro-negative to metallic iron than ferric oxide is, and hence that the change which the pressure of the wheel is here said to effect, of ferric to magnetic oxide, does thus retard rusting.

At best, however, the explanation does not strike one at first as fully satisfactory. Very respectfully, RUST.

Attenuated Scientific Deductions.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Your editorial of the 14th inst., under the above title, contains several statements that are somewhat startling to me. In fact, I do not understand them; hence I beg to ask for more complete information.

To begin with, I am not aware that the fact that small quantities of aluminum increase the fluidity of molten wrought iron in a remarkable manner, has ever been disputed, nor that the cause of this peculiar phenomenon has been fully explained. Then you put down *Berthollet's thermo-chemical principle No. 3* ("every chemical change effected without the intervention of," etc.) as a "recently announced theorem," whereas it is



already almost as well recognized a physical law as *Berthollet's law of gaseous changes*, though the latter was discovered over 50 years earlier. In the chemistry of melted iron and steel these two laws are inseparable, both of them operating at the same time in the molten masses.

Speaking about laws, I quote from Dr. Karl Vogt's celebrated address to his students in Geneva, the following, somewhat freely translated:

"Just as the man of character is the slave of his pledged word, so the investigator of natural science is the slave of proven facts. But the facts alone do not satisfy us: they would only accumulate to a jumbled pile if we did not succeed to connect them with each other, and to draw from the obsolete far-reaching conclusions, developing into general laws. These laws, howsoever we may enlarge them, must, of course, be always based on facts, and they must be able to stand the tests which may be called for by new observations or discoveries. For the laws of natural science recognize no exceptions, and cannot recognize any; each exception which can be proven overthrows the law itself. Natural laws\* are abstractions or rules constructed by us, and an exception is a fact that cannot be harmonized with the law that has been evolved from previously known facts. Hence, a natural law must cover the facts and discoveries that were unknown when it was framed, for it is self-evident that the law must fall when the new facts do not fit in its frame."

I am not aware that the thermo-chemical principle before referred to has ever been disproved or overthrown, nor do I understand how the glass-tube experiment which you have adduced in support of your statements can be brought into connection with it. Is not an "extraneous" force working as long as you heat the glass tube? Cannot a reaction or a series of reactions occur, involving absorption of heat, as long as that heat is at work?

And what do we know of an equilibrium of CO and CO<sub>2</sub>? Is there any proof that these gases, after becoming mixed in certain proportions, are chemically inert on account of these proportions? Would they be inert

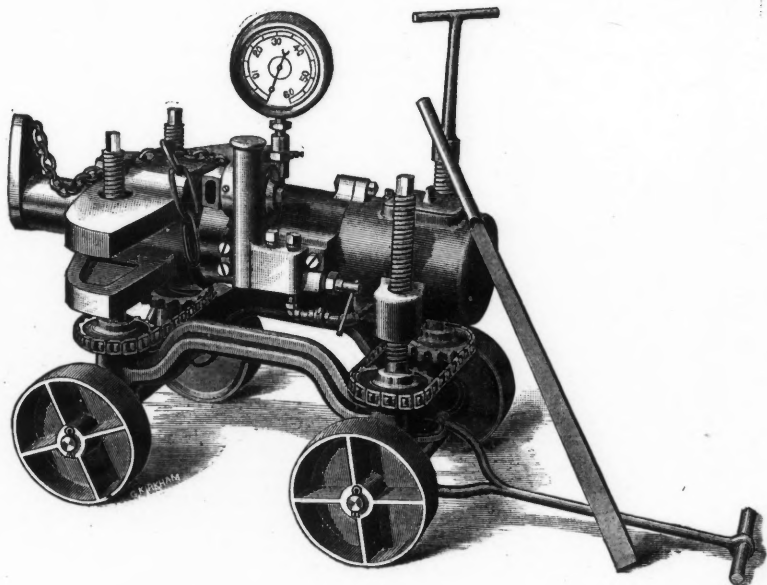
NEW RAILWAY ENGINEERING APPLIANCES.

The operation of removing locomotive drivers has received the attention of inventors, and it is now claimed by the Phoenix Company of this city that it has perfected a successful hydraulic transverse pit jack. The main objections to the system hitherto in practice have been that when, for purposes of repairing or reversing a driver, it has been necessary to remove it, the fire must be drawn, a great deal of time and labors expended, and the locomotive has to be jacked up first at one end and then at the other, until the driver will roll out under the tail-piece. During all this operation the work underneath is obstructed by girders and blocking.

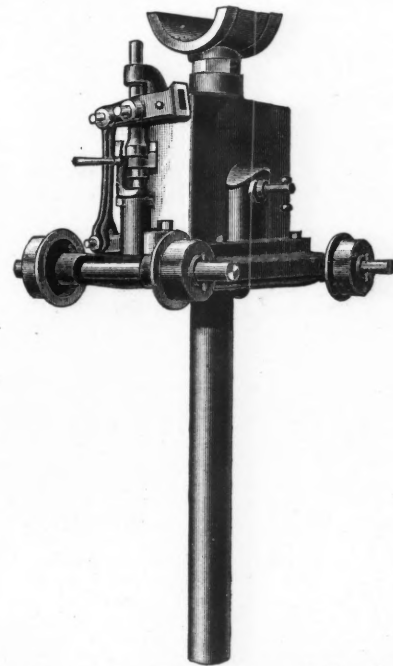
By the use of the jack newly patented, which is manufactured by the Phoenix Company, the engine is not disturbed from its ordinary position and no floor space is required for the tool. The top of the ram has a semi-cylindrical head in which the axle rests, and which may be revolved so that it can be dropped on a track running at any angle with the pit.

In operating, the engine is run over the pit, until the axle or truck to be removed is over the jack track; the jack is then run under the locomotive and pumped up until the weight is taken off the section of tracks, which are then moved sideways, when the wheels are lowered until they clear the frame, when the jack is moved sideways, and when as far as desired is pumped up and track placed under them again, and jack ram lowered until the head clears, when they can be rolled away. Three men are required to work it—one in the pit and one at each wheel. It is said that with three men four pairs of drivers were placed under a consolidation engine in 38 minutes with this appliance.

Another new railway appliance brought out by the Phoenix Company is an improved crank pin press. This press varies from former presses in use in that the truck is all iron and the beam is at the end nearest the work; also in having adjustable screws for regulating the height of the ram to suit the position of the pin. When pressing a pin to place, it has



IMPROVED CRANK PIN PRESS.



if they were introduced in that proportion or if they were not confined?

There is enough food for reflection in these questions without trying to digest at the same time the bearings of the corollary which you have attached to Berthollet's law, and of the rest of the matter which, as it seems to me, you have introduced for the apparent purpose of demonstrating that the equilibrium of CO and CO<sub>2</sub>, as understood in practical metallurgy, is not an obsolete theorem, but that it comes—or is apt to come sooner or later—under a general law.

I think that this particular equilibrium theory, like other scientific bal-last, has been evolved for the purpose of assigning a cause for phenomena which, at the time of its inception, could not yet be explained, but that they can be explained now, with or without sealed glass-tubes.

Respectfully,

A. D. ELBERS.

HOBOKEN, N. J., June 16th, 1890.

[Without at this time discussing Mr. ELBERS' views, we would point out that the question, "Cannot a reaction or series of reactions occur, involving absorption of heat, as long as that heat is at work?" is in perfect harmony with our position, and just such a question as we would put to those who enunciate this corollary.

Mr. ELBERS' may get some light on the questions about carbonic acid and oxide by referring to BELL's experiments bearing on this point, a partial discussion of which he can find on pages 128-9 and 146 of this JOURNAL, February 18th and 25th, 1888.—ED. E. AND M. J.]

**A Meteor Falls and Explodes.**—Shortly after noon on the 25th inst., according to report, a meteor fell with a terrific explosion on a farm near Washington, Kan., scattering great quantities of rock in every direction. One piece was imbedded in the ground to the depth of several feet. The rock was of a grayish color and intensely hot when found. The shock was felt for miles around, many people thinking it was an earthquake.

\*"Naturgesetz," a term which may be applied as well to physical as to natural science.

commonly been found that the jack was lifted entirely off the floor by the strain of forcing the pin to its place. When the faces of the ram and the pin do not coincide exactly the tendency is, when the heavy beam is at some distance from the work, to force the pin slightly out of the true. It was to avoid this, that this style was devised. The chain shown attached to the ram is for pulling the ram back into the cylinder, without having to run it up against some heavy piece of machinery and using a crowbar. An improved safety coupling prevents injury to the gauge from shock caused by sudden release of pressure. The pump valves are large and fall into their seats, without requiring a rush of water to seat them, and the bonnets are made metal to metal, requiring no packing.

KIND-CHAUDRON AND OTHER SHAFT-SINKING METHODS.

The Kind-Chaudron system, by which 58 shafts have been sunk without a single serious accident, owes this success to the fact that nobody works in the shaft until the shaft-lining is put in place.

The watertightness of certain strata in the northern part of the West-phalian districts suggested to Mr. Chaudron the idea of lining only that part of the shaft which crosses water-carrying strata and of preventing the water from lower levels from entering between the walls and the lining of the shaft by strong cementing. This arrangement with the upper parts of the lining necessitated, however, a modification of the ordinary process in which the head of the lining is kept above the natural water level. For closing the shaft lining at the top Mr. Chaudron resorted to the false-bottom idea and submerged the covering completely.

The economy to be effected by this system determined the Gneisenau Company to try it. Concrete was first tentatively applied to shaft 1 in a layer rising only a few meters above the water-carrying level, and as it was found to be water-tight, the shaft was sunk 174 meters, down to the marl, which carries a great deal of water. Mr. Tomson devised the following arrangements, shown in Fig. 4 and 5, in order to apply this system for sinking shaft 2 beyond that depth of 174 meters.

The buckets were guided by wire ropes 25 millimeters in diameter, which were fixed in a wooden frame c c, and passed over pulleys p to

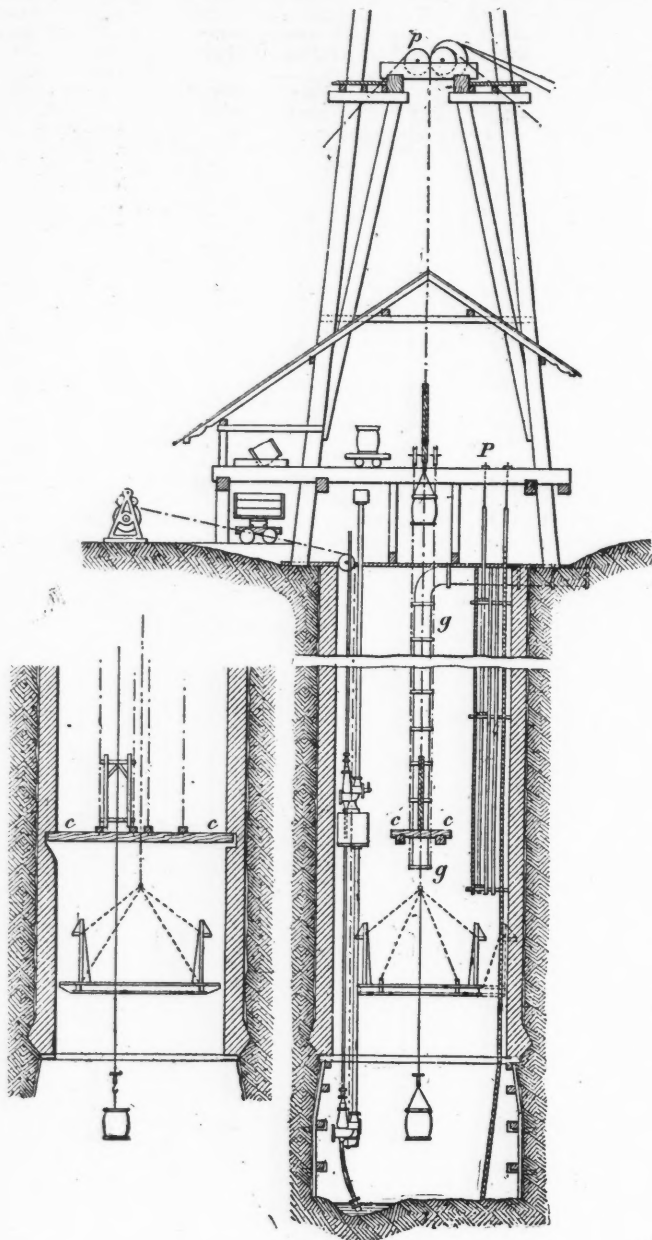


FIG. 4.

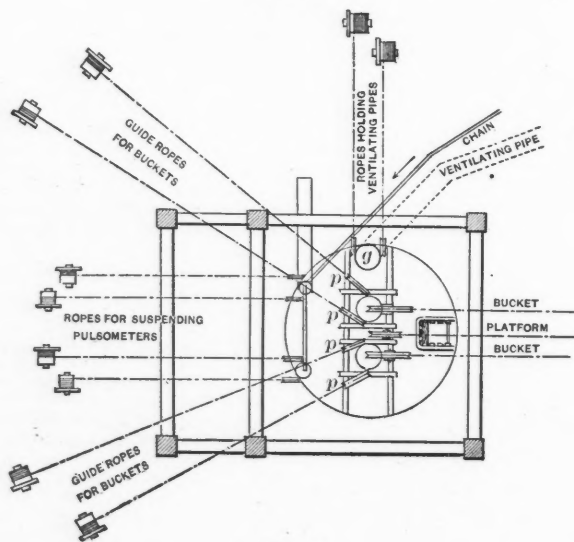


FIG. 5.

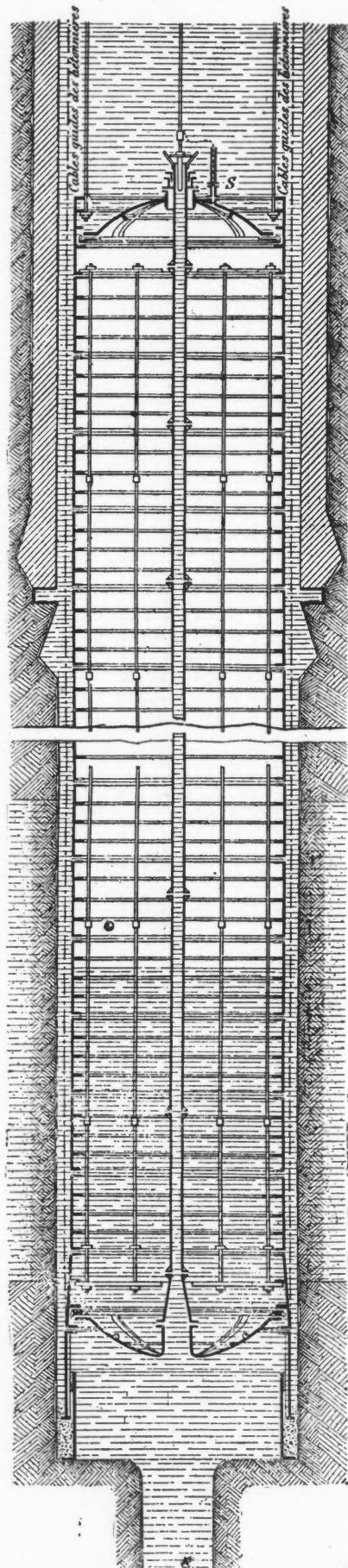


FIG. 6.

KIND-CHAUDRON METHOD OF SHAFT-SINKING.



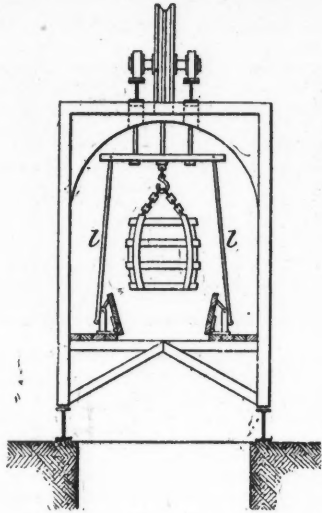


FIG. 7.

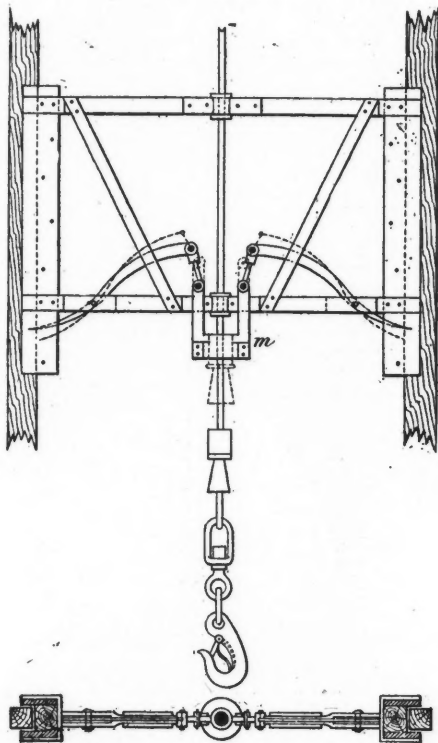


FIG. 8.

windlasses. The attachment frame was buttressed in the expansions left in the masonry for that purpose, and could be set free by loosening the guide ropes.

The ventilating pipes *g*, made of zinc sheet and 0.50 meters in diameter, were held between two ropes and made longer by adding tubes 4 meters long from above and lowering the guide ropes a corresponding distance. Vertical iron ladders, put in to facilitate the ascent in case of accidents, consisted of lengths 5 meters long, were suspended from heavy beams *P*, and were, when required, added to from below. From top to bottom two series of flat iron, also 5 meters long, ran parallel with and in a distance of 0.60 meters from the ladders, connected with these by iron hoops to which were attached light wooden laths closing the compartment. At every 5 meters a horizontal board resting on a hoop, within 0.40 meters of the ladder, served as escapes in an emergency. The whole compartment could readily be raised, its weight per meter being only 50 kilograms, and taken apart. The shaft could be stripped of all its fittings in eight days.

Thirty to forty cubic meters of water per minute were not encountered until in a depth of 200 meters. The shaft was set in brick down to 198 meters, and pure concrete poured in between the wall and the brickwork so that the water could not get behind the latter.

The coal seam was struck at a depth of 245 meters, but the shaft was carried further as water occurred between the first and second seam of coal.

The total length of the lining was 64 meters. The bottom cover resembles a false bottom reversed (Fig. 6). At the lower end was an ordinary moss box. The shaft was ballasted by admitting water through a valve situated in the bottom cover and controlled from the surface by a rod; the action of the moss box depended also on the water let in through that valve. Four tampers which were guided by wire-ropes attached to the second link of the ladder above the moss box, laid the concrete behind the shaft-lining in a space varying from 0.20 to 0.25 meters. In the lower

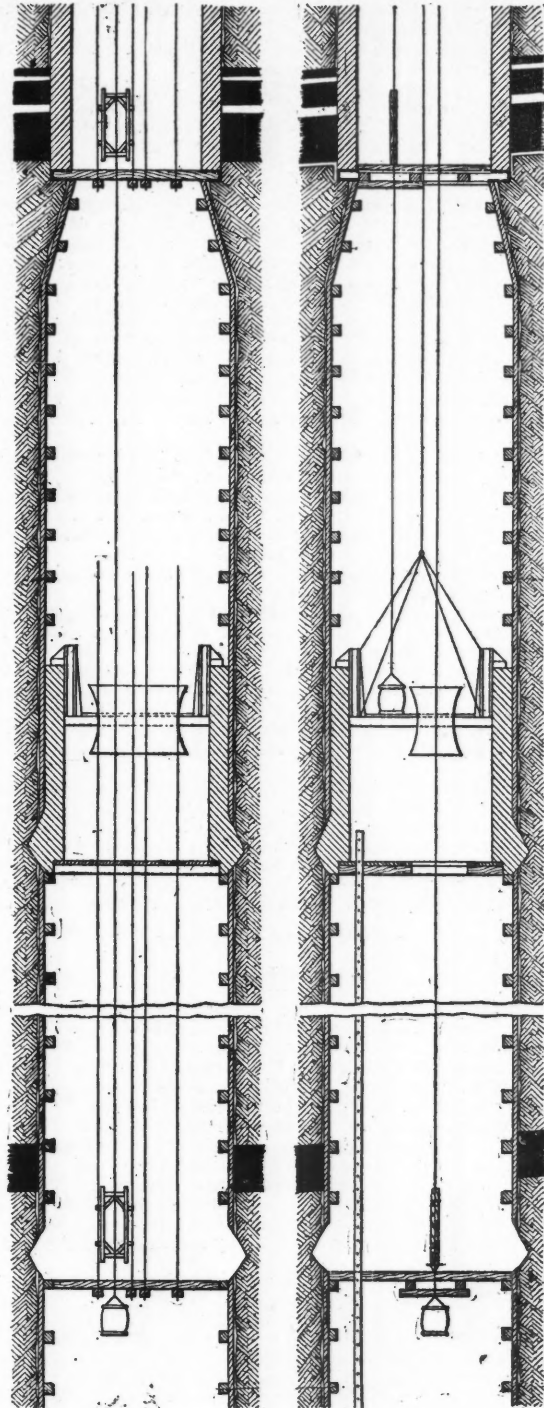


FIG. 9.

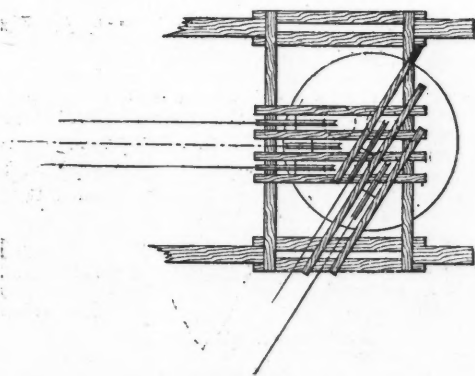


FIG. 10.

METHOD OF SIMULTANEOUS BRICKING AND SINKING.

part down to 240 meters and in the upper part from 184 to 183 meters pure cement was used as this only was considered water-proof under the pressure of 17 to 24 atmospheres.

The process succeeded in every detail, and dispensed with 175 meters of shaft lining, representing a saving of \$37,400.

Mr. Tomson, while engaged in sinking shaft 1 in the Gneisenau mine, devised a means to eliminate the danger arising from the exposure to atmospheric influences of the brick work not completed, and therefore apt to break and partly fall down. The two operations of excavating and of bricklaying can, by this plan, shown in Figs. 9 and 10, go on simultaneously. When 15 to 30 meters have been excavated, provision is made for the insertion of a solid framework, consisting mainly of three beams, and under this protection the excavation goes on further. When the miners reach a distance of 15 meters below that platform frame, masons start the work, at first on this and afterward on scaffolds, propped on the masonry by four bolts and suspended by a heavy steel rope of 60 millimeters diameter, controlled by steam from above.

Elliptic openings, whose axes are 2.55 meters and 1.15 meter, in the scaffold as well as in the fixed platform, are fitted with sheet-iron tubes in the shape of hour-glasses, allowing the two buckets of 0.80 meter diameter to pass, which are guided as far as the fixed platform by two ropes of 25 millimeters, and are raised and lowered by hoisting machinery at the rate of 10 meters a second. In 24 hours 700 tons of stones and water have been raised.

This system was applied below that part of shaft 1 which was lined by the Kind-Chaudron method, between the 245 meter and the 330 meter level, and the shaft with a diameter of 5.05 meters was sunk at a monthly average of 34 meters, with four-day shifts of 8 and 10 men, in a formation with a dip of 6 to 10 per cent., consisting of 65 per cent. of sandstone and puddling stone and 35 per cent. of slate and coal. The masons, in shifts of three, finished three meters a day, with special hoisting machine and two rope-guided buckets for their exclusive use.

The flaps which generally close shafts that are being deepened, and are let down when the bucket has passed through, frequently become slippery and give rise to accidents.

Mr. Raidant, superintendent of the Great Mambourg coal mines, has invented the automatic flaps shown in Fig. 7, which close by the action of the levers *ll*, when the bucket in its course comes in contact with the cross piece. In the Schmidtmannshall salt mine, near Aschersleben, a somewhat analogous apparatus opens and closes the flaps by means of only one lever.

In the last mentioned mine the bucket is directed by a cross-piece sliding between two wooden guides (Fig. 8). The intention is to prevent such shaking of the bucket as may result in some of its contents being spilt. The connection of the cross-piece and the rope is loose enough to allow the latter to slide in the muff-counter-weight *m*, so that if the cross-piece in its descent gets caught between the guides, it is arrested by a parachute brought into play by *m*, whilst the bucket continues its downward course.

#### TELPERAGE.

This is a name given to a recent development of the "wire-rope haulage" system, in which a train of buckets is moved over a suspended track or cable by means of an electric motor acting as a locomotive. It is the joint invention of Professors W. E. Ayrton, John Perry and the late Fleeming Jenkin. A paper by Frederick A. Fernald, in the *Popular Science Monthly* for July, describes the "telpher" line now in operation at Glynde, in Sussex, England. The structure consists of a line of posts 18 feet high and 66 feet apart with crossheads eight feet long at the top. Instead of a cable, round steel rods, 4-inch diameter, are used as the track, on which the buckets or "skeps," as they are called, travel. These slender rods sag under the weight of the loaded skeps, but the trains are made of the length either of one span or two spans, so that the part of the train coming up out of the depression is helped by the weight of the part going down into it.

A train consists of the locomotive and either five or ten skeps, in the latter case the locomotive being at the middle of the train. The skeps are spaced evenly, being connected by poles 14 feet long, in order to distribute the weight of the loaded train over a considerable length of rail. Each skep weighs 101 pounds and holds about 250 pounds of dry coal.

The locomotive consists of a Rekenzaun motor with the necessary gearing, driving wheels, etc. It is suspended from the track by two wheels which have rubber tires. The electrical current drives the motor at the rate of 1,600 to 1,700 revolutions per minute. No grip is needed, the friction of the rubber tires on the track being sufficient to enable the locomotive to climb a grade as steep as one foot rise in 13. In the wet season the rubber tires last only a fortnight, but in dry weather their life is much longer. An electrical governor controls the speed of the train so as to preserve a uniform speed while ascending and descending grades.

Each of the motors receives a power of about 1,500 watts, or two horse power, and as the potential is about 200 volts everywhere on the line, each motor receives about eight amperes when a train is running about four and a half miles per hour. The line at Glynde is a little under a mile in length.

In regard to possible applications of telpherage Professor Perry says: We have at present very modest aims. I should prefer for some time to simply develop the lines like the one we have at Glynde, but I am quite sure that in the future we shall have trains of skeps passing down empty into the coal mines and along the workings to be filled by the men as they dig coal from the face, coming back to the bottom of the pit, and moving up a vertical rod passing on to the ordinary lines at the surface. . . . That telpherage will be a general system of distribution of goods is a fact which is fixed in my mind so securely that no amount of disappointment or worry can remove it.

**Gold and Silver Production of Russia in 1889.**—In 1889 Russia produced 33,448 kilogrammes (2,207,568 ounces) of gold crushed from 20,300,050 tons of rock. The greater part (20,529 kilogrammes) was produced in Siberia. The production of silver during the same year is stated to be 13,273 kilogrammes, while the production of copper amounted to 4,571,015.

#### THE NAROD PULVERIZER.

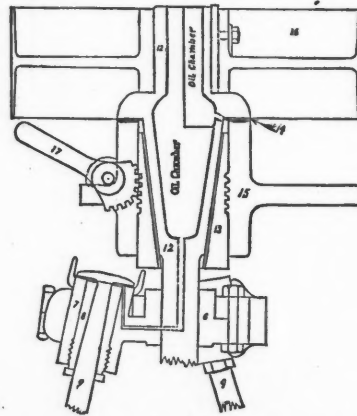
The American Ore Machinery Company, of No. 10 Wall street, New York, has recently perfected, and is now placing on the market a new pulverizing mill, for which it claims several useful improvements in construction. From the accompanying illustrations it will be seen that the machine in question is provided with three rolls, which travel round the chamber at the rate of 150 revolutions a minute, urged by the main shaft, and each roll is affixed to the upright shaft in such a manner as to be free to rotate within journal boxes that are arranged in the head. While the main shaft is revolving the rolls as a whole, one way, the rolls themselves are revolving 450 times a minute in the opposite direction.

The head of the mill is of small diameter compared with the diameter of the chamber, so the rolls have to swing outwardly into positions which cause their shafts to diverge from each other. This is provided for by trunnions or journals fitting in the recesses or bearings of the head. The friction which is generated at the surface of the rolls in their rotation causes them to rotate on their own axes as they are revolved around the chamber.

Above the chamber is a circular screen, with a slight upward taper, within the shell. Through this screen the pulverized material is forced by the spiral flange fans, and then it falls into the hopper.

The inventor of this mill is Mr. Vietts L. Rice, who claims in his patent the following:

The combination in a pulverizing mill of a chamber for receiving material to be pulverized, a main shaft, a number of rolls, shafts upon which these rolls are mounted, a head connected to the main shaft, and oscillating journal bearings having such relation to the main shaft that when the rolls are at rest the rolls will fall away from the chamber; the connection of the rolls in such a way as to allow them to revolve upon their own axes independently; the spiral flange; an adjustable bearing sleeve for the main shaft; a journal box receiving the roll shaft and having an oscillating connection with the head; the main shaft with a downwardly tapering portion, a frame or standard through which it passes, a pulley attached to the upper end of the main shaft, with a bearing on the frame for the purpose of sustaining the main shaft vertically, a sleeve having an upwardly flaring interior surface fitting the downwardly tapering portion of the main shaft, and a lever engaging with the sleeve for adjusting it longitudinally.



SECTIONAL VIEW OF BEARINGS, NAROD MILL.

6. Steel Head for Trunnion Boxes. 7. Trunnion Boxes. 8. Brass Liners in Trunnion Boxes. 9. Roller Shafts. 12. Main Conical Shaft. 13. Sleeve Box for Main Shaft. 14. Washers under Main Shaft Collar. 15. Top Casting for Sleeve Box. 16. Pulley. 17. Adjusting Lever for Main Shaft Box.

It is claimed for this mill that it is the only one having tapered journals oiled from the top, which makes it impossible for any of them to heat in working. The oil chamber is situated in the center of the shaft, which is hollow. All four of the top journals have adjustable boxes, so that the wear can be taken up without removing any part of the machinery. The mill is so constructed that the journals are protected from dust, and it is next to impossible for any to enter.

The rolls and ring (or inner chamber) are made of chilled carbon iron, a material so hard that a file will not touch it, and it is claimed by the inventor that they can neither groove nor chip, nor wear into flat surfaces. The rolls are solid, and connected with shafts which revolve in trunnion boxes, giving them free play against the ring at a pressure of nearly or quite 8,000 pounds to the square inch. The spiral adjustable fans are so arranged as to elevate and discharge from the mill all material as soon as it is ground to a proper degree of fineness to pass through the screen, which can be of any mesh required. In a recent test some phosphate rock ground by this pulverizer passed 98 per cent. of it through a 100-mesh sieve.

One of the "Narod" mills now in operation at the Atha Steel Works, Warren Street, Jersey City, disposed of five tons an hour, giving a finished product that passed through a 60-mesh screen. As the fineness increases, naturally, the capacity of the mill decreases. The material is discharged through the bottom into a hopper to a conveyer by which it can be taken to any desirable spot.

The only wearing parts of the "Narod" mill are the rolls and ring, which are made of a material best calculated to resist the effects of friction.

**Water Tube Boilers.**—Water tube boilers are making very rapid headway abroad. At the Paris Exhibition they were the most numerous class of boilers shown, and three of the exhibitors received the grand prize. One of these boilers, the Belleville, is being used very extensively in both war and mercantile ocean vessels. Since January, 1879, no less than 429 of these boilers have been supplied to different boats, the heating surface of which aggregated nearly 276,300 square feet.



**CURIOS BESSEMER PRACTICE.**

Written for the Engineering and Mining Journal by Henry M. Howe.

In the February number of *Stahl und Eisen*, Dr. F. G. C. Müller gives, with his usual lucidity and charm, an account of the very curious Bessemer procedure at the Nischnje-Saldinsk works, in the Urals. This practice was first stumbled into, found, with surprise, to be possible, seen to suit their unusual conditions, and then adopted and modified into its present shape.

The ore most available for their blast furnaces, the Wisokaja Gora magnetite, has the following composition:

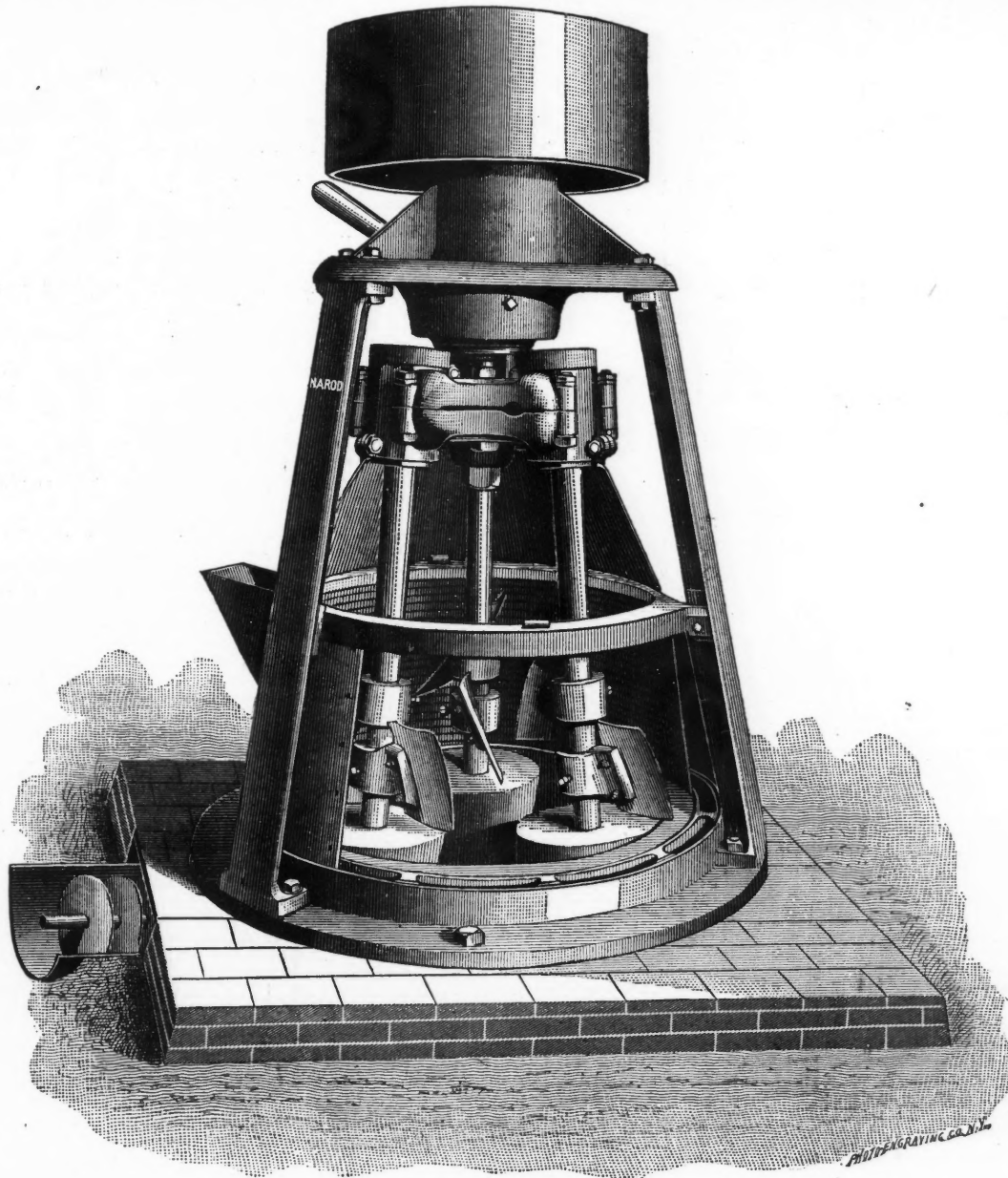
SiO <sub>2</sub>	2.85.	CaO	0.99.
Al <sub>2</sub> O <sub>3</sub>	1.80.	MgO	0.98.
FeO	16.71.	Cu	0.06.
Fe <sub>2</sub> O <sub>3</sub>	75.40.	P	0.03.
MnO	1.30.	S	trace.

This ore can be smelted without fluxes, yielding 20 per cent. of slag.\*

coal per 100 of pig, each of their three blast furnaces turns out about 18 tons of pig in twenty-four hours, with some 30 per cent. of slag. They are, however, so very sensitive that the proportion of silicon in the pig varies capriciously—all the way from 0.8 to 2.5 per cent. So irregular in composition is the cast iron that all thought of working it "direct" was abandoned; it was cast in pigs and remelted in a Siemens' furnace.

To avoid both loss of silicon and waste of fuel, the iron was tapped into the converter as soon after melting as possible. Under these conditions the Bessemerizing was of the English type; that is to say, with a rather high proportion of silicon, and rather low initial temperature.

But one day it happened that, through delay in the converting department, the iron had to lie an hour and a half in the Siemens furnace. Here, of course, it puddled away till when it was finally tapped into the converter its silicon had fallen to 0.8 per cent., and its fracture was quite white. Instead, however, of blowing "cold" as they feared, it "worked hot" from the first, so hot indeed that they had to "scrap" it. The explanation was very simple. Though the iron had lost most of its heat-developer, its silicon, it had meanwhile taken up enough sensible heat in



THE NAROD PULVERIZER.

but the resulting cast-iron is hardly silicious enough for Bessemerizing, containing only 0.2 to 0.3 per cent. of silicon if cold blast be used, and even with hot working and blast at 550 degrees C. (1,023 degrees F.), they can hardly get more than 0.9 per cent. of silicon in the pig. In order to raise the proportion of silicon and manganese, silicious and manganiferous materials are added, and the burden is composed as follows:

Wisokaja Gora ore.....	85.6	per cent.
Heating furnace cinder.....	6.2	"
Manganese ore .....	3.3	"
Sand.....	4.9	"

100.0 per cent.

With blast at 540 degrees C. (1,004 degrees F.), and 110 pounds of char-

\* At least, so Müller says. Ore of the above composition, however, would hardly yield so much slag, unless the charcoal had an extraordinary quantity of ash, or an extraordinary quantity of iron were slagged. Hence, the composition given above is probably richer than the average.

the Siemens furnace to compensate for this loss. What it had lost in potential it had gained in actual heat. The Bessemerizing was in this case of the Swedish type, *i. e.*, with little silicon but high initial temperature.

It was now seen that, in view of another peculiarity of their situation, this Swedish type of Bessemerizing, thus bungled into, was really preferable to the English.

This peculiarity was the enormous quantity of scrap which they made, and which they had, or thought they had, to use in the Bessemer converter. Their rail-mill turned out not less than 25 to 30 per cent. of scrap. What to do with it was a most serious problem. It promised to swamp and sink the establishment; for in the Urals scrap is not readily disposed of. Why they did not whip their rail-mill into less atrocious condition we are not told; nor are we told why, failing this, they could not use up their scrap in the pig-and-scrap or pig-and-ore open-hearth process. However, be their reasons good or bad, they did not, but adopted the following curious procedure:

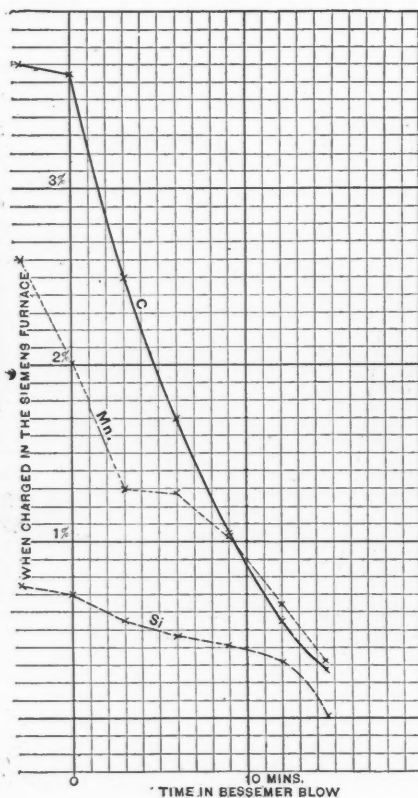
The cast-iron is taken direct from the blast furnace in traveling ladles and poured into a Siemens melting furnace. Here the melter, guided by

its fracture, mixes with it enough scrap to reduce its silicon to about 0.8 per cent., and heats it at least to 1,400 degrees C. (2,552 degrees F.), and occasionally to 1,500 degrees C. (2,732 degrees F.). It is then tapped into the converter and blown in the usual way.

The Siemens furnace, then, plays the triple part of nullifying the irregularity of the smelting, of controlling the initial temperature of the blow, and of using up their burdensome and threatening scrap. This is done at a certain cost: the outlay for fuel, labor and repairs connected with the Siemens furnace, and the scorification and loss of some iron. What the fuel consumption is we are not told, but it should be considerable. It is true that little of the sensible heat of the cast-iron issuing from the blast furnace is lost, and that the carbon, silicon and manganese which puddle out, yield their heat to the bath, the carbon indeed burning to carbonic acid, and hence yielding more heat than if it were burnt in the converter, where it yields carbonic oxide for the most part. On the other hand, the scrap, which sometimes amounted to 40 per cent. of the charge, has to be heated to a very high temperature, and in an apparatus (the Siemens furnace) whose calorific efficiency is very low compared with that of the cupola, the blast furnace, or the converter.

Finally, this procedure has the advantage that it not only dilutes but in part removes the carbon of the cast iron, so that the Bessemerizing is shorter and hence cheaper. Carbon, of course, is, on the whole, very objectionable, for, contrary to Bessemer's expectation, it really yields but little available heat usually, and calls for great expenditure of blast and hence of power and time for its removal.

The order of removal of the non-ferrous elements is shown in the accompanying table and diagram. As might have been anticipated from



the initial high temperature and low proportion of silicon, this element, instead of burning quickly at first, oxidizes slowly till most of the carbon is gone, and then goes with a rush.

Note that in the second series the removal of all three of the elements is very much less in the second three-minute interval than in the first. This may be due to error in sampling, to temporary diminution of the rate of blowing, or possibly to the conversion of a larger proportion of the carbon into carbonic acid instead of carbonic oxide during the second than during the first interval. But the proportion of carbonic acid to oxide in our published analyses decreases, instead of increasing, as the blow proceeds.

Looking at this procedure in another way, we may regard it as the reverse of the compound procedure so often proposed, and now again coming into prominence in Bohemia, viz., beginning the conversion of cast-iron into steel in a Bessemer converter and ending it in an open-hearth furnace. At Nischnje-Saldinsk the conversion begins in the open-hearth furnace—for necessarily the metal must first there, must lose some carbon silicon and manganese—and ending it in the converter. This inverted compounding, however, has less to recommend it than its reverse.

We need not expect to see it often adopted. Indeed, if such irregularity in the blast-furnace work and such abominable rail-mill practice are to be permitted, it would certainly seem better to meet the former, either by using a mixer like that at Braddocks, or by remelting in cupolas; and the latter either by turning the rail-ends at once into open-hearth steel, as already suggested, or by charging them in the converter before and during the blow, and perhaps melting part of them in the cupola with the cast-iron.

The procedure, then, may be regarded as one of the curiosities of metallurgy, adapted to peculiar and peculiarly bad conditions, if to any.

REMOVAL OF NON-FERROUS ELEMENTS.

Series I.

	Percentage present.			Removal.		
	C	Si	Mn	C	Si	Mn
When charged into Siemens furnace.....	3.06	1.31	2.37			
When charged into converter.....	2.28	1.18	1.72	.78	.13	.65
Blown 4 minutes.....	1.34	0.68	1.12	.64	.33	.32
Blown 8 minutes.....	0.70	0.35	0.80	.42	.33	.68
Blown 12 minutes.....	0.28	0.02	0.12			

Series II.

	Percentage present.			Removal.		
	C	Si	Mn	C	Si	Mn
When charged into Siemens furnace ..	3.70	0.75	2.60			
When charged into converter.....	3.65	.70	2.01	.05	.05	.59
Blown 3 minutes.....	2.50	.56	1.31	1.15	.14	.70
Blown 6 minutes.....	1.70	.47	1.29	.80	.09	.02
Blown 9 minutes.....	1.05	.43	1.04	.65	.04	.25
Blown 12 minutes.....	.55	.33	.65	.50	.10	.39
Blown 14.5 minutes.....	.28	.03	.31	.27	.30	.34

NOTES ON THE CHEMISTRY OF CARBURIZATION.

Written for the Engineering and Mining Journal by A. D. Elbers.

“ Seal in a glass tube iron oxide and carbonic oxide; heat them to 1,000 degrees C.; some of the oxygen leaves the iron and unites with the carbonic oxide, yielding a mixture of carbonic oxide and acid. After a sufficient length of time all further action ceases. But now raise the temperature still higher, and some of the oxygen returns to the iron; lower it and oxygen returns to the carbonic oxide.”

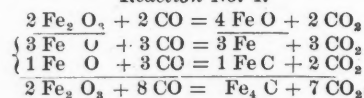
The foregoing quotation from the editorial in the ENGINEERING AND MINING JOURNAL, June 14th, on “Attenuated Scientific Deductions” gives rise to the following notes:

If the monoxide gas were introduced in the exact proportion of, say 6CO to 2Fe<sub>2</sub>O<sub>3</sub>, if the heating were continued for a sufficient length of time, and if deoxidation of the iron oxide and a corresponding production of dioxide gas were the only reactions that did ensue, then the only ultimate result possible, according to our present knowledge of chemical laws, would be: complete deoxidation, viz., 2Fe<sub>2</sub>O<sub>3</sub> + 6CO = 4Fe + 6CO<sub>2</sub>.

If the tube were then heated more intensely the metallic iron might become temporarily oxidized to magnetic oxide (3Fe + 4CO<sub>2</sub> = Fe<sub>3</sub>O<sub>4</sub> + 4CO), but this reaction would be speedily reversed as soon as the heat were lowered to that point at which it is too low for the CO<sub>2</sub> to reoxidize iron but still high enough for the CO to reduce oxide. The two gases cannot react on each other, their combined volume remains practically the same in whichever way their relative proportions may become rearranged, and the initial condition of the contents of the tube cannot be reestablished, because the metallic iron cannot reoxidize higher than Fe<sub>3</sub>O<sub>4</sub>, as long as free CO is present; hence the first complete reduction must also be the ultimate result, viz.: 4Fe + 6CO<sub>2</sub>. If this result cannot be obtained, then some intermediate reaction must occur which has not been accounted for.

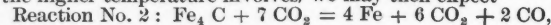
Having only to figure with three elements (Fe, O, C), and having only considered the combinations of Fe + O and CO + O, it is evident that we must look for the missing reaction in the direction of the combination of Fe and C. According to the new carburization theory already described (ENGINEERING AND MINING JOURNAL, February 22d, 1890, p. 227), a part of the iron oxide might then be supposed to react as follows:

Reaction No. 1.



Eight volumes of gas have changed to seven, and this attenuation is probably sufficient to check the progress of carburization. Hence only a part of the iron can become carburized, even when the tube contains sufficient of the monoxide gas to carburize the whole of it.

After raising the heat to that point where the CO<sub>2</sub> will become active (its previous attenuation being partly compensated by the expansion which the higher temperature involves) we may then expect



and later on, Reaction No. 3: 4Fe + 6CO<sub>2</sub> + 2CO = Fe + Fe<sub>3</sub>O<sub>4</sub> + 2CO<sub>2</sub> + 6CO, or more correctly: 3(4Fe + 6CO<sub>2</sub> + 2CO) = 4Fe<sub>3</sub>O<sub>4</sub> + 2CO<sub>2</sub> + 22CO.

Now, lower the temperature, and the result must again be: Fe<sub>4</sub>C + 7CO<sub>2</sub>, the same as in Reaction No. 1, and these changes can, theoretically, be reproduced ad libitum, whereas it is theoretically impossible to reverse the complete deoxidation of the ferric oxide (the theoretical result of the introductory proposition).

Practical demonstration may, however, be hampered by the difficulty of regulating the critical temperatures of the experiment to a nicety. It would certainly be advisable to begin with less than 1,000° C, and with as low a heat as is known to produce carburization. The supply of monoxide gas should be, at least, in the proportion of 8 CO to 2 Fe<sub>2</sub>O<sub>3</sub>.



An excess of the gas can do no harm, as will be readily perceived by repeating the foregoing equations (No. 1-3) with 10 CO instead of eight.

This increase tends only to increase the surplus of that gas which happens to be chemically inactive at one or the other critical temperature. A so-called "equilibrium," or "inertness" of the two gas volumes, as the result of their relative proportions, cannot obtain for the following reasons: When an extraneous force supplies the heat for the heat-absorbing reactions that can take place at a given temperature, then the following law must operate:

"Of the combinations that can be formed at a given temperature (at which the one gas has chemical affinity for oxidized iron, and the other for either metallic or carburized iron), those will be formed, the formation of which sets free the most heat."

Hence if the ultimate result, at that temperature, be:  $4 Fe + 6 CO_2 + 2 CO$ , and if we could then add, say, 60  $CO_2$  and 2  $CO$ , the reversed or any other quantities of the respective gases, it would make no difference "at that temperature," because that which is in excess must, under given conditions, remain in excess until it can either react on itself or "skip."

HOBOKEN, N. J., June 20, 1890.

**BOWERS' ROLLER QUARTZ MILL.**

We illustrate herewith the Bowers' Roller Quartz Mill. The distinguishing feature and claim of superiority of these rolls over others for crushing quartz and other hard substances consists in their shape. Fig. 1 shows old style Cornish rolls when new. Fig. 2, the same after use and Fig. 3 the Bowers' improved crushing rolls, which are said to wear even

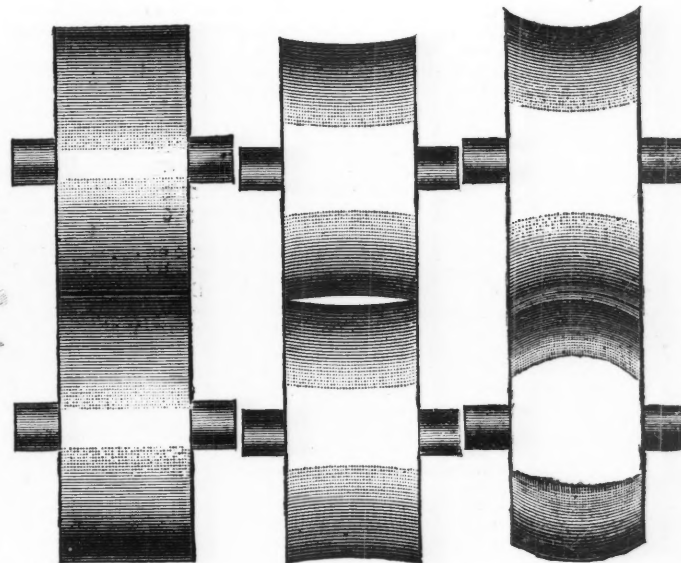
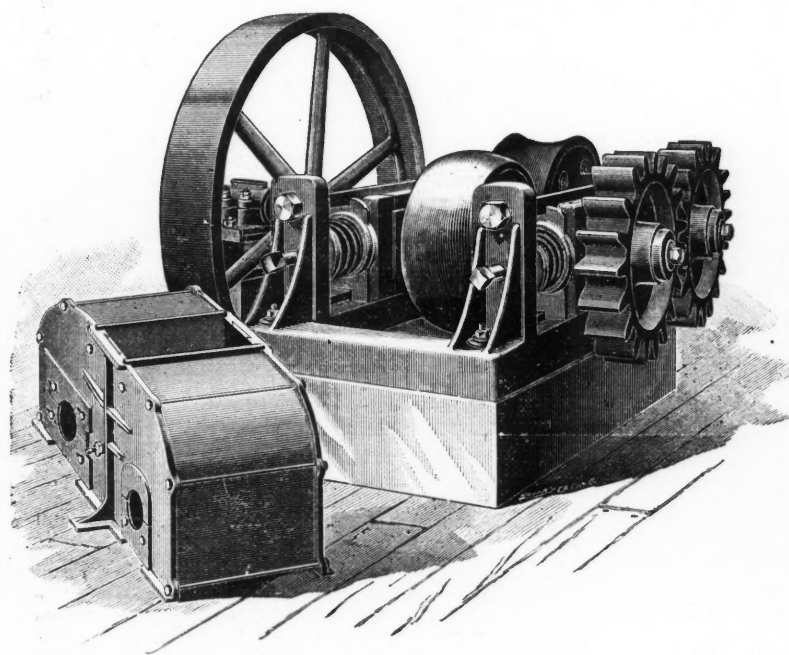


FIG. 1.

FIG. 2.

FIG. 3.

and true on their faces, thus retaining their shape and insuring good work until the steel shells are worn out.

They are highly recommended for either wet or dry crushing, and for either silver, gold, cement, phosphate, or concentrating mills. The old Cornish rolls were in use for crushing ores long before the introduction of stamps; but, owing to the fact, that the faces of both the rolls soon wore concave, thus preventing them from crushing fine enough for metallurgical purposes, the introduction of stamps became necessary. In the Bowers' roller mill one roll is made concave on its face, and the other is made convex on its face, which improvement, together with other details in construction, it is claimed, remove the objections to the Cornish rolls.

Mr. Bowers' roller quartz mill is a good substantial machine, capable of reducing the hardest quartz with great rapidity, and shows great saving in space, power, labor, size of buildings, excavations, &c., as compared with stamps. These roller mills occupy only about one sixteenth the space required for stamps to do the same work.

The claims of superiority made by the manufacturers for this machine are: They consider it a better and cheaper mill than Stamps, saving in labor and in power.

Stillwell & Bierce Manufacturing Company, of Dayton, O., is sole manufacturer of the mill.

**METALLURGICAL USE OF FLUORSPAR.**

(Concluded from page 706.)

Fluorspar was formerly the most important flux for smelting copper ores in the German stack, as well as in the English reverberatory furnace. The Mansfeld copper slate, for instance, was fluxed with up to 10 per cent. of fluorspar, the cost of this being about 8 per cent. of the total smelting cost. The effect of this flux depended essentially on the volatilization of fluor silicon, whereby the strongly acid slag was reduced in silica. The introduction of improved and heated blasts in the Mansfeld works has almost confined the use of fluorspar to the blowing in of furnaces. Five per cent. of fluorspar is commonly added at the start, but the quantity decreases gradually until after from two to five weeks no fluorspar at all is

used. The English reverberatory furnace process fluxed formerly with as much as 10 per cent. of fluorspar, but nowadays this takes place only with ores rather rich in arsenic. Fluoride of calcium with arsenic metals gives very volatile fluoride of arsenic, which, with a reducing flame, easily escapes. The risk of loss involved in the volatile fluoride of copper necessitates the presence of excessive carbon whenever fluorspar is employed in the metallurgy of copper.

While fluorspar is at present of small value in the treatment of copper ores containing sulphur, its property to give very fluid combinations with gypsum and barytes may prove an important means to work poor oxides and silicious ores as well as charges containing azurite, malachite, red oxide of copper, atacamite and earthy red oxide of copper, by reducing the smaller part of the sulphate and forming a matte very rich in copper, and by forcing its larger part together with the fluoride of calcium into the slag which thereby becomes thin and very fluid. Equal quantities of fluorspar with gypsum or barytes produce the most fluid slag. A significant point particularly with poor ores high in silica is that this slag is poor in copper—a fact on which was based the former Freiberg practice of resmelting the copper slag, together with pyrites and fluorspar, thus obtaining copper matte and poor slag, the intention probably being to enrich the matte in copper and impoverish it in iron.

Fluxing copper ores containing nickel, with fluorspar is very favorable for the collection of the nickel in the matte, and has been in use in the Riechelsdorf, Grünthal and Mansfeld works. The chemical process is still entirely obscure and worthy of study in the laboratory. Possibly nickel arsenic is decomposed in volatile fluoride of arsenic and nickel, which

latter goes into the matte. Fluorspar is an almost indispensable flux for making tough copper and, generally, whenever silicon, which makes copper highly brittle, has to be removed. As a means to produce a matte poor in iron in the reverberatory furnace, a mixture of fluorspar, barytes and quartz is more energetic and rapid than an addition of only the two last named, the proportion of the fluorspar and the barytes being for this purpose as between one and three, whilst the quantity of quartz depends on how much iron the roasted matte contains. Too much fluorspar gives a matte rich in iron. For refining and remelting copper, fluorspar finds a constantly increasing use. Mixed with some soda it is the most excellent means to remelt copper ingots and to remove from the metal bath small quantities of arsenic and silicon. The process is kept a secret; the refining slag is, however, reported to be remelted with gypsum or glauber salts and fluorspar.

The introduction of the Pilz and Raschette furnace has made lead and silver smelting without fluorspar a possibility. It is too expensive for this purpose, except for particularly refractory ores; but it has proved most excellent to flux ores containing barytes and zinc. Possibly the temperature of the slag formation is reduced, thus diminishing the quantity of metal that is lost through volatilization. This is of greater importance in the reverberatory than in the stack furnace, so that the use of fluorspar might occasion a special modification of the English reverberatory furnace process, a Derby process, with a flux of about seven per cent. fluorspar. For resmelting lead slags also, a small fluorspar flux is serviceable. It is used, too, for smelting on the Spanish slag hearth.

As in improved lead works the ores to be smelted are almost invariably first roasted, we find, the fluorspar is added at the roasting. The quantity varies from 1 to 5 per cent. according to the percentage of the quartz in the ores. One per cent. of fluorspar, if ground as finely as possible, causes a noticeable economy in fuel. As this flux lowers the temperature in the roasting furnace and shortens the roasting process, the yield of metal must also be favorably affected.

In refining, also, fluorspar is very advantageous, especially when sprinkled on the bath in a fine powder. The litharge is thereby made thinner and retains fewer metallic grains mechanically. The same effect

is reached by adding a small quantity of soda, or mixture of soda and fluorspar.

The slags from tin ores are generally very acid in the stack as well as in the reverberatory furnace. As it is particularly desirable here to reduce the quantity of slag as much as possible, fluorspar, which has this property and in addition makes the slag fluid, has long ago found use, especially in English tin works, where it sometimes forms five per cent. of the charge. Commonly, burnt limestone and fluorspar are mixed, although it seems far preferable to employ soda than lime. The fluorspar fluxing must not be too liberal, as otherwise the furnace walls are attacked and tin seems then to go into the slag. Very impure Peruvian tin is made incandescent in the reverberatory furnace with a mixture of powdered fluorspar, salt, and soda.

Fluorspar with zinc ores is very undesirable, as it attacks the distilling vessels. On the other hand, in order to overcome this obstacle, a material composed of pure quartz-sand with about 3 per cent. fluorspar and some soda has tentatively been used for tubes and muffles which, though apt to frit on the surface in annealing, become, on the escape of fluorspar, far more dense and fire-proof than otherwise can be obtained. In fact, a small quantity of fluorspar is regularly used in any considerable factory making fire-proof ware. The ordinary zinc-distilling vessels are said to be extraordinarily improved by a glaze baking consisting of sulphate of zinc and fluorspar in equal quantities, in regard to product as well as the durability of the muffles. In refining pig zinc the remelting is sometimes facilitated by adding a mixture of glauber salt, rock salt and fluorspar.

When the price is not too high, fluorspar is an advantageous means of fluxing garnierite, but still more important in the concentration of speiss.

Fluorspar has been recommended for regenerating brittle silicon platinum, by keeping the platinum in powdered fluorspar incandescent and cemented long enough to enable the total amount of silicon to escape as a fluoride. It appears, however, more rational to substitute fluorammonium for fluorspar, the price being immaterial because of the small quantity used.

It would be a worthy object for scientific ambition to study the physical properties of fluorspar experimentally smelted together with oxides of metals, ores and metal salts, with or without fluxes of silicates and sulphates, and in different proportions, specially if the range of the investigation were extended to the conduct of metal fluorides and silicon by incandescence in oxidizing and reducing atmosphere.

#### GEMS AND PRECIOUS STONES.

The *Chemical News*, of London, in its issue of June 6th, says:

"This beautifully got up and richly-illustrated volume is not easy to characterize. It is not a monograph of the precious stones of North America, including, as it does, much matter of which the mineralogist can take no account. Still, he will find here abundant valuable information of the North American localities in which such stones have hitherto been found. The author is of opinion that, *e. g.*, the daily yield from the South African diamond mines would exceed in value the entire yearly output of precious stones in the United States. He gives an account of alleged valuable gems which, when they came into qualified hands, were found to be nearly worthless.

"The author gives some hints which may save prospectors from much disappointment at least as far as diamonds are concerned. He explains the error—one of the many delusions contained in the writings of Pliny—that a diamond will not break if struck with a hammer. It is suggested that good specimens may have been destroyed by this rough and fallacious test. As the simplest criterion, the finder is advised to try if a specimen will scratch corundum. If it does so, and if it is not scratched by a diamond, it may safely be assumed to be a diamond. This subject naturally leads to the much disputed question of the origin of diamonds. The rocks in various parts of the United States where diamonds have been occasionally found have been compared with those of Kimberley, which are much more recent formations. Itacolumite, like that of Brazil, has been found in North Carolina but no diamonds have actually been discovered in this formation. It has been recently contended that the diamond is not of terrestrial, but of cosmic formation. This theory receives some confirmation from the fact that diamonds have occurred in meteorites. In 1884, Sir H. E. Roscoe, as here quoted, stated in a paper read before the Literary and Philosophical Society of Manchester, that on digesting some of the 'blue' soft diamond earth of South Africa in ether he obtained a small quantity of an aromatic crystalline body.

"The work before us is unique in its plan, no less than in its accurate and splendid illustrations, and will be welcomed by all lovers of precious stones."

**Chinese Copper.**—Tang Chiung, ex-Governor of Yunnan, has forwarded to Peking from Yunnan about 300 tons of copper. Mining has, however, been carried on there under difficulties, the ventilation being bad and floods occurring, while there is a want of transport, and copper has been stolen. He, however, expects better results in the future. About one hundredweight of copper is obtained from one ton of ore. At Ch'ingki, in Eastern Kueichon, machinery has been imported from Europe to smelt iron, but the works got flooded, and delay has thus been caused.

**Crushed Steel.**—This material is said to be coming into use for cutting stone. It appears to be made by quenching very high-carbon steel in cold water from an excessively high temperature, such as would overheat steel for most purposes. This renders it not only hard, but rather brittle, so that it is possible to pulverize it; it is crushed in a stamp-mill, and sifted closely to size. It is said to be not only cheaper but much more effective than emery, giving a better polish and quicker, and lasting much longer.—(W. METCALF and J. A. BRASHEAR in *Trans. Eng. Soc. W. Penn.*, v. p. 167).

**Compound Peat Fuel.**—A St. Petersburg journal states that a Russian civil engineer, M. de Nicaloff, has succeeded in producing a fuel from peat greatly resembling anthracite coal. The inventor has obtained a patent for his process, which is said to be accomplished by the aid of certain chemicals, and lately an imperial commission has been engaged in

experimenting with the fuel, the result having been very favorable. The peat was found to give a little less heat than ordinary coal, but more than fir or birch wood, which is largely used on railways and steamers and in factories in Russia. In other respects, however, the peat is superior to coal, being cheaper, containing but a very small percentage of sulphur, and being much smaller in bulk. The artificial fuel throws off no dirt and emits no smell, while burning with a clear white flame.

**Artesian Wells in the West.**—The Senate Committee on Irrigation and Reclamation of Arid Lands held a session on the 24th inst., to hear the chief engineer and the agent in charge of the artesian wells investigation. Colonel E. S. Nettleton, chief engineer, read a brief report. The Dakota artesian basin is shown to be the largest in the world, so far as at present developed. Water may and doubtless will be found over an area east and west of at least 500 miles, and north and south through both the Dakotas. Special Agent R. J. Hinton said that about 200 farmers are using their waters to irrigate at least 10,000 acres. The use of artesian water for irrigation is extending.

**The Panama Canal Company.**—The report of the committee appointed to investigate the position of the shareholders and bondholders of the Panama Canal Company was submitted on the 21st inst., in the Chamber of Deputies. It recommended that the petitions of the shareholders and bondholders be returned to the Ministry of Justice. M. Delaunay, in the course of the debate on the report, urged that more light ought to be thrown upon the enterprise, especially in the interest of small holders who had invested all their savings in the shares of the company. M. Gauthier declared that the authorities could not decline to interest themselves in the question. M. Falliers, Minister of Justice, replied that the authorities had never accepted a joint responsibility for the enterprise, but that the Government had not remained insensible to the disaster befalling it. In a few days the official liquidator would be able to report on the present position of affairs, and when it was established who were the responsible parties the Ministry of Justice would intervene, if necessary. In the meantime, he consented to the return of the petitions without in any way pledging the Government.

Panama shares were quoted nominally at 46 francs on the 22d inst. Lieutenant Wyse, who was sent to Colombia to arrange for the extension of the Panama Canal concession, cables that he has received assurance that the Colombian government will support him in his mission.

The committee which was sent to Panama to investigate the condition of the canal made a further report on the prospects of the enterprise on the 27th inst. The committee says that the construction of the canal at the calculated level would occupy twenty years, and would cost 1,737,000,000 francs. In the opinion of the committee the work could only be completed on the basis of an international agreement or a syndicate of the states interested.

#### PATENTS GRANTED BY THE UNITED STATES PATENT OFFICE.

The following is a list of the patents relating to mining, metallurgy, and kindred subjects, issued by the United States Patent Office:

- PATENTS GRANTED TUESDAY, JUNE 27TH, 1890.
- 430,617. Drill Tube Coupling. Milan C. Bullock, Chicago, Ill.  
 330,653. Process of Producing Plumbeates of Alkaline Earths. George Kassner, Breslau, Germany.  
 430,671. Miners' Safety-Lamp. William J. McDowell, Shoe, Pa.  
 430,675. Trolley Carrier. David C. Nelson, Quincy, and Walter R. Eaton, Cambridge, Mass.  
 430,681. Steam Engine. Russell Phillips, Boston. Assignor of four-fifths to Benjamin P. Ryder, East Braintree, and Franklin Keith, East Bridgewater, Mass.  
 430,691. Miners' Lamp Holder. Warren C. Rockwell, Mount Carmel, Pa.  
 430,700. Portable Drilling Machine. Charles L. Smith and Charles H. Westerman, Jamestown, N. Y.  
 430,701. Artificial Fuel Press. George Y. Smith, Minneapolis, Minn.  
 430,709. Car Coupling. William D. Thurmond, Forsyth, Ga., Assignor to the Thurmond Car Coupling Company, of West Virginia.  
 430,710. Welding and Upsetting Machine. Bernard Toulouse and John Delorieux, San Francisco, Cal.  
 430,713. Lead Joint Runner. William Vanderman, Willimantic, Conn.  
 430,718. Machine for Shearing Sheet Metal. Levi K. Williams and Charles A. Williams, Chicago, Ill.  
 430,724. Brick Kiln. John N. Bailey, Goodson, Va.  
 430,729. Car Coupling. Alfred Colvin, Carrollton, Miss.  
 430,738. Car Coupling Drawhead. John J. Laffin, Toronto, Ontario, Canada.  
 430,741. Ore-Roasting Apparatus. John R. Moffitt, Chinese Camp, Cal.  
 430,743. Car Coupling. Thomas L. McKeen, Easton, Pa., Assignor to the Thurmond Car Coupling Company, of West Virginia.  
 430,750. Method of and Apparatus for Manufacturing Metallic Car Wheels. Samuel H. Ralston, Norristown, and John R. Jones, Philadelphia, Pa.  
 430,758. Magnetic Ore Separator. Harris B. Smith, Bridgeport, Conn.  
 430,780. Railroad Tie. Hosea W. Libbey, Boston, Mass.  
 430,800. Chute-Loader. Thomas R. Griffith, Wilkes-Barre, Pa.  
 430,812. Lubricant. John J. Stock, Watertown, N. Y.  
 430,834. Heading Forging and Upsetting Machine. William L. Clouse, Tiffin, Ohio. Assignor to William R. Anderson, same place.  
 430,837. Hydraulic Forging Press. Charles Davy, Sheffield, England.  
 430,838. Method of Electric Welding or Metal Working. Mark W. Dewey, Syracuse, N. Y. Assignor to the Dewey Corporation, same place.  
 430,839. Apparatus for Working Metals by Electricity. Mark W. Dewey, Syracuse, N. Y. Assignor to the Dewey Corporation, same place.  
 430,844. Machine for Fruing Tires. Peter Gendron, Toledo, Ohio. Assignor to the Gendron Iron Wheel Company, same place.  
 430,847. Friction Hinge. Jott Grant, Boston, Mass.  
 430,854. Hydrocarbon Generator and Burner. Albert L. Holland, Minneapolis, Minn., Assignor of one-half to Robert H. Branton, same place.  
 430,884. Pulverizing Mill. Vietts L. Rice, New York, N. Y.  
 430,886. Car-Wheel. Cyrus Roberts, Three Rivers, Mich.  
 430,895. Car-Brake. John I. Stafford, Ramsey, Ill.  
 430,907. Friction Clutch. S. Lloyd Wiegand, Philadelphia, Pa.  
 430,914. Water Tube Boiler. William S. Black, Baltimore, Md.  
 430,917. Car-Coupling. Charles J. Bumpus, Fayette Station, W. Va.  
 430,929. Revolving Roasting Furnace. George Duryer, Orange, N. J.  
 530,937. Glass Annealing Oven. Andrew Ferrari, Glassborough, N. J., Assignor to the Whitney Glass Works, same place.  
 430,939. Railroad Joint. Frederick S. Foltz, U. S. Army.  
 430,953. Car-Coupling. Hugo Hill, Detroit, Mich., Assignor of one-third to Herman Schroeter, same place.  
 430,955. Steam-Boiler Furnace. S. Perry Holmes and Henry Sieben, Burlington, Iowa.  
 430,957. Car-Brake. William M. Johns, and Dennis P. Slattery, St. Louis, Mo.  
 430,969. Compound Locomotive or other Compound Engine. Julian H. Pitkin, Ravenswood, and Julius S. Lane, Oak Park, Ill.  
 430,989. Cutter for Mining Machines. Edwin E. Carter, Pittsburg, Pa., Assignor to John S. Scully, same place.  
 430,998. Rod Rolling mill. Irving A. Kilmer, New Windsor, N. Y., Assignor to the Kilmer Manufacturing Company, same place.  
 431,000. Traveling Crane Mechanism. Louis R. Lemoine, Philadelphia, Pa.  
 431,005. Trolley. Friedrich G. Nordmann, Cincinnati, Ohio.  
 431,012. Cover for Furnaces. Samuel R. Smythe, Allegheny, Pa.



## PERSONALS.

Mr. W. J. Madden has been appointed superintendent of the San Miguel Gold Placers' Company of Colorado.

J. A. Macpherson, of the Consolidated Stock and Petroleum Exchange of this city, has left town on a visit of inspection to the Rappahannock mine, Virginia, in which he is interested.

Mr. L. S. Woodbury, formerly superintendent of machinery at the Calumet and Hecla mine and lately superintendent of the Sudbury mines, Ontario, left Calumet June 24th for Great Falls, Mont., where he builds a large foundry and machine shop, of which he will be the proprietor.

## OBITUARY.

Ormond Beatty, LL. D., at Danville, Ky., on the 24th inst., aged 75. He was ex-president of Centre College, and at the time of his death was professor of moral science there. He had been connected with the institution as professor for fifty-two years, having held the Chairs of Chemistry, Physics and Mathematics.

Edward A. Fraser, aged 65, of Edgewater, N. J., died suddenly at his office in New York on the 24th inst. Mr. Fraser was well known in the wholesale drug business, and for twenty years previous to 1889 was a member of the drug firm of Fraser & Lee. A year ago he sold his interest to Williams, Stiger & Co., and had since devoted himself to the sale of some proprietary medicines in which he was interested.

Frank H. Andrews, President of the Globe Iron and Spring Works, of New York, died on the 21st inst., of pneumonia, after a brief illness. Mr. Andrews was only 38 years old. He was for a time in the employ of the New York Car Spring Company, but eight years ago he established the Globe Iron and Spring Works, this city, for the purpose of doing a general business in railroad supplies. He was also secretary and treasurer of the Baker Heating Company.

Francis C. Yarnall, vice-president of the Lehigh Coal and Navigation Company, died on the 26th inst., at Overbrook, Pa., aged 61 years. Mr. Yarnall was well known in railroad circles, being the president of several of the Lehigh branch lines. He was one of the directors of the Lehigh Valley railroad, and upon the retirement of E. W. Clark, four years ago, was acting president until the election of Mr. Wilbur.

Henry B. Murray, Eastern agent for the Union Iron Works of San Francisco, with an office in New York, died on the 25th inst., about an hour after he was taken sick in his office. Mr. Murray, who was forty-eight years old, was born in Brooklyn on July 5, 1842, and started in life as a machinist, but soon after reaching his majority drifted out West, where he became interested in mines, an interest which he held until his death. About five years ago he took charge of the Eastern office of the Pacific Iron Works, and recently resigned that position to take a similar one with the Union Iron Works.

Colonel Samuel Wetherill, a native of Philadelphia, who was formerly active in manufacturing enterprises in Pennsylvania, but who has resided here since his retirement from business, died at Oxford, Md., on the 24th inst.

Colonel Wetherill was the eldest son of John Price Wetherill, and great grandson of Samuel Wetherill, the first manufacturer of white lead in the United States. After some time spent in the white lead and chemical works of Wetherill & Brother, Philadelphia, in 1844 he was employed at white lead works at Saugerties, N. Y., and Belleville, N. J. His next engagement was with the New Jersey Zinc Company, at Newark, in whose employ he made valuable experiments in the manufacture of zinc white. He subsequently invented the mode of working known as the "furnace process" of producing zinc white, by which a large saving in cost was made, and also the "tower process" of separating the solid impurities. In 1853 he, with Charles J. Gilbert and a party of New York capitalists, who afterward became incorporated as the Pennsylvania & Lehigh Zinc Company, erected works at Bethlehem to reduce the calamine ores of Lehigh county, by the process patented by Mr. Wetherill, who remained with the concern until 1857. He also made exhaustive experiments in the manufacture of spelter, and produced the ingot from which was rolled the first sheet of zinc made from Pennsylvania ores in 1857.

## INDUSTRIAL NOTES.

The National Tube Works Company, at McKeesport, Pa., has just filled a big order of 6-inch line pipe for the Standard Oil Company, which has been shipped to Morgantown, W. Va. Work will be commenced in a few days on another big order for the same company of 8-inch line pipe.

The York Iron Company has shut down the furnace of Black River Falls, Wis., to make needed repairs. The furnace has been running but eight months since the general repairs, and it was expected to run a year and a half. The cost will be \$1,000 and it will take two months' time to get the plant ready to fire up.

The Wampum Iron Works, at Wampum, Pa., have been sold by the sheriff to Mrs. Anna M. Louder for \$19,000. Mrs. Louder was plaintiff in the writ, she having held a mortgage against the company, which had been assigned to her by Andrew Carnegie. A furnace was built on this property in 1856. It was torn down in 1887.

The Berlin Iron Bridge Company, of East Berlin, Conn., has received the contract for the new Stock House for the Isabella furnace at Barneston, Penn., which will be of iron designed and built by that company. The building will be 54 feet in width by 100 feet in length, and arranged so that loaded trains can pass entirely through the building.

It is reported from Pittsburg, Pa., that a syndicate of torpedo men, to be known as the "High Explosive Company," has been formed in the oil regions, with headquarters in that city. The trust will include all the nitro-glycerine firms in Western Pennsylvania, and will have a capital stock of \$100,000. It is said the object is to prevent cutting of rates.

The Canadian Rand Drill Company has been established at Sherbrooke, Province of Quebec. The object of the company is to manufacture Rand drills and other mining machinery, and its capital is \$18,000. The applicants for the charter are Addison C. Rand and James Lewis, of the Rand Drill Company, New York; S. W. Jencks, of the Jencks Machine Company; J. M. Jencks, F. A. Halsey and William Farwell; Mr. Halsey will be the manager, and Mr. J. M. Jencks secretary.

The Amalgamated Association of Iron and Steel Workers held its final session in Pittsburg on the 25th inst. The election resulted as follows: President, William Wihe, of Pittsburg; secretary, Stephen Madden, of Pittsburg; treasurer, James Penny. William Martin, who has been secretary of the association since its organization, surprised the convention by refusing re-election. The next meeting will be held in Allegheny City.

The real estate and plant of the Waterbury Malleable Iron Company, of Waterbury, Conn., was sold at public auction on the premises Thursday, June 19th, by E. De F. Shelton, specialist in manufacturing properties, of 57 Broadway, New York City. The real estate was purchased by E. C. Lewis, a local capitalist, for \$20,000. The machinery was sold in 60 lots and distributed among manufacturers in various parts of the United States, the amount realized covering a fair auction valuation, but at great sacrifice on original cost.

The Pittsburg Locomotive Works, Pittsburg, Pa., are now turning out ten locomotives a month. Among the orders recently completed are ten consolidated locomotives for the Pennsylvania Railroad and seven for the Vandalia lines, while the works have orders for twenty-five for the Baltimore & Ohio. The Erie Car Works have orders for 10,000 freight cars for the Pennsylvania, 5,000 for the Union Pacific, 3,000 for the Missouri Pacific, 4,000 for the Baltimore & Ohio, 3,000 for the New York Central, 2,000 for the Hocking Valley and 2,000 for the Big Four.

The American Gas Investment Company filed a certificate of incorporation at Trenton, N. J., on the 24th inst. The capital stock is \$50,200,000, but only \$10,000 is paid in. The stockholders names are George S. Bixby and Hektor W. Thorne, of New York, and William Talcott, of Paterson. The objects of the company as set forth in the charter, are to construct, acquire, own, manage and operate works for the manufacture, distribution and supply of light, heat and power by gas, electricity or other means and generally to carry on any business incidental thereto and to acquire the stocks and properties of other corporations formed for any similar purpose and to deal in the same. The charter is worded like that of a trust. The fee for the charter is \$10,040, the largest the State, it is said, has ever received.

The scale conference of manufacturers and iron-workers began on the 26th inst., at Pittsburg, Pa., and while nothing definite was done, no wide difference of opinion was developed. The new scale was contrasted with the old one by the manufacturers, and the list of extras appended to the various iron schedules was objected to in many particulars. An effort will be made by the manufacturers to get a modification of certain extras, which can be so construed as to cause trouble from time to time, if the real intent and purport of the language used is not thoroughly understood at the start. There was another session on the 27th. A large part of the scale was gone over, but it will take several days to complete the work. It is stated that a number of manufacturers have made a proposition to the workers to sign last year's scale for three years. This would do away with the yearly scale agitation, but it is not regarded favorably by the workmen.

A well-known writer states in his work on metallurgy, and in reference to the electrolytic treatment of ores, that:

"During the past forty years many attempts have been made to extract metals from their ores by electrolysis, and many ingenious processes have been devised, but few of these, so far as we are aware, have proved successful. Some of the earlier investigations of Bunsen, Sainte-Claire Deville and Baquerel are of special importance, as indi-

cating the general principles upon which such electrolytic operations may be conducted; there is little doubt, however, that much has yet to be done before the separation of the metals from their ores will attain the position of a really practical branch of electro-chemistry. We have noticed in the cases of copper refining by the wet way that many attempts were made in this direction long before a commercially successful application of the electrolytic method was arrived at, and we still hope and believe that electricity will yet be practically employed in extracting metals from their ores; indeed, some trials which we have recently made in this connection are at least of a very hopeful character."

Much progress has, however, been made recently in this branch of metallurgy, electrical engineering firms for the past three years having given it great attention, and among others the United Edison Company, which has unusual facilities for the manufacturing of generators, promptly exploited this field, and is now turning out dynamos to develop any amount of current requisite for the capacity of works treating ores.

This company is now prepared to furnish complete plants, including motive power and generators, baths, pumps, and with all the necessary information for treating ores by the electrolytic method.

(From our Special Correspondent.)

Mr. R. G. Tomlin, of Butler, Ga., has been elected president of the recently organized Cordele Machine Shops Company (Georgia); also Russell C. Harris, secretary and treasurer, and John W. Foster superintendent. The capital stock of the company paid in is \$20,000, with the privilege of increasing it to \$100,000. Work is to be commenced at once.

On the 12th inst., the Griffin (Ga.) Iron Foundry Company was organized with Mr. Charles H. Osborne President, and Mr. Roswell H. Drake Secretary and Treasurer. It is the purpose of the company to make everything from a brass nut to a steam engine; the company has advertised for bids on the erection of the buildings, which are to be of brick trimmed with stone.

William H. Flannagan, of New York; Godfrey M. Fogg, Augustus H. Robinson, and Trevallion B. Dallas, of Nashville; and Milton Humes, of Huntsville, have formed a company for the erection of a gigantic cotton mill at Huntsville, Ala. The company has been incorporated with a capital stock of \$1,000,000. This mill will give employment to about 1,800 hands; the buildings to be erected at once, and complete machinery purchased.

J. H. McFadden & Bro., of Philadelphia, Pa., have leased a large tract of land at the Air Line Junction, near Charlotte, N. C., for the purpose of erecting a cotton compress, which is to be one of the largest in the south. They have a frontage of 800 feet on the Richmond & Danville platform, and will at once erect the compress and the necessary buildings. The compress is to be of the Morse pattern, and to be shipped from West Point, Va., where it is in use at the compress belonging to the McFaddens at that place. The other necessary machinery is to be purchased as the building progresses.

A Monongahela company, of which J. R. Gee is the manager, has purchased a tract of land on the A. T. & O. R. R. and the Car. Central R. R., in Charlotte, N. C., upon which extensive granite works will be built at once. The capital stock is \$50,000. This same company has purchased a large quarry near Mooresville, N. C., in Fredell County, where the granite will be quarried and shipped to the company's works at Charlotte for dressing. The idea is to compete with the largest granite dealers in the north and east, and both the quarry and the works will be operated on a large scale; complete plant of the necessary machinery is being secured.

## CONTRACTING NOTES.

The Milwaukee Bridge and Iron Works has received the contract, at \$43,000, to rebuild the Pease River bridge at Vernon, Tex., and also four bridges on Beaver Creek.

## MACHINERY AND SUPPLIES WANTED AT HOME AND ABROAD.

If any one wanting Machinery or Supplies of any kind will notify the "Engineering and Mining Journal" of what he needs, his "Want" will be published in this column.

Any manufacturer or dealer wishing to communicate with the parties whose wants are given in this column can obtain their addresses from this office.

No charge will be made for these services.

We also offer our services to foreign correspondents who desire to purchase American goods, and shall be pleased to furnish them information concerning American goods of any kind, and forward them catalogues and discounts of manufacturers in each line, thus enabling the purchaser to select the most suitable articles before ordering.

These services are rendered gratuitously in the interest of the subscribers and advertisers; the







Boston mines were destroyed by fire on the night of the 24th inst. Over 2,000 acres of valuable timber also burned. The loss will be large, but cannot be estimated. For two or three days the woods have been on fire, and on Sunday a great deal of difficulty was experienced in fighting the flames away from the shaft houses and mill of the Niwot Mining Company, of which ex-Senator Tabor is president, and it was feared that the whole town would be swept away. There are great mining enterprises at Ward, six concentrating mills, expensive mining plants and several stores. Seven hundred cords of firewood burned at Niwot yesterday, and it is feared that much other valuable property has been destroyed in that neighborhood.

CLEAR CREEK COUNTY.

**AMERICAN SISTERS MINING COMPANY.**—This is the name adopted by the recent consolidation of the Native American, Two Sisters No. 1 and 2 lodes, situated on the eastern slope of Columbia Mountain. The incorporators are John H. Bowman, Henry Seifried, William E. Gray and Lewis M. Pettitdidier, of Colorado, and Augustus H. Heisey, of Pittsburg, Pa. The object and purpose for which this company is organized is to purchase, work, mine and develop, sell and dispose of the two mining claims known as the Native American and the Two Sisters' mine, located in Montana mining district. The capital stock of the company is \$500,000, divided into 50,000 shares of \$10 each. The directors for the first year are John H. Bowman, Henry Seifried, William E. Gray, Lewis M. Pettitdidier and Samuel P. Large.

GUNNISON COUNTY.

**COLORADO FUEL COMPANY.**—This company started shipping coal from its anthracite mine on the 15th inst. This mine has been shut down for repairs the last two months, and now that everything is in thorough repair large shipments will be the result. The company has recently secured control of the anthracite veins near Irwin.

**COLORADO COAL AND IRON COMPANY.**—This company is about starting work on thirty new coke ovens at Crested Butte, and have also had surveyed and commenced work in a small way on a section of anthracite coal land situated just north of town, owned by the Durango Trust Company.

(From our Special Correspondent).

JUNE 21.

**NORTH STAR.**—By special invitation of Messrs. Taylor, Rathoon & Co., your correspondent accompanied a number of Denver gentlemen on a visit to the several properties of the May Mazeppa combination. Our visit was made both pleasant and entertaining, for which the above named gentlemen have our sincere thanks. After sampling mountain trout, we were taken in charge by Mr. Taylor and his capable superintendent, Mr. S. M. Miller, who supplied our party with "Old Clo" for the trip, and we proceeded to examine the workings of the incline shaft on the ore chute, and the different drifts to the right and left upon the same. My examination was careful, personal and as complete as I could make it, and from the 50-foot level to the one at bottom, 450 feet (levels every 50 feet), we found bodies or veins of mineral varying in width, length and depth, as well as in variety and quality, the possibilities of which are great.

In the 150-foot level was an immense body of cube galena, some fine and some coarse grained, part of which had been stoped, leaving exposed a body so large that with outstretched arms it was impossible to reach across it. This runs about 65 per cent. in lead, carrying sufficient silver to pay more than all expenses of mining, shipping and treatment and receiving a royalty for its splendid fluxing properties. There are levels at 50 feet in each direction, northwest and southeast, from 30 to 150 feet in length, exposing enough ore to warrant the assertion that the quantity is sufficient to pay good monthly dividends up in its stock of 1,000,000 shares, \$1 per share, or upon a larger amount. At the 400-foot level an immense body of sand carbonates has been added to the body of galena and hard carbonate ore, which so far is of unknown width and length, but of a quality that warrants shipping, even with a twelve-mile wagon haul and the high freight charges. The ore chute steadily increases in width as depth is gained, and from present appearances they most certainly have a bonanza in their eight claims, as this body of ore has been opened up on one claim only. The facilities for developing, mining and shipping are still in a crude shape, it having been Mr. Taylor's object to first prove that he had a mine both in quantity and quality, and then to add the proper machinery to work it economically, profitably and systematically. This he is now doing and, with the advent of a branch line of the D. & R. G. R. R. from Sargents to White Pine now under consideration by the officials of the road, the output from this property will be at least 100 tons per day. This property will soon be listed on the New York and Boston Exchanges, where we have no doubt it, will attract that attention it so well merits, for in my opinion this is one of the mines Hayden had in his mind when he lost the mineral belt during his memorable survey of the Rockies at Alpine Pass, and said that when it was found again it would prove as rich as any in the

whole range; and to bear out this assertion, look at the production of the Madonna mine, owned by Messrs. Eilers & Richards, of the Pueblo Smelting Company, located in Monarch mining district, that has produced hundreds of tons per month for the past six or eight years, and cannot be bought to-day at any price.

The May Mazeppa is just over the hill from it, and undoubtedly on the same contact.

North Star is a new town, found necessary by Col. Taylor to facilitate the development of these properties, and is about one mile above White Pine, in Tomitchi district.

PITKIN COUNTY.

The Castle Creek Tunnel and Power Company is now employing a force of about 25 men at the site of their improvements at the foot of Keno gulch, on Castle creek. This company has been organized by George S. Newman for the purpose of utilizing the water power of Castle creek for the generation of electric power to be transmitted to the mines, and to bore the Newman tunnel. The men who are now at work are employed in doing the grading for the flume that is to furnish the water to the power house, also in grading for the approach to the proposed tunnel. This flume is to be nearly 9,000 feet in length, and will furnish one of the finest water powers in the mountains. The power house will be built just at the mouth of the gulch, and will be complete in every respect. From this power house wires will reach over the mountains to all the mines in Tourtelotte Park and vicinity, furnishing them all with power for hoisting purposes. The tunnel will be some 3,000 feet in length, and will intercept the main contact at some point within the territory of the Percy company. This tunnel will furnish transportation for all the ores on that part of the mountain and will serve as a drainage tunnel for all the properties in that vicinity. There are large bodies of ore in the Percy mine which will be reached by a connection from this tunnel, and it will thus be possible to land them at the railroad at a low cost for transportation. This is one of the most important works, says the *Aspen Chronicle*, that has been started in Aspen for several years. During the next 60 days the company will expend about \$50,000 in putting in its water power and erecting its plants of machinery. The company, it is said, has the money at its command needed for the completion of the work it has projected.

SAN MIGUEL COUNTY.

**SAN MIGUEL GOLD PLACERS COMPANY.**—This company has secured the services as superintendent of Mr. W. J. Madden who has had long experience in California in hydraulic mining, and who has made a study for some years past of the placers on the San Miguel river. The company expects to be able to use the water of this river before the end of the year. In the meantime the water of Fall Creek is being used, employing for it a 24-inch pipe and a grade of 180 feet to the mile.

GEORGIA.

(From our Special Correspondent.)

LUMPKIN COUNTY.

**DAHLONEGA GOLD MINING COMPANY, LIMITED.**—James R. Hall, of Atlanta, civil and mining engineer, with a corps of men, is regrading and enlarging the entire length of the Ivy ditch (16 miles). There are about 75 men engaged on the work, and it is expected to be completed very soon. It is estimated that this improvement will double the water supply. The Singleton mill, now in process of erection, of this same company, is also about completed, and will be started up in a very few days. A. B. Linderman, manager of the company, is very well satisfied with the progress of the work under his charge, and hopes to soon have it all in running order.

IDAHO.

**NORTH IDAHO MINING COMPANY.**—This company has been recently incorporated, with John McCormick, D. C. Corbin, and J. W. Allen among the number of its directors. The capital stock of the company is placed at \$500,000, shares \$5 each. For the present the headquarters of the company will be at Spokane Falls, but as soon as the Northern Pacific & Missoula road reaches the country where are situated the mines of the company the main office will be removed to Missoula.

SHOSHONE COUNTY.

It is reported that a strike has been made near Raven, about six miles above Murray. The ledge is traced for a long distance, and has been opened on several locations, and shows in each opening the same character of ore, which is a galena and carbonate ore. The strike is considered one of the most important in the history of Coeur d'Alene.

**POORMAN MINING COMPANY.**—This company, of Burke, Lalande district, has paid its sixth dividend. The mine is being worked to the 300-foot level, and the shaft is being sunk another hundred feet. The company has contracted for all its output up to next fall, amounting to about 14,000 tons. The working expenses, including mining and concentrating, are estimated at \$20 per ton of ore and concentrates, which leaves a net profit to the owners of \$25 per ton.

KANSAS.

The following is an official statement of output of ore from the mining district of Galena and Empire City for week ending Saturday, June 21st: Rough ore milled, 1,972,440 pounds; rough ore sold,

1,443,890 pounds; total, 1,972,440 pounds. Zinc ore sold, 720,000 pounds; lead ore sold, 50,000 pounds. Sales aggregated, total value, \$9,195. Total value of output, \$10,245.

MICHIGAN.

The following articles of association were filed with the Secretary of State during the week ending the 21st inst.: Grand Rapids Plaster Company, Grand Rapids, \$125,000; Warren Scharf Asphalt Paving Company, \$60,000; Zoophyte Lubricating Company, St. Clair, \$50,000; The Vermillion and Masaba Iron Land Company, Negaunee, \$1,000,000; Appleton Mining Company, Norway, \$1,000,000; Northeast Negaunee Mining Company, Negaunee, \$1,000,000.

COPPER MINES.

**HURON COPPER MINING COMPANY.**—An assessment of \$5 per share has been voted to-day by the directors of this company, payable July 7th by the stockholders of record July 5th. This statement of financial condition is made as of June 1st:

LIABILITIES.	
Loan account.....	\$250,072.91
Drafts outstanding and bills payable.....	37,962.39
	\$288,035.30
ASSETS.	
Cash items:	
Cash and copper on hand, copper at 16 cents.....	\$95,260.99
Balance resources over liabilities at mine April 30, 1890.....	23,408.60
	118,669.59
Balance of liabilities.....	\$169,365.71

The valuation of buildings, machinery, tools, etc. (exclusive of the mine), January 1st, 1890, was \$160,004.30. The Huron, with its debt out of the way, says the *Boston Transcript*, ought to be a paying mine. This debt of \$169,365.71 will be taken care of by the \$5 assessment, giving \$200,000. The stock has been assessed previously \$9 per share in all, or \$360,000. New hoisting machinery is in process of erection and increased product is expected. The mine is now making something like 105 tons of mineral per month. The mine has produced as high as 130 tons of mineral in a month, and with the new machinery in operation ought to increase its output largely.

(From our Special Correspondent.)

By telegraph, Hancock, June 26: Quincy miners accepted ten per cent. raise; operations resumed to-day. Kearsarge and Franklin miners still out. Kearsarge men violent in preventing others from working.

**CALUMET AND HECLA MINING COMPANY.**—The strike was hrewing here and the company was shrewd enough to place in the dockets on pay day last Saturday a printed slip stating that a raise of 10 per cent. would be granted. The threatened strike was averted, but many are yet dissatisfied. The Superior engine house caught fire last Thursday at 2:30 P. M., from (it is supposed) a spark from the stack, which entered the ventilator on the roof. Two-thirds of the roof was burned and the engine covered with ashes, charcoal, bits of slate, etc. It is not really damaged, but it will be necessary to take it apart, a job that will last several weeks. Contrary to a statement made in a late *Boston Herald*, hoisting will not be hindered, as the auxiliary engine in the same building is capable of doing the work. Hoisting was suspended just 7½ hours.

**QUINCY MINING COMPANY.**—The wages paid at this mine have been somewhat lower than at the Calumet and Hecla and the Tamarack mines. The miners, seeing that the C. and H. men had a raise last Saturday, became very much dissatisfied. They appointed a meeting for last Monday night. The committee appointed to confer with Superintendent S. B. Harris, brought word to the men that a 10 per cent. raise would be granted them.

They were not satisfied with this, but wanted 15 per cent. advance. Captain Harris said that he could not in justice to his company accede to their demands. The result is that the mine is closed down and the surface works all idle. There are no violent demonstrations of any kind.

**TAMARACK MINING COMPANY.**—The strike at the Tamarack mine might be considered a test case. There is little doubt but that they were supported by men working in neighboring mines. They went out Tuesday morning of last week and returned to work last Monday at noon. They used considerable violence in preventing others from working and literally ran the location. Assistant-Superintendent Watson offered them the same as the Calumet & Hecla men were promised last Saturday, and they seemed satisfied. The average wages for underground men have been about \$54.

(From our Special Correspondent.)

HANCOCK, June 25.

**ARCADIAN.**—This property is situated on the Mineral Range, four miles north of Portage Lake, and is described as the northwest ¼ of sec. 20, town 55, range 33. It corners on the Concord property lying southwest of it. It is crossed by four veins bearing about 60 degrees east, with a dip of from 50 degrees to 60 degrees. The easterly vein is a conglomerate vein not yet developed. The Isle Royal vein lies parallel and about 300 ft. distant. This vein is the one upon which the Isle Royal, Grand Portage,



and Sheldon and Columbian mines worked. The last-mentioned mines are considered valuable property and will be heard from soon if copper holds at present figure.

On this vein the openings have been made. Lying parallel and distant about 200 and 500 feet respectively are the Portage and Pryor veins. The Isle Royal runs through the northeast corner of the quarter section, with an easterly bearing of 60 degrees, thus giving a total length of vein on the property of 3,172 feet. Something over 25 years ago three shafts and two winzes were sunk. No. 4 shaft is 1,500 feet from the north boundary, and is down 170 feet. No. 3 shaft is 400 feet further south, and is down 165 feet. Midway between these shafts is an old range partly filled up with rock, it will be useful in proving the value of the ground. At the 85-foot point in No. 4 shaft a drift was run 150 feet north and 475 feet south, going through excellent copper ground. Seventy-five feet below this is another level, running from No. 4 shaft 150 feet north through barren ground, and 480 feet south through good ground. A little stoping has been done in the first level on each side of No. 3 shaft. The hoisting was done by horse power. There was no machinery of any consequence on the location on cessation of operations 25 years ago. 400 feet south of No. 3 shaft, No. 2 shaft was sunk about 100 feet, and a little drifting done. The ground was pronounced fair. Midway between No. 2 and No. 3 a winze was sunk 50 feet through excellent ground.

The mine is owned by Wm. P. Dixon, of New York. S. D. North & Son, of Hancock, have leased the mine and will proceed to further develop it. They have put in pumps and a small engine, and expect to have the mine unwatered Wednesday, when a force of miners will be started with hand drills. Your correspondent gives this full description because he has not been able to find any account of the workings elsewhere.

#### MISSOURI.

##### JASPER COUNTY.

(From our Special Correspondent.)

##### JOPLIN, June 23.

The output of ore from the mines for the week ending the 21st was very large, but the sales of zinc ore throughout the entire district were lighter than the preceding week, owing to the prices offered by the ore buyers being considered a little low. The average price paid for zinc ore was \$24 per ton. Lead remains firm and in good demand at \$25 per thousand. The following are the sales from the several camps:

Joplin mines—1,364,420 pounds zinc ore and 145,160 lead; value, \$19,991.20.

Webb City mines—945,190 pounds zinc ore and 91,800 lead; value, \$14,940.

Carterville mines—641,170 pounds zinc ore and 34,880 lead; value, \$8,598.75.

Zincite mines—219,720 pounds zinc ore and 440 lead; value, \$2,758.

Lehigh mines—83,000 pounds zinc ore; value, \$1,030.75.

Carthage mines—282,500 pounds zinc ore; value, \$3,073.

Galena (Kan.) mines—720,000 pounds zinc ore and 50,000 lead; value, \$9,195.

All districts, total value, \$61,186.70.

D. Boaz was in the city last week, representing Kansas City capitalists, and made some investments in undeveloped land. Just returning from a visit to some silver mines near the Saw Tooth range of mountains at Ketchum, Idaho, he says this lead and zinc district offers better and surer advantages to the investor than anything he has seen throughout the West.

There are several parties here looking over the ground with a view to building a large smelting plant, for which there certainly is a good opening here, as the ores to smelt are within easy reach of inexhaustible coal fields. D. A. Gault and A. B. McConnell, of Joplin, have just closed the sale of a 1,600 acre tract of mineral land near Dayton, Newton County, to Kansas City parties. The land is said to be well located, and to show very promising indications of lead and zinc.

Messrs. A. W. Sewall, Dunham and O'Fallon, who recently purchased 240 acres of land south of the Empire mines and have been doing prospect work under the management of Mr. Sewall, last Saturday cut into a body of zinc ore with a shaft at a depth of 75 feet. They are operating the American Nettle mine, of Ouray, Colo., among other mines.

The new owners of the Diamond mines have taken possession and expect to be running with a full force in the present week. The Oswego land is opening up some very fine and large bodies of ore.

#### MONTANA.

##### BEAVER HEAD.

**LEGAL TENDER.**—A body of ore was struck in this mine at Argenta a few days ago, the ore, it is alleged, going 423 ounces of silver to the ton, 17 per cent. lead. It is reported that the find has created considerable excitement in that locality. The Legal Tender had not been worked for some time, until the present company took hold of it about two months ago. The strike was made in a cross cut and the body is said to be large. The Legal Tender is one of the oldest producers in the State, and away back in the six-

ties high grade ore from it was freighted to California and then shipped round the Horn to England for treatment. The ore then averaged nearly \$400 to the ton. In the early days a New York stock company purchased it, and built a smelter at Argenta, but finally got into litigation. Later on lessees worked the mine until it was thought the ore had all been worked out. The present owners purchased the property a short time ago and put a force of men to work, with the above stated result.

#### MADISON COUNTY.

**TOLEDO.**—A Mr. Frank, of Wardner, Idaho, purchased of Major Budd a fourth interest in the Toledo mine, paying therefor \$17,500 cash. The Toledo is near Sheridan, this county. It is equipped with a good steam hoist, and a 40-ton concentrator is kept running on ore from the mine. The concentrator was started about two weeks ago, and since then 36 tons of concentrates have been shipped to Denver. An 80-foot upraise, recently completed, yielded ore, it is stated, which netted the owners \$1,100. The mine was self-supporting last month.

#### SILVER BOW COUNTY.

**EMMA NEVADA.**—The rich strike of chloride ore found at discovery in this mine has come into the shaft at a depth of 50 feet. The ore body is reported to have grown stronger and richer with depth, demonstrating the permanency and value of the vein found near the surface early in the spring, which occasioned considerable excitement at the time.

#### NEVADA.

##### STOREY COUNTY—COMSTOCK LODE.

**OCCIDENTAL CONSOLIDATED MINING COMPANY.**—Mr. S. White, Jr., of this city, has received the following letter from Superintendent J. H. Kinkead, dated the 13th inst.: "I have nothing new to report since my letter of the 6th inst. We are still extracting a fair grade of ore from the stopes on the 400 and 450 levels and preparing to start the mill. The prospecting work on the 550 and 650 levels is being pushed vigorously and we have great faith that we will find good ore between these levels."

#### WHITE PINE COUNTY.

**ARGUS MINING COMPANY.**—The Sunrise and Self-Cocker mines, at Taylor, belonging to this company, have produced \$800,000. The ore is free milling and of a high grade. A 15-stamp mill comprises part of the property, but for some time past the mines have been idle, owing to half of the interest being tied up in an estate. It has lately been released, however, and Mr. Hilp, a large stockholder, will negotiate a sale for the property in Salt Lake City, after which active work will be pushed and ore shipments resumed.

#### NORTH CAROLINA.

(From our Special Correspondent.)

##### CHATHAM COUNTY.

**NORTH CAROLINA STEEL AND IRON COMPANY.**—Capt. Newman, manager, has put a force of hands to work at Ore Hill for opening up the body of ore preparatory to raising ore for the furnaces in course of erection at Greensboro. A fine body of "red ore" has been opened up that has never been worked. As this ore supply is one of the largest in the State, and is to be worked on a large scale, it will, perhaps, be interesting to the JOURNAL'S Southern readers to have a brief description of it. I will quote extracts from some of the reports of engineers that have examined it for the company, for which I have to thank the manager.

Ore Hill, on the Cape Fear and Yadkin Valley Railroad, is 40 miles from Greensboro. This hill is about one mile long and half a mile wide, lies nearly east and west, with a height of over 200 feet above the valleys of Ephraim's Creek on the north and Tick Creek on the south. Several small streams flow into these creeks from the hill, which is thus cut considerably by ravines. The backbone of the hill is a body of tough quartzite, running a little north of east, and this is flanked on each side by parallel formations of magnesian and clay slates, which in many places show an impure soapstone. These formations stand on edge, and in the joints between them there are contact lodes of limonite iron ore, together with deposits of clays and other decomposed rock stuffs, and in many cases the slates themselves are cut through, or replaced, by iron ores.

Many prospecting pits and trenches have been cut on the outcrops and among the floats of these veins, and several considerable openings have been made, from which ore to supply a charcoal furnace of about 10 tons daily capacity, running in all about three or four half years at two-thirds time, and making, say, 8,000 tons of iron and requiring, say, 16,000 tons of ore, has been taken out in former years reaching back to 1862.

These openings show ore veins ranging from about a foot in width up to about seven feet, and the ore is very generally nearly solid. The thickest and solidest ore I found was in the old shaft known as the 90-foot shaft, and was at the lowest accessible point, about 20 feet above the permanent water level, as indicated by the stream in the adjoining ravine. The miner, Josiah Glover, who had charge of this old work, states that the vein continued the same to the water level and as far below it as he went (being several feet), and no signs of sulphide ores had appeared. I examined the

old dumps and the closed drainage tunnel leading to the foot of the shaft, but found no sulphurs of any sort. I also carefully examined for sulphurs at the old open cuts, now full of water many feet deep from a bold stream, on the south side of the hill, but found no indications showing that the ore solidified into sulphides, or otherwise changed its character below permanent water level. There is also a strong outcrop and float of specular hematite very near and above this submerged working, and from these and from the further fact that I found no ore on the hill that affected the needle, although the hill itself does so at many points, I conclude that these limonite ores are not strictly "gossans" of sulphide veins to be found below, but that they have unaltered and valuable continuations below water level, and may run into magnetites and rich hematites.

After very conservative computations, I estimate that the hill contains about 450,000 cubic yards of ore above permanent water level, as indicated by the springs and streams flowing from it, and as the veins are mostly vertical, a proper system of mining will output at least 400,000 yards of this ore with safety, and it weighs about three tons to the yard, making 1,200,000 tons, which seems to be a conservative estimate of what can be mined by tunneling, drifting and stoping above the bed of mine tracks which should run from ore bins, at the present water tank at the railroad station, back into the hill, on the grade fixed by the present water supply pipe. These tracks should enter the hill by spurs into judiciously located tunnels, continuing on the drainage grade, and I estimate that the ore can be stoped out of the veins, loaded into mine cars, run to and unloaded into ore bins at the water tank for about 50 cents per ton, after the tunnels are opened and tracks laid therein to the veins. Some of these tunnels will cut and serve several veins, and they will also serve as points from which to sink on the veins below water level and develop ores, which will, in my opinion, exceed in quality the ores above water level.

A fair average of these Ore Hill Limonites, analyzed by Prof. P. B. Wilson, is as below:

	Per cent.
Metallic iron .....	33.20
Phosphorus .....	.0408
Sulphur .....	.17
Silica .....	6.58

The Ore Hill specular hematite analyzes as follows:

	Per cent.
Metallic iron .....	49.90
Phosphorus .....	.0370
Sulphur .....	.05
Silica .....	24.44

showing a high percentage of silica which, however, from the nature of its occurrence, can easily be cobbled off.

#### OHIO.

Chief Inspector of Mines Hazeltine, in the annual report of the department filed last week, places the total output of coal for the year in the State at 10,07,385 tons, a decrease of only 3,561 compared with 1888, when the tonnage was the greatest in the history of the State; there were 683 mines in operation, a gain of 22; 20,323 miners were employed, a gain of 1,285; average time worked, 167 days; loss, 29. Had the men worked full time the total output for the year would have reached 20,438,211.

#### PENNSYLVANIA.

The inside workings of the colliery at Mount Carmel were discovered to be on fire on the 23d inst., but was extinguished during the day, and work is to be resumed again.

A dispatch says: "Zinc ore has been discovered on a tract of land three miles west of Bloomsburg. The land is owned by Hoffman & Miller, of Avon, and has been leased to H. A. Hecken, of Allentown, who has for years cultivated it for agricultural purposes, but which will now be discontinued and the work of opening up and developing the vein begin at once. A force of workmen are now employed making preparations for this purpose and taking out several tons daily. It is alleged that experts pronounce it to be of good quality, and claim that the vein is of proportions which will warrant its development. The Delaware, Lackawanna & Western Railroad Company is preparing tracks for the transportation of the ore, which will be completed soon."

#### COAL.

George H. Meyers & Co., of Yorktown, began work on a monster stripping within 100 feet of the Catholic Church and parochial residence at Audenreid. It is their intention to compel the priest to move the church, his residence and barn to some other site, as they claim the coal under them is worth \$30,000. Rev. T. J. Marron, the pastor, had a conference with the firm in Philadelphia on Tuesday last, at which he was told by them that the buildings must be moved, and at no expense whatever to the firm. The affair has created great excitement, and the priest threatens to take out an injunction. He holds a lease for 99 years from the former owner.

Threatenings of another strike are reported from the Phillipsburg, Beech Creek and Osceola



bituminous coal district. Meetings have been held by the miners and mine laborers relative to the adoption of a new scale of prices and better and safer labor appliances. At a general meeting on the 21st inst. a circular was prepared demanding of the mine operators a higher scale of prices, with increased pay for "dead" work. A joint meeting is to be held in Phillipsburg on the 27th inst., when an effort will be made to adjust the growing difficulties.

An explosion in the Farm Hill mine, near Dunbar, occurred about ten o'clock on the morning of the 10th inst., by which a number of miners were entombed. Every effort has been made to rescue the miners, but with no avail. Since the fatal explosion a large force of workmen has been engaged digging their way to the unfortunates. The latest news received as we go to press is to the effect that at two o'clock this morning another shift of men was taken into the mines. Those who came out say they are within a few feet of the burning mine. They will be in the Hill Farm mine to-day.

**ST. LOUIS ORE AND STEEL COMPANY.**—This company has gone into the hands of a receiver. The company is in no sense insolvent, and does not owe a dollar from its bonds. The action was made necessary by the failure of the iron mines of Pilot Knob, Mo. The property of the company consists of the Big Muddy coal fields near Murphysboro, Ill.; the Vulcan Steel Works in Carondelet, and the Pilot Knob Iron Mines, Mo. These three properties are bonded as follows: The coal fields and iron mines for \$1,600,000 and the Vulcan works for \$1,000,000. The steel works have not been operated for two years owing to the failure of the iron mines, so that this made a charge for interest against the other two properties of about \$80,000 per year, and the iron mines have been so little productive during these years that almost the entire interest charge of about \$200,000 per year was thrown on the coal property. This has caused some complaint. July 1 is interest day, and to prevent a foreclosure by a few of the small holders at the expense of the big ones, it was determined to ask for a receiver. Accordingly yesterday the Farmers' Loan and Trust Company of Illinois, trustees for the bonds, filed a bill at Springfield, Ill., and at the request of over two-thirds of the bondholders, Mr. E. A. Hitchcock, the president of the company, and one of the largest bondholders, was appointed receiver. Secretary Garrisch said: "As far as I can ascertain the company does not owe one dollar in the world. Everything has been paid up to July 1, even including labor, supplies, etc. It can hardly be said, therefore, that the company is insolvent. This action was taken to protect the large bondholders and put the business of the company on a new and more satisfactory basis."

**OIL.**

Exports of refined, crude, and naphtha from the following ports, from January 1st to June 20th, were as follows:

	1890. Gals.	1889. Gals.
From Boston.....	1,284,219	2,251,517
Philadelphia.....	60,598,417	58,913,511
Baltimore.....	4,209,965	1,782,077
Perth Amboy.....	6,464,290	9,301,433
New York.....	185,063,844	187,360,851
Total.....	257,620,735	250,609,389

**SOUTH DAKOTA.**

**HAND COUNTY.**

**GLENDALE TIN MINING COMPANY.**—F. H. Long, secretary and general manager of this company, returned to the mine on the 16th inst., and operations were resumed immediately after his arrival. The tunnel being run to tap the ledge is now in about seventy-five feet, but it is not expected that the ledge will be encountered before three hundred feet have been driven. The company now has a large area of mining property in the vicinity of its mine under bond. A number of the bonds held by the company, it is said, will be taken up soon, and among the properties that will change hands at that time are the Chicago, Del Norte, Dixie, Jumbo, Advance, and Margaret groups, comprising about one hundred and fifty claims. Milling operations will probably be resumed shortly.

**UTAH.**

**EMERY COUNTY.**

Recent reports from Price state that oil and asphalt have been found there in large quantities. One company, composed of T. A. Wally, A. R. Wilfly, Henry Apple and Dr. G. Hassenplug, of Denver, has already been organized, and 5,000 acres of this land secured. Upon one portion of the tract a spring has been discovered, from which eight barrels of oil can be dipped every 24 hours. A large vein, which, it is stated, assays 98 per cent. of asphalt, has also been found near here.

**SUMMIT COUNTY.**

**ALLIANCE MINING COMPANY.**—Owing to the trouble encountered with surface water in the upper workings of the Alliance mine, only a small force of miners is at present employed, but as soon as the flow of water from the surface ceases more men will be employed. A 30-ton lot of first-class ore was recently sent to market, and it is expected that shortly the ore shipments will be largely in-

creased ones. This week a hundred-ton lot of Alliance second-class ore was hauled to the Union concentrator, and more will follow if the returns are satisfactory. In the meantime, however, a set of jigs is being put up below the mouth of the old Hanauer tunnel on the company to work the second-class ore dump. The 4,500-foot drain tunnel, which is being driven under contract, has reached a distance of about 4,250 feet, and this much has been accomplished in a little over a year's time. After the 4,500 feet are run there will remain some 300 feet to be driven in order to reach the bottom of the shaft, but just how this work will be done or the shaft connections made is not authoritatively stated, although it is said the company will do the work. This drain tunnel will tap the Alliance shaft at a depth of about 1,200 feet. 800 feet below the present deepest working. The vein dips to the east of the shaft 100 feet, and if it has not already been cut by the tunnel it soon will be.

**TOOELE COUNTY.**

**MERCURY GOLD MINING AND MILLING COMPANY.**—Articles of incorporation of the Mercury Gold Mining and Milling Company have been filed with Secretary Sells. This company has been organized to conduct a general mining and milling business in this territory, and Salt Lake City is named as the place wherein the principal office will be located. The capital stock is \$5,000,000; shares, \$25 each. A number of the shares have been subscribed for, and the remaining shares are held as working capital. There is the usual provision that the private property of the stockholders shall not be liable for the debts of the company. The mining properties are the Mercer, Georgia No. 3, the South Side 1 and 2, Resolute 1 and 2 and Apex, all in Camp Flood mining district.

**WASHINGTON COUNTY.**

**LITTLE GEM MINING AND SMELTING COMPANY.**—This company, of St. George, has filed articles of incorporation. The object of the company is to conduct a general mining and smelting business. Its capital stock is \$10,000, shares \$10 each. The officers are: S. L. Adams, Jr., president; S. G. Higgins, vice-president; S. A. Pymm, secretary and treasurer.

Silver Reef mining camp used to be quite a place, but it has dwindled down to almost nothing. The erection of a smelter at St. George will enliven matters in this district.

**WASHINGTON.**

**NORTHWESTERN MINING AND DEVELOPING COMPANY.**—Articles of incorporation for this company have been filed in the auditor's office at Tacoma. The object of the company is to locate and work all kinds of mines. The principal place of business will be Tacoma. The capital stock of the company is \$100,000, shares \$2 each. The trustees named for the first six months are C. L. Dawson, C. A. Gale, R. J. Brown and A. D. Grant, of Tacoma, and F. T. St. John and Paul Igo, of Puyallup.

**WEST VIRGINIA.**

**MONONGALIA COUNTY.**

The most important case before the Supreme Court of Appeals of West Virginia is that of Guffey vs. Hukill, coming up on a writ of error from the Circuit Court of Monongalia County, in which a property valued at \$200,000 is involved. The case originated in the Monongalia Court, in a suit brought by James M. Guffey and Michael Murphy against E. M. Hukill for the possession of a tract of 30 acres of land in Cass district, that county, leased in July, 1888, to Rezin Calvert by David Wise for oil and gas operations. The case came on for trial February 22d last. The plaintiffs showed the lease from Wise to Calvert, running 30 years, or as long as oil may be found in paying quantities; one well to be completed in six months, and in case of failure to complete such well, to pay a yearly rental of 50 cents per acre, payable every six months, as full payment for such delay. It was also shown that plaintiff had paid, on May 9, \$1,500 for the lease, \$1,000 to J. B. Donley, agent for Ida C. and Winnie J. Calvert, and \$500 to George H. Dimick and Charles L. Skinner, who had sold the lease to them. It was also shown that Dimick tendered David Wise \$7.50 rental for the first six months on July 1, and also on July 11, 1889, and \$15 rental for the whole year on January 10, 1890, which Wise refused to receive. The defense offered in evidence the original lease from David Wise to William Hays, it being admitted by defendant that the signature of David Wise was not at the end of said lease following the closing words thereof. The court admitted the lease in evidence as an unrecorded document, the lease showing Wise let the land to Hays for one-eighth the oil, and \$20 a year for each gas well, operations to commence in nine months, or to pay \$1.33½ per month, and ending with the following: "And a failure on the part of said second party to comply with either the one or the other of the foregoing conditions shall work an absolute forfeiture of the lease." A certified copy of the original lease from Wise to Hukill was then admitted. E. M. Hukill showed he began operations on the tract in question in May, 1889, and got oil November 25th, 1889. In rebuttal Guffey & Murphy showed that they had notified Hukill to cease operations on July 15th, 1889,

stating that they had a prior lease. The court gave the plaintiffs judgment for possession and for costs, but the defendant desiring to appeal, a stay of 30 days was granted, a bond of \$10,000 being given. The case has now come up before the West Virginia Supreme Court of Appeals and is being tried.

**FOREIGN MINING NEWS.**

**BELGIUM.**

**VIILLE-MONTAGNE.**—The report for 1889 of the Viille-Montagne Zinc Mines and Foundries Company shows that the company produced last year 52,808 tons of rough zinc, 50,173 tons of rolled zinc, and 8,587 tons of zinc white. An understanding arrived at between the company and other kindred undertakings for regulating the production of rough zinc in Europe has been attended with the results which had been anticipated. But while the Viille-Montagne was enabled to obtain better prices for its products last year, the undertaking was affected by three adverse influences which greatly increased the working expenses. The first of these was the heavy advance in coal, which was such a marked feature in the industrial history of 1889, and which was no small matter for the Viille-Montagne, since it uses 360,000 tons of coal annually. The second adverse influence was a rise in wages occasioned by the increased activity observable in 1889 in European industry. The third adverse influence was the higher price of the minerals which the company had to purchase in the course of last year. Notwithstanding, however, all the difficulties of the moment, the Viille-Montagne realized in 1889 a rough profit of £226,641, or £36,817 more than in 1888. After payment of all the fixed charges for the year, and after carrying £28,000 to the reserve fund, the council of administration was enabled to recommend the payment of a dividend for 1889 at the rate of 3¼ per cent. upon the share capital, a final balance of £300 being carried to the credit of 1890.

**CANADA.**

**PROVINCE OF NOVA SCOTIA.**

(From our Special Correspondent.)

**COAL.**

HALIFAX, June 24, 1890.

The Londonderry Iron Company has, it is stated, concluded to suspend regular work at their colliery at Mogan owing to the expense of mining, and will for some months confine themselves to prospecting for other seams believed to be in the vicinity of the mine.

Some delay has been caused in the coal trade from Pictou and Cape Breton by the strike of coal handlers at Montreal. By latest advices the strike is about ended, as plenty of non-union labor is offering. The Canada Pacific Railway, which takes annually over 100,000 tons of lower province coal, will likely after this take their coal at Three Rivers. At Salem, in Annapolis County, small seams of coal have been found, and preparations are being made for a more thorough search. Should workable seams be proved here, the iron deposits of the valley, which are extensive, could be utilized on the spot, and there would be an opening for a considerable domestic local trade, and for supplying Yarmouth, St. John, etc.

A dispatch received from Halifax dated June 26th states: Twelve hundred coal miners are out on strike at the Spring Hill collieries. The men object to the system of "docking" a whole box of coal for short measure. Everything at the colliery is at a standstill. This is the largest mine in Nova Scotia.

**GOLD.**

The Huntington Reef Gold Company has held its first meeting at Yarmouth. A large mill has been built there and crushing commenced. The ores are low grade, but are believed to be in quantity. The capital is furnished by Providence, R. I., men, Mr. McKenna being president and Mr. S. D. Huntington manager.

(From our special correspondent.)

PORT ARTHUR, June 24, 1890.

The district lying east of Port Arthur along the North Shore of Lake Superior is attracting attention this season, several exploring parties being out in the vicinity of Schreiber and Jackfish Bay, a section which is traversed by very strong and well-defined fissure veins carrying gold and silver. Some very good samples of gold-bearing quartz have been brought in showing little free gold, but giving good assays. The writer picked free gold out of a ledge 75 feet wide running along the face of a bluff near Schreiber.

**BADGER SILVER MINING COMPANY.**—The new vein, Badger No. 2, is improving very fast as depth is attained. At the surface it did not show any silver, but assayed 22 ounces per ton; 10 feet below it assayed across the vein \$210 per ton of 2,000 pounds; at 30 feet depth it gave an average assay of 1,757 ounces of silver to the ton. The shaft is now down 47 feet, and the average assay for the last 7 feet gives 3,249 ounces of silver to the ton of 2,000 pounds. At 43 feet the contact between the trap and underlying black slates was



reached, and from one blast in the vein at this point 2,450 pounds of ore was blown out that will assay not less than 3,000 ounces to the ton. Supt. Shear proposes to sink to a depth of 64 feet before drifting. This depth will bring the shaft to a level with No. 1 adit level in the old workings, with which connection can be made if found advisable.

An adit level is being run into the southwest side of the Badger mountain, on the continuation of "Badger No. 2." The adit will cut the vein 30 feet beyond the point of discovery, which will be about the contact between the trap and slates. The vein on this side of the mountain is improving just as fast as at No. 2 shaft, giving assays of 15, 44, 78, 204 and 370 ounces of silver to the ton. All of the ore taken from No. 2 shaft and the adit level on the other side of the mountain is being barreled for shipment, it being all high-grade smelting ore. The force of miners has been increased and all preparations made for a busy and profitable season's work.

The Badger people have made all preparations to put on a large force of men about July 1st and intend to exploit thoroughly every foot of the ground, as well as to work the known veins. The silver exists in the veins principally in the form of argentite and assays from 200 to as high as 4,500 ounces to the ton. There was great competition for the purchase of this mine, and the Badger people may be congratulated on their luck in getting it. Supt. Shear of the Badger will have charge of the works.

**MOCAN VALLEY GOLD LOCATION.**—This most promising property in the district east of Port Arthur is situated  $3\frac{1}{2}$  miles north of the C. P. R. at Jackfish Bay; it is easily accessible through the Mocan valley, which is quite suitable for a wagon road. The north end of the location borders on Mocan lake, a deep, clear body of water about half a mile in length. The outlet is 15 feet wide; it passes directly through the location and near the works on the vein, and makes a descent of 40 feet above and near the works referred to, and will give an excellent supply of water for mining purposes. The creek lies in a deep valley that occupies the western portion of the location, the mountains rising on each side to about 200 feet. The location and vicinity are well supplied with timber for mining purposes.

The rock formation consists of the Huronian diorites and chloritic schists, striking east and west, and dipping at a high inclination southward with an occasional syenitic vein penetrating it from a great granitic syenite belt which bounds it on the south side within a few hundred feet of the location. Several quartz veins intersect the location, two of which carry free gold. One of them, which may be said to be the main vein of the location, is in about the center of the location striking eastward across the mountain from the above mentioned valley. It has been exposed here and there over a distance of about a thousand feet, from the foot of the hill up the face of, and back on the summit; it is a strong fissure vein, from 2 to  $6\frac{1}{2}$  feet wide, of quartz with an inch of clay on the foot wall in the tunnel.

The tunnel was driven in on the vein for 30 feet at the foot of the mountain, 25 feet above the level of the valley. The vein here is four to seven feet in width, and carries considerable auriferous pyrites, assaying \$22 gold per ton of 2,000 pounds. On the surface, about 50 feet farther east, the vein carries free gold, and it is expected that if the tunnel was driven in to cut that point it would show free gold also; in fact, a few colors were shown in the last blast put into the tunnel. The vein in the tunnel dips 60 degrees to the south. Thirty-five different tests have been made on this vein in pulverizing, roasting and washing, and with few exceptions turned out a good showing of gold dust in the pan. A test of 1,200 pounds made by the Northwestern Reduction and Chemical Works of Chicago of the rich part of the vein gave an average of \$41.34 gold to the ton of 2,000 pounds. Assays from other parts of the vein by C. Kreissman, M. E., of Port Arthur, gave an average of \$20 gold to the ton of 2,000 pounds.

The second vein bears N.N.W. dips westward 30 degrees to the horizon, and lies about 15 chains to the east of the tunnel and will intersect the main vein. It is 3 feet wide, and consists of decomposed quartz. No assays have been made of this vein, but it shows free gold in considerable quantities by panning.

This is the only location taken up in the vicinity of Jackfish, and it gives great promise of proving a first-class property and, in the interest of the district, should be under development, and now that the estate to which it belongs is settled, it is hoped it may soon be worked.

**PORCUPINE.**—This property adjoins the Badger on the west and is composed of 160 acres. It was purchased on the 3d inst. by the Badger Silver Mining Company for \$50,000. The Porcupine is traversed by three strong veins, one of which has been partially developed; they average from 2 to 5 feet in width. No. 1 vein shows up immensely rich; it was opened up in 1886, about \$10,000 being spent in driving adit levels, and sinking a shaft about 80 feet. Over \$20,000 worth of silver was taken out at that time. Owing to some legal difficulties, it has been lying idle since

## MEXICO.

A press dispatch from San Antonio, Tex., says that 1,500,000 acres of mineral and agricultural land in Mexico were sold on the 24th inst. to an English syndicate by a San Antonio firm.

**MEXICAN NORTHERN RAILWAY COMPANY.**—Articles of association of this company, with a capital of \$3,000,000, were filed in the office of the Secretary of State at Albany on the 26th inst. The railroad will be constructed in Mexico, from a point on the Mexican Central Railway, within fifteen miles northerly or southerly from Escalon, a northeasterly direction to the district of Sierra Mojado. The company, in connection with its railroad, will also open telegraph, telephone and steamboat lines. This company has valuable concessions, which were granted to it by the authorities of Mexico in March, and is about to establish smelters and metallurgical works there. The directors of the company are: Robert S. Towne and August R. Meyer, of Kansas City; Nathaniel Witherill of New York City; Edward M. Shepard, of Brooklyn; A. Foster Higgins, of Greenwich, Conn., and Charles J. Nourse and Nelson S. Spencer, of New York State.

## MEETINGS.

Ruby Wilkes Mining Company, at the Telephone Exchange, Deadwood, S. Dak., July 12, at 8 P. M.

## DIVIDENDS.

Alice Gold and Silver Mining Company, dividend No. 24 of '06  $\frac{1}{2}$  per share \$25,000, payable July 1st at the Farmers' Loan and Trust Company, New York. Transfer books close June 21st and reopen July 22d.

Lehigh Zinc and Iron Company. The directors of this company have called for redemption 600 shares of the preferred capital stock, such shares being numbered from 1,801 to 2,400. This stock will be redeemed at par and in cash at the office of the company, at No. 47 North Front street, Philadelphia, Pa., on and after July 1st.

Tennessee Coal and Iron Company, the coupons due July 1st on the "Birmingham Division" bonds of this company, will be paid at the Hanover National Bank, New York City.

Virginia Mining and Improvement Company, the interest due on coupon, No. 12, of the Trust Mortgage 6 per cent. bonds of this company, will be paid July 1st, at the office of the Boston Safe Deposit and Trust Company, Boston, Mass.

## ASSESSMENTS.

COMPANY.	No.	When levied.	Due in office.	Day of Sale.	Am't per share.
Best & Belcher.....	46	May 13	June 17	July 8	.25
Bodie, Cal.....	16	May 21	June 25	July 16	.25
Challenge Con., Nev.....	6	May 14	June 17	July 8	.50
Confidence.....	16	May 10	June 13	July 2	.75
Con. New York.....	3	May 22	June 26	July 17	.15
Crocker, Ariz.....	9	June 16	July 25	Aug. 15	.15
Dexter, Nev.....	1	May 29	July 1	Aug. 1	.08
Found Treasure.....	6	May 22	June 26	July 18	.25
Hartsborn, S. Dak.....	5	May 24	June 30	July 19	.00 $\frac{1}{2}$
Holmes, Nev.....	12	May 19	June 24	July 15	.25
Mayflower, Cal.....	47	May 7	July 10	July 31	.30
Mexican, Nev.....	3	May 13	June 18	July 9	.25
Occidental Con. Nev.....	6	Apr. 23	June 6	June 30	.25
Seg. B. & Mides., Nev.....	6	May 5	June 9	June 30	1.75
Sierra Nevada.....	97	May 10	June 12	July 2	.50
Silver King, Ariz.....	3	June 9	July 17	Aug. 11	.20
Stanard Con., Cal.....	3	June 2	July 15	Aug. 9	.50
Teresa, Mex.....	1	May 9	June 13	June 30	.10

## MINING STOCKS.

For complete quotations of shares listed in New York, Boston, San Francisco, Baltimore, Denver, Kansas City, Minneapolis, St. Louis, Pittsburg, Birmingham, Ala.; London and Paris, see pages 749 and 750

NEW YORK, Friday Evening, June 27.

The week under review presents no change in the condition reported in this column for weeks, or rather, for months past. We have from time to time endeavored to awaken an interest among dealers in mining stocks, pointing out the causes to which are largely due the prevailing apathy, and suggesting means whereby the public can once more be led to invest in mining. Despite of appearing tedious, we cannot refrain from again recapitulating these causes and effects. The public is not partial to mining just now. This fact is apparent to all who follow the doings of the local mining exchange. We do not mean by this that

no money is being invested in mining concerns. It is, and in large amounts; but by the public we mean the public at large, composed for the most part of small investors who like to put their modest capital in ventures which promise to give a large return. This being stated, it is superfluous to add that the public has been swindled so often that it very naturally refuses to "do so any more." All regular readers are aware of our oft-repeated advice to clear out the disreputable stocks which form part of the mining stocks listed on the Consolidated Stock and Petroleum Exchange. As to a remedy, we can see no other means of bringing about a revival than to invite the public to deal in sound enterprises vouched for by the Exchange as possessing some actual value.

Let the dealers in mining stocks make a combined effort to purify the methods in vogue. In return we can assure the public that it might be worth their while to turn their eyes once more toward legitimate mining, by means of which many fortunes have been honestly acquired. It is well and proper that they should be cautious, but they should also have some faith.

In view of the fact that the national holiday falls on a Friday, the Consolidated Stock and Petroleum Exchange has decided to adjourn from Thursday of next week until the following Monday.

Interest continues to be attached to the stock of Phoenix of Arizona. The company has secured, by the sale of treasury stock, sufficient funds to proceed at once with the work of putting on water power at the mill. President Bradstreet reports, after a careful investigation, that the supply of water in Cave Creek is much larger and more constant than at first believed. The water right belonging to this company is of itself a valuable possession. Work on the dam and water power will at once be energetically prosecuted. The importance of this move is that the dam reservoir must be built in the dry season and part of the pipe line laid, otherwise it would have necessitated an interval of a year before this step could have been taken. Further reference to this property will be found in our mining news column. The stock has fluctuated slightly during the week, 15,550 shares at \$1.20@1.35 having been disposed of.

Of the Black Hill's stocks Caledonia sold a \$1.70@1.90. Deadwood Terra was not traded in. Father de Smet had a call from the country and sold 100 shares at 40c.

El Cristo declined steadily during the week, starting at \$1 and closing at 90c., with 1,400 shares to its credit.

Rappahannock as usual sticks to the 5c. mark and manage to dispose of 500 shares. San Sebastian had one sale at 25c.

The holders of Santiago stock have not fulfilled the wishes of the speculatively inclined. After its one week of semi-activity nothing more has been heard from it.

Horn Silver Mining Company, of Utah, declared a regular quarterly dividend of  $12\frac{1}{2}$  c. per share, payable on and after June 30. Stock opened at \$3.25 and advanced during the week closing at \$3.30, with only 849 shares sold. Old Ontario turns up with one sale at \$45.

The Alice Gold and Silver Mining Company has declared a dividend (No. 24) of \$25,000, payable on July 1st. This stock continues one of the favorites. During the week 850 shares were sold at from \$2.70 to \$2.80. The company is working on the 1,300-foot level and expects to tap the Alice vein in August. Just now they are working on the low-grade ore. Moulton was not traded in this week. It is understood that negotiations of some kind are pending between the Wall Street Mining and Milling Company and some capitalists. A strike is reported at the property, but as very little of the stock is held here the announcement has not caused any commotion. Sales of outside parties not recorded in the official list of the Exchange are reported.

On reports of improved quality of ore and larger body than was thought, there has been some inquiry for Silver Mining of Lake Valley. Very little stock, however, was offered. Fifty-one cents were bid at the close without takers.

There has been no dealing in the copper stocks this week.

Minnesota Iron Company was traded in at \$86 @ \$86.50.

We note sales in the Comstocks of Consolidated California & Virginia at \$5@55.38; Crown Point, \$3.10; Gould & Curry, \$3.15; Ophir, \$4.65@55.25; Savage, \$5.13; Yellow Jacket, \$3.20@3.60; Alta, \$1.40@1.65; Andes, 90c.; Bullion, \$4@4.50; Chollar, \$4.25@4.65; Julia, 50@55c.; Mexican, \$3.70@4.30; Potosi, \$7.75; Scorpion, 40c.; Union Consolidated, \$3.90; Utah, \$1.20@1.35.

Some activity is to be noted in the Tuscarora stocks. Belle Isle is reported to have made a strike and the stock has been in demand. This week 1,600 shares at 85c.@1.30 were sold. Navajo sold at 45 cents. North Commonwealth has one transaction at \$2.30.

Mt. Diablo shows two sales at \$2.25 to \$2.60.

Of the Colorado stocks Freeland declined from 50c. to 37c. Leadville Consolidated was stationary



at 12c., with moderately large transactions. Small Hopes has one sale at 95c.

Astoria shows this week 5,000 shares disposed of at the usual price, 4c.

Sutter Creek was steady at \$1.30 to \$1.35. Bodie Consolidated sold 1,600 shares at 45c. to 55c.

Plymouth Consolidated was neglected at \$7. There were no transactions in Quicksilver, either preferred or common. Tioga, a stranger to the Exchange, was dealt in this week, 100 shares selling at 25c.

Brunswick Consolidated at from 95c. to 97c., sold 8,200 shares.

**Boston.** June 28.

(From our Special Correspondent.)

The demand for copper stocks the past week has been fairly active, although the market has not shown quite so much strength as in the past few weeks, at the same time there is a gradual absorbing of the good stocks for investment, and speculation is running more into the low priced and fancy stocks, which bids fair to run wild during the coming six months. These latter stocks are favorites at the new Stock Exchange, and a large business is done in them, the greater portion being in stocks selling below one dollar per share.

Calumet & Hecla had a set back on Friday last to \$300 on the receipt of advices that the hoisting house was on fire. As usual, timid holders rushed in to sell their stock, causing the decline above stated. They were, however, as anxious to buy their stock back on the fact becoming known that no large damage was done, and the stock quickly advanced to \$315, selling later at \$320 again.

Tamarack has been very strong, selling up to \$225, reacting to \$220, on account of the apprehended strike at the mine, which appears to have been settled satisfactorily to all parties.

Boston & Montana touched \$67 1/2, with reaction to \$65 1/2.

Butte & Boston declined to \$23, rallying later to \$24.

Franklin has had quite an active week and shows an improvement over last week's sales of \$2 1/2, selling up to \$23 1/2, with reaction of the fraction.

Kearsarge, owing to the labor troubles at the mine, has been heavy and declined to \$22, to-day recovering to \$22 1/2.

Centennial also declined to \$37 after selling at \$39 1/2, but there is a good demand for it, and we look to see both this stock and Kearsarge selling at much higher figures later on. Osceola declined to \$45 1/2, but later sold at \$48, with latest sales at \$46 1/2.

Atlantic, steady at \$26 1/2 @ \$27 1/2.

Quincy has declined to \$125. The advance in this stock was rather too rapid, and the reaction is but natural.

Huron, which has been steadily declining of late, sold off to \$3 1/2 on the announcement of an assessment of \$5 per share, \$200,000, which sum is needed to pay off its indebtedness and put the mine on a paying basis.

Alouez advanced to \$9, at which price considerable stock changed hands. The prospects for Alouez are very encouraging, and although the stock declined to-day on rather a dull market to \$8 1/2, we believe it to be a good purchase.

Arnold is growing in favor. The developments at the mine are very promising. The recently discovered vein is stated to be one of the widest in the district. Stock sold at \$2 1/2, and is very firm.

The general list of non-producing mines has been quite active this week at advancing prices. Aztec sold at 50c. This mine has recently been assessed 10c. per share, and is to be worked on tribute. Dana sold at 50c. Hanover at 55c. Hungarian at 60c. Native at 32 1/2c. Pontiac at 70c. Washington at 65c. Star at 47 1/2c.

Santa Fe declined to 80c.

Ridge sold at \$1 1/2, and National at \$2 1/2.

The silver stocks, pending the action of Congress, have been rather heavy. Catalpa declined to 47 1/2c. and Crescent to 17 1/2c. Dunkin sold at 65c. Breece offered at 45c. without sales.

The market closes dull but fairly steady at the lowest prices of the day. We expect reactions now and then, but the strong position of ingot copper cannot fail to attract attention to the copper stocks and advance prices.

By Telegraph.—Kearsarge, \$24; Calumet and Hecla, \$310; Tamarack, \$219; Quincy, \$125; Boston and Montana, \$66; Osceola, \$47; Centennial, \$37 1/2; Franklin, \$23; Atlantic, \$26 bid; Alouez, \$9; Butte and Boston, \$24 1/2; Huron, \$3 1/2; Santa Fe, 80 cents bid.

**Denver.** June 23.

(From our Special Correspondent.)

Market has been fairly active during the week, and the increase of sales shows that the Clearing House and the decisive stand taken by the new officers, with the thorough support of the most reliable and prominent brokers of the Exchange, has had a very beneficial effect.

Stocks generally are advancing in price, and the new system adopted by some of the brokers, to examine personally each and every property listed on the Exchange, mine or prospect, and to keep posted upon the development thereof, will give them the proper amount of confidence to advise their customers where, when, and how to invest. Requests

for information in regard to investments, and remittances for same from the East are becoming more noticeable.

Clearings reported June 21 were \$5,929.75. This amount represents only the balances on cash sales and does not show the actual amount of business done. Hereafter Manager Calkins will furnish daily a statement of the actual value of transactions instead of the amount of balances, so that the public may see the real amount of business done on the Exchange. As Clearing House manager, Mr. Calkins has shown himself well qualified for the position, and since he assumed charge there has been very little kicking against the Clearing House. Brokers find that under efficient management the Clearing House saves them much time and trouble.

The fifth monthly dividend of 20 cents per share will be paid upon Oro mining stock July 5th.

Fourth monthly dividend of two cents per share upon Little Rule stock will be paid at C. N. Perkins' office, 904 Seventeenth street. Books close June 26th, paid June 30th.

Advertisements for bids to tear down the old building on the lots where the new Exchange is to be built will be published to-morrow and work pushed as rapidly as possible.

Prices and sales during the week ending June 21st, 1890:

Table with columns: Company, Opening, H., L., Closing, S. Lists various companies like Alleghany, Amity, Bangkok, etc.

Table with columns: Company, Opening, H., L., Closing, S. Lists various companies like Argonaut, Aspen United, Big Indian, etc.

Total for the week... 314,900. Buyer 30 days... Seller 60 days... Seller 30 days...

**Minneapolis.** June 24.

Table with columns: Company, Bid, Ask. Lists companies like Algoma, American Iron, American Ruby, etc.

**Salt Lake City.** June 21.

Table with columns: Company, Bid, Asked. Lists companies like Alice, Anchor, Alliance, Apex, etc.

**Butte, Mont.**

A preliminary agreement for the organization of a mining exchange at Butte, Mont., has been signed by the leading mining men of that city. The original subscription will be 50 shares, at \$100 each. Of this amount \$50 per share is to be paid upon organization and the remainder on call of the treasurer.

**Kansas City.** June 19.

Table with columns: Company, Opening, H., L., Closing, Sales. Lists companies like Argonaut, Bates-Hunter, Big Six, etc.

**Lake Superior Iron and Gold Stocks.**

(Special Report by David M. Ford, Houghton, Mich.)

Table with columns: Name of company, Par value, Bid, Asked. Lists companies like Ashland Iron, Aurora Iron, Champion Iron, etc.

Table with columns: Name of Company, Par value, Lowest, High. Lists companies like Gold Lake Mt. Co., Grayling Gold & Silver Co., etc.

\* Actual sales were made at these prices.

**PIPE LINE CERTIFICATES.**

(Special Report by Messrs. Watson & Gibson.)

The steadiness of the oil market, when the course of prices is considered, is an indication of the underlying strength which may be attributed to two important facts. The first, that the statistical situation is strong and is daily growing stronger, as deliveries still exceed the runs by nearly 12,000 barrels per day, and there is no news of importance from the oil fields. The second fact is the gradual change of the ownership of oil producing territory, gradually passing from the hands of individual operators who have been long in the business into the possession of the Standard Company, the strongest organization of its kind in this or any other country, yet speculators and operators are inclined to let oil severely alone.

Prices for the past week have gradually shaded off, but if it can be attributed to any good reason it is to the general apathy which exists among the traders and to which we have referred.

**NEW YORK STOCK EXCHANGE.**

Table with columns: Opening, Highest, Lowest, Closing, Sales. Lists dates from June 21 to 27.

Total sales in barrels... 264,000

**CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.**

Table with columns: Opening, Highest, Lowest, Closing, Sales. Lists dates from June 21 to 27.

Total sales in barrels... 365,000

**COAL TRADE REVIEW.**

NEW YORK, Friday Evening, June 27.

**Statistics.**

Mr. John H. Jones, chief of the Bureau of Anthracite Coal Statistics, furnishes us the following statement of shipments of anthracite coal (ap...

proximated) for the week ending June 21st, 1890, compared with the same period last year:

Regions.	June 21, 1890.	June 22, 1889.	Difference.
Wyoming Region Tons	442,101	414,686	Inc. 27,415
Lehigh Region .. "	140,562	135,447	Inc. 5,115
Schuykill Region. "	232,354	203,609	Inc. 48,745
Total.....	835,017	753,742	Inc. 81,275
Total for year to date..	14,328,278	14,344,198	Dec. 15,920

PRODUCTION OF COKE on line of Pennsylvania R. R. for the week ending June 21st, and year from January 1st, in tons of 2,000 lbs.: Week, 100,612 tons; year, 2,589,756 tons; to corresponding date in 1889, 2,068,823.

**Anthracite.**

As expected, the meeting of the sales agents of the anthracite coal companies resulted in both an increase in July prices and in an increase in the number of tons to be mined during the month. Against the increase in price no one seems to urge any objection, unless it be a few large buyers who have jumped into the market and tried to secure large lots at June prices for July delivery. Against the increased tonnage there is some grumbling, chiefly on the part, however, of those operators who have been stocking up at April and May prices. The output is placed at 3,250,000 tons, or an increase of half a million tons over June. This has been rendered necessary by considerable overshipping, which would have a demoralizing effect. The total tonnage up to July 1st will figure up to 15,000,000 tons, instead of 12,000,000 tons, as it was expected early in the season it would be. This shows that a large amount of coal has gone forward into consumption, and if not actually consumed it is just that much nearer consumption. Notwithstanding this large output of 15,000,000 tons, the stocks in the hands of the producers have been gradually decreased, until they are now probably 150,000 tons less than they were at the corresponding period last year. The question of course presents itself: How much coal will the market take for the year? At the early meetings of the sales agents it was estimated that the quantity would be 36,000,000 or 36,500,000 tons. It is clearly demonstrated now that those estimates were erroneous, and the chances are now in favor of the market taking 37,000,000 tons and possibly 38,000,000 tons for the year.

Some operators say that they can now get all the business they want at June prices. Buyers, however, may find themselves disappointed. Several large producers are holding these eleventh-hour orders under consideration, and they state that they will only be filled at June prices under the most favorable circumstances.

The majority of the consumers' dealers have not yet put in stock, but they are scared into the market since the talked-of July rise. There is a suspicion that some who are still drawing on old contracts are getting even April prices, the quantities in the contracts having been enlarged to secure business.

The tone of the market has been tolerably firm, producers being able to move all the coal they can get. Operators have their hands pretty full, and as they bought at lower than present prices they are, many of them, content to hold on and wait for a larger profit. A large order for Plymouth coal was placed yesterday at July prices, or \$3.85 net for stove for late July delivery. As this was done by a shrewd and large consumer, it may be taken to indicate a belief that July will prove a good time to buy compared with later months.

Pea coal is weak and buckwheat not much better. They have got down to that point below which they cannot go without entailing actual loss.

The new scale adopted by the companies is: Stove, \$4; egg, \$3.75; broken and chestnut, \$3.65; pea, clear free-burning, \$2.50 f. o. b.; other grades, 10 cents to 30 cents less; buckwheat, \$1.60 to \$1.80 f. o. b.

The Reading Company has issued the following price list, f. o. b. New York:

	Lump.	St. Boat.	Broken.	Egg.	Stove.	Chestnut.
Hard white ash ..	\$4.15	\$4.15	\$3.90	\$3.90	\$4.00	\$3.65
Free white ash ..	.....	.....	3.75	3.75	4.00	3.65
N. Franklin white ash ..	.....	.....	.....	4.00	4.00	3.55
Shamokin ..	.....	.....	.....	3.95	4.25	3.75
Schuykill red ash..	.....	.....	.....	3.95	4.25	3.95
Lorberry ..	.....	.....	.....	3.95	4.25	3.95
Lykens Valley ..	.....	.....	4.75	5.00	5.00	4.50

**Bituminous.**

The market is dull, stocks are accumulating, and while the agreed prices are generally lived up to, there are not wanting suspicious of shading. The labor agitators are commencing to prove a factor in the market. Though much of the soft coal district affected by the present strikes does not ship to this market, the stoppage of a large output must necessarily have an indirect effect here. But, if what we hear from reliable sources be true, the leaders of the strikers in the Clearfield

region have for some days been at work trying to extend the movement for a 10 per cent. increase in the scale of wages to the Elk Garden mines in West Virginia, and also to Maryland mines. In the former, however, the miners are known to be unorganized, and in the latter very well content with their lot at present. Late reports from the scene of war are conflicting. It is known, however, that the Pennsylvania Gas Company's and the Westmoreland Gas Company's miners remain out. About the Bell, Lewis & Yates, the Rochester and Pittsburg mines, there are absolutely contradictory reports. One party states the strike is still on, with every chance of a victory for the mine owners. Another says the men have given in. At the Blossburg & Arnot mines the men have returned to work at an advance of 10 per cent. This state of affairs induces a feeling of satisfaction instead of disquiet at the present dimensions of stocks.

Freights remain about the same as last week. Large vessels are plenty at Philadelphia and small vessels very scarce and in great demand, and rates firm. At Baltimore vessels are very scarce.

Prices remain unchanged: Baltimore, \$2.40@ \$2.50 f. o. b.; Philadelphia, \$2.50@ \$2.60; in New York harbor, \$3.25; alongside, \$3.50.

**Boston.**

June 26.

[From Our Special Correspondent.]

The anthracite coal market is inactive. The action of the companies at their meeting this week in marking up prices 10 cents on stove and 15 cents on broken and egg creates very little interest here. If the advanced prices are obtained it will be on coal sold to other than the Eastern markets. The f. o. b. prices at New York now are \$4 for stove, \$3.80 for egg, and \$3.65 for broken.

These prices seem high in comparison with those which have prevailed since the season opened, but at \$4 for stove coal there is very little money in it to individual operators. There is a good supply of nearly all kinds of anthracite, and the restriction of output to 3,500,000 tons for July is wisely ordered, and is considered to mean that the companies will stand up to the policy, represented by their prices, of strengthening the market. This will give retailers confidence in the situation.

The bituminous market at this port is as featureless as ever. There is some little buying of cargo lots, but no large business is reported. Parties who have contracted for Cumberland coal will do well not to fall behind in shipments. It is possible that the demand for Cumberland coal will exceed the supply at tidewater to an uncomfortable extent later in the season.

The price of bituminous coal, without noteworthy change, is fully as firm as at any time this season, for standard coal.

The freight situation is unchanged as to water rates, but there has been inaugurated a movement on the New York, New Haven & Hartford Railroad to reduce the tariff on coal to many points in Connecticut and some in Massachusetts, occasioned, it is said, by the action of the New York & New England Railroad in cutting rates. This may develop into something quite lively. An immense amount of coal comes to New England by all rail nowadays.

The retail movement is unchanged. Dealers are generally selling at \$5.25 delivered. This is a fair price for stove coal bought six weeks ago, but will figure no profit at to-day's prices in the wholesale market. One result of the break in the combine is that the city gets coal at a reduced figure, and there will be more glory than profit in city business in 1890-91.

**Buffalo.**

June 26.

[From our Special Correspondent.]

In the absence of any other news the following incidents may be interesting:

About nine miles from Buffalo, at Bertie, Canada, are nine natural gas wells, producing the enormous quantity of 15,333,000 cubic feet of gas per day. A company has been organized, and will supply adjoining towns and villages. The questions now mooted are: (1) What is going to be done with all this gas; and (2) Might not Buffalo make good use of it?

The following bids have been sent in for supplying the Poor department with coal and wood for 1890-91:

Thomas Loomis & Co., stove and nut, \$4.75; wood, per cord, \$4.50.

Charles T. Hall, coal from August 1st to April 30th, \$4.75; from May 1st to July 31st, \$3; wood free.

John Ferguson, \$4.40 for coal; wood free if coal bid is accepted.

Charles G. Boughton, coal \$4.90; wood free.

James Hanrahan, \$4.75 from August 1st to April 30th, and for May, June and July, \$4.25; with free wood.

John L. Schwartz, William J. Sloan, and John Brendel, each \$4.75, with free wood.

Joseph E. Galvin, \$4.75 for coal with free wood, and offered to split the wood.

This is another bomb shell thrown into the coal dealers' exchange, and will probably call for heroic action.

The Coal Exchange has suspended Messrs. Thomas Loomis & Co., for cutting coal rates, and the outlook for a hot war is decidedly imminent. Particulars were given in last number of ENGINEERING AND MINING JOURNAL. The penalty for

cutting prices is as high as \$400 and suspension until paid. The idea prevalent is that Loomis & Co. will not pay any fine if one is levied, as they say they are not the only ones cutting under schedule.

With regard to the occupancy of the north pier by the Delaware, Lackawanna & Western Railroad Company, U. S. Engineer Stickney says: "The pier is claimed by the Lackawanna people, and they have occupied it for a long time, and have made many improvements in the way of dredging surrounding waters, etc., but they have never proved their title to the property, and it is claimed by government officials as United States land. At present, as heretofore, the Lackawanna people are in possession, with consent of the government, a revocable license having been issued. This was done as the result of a mutual understanding."

Lake freights are steady, with light business. The shipments of coal from June 19th to June 25th, both days inclusive, aggregated 53,610 net tons, viz.: 18,350 to Chicago, 9,010 to Milwaukee, 3,350 to Duluth, 11,280 to Superior, 200 to Bay City, 1,350 to Marquette, 2,980 to Gladstone, 2,080 to Detroit, 1,840 to Toledo, 500 to Alpena, 1,150 to Ashland, 970 to Saginaw, 600 to Racine; total thus far this season, 514,380 net tons. The rates of freight were 60c. to Chicago, 50c. to Milwaukee, Alpena and Portage; 45c. to Gladstone, 40c. to Duluth, Saginaw, Superior, Marquette and Ashland; 60c. to Racine, and 30c. to Detroit and Toledo.

Coal receipts by canal for third week in June, 168 net tons; shipments, 454 net tons. No new freights reported.

**Chicago.**

June 25.

[From our Special Correspondent.]

At this season of the year great activity cannot be looked for in this market; as to anthracite coal, the general feeling is one of confidence for the future; prices are held firm, and some movement is noted. It is said that the receipts of anthracite are less than the consumption—so decreasing stocks are held.

Owing to the activity of the manufacturing and industrial interests, bituminous coal is in good demand, but at prices that are not remunerative to shippers, who are expected to hold back their product and so bring the price up.

The Coal Dealers' Association, of the Northwest, held their annual meeting in this city on June 18th. Only a small part of its members was present, and only routine business was transacted.

Retail figures are, for large egg, \$5.75; small egg, range, and chestnut, \$6.

On cars f. o. b.: Chicago grate, \$4.75; stove, range, and chestnut, \$5. Lehigh lump, \$7.

Bituminous per ton of 2,000 pounds: Green and Sullivan County (Ind.) shaft, \$2.25@ \$2.40; Jackson Hill, \$3.25; Hocking Valley, \$3; Ohio Central, \$3; Erie, Briar Hill, \$4.15@ \$4.20; Indiana block, \$2.35; Youghiogheny, \$3.35; Sunday Creek, \$3; Connellsville coke, \$5.20.

The present condition of the Chicago iron market may be said to be most assuring in its character, with a general feeling of confidence, firm prices and a promising outlook. The past week has seen an active one here, as well as west and northwest of this city. Lake Superior coke and Southern irons have been in good demand. The same may be said of car wheel, malleable and silvery; still it is hard to specify any class of irons having any advantage over others; inquiry seems to be unusually evenly distributed, and transactions have been larger, with many more pending and in view. Furnaces are busy, and there is but little surplus held, the bulk of which is well placed for early delivery. No actual speculation has as yet been discovered, yet some inquiries would indicate that a buying element will enter the market for that purpose if matured.

**Pittsburg.**

June 26.

[From our Special Correspondent.]

Coal.—The situation remains about the same; the season is fast drawing to a close; most of the lower markets have sufficient coal on hand to last the balance of the year. The big tow boats engaged in transporting Pittsburg coal have made their last trip for the season.

Nominal rates in pools:

	Per 100 bushels.	Per 100 bushels.
1st pool.....	\$4.75	3d pool.....\$3.90
2d pool.....	4.50	4th pool .. .. . 3.25
Railroad coal, \$5.00@ \$5.50.		

Connellsville Coke.—The market continues very firm, with a good demand. The terrible disaster at the Hill Farm mine has caused a suspension of work throughout the entire coke region. The result is we are without the usual facts and figures that generally accompany this report. We can only say that the demand continues very active, with prices steadily maintained as follows; f. o. b. cars at ovens, firm, \$2.15; foundry, \$2.45; crushed, \$2.65; freights to all parts unchanged.

**FREIGHTS.**

From Philadelphia to: Bangor, \$1.05; Bath, \$1.10; Boston, 105@ \$1.10; Charleston, .70; Gloucester, \$1.10; Milton, 1.25; Newburyport, \$1.00; New York, .90; Norfolk, 65; Providence, \$1.00; Portland, \$1.05; Rockport, \$1.30; Washington, \$1.85.

From New York to: Bangor, \$1.00; Bath, \$1.00; Beverly, \$1.00; Boston, \$1.00; Bristol, \$1.00; Bridgeport, \$1.00; Brooklyn, \$1.00; Cambridge, \$1.00; Cambridgeport, \$1.00; Charlestown, \$1.00; Chelsea, \$1.00; Com. Pt., \$1.00; East Boston



\*70; East Cambridge, \*70; East Greenwich, \*75; Fall River, \*75; Gardner, \*70; Lynn, \*85; Marblehead, \*80; Medford, \*90; New Bedford, \*75; Newburyport, \*90; New Haven, \*60; New London, \*75; Newport, \*75; Norwich, \*75; Norwalk, \*80; Portland, \*70; Portsmouth, N. H., \*80; Providence, \*75; Quincy Pt., \*80; Rockland, \*70; Sacon, \*90; Salem, \*70; Saugus, \*80; Wareham, \*75.

From Baltimore to: Boston, Mass., 1.25; Charleston, 70; Fall River, 1.20; Galveston, 3.25; New Bedford, 1.20; New Haven, 1.20; New London, 1.20; New York, N. Y., 1.10; Portland, 1.25; Portsmouth, N. H., 1.25; Providence, 1.20; Quincy Pt., 1.35; Richmond, 70; Salem, Mass., 1.25; Savannah, .80; Williamsburg, N. Y., 1.15.

\*And discharging. †Alongside. ‡And towage. §Flat

METAL MARKET.

NEW YORK, Friday Evening, June 27.  
Prices of silver per ounce troy.

June	Sterling Exch'ge	Lond'n Pence.	N. Y. Cts.	June	Sterling Exch'ge	Lond'n Pence.	N. Y. Cts.
21	4.87	47½	1.04	25	4.87	47¾	1.04
23	4.87	47¾	1.04	26	4.87	47¾	1.04½
24	4.87	47¾	1.04	27	4.87	47¾	1.04½

Council bills were allotted a decline of ¼d. this week. The market here and in London has remained comparatively steady, inclining toward weakness before the decisive vote of the House of Representatives against the free coinage bill passed by the Senate. The probability still remains, as outlined editorially in these papers, June 14th, when we said, "It seems probable that the present agitation will result in either a simple measure calling for the purchase of 4½ million dollars (or ounces) of silver monthly to be paid for in notes redeemable in lawful money, or a simple instruction to the Secretary of the Treasury to purchase monthly the maximum (\$4,000,000 worth) allowed under the present law and to coin the same into standard dollars." Our information at that time as to what the Senate and the House would do have since been verified so that our sources of information have been shown to be good. We see as yet no reason to change this forecast of what may yet come.

Silver Bullion Certificates.  
NEW YORK STOCK EXCHANGE.  
Price.

	H.	L.	Sales.
June 21.....	105¼	105½	40,000
June 23.....	104¾	104½	105,000
June 24.....	104¾	104½	81,000
June 25.....	104½	104	50,000
June 26.....	105	104½	110,000
June 27.....	104½	104	10,000

CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.

June 21.....	105¼	105½	30,000
June 24.....	104¾	104½	10,000
June 25.....	104¾	104½	25,000
June 26.....	105	104½	30,000

Total sales..... 491,000

Foreign Bank Statements.

The governors of the Bank of England at their weekly meeting on Thursday advanced its rate for discount from 3 to 4 per cent. During the week the bank gained £113,000 bullion, but the proportion of its reserve to its liabilities was reduced from 39.81 to 36.83 per cent., against an advance from 43.51 to 43.75 per cent. in the same week last year, when its rate for discount was 2½ per cent. The bank on the 26th inst. lost £83,000 bullion on balance. The weekly statement of the Bank of France shows a gain of 1,975,000 francs gold and a loss of 1,625,000 francs silver. The weekly statement of the Imperial Bank of Germany shows a specie loss of 1,220,000 marks.

Domestic and Foreign Coin.

The following are the latest market quotations for American and other coin:

	Bid.	Asked
Trade dollars.....	80	\$ 81
Mexican dollars.....	.80-81	.81½
Peruvian soles and Chilean pesos.....	.74	.75½
English silver.....	4.86	4.90
Five francs.....	.94	.95
Victoria sovereigns.....	4.87	4.90
Twenty francs.....	3.86	3.90
Twenty marks.....	4.74	4.78
Spanish doubloons.....	15.55	15.70
Spanish 25 pesetas.....	4.30	4.35
Mexican doubloons.....	15.55	15.70
Mexican 20 pesos.....	19.50	19.60
Ten guilders.....	3.96	4.00
Bar silver.....	104½	105½

Copper.—The tone of the market is still very firm indeed, and although the difficulties with the workmen, which threatened to result in serious strikes at several of the Lake mines, have now been arranged, values have shown no inclination to give way, clearly proving that the position is inherently strong. Of Lake brands nothing is now obtainable from producers below 17c., but from second holders a few small lots might possibly still be secured at from 16½-17c., but it looks as if these lots would soon be out of the way. As was generally foreseen, the demand for Arizona copper has greatly increased, and those descriptions have now advanced to 15½-16c. Casting brands are also held

for higher prices, and nothing is now obtainable below 14½@15. To sum up, the market is exceedingly strong for all sorts, and deliveries are going on at a very great rate. In London the market for Chili bars and G. M. B. copper which closed last week at a slight reaction stiffened again, and after opening steady on Monday morning gradually and steadily advanced, closing to-day as per cable advices at £53 17s. 6d. @ £59 spot and £59 10s. @ £59 12s. 6d., three months, or a rise of from 10s. to 15s. for the week. The amount of business done in London during the week has been very large, a total of nearly 6,000 tons of G. M. B.'s having changed hands during that time at gradually increasing prices. The latest quotations for refined and manufactured sorts are: English tough, £62 @ £62 10; Strong sheets, £70 @ £71; Best selected, £64 10s @ £65; yellow metal, 6½d. per pound.

A sale of 7,000 tons Boston & Montana matte, for delivery from July to December, is also reported, at the comparatively very low price of 11s. 9d., English terms.

It is anticipated that the total deliveries in England will again be very large for the present month.

The exports of copper during the past week were as follows:

	Copper.	Lbs.	
To Rotterdam.....	775 pigs.	224,000	\$26,000
S. S. Amsterdam.....	Copper matte.	Lbs.	
To Liverpool.....	50 bbls.	61,954	\$5,000
S. S. Runic.....	Copper.		
To Liverpool.....	76 cases.	117,082	15,800

Tin.—The market has been exceedingly irregular during the whole of the week. In sympathy with the movements in silver it opened steady on Monday, and prices afterward hardened somewhat on receipt of higher quotations from London, but subsequently the market became weaker, partly owing to the arrival of two steamers bringing rather large supplies, and to-day at the close the feeling is flat, with July tin selling at 21½c., and August at 21c. Ample supplies having now come in, the premium hitherto paid for spot tin will doubtless disappear. The London market has also been rather irregular, with pretty free selling all along, and the closing prices to-day received by cable are at the lowest figures of the week, viz: £93 15s. @ £94 spot, and £94 10s. @ £94 15s. three months.

Lead.—The market, which closed strong last week at 4.50, was hammered down early in the week by certain operators, and some sales took place at 4.45 and 4.42½, but the quantity of metal offered at these figures was very small and buyers were only too ready to pick them up at the first chance. When they were out of the market prices quickly improved again, and we close very firm to-day at 4.50 to 4.55.

The Chicago Lead Market.—Messrs. Everett & Post telegraph us as follows: "The market opened strong, refiners declining to sell under 4.50c., and only a limited quantity at that. Some 300 tons of Corwith lead sold at 4.40c. from store. Outside 400 tons of soft Missouri, Wisconsin and desilverized soft leads sold at 4.40@4.50c. Consumers are fairly well supplied for present requirements. The market at the close is strong."

The St. Louis Lead Market.—Messrs. John Wahl & Co. telegraph us as follows: "The market advanced in the early part of the week. Both common and refined lead have been sold at 4.30@4.35c. Sales aggregate 300 tons at these figures; 4.35c. has been bid and refused for refined lead, July delivery. At the close the market is a little easier in sympathy with seaboard quotations."

Spelter remains steady and firm, with very little metal offering at 5.55@5.60.

Antimony.—There is hardly anything offering on the spot, and the present quotations are as follows: Cookson's, 25c.; L.X., 22c.; Hallett's, 20½@21c. The demand continues very good.

Nickel has been in very good demand, and the foreign producers have raised their prices considerably. We have now to quote 75c. to 80c.

Quicksilver.—There is no appreciable change either in quotations or in general features; \$55 at New York and £10 @ £10 1s. is the price asked.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, June 27.

Although New York is proverbially the weakest spot in the iron market, the efforts of the bear element during the past week have signally failed in accomplishing any reduction in prices. Stocks throughout the country are short, consisting of less than three weeks' supply, and prices have stiffened.

Speculative buyers are to be found, but sellers do not encourage them by any trimming down of the "odd quarter" or any fraction of the dollar, odd or even. A contemporary, which claims to be an authority on iron, quotes some grades at \$1 a ton less than we do. It is safe to assert that if any quantity could be obtained at the prices quoted it would be gobbled up promptly.

The "wash" sales in pig iron warrants have been rather large during the week, but as these transactions are looked at askance by the conservative

element they have had no effect on the market. It is reported that the week's sales at the Consolidated Stock and Petroleum Exchange were of warrants representing 13,300 tons at from \$16.25 to \$16.75. Both extremes were reached on the first day of the week as well as the last, and the significant fact that these transactions represented fully one-fourth the iron in store does not appear to have had any effect on the price, while the least departure from the ordinary in the real market stiffened prices at once. A dealer found himself burdened with warrants secured last fall, went to the exchange one day and tried to sell. No one would buy them, even at a slight reduction. He hawked them about in vain. Nevertheless, in the reported exchange sales on the following day warrants for 3,000 tons seem to have changed hands.

Pig Iron.—Transactions in pig iron have been confined to consumption, with a fairly active demand for prices a shade lower than those quoted. Rather than any indication of weakness, as has been stated, the trade evidenced a firmness which was reflected to some extent in prices. There is little pig iron available more than is demanded for current purposes, and the expectation of a rising market results in a little eagerness to find some at anything lower than these prices: Standard Northern iron, No. 1 x foundry, \$17.75 @ \$18.25; No. 2 \$17; Southern, No. 1, \$17 @ \$17.50; No. 1, soft, \$16.50 @ \$16.75; No. 2, \$16.25 @ \$16.50.

Scotch Pig.—Business for the week has been very light, with no transactions of any volume. With the exception of a slight shading in Coltness, prices are the same as last week: Eglington, \$19; Dalmellington, \$22; Summerlee, \$23.50; Coltness, \$23.50 @ \$24.

Spiegeleisen and Ferro-Manganese.—Nothing is doing. Though supplies here are not large, and the nominal prices fair, it is understood that both articles are being held on the other side for higher prices. Prices remain: 80 per cent. ferro-manganese, \$75 @ \$80; 20 per cent. spiegeleisen, \$31.50 @ \$32. These prices are asked, but as there have been no transactions during the week, it is difficult to quote prices which would actually buy the material.

Muck Bars.—Last week's nominal quotations, \$28 @ \$29, hold good. No transactions are known to have been made which impart any degree of activity, and a substantial order might result in shading down 50 cents or so.

Steel Rails.—About 30,000 tons went west and south during the week, but none of the transactions are even hinted to have been at less than quoted prices. The demand continues fairly active, and most of the mills claim to be fully booked ahead for from one to three months.

What little demoralization there was in this market has quite disappeared, though in some quarters prices are stated as \$30.25 @ \$31. The larger firms will not do any business at anything short of the higher figure.

Rail Fastenings.—Last week's prices rule this week, with a general report of dull business, but firm. Spikes, 2.05c.; angle plates, 1.90c.; bolts and square nuts, 2.70c., and hex. nuts, 2.95c.; complete joint, 90c. for steel and 70c. for iron.

Structural Iron and Steel.—Business keeps on steadily without any falling off, and there is every indication of prices remaining where they are for some time. Several large orders are soon to be placed, among them 4,500 tons for the Burlington bridge. All the manufacturers are as busy as they care to be. Prices remain: Universal plates, 2.20; bridge plates, 2.15 @ 2.20; angles, 2.15 @ 2.20; tees, 2.65; beams, 3.10.

Tubes and Pipe.—The mills are all working full time, and the output is bespoken well ahead. Several large expectations are bracing the market to a state approaching stiffness. Among these is the fact that orders have been issued by the Standard Oil Company for the construction of another great pipe line from the Ohio fields to Chicago similar in size and capacity to the one now in operation from Findlay, O., to that city. The orders are divided among a number of factories, that the work may be expedited. The new pipe line will be built of 6-inch or 8-inch tube, the same as the present one, and will be laid alongside the first one. The new line will call for 280 miles of pipe. It is expected that by our next report a slight increase in prices, or reduction of discounts, will have been agreed upon. Ruling discounts on car lots are: 47½ per cent. on butt, hiack; 40 on galvanized; 60 on lap, black, and 47½ on lap, galvanized; 40 on 1½-inch boilers; 50 for 2 to 4-inch, and 52½ on larger than 4-inch casing, all sizes, 50 per cent.

Merchant Steel.—Business is dull, but prices remain firm as reported last week: Best English tool steel, 15c. net; American tool steel, 7½ @ 10c.; special grades, 13 @ 20c.; crucible machinery steel, 5c.; crucible spring, 3½c.; open-heart machinery, 2½c.; open-heart spring, 2½c.; tire steel, 2½c.; toe calks, 2½c.; flat file, 4½c.; mill file, 5½c.; taper file, 7½c.; first quality sheet, 10c.; second quality sheet, 8c.

Old Rails.—This section of the iron market is cheerfully brisk. The demand keeps ahead of the supply and prices have advanced a trifle. Three and four thousand ton lots are reported sold at \$24.50, though it is hard to induce holders to sell



at anything lower than \$24.75, with \$25 invariably asked, and in some cases insisted upon. Pittsburgh has been a large buyer lately and wants more.

**Scrap Iron.**—The usual amount of scrap is moving along and the demand is sufficient to keep the prices firm. We quote: Wrought scrap, \$21@22.50 from yards. Cast, stove plates, \$13@14; machinery scrap, \$15@16.

**Billets.**—The market is generally dull, with activity in streaks. Large buyers could probably shade something lower than the generally quoted price, \$31.25@32.

**Chicago. June 25.**

(From our Special Correspondent.)

**Pig Iron.**—Prices are held firm, with no notable change in quotations. Several large lots have been placed at different figures, but in such a manner as to have no influence on quotations. We quote to-day, for cash per ton of 2,240 pounds f.o.b.: Chicago, for Nos. 1 and 2 Lake Superior charcoal, No. 3 for car wheels and Nos. 4 and 5 for malleable, \$20.50@22; Lake Superior coke Bessemer, \$18; No. 1 Lake Superior coke Bay View, \$17; No. 2, \$16.50; No. 3, \$16; Southern coke, No. 1, \$16.50@17; No. 2, \$15.50@16; No. 3, \$15@15.50; Southern charcoal, \$19@19.50; standard Southern car wheel, \$24@25; Ohio softeners, Hanging Rock, \$18.50@19; Jackson County, \$18@19; Hanging Rock cold blast, \$26@28; warm blast, \$23@25; No. 1 Scotch, according to brands, \$25@28; American Scotch, \$19@20; Bay View Scotch No. 1, \$17; No. 2, \$16; Chicago Scotch No. 1, \$17; No. 2, \$16; Emma Scotch, \$19@19.50; Black band, Hubbard Scotch, \$19.50; Haselton, \$20.25; soft Silvery, \$18; Wellston No. 1, \$19; No. 2, \$18.50@19; Hamilton No. 1, \$18; Norton No. 1, \$18@18.50; Zanesville No. 1, \$18.

**Bar Iron.**—The demand is good from all classes of consumers, and the market is a strong one, with a very favorable outlook. As is their custom the mills will close down in July for repairs. Prices are firm and \$1.65 f. o. b. Valley mills is reported to be the bottom quotation; local mills are asking \$1.85@1.90; store trade is good and dealers are asking \$2@2.20, according to quantity.

**Structural Iron.**—We report a greatly increasing demand both for railroad and building material, as compared with previous years, and, judging from present indications, we predict a heavy demand for some time to come. Foundries running on structurals as a matter of course have all they can do, yet dealers claim that there is less profit in this business. The figures are: Angles, iron and steel, \$2.30@2.40; universal plates, \$2.50; sheared plates, \$2.50; tees, \$2.60@2.70; beams and channels, \$3.20.

**Black Sheet Iron.**—Prices are firm, with a slight advance at mills, which have all they can do until August, which fact, with the usual shut down for repairs, will tend to keep up quotations. Mills are now asking \$3.10 for No. 27 f.o.b. Chicago and are not at all eager for orders.

**Galvanized Sheet Iron.**—Under the existing heavy demand which prevents the prompt filling of orders current quotations are maintained with great firmness and an early advance is probable. Discounts for both cheap and standard brands are now 6 1/2 per cent., and 5 and 5 per cent. on charcoal from store. Jobbing lots are quoted according to quantities.

**Merchant Steel.**—Demand good and inquiry large. This market is devoid of new features, prices being unchanged. For tool steel, \$7.75@8; specials, \$12@12.50; open hearth machinery, \$2.75; Bessemer machinery, \$2.50@2.60; open hearth spring, \$2.60@2.65; tire, \$2.50@2.60; toe calk, \$2.70@2.80; crucible sheet, \$7@10; crucible spring, \$3.75.

**Plates, Tubes, etc.**—The fair demand and good inquiry continues; mills are behind with their orders, and prices are well maintained. Tank iron, \$2.70; tank steel, \$2.90; heavy sheets from 10 to 14, \$2.90@3; steel sheets 10 to 14, \$3.25@3.50; shell iron, \$3@3.25; flange iron, \$4@4.25; flange steel, \$3.50; shell steel, \$3.25; boiler rivets, \$4@4.25; fire box iron and steel, \$4.75@5.50; boiler tubes 4 1/2 inches, and larger 5 1/2 per cent., 2 to 4 inches 50 per cent., and 1 1/2 inches and smaller 45 per cent.

**Nails.**—The immense consumption during the present building season of wire and cut nails serves to keep up the demand at strong prices; for wire nails the rate is \$2.40; at stores prices vary from \$2.45 to \$2.50, and firm in either large or small lots. Steel cut nails are \$1.95@2, jobbers' prices, and \$1.90 is now asked at mill.

**Scrap Iron.**—The present condition of this market seems to be that of firmness in prices and of scarcity of material. The bulk of stock is held by one or two firms, who seem disposed to maintain their position. We quote country mixed scrap, \$13.50@14, according to condition; No. 1 mill, \$14@14.50; light wrought, \$9.50, horse shoes, \$17.50@18; axles, \$23; cast machinery, \$12.50@13; stove plates, \$9.50@10; borings, \$8@8.25; wrought turnings, \$11.50@12; No. 1 railroad shop or forge, \$18.50@19.50; track scrap, \$19.

Sheet and hot copper, 22c. pound rates. Sheet brass, copper and brass wire, 22 per cent. discount, factory delivery. The copper market is steadily advancing.

**Louisville. June 24.**

(Special report by HALL BROS. & Co.)

The week under review has not shown quite so much activity though buying has been fair yet, not so heavy as last. Furnaces claim to have practically withdrawn from the market, saying they are booked well ahead for several months and prefer to wait results of present advance. One furnace, we learn, has a strike, but the general strike predicted has not as yet materialized. Many buyers have covered their wants for this year. St. Louis has consummated several large sales for this year's delivery at a concession. July and August will tell the tale as to whether present advances will hold good; if they do the chances are we can look for a good fall trade. Furnaces, as a rule, are holding firm to 50c. advance over the lowest prices that were ruling several weeks since. Charcoal irons are dragging. We quote substantially as last.

Hot Blast Foundry Irons.	
Southern Coke No. 1.....	15.25@15.50
" " No. 2.....	14.50@15.00
" " No. 3.....	14.00@14.25
Mahoning Valley, Lake ore mixture.....	17.75@18.75
Southern Charcoal No. 1.....	17.00@17.50
" " No. 2.....	15.50@17.00
Missouri " No. 1.....	18.00@18.50
" " No. 2.....	17.00@17.50
Forge Irons.	
Neutral Coke.....	13.50@14.00
Cold Short.....	13.50@13.75
Mottled.....	12.50@13.00
Car Wheel and Malleable Irons.	
Southern (standard brands).....	22.00@23.00
" (other brands).....	18.00@19.00
Lake Superior.....	22.50@23.00

**Philadelphia. June 26.**

(From our Special Correspondent.)

**Pig-iron.**—There is a disposition, among forge iron users particularly, to buy a great deal of material this month, but there is not a corresponding willingness upon the part of makers to drop prices to effect sales. The only symptom of weakness shown since Monday has been in the acceptance by makers of inferior irons, both foundry and forge, of offers a little below usual quotations. The strong feature of the market is the heavy consumption in progress, and another very strong point is the opening up of heavy requirements for the fall. Several lots of forge iron were taken yesterday at \$15.50. Best brands were held at \$16, but buyers claim that these prices could be shaded, a statement which is denied by the makers and brokers themselves. No Southern iron has been offered here for a few days, and some offers made two weeks ago have been withdrawn for some reason. No. 1 foundry is quoted as high as \$18.50 for standard makes, without concessions of any kind. A few companies prefer to let stocks accumulate rather than sell at less.

**Muck Bars.**—Muck bars are quoted as usual, at \$23@28.50, and nothing of importance has taken place in the market.

**Billets and Slabs.**—A quotation of \$32.50 was given to-day to a buyer of billets. The general tone of the market is strong.

**Foreign Material.**—Brokers report a few inquiries this week, and only one sale of spiegel-eisen has taken place. No change in quotations.

**Merchant Iron.**—Car builders have been the heaviest buyers for the past few days, but local mills claim a good demand in a small way. Refined is selling at \$1.80 to \$1.90. Western iron continues to be offered in eastern markets at low prices.

**Nails.**—There is quite a free movement in nails.

**Sheet Iron.**—The sheet iron demand has fallen off for the present, but mills are over sold and manufacturers are quite contented with the situation. Card rates will not be departed from.

**Plate and Tank Iron.**—Nothing of interest has occurred in this branch for a few days, and quotations remain unchanged. A large order might be taken at the usual concessions, but nothing of that kind is now being offered. Tank, 2-10c. The buyers of bridge plate have a good deal of business to place, but as manufacturers are not offering any inducements it is not likely that much business will be reported for a week or two.

**Structural Iron.**—There is no change in quotations, and not much movement in the market. A good deal of anxiety exists both among manufacturers and buyers with reference to the metal schedule, and how it will be fixed up.

**Steel Rails.**—Rumors are again afloat concerning the placing of large orders in Pennsylvania steel rail mills, but the local rail interests are not able to give any confirmation of them. Small lots are quoted to-day at \$32 to \$32.50, but there is some uncertainty as to what a large block could be had for.

**Old Rails.**—Old rails are wanted all around, and brokers are promising to have supplies here by the middle of July. Quotations are nominally \$24.50 at tidewater.

**Scrap.**—A good deal of scrap is arriving, and dealers are making an effort to fill their yards. For No. 1 \$22.50 is quoted.

**Pittsburg. June 26.**

(From our Special Correspondent.)

**Raw Iron and Steel.**—During the past six months the iron and steel market has undergone various changes. Taken as a whole, the sales of raw iron and steel have been the largest ever made

in the first half of any year. Prices have varied, according to demand and circumstances. We reported sales the first week in January 50,225 tons, against 23,970 tons made the first week in January, 1889. Current rates for January, 1890, were: Bessemer, \$21@24.50; Grey Forge, \$18.50@19. No. 1 Foundry, \$21; No. 2, \$20; muck bar, \$31.25; steel billets, \$36@37; slabs, \$30@37; ferro-manganese, 80 per cent., \$10.10@10.50; speigel, 10 and 12 per cent., \$35, 20 per cent., \$41; steel wire rods, \$51; old iron rails, American T's, \$28@29; bloom ends, \$26; charcoal iron, cold blast, \$26@29. No. 2 Foundry, \$22.75@23; warm blast, \$24@24.50; coke, native ore, Grey Forge, \$18.50; No. 1 Foundry, \$20; No. 2 Foundry, \$19.

Prices that govern the market at the present time rule very materially below those at which iron and steel could be purchased at that time, notwithstanding the fact that it costs several dollars per ton more to produce the article than it did in January; taking all the facts into consideration, we fail to see how iron can be made and sold below present prices. All the steel rail mills in this vicinity have about all the orders they want at the present time booked. One firm remarked, we had to refuse a large order, at satisfactory prices, being unable to furnish the rails in the time specified. The pipe iron business seems to be coming to the front. Several large orders for pipe are now on the market; one large firm wants 400 miles of 6-inch pipe to complete an oil line from West Virginia to Philadelphia. A lot of 20 miles of 10-inch gas pipe is ordered, and another company wants 60 miles of 10 and 12 inch pipe, making a total of 480 miles. Pipe mills in Pittsburgh have all the orders they can take, but prices are not picking up in proportion to the demand. Taking these things into consideration, we fail to see where lower prices are to come in. From the point of view of the producers the present condition of the market is favorable, and the indications for the balance of the year are considered very promising. The conditions have not changed materially during the past week, but the slight change that is manifest is in the direction of a firmer tone. Conservative and well-informed parties are of the opinion that the market is now in such a stable condition that there is little prospect of a sharp movement in either direction, and that any change is likely to be an improvement.

**Coke and Coke Smelted Lake Ore.**

2,000 Tons Mill Iron.....	15.75 cash.
2,000 Tons Mill Iron.....	15.75 cash.
2,500 Tons Bessemer Valley furnace.....	19.00 cash.
1,000 Tons Bessemer.....	19.45 cash.
1,500 Tons Bessemer.....	19.50 cash.
1,000 Tons No. 1 Mill.....	16.00 cash.
1,000 Tons Bessemer.....	19.50 cash.
750 Tons Grey Forge.....	15.75 cash.
500 Tons Grey Forge, August.....	16.00 cash.
500 Tons Grey Forge.....	15.50 cash.
500 Tons Bessemer.....	19.00 cash.
500 Tons Bessemer.....	19.00 cash.
500 Tons Bessemer at furnace.....	19.00 cash.
500 Tons Mill, all ore.....	17.50 cash.
350 Tons Off Bessemer.....	17.50 cash.
150 Tons No. 2 Foundry, all ore.....	17.50 cash.
100 Tons No. 3 Foundry.....	17.00 cash.
50 Tons No. 2 Foundry.....	16.50 cash.

**Coke Native Ore.**

250 Tons Grey Forge.....	15.65 cash.
150 Tons Silvery No. 1.....	18.75 cash.
100 Tons Silvery No. 2.....	17.00 cash.

**Muck Bar.**

1,000 Tons Neutral.....	29.25 cash.
1,000 Tons Neutral, August and September.....	29.75 cash.
1,000 Tons Neutral, July.....	29.50 cash.
500 Tons Neutral.....	29.75 cash.

**Steel Slabs and Billets.**

2,000 Tons Billets.....	30.50 cash.
1,500 Tons Billets, August and September.....	32.50 cash.
1,250 Tons Billets, August to October.....	32.50 cash.
1,000 Ton Billets.....	31.00 cash.
500 Tons Billets.....	31.50 cash.

**Skelp Iron.**

400 Tons Sheared Iron.....	21 1/2 4 mo.
300 Tons Narrow Grooved.....	17 1/4 4 mo.
200 Tons Wide Grooved.....	18 1/2 4 mo.

**Steel Wire Rods.**

750 Tons American Fives, August.....	46.50 cash.
500 Tons American Fives.....	44.00 cash.

**Steel Bloom Ends.**

1,000 Tons Bloom Ends.....	21.50 cash.
1,000 Tons Bloom Ends.....	21.50 cash.
500 Tons Bloom Ends.....	21.75 cash.

**Ferro-Manganese.**

150 Tons 80 per cent., seaboard.....	75.00 cash.
100 Tons 80 per cent., Pittsburgh.....	78.00 cash.
100 Tons 80 per cent., seaboard.....	78.00 cash.
75 Tons 80 per cent., seaboard.....	78.50 cash.

**Spiegel.**

200 Tons 20 per cent., seaboard.....	32.00 cash.
--------------------------------------	-------------

**Prices.**

<b>Coke or Bituminous</b>	20% Spiegel at New York....	\$31.00
<b>Pig—</b>	Muck-Bar.....	29.00@29.75
Foundry No. 1.....	17.50@18.00	
Foundry No. 2.....	16.25@16.50	
Gray F. No. 3.....	15.50@16.00	
" No. 4.....	15.00@15.25	
White.....	14.50@14.75	
Mottled.....	14.50@14.75	
Silvery.....	13.75@13.95	
Bessemer.....	19.00@19.50	
Low Phos.....	19.50@24.50	
<b>Charcoal Pig—</b>		
Foundry No. 1.....	23.50@24.50	
Foundry No. 2.....	22.00@22.75	
Cold-Blast.....	25.00@25.00	
Warm-Blast.....	24.00@25.00	
10 + 12% Spiegel f. o. b. N. Y., August.....	29.00	
20% Spiegel at New York....	\$31.00	
Muck-Bar.....	29.00@29.75	
Steel Blooms.....	31.00@31.50	
Steel Slabs.....	31.00@31.60	
Steel Cr'y Ends.....	21.00@21.50	
Steel Bl. Ends.....	20.50@21.00	
Ferro-Man. 80% f.o.b. Baltimore, Sept.....	78.50	
Old Iron Rails.....	31.00@32.50	
Old Steel Rails.....	26.00@26.50	
Old Steel Rails.....	21.50@22.00	
No. 1 W. Scrap.....	20.00@21.00	
No. 2 W. Scrap.....	18.00	
Steel Rails.....	33.00@33.50	
" light sec.....	33.00@37.00	
Bar Iron, nom.....	1.85@1.90	
Iron Nails.....	1.90	
Steel Nails.....	1.90	
Wire Nails.....	2.30@ 2. 3/4	



CHEMICALS AND MINERALS.

NEW YORK, Friday Evening, June 27.

**Heavy Chemicals.**—The trade in heavy chemicals continues quiet, and without features of interest. Prices show no appreciable change, and altogether the situation is the same that has been reported in these columns for the past two weeks.

Caustic soda, 70 to 74 per cent., 2.55@2.57½c.; 76 to 77 per cent., 2.60@2.62c. There is more excitement in this article than in all the others. Buyers are inclined to fight shy of the present advancing tendency, believing, as usual, that a change of direction in their favor will take place before long.

Carbonated Soda Ash.—For both 48 per cent. and 58 per cent. quotations are 1.40@1.45c. There is a very fair demand.

Caustic Soda Ash.—Quiet at 1.40@1.50c. Bleaching Powder.—Liverpool brands are quoted at 1.30@1.35c., while Newcastle is 1.25c. Sal Soda.—Quotations in this are 97½@1c.

**Acids.**—So far as amount of actual business transacted or prices are concerned, manufacturers state that no improvement can be noted; indeed, there is no particular reason why it should change materially.

In the course of an interview an officer of the Knickerbocker Chemical Company stated as follows to a representative of the ENGINEERING AND MINING JOURNAL: "It has been the policy of the Knickerbocker Chemical Company to refrain from newspaper controversy. We have believed that our intentions could best be demonstrated by our actions, and that our condition was a matter in which our stockholders only were concerned. You may state as official information that the Knickerbocker Chemical Company will continue in existence after July 1st with its present membership intact, the agreement having been renewed for a year. This should set at rest any rumors to the contrary."

Acid, per 100 pounds in New York and vicinity: Acetic, \$1.75@2.25; muriatic, 18-degree, 80c.@1.25; muriatic, 20-degree, 90c.@1.50; muriatic, 22-degree, 90c.@1.75; nitric, 36-degree, \$2.75@3.50; nitric, 40-degree, \$3.25@4.50; nitric, 42-degree, \$3.75@4.75; sulphuric, 60-degree, 70@80c., and sulphuric, 66-degree, 85c.@1.

**Fertilizing Chemicals.**—The trade in fertilizers has been as is customary at this time of the year. There is no noticeable change in prices, only one or two articles showing any change from our last week's list. We accordingly quote high grade dried blood \$1.90@1.95. For the low grade the price is \$1.80@1.85. Azotine, \$1.90@1.95. Tankage, high grade, 9 to 10 per cent. ammonia and 15 to 20 per cent. phosphate, \$19@20 per ton, and low grade 7 to 8 per cent. ammonia and 25 to 30 per cent. phosphate, \$18@18.50. Fish scrap, \$20.50@21 per ton. f.o.b. factory. Sulphate of ammonia at \$3.00@3.10 per cwt. Concentrated tankage, \$1.80@1.85. Refuse, hone black, guaranteed 70 per cent. phosphate, \$18.50@19 per ton. Dissolved bone-black is nominally 95c. per unit for available phosphoric acid, although on large lots prices might be somewhat reduced, and acid phosphate 80c. per unit for available phosphoric

acid. Steamed bones, unground, \$20@23; ground, \$25@26.

Charleston rock, undried, \$5.75 per ton; kiln-dried, \$7@7.25 per ton, f. o. b. vessels and cars respectively at the mines. Freight by rail from Charleston to New York, \$2.25@2.50 per ton. Charleston rock, ground \$11.50@12, ex vessel at New York.

Quotations are for 48 to 52 per cent. sulphate of potash, \$1.12½ per 100 pounds for shipments from date; high grade manure salts, basis 90 per cent. sulphate of potash, \$2.37½ per 100 pounds.

Kainit.—There have been a good many orders and sales aggregating 5,000 or 6,000 tons during the week. Prices remain the same, \$9.50@9.75.

Muriate of Potash.—The following have been the arrivals during the week: At Boston, 150 tons; at Baltimore, 100 tons, at New York, 250 tons, all of which quantity was contracted. Quotations are \$1.77½@1.85.

Nitrate of Soda.—There is very little doing in nitrate, which is quoted at \$1.70 ex-ship.

Brimstone.—Dull at \$21.50 for best unmixed seconds on the spot, and \$21 (nominally) for thirds. For forward shipments quotations are \$20@20.50. Prices probably will not go any higher, but in return they will in all probability rule high until September.

NOTES OF THE WEEK.

A despatch from Boston says that a combination has been made among the manufacturers of ammonia, and in consequence the price has advanced from 5½ to 8c. a pound. The combination, it is stated, takes in practically all of the producers, and is regarded by the trade as strong in its hold upon the market.

Liverpool. June 18.

(Special Report by Messrs. J. P. Brunner & Co.)

Caustic soda has continued in good demand, while there is little change to report in other lines of heavy chemicals.

So da ash is about unchanged. There are some inquiries for special brands, but orders are not plentiful. We quote: Caustic ash, 1½d.@1½d.; carb. ash, 1½d.@1½d., according to brands.

Soda crystals are in good request at £3 2s. 6d. up to £3 5s. per ton, according to quantity.

Caustic soda very strong, and prices have had a further advance. This article is very scarce and buyers have experienced great difficulty in filling orders for June delivery.

In 60 per cent. sales have been made at £7 10s.

For 70 per cent. £8 10s. has been paid freely for anything offering for delivery this month and same price paid for July. There are orders in the market to-day at £8 10s. for June, but makers are cleaned out, while for what little there is in second hands 2s. 6d. more money is asked. In 74 per cent. £8 17s. 6d. has been paid for late July, and as high as £9 5s. is asked for some brands, while there is nothing offering for June.

Seventy-six per cent., £9 15s.@10. Bleaching powder is quite demoralized, and although £5 is nominal spot value, this figure could probably be shaded in some cases, but we hear of no orders to test the market.

Chlorate of potash scarce at 4½d. @ 4½d. per lb.

Bicarb. soda firm at £5 15s. per ton and upward for one cwt. kegs according to brand and quantity, with usual allowances for larger packages. Makers have little to sell at the moment.

Sulphate of ammonia shows a decided improvement, and to-day £11 10s.@£11 12s. 6d. are nearest values for good gray 24 per cent. f. o. b. Liverpool. There is a good inquiry from the States for this article.

BUILDING MATERIAL MARKET.

NEW YORK, Friday Evening, June 27.

**Lime.**—A moderate amount of shipping has once more started.

The Knox County (Maine) Lime Association has been dissolved. Internal dissensions caused by violations of the agreement, has brought about the end of what was outwardly a flourishing concern. It has gone the way of all combinations whose members are more anxious to sell their product than to keep their word. As our readers will remember, all shipments were stopped a few weeks ago in order to allow the market to dispose of the then existing supply. One or two members paid no heed to the embargo, and shipped their lime hither, the total collapse of the association being the inevitable result. Some of the smaller concerns will probably wind up their affairs, as they will be unable to compete with the larger firms.

In this market there has been a fair demand, and consumption and prices will hereafter be regulated by the ordinary laws of demand and supply. Some uncertainty will be experienced by contractors and builders who henceforth will not be able to name a definite price for lime in their specifications, as was the case when the association fixed the price.

The price for Rockland common has dropped from \$1 to 90 cents. Finishing is still in good demand at \$1.20; St. John, common and finishing, 90c.@95c.; Glens Falls, common and finishing, 85c.@1.10.

**Bricks.**—There is a good demand for bricks. The supply is not quite so full, accumulations having been exhausted. Quotations are for Haverstraws, \$6@6.50; Uprivers, \$5@5.50; Jerseys, \$4@5; Pales, \$2.75@3.25 per thousand.

NOTES OF THE WEEK.

Nearly 1,500 carpenters at Denver, Colo., who went out in sympathy with the striking mill machine and bench men, returned to work on the 23d inst. They will, however, contribute to the support of the strikers, and all lumber from the mills refusing to grant the strikers' demand will be boycotted.

The strike of the building laborers in Boston, Mass., is ended. Their pay is now 25 cents per hour.

Seventy-five quarrymen in the Crescent Stone Company's quarries and 50 in the quarries of the Globe Stone Company at Joliet, Ill., struck for increased wages on the 23d inst., and marched over to the quarries of the Joliet store. Here every one was forced to quit work. The sheriff and a posse dispersed the strikers and arrested five of their number.

IMPORTS AND EXPORTS OF METALS AT NEW YORK JUNE 14 TO JUNE 21 AND FROM JANUARY 1.

IMPORTS.		
Spelter.	Week.	Year.
Tons.	Tons.	Tons.
Amer. Metal Co.	197	197
Hendricks Bros.	50	50
La Marche's Sons, H.	5	5
Lewisohn Bros.	50	50
Meyer, G. A. & E.	9	9
Muller, Schall & Co.	93	93
Total.	404	404
Corres. date, 1889.	318	318
Pig Lead.		
Lbs.	Lbs.	Lbs.
Caswell, E. A.	111	111
Hendricks Bros.	50	50
Schulz & Co., A.	98	98
G. W. Sheldon.	149	149
Total.	408	408
Corres. date, 1889.	129	129
Tin.		
Tons.	Tons.	Tons.
Abbot, Jere, & Co.	50	50
Amer. Metal Co.	2,125	2,125
Bidwell & French.	640	640
Bruce & Cook.	10	10
Carter, Hawley & Co.	10	10
Cohen, H.	20	20
Crooks & Co., R.	75	75
Dayol & Son.	15	15
Hendricks Bros.	26	26
Lehman, S. & Co.	67	67
Muller, Schall & Co.	520	520
Naylor & Co.	841	841
Nissen, Geo.	10	10
Phelps, Dodge & Co.	2,350	2,350
Thomson, A. A. & Co.	30	30
Thomson, D. & Co.	40	40
Townsend, & Co., J. R.	30	30
Trotter & Co., N.	75	75
Total.	6,334	6,334
Corres. date, 1889.	75	4,932
Tin Plates.		
Boxes.	Boxes.	Boxes.
Bruce & Cook.	2,770	51,708
Byrne & Son.	1,000	1,000

Steel Blooms, Billets, and Slabs.		
Tons.	Tons.	Tons.
Baldwin Bros. & Co.	2	2
Dana & Co.	297	1,356
Downing, R. F. & Co.	5	5
Henderson Bros.	1	1
Martin & Co.	80	80
Milne, A., & Co.	18	18
Pope, Jas. E., Jr.	61	61
Roebling's Sons, J. A.	1,241	1,241
Wolf & Co., R. H.	60	60
Total.	297	2,824
Corres. date, 1889.	500	47,691
Bar Iron.		
Tons.	Tons.	Tons.
Abbott & Co., Jere.	489	489
Bacon & Co.	804	804
Crocker Bros.	77	77
Dickerson, Van	6	6
Dusen & Co.	285	285
Downing & Co.	11	11
E. J. Jacobus.	60	60
Fuller, Dana & Fitz.	385	385
Holt, H. N.	559	559
Lillenberg, N.	249	249
Lundberg, G.	234	234
Milne & Co.	269	269
Muller, Schall & Co.	25	25
Naylor & Co.	104	1,388
Page, Newell & Co.	10	10
Plenty, J.	3	3
Wilson, J. G.	679	5,000
Total.	679	5,000
Corres. date, 1889.	50	3,263
Scrap Iron.		
Tons.	Tons.	Tons.
Crossman & Co., W. H.	30	30
Muller, Schall & Co.	18	18
Samper & Co., S.	136	136
Stevens, Corvin & Co.	30	30
Ward, J. E. & Co.	392	392
Total.	656	656
Corres. date, 1889.	1,033	1,033
Steel and Iron Rods.		
Tons.	Tons.	Tons.
Abbott & Co.	100	5,390

American S. Co.	565	565
Bacon & Co.	73	73
Carey & Moen.	12	230
Cooper, Hewitt & Co.	371	371
Dana & Co.	373	373
Downing & Co.	75	75
Galpin, S. A.	1,066	1,066
Greely & Co. C. S.	35	35
Hazard Mfg. Co.	179	179
Jacobus, E. Y.	2	2
Lee, James & Co.	1,249	1,249
Lillenberg, N.	390	390
Lundberg, G.	126	126
Milne & Co.	355	355
Muller, Schall & Co.	50	607
Naylor & Co.	70	3,704
Page, Newell & Co.	1,078	1,078
Roebling's Sons, J. A.	1,776	1,776
Schulze, P. R.	1	1
Temple & Lock-	6	6
wood.	4	4
Wiebush & Ho.	25	25
Wood & Niebuhr.	2,707	2,707
Wolf & Co., R. H.	232	232
Total.	725	19,807
Corres. date, 1889.	725	25,969
Old Rails.		
Tons.	Tons.	Tons.
Bowring & Archibald.	340	340
Frankfort, M.	3,282	3,282
Henderson Bros.	300	300
Hernsheim, L.	350	350
Mosle Bros.	123	123
Naylor & Co.	1,083	1,083
Sawyer, Wallace & Co.	610	610
Total.	6,088	6,088
Corres. date, 1889.	8364	8,364
Copper.		
Pounds.	Pounds.	Pounds.
Abbott & Co., Jere.	224,778	2,230,129
Amer. Met. Co., L.	269,156	1,840,563
Barber & Co.	13,750	13,750
Belmont, Aug. & Co.	497,248	1,454,563
Burgess & Co.	173,731	173,731
French, Edge & Co.	135,374	135,374
Heidelbech, Siehe-	672,608	672,608
heimer & Co.	66,950	66,950
Seaman, S. H.	100,000	100,000
Ward, J. E. & Co.	112,004	112,004
Wilms & Thune.	5,426,354	5,426,354
Total.	7,664,404	54,263,568
Corres. date, 1889.	11,250	2,834,097
Copper Matte		
Pounds.	Pounds.	Pounds.
American Metal Co.	224,778	2,230,129
Lewisohn Bros.	242,691	1,500,103
Nichols, Geo. H.	267,202	267,202
Paulsen, Wm.	1,039,428	1,039,428
Wilms & Thune.	2,848,706	2,848,706
Total.	4,671,404	7,885,568
Corres. date, 1889.	9,991	11,319,082



DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Main table with columns: NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS, DIVIDENDS, NAME AND LOCATION OF COMPANY, CAPITAL STOCK, SHARES, ASSESSMENTS. Lists various mining companies and their financial details.

Gold, Silver, Lead, Copper, Non-assessable. \* This company, as the Western up to Dec. 10th, 1881, paid \$1,400,000. † Non-assessable for three years. ‡ The Deadwood previously paid \$276,000 in eleven dividends, and the Terra \$ 5,000. § Previous to the consolidation in Aug. 1884, the Copper Queen had paid \$81,300 in dividends, and the Con. Virginia, \$240,000. ¶ Previous to the consolidation, of the Copper Queen with the Atlanta Aug 1888 the Copper Queen had paid \$1,250,000 in dividends. † 1,000,000



NEW YORK MINING STOCKS QUOTATIONS.

DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, June 21, June 23, June 24, June 25, June 26, June 27, SALES.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, June 21, June 23, June 24, June 25, June 26, June 27, SALES.

\*Ex dividend. †Dealt in at the New York Stock Ex. Unlisted securities. ‡Assessment paid. Dividend shares sold, 20,619 Non-dividend shares sold 39,160. Total, New York, 59,779.

BOSTON MINING STOCK QUOTATIONS.

Table with columns: NAME OF COMPANY, June 20, June 21, June 23, June 24, June 25, June 26, SALES.

Table with columns: NAME OF COMPANY, June 20, June 21, June 23, June 24, June 25, June 26, SALES.

Boston: Dividend shares sold, 30,817. Non-dividend shares sold, 82,405. Total Boston, 113,222.

COAL STOCKS.

Table with columns: NAME OF COMPANY, Par value of shares, June 21, June 23, June 24, June 25, June 26, June 27, Sales.

San Francisco Mining Stock Quotations

Table with columns: COMPANY, CLOSING QUOTATIONS, June 20, June 21, June 23, June 24, June 25, June 26.

\*\*Sales in New York, 85,235; in Philadelphia, 42,243. Total sales, 127,478.

STOCK MARKET QUOTATIONS.

Baltimore, Md.

Table with columns: COMPANY, Bid, Asked, L. H., L. H. listing various coal and mining companies.

Birmingham, Ala.

Table with columns: COMPANY, Bid, Asked, L. H., L. H. listing various Alabama coal and mining companies.

Pittsburg, Pa.

Table with columns: COMPANY, B, A, Closing listing various Pennsylvania coal and mining companies.

St. Louis, June 25.

Table with columns: COMPANY, Bid, Asked listing various Missouri coal and mining companies.

Table listing various mining stocks and their prices, including Golden King, Golden West, Granite Mountain, etc.

Trust Stocks. June 27.

The following closing quotations are reported to-day by C. I. Hudson & Co., members of New York Stock Exchange: CERTIFICATES.

Table listing sales at the New York Stock Exchange week ending June 27.

Foreign Quotations.

London.

Table listing foreign quotations for various mining and industrial products from London.

Paris.

Table listing Paris quotations for various mining and industrial products.

CURRENT PRICES.

These quotations are for wholesale lots in New York.

CHEMICALS AND MINERALS.

Table listing current prices for various chemicals and minerals such as Acetic, Muriatic, Nitric, Sulphuric, etc.

Table listing prices for various types of ground French, domestic, and foreign products.

THE RARER METALS.

Table listing prices for various rare metals including Aluminum, Arsenic, Barium, Bismuth, Cadmium, etc.

BUILDING MATERIAL.

Table listing prices for various building materials such as Bricks, Jerses, Up Rivers, etc.

THE ENGINEERING AND MINING JOURNAL will thank

any one who will indicate any other articles which might with advantage be quoted in these tables or who will correct any errors which may be found in these quotations.



## RICHARD P. ROTHWELL, MINING ENGINEER.

Editor of the ENGINEERING AND MINING JOURNAL, is about to make an extensive trip through most of the Western States and Territories, visiting Colorado, New Mexico, Arizona, California, Nevada, Utah, Idaho, Montana, Dakota, etc. Persons desiring his professional services in examining mines or advising on the management or methods of working mines should address him,

P. O. BOX 1833, NEW YORK CITY.

## THE MESHACERTY MINE, OF MARICOPA COUNTY, ARIZONA.

A continuation of and adjoining the well known "Phoenix Mine," which is now selling at \$1.50 per share. A limited amount of stock in the Meshacerty mine for sale at subscription price of 20 cents per share for working capital. For particulars call on or address,

A. W. PETERS, 60 Broadway, New York.

TO THOSE LOOKING FOR

# Manufacturing Sites IN THE SOUTH.

The most desirable locations in the South for manufacturing wagons, stoves, agricultural implements, furniture, or for foundries, machine shops, rolling mills, muck bar mills, iron pipe works, horse and mule shoes, nail works, glass works, cotton or woollen mills, and tanneries, are to be found in Virginia, along the line of the Norfolk & Western Railroad from Norfolk to Bristol, and upon its branch lines. Hard wood of every variety; pig iron from the furnaces at Lynchburg (2), Roanoke (2 in operation and 1 now under construction), Pulaski (1 in operation and 1 to be built in 1890), Ivanhoe (1 in operation and 1 to be built in 1890), Radford (1 to be built in 1890), Salem Graham, Max Meadows and Bristol (1 at each point under construction); bar iron from the rolling mills at Richmond, Roanoke, Lynchburg and Richlands (1 now under construction); coke and semi-bituminous coal from the Pocahontas Flat Top field; superior gas coals from the mines on the Clinch Valley Extension; glass sand from Tazewell County; cotton from the markets of the Southern States, and wool from all the Western and South-western States and Territories, at advantageous freight rates. Favorable freight rates made upon raw materials to all factories established upon its line, as well as to points in the United States and Territories upon the manufactured articles.

Those seeking new fields for manufacturing establishments should not fail to investigate the wonderful development of iron, coal and coke industries that has been made within the past five years along the line of the Norfolk & Western Railroad, and the advantages offered by the State of Virginia in the supply of raw materials by the Norfolk & Western Railroad in the matter of freight facilities and rates upon raw materials; and for reaching home, far distant and foreign markets, and by the cities and towns along its line in the way of advantageous sites, free or at moderate cost. Many of the cities and towns exempt manufacturing establishment from taxation for a series of years.


For further information as to freight rates and sources of supply of raw materials, maps of the Norfolk & Western Railroad and its extensions now under construction, and pamphlets descriptive of the territory tributary to its lines, apply to

A. POPE, CHARLES G. EDDY,

General Freight Agent, Roanoke, Va.

Vice-President.

**THE NEW PULSOMETER STEAM PUMP**



*Unequaled in Economy, Efficiency, Durability and Cheapness for*

MINING,	PAPER MILLS,	QUARRIES,	and all kinds of general
RAILROADS,	CHEMICAL WORKS,	IRRIGATION,	contractors' work, fire and
STEAMBOATS,	GAS WORKS,	FOUNDATIONS,	manufacturing purposes.
COFFER DAMS,	TANNERIES,	EXCAVATIONS,	
SEWERS,	BREWERIES,	WELL SINKING,	
HYDRAULIC MINING,	SUGAR REFINERIES,	BRICK YARDS,	

Send for  
Illustrated Catalogue D and  
Price List.

**PULSOMETER STEAM PUMP CO.,**  
Manufacturers and Sole Owners.  
120 Liberty St., New York.

Patented in U. S. and Canada.

## TO INVESTORS. THE BEAVER LICK IRON COMPANY, WEST VIRGINIA. AUTHORIZED CAPITAL, \$1,000,000.

Fifteen hundred acres iron land; 2,000 acres New River coking coal; nearly 800 acres at White Sulphur Springs West Virginia, for a town site. First issue of stock, 7,000 shares, 1,000 of which have been taken. This is an enterprise which will bear careful examination. For particulars apply to

Or to  
Hon. A. C. SNYDER, President, Lewisburg, W. Va.  
R. W. MONTAGUE, Secretary, White Sulphur Springs, W. Va.

### DIVIDENDS.

**DALY MINING COMPANY, MILLS BUILDING, 15 Broad Street.** NEW YORK, June 20, 1890.  
DIVIDEND No. 40.  
A dividend of TWENTY-FIVE (25) CENTS per share has been declared for May, payable 30th inst. Transfer Books close on the 25th inst.  
LOUNSBERY & CO.,  
Transfer Agents.

### FOR SALE.

For sale at a bargain, in one of the principal cities of Colorado, an assay office and chemical laboratory perfectly equipped, and now doing a good business. Immediate possession, satisfactory reasons for selling. Address J. M., ENGINEERING AND MINING JOURNAL.

CHARLES S. WHITMAN. ERNEST WILKINSON.  
**WHITMAN & WILKINSON,**  
SOLICITORS OF  
**PATENTS**  
And Counselors in PATENT CAUSES,  
Atlantic Building - WASHINGTON, D. C.

### CHAS. COOPER & CO.

194 Worth St., New York,  
**MANUFACTURING CHEMISTS,**  
OFFER A FULL LINE OF CHEMICALS, CP.  
ACIDS, CUPEL BONE ASH, Etc.  
Send for Monthly Price List.

S. D. OLIPHANT,  
**MANUFACTURERS' AGENT**  
Penn Building, Pittsburg, Pa.

## A LIMITED COMPANY.

The owner of a valuable mining property, containing Silver and Gold, situated two miles from  
**COLD SPRING, N. Y., DOCK,**  
wants to meet party with capital for development. Vein already discovered.  
For particulars apply to

**Cold Spring, N. Y.,**

P. O. BOX 42.

### SUBSCRIBE FOR

**Howe's Metallurgy of Steel,**

PRICE, \$10.00.

SCIENTIFIC PUBLISHING CO., 27 Park Place, N. Y.

### A New Book on Assaying.

The Newest and Best in the English Language

IT LEADS ALL OTHERS!

Now Ready.

## THE ASSAYERS' MANUAL.

An Abridged Treatise on the Docimastic Examination of Ores, and Furnace and other Artificial Products. By Bruno Keri, Professor in the Royal School of Mines; Member of the Royal Technical Commission for the Industries, and of the Imperial Patent Office, Berlin. Translated from the German by Wm. T. Brant, Editor of "The Techno-Chemical Receipt Book," etc. Second American Edition. Edited with extensive additions by F. Lynwood Garrison, Member of the Am. Institute of Mining Engineers, Iron and Steel Institute, Verein Deutscher Eisenhüttenleute, etc. Illustrated by 87 Engravings. Three hundred and fifty-four pages. 8vo, cloth, price \$3.00. By mail, free of postage, to any address in the world.

Abstract of contents: GENERAL DIVISION.—I., Mechanics; Manipulations; II., Chemical Operations; III., Assay Furnaces IV., Assay Vessels; V., Balances and Weights; VI., Tools and Implements; VII., Assay Reagents. SPECIAL DIVISION.—I., Lead; II., Copper; III., Silver; IV., Gold; V., Platinum; VI., Nickel; VII., Cobalt; VIII., Zinc; IX., Cadmium; X., Tin; XI., Bismuth; XII., Mercury; XIII., Antimony; XIV., Arsenic; XV., Uranium; XVI., Tungsten; XVII., Chromium; XVIII., Manganese; XIX., Sulphur; XX., Fuel; Appendix; Index.

A circular of 8 pages quarto, giving the full Table of Contents of this important book, as well as a new List of Leading Books on Metal Mining, Metallurgy, Mineralogy, Assaying, Chemical Analysis, etc., sent free to any one in any part of the world who will send his address.

Our new and revised Catalogue of Practical and Scientific Books, 86 pages, 8vo, and our other Catalogues, the whole covering every branch of Science applied to the Arts, sent free, and free of postage, to any one in any part of the world who will furnish us with his address.

**HENRY CAREY BAIRD & CO.,**  
INDUSTRIAL PUBLISHERS, BOOKSELLERS and IMPORTERS,  
810 Walnut St., Philadelphia, Pa., U. S. A.

**FREE ADVERTISING.**

Inquiries from employers in want of Superintendents, Engineers, Metallurgists, Chemists, Mine or Furnace Foremen, or other assistance of this character, will be inserted in this column **WITHOUT CHARGE.**  
The labor and expense involved in ascertaining what positions are open, in gratuitously advertising them and attending to the correspondence of applicants, are incurred in the interest and for the *exclusive* benefit of subscribers to the **ENGINEERING AND MINING JOURNAL.**  
Applicant's should include the necessary postage for forwarding their letters.

**Positions Vacant.**

**785 FOUNDRY FOREMAN**—A man of steady habits having experience in handling men, the making of heavy castings in dry and green sand. Address, stating experience and reference, **PITTSBURG, ENGINEERING AND MINING JOURNAL.**

**786 A CHEMIST FAMILIAR WITH STEEL** work; thoroughly competent and a rapid workman. Address, stating references and salary expected, **POTTSTOWN, ENGINEERING AND MINING JOURNAL.**

**787 FOREMAN WANTED TO TAKE** charge of a machine shop; competent to manage men, and experienced in steam engine building. Address **AMERICAN, ENGINEERING AND MINING JOURNAL.**

**788 WANTED IMMEDIATELY—A COMPETENT** foundry foreman; one with an experience in all kinds of machine and engine castings. Address **JENCKES, ENGINEERING AND MINING JOURNAL.**

**789 MINER WANTED—AN EXPERIENCED** man of steady habits to superintend the work of mining clay, feldspar and flint. South. In a healthy climate. Mountain work. State experience and salary expected. Address **MANAGER, ENGINEERING AND MINING JOURNAL.**

**791 A COMPETENT MINING ENGINEER** who can speak Spanish is wanted by a company in Northern Mexico. Address **EMPIRE, ENGINEERING AND MINING JOURNAL.**

**792 GOOD STEEL MELTER AND FIRST** helper at steel works in Pennsylvania. Address **MELTER, ENGINEERING AND MINING JOURNAL.**

**793 MECHANICAL ENGINEER FOR A** large machine works; must be able to design, estimate and construct rolling mills and furnaces, engines, mining and hydraulic machinery, heavy gearing and general heavy machinery; the right man will find this a good opportunity for advancement; state age, experience and salary expected, and send copies of references. Address **ENGINEER, ENGINEERING AND MINING JOURNAL.**

**794 A COMPETENT MAN OF GOOD** habits to superintend a foundry melting 50 tons per day. Only experienced men with good references need apply. Address **EXPERIMENT, ENGINEERING AND MINING JOURNAL.**

**795 WANTED—SUPERINTENDENT FOR** copper property who thoroughly understands both mining and smelting. Must be capable and have first-class references. Address **MORISON, ENGINEERING AND MINING JOURNAL.**

**Situations Wanted.**

Advertisements under this heading will be charged only 10 cents a line.

**A ACCOUNTANT AND BOOKKEEPER, WITH** nearly 20 years' experience among Venezuelan and Central American gold mining companies, with practical mining knowledge, and possessing the Spanish, English, German and French languages, having just ended his contract, is open for a similar engagement in the tropics. Would act as assistant manager. Best references. Address **EXPLORE, ENGINEERING AND MINING JOURNAL.**

**A GRADUATE MINING ENGINEER** wishes to engage in some mining or metallurgical enterprise. Address **K., ENGINEERING AND MINING JOURNAL.**

**A METALLURGIST AND ENGINEER, OF** many years' experience in constructing and operating large works, treating gold, silver, and other metals, would like to make an engagement after June 1st. California or South preferred. Address **STAR, care ENGINEERING AND MINING JOURNAL.**

**A MINING ENGINEER, GRADUATE OF** Columbia College School of Mines, with seven years' experience in assaying, mining and smelting in the West and in Mexico, and at present employed in mining in the latter country, desires position to run or operate mines or do prospecting in Mexico or any Spanish-American country. Speaks Spanish and is familiar with Mexican customs and mining laws. Best of references furnished in regard to integrity and ability. Will be in New York August 1st. Address **J. M. T., P. O. Box 414, Far Rockaway, Long Island, New York.**

**AN EXPERIENCED MAN DESIRES POSITION** as general manager and mining superintendent of mines and works. Practical acquaintance in gold, silver, copper, lead and iron mine. First-class references. Address **MINE MANAGER, ENGINEERING AND MINING JOURNAL.**

**A THOROUGH MINER DESIRES A SITUATION** as manager of gold or silver mines. Twenty-eight years' experience on the Pacific Coast. Understands milling, smelting, and all modern mining machinery. Best of references. Address **MINER, ENGINEERING AND MINING JOURNAL.**

**CHEMIST OF OVER 10 YEARS' PRACTICE** (three in U. S. Assay Office) desires a position. Is well versed in general public laboratory work, rapid iron and steel analyses, etc. Highly recommended by prominent chemists. **J. F. SLEEPER, 79 Washington street, Brooklyn, N. Y.**

**SITUATION WANTED BY AN ENGINEER** chemist and metallurgist, having had charge of laboratory in large iron works. Address **ANALYSIS, care ENGINEERING AND MINING JOURNAL.**

**Miscellaneous Wants.**

**WANTED—TWO PETROLEUM EXPERTS** for examination of South American oil fields. Address **OIL, ENGINEER AND MINING JOURNAL.**

**Contracts Open.**

Proposals are invited on the following contracts before the dates specified, full particulars concerning which can be obtained by applying to the parties whose addresses are given.

**BRIDGE**—Plans, specifications, strain sheets, etc. Address, **O. D. Stern, County Clerk, Eureka, Cal., until July 15.**

**BRIDGE**—Furnishing plans, specifications, strain sheets and working details for a bridge across the River at Alder Point, on the survey established by the Board of Supervisors. A plan of the site, etc., will be furnished upon application. Address **O. D. Stern, Clerk, Eureka, Cal., until July 15th.**

**BRIDGE PIERS AND FOUNDATIONS**—Over the ship canal across Minnesota Point, Duluth. Address **Myron Bunnell, President Board of Public Works, Duluth, Minn., until July 1st.**

**WATER WORKS**—A gravity water works plant, consisting of a masonry dam, about 4½ miles of cast iron main pipe, with intersections to supply the towns of Hughesville and Picture Rocks, fire-plugs, etc., for public use. Address **Hughesville Water Co., Hughesville, Pa.**

**STEEL BEAMS, ETC.**—Sealed proposals will be received at the office of the Board of Court House and City Hall Commissioners, 542 Boston block, Minneapolis, Minn., until July 10th, for cut stone work, brick work, steel floor beams and channels, cast-iron columns, mullions and lintels, and fire clay tile floor arches.

**WATER WORKS**—The City of Vermillion, Clay County, South Dakota, will give a liberal franchise to any party, or corporation, who will put in a system of water-works. We have over 2,000 people, and the State University with 400 students. Artesian water can be obtained in the city to any amount. Correspondence solicited. **F. N. Burdick, Mayor.**

**RAILWAY CONSTRUCTION**—Forty miles of clearing, grubbing, grading and bridging from deep water, on the west bank of Hood's canal, from Union City north. Address **F. A. Hill, Chief Engineer and Superintendent of Construction, Seattle, Wash., until July 15th.**

**RAILWAY WORK**—Grading, masonry, track-laying, trestling, etc., on the first division of the South Bound Railroad. Address **B. A. Denmark, President, Savannah, Ga.**

**DREDGING**—At Brooklyn (N. Y.) Navy Yard. Address **N. H. Farquhar, Chief of Bureau of Yards and Docks, Washington, D. C., until July 2d.**

**COALING LIGHTERS**—Address **H. J. Laslett, Naval Storekeeper, H. M. Dockyard, Bermuda, until July 1st.**

**PAVING**—Approximate quantity, 12,504 square yards. Address **R. F. Allender, City Clerk, Martin's Ferry, O., until July 3d.**

**WATER WORKS**—For the construction and operation of a system of water works on the franchise plan, to run for 20 years, city taking 53 hydrants. Address **A. M. Parsons, Chairman, Box 159, Somerset, Ky., until July 13th.**

**PIERS AND FOUNDATIONS** of a drawbridge over the ship canal across Minnesota point, Duluth, Minn. Address **Myron Bunnell, President Board of Public Works, Duluth, Minn., until July 13th.**

**WATER WORKS**—For constructing a complete system of water works. Address **A. O. Ruspert, City Auditor, Fargo, Dak., until July 7th.**

**WATER WORKS**—For the construction and operation of a system of water works at Somerset, Ky., on the franchise plan, to run for 20 years, city taking 55 hydrants. Address **A. M. Parsons, Chairman, Box 159, Somerset, Ky., until July 13th.**

**PUMPING ENGINES, ETC.**—For furnishing all materials, constructing and erecting at the Chain of Rocks, two pumping engines and appurtenances complete. Address **Emory S. Foster, Secretary Board of Public Improvements, St. Louis, Mo., until July 15th.**

**WATER WORKS**—For sinking an artesian well 750 feet deep, erecting a brick tower 100 feet high with tank on top, 20 x 35 feet, and boiler, engine, pump and pipes with capacity to elevate 50 to 100 galls. per minute to the tank. Address **Nelson Tift, Albany, Ga.**

**SEWERS**—About 17,300 feet of 18-inch outfall sewer for the Marion, O., sewerage system. Bonds to the amount of \$5,000 must accompany each bid. Address **Mayor of Marion, O., until July 18th.**

**BRIDGE**—The Board of Supervisors of Humboldt County, Cal., will receive sealed proposals, together with plans, specifications, strain sheets and working details for building a bridge across Eel River at Alder Point. Bridge to be built on the survey as established by said Board, and now on file in its office. A plan of the bridge site and any required information will be furnished on application to the Clerk of the Board. The Board reserves the right to reject any and all bids. By order of the Board. Address **O. D. Stern, Clerk, Eureka, Cal., until July 15th.**

**SEWAGE AND WATER MAINS**—For furnishing the necessary material and putting in an underground system of sewerage; also for grading and paving the streets of Key West, Fla., and furnishing the material for same; also for furnishing and laying of water mains. Each bid must be accompanied by a cash deposit or certified check for \$500. Bidders are expected to bid separately on sewer system and material, on grading and paving of streets, and furnishing and laying water mains. Address **Wm. L. Delaney, City Clerk, Key West, Fla., until Sept. 1st.**

**PUMPS and WATER WORKS**—For constructing a pumping station and putting in a complete new water system, including power, mains, hydrants and settling basin, and all things necessary to supply said city with water and fire protection, requiring about 1,270 feet of 12-inch pipe, 1,125 feet of 10-inch pipe, 8,825 feet of 8-inch pipe, 33,770 feet of 6-inch pipe, 5,894 feet of 4-inch pipe, 71 hydrants, and 41 service and valve boxes. Said proposals also to state the additional cost in case City of Fargo, N. D., shall decide to take its water supply from a point about one and one-half miles outside of the limits of said city. 2. For extending the water system now in operation in said city so as to cover the circuit indicated in said plans and specifications, requiring about 1,625 feet of 8-inch pipe, 15,400 feet of 6-inch pipe, 2,362 feet of 4-inch pipe, together with hydrants and service and valve boxes. All proposals to be accompanied with a certified check, payable to the order of the City Treasurer of said city in the sum of \$2,000, which will be forfeited to said city if the proposal is accepted and the party submitting the same shall fail to enter into a contract with said city in accordance with the same, and to furnish such securities for the performance thereof as may be required by the City Council of said city. Address **A. O. Rupert, City Auditor, Fargo, North Dakota, until July 7th.**

**PROPOSALS**

FROM

**Tunnel Contractors.**

**THE CATARACT CONSTRUCTION COMPANY**

invites proposals until July 19th from contractors for constructing the

**TUNNEL OF 8,000 FEET**

more or less, with cross section about eighteen by twenty-nine feet of

**THE NIAGARA FALLS POWER COMPANY**

at Niagara Falls, N. Y.

Contractors will be expected to personally inspect the site before making proposals. For form of contract, proposal, and information, apply, after June 28th, 1890, to

**ALBERT H. PORTER,**  
ENGINEER,  
NIAGARA FALLS, N. Y.

**SUBSCRIBE AT ONCE**

FOR

**Howe's Metallurgy of Steel,**

The Greatest Work on the Subject ever

Published.

**PRICE \$10.**

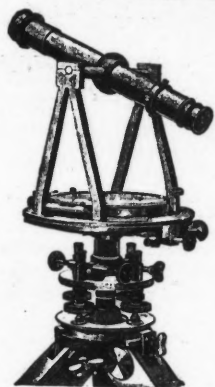
**SCIENTIFIC PUBLISHING CO.,**

PUBLISHERS,

**27 PARK PLACE, NEW YORK.**

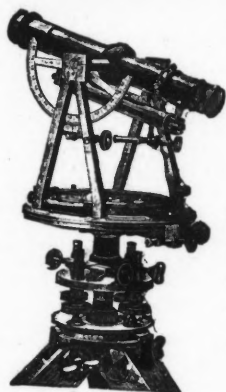


**QUEEN & CO.,**  
PHILADELPHIA.



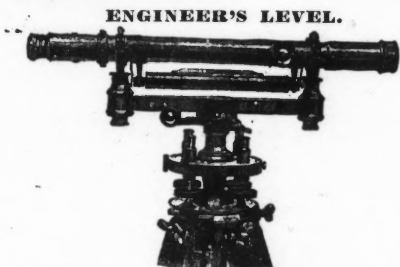
**RAILROAD ENGINEER'S**  
**PLAIN TRANSIT.**

Power of telescope, 24 diam. Vertical adjustment to telescope. Compound long centers. Two outside verniers reading to minutes. Five-in. needle; 6 3/4-in. graduation. Patent focusing adjustment to eye piece. Improved attachment to tripod. Shifting tripod head, with slide protector, tangent and opposing piece, complete with box, tripod, and the usual accessories, price, \$150.



**ENGINEER'S**  
**FULL TRANSIT.**

Same as transit above described, but with addition of level to telescope, vertical arc, clamp, and tangent, with tripod and box complete, price \$180.



**ENGINEER'S LEVEL.**

Telescope, 18 or 20-in. Power, 40 to 50 diameters, as desired. Improved adjustment to eye piece. Shifting tripod head. Complete with tripod, box, sunshade, screw drivers, plumb bob, etc., price, \$110. Any of these instruments sent on approval, with privilege to return if not satisfactory. **QUEEN & CO., Philadelphia,** MANUFACTURERS OF ENGINEER'S, SURVEYOR'S, AND DRAUGHTSMAN'S SUPPLIES. Catalogue on application.

**MEMORY,**

What it is, and How to Improve It.  
BY DAVID KAY, F.R.G.S.

330 Pages. Price \$1.50

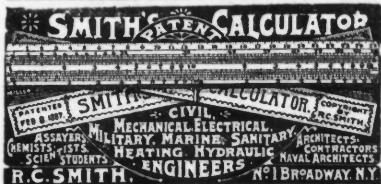
FOR SALE BY THE,

**SCIENTIFIC PUBLISHING CO.,**

27 PARK PLACE.

**STEVENS PATENT SPRING CALIPERS**

Leader, No. 70. Price, by mail, postpaid.  
2 3/4 inch, \$0.65 4 inch, \$0.75 6 inch, \$0.85  
8 " 0.70 10 " 0.80 12 " 1.00  
All those supplied with Ideal Nut costing 25c. additional.  
Ideal and Leader Spring Dividers and Calipers, Ideal Surface Gauges, Depth Gauges, and Fine Machinists' Tools.  
Illustrated catalogue free to all.  
**J. STEVENS ARMS & TOOL CO.**  
P. O. Box 233 Chicopee Falls, Mass.



Size 10x1 x1 1/4 inch. Complete pocket book. All practical problems solved at sight. Mailed on receipt of \$1.00.



**G. S. WOOLMAN,**  
116 FULTON ST., NEW YORK.

200 page Catalogue of Engineering Instruments and Materials for Field and Office Work on application if this journal is mentioned.

**THE BRANDIS MFG. CO.,**

55 Fulton St., New York,

MANUFACTURERS OF

**ENGINEERING AND SURVEYING**  
**INSTRUMENTS.**

CATALOGUES SENT ON APPLICATION.

**BLASTING**  
**POWDER.**

Orange Sporting Powder.

ORANGE MILLS ESTABLISHED 1808.

Electric Blasting Apparatus.

Send for Illustrated Pamphlet describing Apparatus, and showing sizes of grain of Powder FREE.

**LARLIN & RAND POWDER CO., 29 MURRAY ST., NEW YORK.**

BRANCH OFFICE: 218 North Second St., St. Louis, Mo.

"The Greatest Work on the Subject ever Written."

**Howe's Metallurgy of Steel.**

NOW READY.

PRICE, \$10.

SCIENTIFIC PUBLISHING COMPANY,

27 PARK PLACE, NEW YORK.



**KEUFFEL & ESSER CO.,**  
NEW YORK.

FACTORY, HOBOKEN, N. J.  
Manufacturers of  
**Drawing Materials,**  
**Surveying Instruments,**  
**&c.**

Superior Swiss Drawing Instruments, Extra and Best Quality, German Drawing Instruments, Paragon, Duplex, Universal, Anvil Drawing, Helios, Blue Process Papers, Scales, Triangles, T-Squares, Drawing Boards Standard Profile and Cross-section Papers. Catalogue to Professional People on Application.

**ATLANTIC DYNAMITE COMPANY**

SUCCESSORS TO

The Atlantic Giant Powder Co. and Judson Powder Co.  
Small & Schrader, G1 Agts., Offices, 245 Broadway, N.Y.  
MANUFACTURERS OF THE ORIGINAL

**GIANT POWDER**  
**THE HIGH EXPLOSIVE**

SAFE, RELIABLE, POWERFUL, AND EFFECTIVE.  
ALSO MANUFACTURERS OF

**JUDSON POWDER**

A SUBSTITUTE FOR BLACK POWDER.

Guaranteed 50 per cent. stronger than the best Black Powder, and far safer to use. Adapted for all kinds of blasting where Black Powder has heretofore been used. Also dealers in Blasting Caps, Fuse, Electrical Batteries, etc. For sale in all sections of the country by our authorized agents.

**THE AETNA POWDER CO.,**

MANUFACTURERS OF

**DYNAMITE, MINING POWDER, SPORTING POWDER, ELECTRICAL EXPLODERS**  
**AND BLASTING SUPPLIES.**

Send for Descriptive Pamphlet, Mailed Free.

95-101 RANDOLPH ST., CHICAGO.

**"PULL UP" BLASTING MACHINE.**

The strongest and most powerful machine ever made for Electric Blasting. No. 4 size fires 70 holes; No. 3 size fires, 40 holes. Are especially adapted for submarine blasting and large mining works.

**"VICTOR" BLASTING MACHINE.**

Made in two sizes: No. 2 fires 20 to 30 holes. No. 1 fires 5 to 5 holes. Adapted for prospecting stump blasting, quarry and general rail road work.

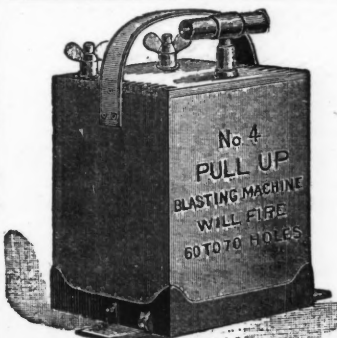
**VICTOR ELECTRIC PLATINUM FUSES.**

Superior to all others for exploding any make of dynamite or blasting powder. Each fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted.

**STANDARD ELECTRIC FUSE AND BLAST TESTER**  
WIRE REELS, NEW DESIGN, LEADING AND CONNECTING WIRE.

Manufactured only by

**JAS. MACBETH & COMPANY**  
128 MAIDEN LANE, NEW YORK, U. S. A.



Send for Catalogue.

**FOR SALE FOR CASH, OR CREDIT ON CAR TRUST**

- 20 Second-Hand Narrow Passenger Coaches.
- 20 Second-Hand Standard Passenger Coaches.
- 30 New Standard Gauge Passenger Coaches built at one of the best works in the United States. All modern improvements. Price, \$3,700 each. Now ready for lettering.
- 40 Second Hand Narrow Gauge Locomotives, different sizes.
- 60 Second-Hand Standard Gauge Locomotives, different sizes.

These Locomotives have been overhauled, all in good condition, ready for immediate delivery.  
1,000 tons of 40 lb. second-hand steel and iron rails.  
800 tons of 33 lb. iron and steel rails, second-hand.  
1,200 tons of 40 lb. iron and steel rails. All these rails are in good order.  
Also 9 Sleeping Cars suitable for theatrical purposes. Second-hand.  
Southern and Western Delivery.

APPLY TO

**ALFRED W. LADD, 44 Broadway, N. Y.**

ALL MATERIALS FOR ELECTRICAL RAILWAYS FURNISHED.

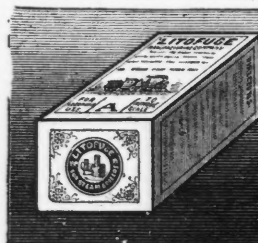
**CHALMERS-SPENCE CO: ASBESTOS** NON-CONDUCTING SECTIONAL COVERINGS  
 BRAIDED PACKINGS, CEMENTS, Etc.

59 and 61 Liberty St., New York. Works: 419 to 425 E. Eighth St., N. Y. Branches: Chicago, Pittsburgh, Boston, Philadelphia.

**SEND FOR OUR NEW CATALOGUE.**  
**Scientific & Technical Books.**  
 SCIENTIFIC PUBLISHING COMPANY,  
 27 Park Place, New York.

**DIXON'S**  
**Graphite Grease**  
**for**  
**Wire Ropes.**  
 TOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

The best material for coating wire rope that can be applied. The rope will last twice as long as it would without the grease. The Graphite grease prevents the wire in the rope from rusting. It prevents the rope from abrasion when brought in contact with hard substances. It prevents the wires forming the rope from abrasion one against the other, as the Graphite finds its way into and fills the minutest spaces, and is held there by the fatty substances in the mixture.



*Litofuge*  
 is the best boiler compound

LITOFUGE MANUF'G CO., 762 JOHN ST. NEW-YORK.

CLEAN BOILERS GUARANTEED. YEARLY CONTRACTS SOLICITED.

**GEMS AND PRECIOUS STONES,**  
 Price only \$10.

**OILLESS BEARINGS.**  
 For Pulley Block and Tramway Sheaves, Loose Pulleys and other Bearings. Positively no oil or other lubricant required. Have been in constant use for years, requiring no attention, and giving complete satisfaction. Send full particulars, with order, and we will furnish them on 30 days' trial. No pay if they fail to do what we claim for them.  
 NORTH AMERICAN METALINE COMPANY  
 35 Bleecker Street, New York City.

W. S. TYLER, Pres. PROCTOR PATTERSON, Sec. & Treas



MANUFACTURERS OF  
**EXTRA HEAVY Double Crimped**  
**STEEL, IRON, COPPER AND BRASS**  
**EXTRA HEAVY BATTERY**  
**Mining Cloths.**  
 Cleveland, Ohio.

FRASER & CHALMERS, AGENTS, Chicago, New York, Denver, Salt Lake City and Chihuahua, Mex.

THE TRENTON IRON CO., Trenton, N. J. COOPER, HEWITT & CO., New York.  
 Manufacturers of

**IRON AND STEEL WIRE**

of every description, plain, galvanized, tinned, and lead-coated; spiral ribbon fence wire; steel wire ties for baling hay, straw, excelsior, etc.

**IRON AND STEEL WIRE ROPE**

for all purposes, including cables of the best quality and of any desired length for street cable roads.

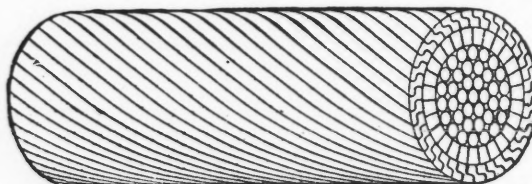
Special attention is called to the Trenton Iron Company

**PATENT LOCKED WIRE ROPES.**

far superior to any other in strength and durability.

One of these ropes will outwear two or three ropes of the ordinary style.

THE TRENTON IRON COMPANY



The wires are interlocked. "Unstranding" or projection of broken wires is impossible.

A smooth surface only is presented to the sheave or drum, causing these to last indefinitely.

ALSO CALL ATTENTION TO THEIR

**PATENT WIRE ROPE TRAMWAYS (BLEICHERT SYSTEM).**

Also their hoisting and conveying plants for quarries, open cut mines, docks and contractor's work.

**HAULAGE AND TRANSMISSION OF POWER BY WIRE ROPES A SPECIALTY.**

Surveys made and plans furnished at moderate rates by competent engineers.

**WASHBURN & MOEN MANUFACTURING CO.,**

WORCESTER, MASS.

Established in 1831.

MAKERS OF IRON AND STEEL.

MANUFACTURERS OF  
**IRON, STEEL and COPPER**  
**WIRE.**



SPECIALTIES:  
**WIRE ROPE,**  
**BARBED WIRE.**

NEW YORK WAREHOUSE: 16 Cliff Street.

CHICAGO WAREHOUSE: 107 Lake



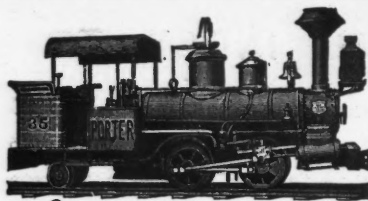
ALPHABETICAL INDEX TO ADVERTISERS

- Indicates every other week or monthly advertisements.

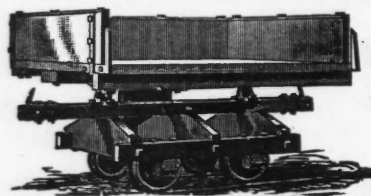
Table listing various companies and their advertisement frequencies. Includes entries like Aaron, C. H., Abbot, Jere & Co., Abendroth & Root Mfg. Co., Adams, G. H., Adams, W. H., Advertising Rates, Aerated Fuel Co., Aetna Powder Co., Altkman & Auman, Allen, S. L. & Co., Allentown Foundry & Machine Co., Allis, Edw. P. & Co., Aluminum Brass & Bronze Co., Am. Diamond Rock Boring Co., American Oil Stove Co., American Gas Furnace Co., American Geologist, American Metal Co., American Well Works, American Wood Powder Co., Archer, J. B., Atlantic Dynamite Co., Atlantic Mining Co., Austin, W. L., Automatic Typewriter Co., Babcock, J. A. & Co., Badgley, C. W. & Co., Baltimore Copper Works, Banks, John H., Barnes, W. F. & John Co., Barr Pumping Engine, Beckett Foundry & Machine Co., Berge, J. & H., Berlin Bridge Co., Berwind-White Coal Mining Co., Bewick, Moreing & Hooper, Bien, J. R., Blake, Geo. F. Mfg. Co., Blake, John H., Blake, T. A., Blandy, John F., Biauveit, Harrington, Boggs, W. R., Jr., Borgner & O'Brien, Boss, M. P., Boston & Colorado Smelting Co., Boston & Montana Mining Co., Bowers & Miller, Bradley Fertilizer Co., Brandt, Randolph, Brandis Manufacturing Co., Brodie, Walter M., Brown Hoisting & Con'ing Mch. Co., Brunton, D. W., Brush Electric Co., Buchanan, C. G., Buck, C. W., Buckeye Engine Co., Bucyrus Steam Shovel & Dredge Co., Buffalo Steam Pump Co., Bullock, M. C. Mfg. Co., Burleigh Rock Drill Co., Burlingame, E. E., Butlers, Charles, California Wire Works, Cambria Iron Co., Cameron, A. S., Steam Pump W'ks., Carpenter, Franklin R., Carter, Hawley & Co., Caspar, C. N., Castner & Curran, Cataract Washing Machine Co., Central Mining Co., Century of Electricity, A., Chadborn & Coldwell Mfg. Co., Chalmers-Spence Co., Chance, H. M., Channing, J., Chester Foundry & Machine Co., Chester Steel Castings Co., Chicago Iron Works, Chism, Richard E., Chisom, Frederic F., Chrome Steel Works, Chur, A. T., Chute, H. T., Cincinnati Corrugating Co., Clark, C. J., Clark, W. J. & Co., Clayton Air Compressor Works, Cleveland City Forge and Iron Co., Cleveland Iron Mfg. Co., Clement, Victor M., Colliery Guardian, Comstock, C. M. & Co., Comstock, Theodore B., Consolidation Coal Co., Consolidated Ice Machine Co., Contracts Open, Cook Mining Machinery Co., Cooper, Chas. & Co., Cooper Hewitt & Co., Copeland & Bacon, Copper Queen Con. Mfg. Co., Copper Smelting, Peters', Copper Smelting, Vivian's, Cowies Electric, Smelting & Alum-inum Co., Coxe Bros & Co., Cox & Rockwell, Crescent Steel Co., Curtis, J. S., Cyclone Pulverizer Co., Daggett, Eisworth, Davidson's Steam Pump, Davis, Chas. H., Davis, F. M., Dearden, W., DeCrano, E. G., De La Bouglise, Geo., De La Vergne Ref. Mach. Co., Delaware & Hudson Canal Co., Delta Eng. & Mfg. Co., Denver Fire Clay Co., Dermigny, L. & Co., Detroit Copper Mining Co., Dewey, Fred P., D. Frisbie Co., Diamond Prospecting Co., Dickerman, Alton L., Disston, Henry, & Sons, Dividends, Dixon, A. H. & Son, Dixon, Joseph, Crucible Co., Dodge Coal Storage Co., Duckert Portable House Co., Eastman Co., Eddy, Charles G., Eddy Valve Co., Eimer & Amend, Electricity in Modern Life, Elgin Wind Power & Pump Co., Ely, E. B., Empire Laundry Machine Co., Empire Wringer Co., Endicott & Macomber, Endlich, F. M., Everett, Dr. W. E., Farish & Farish, Farrei Foundry and Machine Co., Farson, E. S., Mfg. Co., Fishkill Landing Machine Co., Fiske Bros., Ford, David M., Fort Scott Foundry & Machine Co., Frank & Co., Fraser & Chalmers, Frecheville, R. J. & Wm., Free Advertising, Freeland, Francis T., Freese, E. M. & Co., Frey, E. & S., Frisbee-Lucop Mill Co., Frossard, John D., Frue Vanner Concentrator, Fulton Boiler Works, Fulton, Henry, Fulton Iron Works, Furlonge W. H., Gail, Bumiller & Unzicker, Garrison, F. Lynwood, Gates Iron Works, Gems and Precious Stones, Gifford, William E., Globe Machine Co., Golden Gate Concentrator Co., Goodell Co., Goodrich & Clark, Gordon, Strobel & Laureau, Ltd., Goudie, James H., Grant, E. R., Graves, L. S. & Son, Gregory, H. P. & Co., Griffith & Wedge Co., Gurley, W. & L. E., Haddock, Shonk & Co., Hale Pavement Co., Hall, E. I. & Co., Half Steam Pump Co., Hammond, John H., Hampton, Wm. Huntley, Handy & Harman, Hardmann, John E., Harrington & King Perforating Co., Harden, O. B., Hartford Steam Boiler Inspection and Ins. Co., Hartley & Graham, Hartman Mfg. Co., Harvey, T. W., Lumber Co., Hasenzahl, W., Hastings, John B., Hauck & Comstock, Heil, Henry, Chemical Co., Heine Safety Boiler Co., Heller & Brightly, Hendrie & Holthoff Mfg. Co., Herberston & Sons, Herndon, J. H., Hincley, Spier & Hayes, Hofmann, Ottokar, Holibaugh & Van Ness, Hoskins, William, Howard & Morse, Howe, H. M., Hunt, C. W. Co., Hunt, Joseph, Hunt, R. W. & Co., Hunt's, Dr. T. S. Works, Huntington, F. A., Illinois Steel Co., Indian Engineering, Industrial Mfg. Co., Ingersoll-Sergeant Rock Drill Co., Ireidel, F. W., Iron Bay Mfg. Co., Jarvis, Wm. F. & Co., Jeffrey Manufacturing Co., Jessop, W. & Sons, Jones, D. F., Manufacturing Co., Journal Assoc. of Eng. Societies, Kalamazoo Wagon Co., Kansas City Sm. & Ref. Co., Kedzie, G. E., Kelsey Press Co., Kennedy, Julian, Keuffel & Esser Co., Keys, W. S., Kidston, A. G. & Co., Kingman, Jerry, Kountze Bros., Kraft, Walter G., Knowles Steam Pump Works, Krom, S. R., Ladenburg, Thalmann & Co., Lafin & Rand Powder Co., Lamb Co., Lau, J. H. & Co., Lavagnino, G., Ledoux & Co., Lees, Samuel & Co., Leggett, Thomas H., Leigh Valley Coal Co., Lehigh & Wilkes-Barre Coal Co., Lewisohn Bros., Liberty Machine Works, Lidgerwood, Mfg. Co., Lippincott, J. B. Co., Litofuge Manufacturing Co., Little, J. R., Lixiv. of Silver Ores, Stetefeldt, Ludlow Valve Mfg. Co., Macbeth, Jas. & Co., Machinery for Sale, Magnolia Anti-Friction Metal Co., Maher, James A., Mariner & Hoskins, Maris Machine Co., Maryland Coal Co., Mason John W. & Co., Mason Regulator Co., Maynard, George W., McCulloch, E. A., McDermott & Duffield, McDowell, F. H., McEwen, A. C., McGowan, John H. Co., Mcklenburg Iron Works, Merchant & Co., Metallurgy of Steel, Meyer, A., Michigan Mines & Minerals Statistics, Mill & Mine Electric Equipment Co., Mines and Lands for Sale, Mining Accidents and their Prevention, Mining Code of Mexico, Mining Industry, Mining and Scientific Review, Mining World & Engineering Record, Miscellaneous Wants, Moore, Dr. Gideon E., Moore Mfg. & Foundry Co., Moore, Samuel L. & Son Co., Moore & Hibbert, Morgan Crucible Co., Morris County Machine & Iron Co., Morris Machine Works, Motley, Thornton N. & Co., Muilins Silicated Iron & Steel Co., Munroe, R. & Son, Nesslage, Colgate & Co., Newark Smelting & Ref. Co., New York Central Iron Works, New York Metallurgical Works, Nicholson, Frank, Nordyke & Marmon Co., Norfolk & Western R. R., North American Metalline Co., Norwalk Iron Works Co., Oil Well Supply Co., Ltd., Oicott, Eben E., Oilphant, S. D., Orford Copper Co., Osceola Con. Mfg. Co., Palmer, C. E., Parke & Lacy Co., Parker, Richard A., Patton, William L. & Co., Peak, W. E., Peiton Water Wheel Co., Pencoyd Bridge & Const. Co., Pennsylvania Lead Co., Pa. Diamond Drill & Mfg. Co., Pennsylvania Salt Mfg. Co., Pennsylvania Steel Co., Peters, Edward D., Jr., Phelps, Dodge & Co., Phillips, Wm. B., Phoenix Iron Works, Phosphor Bronze Smelting Co., Pittsburg Reduction Co., Pittsburg Rustless Iron Works, Poetsch-Sootsmith Freezing Co., Poole, Robt. & Son Co., Porter, H. K. & Co., Positions Vacant, Pott, John N., Potts, Frederick A. & Co., Potter, William B., Powell, Wm. Co., Pulsometer Steam Pump Co., Practical Blacksmithing, Pratt & Whitney Co., Price, Thomas & Son, Queen & Co., Quincy Mining Co., Rand Drill Co., Randol, J. B., Randolph, John C. F., Raymond, Rossiter W., Reidville Mfg. & Improvement Co., Ribon & March, Richards & Co., Ricketts, Pierre de P., Ridgway, C. & Son, Ringler, F. A. & Co., Riote, E. N., Risdon Iron Works, Roberts, A. & P. & Co., Roebiling, J. A. Sons & Co., Rolker, Charles M., Rowland, Richard P., Rowland, Waipole, Russell Process Co., Scaife, William B. & Sons, Schwarz, Theodore E., Scott, J. G. & Co., Scovill & Adams Co., Seeger & Guernsey Co., Shelton, E. de F., Simmons, John, Simons, W. & Co., Situations Wanted, Smith, C. H., Smith, Ed. & Co., Smith, Frederick H., Smith, Hamilton, Jr., Smith, Neustaedter & Wislon, Smith, R. C., Smith & Wesson, Solvay Process Co., Spotswood, Geo. A., Sprague Electric R. R. & M. Co., St. Louis Sampling & Testing Works, Stanley's Coal Drifting Machine, Stanley Rule & Level Co., Steamship Journal, Steam Stone Cutter Co., Steel Rail Supply Co., Stephens, H. J., Stephenson, John, Co., Ltd., Stetefeldt, C. A., Stevenot, Emile K., Stevens Arms & Tool Co., Stevens, Horace J., Stevenson, Robt., Stickney, Conyngham & Co., Stillwell & Bierce Mfg. Co., Sturtevant, B. F., Tamarack Mfg. Co., Taylor Gas Producer Co., Taylor, John & Co., Taylor & Brunton, Teknisk Tidsskrift, Tibbs, Adolph, Thompson Mfg. Co., Tobin, S. Richard, Tommins & Adams, Totten & Hogg Foundry Co., Trenton Iron Co., Trippel, Alexander, Trocmner, Henry, Trona Iron Works, Turck Hydraulic Power Co., Tyler, W. S., Wire Works Co., Uddenburg, Arthur, Union Iron Works, Union Metallic Cartridge Co., Union Wire Rope Tramway Co., United Edison Mfg. Co., United Foreign Express Co., United Gas Improvement Co., Van Nuis, C. S., Van Wagoner & Williams, Vermeule & Bien, Vermeule, C. C., Voland & Van Zeim, Vainwright Mfg. Co., Walker Manufacturing Co., Ward & Olyphant, Washburn & Moen Mfg. Co., Webster, Camp & Lane Machine Co., Webb's Adder Co., Wellington Machine Co., Wenstrom, Olof, Western Mining & Financial Agency, West Point Boiler Works, Wheeler, C. Gilbert, Whim Company, White, Samuel, Jr., Whitman & Wilkinson, Whitney A. & Sons, Whitney & Kemmerer, Wilkin Mfg. Co., Williamsport Wire Rope Co., Williams, John, Wiswell Electric Mfg. Machine Co., Witherow, Jas. P., Wolterack, H. C. & Co., Woolman, G. S., Worthington, Henry R., Wyatt & Weingaertner

**H. K. PORTER & CO.,**  
Builders of **LIGHT LOCOMOTIVES,**  
**PITTSBURG, PA.**

On application catalogues will be mailed giving description and power of over 80 sizes and styles of locomotives adapted to all varieties of service, including outside and underground work at Mines, Narrow-Gauge or Wide-Gauge Railroads, Logging Railroads with wood or iron rails, Street-Car Rail ways, Contractors' works, Plantations, Shifting at Furnaces, Mills, etc. All work steel fitted and built to interchangeable system, and duplicate parts always kept on hand.



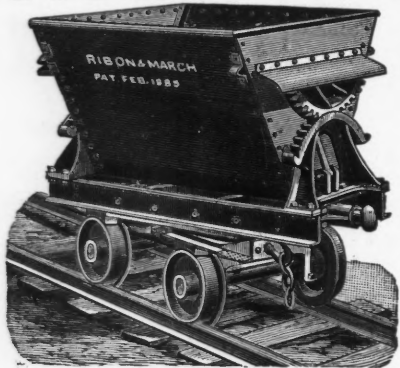
This cut is changed weekly.



**A. C. McEwen,**  
**NOVELTY WOOD-WORKER AND CAR BUILDER,**  
Manufacturer of the  
**McEwen Dumping Wagon, Side, End, Revolving and Bottom Dumping, Tunnel, Construction, Mine, Plantation, Logging, Hand, Push, and Small Cars of all kinds.**  
**No. 79 MORGAN ST., JERSEY CITY, N. J.**

**RIBON & MARCH**

MANUFACTURERS OF



**MINING MACHINERY,**

1st, 2d & Provost Sts., Jersey City.

**STAMP MILLS,**

**PANS & SETTLERS, RETORTS, etc.**

**PATENT DUMPING CARS**

For Mines, Railroad Construction, Etc.

**OUR ILLUSTRATED CATALOGUE WILL BE SENT ON APPLICATION.**

**Steel or Iron Spiral Riveted Pipe.**



3 to 24 Inches Diameter; 2 to 25 Feet Lengths. All Pressures.

Unrivalled for Water Works, Hydraulic Mining, Irrigation, etc as proved by 12 years' practical experience.

**ABENDROTH & ROOT M'FG. COMPANY,**  
**28 CLIFF STREET, NEW YORK.**

**THE METALLURGY OF STEEL.**

THE SCIENTIFIC PUBLISHING CO., Publishers,

27 PARK PLACE, NEW YORK:

Please enter my name as a subscriber to one copy of THE METAL LURGY OF STEEL, for which I agree to pay \$10.

SUBSCRIBER, \_\_\_\_\_

ADDRESS, \_\_\_\_\_

CITY or TOWN, \_\_\_\_\_

**ATLANTIC MINING COMPANY.**

Joseph E. Gay, President.

John Stanton, Secretary and Treasurer.

Eastern office, 76 Wall Street, New York.

Main office, Atlantic Mine P O., Houghton Co., Mich.

**BOSTON & MONTANA CON. COPPER AND SILVER MINING COMPANY.**

Jos. W. Clark, Pres. A. S. Bigelow, Sec. and Treas.  
Eastern office, 69 Devonshire Street, Boston.  
Mine office, Butte City, Montana.

**CENTRAL MINING COMPANY.**

Joseph E. Gay, President.

John Stanton, Secretary and Treasurer.

Eastern office, 76 Wall Street, New York.

Main office, Central Mine P. O., Keweenaw Co., Mich.

**COPPER QUEEN CONS. MINING COMPANY OF ARIZONA.**

J. Douglas, President.

J. Van Vleck, Secretary and Treasurer.

Office, 52 William Street, New York City.

**DETROIT COPPER MINING COMPANY OF ARIZONA.**

William Church, President.

Joseph Van Vleck, Secretary and Treasurer

Office, Morenci, Arizona.

**OSCEOLA CON. MINING COMPANY.**

Jos. W. Clark, President.  
A. S. Bigelow, Secretary and Treasurer.  
Eastern office, No. 69 Devonshire street, Boston.  
Mine office, Opechee, Michigan.

**QUINCY MINING COMPANY.**

Thomas F. Mason, President.

William Rogers Todd, Secretary and Treasurer.

Eastern office, No. 4 Exchange Court, New York.

Main office, Hancock, Michigan.

**TAMARACK MINING COMPANY.**

Jos. W. Clark, President.

A. S. Bigelow, Secretary and Treasurer.

Eastern office, No. 69 Devonshire street, Boston.

Mine office, Opechee, Lake Superior, Mich.

WE CAN GIVE

**Great Inducements**  
TO THOSE WISHING  
**TO ESTABLISH FACTORIES,**  
Having excellent water power and railroad facilities, and can furnish wood of different kinds. Also a great variety of minerals.

**REIDVILLE MINING AND IMPROVEMENT COMPANY,**

74 COURTLAND ST., NEW YORK.

A. F. REID President.

J. E. REID, Secretary.

**Practical Blacksmithing.**

A collection of articles contributed at different times by skilled workmen, covering nearly the whole range of Blacksmithing, from the simplest job of work to some of the most complex forgings.

COMPILED AND EDITED BY

**M. T. RICHARDSON.**

Illustrated, 1889. Price \$1.00.

**The Scientific Publishing Company,**  
**27 PARK PLACE, NEW YORK.**

**Directory of the Iron and Steel Works**

OF THE

**UNITED STATES FOR 1890.**

Price, \$3.00.

Sent post-paid on receipt of price by

**The Scientific Publishing Company,**  
**27 PARK PLACE, NEW YORK.**





### EIMER & AMEND,

205-211 Third Avenue,  
New York.

Everything necessary for the Chemist and Assayer will be furnished of best quality at reasonable prices.

Glass and metal apparatus, special, made to order, according to drawings.

Glass blowing and engraving done on premises.

## ASSAYERS' SUPPLIES,

Chemicals and Chemical Apparatus

Best goods, low prices, prompt shipment, careful packing.

### RICHARDS & COMPANY

41 Barclay Street, New York.  
Agents for BECKERS SONS' Balances and Weights of Precision, of Rotterdam, Holland.

### Morgan Crucible Co.,

Battersea, England,

MANUFACTURERS OF

Crucibles, Furnaces, Muffles, AND SCORIFIERS

Of Superior Quality.

LEONARD RICHARDS, Agent,  
41 Barclay St. New York.



ESTABLISHED 1850.

### J. & H. BERGE,

ASSAYERS', CHEMISTS' & JEWELERS' SUPPLIES,  
95 John Street, P. O. Box 401,  
NEW YORK.



## NEW YORK METALLURGICAL WORKS,

E. N. RIOTTE, MANAGER,

104 and 106 WASHINGTON STREET, NEW YORK.

ASSAYS: Gold, Silver, Copper, Lead or Iron, \$3; Zinc, Antimony or Tin, \$5; Gold, Silver and Copper or Lead, \$8.  
SAMPLING: Sampling and Assay, from \$1 to \$5.  
ORE WORKING TEST: Free Milling, \$25; Roasting and Chlorinating or Amalgamating or Leaching, \$40.  
EVERY PROCESS AND EVERY KIND OF CONCENTRATOR USED.

## THE NEWARK SMELTING AND REFINING WORKS,

EDWARD BALBACH & SON, Proprietors,  
Newark, New Jersey.

SMELTERS AND REFINERS OF GOLD, SILVER, LEAD AND COPPER ORES,

BULLION AND ARGENTIFEROUS COPPER MATTE received on consignment or purchase.

SMELTING & REFINING WORKS, } NEWARK, N. J. | BUENA FE SAMPLING WORKS,  
ELECTROLYTIC COPPER WORKS, } Agency, Sabinas Coahuila, Mex.

## THE PENNSYLVANIA SALT MANUFACTURING COMPANY

INCORPORATED 1850.

### SMELTING AND REFINING DEPARTMENT.

WORKS AT NATRONA, NEAR PITTSBURG, PA.

The highest prices paid for GOLD, SILVER and COPPER IN ORES, BULLION AND MATTES. Address

### PENNSYLVANIA SALT MANUFACTURING CO.,

115 CHESTNUT STREET, . . . PHILADELPHIA, PA.

"The Greatest Work Ever Written on the Subject!"

## THE METALLURGY OF STEEL.

By H. M. HOWE.

Just Published by THE SCIENTIFIC PUBLISHING CO. Price \$10.

## HENRY HEIL CHEMICAL CO.,

212 SOUTH FOURTH ST., ST. LOUIS, MO.,  
MANUFACTURERS AND IMPORTERS OF  
Crucibles, Scorifiers, Muffles, Assay Furnaces, Balances, Weights, Apparatus and Chemicals.

Glass and Porcelain Ware, Filter-Paper, Platinum Wire, Foil and Ware, Hydrometers, Thermometers, Galvanic Batteries, Gas and Coal Oil Stoves, commercially and chemically pure Acids and Chemicals, &c. &c.



Test Lead absolutely free from silver, French and American Boneash, Borax and Borax Glass, Saltpeter, Cyanide of Potassium, Sodium, Monoxide, Hyposulphite of Soda, etc. etc.

All and everything the chemist and assayer needs can be found at our establishment. We guarantee best quality and lowest prices. Catalogue on application.  
OLDEST AND LARGEST HOUSE IN THE UNION.



Established during the first gold discoveries in California.

JOHN TAYLOR & CO. John Taylor, Henry R. Taylor.  
63 First St., SAN FRANCISCO, CAL.,



Importers and Manufacturers of Assayers' Materials, Mine and Mill Supplies, Chemicals and Chemical Glassware and Apparatus.

All articles required for a chemist, assayer and for fitting up a quartz mill. None but the best chemicals, crucibles and other appliances such as our long experience assures us to be the best, are kept in stock and all furnished at reasonable prices. Agents for the Pacific Coast for the Morgan Crucible Co., Battersea, England. Borax, Bone Ash, Cyanide Potass, etc., at manufacturers' prices. Our illustrated catalogue and assay tables sent free on application.

### VOLAND & VAN ZELM,

Lately with Becker & Sons,

Manufacturers of BALANCES and WEIGHTS of PRECISION.  
P. O. Box 327, New Rochelle, N. Y.  
Illustrated Price Catalogue on Application.

ESTABLISHED IN 1840.

### HENRY TROEMNER,

710 MARKET ST., PHILADELPHIA, PA.,

MAKER OF

Assay & Analytical Instruments, Fine Weights, etc.,

In use at U. S. Assay Office, New York; U. S. Mints at Philadelphia, New Orleans, and U. S. Treasury Departments, Washington, etc., etc.

E. H. SARGENT & CO., 125 State St., Chicago, Agents.

### BLUE WELSH

## DINAS SILICA FIRE-BRICKS AND CEMENT

For Open-Hearth and Basic Furnaces, and for Lining Bessemer Converters.

TRADE MARK, "ABERNANT,"

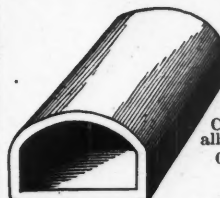
IMPORTED AND FOR SALE BY

A. T. CHUR, Sole Agent  
Room 88, Potter Building, New York.

## THE DENVER FIRE CLAY CO.,

MANUFACTURERS OF

Fire Brick, Muffles, Crucibles, etc.



Dealers and Jobbers in Chemicals, Glassware, and all kinds of Assayers' Supplies.  
Office: 1635 LARIMER ST., DENVER, COLO.

General Agents for the Ainsworth Gold Balance.

### HOSKINS'S PATENT

Hydro-Carbon Blow-Pipe and Assay Furnaces.

Send for price-list to

W. HOSKINS, 31 So. Clark St., Room 51, Chicago.

## GAS BLAST FURNACES,

FOR MELTING, ASSAYING, ETC.

For power only, where artificial blast is obtainable. Reichelm's Patents. Send for Catalogue.

AMERICAN GAS FURNACE CO., 80 Nassau Street, N. Y.

## QUICKSILVER.

J. B. RANDOL,

320 SANSOME ST., ROOM 22  
SAN FRANCISCO.

## ANALYTICAL LABORATORY

AND

### ASSAY OFFICE

OF

Dr. Gideon E. Moore,

221 PEARL ST., S. W. Cor. PLATT, NEW YORK.

Assays of Ores, Metals, and Metallurgical products. Analyses of Ores, Minerals, Waters, and Natural and Industrial products of every description.

Printed Price List on Application.

## QUEEN & CO.,

ADDRESS

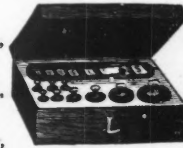
Department No. 4 Physics and Chemistry.

PHILADELPHIA, PA.

Chemical Apparatus, Chemicals, ASSAYER'S MATERIALS.

General Laboratory Supplies.

Crucibles, Scorifiers, Furnaces, Platinum, Cupel Molds, Filter Paper, Bone Ash, Borax Glass, Cyanide Potass, Commercial & C. P. Acids & Chemicals.



Queen's Fine Analytical Balances.

Best Bohemian and German Glassware.

Best Quality and Lowest Prices Guaranteed.

Our Catalogue is the most complete published.

## GEMS AND PRECIOUS STONES

"It is authoritative and captivating literature upon the subject of which it treats."—N. Y. Sun.

### Street's Classified Directory

OF

East India, Australasia, Africa, China, Japan, South and Central America, British Colonies and West Indies.

Price, 15.00.

STREET & CO., London, Publishers.

Agent for U. S., J. G. SCOTT, 157 Broadway, New York

**AARON, C. H.,**  
Metallurgist,  
Santa Lucia,  
Honduras, C. A.

**ADAMS, W. H.,**  
Mining Engineer and Metallurgist,  
71 WALL STREET, NEW YORK.  
REPORTS ON AND MANAGES MINERAL PROPERTIES.  
Specialties: Pyrites, Copper, Sulphuric Acid Plant.

**AIKMAN & AUMAN,**  
Mining and Civil Engineers,  
29 Hollenback Coal Exchange, Wilkesbarre, Pa.

**AUSTIN, W. L.,**  
Metallurgist.  
PORTLAND, OREGON.  
Specialty: Pyritic Smelting.

**BEWICK, MOREING & HOOPER,**  
MINING ENGINEERS,  
508 California Street, San Francisco.  
London: Suffolk House, Laurence Pountney Hill, E. C.  
S. Africa: Leakes Buildings, Johannesburg.  
Report on mines for London Market.

**BLANDY, JOHN F.,**  
Mining Engineer; Territorial Geologist,  
PRESCOTT, YAVAPAI CO., ARIZONA.  
Mines examined and reported on.

**BLAUVELT, HARRINGTON,**  
Mining Engineer and Metallurgist.  
Mines examined and reported upon.  
REYMERT, VIA FLORENCE, ARIZONA.

**BOGGS, W. R., JR.,**  
Mining Engineer and Metallurgist,  
P. O. Box 71, Winston, N. C.

**BOSS, M. P.,**  
Milling Engineer,  
309 California Street, San Francisco.  
Eastern Representative: E. E. Oicott, E. M., 10 Cedar St.  
Continuous system of pan amalgamation. Standard  
combination pan. Standard mill details. Standard continuous  
mill. Quartz mills designed with care and thoroughness.

**BOWERS & MILLER,**  
Civil, Mechanical Engineers and  
Metallurgists,  
Designers and Builders of Quartz Mills and General  
Mining Machinery. Tests made on ore to determine  
best treatment.  
36, 37 and 38 Good Block, Denver, Colo.

**BRODIE, WALTER M.,**  
Mining Engineer and Metallurgist,  
Batopilas, Chihuahua, Mexico.

**BURLINGAME, E. E.**  
Assay Office and Chemical Laboratory,  
1736 and 1738 LAWRENCE STREET, DENVER, COLO.

**BUTTERS, CHARLES,**  
Mining Engineer and Metallurgist,  
The Butters Ore Milling Works,  
Kennet, Shasta Co., Cal., on Cal. & Oregon Railroad.

**CARPENTER, FRANKLIN R., Ph.D., F.G.S.A**  
Consulting Engineer.  
Attention given to mining reports, reduction works,  
and all matters relating to the business of mining.  
Rapid City, South Dakota.

**CHANCE, H. M.,**  
Mining Engineer and Geologist.  
Specialty: Examination of Coal and Iron Properties,  
Mining Methods and Appliances.  
418-420 Drexel Building, Philadelphia, Pa.

**CHANNING, J. PARKE,**  
Mining Engineer,  
ISHPEMING, L. S., MICH.  
Agent East New York Mine, Marquette Range. Late  
Inspector of Mines for the Gogebic Range.

**CHISM, RICHARD E.,**  
Mining Engineer,  
Callejon Espirito Santo No. 4, CITY OF MEXICO.  
Reports on mines anywhere in Mexico. Examination of  
Titles and Settlement of Lawsuits, etc., a specialty.  
Knows good mines for sale. Correspondence solicited.

**CHISOLM, FREDERIC F.,**  
Consulting Mining Engineer of the Union  
Pacific Railway.  
Permanent address: Denver, Colo. Economic Geology  
and Mining, Examinations and Reports.

**CHUTE, H. O.,**  
Marquette Assay Office,  
Analytical Chemist and Assayer,  
MARQUETTE, MICHIGAN.

**CLARK, C. J.,**  
Mining Engineer,  
3212 PINE STREET, ST. LOUIS, MO.  
SPECIALTIES:  
Concentration and Milling of low grade Gold and Silver  
Ores Modern Placer Mining, Antimony Min-  
ing, and Smelting by all processes.

**CLEMENT, VICTOR M.,**  
Mining Engineer and Metallurgist.  
The practical mining and treatment of gold, silver and  
lead ores a specialty. Will examine and report upon  
mining properties in the Cour d'Alene District and  
vicinity. Manager Banker Hill and Sullivan Mines.  
WARDNER, CEUR D'ALENE, IDAHO.

**COMSTOCK, THEO. B.,**  
Mining Engineer and Metallurgist,  
Geologist for Central Texas, State Geological Survey,  
Austin, Texas.  
Specialty: MINING INDUSTRIES OF THE SOUTHERN  
STATES.

**CURTIS, J. S.,**  
Mining Engineer,  
Johannesburg, Transvaal,  
South Africa.

**DAGGETT, ELLSWORTH,**  
Mining Engineer and Metallurgist,  
Salt Lake City, Utah.

**DEARDEN, WALTER,**  
Assayer and Chemist,  
Mines examined and reported on.  
Trinidad, Colorado.

**DE LA BOUGLISE, GEO.**  
Mining Engineer,  
63 Rue de la Victoire, PARIS, Franco.

**DEWEY, FREDERIC P.,**  
Chemist and Metallurgist,  
Washington Laboratory and Metallurgical Works,  
621 F St. N. W., WASHINGTON, D. C.

SPECIALTY—Examination, Demonstration and De-  
velopment of Patented Processes.

**DICKERMAN, ALTON L.,**  
Mining Engineer,  
Ironwood, Mich.

**ENDLICH, F. M.,**  
Mining Engineer and Metallurgist,  
Formerly of Smithsonian Institution and U. S. Geolog-  
ical Survey (Hayden).  
Address: OURAY, COLO.  
Reports on mines, management of mines and reduction  
works, treatment of low-grade ores, treatment by  
lixivation.

**EVERETTE'S MINING OFFICE,**  
Pioneer Mining Office of Pacific Northwest.  
Having the largest permanent brick assay furnaces,  
chemical laboratory and mining office on the northwest  
coast, with a collection of about 4,000 samples of the  
ores of Alaska, British Columbia, Oregon and the north-  
west territories; and having made personal examina-  
tions of nearly every mining camp on the Pacific slope  
from California to Alaska, I am prepared to do any class  
of legitimate and honest mining work, such as  
EXAMINING, ENGINEERING, SAMPLING AND REPORTING  
ON THE VALUE OF ALL MINERAL, COAL AND FIRE-  
CLAY PROPERTIES, BUILDING STONES, EARTHES, ASSAYS  
AND ANALYSIS OF ORES, WATERS, CHECK, SAMPLES OF  
ORE, PULPS,  
"Organic Analysis" work, and in fact any work con-  
nected with the office of a first-class mining geologist  
and chemist. Any information mining men may desire  
to know relative to the MINERAL OR COAL RE-  
SOURCESES of the entire Pacific northwest will be hon-  
estly given. Address **Dr. Willis E. Everette**, Con-  
sulting Mining Expert and Geologist, 1,318 E Street,  
Tacoma, Wash. Ter.

WM. A. FARISH. JOHN B. FARISH.  
**FARISH & FARISH,**  
Mining Engineers,  
No. 8 Windsor Block, Denver, Colo.  
Cable address, "FARISH, Denver."

**FRECHEVILLE, R. J. & WM.,**  
Mining Engineers,  
33 Broad Street Avenue, New Broad Street,  
London, E. C., England.

**FREELAND, FRANCIS T.**  
Mining and Mechanical Engineer.  
Mines and mining; hoisting, pumping, and concentra-  
ting plants. P. O. Box No. 23, LEADVILLE, COLO.

**FROSSARD, JOHN D.,**  
Mining Engineer and Geologist,  
30 St. Francois Xavier Street, Montreal, Canada.  
Canadian phosphate and asbestos lands a specialty.

**FULTON, HENRY,**  
Mining Engineer,  
BOULDER, COLORADO.  
Examines mining property exclusively in interest of  
purchasers.

**FURLONGE, W. H.**  
Mining Engineer,  
JOHANNESBURG, SOUTH AFRICAN REPUBLIC.  
Special attention given to the expert examination of  
mineral properties in the Transvaal and that region.

**GARRISON, F. LYNWOOD,**  
Metallurgical Chemist and Mining  
Engineer,  
328 Chestnut Street, Philadelphia.  
Advices on metallurgical and mining questions.

**GIFFORD, WILLIAM E.,**  
Analytical Chemist and Assayer,  
124 PEARL ST. (Hawover Square), NEW YORK.  
Analysis and Assays of Ores, Metals, etc.

**GOODRICH & CLARK,**  
Civil and Mining Engineers,  
Elkhorn, McDowell County, West Va.  
Development of coal lands and construction of coke  
plants a specialty.

**GOUDIE, JAMES H.**  
Civil and Mining Engineer.  
IRONWOOD, MICH.  
Reports on Mining Properties on the Gogebic Range.  
Explorations Superintended.

**HAMMOND, JOHN HAYS,**  
Mining Engineer and Metallurgist.  
Consulting Engineer Union Iron-Works, San Francisco  
Cal., and Original Empire and North Star Mining Com-  
panies, Grass Valley, Cal. Address  
GRASS VALLEY CALIFORNIA.

**HAMPTON, WM. HUNTLEY,**  
Analytical Chemist and Assayer,  
191 North 13th street, Portland, Oregon.  
Associate late Joshua E. Clayton, Pacific-Northwest-  
ern Agent Russell Process. Mining property examined  
and reported on. Correspondence solicited.

**HARDMAN, JOHN E.,**  
Mining Engineer,  
OLDHAM, NOVA SCOTIA.  
The development of Gold Properties a Specialty.

**HERNDON, J. H.,**  
Analytical Chemist and Assayer,  
Chief Chemist, Geological Survey of Texas.  
Austin, Texas.

**HOFMANN, OTTOKAR,**  
Metallurgist and Mining Engineer.  
Cushuiriachic, Chihuahua, Mexico.  
Erection of Leaching and Chlorination Works a specialty

**HOLIBAUGH & VAN NESS,**  
Mining Engineers.  
Joplin, Mo., 301 West Fourth Street.  
Kansas City, Mo., Room, 12 and 13, Mining Exchange.

**HOWE, HENRY M.,**  
Mining Engineer and Metallurgist,  
241 Beacon Street, Boston, Mass.  
Reports on mineral properties and metallurgical pro-  
cesses. Advises on mining and metallurgical questions.

**HUNT, JOSEPH,**  
Mining Engineer and Metallurgist.  
(Late Supt. Crane Iron Co.)  
ALLEN TOWN, PENNA.  
Reports on Blast Furnace Location, Construction  
and Management, Iron Ores and Coal, and the Develop-  
ment of same.

**KEDZIE G. E.,**  
Consulting Mining Engineer and  
Analytical Chemist,  
Ouray, Colorado.  
Will advise upon the development and management of  
mines in the San Juan.

**KENNEDY, JULIAN,**  
Engineer. Specialty: Iron and Steel Works.  
Hamilton Building, Pittsburg, Pa.

**KEYES, W. S.,**  
Mining Engineer.  
PACIFIC UNION CLUB SAN FRANCISCO, CAL.  
Examines Mines, or Mill and Furnace Property.

**KINGMAN, JERRY, E. M.**  
**Utah Assay Office.**  
Chemist and Assayer,  
BOX 721,  
HELENA, MONTANA.

**LAVAGNINO, G.,**  
Mining Engineer,  
SALT LAKE CITY, UTAH.

**LEGGETT, THOMAS H.,**  
Mining Engineer.  
Manager Darien Gold Mining Company, Ltd., Cana,  
via Panama, S. A.

**MARINER & HOSKINS,**  
Assayers and Analytical Chemists,  
81 S. Clark street, Chicago.  
Specialty: Assays and analyses of all kinds of ores;  
weighing and sampling car load lots in Chicago and  
vicinity.



**MAHER, JAMES A.,**  
Civil and Topographical Engineer,  
(Late Topographer, U. S. G. S.) Will report on  
Southern properties. JOHNSON CITY, TENN.

**MAYNARD, GEORGE W.,**  
Consulting, Mining, and Metallurgical  
Engineer.  
Rooms 32 and 33, 31 Nassau St., Elevator 75 Cedar St.,  
New York.

**MCULLOCH, E. A.,**  
Mining Engineer.  
Address P. O. Box 2346,  
New York.

**MCDERMOTT & DUFFIELD,**  
Mining Engineers and Metallurgists,  
23 Bucklersbury, London, E. C., and  
2 Wall Street, New York.

**MC DOWELL, F. H.,**  
Consulting and Mining Engineer,  
120 Liberty Street, New York.

**MOORE & HIBBERT,**  
STAUNTON, VA.  
Mining Engineers  
AND  
Experts in Iron and Manganese Ores.  
Reports on and manages Mineral Properties, Mines  
and Mineral lands bought and sold. Analyses and  
Assays of Ore, Metal, etc., etc.

**NICHOLSON, FRANK,**  
Mining Engineer and Metallurgist,  
P. O. Box 104, PHOENIX, ARIZONA.  
Examines and reports on mines and mill and furnace  
property.

**OLCOTT, EBEN E.,**  
Mining Engineer and Metallurgist,  
101 PEARL ST., N. Y. CITY. Cable Address "Kramolena."  
Eastern representative of the M. P. Boss Continuous  
Milling System.

**PALMER, C. E.,**  
Mining Engineer and Metallurgist.  
ASPEN, COLORADO.

**PARKER, RICHARD A.,**  
Consulting Mining Engineer.  
SPECIALTIES: Lake Superior Iron Ores and the  
Precious Metals.  
Address: Marquette, Mich.

**PETERS, EDWARD D., JR.,**  
Mining Engineer and Metallurgist.  
Attends exclusively to Copper Mining and Smelting.  
Care Dr. B. Cushing, Percival Avenue, Dorchester,  
Mass.

**PHILLIPS, WILLIAM B., PH. D.,**  
(SUCCESSOR TO PHILLIPS & CLAGHORN)  
Mining Engineer and Metallurgical Chemist,  
2014 Morris Avenue, Birmingham, Ala.

**POTT, JOHN N.,**  
Mem. Am. Soc. C. E. and Am. Inst. M. E.,  
Civil and Mining Engineer,  
Rooms 9 and 10 Post Office Building, Philadelphia, Pa.  
Special attention paid to the surveying, exploring and  
developing of coal lands.

**POTTER, WILLIAM B.,**  
Mining Engineer and Metallurgist,  
St. Louis Sampling and Testing Works, 1225 and 1227  
Spruce Street, St. Louis, Mo.

**PRICE, THOMAS & SON,**  
Mining and Metallurgical Engineers,  
Assayers and Analytical Chemists.  
524 Sacramento Street, San Francisco, Cal.  
THOMAS PRICE. ARTHUR F. PRICE.

**RANDOLPH, JOHN C. F.,**  
Consulting Mining Engineer.  
NO. 35 BROADWAY, NEW YORK.  
Absent in Borneo on professional business.

**RAYMOND, ROSSITER W.,**  
Mining Engineer and Metallurgist,  
13 Burling Slip, New York City. P. O. Box 1465.

**ROLAND, WALPOLE,**  
Civil and Mining Engineer,  
PORT ARTHUR, CANADA.

**ROLKER, CHARLES M.,**  
Mining Engineer,  
18 Broadway, New York.

**ROTHWELL, RICHARD P.,**  
Mining and Civil Engineer,  
Editor of ENGINEERING AND MINING JOURNAL,  
27 Park Place, New York City.  
Advises on the Working and Management of Mines.

**SCHWARZ, THEODORE E.,**  
Mining Engineer.  
1065 Pearl Street, Denver, Colo.

**SMITH, FREDERICK H.,**  
Consulting Engineer and Geologist,  
227 East German street, Baltimore, Md.

**SMITH, NEUSTAEDTER & WISHON,**  
Mining and Civil Engineers,  
BUTTE, MONTANA.

**SPOTSWOOD, GEO. A.,**  
Mining and Civil Engineer,  
Kingston, Ont.  
Mineral properties examined and reported on. Special-  
ties, Iron, Mica, Phosphate and Asbestos.

**STEFELDT, C. A.,**  
Mining Engineer and Metallurgist,  
Care of L. Falkenau, Safe Deposit Building, San  
Francisco, Cal.

**STEVENOT, EMILE K.,**  
Mining Engineer and Metallurgist,  
Angel's Camp, Calaveras Co., California.  
Reports on mines, erects and operates reduction-works.

**STEVENSON, ROBT.,**  
Certificated Civil and Mining Engineer,  
Mine-owner & Agent for Foreign Companies.  
Address: 114 Lick House,  
San Francisco, Cal.

**TAYLOR & BRUNTON,**  
Mining Engineers,  
ASPEN, COLORADO,  
Or P. O. Box 203, New York.

**THIES, ADOLPH,**  
Mining Engineer.  
SPECIALTY, CHLORINATION OF GOLD ORES.  
Haile Gold Mine, S. C.

**TRIPPEL, ALEX.,**  
Mining Engineer and Metallurgist,  
GLOBE, ARIZONA TER.  
Consultations about mines and reduction-works in  
Arizona a specialty.

**UDDENBERG, ARTHUR,**  
Analytical Chemist and Assayer,  
ISHPEMING, L. S., MICH.  
Analyses of iron ores and all kinds of minerals a  
specialty.

**WENSTROM, OLOF,**  
Consulting Mining Engineer,  
Marquette, Mich.  
LAKE SUPERIOR MINES.

**WESTERN MINING AND FINANCIAL  
AGENCY**  
1,758 Larimer st., Denver, Colo.  
Examination and Reports on Mines a Specialty. In-  
formation furnished regarding mines. Interests of  
non-residents attended to. Correspondence solicited.  
Reference given.  
FELIX LEAVICK. A. F. WUENSCH.  
THEO. BARLOW.

**WHEELER, C. GILBERT,**  
Assayer, Chemist and Geologist,  
143-5 Lake Street, Chicago.  
Extended experience in the United States, Mexico  
and South America as examiner of mines.

**WILLIAMS, JOHN,**  
Mining Engineer,  
Care of ENGINEERING AND MINING JOURNAL,  
27 Park Place, New York.  
Will examine and report on mines and irrigation  
works.

**WOLTERECK, H. C. & CO.,**  
Analytical Chemists & Mining Engineers  
Assays of Ores, Metals, and Metallurgical Products.  
Analyses of Mineral Waters, Fertilizers, Lubricants  
and Industrial Products of every description.  
Mining properties investigated and developed.  
Correspondence solicited.  
CHATTANOOGA, TENN. DR. H. C. WOLTERECK, Mgr

**WYATT & WEINGAERTNER,**  
Consulting, Analytical and Technical  
Chemists,  
24 Park Place, New York.  
Advise in every branch of chemical technology.

**PATENTS** and PATENT CAUSES: J. R.  
LITTELL, opp. Pat. Office,  
Washington, D. C. OPINIONS  
upon patentability, validity and scope and infringe-  
ment. Interferences, Trade-Marks, Contracts. Prac-  
tice confined to Patent Causes. (Mention "JOURNAL.")

**BANKERS AND BROKERS.**

**NESSLAGE, COLGATE & CO.,**  
Bullion Brokers,  
29 Wall Street, New York.  
Dealers in all kinds of foreign moneys, Foreign Ex-  
change, Government, State, County and City Bonds.  
Consignments of Fine or Base Bullion received on most  
favorable terms.

**HANDY & HARMAN,**  
DEALERS IN  
BULLION, SPECIE, AND BONDS,  
No. 24 Nassau Street, New York.  
Sovereigns, Francs and Marks, Doubloons,  
Mexican Dollars, Fine Silver Bars, Fine Gold Bars.  
Special attention given to Investments and to Consig-  
nments of Silver and Gold Bullion of all grades.  
REFERENCES:  
AMERICAN EXCHANGE NATIONAL BANK, NEW YORK  
CITY, THIRD NATIONAL BANK, NEW YORK CITY.

**KOUNTZE BROTHERS,**  
Bankers,  
120 Broadway (Equitable Building), N. Y.,  
Transact a general banking and collection business  
Receive deposits subject to check at sight, and allow  
interest on daily balances. Issue letters of credit and  
circular notes, available in all parts of the world. Make  
cable transfers.

FOR TRAVELERS,  
**CIRCULAR LETTERS OF CREDIT**  
Available in all parts of the world,  
ISSUED BY

**LADENBURG, THALMANN & CO.,**  
44 AND 46 WALL ST., NEW YORK.

**WILLIAM L. PATTON & CO.,**  
BANKERS AND BROKERS,  
6 Wall Street, New York.  
Stocks Bought and Sold on Commission.  
Interest allowed on Deposits.  
WM. L. PATTON, Member N. Y. Stock Exchange.  
H. L. SALTONSTALL.

**SAMUEL WHITE, JR.,**  
Commission Stock Broker,  
56 Broadway, New York.  
Special attention given to MINING STOCKS. Acts  
as Registrar of Transfers.  
Mining Properties negotiated.

**E. R. GRANT,**  
MINING STOCK BROKER,  
57 Broadway, New York.  
Member Consolidated Exchange. Fifteen years  
experience  
TUSCARORA STOCKS a specialty. Orders executed  
in New York and San Francisco.

**C. H. SMITH,**  
COMMISSION STOCK BROKER,  
No. 15 Congress Street, Boston.  
Special attention given to buying and selling Copper  
stocks in Boston market.  
ORDERS RESPECTFULLY SOLICITED.

**DAVID M. FORD,**  
ISHPENNING, L. S., MICH.,  
DEALER IN  
Lake Superior Gold, Iron and Copper  
Stocks.

"The richest mines in the world."  
Correspondence Solicited.

**C. W. BUCK,**  
Experience of twenty-five years as a Miner  
in the Rockies,  
Dealer in Stocks and Mines.  
1,207 Fifteenth Street, Denver, Colo.  
Correspondence Solicited.

**10 to 20 PER CENT.**  
Per annum can be earned on money carefully in-  
vested in Lake Superior Iron Stocks. The iron  
mines of the district are the largest and most  
profitable in the world. We make a specialty of  
investing money for persons who desire to put it  
where it will bring regular returns.  
We also handle the Lake Superior Gold Stocks.  
These give every promise of proving very valu-  
able. Information regarding mines and stocks  
promptly and cheerfully furnished.  
Correspondence solicited.

**HORACE J. STEVENS,**  
Ishpeming, Mich.  
REFERENCE:  
ISPHEMING NATIONAL BANK.

# ILLINOIS STEEL COMPANY,

MANUFACTURERS OF

Bessemer, Foundry and Mill Pig Iron, Spiegel and Ferro-Manganese, Iron and Steel Merchant Bar, Nails and Rail Fastenings, Light "T" and Street Rails, Steel Blooms, Slabs, Billets and Wire Rods of any required chemical composition; Iron or Steel Car Truck Channels and Steel "I" Beams and Structural Shapes; and

## Bessemer Steel Rails from 8 to 100 lbs. per Yard.

ROLLS FOR STANDARD SECTIONS AND SHAPES ALWAYS IN STOCK. SPECIAL SECTIONS AND SHAPES MADE TO ORDER.

This Company owns and operates Five Works, namely: North Works and Union Works, Chicago, Ill.; South Works, South Chicago, Ill.; Joliet Works, Joliet, Ill.; Milwaukee Works, Milwaukee, Wis.

General Offices, 10th floor, "Rookery," Chicago, Ill.

New York Offices, 46 Wall St.

Milwaukee, Wis., Office, 151 N.W. Ins. Building

### PITTSBURGH RUSTLESS IRON WORKS

Operating under the

#### BOWER-BARFF PATENTS,

Treats Architectural Iron Work, Wrought Pipe and Fittings, Soil Pipe, Plumbers' Supplies, Fire-Places, Grates, and Hollow Ware.

PITTSBURGH, PA.

### THE PRATT & WHITNEY CO.,

HARTFORD, CONN., U. S. A.,  
Manufacture Lathes, Planers, Shapers, Drills,  
Lathe Chucks, Planer Centers and Vises, Bolt-  
cutters, Renshaw Hatchet-Drills, Screw  
Plates, etc., in every respect Desirable for Mine  
Use

THE ROBERT W. HUNT & CO.  
Bureau of Inspection, Tests and Consultation.  
Principal Office: 631-633 The Rookery, Chicago.  
Branch Offices: 161 Broadway, New York; 323 Chest-  
nut street, Philadelphia; Hamilton Building, Pittsburg  
Northwestern agents for Riehle Testing Machines.

SUBSCRIBE NOW FOR

## HOWE'S METALLURGY OF STEEL

SCIENTIFIC PUBLISHING CO., PUBLISHERS.

### JESSOP'S STEEL

Best Drill, Tool, Double Shear, Blister, Truss  
Spring, Circular Saw Plates, Sheet Steel,  
Annealed Tool Steel.

MANUFACTORY: SHEFFIELD, ENGLAND.  
Agencies Throughout the United States.

CHIEF AMERICAN OFFICE,

91 JOHN ST., NEW YORK.

WILLIAM JESSOP & SONS, Limited.

GOLD MEDAL, PARIS, 1889

### CLEVELAND IRON MINING CO.,

Mercantile Bank Building,

CLEVELAND, O.

Organized 1850.

Total Production to Date, 4,200,000 Gross Tons.

Dealers in Lake Superior iron ore from their  
own mines at Ishpeming, Mich.

Specially adapted for making strong, tough  
iron, and for carrying large proportions of mill  
cinder and cold short ores.

## DIRECTORY

OF THE

## Iron and Steel Works

OF THE

UNITED STATES FOR 1890.

PRICE, \$3.00.

Sent post-paid on receipt of price.

THE SCIENTIFIC PUBLISHING CO  
27 PARK PLACE, NEW YORK.

## Mullins Silicated Iron and Steel Company

Controlling Mullins' Patents for Treatment of Iron and Steel.

DEPARTMENT OF CAST IRON.

The Silica Process increases transverse and tensile strength, decreases shrinkage, makes castings fine-grained, uniform, comparatively free from air holes, soft and malleable. Its use as a Purifier and Softener effects important savings in foundry work.

219 First National Bank Building, Chicago.

WHEN YOU WANT THE BEST

**Drill Steel, Tool Steel, Die Steel, Spring  
Steel, Machinery Steel, Steel Forg-  
ings, Coiled Springs,**

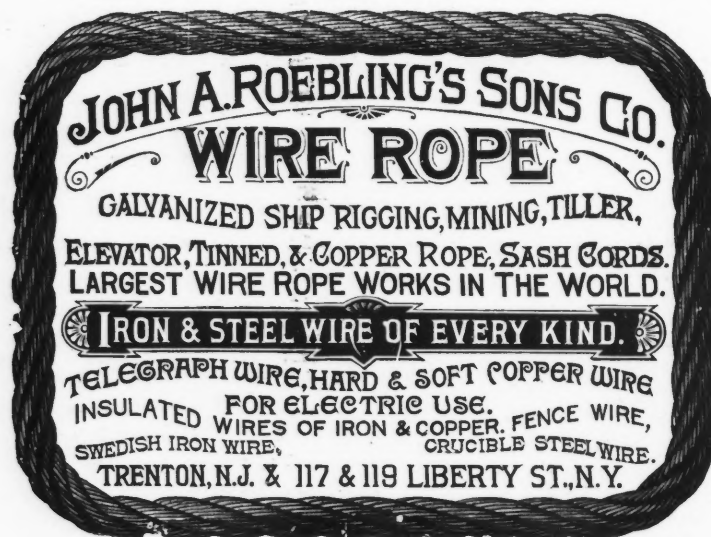
SEND YOUR ORDERS DIRECTLY TO US, OR SPECIFY OUR PRODUCT IN ORDERS TO MERCHANTS

## CRESCENT STEEL CO.,

64 and 66 South Clinton St.,  
CHICAGO, ILLS.

136 First Avenue,  
PITTSBURGH, PA.

480 Pearl Street,  
NEW YORK, N. Y.



## THE CINCINNATI CORRUGATING CO.,

BOX 258, PIQUA, OHIO,

MANUFACTURERS OF

Superior Iron and Steel Roofing, Siding, Ceilings,  
Arches, Lath, etc.

Furnish Light and Heavy Corrugated Galvanized Plates  
of Special Pattern Promptly to Order.

CORRESPONDENCE INVITED.



### Pencoyd Bridge & Construction Co.,

DESIGNERS AND MANUFACTURERS OF

**RAILROAD BRIDGES, ROOFS, VIADUCTS, TURNTABLES,**

And all Classes of Structures Composed of STEEL OR IRON.

C. C. Schneider, Chief Engineer. Philadelphia Office, 261 S. 4th St.

James Christie, Mechanical Engineer. New York Office, 35 Broadway.

Works at PENCOYD, PA.

### PENCOYD IRON WORKS.

### A. & P. ROBERTS & CO.,

MANUFACTURERS OF

**Wrought Iron & Open Hearth Steel.**

BEAMS, CHANNELS, ANGLES, TEES, DECK BEAMS, BARS, SHAFTING

Special Shapes for Car, Ship and Bridge Builders; also for Cable Railway Construction. Rolled or Hammered Car Axles of Iron or Steel.

Special attention given to High Test Iron or Steel for particular requirements.

Works at PENCOYD, PA.

Office 261 S. FOURTH ST., PHILA.

### James P. Witherow,

ENGINEER AND CONTRACTOR,

LEWIS BLOCK, PITTSBURG, PA.

GENERAL AGENT FOR

### Whitwell Fire Brick Stoves

AND

### CLAPP-GRIFFITHS PATENTS

For the Manufacture of Soft Steel.

SPECIALLY ADAPTED FOR

A No. 1 Boiler Plates, Boiler Rivets, Wire

Rods, Stay Bolts, Stamping Ware,

Nail Plates, Etc., Etc.

Will contract to completely erect, equip, and place in operation Blast-Furnaces, Whitwell Stoves, and Steel Plants. As I manufacture at our works every thing appertaining to blast-furnace and steel-works construction, and guarantee promptness and satisfaction

JUST PUBLISHED.

### Annual Statistical Report

ON THE

IRON AND STEEL INDUSTRIES IN 1889,

BY THE

SECRETARY OF THE BRITISH IRON TRADE

ASSOCIATION.

PRICE \$2.00.

FOR SALE BY

THE SCIENTIFIC PUBLISHING COMPANY,

27 PARK PLACE, NEW YORK.

### The Mining Code of the Republic of Mexico.

By RICHARD E. CHISM, Mining Engineer.

PRICE, \$1.00.

Translated from the Official Edition in the original Spanish.

Published by the SCIENTIFIC PUBLISHING Co., 27 Park Place, New York.

### PHELPS, DODGE & CO.,

IMPORTERS OF

### TIN PLATE,

Roofing Plate, Sheet Iron, Copper, Pig Tin, Wire, Zinc, etc.

MANUFACTURERS OF

COPPER and BRASS.

CLIFF STREET NEW YORK.

**SCAIFE'S** CORRUGATED IRON, LIGHT, FIRE-PROOF, EASILY ERECTED.  
 THE BEST FOR ROOFING. **IRON ROOFS** DURABLE, CHEAP.  
 AND SIDING MILLS, SMELTING WORKS, AND BUILDINGS.  
 FOUNDRIES, STORE-HOUSES, RR. DEPOTS ETC. ETC.  
**WM. B. SCAIFE & SONS,**  
 SEND FOR CIRCULAR AND PRICE LIST. 119 FIRST AVE., PITTSBURG, PA.

# CORRUGATED IRON.

Seven Sizes of Corrugations—Straight or Curved. We want to mail you the Finest Roofing Catalogue ever published.

## THOMPSON MFG. CO., Cleveland, Ohio.

CHICAGO OFFICE, J. W. Ross, 123 Dearborn Street.  
 KANSAS CITY OFFICE, A. S. Chamberlin, 710 Wyandotte Street.  
 ST. PAUL OFFICE, Chas. Nelson Supply Co., 418 Wacouta Street.

OFFICE AND WORKS:

### STEELTON, PENN'A STEEL CO. PA.

PHILA OFFICE, 208 S. Fourth St.  
 NEW YORK OFFICE, 3 Wall St.

# STEEL

RAILS 12 to 85 pounds per yard, OF ALL PATTERNS, for Steam and Street Roads.  
 SPLICE PLATES, PLAIN & ANGLE  
 BLOOMS AND BILLETS.  
 SLABS FOR SHIP, TANK, SHELL, FLANGE, AND NAIL PLATE.

FROGS AND CROSSINGS, SWITCHES AND SWITCH STANDS, ELECTRIC SEMAPHORE SIGNALS, Worked at any distance with precision  
 ELECTRIC ALARM SIGNALS, Dispensing with men at highway crossings.

### A. G. KIDSTON & CO.,

Cable Address, Holyrood, Glasgow.

81 Great Clyde Street, Glasgow, Scotland.

Pig Iron, Steel in all forms, Wire Rods, Tin Plates, Metals.

### MERCHANTS.

THE TRADE SUPPLIED

IN ALL PARTS OF THE WORLD.

Spiegeleisen, Ferro-Manganese, Old Rails, Nailrods, Scrap and Crop Ends.

### JERE. ABBOTT & CO.,

23 Cliff St., New York.

35 Oliver St., Boston.

**IRON.** Swedish Iron, Speiegeleisen, Ferro-Manganese.

Bessemer, Basic, and Siemens-Martin **STEEL.** Blooms, Billets, Slabs, Bars and Wire Rods.

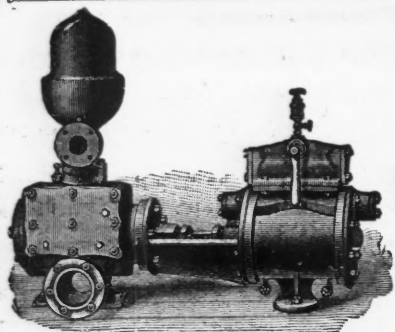
COPPER, Copper Ore, Matte, etc. **METALS.**

Agents for THOS. FIFTH & SONS, Ld. (Steel), Sheffield, England.

# STEEL CASTINGS

FROM 1-4 TO 15,000 POUNDS WEIGHT.

True to pattern, sound, solid, free from blow-holes, and of unequalled strength. Stronger and more durable than iron forgings in any position or for any service whatever.  
 50,000 CRANK SHAFTS and 40,000 GEAR WHEELS of this steel now running prove this.  
 STEEL CASTINGS for Stamp Mills and other Mining Machinery a specialty.  
 STEEL CASTINGS of every description. Send for Circulars and Prices to  
**CHESTER STEEL CASTINGS CO.** (Office: 407 Library St., Phila., Works: Chester, Pa.)

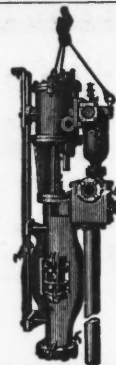


# CAMERON STEAM PUMP.

**SIMPLE** No Outside Valve Gear. **COMPACT**  
**EFFICIENT** THE BEST PUMP MADE FOR EN-  
 GINEERING and MINING USE. **DURABLE**

For Illustrated Catalogue address

**THE A. S. CAMERON STEAM PUMP WORKS,**  
 Foot of East 23d Street, New York.



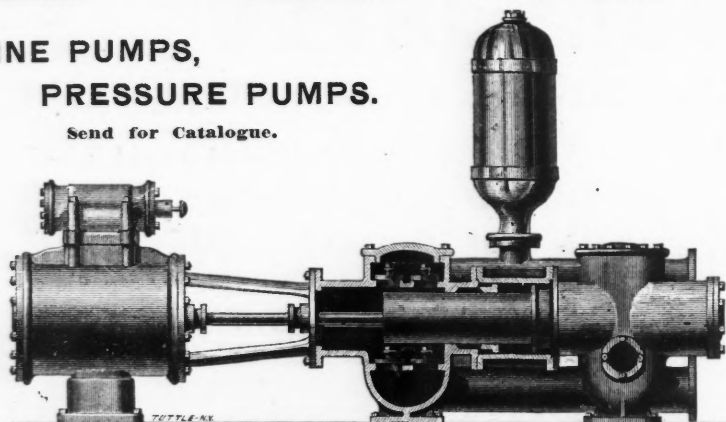
**DAVIDSON'S STEAM PUMP** IS WARRANTED TO BE **STEAM PUMP** MADE  
 THE MOST EFFICIENT EITHER SINGLE or DUPLEX. 43-53 Keap St., Brooklyn, N. Y.

## HALL STEAM PUMP COMPANY,

91 Liberty Street, New York,  
 CHICAGO PITTSBURG. ST. LOUIS.

**MINE PUMPS,  
 PRESSURE PUMPS.**

Send for Catalogue.



## PUMPS

FOR HYDRAULIC MINING, DREDGING, IRRIGATION, AND RECLAMATION.

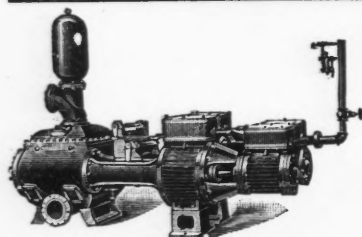
Superior to any other. Send for circulars.

**Morris Machine Works,**  
 BALDWINVILLE, N. Y.

### Mining Accidents and Their Prevention.

BY SIR FREDERICK A. ABEL.  
 Price, \$4.00

With a supplement containing the laws governing coal mining in each State of the United States, Great Britain and Germany. In Press. This is a complete and admirable statement of MODERN COAL MINING. An invaluable book for every one interested in mining. Published by the SCIENTIFIC PUBLISHING CO., 27 Park Place, New York.



## THE BUFFALO STEAM PUMP CO.,

BUFFALO, N. Y.,  
 MANUFACTURERS OF

**STEAM PUMPS**  
 FOR ALL DUTIES.

## GEO. F. BLAKE M'F'G CO.,

BUILDERS OF

EVERY VARIETY OF MINING AND GENERAL



95 and 97 Liberty St., New York.

535 Arch Street, Philadelphia.

111 Federal Street, Boston.

SINKING PUMPS AND AIR COMPRESSORS A SPECIALTY.

SEND FOR ILLUSTRATED CATALOGUE.

## THREE STANDARD MECHANICAL WORKS.

*Engineer, Millwright, and Mechanics' Pocket Companion, Templeton's.*

Comprising Decimal Arithmetic, Tables of Square and Cube Roots, Practical Geometry, Mensuration, Strength of Materials, Mechanic Powers, Water Wheels, Pumps and Pumping Engines, Steam Engines, Tables of Specific Gravity, etc. Also a series of Mathematical Tables, containing the circumferences, squares, cubes and areas of circles, superfluous, and solidity of spheres, etc. Revised, corrected and enlarged from the eighth English edition, and adapted to American practice with the addition of much new matter. By Julius W. Adams. Price, \$2.00.

### Fire Engines.

Hand Book of Modern Steam Fire Engines, including the Running, Care and Management of Steam Fire Engines and Fire Pumps. By Stephen Roper, engineer. Second edition. With illustrations. It also contains a treatise on the Chemical Fire Engine, giving a description, the care, management, and use of same. Revised and corrected. By H. L. Stellnagen, M. E. Pocket-book form. Price, \$3.50.

### Mechanical Text Book.

Or, Introduction to the Study of Mechanics. By Wm J. M. Rankine, C. E., LL. D., Trinity College, Dub., F. R. S., London and Edin., F. R. S. S. A. and E. F. Bamber. With numerous diagrams. Third edition. London. Price, \$3.75.

FOR SALE BY

**SCIENTIFIC PUBLISHING COMPANY**

27 Park Place, New York.

## Subscribe for GEMS AND PRECIOUS STONES.

The most beautiful specimen of gem literature.—*Jewelers' Review.*

Price \$10.

THE SCIENTIFIC PUBLISHING CO., PUBLISHERS.



OIL ALWAYS BELOW BURNERS--INSURABLE IN ALL INSURANCE COMPANIES.

We Guarantee Insurance when Plant is Installed according to our Specifications.

# THE AERATED FUEL COMPANY,

425 MAIN STREET, SPRINGFIELD, MASS.

FORGING, WELDING, BRAZING, MELTING, ANNEALING, HARDENING, TEMPERING.

THE GILBERT & BARKER MANUFACTURING CO., Springfield, New York and Boston, General Agents for U. S.

Represented by W. S. COLLINS, 171 Broadway (Suite 24), New York; Wm. PICKETT, SON & Co., 170 Lake St., Chicago, Ill.; C. S. BARROWS, 6 Wade Building, Cleveland, O. Also for Michigan and Indiana. CHILTON JONES, Gananoque, Ontario. G. M. SMITH, Los Angeles, Cal. THOMAS, SHEPARD & SEARING, Arapaho Building, Denver, Col.

SEND FOR CATALOGUES.

## UNITED GAS IMPROVEMENT CO.,

Drexel Building, Chestnut & Fifth Streets,  
PHILADELPHIA, PA.

**OFFICERS:**

WM. W. GIBBS, President.  
GEORGE PHILLER, Vice-President.  
SAM'L T. BODINE, Gen'l Manager.  
RANDAL MORGAN, Gen'l Counsel.

EDWARD C. LEE, Secretary and Treasurer.  
ALEX. C. HUMPHREYS, Gen'l Supt.  
WALTON CLARK, JR., Ass't Gen'l Supt.  
H. H. EDGERTON, Chemist and Engineer.

**DIRECTORS:**

GEORGE PHILLER,  
THOMAS DOLAN,

HENRY C. GIBSON, WM. T. CARTER,  
SAMUEL T. BODINE, WILLIAM G. WARDEN.

BUILDERS, LESSEES AND PURCHASERS OF

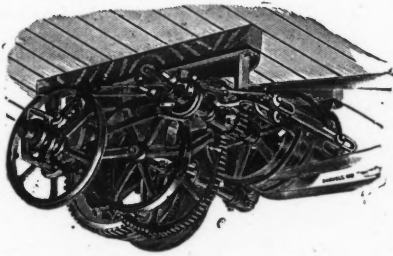
**GAS WORKS.**

### ARCHER GAS-FUEL PROCESS.

This Process solves the Problem of cheap Gaseous Fuel, meeting every requirement of Natural Gas, as to EFFICIENCY AND ECONOMY. It has been in successful operation on a large scale, from 3 to 28 months in many of the largest Iron, Steel, Glass, Pipe, Copper Works; Agate and Granite Ware Works; Iron Ship Yards and other manufacturing establishments in the United States. IT IS THE ONLY PRACTICALLY RUNNING AND COMMERCIALY SUCCESSFUL WATER OIL-GAS SYSTEM IN THE WORLD.

We invite Manufacturers and all users of fuel to the most rigid examination into the practical working of the ARCHER GAS-FUEL SYSTEM. This Process is applicable for all uses, from a rivet and bolt-head furnace, to the largest Open-Hearth or heating Furnaces, and for Steam Boilers. It is absolutely safe. But one man required on turn to furnish fuel for the largest Iron and Steel Works. Lima or other crude oil used. Orders for Gas Producers filled on short notice. Address or call on

J. B. ARCHER, 45 Broadway, N. Y.



FRISBIE FRICTION PULLEYS & CLUTCHES.

## ELEVATORS.

The D. Frisbie Co. 108 Liberty St.,  
NEW YORK

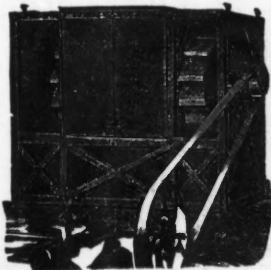
ESTABLISHED 1847.

A. WHITNEY & SONS,  
CAR WHEEL WORKS,  
PHILADELPHIA, PA.

MINE CAR WHEELS of all sizes, with Hubs—either Solid or for Self-Oiling. Descriptive Circulars, with Cuts, mailed on application. CASTINGS of Wheel Iron, CHILLED or UNCHILLED, for Dies, Crushers, etc.

### THE MURPHY "CHAMPION" VENTILATORS

For Mines Buildings, etc.



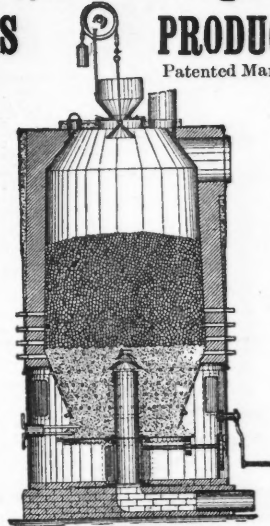
Capacity 25,000 to 500,000 cubic feet of air per minute. Instantly converted from exhaust to blower, or vice versa. The efficiency of this fan is much greater per horse power consumed than any other style manufactured.

For information and prices, address

M. C. BULLOCK MANUFACTURING CO  
CHICAGO, ILL.

### The Taylor Revolving-Bottom GAS PRODUCER.

Patented March 19, 1889.



No.  
399,793  
399,794  
399,795  
399,796  
399,797  
399,798  
399,799

And all Foreign Countries

The best Producer for either Bituminous or Anthracite coal or Lignite. Applicable to all regenerative furnaces; also for gas-firing Lime, Brick and Pottery Kilns, Sugar-house Char Kilns, Boilers, etc. Also Producer Gas for Gas Engines.

For illustrated descriptive pamphlet and all particulars address

### TAYLOR GAS PRODUCER CO.

(BROWN BUILDING)

Fourth & Chestnut Sts., PHILADELPHIA, Pa.

**JUST PUBLISHED.**

"Gas and Petroleum Engines." A practical treatise on the "INTERNAL COMBUSTION ENGINE." By William Robinson, M. E., Senior Demonstrator in Applied Physics and Electrical Engineering, also late Senior Demonstrator in Mechanical Engineering and Applied Mathematics, in the City and Guilds of London Technical College, Finsbury; Associate Member of the Institution of Civil Engineers; Member of the Institution of Electrical Engineers; Member of the Physical Society of London.

With Numerous Illustrations.

**CONTENTS:**

- Chapter I.—Introductory.
- " II.—The action in the Otto gas engine.
- " III.—Modifications of the Otto type of gas engine.
- " IV.—Uses of petroleum in prime motors.
- " V.—History of combustion and calorific engines.
- " VI.—Classification of internal combustion engines.
- " VII.—Methods of firing.
- " VIII.—Elementary principles and calculations.
- " IX.—Energy.
- " X.—Measurement of temperature.
- " XI.—Combustion.
- " XII.—Fuel.
- " XIII.—The working fluid.
- " XIV.—Laws of gases.
- " XV.—Combustion in the engine cylinder.
- " XVI.—Transformation of heat into work.
- " XVII.—Trials of gas motors.

Fully Illustrated. 1890. \$5.50.

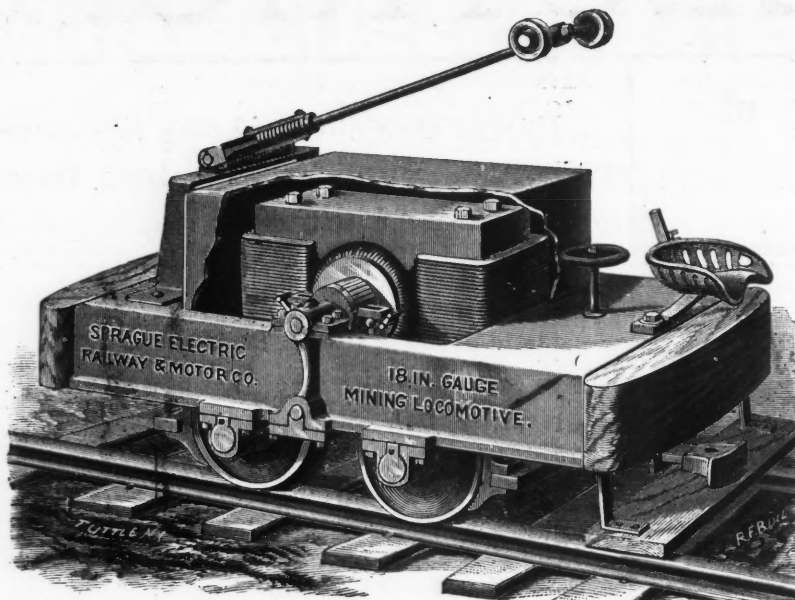
SCIENTIFIC PUBLISHING CO.,  
27 Park Place, New York.

## THE MINING INDUSTRY

DENVER, COLO.

The leading Mining and Scientific paper of the West. Original and Reliable. Price, \$3 per annum.

# SPRAGUE ELECTRIC MINING MACHINERY.



INCREASED PROFITS in MINING result from the REDUCTION of COST of POWER USED.  
 Over SEVENTEEN THOUSAND HORSE POWER of ELECTRICAL APPARATUS sold by us for ELECTRIC  
 POWER TRANSMISSION during the First Sixty Days of 1890. MINES COMPLETELY  
 EQUIPPED for Operating ALL KINDS OF MINING MACHINERY.

SEND FOR OUR NEW CIRCULAR ON ELECTRIC TRANSMISSION OF POWER FOR MINES.

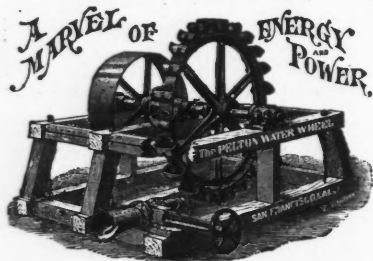
SPRAGUE ELECTRIC RAILWAY & MOTOR CO., 16 & 18 Broad St., New York.

## THE PELTON WATER WHEEL

GIVES THE HIGHEST EFFICIENCY OF ANY WHEEL IN THE WORLD.  
 OVER 900 ALREADY IN USE.

AFFORDS THE MOST SIMPLE AND RELIABLE POWER FOR ALL MINING AND MANUFACTURING  
 MACHINERY. ADAPTED TO HEADS RUNNING FROM 20 UP TO 2,000 FEET.

From 15 to 20 p.c. better results guaranteed than can be produced from any other Wheel in the country.



### ELECTRIC TRANSMISSION.

The advantages the Pelton Wheel affords in the way of a  
 uniform and reliable power, close regulation, and the facility  
 of adaptation to varying conditions of speed and pressure,  
 have brought it into special prominence for this class of work.

ALL APPLICATIONS

should state amount and head of water, power required,  
 and for what purpose, with approximate length of pipe line.

SEND FOR CATALOGUE.

## THE PELTON WATER WHEEL COMPANY

121-123 MAIN STREET, SAN FRANCISCO, CAL., U. S. A.;  
 145 BROADWAY, NEW YORK CITY.

### PELTON WATER MOTORS.

Varying from the fraction of 1 up to 15 and 20 horse power, unequalled for all light-running machinery. War-  
 ranted to develop a given amount of power with one-half the water required by any other.

SEND FOR MOTOR CIRCULAR. ADDRESS AS ABOVE.

CHARLES H. DAVIS, C. E.,  
**CONSULTING ELECTRICAL ENGINEER,**  
 120 Broadway, New York. 308 Walnut Street, Philadelphia.  
 ELECTRIC LIGHT AND POWER FOR MINING A SPECIALTY.  
 CORRESPOND with us before BUYING. We can SAVE you MONEY.

THE MILL AND MINE  
**Electric Equipment Company,**  
 ENGINEERS AND CONTRACTORS,  
 COMPLETE ELECTRIC LIGHT AND POWER EQUIPMENTS. ELECTRIC MINE HAUL-  
 AGE, PUMPING, HOISTING, VENTILATING, COAL MINING MACHINERY.  
 ELECTRICAL SUPPLIES.  
 (OFFICE 95 FIFTH AVE.) PITTSBURG, PA.

Just Published.

## ELECTRICITY IN MODERN LIFE

By G. W. DE TUNZELMANN, B. Sc. (late Professor of  
 Natural Philosophy, H. M. S. "Britannia;" Member of  
 Physical Society, London; Member of the Mathematical  
 Society, London).

This work is of especial value to students in electric-  
 ity, as it presents concisely and clearly an intelligent  
 sketch of the more important of the functions of elec-  
 tricity and the scientific principles underlying the prac-  
 tical applications, with a history of their development.  
 Profusely illustrated, 272 pages, bound in cloth,  
 gilt..... \$1.25

## ELECTRICAL ENGINEERING,

For Electric Light Artisans and Students.  
 (Embracing those branches prescribed in the syllabus  
 issued by the City and Guilds Technical Inst.),  
 By W. SLINGO,  
 Principal of the Telegraphists' School of Science, Di-  
 rector of the Electrical Engineering Section, People's  
 Palace, London, and  
 A. BROOKER,  
 Instructor in Electrical Engineering at the Telegraph-  
 ists' School of Science and at the People's Palace,  
 London. With 307 Illustrations. 1890. \$3.50.

## A Century of Electricity.

By T. O. MENDENHALL,  
 Supt. U. S. Coast and Geodetic Survey.  
 Price..... \$1.2

FOR SALE BY  
**SCIENTIFIC PUBLISHING CO.,**  
 27 Park Place, New York,



# ELECTRICITY.

<b>Transmission of Power by Electricity.</b>	Power transmitted any distance up to 25 miles, over any kind of country, from any source of power, and suitable for any application of power.
<b>Lighting by Electricity.</b>	Incandescent lighting and arc lighting of every kind, any distance, to light any place under any condition. Perfect safety and reliability.
<b>Commercial Refining of Metals by Electricity.</b>	Plants for the commercial deposition of Copper, Zinc, Lead, Tin, etc., by electricity. Least expense in treatment. Metals recovered chemically pure.
<b>Recovery of Precious Metals from Refractory Ores by Electricity.</b>	Recovery of Gold, Silver, Platinum, etc., from refractory ores which cannot be profitably treated by any other method.
<b>Irrigation by Electricity.</b>	Irrigation of any tract, regardless of distance, level and character of country.
<b>Operation of Drills, Hoists, Ventilating Fans, Pumps, Stamp Mills, etc., etc.</b>	Every kind of device or machine requiring power can be operated by electricity, better and cheaper than by any other means.

**Plants in practical operation doing all of the above. Write to us, giving data for estimates.**

## UNITED EDISON MFG. CO.

MAIN DISTRICT OFFICES:

Eastern District, 65 Fifth Avenue, New York City.  
 Central Rialto Building, Chicago, Ill.

Mountain District, 730 Seventeenth Street, Denver Colo.  
 Pacific " Chronicle Building, San Francisco, Cal.

Canadian District, Toronto, Canada.



**THE SOLVAY PROCESS COMPANY,  
SYRACUSE, N. Y.,**

MANUFACTURERS OF

**Soda Ash, Caustic Soda and Bi-Carbonate of Soda**

By the "SOLVAY" or "AMMONIA" Process.



**Soda Ash** { 58 per cent. .... "PURE SODA."  
48 " ..... "AMMONIA SODA"  
36 " ..... SODA ASH } **Caustic Soda** { 60 per cent. .... CAUSTIC  
70 " ..... CAUSTIC  
74 " ..... CAUSTIC  
76 " ..... CAUSTIC

For use in the manufacture of **GLASS, PAPER, SOAP, SODA CRYSTALS** and **BI-CARBONATE** and in many other industries, our products are **THE BEST.**

Analysis of 58 Per Cent "PURE SODA."

Iron and Alumina Oxides.....	0.025 per cent.	Carbonate of Magnesia.....	0.175 per cent.
Silica.....	0.025 "	Chloride of Soda.....	0.904 "
Carbonate of Lime.....	0.404 "	<b>CARBONATE OF SODA.....</b>	<b>98.467 "</b>

Works at **GEDDES**, near Syracuse N. Y.

Sole Agents, **WING & EVANS**, 54 William St., New York City.

**ROBERT POOLE & SON CO.**

MANUFACTURERS OF

**SHAFTING, PULLEYS**

The Poole & Son Leffel Turbine  
Water-Wheel,

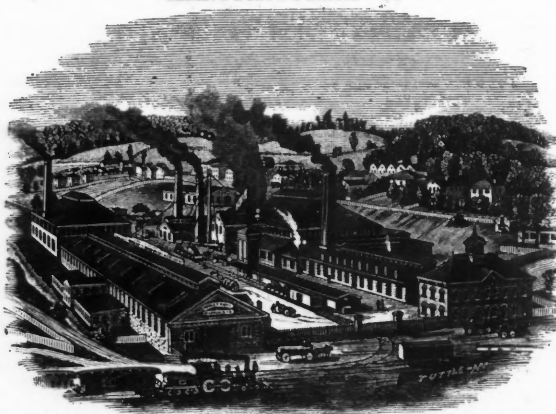
SPUR, BEVEL, ANGLE, MORTISE,

HELICAL, DOUBLE HELICAL AND

WORM; STEAM ENGINES AND

BOILERS, DRIVING PLANT FOR CABLE

RAILWAYS.



**AND HANGERS.**

Superior Machine Molded Gearing,

MACHINERY FOR FLOUR MILLS,

GRAIN ELEVATORS, WHITE

LEAD WORKS, FERTILIZER

FACTORIES AND DREDGING MACHINES.

Special Facilities for Heavy Work.

Correspondence Solicited.

233 East German Street, Baltimore Md

**THE CELEBRATED  
SMITH & WESSON REVOLVERS**

HAVE BROKEN ALL RECORDS for REVOLVER SHOOTING.



THE MOST PERFECT  
**SMALL ARMS**  
EVER MANUFACTURED.

UNRIVALED IN  
BEAUTY OF FINISH,  
DURABILITY  
and ACCURACY

Manufactured in calibres .32, .38 and .44-100. Single and Double Action, Hammerless Safety and Target Models, with all latest improvements—Automatic Shell Extractor, Rebounding Lock and Patented Safety Device. The Smith & Wesson Revolvers are constructed entirely of **best wrought steel**, carefully inspected for workmanship and stock, and **guaranteed**. Do not be deceived by **imitations** largely manufactured of **malleable cast iron**, and often sold for the genuine Smith & Wesson. All of the Revolvers of this firm are stamped upon the barrels with their name, address and dates of patents. If dealer cannot supply you, orders sent to address below will receive prompt and careful attention. Catalogues and prices furnished upon application.

MENTION THIS PAPER  
WHEN YOU WRITE.

**SMITH & WESSON**, Springfield, Mass.



**W. J. CLARK & COMPANY**, Salem, Ohio

MANUFACTURERS OF

**ELEVATING & CONVEYING SPECIALTIES**

Sole Mfrs. of the "SALEM" ELEVATOR BUCKET,  
For Mill and Elevator Work, Ear Corn, Corn and Cobs, Ores, Coal  
Broken Stone, etc Sent 6 cents (stamps) for postage on

**THE  
SCIENTIFIC PUBLISHING CO.**

27 PARK PLACE, NEW YORK,

ARE FULLY EQUIPPED FOR

COMMERCIAL JOB,

BOOK, TECHNICAL,

SCIENTIFIC AND

NEWSPAPER

**PRINTING.**

ALSO FOR

LITHOGRAPHING,

ENGRAVING AND

BOOKBINDING

MAP ENGRAVING A SPECIALTY.

Mining Companies' Reports Printed on Shortest Notice.  
Bonds and Share Certificates printed or engraved in the best style.

1833.

1890

**CHARLES W. LOGAN'S**

**CHOICE FLAVORING EXTRACTS,**

**VANILLA, LEMON, ORANGE, Etc.**

UNEXCELLED FOR

**STRENGTH AND FINE FLAVOR**

Also a full line of Proprietary Remedies, perfectly reliable and very popular.

Send for list and prices.

**E. & S. FREY,**

Baltimore, Md., U. S. A.

Mention the ENGINEERING AND MINING JOURNAL.



**THE**

# METALLURGY OF STEEL

BY HENRY M. HOWE, A. M., S. B.,

*Mining and Metallurgical Engineer.*

ILLUSTRATED WITH MANY ENGRAVINGS AND PLATES

ROYAL QUARTO, PRICE \$10.00.

This magnificent work, without any equal in the technical literature of any language, which has been issued serially in THE ENGINEERING AND MINING JOURNAL, is now published in book form. It forms the most complete and exhaustive treatise on the Metallurgy of Steel ever written, and is absolutely indispensable to every one engaged in making and using steel.

CONTENTS:

CHAPTER :	CHAPTER :
I—Classification and Constitution of Steel.	XII—The Prevention of Blowholes and Pipes.
II—Carbon and Iron, Hardening, Tempering, and Annealing.	XIII—Structure and Related Subjects.
III—Iron and Silicon.	XIV—Cold Working, Hot Working, Welding
IV—Iron and Manganese.	XV—Direct Processes.
V—Iron and Sulphur.	XVI—Charcoal Hearth Processes.
VI—Iron and Phosphorus.	XVII—The Crucible Process.
VII—Chromium, Tungsten, Copper.	XVIII—Apparatus for the Bessemer Process
VIII—The Metals Occurring but Sparingly in Iron.	APPENDIX :
IX—Iron and Oxygen.	I—Special Steel.
X—Nitrogen, Hydrogen, Carbonic Oxide.	II—Anti-Rust Coatings.
XI—General Phenomena of the Absorption and Escape of Gas from Iron.	III—Lead-Quenching.

An eminent metallurgist writes to *Industries*, London : "I cannot refrain from expressing my admiration of Mr. Howe's unequalled work. The whole Metallurgical World has been ransacked, and we have laid before us all that has been done since the publication of Percy's well-known works. Not content with merely summarizing the results of others, Mr. Howe has, in a most painstaking and able manner, fearlessly commented thereon, for which he justly merits the thanks of all concerned. In doing this, he has, of course, exposed himself to the attacks of many, for in such a wide field as the complete metallurgy of steel difference of opinion must of necessity occur ; but, like all pioneers and leaders, he has the questionable satisfaction of knowing that by his aid others may sometimes see even further than himself."

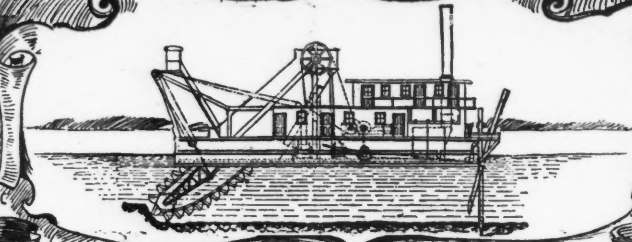
PUBLISHED BY

THE SCIENTIFIC PUBLISHING COMPANY,

27 Park Place, New York.

# DREDGES & SHOVELS

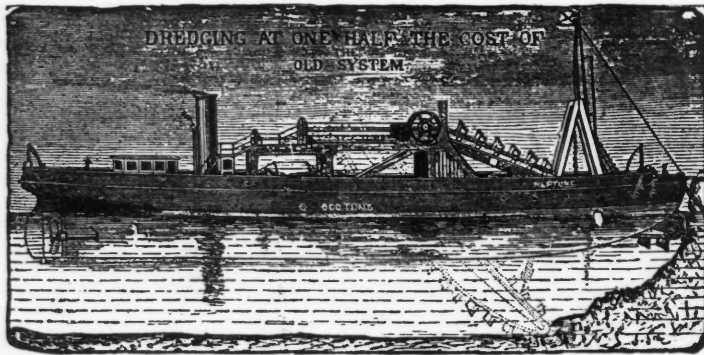
Drainage and Irrigation  
Filling Land  
Levee Work  
Harbor Work, etc. etc.



Railroads.  
Contract Work.  
Stripping Coal and Ore  
Brick yards,  
Highways  
etc.

ADDRESS **BUCYRUS STEAM SHOVEL AND DREDGE CO.** BUCYRUS OHIO.

## PATENT HOPPER DREDGERS.



GOLD MEDAL, EDINBURGH EXHIBITION, 1886.  
SILVER MEDAL PARIS EXHIBITION, 1889.  
INVENTORS AND SOLE PATENTEES OF THE

### Traversing Bucket Ladder

To enable Dredgers to excavate their own flotation.  
Builders of Barge-loading Dredgers, Steam Hopper Barges Sewage Steamers, etc., etc. 83 of such vessels have now been constructed for various Governments and principal Harbors, at home and abroad.

Inventors and Constructors of the Hopper Dredger

**W. SIMONS & CO.,**  
RENFREW, SCOTLAND.

## PRESSURE BLOWER.

Owing to the death of Mr. Andrew Campbell, the Patents for this Blower, which surpasses anything yet invented, are for Sale.

I call your attention to the new Pressure Blower invented by Mr. Campbell (the inventor of the Campbell printing press). It will be readily appreciated by those requiring a steady, uniform blast, without pulsation under high pressure. The peculiar construction avoids valves or movable abutments common to all rotary pressure blowers, or the regurgitation common to pressure blowers as heretofore constructed. In the large blowers the displacement of piston is less than one per cent. It is perfectly balanced and will run at a high rate of speed, therefore giving a better result than any other machine on the market.

Our largest catalogued machine will deliver (measured) 75 cubic feet of air per revolution. It matters not what the speed may be, anywhere from one revolution to the minute to 350, which will deliver 26,250 feet per minute, or over one and one-half million cubic feet per hour, which would be equivalent to removing every inch of air from a shaft 8 by 8 feet, 4 1/4 miles long, every hour, by exhaust, or will expel the same amount of foul air by introduction of fresh.

For particulars apply to

**S. RICHARD TOBIN, 150 NASSAU STREET, NEW YORK.**

NOW READY!

ORDER AT ONCE!

H. M. HOWE'S GREAT WORK,

### THE METALLURGY OF STEEL.

"The most notable contribution to the literature of iron and steel metallurgy."

Price, \$10. SCIENTIFIC PUBLISHING CO., 27 Park Place, N. Y.

## ALUMINUM BRASS AND BRONZE CO.,

MANUFACTURERS OF

GOWLES' ALUMINUM AND SILICON COPPER ALLOYS,  
IN INGOTS, SHEETS, RODS, WIRE AND CASTINGS.

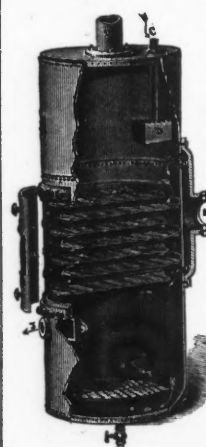
SHEET COPPER, SHEET BRASS, PURE ALUMINUM,

STEWART BUILDING,

ROLLING MILLS,

53 Chambers Street, New York,

Bridgeport, Conn.



STILLWELL'S PATENT  
LIME-EXTRACTING

### Heater and Filter

COMBINED

Is the only one that will prevent Scale in Steam Boilers,

Removing all Impurities from the Water before it enters the Boiler.

STILLWELL & BIERCE  
MFG. CO.,

DAYTON, OHIO.

JUST OUT.

### The Elements of Laboratory Work.

A Course of Natural Science.

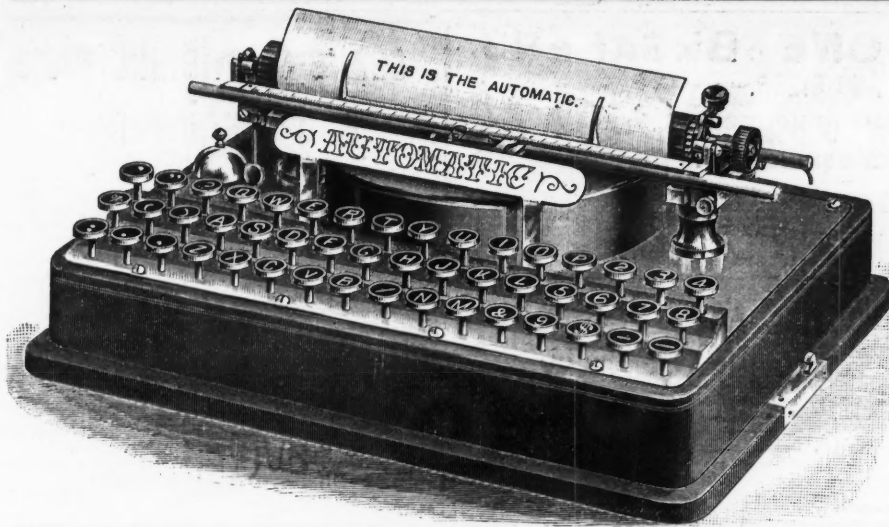
By A. G. REAL,

Science Master at Tonbridge School, Tonbridge, England.

Price, \$1.40.

Scientific Publishing Co.,  
27 Park Place, New York.





**THE Automatic Typewriter**

is peculiarly well adapted for business correspondence. The method of operation is easily acquired, and a few days' practice will enable any one to write twice as fast as with a pen.

This machine is constructed on scientific principles. It is compact, portable; is especially adapted for use while travelling on board trains, etc.; is rapid, durable, has permanent alignment, is covered and protected from dust; the impression is made directly from the face of the type; no "ink ribbon" intervenes between the type and the paper; it is attractive in appearance, and is the only writing machine in the market in which the letters are made of their proper widths and are automatically spaced correctly. It is a high class machine.

PRICE, \$65.00.

**HENRY ABBOTT,**

SOLE AGENT,

NO. 4 MAIDEN LANE, NEW YORK.

**PRACTICAL MINING,**

A Field Manual for Mining Engineers.

By JOHN G. MURPHY, E. M.

PRICE, \$1.50.

FOR SALE BY

**THE SCIENTIFIC PUBLISHING COMPANY,**  
27 PARK PLACE, NEW YORK.

SEND FOR OUR  
**NEW CATALOGUE**

OF  
Scientific and Technical Books

**THE SCIENTIFIC PUBLISHING CO.,**  
27 Park Place, New York

**The Brown Hoisting and Conveying Machine Co.,**

CLEVELAND, OHIO, U. S. A.,

MANUFACTURERS AND SOLE PROPRIETORS OF THE PATENTS,

Applications and Designs under which the Brown Hoisting and Conveying Apparatus, and the various Tramways for it are built.

**A NEW AND COMPLETE SYSTEM FOR HANDLING OF MATERIALS.**

The Brown Patent Cable Tramway system.

The Brown Patent Suspended Beam Tramway system.

The Brown Patent Bridge Tramway system.

The Brown Patent Shed Tramway system.

The Brown Patent Warehouse Tramway system.

The Brown Patent Sewer Machine Tramway system.

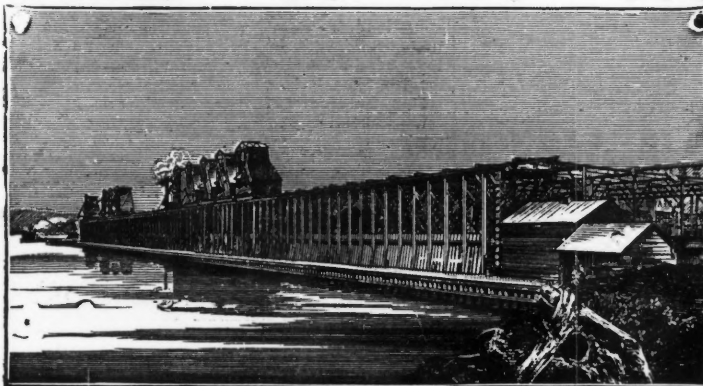
The Brown Patent Continuous Elevated Tramway system.

The Fayette-Brown Patent Automatic Furnace Hoist.

The only Positive Acting and Successful Automatic Hoisting and Conveying Machines that will take material either from or to any desired point on the line of its Tramway and automatically lower or dump the same at will of the operator. Especially adapted to the Loading or Unloading of Vessels, Boats, Cars, etc., with Coal, Ores, etc., where it is desired to convey the materials a considerable distance Will Automatically Hoist from Vessel, Car or Mine, and convey directly and deposit at stock pile, either on dock or in a yard or warehouse, and vice versa.

**THE C. W. HUNT COMPANY.**

45 BROADWAY, NEW YORK.



Lehigh Coal & Iron Co's. Dock, West Superior, Wis. (Duluth). The largest coal-receiving wharf in the world, 2500 feet long, 300 feet wide; 75 automatic railways, 36 feet high. Nine movable elevators, each carrying an independent 35 H. P. hoisting engine, taking steam from a pipe running the entire length of the trestle. Capacity for unloading from vessels, 7000 tons in 24 hours.

Design and make plans for all classes of wharves, buildings, and trestle for storing coal, ore and similar materials.

They also furnish of their own make all mechanical parts for the machinery for unloading vessels and storing the cargoes. They have ample shops and machinery, and manufacture everything they sell, except T rails and wire rope. They make regularly, and always have in stock:

Automatic, cable and surface railways and their equipment, self-filling steam shovel for coal, self-dumping steel tubs for coal and ore, locomotive coaling buckets, coal elevators, hoisting blocks, mast and gaff fittings, wheelbarrows, coal screen and coal chutes, counting registers, T rail, cast-steel wire rope, "Stevadore" manilla hoisting rope, crane chain friction hoisting drums, and engines especially adapted for hoisting purposes.

Locomotives, flat, box, coal, coke and charging cars, switches, crossings and every part for a complete system of narrow-gauge railways, 21 inches gauge, for manufacturers, gas companies and small mines. Everything except locomotives kept in stock. They have been in this business exclusively for fifteen years, and their coal handling machinery is in use in almost every port in America.

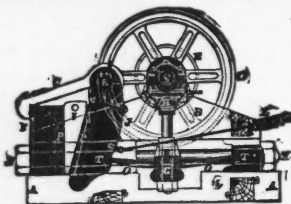
**THE DODGE SYSTEM FOR ANTHRACITE AND BITUMINOUS COAL STORAGE.**

The following Plants are in operation or under construction:

- Philadelphia & Reading R. R. Co., Port Richmond, Philadelphia..... Storage capacity, 80,000 tons.
- Pennsylvania R. R. Co., South Amboy, N. J..... Storage capacity, 100,000 tons.
- Delaware & Hudson Canal Co., Oneonta, N. Y..... Storage capacity, 20,000 tons.
- Delaware & Hudson Canal Co., Rondout, N. Y..... Storage capacity, 120,000 tons.
- Delaware & Hudson Canal Co., Quaker Street, N. Y..... Storage capacity, 120,000 tons.
- Central R. R. of N. J., Hampton Junction, N. J..... Storage capacity, 180,000 tons.
- Central R. R. of N. J., Salem, Mass..... Storage capacity, 80,000 tons.

**DODGE COAL STORAGE COMPANY**  
ROOMS 127 and 129 BULLITT BUILDING, PHILADELPHIA, PA

**BLAKE PATENT STONE BREAKERS.**



ALL STYLES AND SIZES.  
 MULTIPLE JAW CRUSHERS  
 FOR FINE CRUSHING.  
 PIG IRON BREAKERS.  
 THEO. A. BLAKE, New Haven, Conn.



**THE HASENZAHL  
 DIAMOND BIT DRILL.**

BEST PROSPECTORS' DRILL YET INVENTED.  
 Can be operated by hand to a depth of 300 to 500 feet, and power can be attached when desired. Is constructed of cast-steel and wrought-iron, and strong, durable, and efficient. Weight, complete, of the small size, only 250 pounds.  
 Write for catalogue and particulars.  
**Wm. Hasenzahl, Mfr.,**  
 135 WEST SECOND STREET, CINCINNATI, OHIO.



Established 1870.  
**HELLER & BRIGHTLY,**  
 Spring Garden & Ridge Ave.,  
 PHILADELPHIA, PA.  
**SURVEYING INSTRUMENTS.**  
 Descriptive and Illustrated Price List on application.

**GEMS AND PRECIOUS STONES**  
 PRICE, \$10.00.  
**Scientific Publishing Co.,**  
 27 Park Place, New York

**THE BOSTON AND COLORADO  
 SMELTING COMPANY.**

OFFICE, DENVER, COLORADO.  
 WORKS, ARGO, COLORADO.  
 IN OPERATION SINCE 1867.  
 Makes a specialty of treating argentiferous and auriferous copper ores, mattes, etc., silver or gold ores, pyrites and pyritous concentrates containing gold, silver, and copper.  
 Separation and refining of gold and silver, copper alloys, and other rich metallurgical products.  
 The highest prices paid that can be obtained in any market.  
 N. P. HILL, General Manager.  
 RICHARD PEARCE, Manager.  
 HENRY HANINGTON, Cashier.

**THE AMERICAN METAL CO., Limited,**  
 80 Wall St., New York. Post-Office Box 957.  
 Copper, Copper Ores and Mattes. Tin, Lead, Spelter, Antimony, Nickel, Aluminium, Bullion and Iron.  
**ADVANCES MADE ON CONSIGNMENTS.**  
 AGENTS FOR  
 Henry R. Merton & Co. London.  
 Williams, Foster & Co., Lt., Swansea.  
 Metallgesellschaft, Frankfurt-on-Main.

Established 1845.  
**W. & L. E. GURLEY, TROY, N. Y.**  
 Largest Manufacturers of Civil Engineers' and Surveyors' Instruments. Send for Illustrated Circular Price List, showing latest improvements.

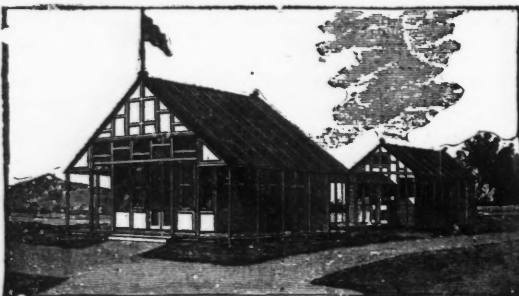
**LEWISOHN BROTHERS,  
 NEW YORK,**

O. BOX 1247. 81 AND 83 FULTON STREET,  
 BUY AND MAKE ADVANCES ON

**COPPER MATTE AND ORE, ALSO COPPER-SILVER MATTE AND ORE.**

AGENTS FOR THE FOLLOWING MINING COMPANIES:  
 Boston and Montana Consolidated Copper and Silver Mining Company, Montana.  
 Butte & Boston Mining Company, Montana.  
 Arizona Copper Company, Arizona.  
 Tamarack Mining Company, Lake Superior, Mich.  
 Osceola Mining Company, Lake Superior, Mich.  
 Kearsarge Mining Company, Lake Superior, Mich.  
 Santa Fe Copper Company, New Mexico.

**DUCKER PORTABLE HOUSES AND BUILDINGS**



For Miners, Prospectors, Surveyors, Contractors, and Construction Companies.  
 Strictly Portable, Weather and Water-proof  
**ANY SIZE OR STYLE.**  
 Send for Catalogue.  
**DUCKER PORTABLE HOUSE CO.,**  
 239 BROADWAY, N. Y.

**Assayers, Metallurgists  
 and Engineers.**

**LEDOUX & CO.**  
 9 Cliff Street, N. Y. City.

Sample and Assay Ores, Metals and Furnace Products of all kinds. Test by working processes all classes of ores and determine the best method of treatment. Analyses of chemicals, waters and all industrial products.

**HASTINGS, JOHN B.,  
 Consulting Mining Engineer.**

Offices: 80 Lombard st., London, E.C., England, and Seymour Scott, Esq., 72 Broadway, New York.

**P. DE P. RICKETTS** Metallurgists, Chemists  
 AND  
**JOHN H. BANKS,** Mining AND Engineers  
 49th St. and 4th Ave., Sampling and testing of ores, metals and furnace products a specialty.  
**NEW YORK.**

**ORFORD COPPER CO.,  
 COPPER SMELTERS**

Works at Constable's Hook, N. J., opposite New Brighton, Staten Island. Copper Ore, Mattes, or Bullion purchased. Advances made on consignments for refining and sale. Specialty made of Silver-Bearing Ores and Mattes.

**INGOT AND CAKE COPPER.**

President, **ROBERT M. THOMPSON,**  
 Office, 37 to 39 Wall Street, New York.

**BALTIMORE  
 Copper Smelting and Rolling Co.**  
 (THE BALTIMORE COPPER WORKS.)  
 Office: KEYSER BUILDING,  
 Baltimore, Md.

INGOT COPPER. SHEET COPPER.

**THE CHEAPEST ALUMINUM**

As well as the best, is offered to the trade by the **COWLES ELECTRIC SMELTING & ALUMINUM CO.** Cleveland, O., at \$2.00 per pound for the Aluminum contained in an alloy with copper, and \$1.60 per pound when alloyed with iron, the same being subject to analysis.  
 Manufacturers of Manganese Bronze, Aluminum and Silver Bronze. Heavy Castings a specialty.

**ALUMINUM, \$2 PER POUND.**

The Pittsburg Reduction Company, 95 Fifth avenue, Pittsburg, Pa., U. S. A., offer commercially pure aluminum at the following rates at Pittsburg, Pa.:  
 Lots of 1,000 lbs. and over..... \$2.00 @ lb.  
 Lots of 500 lbs. and over..... 2.25 @ lb.  
 Lots of 100 lbs. and over..... 2.50 @ lb.  
 Metal guaranteed to be equal in quality to the best metal manufactured by any other process.

**BULLOCK'S DIAMOND PROSPECTING CORE DRILLS**

The only reliable prospecting machine made that will give an absolutely correct and accurate record of all strata penetrated. See record of hole at Lincoln, Nebraska, 2463 feet in depth, and another at Raytown, near Kansas City, Missouri, 2400 feet. These are the two deepest holes bored by any diamond drills in the United States. All drills sold without any restrictions as to use. Fifteen styles to select from, including Hand and Horse-Power Drills.

**LANE'S BAND FRICTION HOISTING MACHINERY**

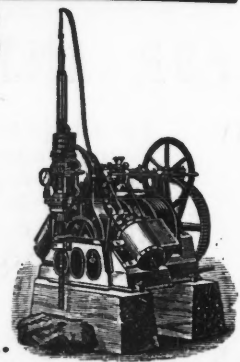
Bullock-Corliss and Slide Valve Engines.

GENERAL MINING MACHINERY

**M. C. BULLOCK MANUFACTURING COMPANY,**

Cable Address "BULLOCK, CHICAGO."

CHICAGO, U. S. A.





CLASSIFIED LIST OF ADVERTISERS.

Webb's Adder Co
Agricultural Implements:
Allen S. L. & Co
Chadborn & Coldwell Mfg. Co
Goodell Co
Air Compressors and Rock Drills:
American Diamond Rock Boring Co
Bullock, M. C., Mfg Co
Burlingame Rock Drill Co
Clayton Compressor Works
Diamond Prospecting Co
Hazenahl, W.
Ingersoll Sergeant Rock Drill Co
Morris County Machine and Iron Co
Norwalk Iron Works Co
Penn. Diamond Drill & Mfg. Co
Rand Drill Co
Arms and Ammunition:
American Wood Powder Co
Hartley & Graham
Smith & Wesson
Stevens Arms & Tool Co
Tomlinson & Adams
Asbestos:
Chambers-Spence Co
Asphalt:
Cart-r, Hawley & Co
Assayers & Chemists' Supplies:
Berge, J. & H
Borzner & O'Brien
Chur, A. T.
Denver Fire Clay Co
Elmer & Amend
Fleming, Howard
Henry Hill Chemical Co
Hoskins, Wm
Queen, Jas. W. & Co
Richard & Co
Taylor, John & Co
T. Gomer, Henry
Voland & Van Zelm
Bankers and Brokers
Buck, C. W
Ford, David M
Grant, E. R.
Handy & Harman
Johnson, H. M
Kountze Bros
Ladenberg, Thalmann & Co
Nesslage, Colgate & Co
Patton, William L. & Co
Smith, C. H.
Stevens, H. J.
White, S. Jr
Betting:
Jeffery Mfg. Co
Hendrie & Bothoff Manufacturing Co
Blasting Caps and Machine:
Lau, J. H. & Co
Macbeth, James & Co
Blowers:
Turvant, B. F.
Tobin, S. R.
Boiler Compound:
Littvuge Manufacturing Co
Boilers:
Abendroth & Root Mfg. Co
Fulton Boiler Works
Globe Machine Co
Helme Safety Boiler Co
New York Central Iron Works
Steele Point Boiler Works
Books and Periodicals:
Casper, C. N.
Colliery Guardian
Gems and Precious Stones
Ladian Engineering
Lippincott, J. B. Co
Luxivation of Silver Ores
Mexican Mining Code
Mines and Mineral Statistics of Mich.
Mining Accidents and their Prevention
Mining Industry
Mining and Scientific Review
Mining World and Engineering Record
Practical Blacksmithing
Steamship Journal
Technik Tidsskrift
Boxes:
Lees, Samuel & Co
Brick Machinery:
Freese, E. M. & Co
Wellington Machine Co
Bridges:
Berlin Bridge Co
Pencoyd Bridge & Const. Co
Scaife, W. B. & Sons
Buckets:
Clark, W. J. & Co
Buildings:
Berlin Iron Bridge Co
Castings: (See Steel.)
Carriages:
Kalamazoo Wagon Co
Cars:
John Stephenson Co. Ltd
McEwen A. C.
Motley, Thornton N. & Co
Rhon & March
Car Wheels:
Whitney, A. & Co
Chemicals:
Cooper, Chas & Co
Henry Hill Chemical Co
Queen, Jas. W. & Co
Solvay Process Co
Coal:
Berwind-White Coal Mining Co
Borden & Lovell
Castner & Curran
Consolidated Coal Co
Coke Bros
Cox & Rockwell
Delaware & Hudson Canal Co
Haddock, Shonk & Co
Lehigh Valley Coal Co
Lynch and Wikes-Barre Coal Co
Maryland Coal Co
Potts, Frederick A. & Co
Stickney, Conyngham & Co
Ward & Olyphant
Whitney & Kemmerer
Commission Merchants:
Adams, G. H
Gregory, H. P. & Co
Lees, Sam'l & Co
Peck, W. E.
Concentrators, Crushers, and Pulverizers:
Blake Crusher Co
Bradley Fertilizer Co
Cyclone Pulverizer Co
Farrel Foundry and Machine Co
Fort Scott Foundry and Machine Co
Fraser & Chalmers
Frisbee-Lu-top Mill Co
Frue Vanner Concentrator
Gates Iron Works
Golden Gate Concentrator Co
Hendy & Meyer Engineering Co
Huntington, F. A.
From, F. R.
Farke & Lacy Co

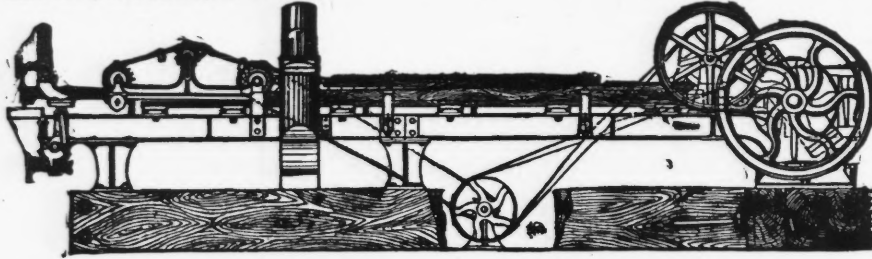
Risdon Iron Works
Totten & Hoag
Wiswell Electric Mining Machine Co
Contracts Open
Corrugated Iron:
Berlin Iron Bridge Co
Cincinnati Corrugating Co
Scaife, W. B. & Sons
Thompson Mfg. Co
Contractors and Miners Supplies:
Cleveland City Forge & Iron Co
Motley, Thornton & Co
Pratt & Whitney Co
Copper Producers: Dealers:
Abbott, Jere. & Co
American Metal Co
Atlantic Mining Co
Baltimore Cop Works
Boston & Col S. Co
Boston & Mont. M. Co
Central Mining Co
Copper Queen Mfg. Co
Detroit Mfg Copper Co
Levinson Bros
Orton Copper Co
Oseola Con. Mfg. Co
Penn Salt Co
Tamarack Mfg. Co
Cutlery:
Babcock, J. A. & Co
Tomlinson & Adams
Diamond Drills:
American Diamond Rock Boring Co
Diamond Prospecting Co
Hazenahl, W.
M. C. Bullock Mfg. Co
Penn. Diamond Drill & Mfg. Co
Dividend Notices.
Dredges:
Bucyrus Steam Shovel & Dredge Co
Simons, W. & Co
Electric Light Machines, Dynamos:
Brush Electric Co
Powell, Wm. & Co
Sprague Electric R. & Motor Co
United Edison Mfg. Co
Electrical Supplies:
M. H. & Co Electric Equipment Co
Van Nuis, C. S.
Electrotypers and Engravers:
Rungler, F. W. & Co
Elevators and Conveyors:
Brown Hoisting & Conveying Mach. Co
Cooper, Hewitt & Co
Frisbie, D. & Co
Graves, L. S. & Son
Hunt, C. W. & Co
Jeffrey Manufacturing Co
Scaife, W. B. & Sons
Union Wire Rope Tramway Co
Walker Manufacturing Co
Engineers and Chemists:
Aaron, C. H.
Abadie, Emile R.
Adams, W. H.
Alkman & Auman
Austin, W. L.
Austen & Wilber
Banks, J. H.
Bewick, Moreing & Hooper
Bierwith, L. C.
Blandy, John F.
Blauvelt, Harrington
Boggs, W. B., Jr.
Boss, M. P.
Bowers & Miller
Brodie, Walter M.
Burlingame, H. E.
Butters, Charles
Carpenter, Franklin B.
Chance, H. M.
Channing, J. Parke
Cham, Richard
Chisolm, Frederic F.
Clark, C. J.
Clement, Victor M.
Comstock, Theodore B.
Court, W. H.
Curtis, J. S.
Daggett, Ellsworth
Davis, Chas H
De La Bouglise, Geo.
Lewy, Frederic P.
Dickerman, Alton L.
Endlich, F. M.
Everette, Dr. W. E.
Farish & Farish
Fie, H. W. R. J. & Wm
Freeland, Francis T.
Frossard, John D.
Fulton, Henry
Furlong, W. H.
Gaerter, E. G.
Garrison F. Lynwood
Gifford, William E.
Gould, James H.
Hammond, John H.
Hampton, W. Huntley
Hardman, John E.
Hastings, John B.
Herdond, J. H.
Holtzbaugh & Van Nuis
Engineers' Instruments:
Brandis Manufacturing Co
Gurley, W. & L. E.
Heller & Brightly
Kuffel & Esser Co
Queen & Co
Woolman, G. S.
Exporters:
Adams, G. H.
Gregory, H. P. & Co
Lees, S. M'l & Co
Peck, W. E.
Express Companies:
United Foreign Express Co
Extracts, Flavoring:
Frey, E. & Co
Fire-Brick:
Borgner & O'Brien
Chur, A. T.
Denver Fire Clay Co
Furnaces:
Aerated Fuel Co
American Gas Furnace Co
Bartlett, F. L.
Gordon, Strobel & Laureau, Lt.
Hoskins, Wm
Moore, Samuel L. & Son Co
Parke & Lacy Co
Witherow, Jas. P.
Fuses:
Macbeth & Co
Gas Works:
Archer, J. B.
Taylor Gas Producer Co
United Gas Improvement Co
Hoisting Machinery: (See Machinery)
Insurance Companies:
Endicott & Macomber
Harford Steam Boiler, Inspection and Insurance Co
Indurated Fibre Ware:
Cordley & Hayes
Lands and Mines For Sale:
Norfolk & Western R. R.
Reidville Mfg. & Impmt. Co

Sheldon, E. de F
St. Mary's Canal Mineral Land Co
Laundry Machines:
Catacract Washing Machine Co
Empire Laundry Machine Co
Empire Wringer Co
Locomotives:
Place, Geo
Porter, H. K. & Co
Lubricants:
Blake Bros
Blake, John H.
North American Metal Co
Magnolia Anti-Friction Metal Co
Machinery for Sale (Second Hand):
Blake, George F., Mfg. Co
Blake, Theo
Jarvis, Wm F. & Co
Oliphant, S. D
Machinery - Mining, Milling, Smelting and other Machinery:
Abendroth & Root Mfg. Co
Allentown Foundry & Machine Co
Allis, Edw. P. & Co
American Well Works
Automatic Typewriter Co
Barnes, W. F. & John Co
Beckett Foundry & Machine Co
Bennett Bros & Co
Blake, Geo. F. Mfg. Co
Brown Hoisting & Conveying Mach. Co
Buckeye Engine Co
Bullock M. C. Mfg Co
Cameron A. S. Steam Pump Works
Chester Foundry & Machine Co
Cleveland City Forge & Iron Co
Cook, Miller & Machinery Co
Cresland & Co
Davidson Steam Pumps
Davis, F. W.
Delta Engineering & Mfg. Co
Diamond Prospecting Co
Dodge Coal Storage Co
Farrell Foundry & Machine Co
Fishkill Landing Machine Co
Fort Scott Foundry and Machine Co
Fraser & Chalmers
Fulton Boiler Works
Fulton Iron Works
Gal, Bumiller & Unzicker
Globe Machine Co
Hunt, C. W. & Co
Griffith & Wedge
Hendrie & Bothoff Manufacturing Co
Hasek & Co stock
Hertberts, J. & Sons
Hunt, C. W. Co
Huntington F. A.
Industrial Mfg Co
Ingersoll-Sergeant Rock Drill Co
International Boiler Co
Iredell, F. W.
Jeffrey Manufacturing Co
John Stephenson Co., Ltd.
Jones, D. F. Mfg Co
Knowles Steam Pump Works
Lidgerwood Mfg. Co
Mansfield, H. H.
Maris Machine Co
McGowan, John H.
McEwen, A. C.
Mecklenburg Iron Works
Moore Manufacturing & Foundry Co.
Moore, Samuel L. & Son
Morris County Machine & Iron Co.
Mullins Silicated Iron & Steel Co.
Nurdyke & Marmon Co.
Norwalk Iron Works
Parke & Lacy Co
Penn Diamond Drill & Mfg. Co
Phoenix Iron Works
Porter, H. K. & Co
Rand Drill Co
Rebol & March
Risdon Iron Works
Scaife, W. B. & Sons
Stanley Bros
Sawmill & Blerece Mfg. Co
Trenton Iron Co
Union Iron Works
Wanwright Mfg. Co
Walker Manufacturing Co
Webster, Comstock & Machine Co
West Point Boiler Works
Whim Company
Wilkin Mfg. Co
Wiswell Electric Mfg. Machine Co
Mats:
Hartman Mfg. Co
Medicines:
Dixon, A. H. & Son
Metal Dealers:
Abbot, Jere. & Co
Lewisohn Bros
Magnolia Anti-Friction Metal Co
PHELPS, DODGE & CO
Metallurgical-Works and Processes:
Cowles Elect Smelt & Aluminum Co.
Kansas City S. & Ref. Co.
Ledoux & Co.
Newark S. & Mining Works
New York Metallurgical Works
Pennsylvania Salt Mfg. Co
Pittsburg Reduction Co
Russell Process Co.
St. Louis Sampling & Testing Works
Mining Companies:
Atlantic Mining Co
Boston & Montana Mfg. Co
Central Mining Co
Cleveland Mfg. Co
Copper Queen Mfg. Co
Detroit Copper Mfg. Co
Oseola Cons. Mfg. Co
Quincy Mfg. Co
Reidville Mfg. & Impmt Co
Tamarack Mfg. Co
Motors:
Turk Hydraulic Power Co
Oil Stoves:
American Oil Stove Co
Ore Crushers: (See Smelting Works)
Ore Washers:
Hauk & Comstock
Packing and Pipe Covering:
Braadt, Rand phn
Chalmers Spence Co
Littvuge Manufacturing Co
Patents:
Littel, J. R.
Phosphor-Bronze:
Phosphor-Bronze Smelting Co
Photographers' Instruments:
Eastman Co.
Scott & Sons
Portable Houses:
Ducker Portable House Co
Harvey, T. W. Lumber Co
Pipes:
Abendroth & Root Mfg. Co
Merchant & Co

Scaife W. B. & Sons
Spiral Weld Tube Co
Powder:
Aetna Powder Co
American Wood Powder Co
Atlantic Dynamite Co
Lafin & Rand Powder Co
Macbeth, J. & Co.
Printing Machinery:
Liberty Machine Works
Relsky Press Co (See Machinery.)
Pumps: (Also see Machinery.)
Blake, Geo. F. Mfg. Co
Buffalo Steam Pump Co
Cameron, A. S. Steam Pump Works
Davidson's Steam Pump
Hall Steam Pump Co
Knowles Steam Pump Works
Pulsometer Steam Pump Co
Washington Henry Co
Quarrying Machinery:
Diamond Prospecting Co
Ingersoll-Sergeant Rock Drill Co
Rand Drill Co
Steam Stone Cutter Co
Quicksilver:
Randol, J. B.
Railroad Equipment:
Hunt, C. W. & Co
Railway Sleepers:
Millen, L. R. & Co.
Refrigerating Machines:
Cons. Ice Machine Co
De La Vergne Ref. Machine
Dermigny, L. & Co
Farson, E. S. Mfg. Co
Rock Drills: (See Air Compressor)
Roofing:
Berlin Iron Bridge Co
Cincinnati Corrugating Co
Merchant & Co
Scaife, William B. & Sons
Thompson Manufacturing Co
Rustless Iron:
Pittsburg Rustless Iron Works
Shaft Sliding:
Poetsch-Scoy Smith Freezing Co.
Shoes and Dies:
Chrome Steel Works
Crescent Steel Co
Pittsburg Steel Casting Co.
Silver Ware:
Babcock, J. A. & Co.
Tomlinson & Adams
Smelting and Refining Work:
Aluminum Brass & Bronze Co.
Baltimore Copper Works
Boston and Colorado Smelting Co
Cowles Smelting & Aluminum Co.
Kansas City S. & Ref. Co.
Newark S. & Refining Co
Orford Copper Co.
Penn Lead Co.
Penna. Salt Mfg. Co.
Phosphor Bronze Smelting Co.
Pittsburg Reduction Co.
Shovels, Spades, etc.:
Cheftain Hay Rake Co
Jones, D. F. Mfg. Co
Motley, Thornton N. & Co.
Steel Rails, Castings, Drill Stee:
Abbot, Jere. & Co.
Hendrie & Bothoff Manufacturing Co
Chester Steel Casting Co
Chrome Steel Works
Crescent Steel Co
Hunt, Robt W. & Co.
Illinois Steel Co.
Jeasop, W. & Sons, Lt.
Pennsylvania Steel Co.
Roberts, A. & P. & Co.
Steel Rail Supply Co.
Tools:
Barnes, W. F. & John Co
Cheftain Hay Rake Co
Dialton, Henry & Sons
Fratt & Whitney Co
Motley, Thornton N. & Co.
Simmons, John
Smi h, R. C.
Stanley Rule & Level Co
Stevens Arms & Tool Co
Van Nuis, U. S.
Tubes:
Wanwright Mfg. Co
Tubs, Dumping and Hoisting:
Motley, Thornton W.
Steucler & Woods
Turbines:
Allen-ow Foundry & Machine Co
Stillwell & Bierce
Turbuckle:
Cleveland City Forge & Iron Co.
Type writers:
Automatic Typewriter Co.
Valves:
Eddy Valve Co
Ludlow Valve Mfg. Co
Mason Regulator Co
Powell, Wm. & Co.
Varnish:
Smith, Edward & Co.
Ventilators:
Bullock, M. C. Mfg. Co.
Water Purifiers for Boilers:
Stillwell & Bierce Manufacturing Co
Wanwright Mfg. Co.
Water Wheels:
Pelton Water Wheel Co
Ridgway, Craig & Son
Stillwell & Bierce Manufacturing Co
Well Drilling Machinery:
American Well Works
Oil Well Supply Co., Limited
Penn Diamond Drill & Mfg. Co
Tuna Iron Works
Whips:
Comstock, C. M. & Co
Windmills:
Industrial Mfg. Co.
Elgin Wind Power & Pump Co.
Lamb & Co
Wire Cloth:
Harrington & King Perforating Co.
Howard & Murae
Tyler, W. S. Wire Works Co.
Wire Rope:
California Wire Works
Hanson, John W. & Co.
Roebling, J. A. Sons & Co.
Trenton Iron Co
Washburn & Moen Mfg. Co
Williamsport Wire Rope Co.
Wire Rope Fraysaws:
Badgley, C. W. & Co.
Cooper, Hewitt & Co.
Hunt, C. W. Co
Union Wire Rope Tramway Co.
Walker
Wood Working Machinery:
Barnes, W. F. & John Co
Frank & Co.
Globe Machine Co
Motley Thornton & Co

# THE GOLDEN GATE CONCENTRATOR.

The machines have been thoroughly tested in practical work for more than four years, and upon many different classes of ores, and we cordially invite those in need of concentrating machinery to correspond with us and inform themselves as to their merits. We have been engaged in the business of manufacturing concentrators for ten years, and, with ample means and the best facilities at our disposal for determining what are the best conditions for ore concentration, we have produced a practical machine of extraordinary merit, which stands the test of continuous work, and possesses among other advantages the following:



1. Simplicity; the principal moving part being a tray, having the reciprocating movement peculiar to our machines.
2. The pulp is allowed to settle and become stratified before the gangue is removed, allowing us to save a larger proportion of fine mineral than other machines.
3. A wide range of adjustment, which renders our machines well adapted for treating widely different classes of ores.
4. Will treat equally well material either coarse or fine, no separation into sizes being required, thus in many places replacing, with profit, jigs and slime tables.
5. It has a large daily capacity from three to ten times that of the ordinary low-priced machines, which makes it cheaper to buy and cheaper to set up and run than the latter.
6. A concentrator must be constructed so as to be able to stand the strain of continuous duty, and to meet this requirement we build our machines extra strong and solid, using nothing but the best of workmanship and materials, and making due provision for taking up wear and for the easy renewal of parts when worn.

We have unequalled facilities for making general tests of ores, and especially for determining the practicability of working them by concentration, our charges for such work being very reasonable. Transportation charges on ores sent to us must be fully prepaid in all cases, and all packages should have distinctive marks both on outside and inside to identify them by. On application, we will mail, free illustrated descriptive circulars; also our pamphlet treating of ore concentration, which will be of value to those interested in this subject, and especially to those who may be intending to send ores to be tested. Further information may be obtained at central office in Boston; also of

D. U. JENNINGS, 45 Broadway, New York.

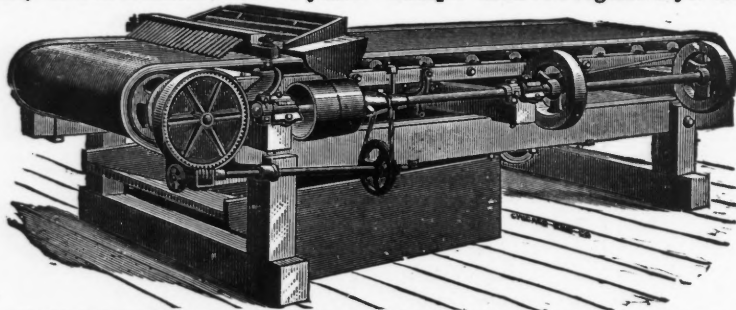
PARKE & LACY, 8 California St., San Francisco, Cal.

Address GOLDEN GATE CONCENTRATOR COMPANY, 160, 162 and 164 HIGH STREET, BOSTON, MASS., U. S. A.

## IMPROVED FRUE VANNER CONCENTRATOR

WITH IMPROVED FORM OF BELT.

Capable of Treating the Pulp from Five Stamps, 10 to 15 Tons Daily. Has been successfully used in California for two years. Cheaper than two regular style vanners.



Patented Dec. 22d, 1874; Sept. 2d, 1879; April 27th, 1880; Feb. 20th, 1883; Sept. 18th, 1883.

General Agent: W. McDERMOTT, 2 Wall Street, New York.

Manufacturers: FRASER & CHALMERS, Fulton and Union Sts., CHICAGO.

Agents: L. C. TRENT, 7 W. 2d South Street, Salt Lake City, UTAH.

H. O. REINHARDT, 11 Calle de Juarez, CHIHUAHUA, Mex.;

W. H. EMANUEL, DENVER, COLO.

FOR DESCRIPTIVE CIRCULAR.

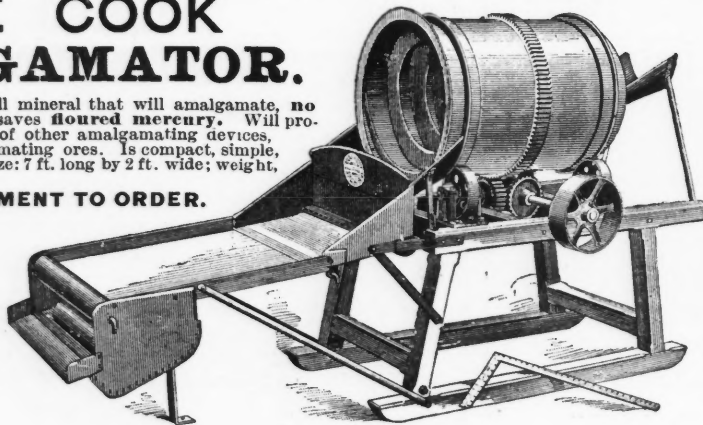
## THE COOK AMALGAMATOR.

This machine will save all mineral that will amalgamate, no matter how fine. It saves floured mercury. Will produce pay from tailings of other amalgamating devices, treating pay free amalgamating ores. Is compact, simple, portable and durable. Size: 7 ft. long by 2 ft. wide; weight, 450 lbs.

PLACER ATTACHMENT TO ORDER.

For further information, address

THE COOK  
Mining Machinery  
COMPANY,  
117-119 North Front St.  
Camden, N. J., U. S. A.



## HYDRAULIC, STEAM AND POWER ELEVATORS,

PASSENGER AND FREIGHT.

L. S. GRAVES & SON.

ROCHESTER. CLEVELAND.

BOSTON. ST. LOUIS.

NEW YORK, 92 and 94 Liberty St.

JUST PUBLISHED:

### THE HYDRAULIC GOLD MINER'S MANUAL,

By T. S. G. KIRKPATRICK, M. A., Oxon,

Chairman of the Orita Gold Mines, Limited; Director of the Golden Gate Alluvial Syndicate, Limited; Director of the Gravel Gold Mines of Colombia, Limited.

With Illustrations. 1890. \$2.25.

SCIENTIFIC PUBLISHING CO.

27 Park Place, New York.

## CATARRH

### HAY FEVER

### CATARRHAL DEAFNESS

**A NEW TREATMENT.**

Sufferers are not generally aware that these diseases are contagious, or that they are due to the presence of living parasites in the lining membrane of the nose and eustachian tubes. Microscopic research, however, has proved this to be a fact, and the result of this discovery is that a simple remedy has been discovered which permanently cures the most aggravated cases of these distressing diseases by a few simple applications made (two weeks apart) by the patient at home. A pamphlet explaining this new treatment is sent free by A. H. DIXON & SON, 337 and 339 West King Street, Toronto, Canada.

## DR. THOMAS STERRY HUNT'S NEW WORKS.

Chemical and Geological Essays :

Second Revised Edition, with new Preface, pp., xlvii and 489 cloth

\$2.50

Mineral Physiology and Physiography :

A Second Series of Chemical and Geological Essays, with a General Introduction. 710 pp., cloth

\$5.00

A New Basis for Chemistry:

A Chemical Philosophy. 247 pp., cloth

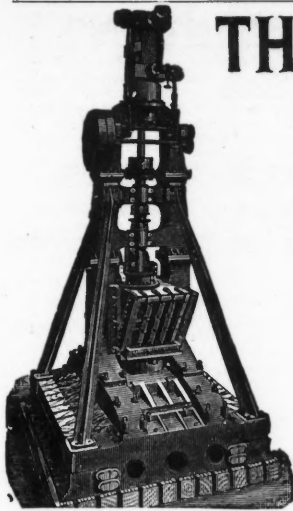
\$2.00

In Preparation by the same author :

“Systematic Mineralogy Based on a Natural Classification.”

SCIENTIFIC PUBLISHING COMPANY, 27 Park Place, New York.





# THE EDWARD P. ALLIS COMPANY,

RELIANCE WORKS, MILWAUKEE, WIS.,

MANUFACTURERS OF

## MINING MACHINERY,

STEAM ORE STAMPS, ROCK and QUARTZ CRUSHERS,  
Air Compressors, Pumping and Hoisting Plants, Etc.

SOLE BUILDERS OF

### REYNOLDS' IMPROVED CORLISS ENGINES.

Unequaled for Economy of Fuel and Close Regulation.

Write for our Catalogue and Prices.

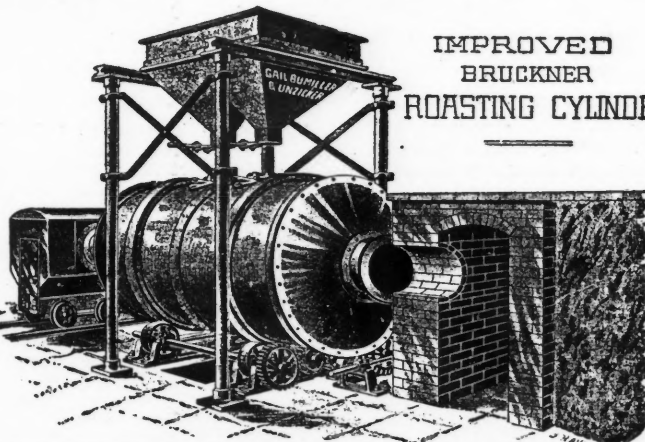
# CHICAGO IRON WORKS.

Gail, Bumiller & Unzicker  
PROPRIETORS.

MANUFACTURERS OF  
General Mining Machinery,  
Engines and Boilers.

SECTIONAL MACHINERY,  
For transportation on mule back.

WRITE FOR CATALOGUES.



IMPROVED  
BRUCKNER  
ROASTING CYLINDER.

OFFICE AND WORKS  
Cor. Hawthorne Av. and Willow St.  
CHICAGO, ILL.

Machinery for Milling,  
Smelting and Concentration  
of Ores.

HOISTING AND PUMPING  
MACHINERY.

ESTIMATES AND PLANS FUR-  
NISHED PROMPTLY.

## QUARTZ MILLS AND GENERAL MINING MACHINERY,

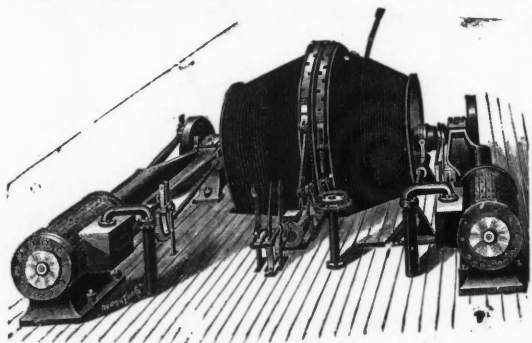
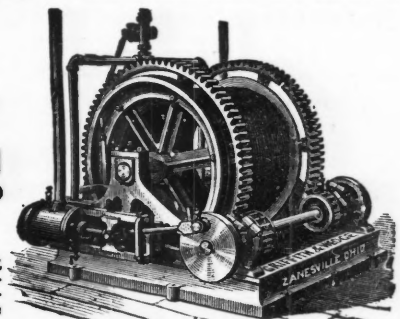
HOISTING-ENGINES, with Link Reverse Motion, Single or Double  
Reels, Compound Brakes, MINERS' PROSPECTING-ENGINES,  
SAFETY-CAGES, MINING-CARS, Etc.

And to furnish Plans and Estimates for the complete Machinery of FIRST-CLASS STAMP MILLS FOR BOTH SILVER AND GOLD, or Estimates for BATTERIES, AMALGAMATING PANS, SETTLERS, OXLAND & HOWELL'S CHLORIDIZING AND CALCINING FURNACES, REVOLVING DRY KILNS, MELTING FURNACES, RETORTS, CLEAN-UP PANS, ENGINES, BOILERS, AND ROCK-BREAKERS, SHAFTING, PULLEYS, AND GEARING. During the past three years, we have furnished the Machinery for the following Quartz Mills:  
Alice Gold and Silver Mining Co., Butte, Montana, 60 Stamps Dry Crushing Silver Mill. | Empire Mining Co., Park City, Utah, 30 Stamps Dry Crushing Silver Mill,  
Moulton Mining Co., Butte, Montana, 40 Stamps Dry Crushing Silver Mill. | Broadway Mining Co., Silver Star, Mont., 40 Stamps Gold Mill.  
Algonquin Mining Co., Phillipsburg, Mont., 20 Stamps Dry Crushing Silver Mill. | Silver Valley Mining Co., of North Carolina, 20 Stamps Gold Mill.

Together with many smaller Mills throughout the West. Our Hoisting-Engines are in use at over one hundred Silver Mines in the West and Coal Mines in the State. We also manufacture FIRST CLASS PORTABLE ENGINES AND SAW-MILLS. We guarantee all of our Machinery of first-class Material and Workmanship.

Branch House, 14 South Broadway, St. Louis, Mo.,  
K. Posse, M. E., Manager.

GRIFFITH & WEDGE CO., Zanesville, Ohio.



## WEBSTER, CAMP & LANE MACHINE COMPANY,

MANUFACTURERS OF

### MINING MACHINERY,

Improved Band Friction Hoisting Machinery, Geared or  
Direct Acting, for round or flat rope.

WIROPE HAULAGE MACHINERY  
(ENDLESS OR TAIL ROPE SYSTEMS).

CORNISH PLUNCER and BUCKET LIFT PUMPS. AUTOMATIC or SLIDE  
VALVE STEAM ENGINES, CAGES SHEAVES, BUCKETS, Etc.

133 N. MAIN STREET, AKRON, O.

If you have a good thing to sell, let all the world know it by advertising in  
**THE ENGINEERING AND MINING JOURNAL.**

**AMALGAMATING MACHINERY.**

Stamp Mills for Wet or Dry Crushing. Huntington Centrifugal Quartz Mill. Drying Cylinders. Amalgamating Pans, Settlers, Agitators and Concentrators. Retorts, Bullion and Ingot Moulds, Conveyors, Elevators, Bruckners and Howell's Improved White's Casting Furnaces, Etc.

**FRASER & CHALMERS,  
MINING MACHINERY**

**CONCENTRATING MACHINERY.**

Blake, Dodge and Comet Crushers, Cornish Crushing and Finishing Rolls, Hartz Plunger and Collom Jigs. Frue Vanner & Embrey Concentrators, Evans', Calumet, Collom's and Rittenger's Silice Tables, Trommels, Wire Cloth and Punched Plates. Ore Sample Grinders and Heberle Mills.

**IMPROVED CORLISS AND SLIDE VALVE STEAM ENGINES.** Horizontal, Vertical and Sectional.  
**IMPROVED STEAM STAMPS**

Hoisting Engines, Safety Cages, Safety Hooks,  
**ORE CARS, WATER & ORE BUCKETS,**  
Air Compressors, Rock Drills, Etc.  
**GENERAL MILL AND MINING SUPPLIES, ETC.**  
Sectional Machinery for **MULE-BACK TRANSPORTATION.**



Pumping Engines and Cornish Pumping Machinery,  
**IMPROVED WATER JACKET**  
Blast Furnaces for Calena and Copper Ores,  
**SLAG CARS AND POTS,**  
Roots & Baker Pressure Blowers, Suspended Tramways.  
Sole Western Agents for Tyler Wire Works Double Crimped Mining Cloths.

**General Offices and Works: FULTON AND UNION STREETS, CHICAGO, ILL.**

**BRANCH OFFICES:** NEW YORK, Room 43, No. 2 Wall St. DENVER, COLO., 1316 Eighteenth St. SALT LAKE CITY, UTAH, 7 W. Second South St. HELENA, MONT., Room 28, Merchants' National Bank Building, 4 North Main St. LONDON, ENG., 23 Bucklersbury, E. C. CHIHUAHUA CITY, MEXICO, No. 11 Calle de Juarez. LIMA, PERU, South America. JOHANNESBURG, TRANSVAAL, South Africa.

**FULTON IRON WORKS.**

HINCKLEY, SPIERS & HAYES,

Office: 213 FREMONT ST.,

SAN FRANCISCO, CAL.

**MINING MACHINERY.**

Geared and Direct-Acting Hoists.  
Portable Mining Hoists.  
Ore and Water Buckets.  
Swivel and Self-Dumping Ore Cars  
Safe Cages and Incline Skips.  
Sheaves, Chilled Car Wheels.  
Water-Wheel Hoists.  
Incline Gravity Tramways.  
Cornish Plunger and Sinking Pumps.  
Pump and Balance Bobs.  
Steam Mining Pumps.  
Air Compressors and Rock Drills.  
**SEND FOR CATALOGUES.**



**MARINE MACHINERY.**  
High-Pressure, Compound, Triple & Quadruple Expansion Marine Engines and Boilers of all descriptions.

**MILLING MACHINERY.**

Fulton Rock Breakers.  
Wet and Dry Crushing Stamp Mills.  
Automatic Ore Feeders.  
Amalgamating and Grinding-Pans.  
Settlers, Agitators and Clean-up Pans.  
Quicksilver Elevators and Strainers.  
Gold and Silver Retorts and Bullion  
Frue Ore Concentrators. [Molds.  
Tustin Rotary Pulverizers.  
Corliss and Plain Slide Valve Engines.  
Stationary and Portable Boilers.  
Llewellyn & Stark Heaters.  
**SEND FOR CATALOGUES.**

**HOWARD & MORSE**  
45 FULTON ST.  
NEW YORK.  
HEAVY MINING  
COPPER.  
BRASS,  
STEEL  
OR IRON  
WIRE CLOTH.

ALSO MANUFACTURERS OF  
GENERAL WIRE WORK.  
Window Guards,  
Stable Fixtures,  
TRAILING  
Sand Screens  
Coal Screens  
Etc.

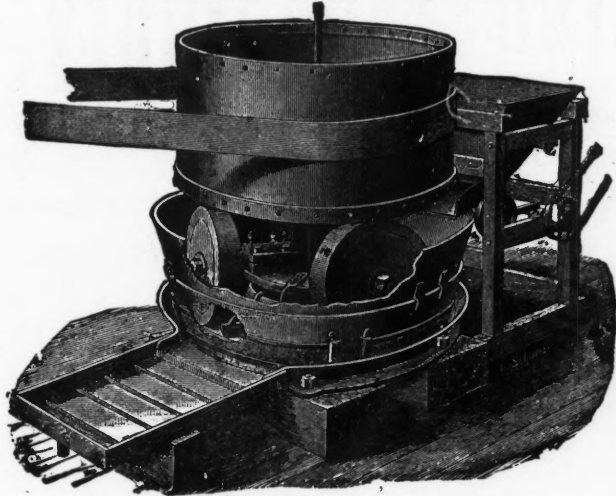
EXCLUSIVE MANUFACTURERS OF THE HEAVY TEMPERED  
**"National Battery and Bolting Wire Cloth."**

**WILLIAMSPORT WIRE ROPE CO.**  
MANUFACTURERS OF  
**WIRE ROPE**  
Iron, Steel and Galvanized  
STREET CABLES A SPECIALTY.  
WILLIAMSPORT, PA.  
Correspondence Solicited



# RISDON IRON WORKS,

Cable Address, "RISDONS," San Francisco.



BRYAN'S ROLLER QUARTZ MILL.

S. E. Cor. Howard and Beale, SAN FRANCISCO.  
**MINING and MILLING**  
 MACHINERY, ENGINES AND BOILERS.

Sheet-Iron Water Pipe for Mining, Irrigation and Town Supply  
 EXCLUSIVE AGENTS FOR THE PACIFIC COAST OF

HEINE PATENT SAFETY BOILER AND MACBETH STEEL PULLEY  
 AGENTS FOR THE PACIFIC COAST

**BRYAN'S ROLLER QUARTZ MILL,**  
 Cheapest and Most Perfect Roller Mill Made  
 FOR THE FOLLOWING REASONS:

1. It is cheaper.
2. It is more durable.
3. It crushes a larger amount of ore with less power.
4. It amalgamates a larger percentage of the gold.
5. Its "clean-up" is quicker and fuller.
6. It is portable, requires no frame work, and is ready for the foundation as it leaves the shop.

GILMORE MINE, Virginia, July 21, 1888.

RISDON IRON WORKS, San Francisco, California:

Gentlemen: I have been running one of your four foot Bryan Roller Quartz Mills for about a year on very hard gold quartz. We are running the mill at 48 revolutions per minute, and are pulverizing through a fine 30-mesh wire screen between 9 and 10 tons per day of 10 1/4 hours. On softer ore, I have pulverized as high as 20 tons per day of 11 hours, and amalgamated 68 per cent inside of battery. We are still using the original tires and dies which came with the mill. Tires are yet 1 inch thick, ring 1/2 inch, and dies are 3 inches thick. With the exception of new screens and re-babbiting the drum around the center-post, we have had no repairs to cost anything. Any parties wishing to see a splendid pulverizer at work, or a complete mill, may be referred to me at the Gilmore Mill, of which I have the charge.

Yours very truly, T. RUSSEL WILLARD, Columbia, Va

# UNION IRON WORKS,

Corner First and Mission Streets, San Francisco, Cal.

MANUFACTURERS OF

## Mining and Milling Machinery.

SPECIALTIES:

Scott & O'Neil Automatic Cut-Off Engines, Ide Engines, Rock Breakers, Quartz Mills,  
 Hoisting Engines,

ROLLS AND CONCENTRATING MACHINERY.

**PUMPS.**

Cornish and Other.

**PUMPS.**

COPPER AND LEAD FURNACES.

ALL CLASSES OF MARINE WORK.

Hydraulic Lift Dock, Capable of Docking the Largest Vessels.

Send for Circulars.

NEW YORK OFFICE, 145 BROADWAY.

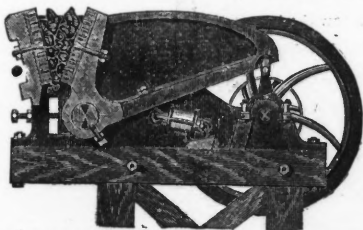
Cable Address "UNION."

# PARKE & LACY COMPANY

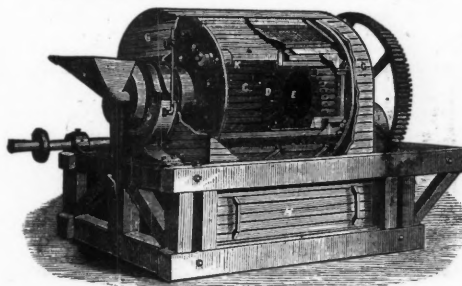
MANUFACTURERS OF

ROASTING FURNACES AND JIGS,  
 Wall's Patent Crushing Rolls  
 ENGINES, BOILERS, STEAM PUMPS.

AIR COMPRESSORS AND ROCK DRILLS.  
 HOISTING WORKS, STAMP MILLS, AND  
 CONCENTRATING WORKS.

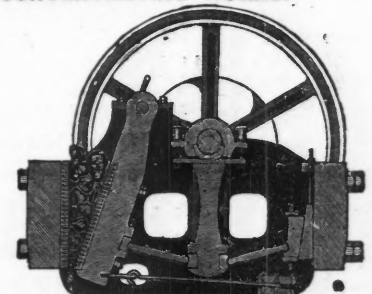


THE "DODGE" ROCK BREAKER, WITH PAT. STEEL PIN PLATES.



THE "DODGE" PULVERIZER.

21 and 23 Fremont Street,  
 SAN FRANCISCO, CAL.  
 SYDNEY, N. S. W.



THE "GIANT" ROCK BREAKER WITH PAT. STEEL PIN PLATES.

## F. A. HUNTINGTON,

MANUFACTURER OF

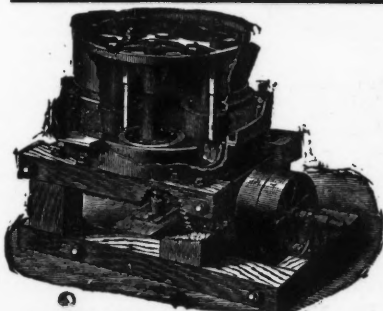
### Centrifugal Roller Quartz Mills,

CONCENTRATORS AND ORE CRUSHERS,

MINING MACHINERY OF EVERY DESCRIPTION,

STEAM ENGINES and SHINGLE MACHINES

SEND FOR CIRCULAR.



Centrifugal Roller Quartz Mill.

213 & 217 FIRST ST., SAN FRANCISCO, CAL.

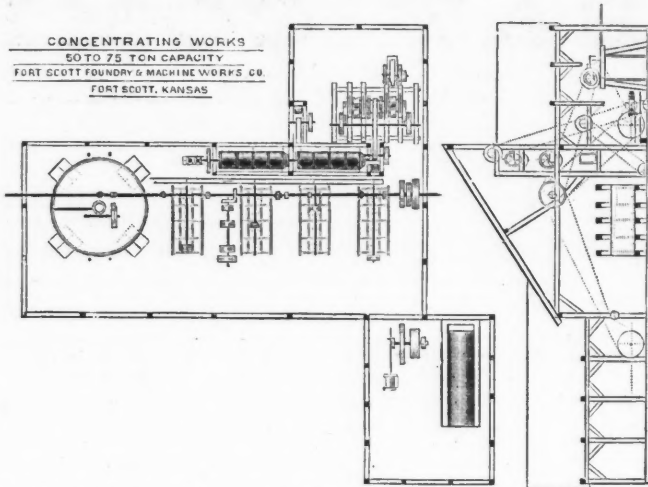
Orders Received by Walter McDermott, 2 Wall Street, New York City.

CONCENTRATION.

# Practical Ore-Dressing Machinery.

We have led the advance in the great development which the mechanical treatment of ore has undergone in the past few years. The largest dividend-paying companies are our regular customers.

- Blake Crushers
- Cornish Rolls,
- Composition Metal Rolls and Crusher, Plates,
- Ore Elevators,
- Revolving Sizing Screens
- Perforated Sheets,
- Jig Machines, Clausthal & Hartz Patterns,
- Copper Wire Cloth for Jigs,
- Hydraulic Classifiers,
- Rotary and Percussion Tables,
- Cupola Smelting Furnaces,
- Improved Scotch Hearth Furnaces,
- Improved Slag Furnace.



- Lead Kettles,
- Lead, Zinc and Copper Molds,
- Slag Cars and Pots,
- Casting for Zinc Furnace,
- Reverberatory Roasting Furnace
- Coke Oven Castings,
- Thompson Amalgamators.
- Stamp Mills,
- Cornish Pumps,
- Steam Pumps,
- Mining Cars and Tubs,
- Mining Hoisting Machinery,
- Coal Washing Machinery.

Continuous automatic mechanism in the successful and profitable concentration of low grade ores in large quantities requires the highest skill, best materials, perfect workmanship for all the necessary details of a first-class plant.

This line has been our one great specialty, and this has been the secret of our success. When desired we can furnish foremen from our force of capable workmen experienced in the advanced ideas and improved methods of handling concentration machinery. We are prepared to furnish promptly works of any capacity from 25 tons per day or upward.

Our mining engineer will fill appointments at any time in Kansas City, Chicago or St. Louis.

A. W. WALBURN, Prest. and Treas.  
 M. SWENSON, Vice-Prest. and Secy.  
 F. DE STWOLINSKI, Mining Engineer.  
 J. G. HOEFER, Superintendent.

Address **FORT SCOTT FOUNDRY & MACHINE WORKS CO.,**

**Fort Scott, Kansas, U. S. A.**

## PENNSYLVANIA DIAMOND DRILL & MAN'F'G CO.

ESTABLISHED 1869.

BIRDSBORO, BERKS CO., PA.

Has a larger experience than any other Company in the Boring of Prospecting Holes with the Diamond Drill. We make a Specialty of Prospecting Mineral Lands by taking out Cores, and of Boring Artesian Wells, Round and Straight.

Aggregate of test holes bored furnishing cores 111,502 ft.  
 well holes bored..... 11,771 ft.

Total..... 123,273 ft.  
 Or, 23.3 miles, in addition to holes for tunneling and shafting.

Largest hole bored..... One foot in diameter.  
 Deepest hole bored..... 2,352 ft.

BUILDERS OF  
**Diamond Drilling Machinery,**  
**Stationary Engines,**  
 Deep Well and Mine Pumps, Air Compressors, Power and Hand Cranes, General Machinery, Flour Mill Rolls Ground and Grooved. Repairing Promptly Attended to.

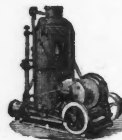
## THE AMERICAN GEOLOGIST.

A monthly journal of geology and allied sciences. Represents American and Canadian geology. Now in the fifth volume. Subscription, \$3.50 per year.

Remit money by P. O. Department, express, or draft on New York.

## THE GEOLOGICAL PUBLISHING CO., MINNEAPOLIS, MINN.

## PROSPECTING MACHINERY FOR ALL PURPOSES. Also LIGHTNING WELL-SINKING MACHINERY & TOOLS



MANUFACTURED BY  
**THE AMERICAN WELL WORKS, AURORA, ILL.**  
 BRANCH HOUSES: 11-13 S. CANAL ST., CHICAGO; 1113 ELM ST., DALLAS, TEX.

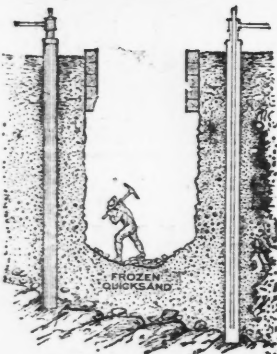
## FREEZING PROCESS.

SHAFTS, TUNNELS and FOUNDATIONS in Quicksand and Difficult Ground by the PNEUMATIC and FREEZING PROCESSES.

Quicksand of any depth can be readily penetrated by the Freezing Process (American patents owned by us), which makes available many deposits of minerals hitherto inaccessible.

We are using this process with gratifying success, and are now prepared to take contracts for work in any part of the country.

**POETSCH-SOYSMITH FREEZING COMPANY,**  
 NO. 2 NASSAU ST. NEW YORK.



"Know the law and avoid litigation!"

**Payne's Legal Adviser**—Is a new epitome of the Laws of the different States of our Union and those of the General Government of the United States, and will be found invaluable to those who are forced to appeal to the law, as well as to that large class who wish to avoid it. The whole is alphabetically arranged so as to make reference to it easy. This work also contains legal forms of Deeds, Mortgages, Contracts, Assignments, Power of Attorney, Acknowledgments, Builders' Contracts, Bills of Lading, Bills of Exchange, Affidavits, Certificate of Incorporation, Form of Release, For Sale Contracts, Responsibilities of Common Carriers, Proofs of Loss, Leases, Assignment of Lease, Articles of Partnership, Notice of Dissolution, Deed of Trust, Bill of Sale, Wills, etc., etc. Large 12mo, cloth, 300 pages. Price....\$1.50

of Release, For Sale Contracts, Responsibilities of Common Carriers, Proofs of Loss, Leases, Assignment of Lease, Articles of Partnership, Notice of Dissolution, Deed of Trust, Bill of Sale, Wills, etc., etc. Large 12mo, cloth, 300 pages. Price....\$1.50

## SCIENTIFIC PUBLISHING CO.,

27 Park Place, New York.

## CONTRACTORS' TOOLS AND SUPPLIES.

Construction Locomotives, Dump Cars, Derrick Winches, Hoisting Engines, Wheelbarrows, Drag and Wheel Scrapers, Shovels, Picks, Mattocks, Mauls, Horse-Powers, Track Gauges, Rail Tongs, Forges, Etc., Etc.

Catalogues and all information desired sent on application.

**THORNTON N. MOTLEY & CO.,** Manufacturers and Dealers, 43 John St., New York, U. S. A.

CABLE ADDRESS, "PLICATION."



# MECKLENBURG IRON WORKS.

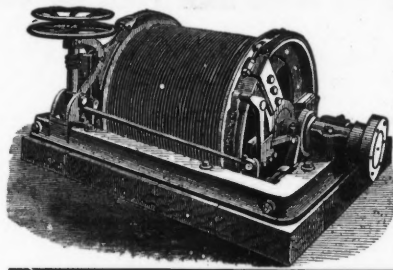
JOHN WILKES, Manager, Charlotte, N. C.

## STAMP MILLS FOR GOLD ORE A SPECIALTY.

CONCENTRATORS, HOISTS, CRUSHERS, ENGINES and BOILERS.

# IRON BAY COMPANY,

DULUTH, MINNESOTA.



We are now occupying our new works at West Duluth, where we have unsurpassed facilities for the manufacture of

**GENERAL MINING MACHINERY,**  
DIRECT ACTING, GEARED AND IMPROVED EXTERNAL BAND FRICTION HOISTING MACHINERY, PUMPING PLANTS,

**CORNISH PLUNGER AND BUCKET LIFT PUMPS**  
SHEAVE, CAGES, SKIPS, MINING CARS, BUCKETS, ETC., ETC.

Improved Iron Bay Corliss and Automatic Slide Valve Engines, Marine, Stationary and Portable Boilers.  
*Correspondence Solicited.*

## CONCENTRATION OF IRON ORES

**BUCHANAN'S MAGNETIC SEPARATOR (In Three Sizes.)**

Buchanan's Improved Rock Breakers and Crushing Rolls, Screens, Round and Hexagonal Elevators, Shafting and Pulleys, Steam Engines—Corliss and Slide Valve—Boilers and Hoisting-Engines

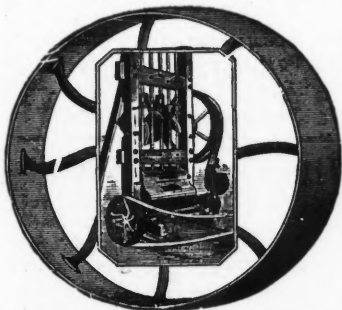
For reference from parties now using this machinery, address THE BECKETT FOUNDRY AND MACHINE CO., Arlington, N. J. or the company's engineer, C. G. BUCHANAN, 120 Liberty Street, New York.

N. B.—We are the sole manufacturers of the Buchanan Magnetic Separator. Any parties making or using same, unless authorized by us, will be prosecuted according to law.

# MINING & MILLING MACHINERY

OF EVERY DESCRIPTION.

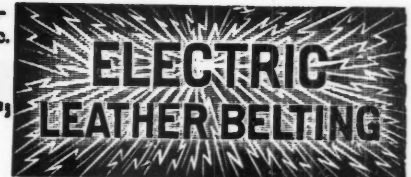
Lidgerwood Hoisting Engines,  
Concentrating Works, Sturtevant Blowers,  
Knowles Steam Pumps, Blake Crushers, Stamp Mills.



Engines, Boilers, Iron Pipe, Belting, Hoisting Rope, Quick-silver, Iron Roofing, Lubricating Oils, Emery Wheels, etc., etc.

**HENDRIE & BOLTHOFF MANUFACTURING CO.,**

Corner Seventeenth and Wazee Streets,  
DENVER, COLORADO.



# SULLIVAN DIAMOND PROSPECTING DRILLS

Simple in Construction—Rapid and Accurate in Operation—  
Economical in Wear of Carbon and Use of Steam or Air.

ADAPTED TO HARD OR SOFT ROCK REMOVING A SOLID CORE.

These drills embody the best principles of construction, as to engines, feed and hoisting apparatus. The cut of "N" drill shows the general type of Sullivan Drill, from 700 to 4000 feet capacity. "E" drill for underground prospecting, capacity 300 feet. "M" hand drill, capacity 300 feet.

**STEEL GANG AND DIAMOND POINTED QUARRYING MACHINERY, STEAM PUMPS, BOILERS.**

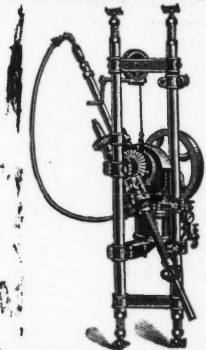
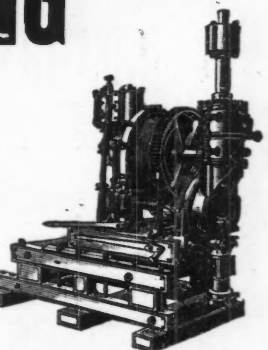
SEND FOR CATALOGUE. Contractors for Diamond Drill Prospecting.

**DIAMOND PROSPECTING CO., Gen. Agts.,**

Cable Address, "Diamond, Chicago." 15 & 17 N. CLINTON ST., Chicago, Ill., U. S. A.  
A. B. C. Code used—Fourth London Edition.

EASTERN OFFICE,  
28 Broadway, New York.

**SIMPSON & WATKINS,**  
Agents for Pennsylvania, Scranton, Pa.



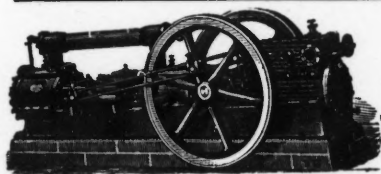
"E" Drill.—Capacity, 300 ft

"N" Drill.—Capacity 2000 ft.

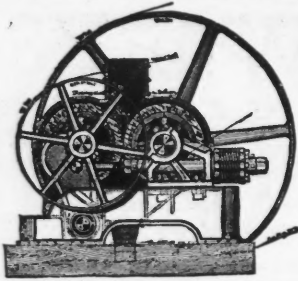
## AIR COMPRESSORS

FOR ALL APPROPRIATE PURPOSES, IN ALL RESPECTS OF DESIGN AND WORKMANSHIP THE BEST IN THE MARKET. Used by the most critical buyers and in the most important positions in Alabama, New York, Pennsylvania, Ohio, Illinois, Indiana, Missouri, Michigan, Wisconsin, Wyoming, Colorado, Kansas, Ind. Territory, Texas, Kentucky, N. Mexico, California, N. Brunswick, Scotland.

**STANDARD SIZES FOR POWER ALWAYS IN STOCK OR IN PROGRESS.**  
Machines for any reasonable pressure. We have produced 4000 lbs. pressure per square inch. No water used in air-cylinder and a serious evils avoided. Air-valves of Corliss Pattern, beyond comparison the most effective valves for all situations, and particularly the high mountainous countries. Speed corresponds with most approved steam-engine practice, and is not limited by the conditions of an air-cylinder. Dry Air, Steam Expansion, Close Regulation, Greatest Capacity, Highest Economy, Unequaled Durability. "Machine" for Steam and Water-Power.  
DESCRIPTIVE CIRCULAR SENT ON APPLICATION.  
The Norwalk Iron-Works Company, South Norwalk, Conn.



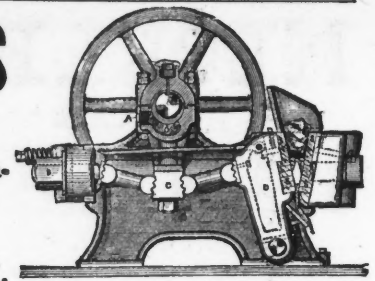
Send for our Catalogue of Scientific and Technical Books,  
**THE SCIENTIFIC PUBLISHING CO., 27 Park Place, New York**



# KROM'S Perfected Standard Steel ROLLS AND ORE BREAKERS,

For Crushing and Pulverizing Ores. Ore Feeders, Dry Kilns, Pneumatic Jigs. Plans for Crushing, Leaching and Concentrating Mills. Send for Circulars.

S. R. KROM,  
151 CEDAR STREET, - - NEW YORK.



## CYCLONE PULVERIZER.

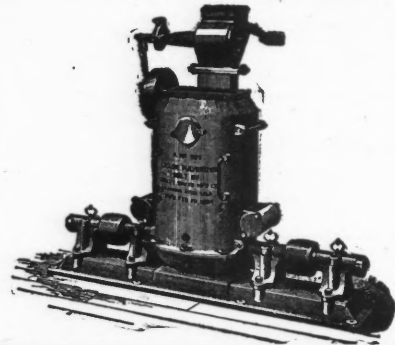
The most economical Pulverizer in the  
WORLD.

Simplest in construction, reducing to any degree of fineness, with uniformity of product.

No regrinding.

THE CYCLONE PULVERIZER COMPANY,

15 STATE STREET, NEW YORK.



QUARTZ, and all kinds of  
ORE,

MICA,  
BONE,  
DRUGS,  
SPICES.

Invaluable to Paint Manufacturers, where fine grinding is a necessity.

## Forster's Patent Rock and Ore Breaker.

FOR EITHER COARSE OR FINE CRUSHING.  
NEARLY 400 IN USE.

FOR  
MINES,  
RAILROADS  
AND  
MACADAM.



Does the work of any other BREAKER with but ONE-THIRD the power and one-half the expense of keeping in repair.

Totten & Hogg  
IRON & STEEL  
Foundry Co.,  
Pittsburg, Pa.

Only Manufacturers.

CORRESPONDENCE  
SOLICITED.

### COPPER SMELTING

ITS HISTORY AND PROCESSES.

BY HENRY HUSSEY VIVIAN, M. P.

PRICE, \$2.

An extremely valuable and very scarce work.

PUBLISHED BY

THE SCIENTIFIC PUBLISHING CO.

27 Park Place, New York.

### STANDARD BOOKS ON CIVIL ENGINEERING.

- Tables Showing the Weight of Different Lengths of Round, Square, Flat, Bar, and Cast Iron. By S. Penn and A. W. Ryberg. 8vo. London, 1889.....\$0.80
- Testing Machines: Their History, Construction and Use. By Arthur V. Abbott..... 50
- Text-Book on Roofs and Bridges. Part I. Stresses in Simple Trusses. By Professor Mansfield Merriman. 8vo..... 2.50
- Text-Book on the Mechanics of Materials and of Beams, Columns and Shafts. By Mansfield Merriman, C. E. 8vo..... 2.00
- Key to the Text-Book of Mechanics of Materials, etc. 8vo..... 50
- The "Schwedler Bridge," a Comparison of the various Forms of Girder Bridges, showing the advantages of the "Schwedler Bridge," together with an Elucidation of its Theoretical Principles, being a Paper read at the Institution of Civil Engineers, and to which the Council awarded a Miller Prize. By W. Beswick Myers. Plates. 8vo..... 1.00
- Theory and Calculation of Continuous Bridges. By Mansfield Merriman, Ph.D..... 50
- Theory and Practice of Surveying. Designed for the use of Surveyors and Engineers generally, but especially for the use of Students in Engineering. By J. B. Johnson. Illus. 8vo..... 3.50
- Theory of Arches. By Professor W. Allan. 18mo.. 50
- Theory of Deflections and of Latitudes and Departures. With special applications to Curvilinear Surveys, for Alignments of Railway Tracks. By Isaac W. Smith, C. E. Illus. 16mo, morocco, tucks..... 3.00
- Theory of Iron Roof and Bridge Construction. By Prof. Ritter, Ph.D. Translated from third German edition by Lieut. H. R. Sankey, R. E. 495 diagrams, 8vo..... 6.00
- Theory of Solid and Braced Arches. By William Cain, C. E..... 50

SCIENTIFIC PUBLISHING CO.,  
27 PARK PLACE, NEW YORK.

## WARDWELL STONE CHANNELING

### AND QUARRYING MACHINE

Will pay for itself in a short time in the reduced cost of getting out Stone. Has no equal for

EFFICIENCY

AND

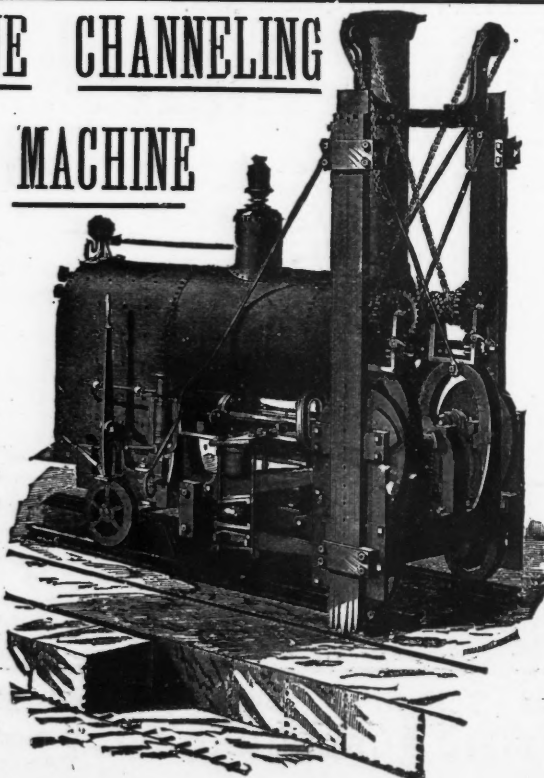
ECONOMY

of operation. Pronounced by those who have used it, the best machine for the purpose in the world.

Send for Illustrated Catalogue, with full descriptions and letters from parties now using the machines.

STEAM STONE CUTTER CO.,

Rutland, Vermont.





# NEW GRIFFIN MILL.

"FOUR TONS EVERY HOUR."

From  
G. H. NICHOLS & CO., of New York.

LAUREL HILL, L. I., N. Y., Feb. 15, 1890.

MESSRS. BRADLEY FERTILIZER COMPANY.

Dear Sirs:

I am very much pleased with our Griffin Mill. It runs beautifully and we easily grind four tons (of S. C. Phosphate) every hour we run. We have just ground 37 tons 400 pounds in 9 hours, all being accurately weighed. Our arrangements are such that we know every hour just the amount ground.

The mill does not vibrate at all, and heats nowhere. I cannot speak too highly of the mill in general and of its new and important principle, the mode of making the roll travel around the ring in such a manner that the face of the roll is always parallel with the face of the ring. This happy thought of Griffin's has placed this mill so far ahead of others that a comparison between them and this seems to me quite absurd.

For a given output, the sum of the expenses due to first cost, power, wear, and labor, is shown in the New Griffin Mill to be so far below that of any other mill on the market today that I shall expect it to create quite a revolution in grinding hard substances, not only in the dry but in the wet way. It is certain to replace the stamp mill.

Yours respectfully,

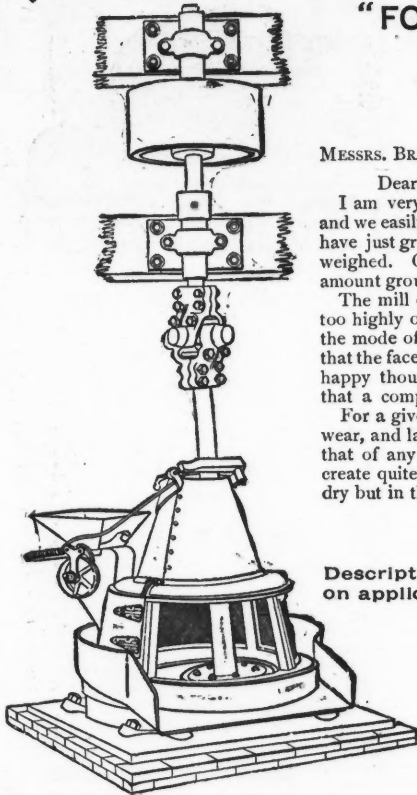
(Signed) J. B. F. HERRESHOFF, *Supt.*

Descriptive Circulars and full information furnished on application to

## BRADLEY FERTILIZER CO.,

Manufacturers and General Agents,

27 Kilby St., Boston, Mass.



## SAMUEL L. MOORE & SON'S CO.,

Established 1854. Incorporated 1886.

### MACHINE SHOP AND FOUNDRY,

Elizabethport and Centreville,

NEW JERSEY.

Railroad Castings a Specialty.

Full Line of Patterns for

Copper and Zinc Smelting Furnaces

Chemical Works, Sulphuric,  
Nitric, and Muriatic  
Acid Plants.

PYRITES BURNERS.

EITHER LARGE ORE OR FINES.

Improved Regulus Metal Valve for Acid.

Steam-Engines, Shafting, Pulleys, Mill Gearing and  
Crushers, Dick's Punches and Shears, and all kinds of  
Machinery built at short notice.

Samuel L. Moore, Pres.

Douglass G. Moore, Vice-Pres.

M. F. Moore, Treas. and Secy.

Front, Marshall and Franklin Sts.,

ELIZABETH, N. J.

## ORE WASHERS

Thomas System Improved,

MANUFACTURED BY

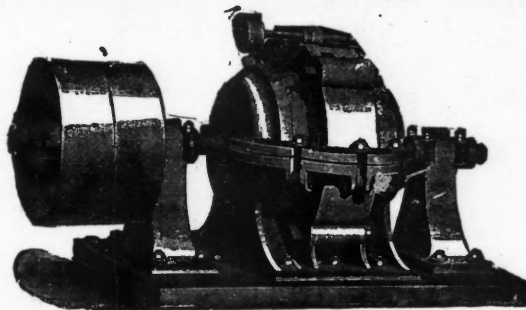
HAUCK & COMSTOCK,

MECHANICSBURG, PA.

Subscribe for Howe's Metallurgy of Steel. \$10.

# THE ONLY SUCCESSFUL MILL FOR FINE PULVERIZING.

All kinds of Ores, Phosphate Rock, Cements, Limestone, Graphite, Mica, etc., etc., reduced to Fine Powder at Half the Cost of that by Buhr Stones.



Records of six years' Constant Use. Blast Mills, Screen Mills, Small Mills for Sampling. Finished product, no tailings. Capacity up to 3 tons per hour.

## FRISBEE-LUCOP MILL COMPANY,

145 Broadway, New York.

59 First Street, San Francisco, Cal.

## GATES ROCK & ORE BREAKER.



CAPACITY IN TONS OF 2,000 POUNDS.

Size 0.....	2 to 4 tons per hour.	Size 5.....	25 to 40 tons per hour.
" 1.....	4 to 8 " " "	" 6.....	30 to 60 " " "
" 2.....	6 to 12 " " "	" 7.....	40 to 75 " " "
" 3.....	10 to 20 " " "	" 8.....	100 to 150 " " "
" 4.....	15 to 30 " " "		

Passing 2 1/4 in. ring, according to character and hardness of material.

Great SAVING in POWER. Adjustable to any Degree of Fineness.

The principle involved in this Breaker acknowledged to be the greatest success ever introduced into Stone Breaking Machinery.

The Gates Breaker has made more railroad ballast and road metal than all other kinds of breakers combined.

UNIVERSALLY ADOPTED BY MINING COMPANIES. MANY HUNDREDS USED BY RAILWAY COMPANIES.

Will furnish a thousand references from Contractors, Street Superintendents, Mines, Cement Manufacturers, etc., etc.

ALSO MANUFACTURE

### THE CORNISH ROLLS PULVERIZER

Fine Crushing Plants, Concentrators and other Mining Machinery.

Address for CATALOGUE,

GATES IRON WORKS, 50<sub>B</sub> So. Clinton St., Chicago.

73a Queen Victoria Street, London. 215 Franklin Street, Boston, Mass. 12 Cortlandt Street, New York.

## THE RUSSELL PROCESS.

For information concerning this process for the reduction of Ores containing precious metals and terms of license, apply to

THE RUSSELL PROCESS CO. New Haven, Conn.

### THE LIXIVIATION OF SILVER ORES

WITH HYPOSULPHITE SOLUTIONS.

By CARL A. STETEFELDT.

Illustrated. Price, \$5.00 in Cloth.

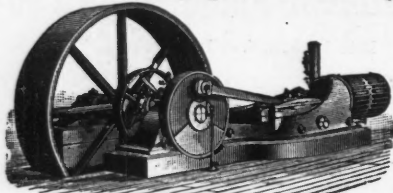
The only treatise on this new and important department of metallurgy.

Every one interested in the treatment of silver and gold ores should read it.

Published by the SCIENTIFIC PUBLISHING CO., 27 Park Place, New York.

**New Tangeye Buckeye Automatic Cut-off Engines**

In Use, Over 1,000.  
25 to 2,500 H. P.

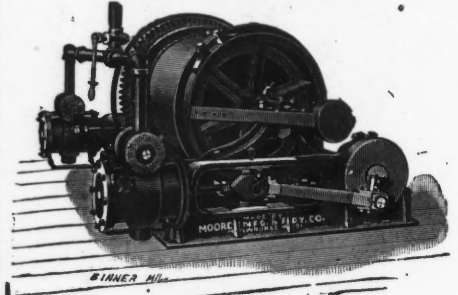


These engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and superior regulation guaranteed. Self-Contained Automatic Cut-off Engines 12 to 100 H. P. for driving Dynamo Machines a specialty. Illustrated Circulars, with various data as to practical Steam Engine Construction and performance, free by mail. Address

**BUCKEYE ENGINE CO., Salem, Ohio.**  
10 Telephone Bldg., N. W. ROBINSON, 154 Wash'ton St., Chicago, Ill.  
18 Cortlandt St., N. Y., ROBINSON & CARY, St. Paul, Minn.  
**KENSINGTON ENGINE WORKS, LIMITED, PHILADELPHIA.**  
Sole Licensees and Mfrs. for New Jersey (South of Trenton), E. Pennsylvania, Delaware, Maryland and Virginia

**Moore Mfg. & Foundry Co**

MILWAUKEE, WIS., U. S. A.



Paper Friction Hoisting Engines AND

**Hoisting Drums**  
A full line of Coal and Ore Handling Machinery. Estimates furnished on complete plants.  
**Pile Driving and Mining Engines.**  
Send for Illustrated Catalogue.

**IMPROVED HOISTING ENGINES**

FOR MINES.

1, 2, or 4 Drums, with Reversible Link Motion or Pat. Improved Friction.

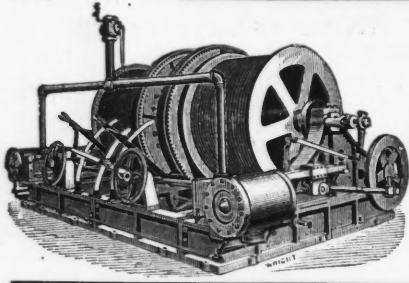
MADE ONLY BY THE

**LIDGERWOOD MANUFACTURING CO.**

96 LIBERTY ST., NEW YORK.

34 and 36 West Monroe Street, Chicago.  
197 to 203 Congress Street, Boston.

AGENTS: Moses P Johnson, St. Louis, Mo.  
Hendrie & Bolthoff Man'g Co., Denver, Colo.  
Frazer & Chalmers, Salt Lake City, Utah; Helena, Mont.

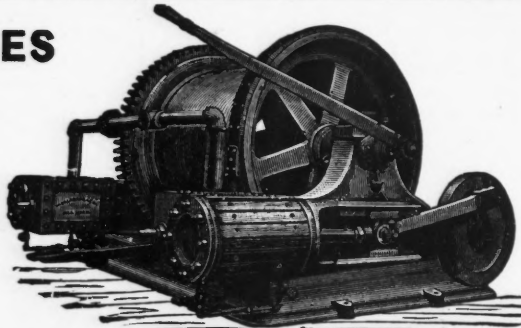


**"BACON'S" WINDING ENGINES**

FOR

Mines, Inclines, Quarries, AND EVERY POSSIBLE DUTY, WITH FRICTION DRUMS or LINK MOTION. Complete Hoisting and Mining Plants a Specialty.

**COPELAND & BACON,**  
85 Liberty St, New York.  
535 Arch St., Philadelphia, Pa.



**THE JEFFREY COAL MINING MACHINE and HAULAGE SYSTEM**

ARE A COMPLETE SUCCESS.

We have now in operation two plants at Jobs, O.; two plants at Shawnee, O.; one plant at Thurmond, W. Va.; one plant at Cannelton, Pa.; two plants at Fairmont, W. Va.; one plant at Spillman, W. Va.; others under construction. Correspondence solicited.

**JEFFREY MFG. CO., 162 E. First Ave., Columbus,**

**ELECTRIC**

JUST ISSUED FROM THE PRESS!

The Greatest Work ever Published on the Subject!

**"THE METALLURGY OF STEEL."**  
BY H. M. HOWE.

This book has been produced by the Scientific Publishing Company, regardless of expense, in a manner which is suitable to the importance of the subject, the prominence of the author, and to the fact that it has already taken its place as the standard work on steel. Profusely illustrated, printed on fine heavy paper, bound in cloth, gilt.

PRICE, \$10.

Subscribe at once before the edition is out of print.

(See subscription form on page XXI.)

**LUDLOW VALVE MFG. CO.**

Office and Works:  
938 to 954 RIVER STREET  
AND  
67 to 83 VAIL AVENUE  
TROY, N. Y.

**VALVES** — Double end single Gate, 1/2 in. to 48 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam and Oil, Yard and Wash Hydrants.

Send for circular.



ALSO CHECK VALVES, FOOT VALVES AND FIRE HYDRANTS.

**WEST POINT BOILER WORKS**

Boilers with our Patent Eclipse Manhole and Plate in each.

And all kinds of Sheet Iron Work made to Order.

**R. Munroe & Son**  
23rd & Smallman Sts., Pittsburgh, Pa.

**ENGINEERS,**

Send to Walter G. Kraft, Chicago, U. S. A., for a copy of

**ZWICKER'S PRACTICAL INSTRUCTOR,**

the most complete work on questions and answers published. Mailed on receipt of price. Only \$1.

SEND FOR CIRCULARS.

**THE STEAMSHIP,**

A NEW MONTHLY JOURNAL OF

Marine Engineering and Steamship Building

JOHN LOCKIE, C. E., EDITOR AND PUBLISHER.

2 Custom-House Chambers, Leith, Scotland

Subscriptions for the United Kingdom 6s. per year for foreign countries 8s. per year.

**The MINING CODE of the REPUBLIC of MEXICO**

By RICHARD E. CHISM, Mining Engineer.

Price, \$1.00.

Translated from the Official Edition in the original Spanish.

Published by the SCIENTIFIC PUBLISHING COMPANY 27 Park Place, New York.

**EDDY STRAIGHT-WAY VALVES**

(Brass, Iron Quick Opening)

**FIRE HYDRANTS.**

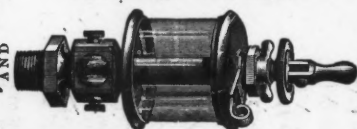


**THE EDDY VALVE CO.,** Waterford, N. Y.

JACOB JAMER, 84 John St., New York Agents.

THE LATEST AND BEST.

For Dynamos AND



Steam Engines.

POWELL'S PATENT SIGNAL SIGHT FEED OILER, LUBRICATORS, STAR-VALVES.  
**THE W. M. POWELL CO.,**  
80, 82 and 84 Plum Street, CINCINNATI, O.





J. M. ALLEN, PRESIDENT.  
W. B. FRANKLIN, VICE-PRESIDENT.  
F. B. ALLEN, 2D VICE-PRESIDENT.  
J. B. PIERCE, SECRETARY AND TREASURER



**CORLISS ENGINES**  
ROLLING MILL  
HEAVY HOISTING  
HORIZONTAL  
RETURN  
TUBULAR  
BOILERS  
HYDRAULIC  
VERTICAL  
LOCOMOTIVE  
and SCOTCH.  
Complete Mine, Tunnel, Quarry and Furnace Plants.  
MOUNT SAVAGE FIREBRICK.  
F. W. IREDELL, 10 PARK PLACE, N. Y.

**THE COLLIERY GUARDIAN**

AND JOURNAL OF THE COAL AND IRON TRADES.  
Published every Friday. Per annum, post free, to U. S. A. and Canada, £1 7s. 6d., or \$6.60.  
THE RECOGNIZED ORGAN OF THE COAL AND IRON TRADES. Established 1869  
H. KIRBY ATKINSON, F.G.S., Manager  
Office: Essex St., Strand, London, W. C.

**Electric Bells, and all about them.**

-S. R. BOTTOME. 196 pages, 100 illustrations.  
In this volume the whole subject of Electric Bells is explained in simple language. Any one with an English education can master it in a few hours. The illustrations are great helps to understanding the descriptions. The work begins by showing how the force applied to Electric Bells is produced, and goes on to tell how to arrange every kind of signal which can be given by electricity, as well as all needed information that belongs to the subject.  
It is just the book needed by mechanics who have occasional calls upon them to mount bells, and Bell-Hangers, Locksmiths, etc., who are not yet acquainted with all the uses of the Electric Bell. Cloth.....75 cts.

THE SCIENTIFIC PUBLISHING CO.,  
27 Park Place, New York.

TO MANUFACTURERS  
OF  
**Mining Machinery.**

The ENGINEERING AND MINING JOURNAL is the leading mining paper in the world, and is the best medium to put manufacturers of machinery in communication with buyers.

**ADVERTISE.**



**"FISHKILL" CORLISS ENGINE.**  
EFFICIENT, DURABLE, ECONOMICAL

Endorsed by eminent engineers and leading manufacturers.  
ALSO BOILERS, SHAFTING, PULLEYS, HANGERS, GEARING.  
FISHKILL LANDING MACHINE CO., Fishkill-on-Hudson, N. Y.



Engine and Boiler TRIMMINGS.  
Steam Jet Pumps  
Gate Valves.  
IRON PIPE AND FITTINGS.  
CINCINNATI, O. and RICHMOND, VA

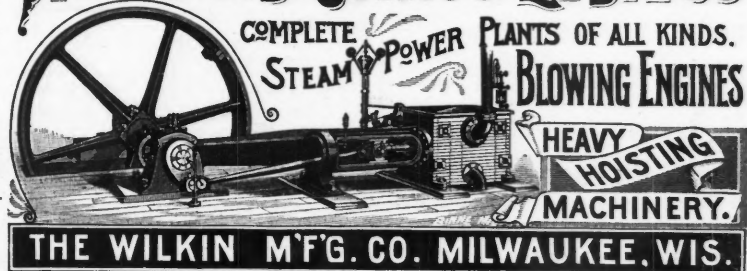
**THE CHESTER FOUNDRY AND MACHINE COMPANY.**  
CHESTER, PA.

Builders of CRANES of every type and capacity, Steam DERRICKS, MARINE, PUMPING, BLOWING and REVERSING MILL-ENGINES, CORLISS ENGINES and MINING MACHINERY, COTTON COMPRESSES, SUGAR MILLS, Hydraulic Presses and Machinery, Heavy Cut and Cast Gearing, Sheaves Hoisting Engines, Boilers and Special Machinery of every description.  
CASTINGS in dry or green sand and loam up to 40 tons weight; cast iron work for blast furnaces, acid plants, rolling mills, etc.

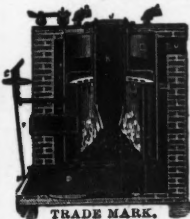
**ALLENTOWN FOUNDRY & MACHINE CO.**  
ALLENTOWN, PA.

ALL KINDS OF MACHINERY  
FOR MINING AND WASHING HEMATITE ORES;  
ORE JIGS, PUMPS, ENGINES AND BOILERS;  
FOR MANUFACTURING AND MINING PURPOSES.  
PAINT, CEMENT AND BARK MILLS;  
POWDER MILL MACHINERY;  
LIGHT AND HEAVY MILL GEARING;  
PULLEYS, HANGERS AND SHAFTING;  
EUREKA TURBINES, BLAST FURNACE WORK, SUCH AS BELLS, HOPPERS, HOT BLAST STOVES, TUYERE JACKETS, ETC.  
LIGHT AND HEAVY CASTINGS  
ROUGH AND FINISHED TO ORDER.  
SEND FOR ESTIMATES AND PRICES.

**Nordberg-Corliss Engines**

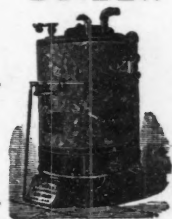


**THE DUNNING PATENT WROUGHT-IRON BOILER**



WITH SELF-FEEDING COAL MAGAZINE IS THE BEST FOR  
Low Pressure Steam or Hot-Water Heating  
And insures a warm House night and day. Over 15,000 in use. Keeps steam up constantly. Also Steam Engines and Boilers of all kinds and Machinery generally.

MANUFACTURED AT THE  
**NEW YORK CENTRAL IRON WORKS,**  
40 EXCHANGE STREET, GENEVA, N. Y.  
New York Office, - - - 36 Park Place.  
Send for Illustrated Catalogue, with full description.



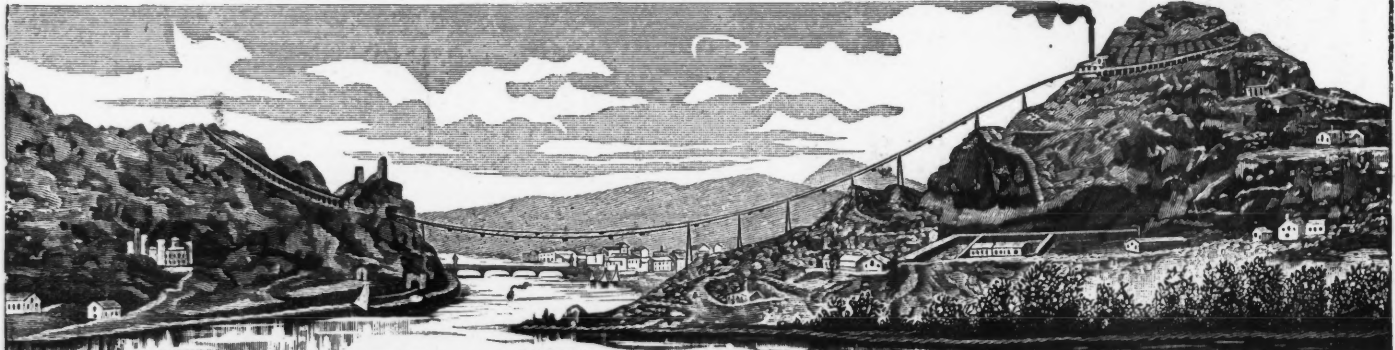
# IMPROVED WIRE ROPE TRAMWAYS,

WALKER'S PATENT DIFFERENTIAL DRUMS FOR ROPE HAULAGE, CLIP PULLEYS and COTTON ROPE DRIVING MACHINERY

**HAULING MACHINERY,**  
For Main and Tail Rope, Endless Rope or Chain.  
**AERIAL ROPEWAYS,**  
For Carrying Minerals in Mountain Districts.

**MINE VENTILATING FANS,**  
Giving better results than any other Fan in use.  
**HAND BLOWING FANS,**  
For Ventilating Single Headways or Tunnels.

**WIRE ROPE** of an Improved Make and Quality. **STEEL MINE CARS, STEEL AND IRON SHEAVES, PULLEYS, ETC.**  
MACHINE MOLDED GEARING AND MINING MACHINERY A SPECIALTY. CORRESPONDENCE SOLICITED.

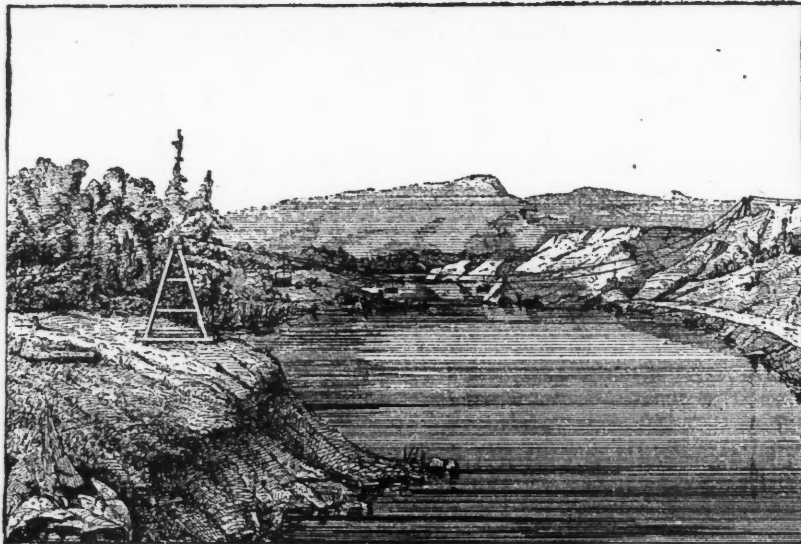


**THE WALKER MANUFACTURING CO. CLEVELAND, OHIO. U.S.A.**

## CALIFORNIA WIRE WORKS.

9 FREMONT STREET, SAN FRANCISCO, CAL.

Manufacturers of Flat and Round Wire Rope



For Cable Railways, Hoisting & Mining Purposes

### HALLIDIE'S PATENT WIRE ROPEWAY

Simplest and Most Economical Means of Transportation.  
Send for Illustrated Catalogue.



#### THE COMPANY PAYS THE FREIGHT

*(Send for circulars and see how far.)*  
On their **COMMON SENSE NEW STEEL WHIM**. All complete for \$125.00. No cog wheels or clutches to break. Ninety percent of this Whim is wrought iron and steel and will spring or bend before breaking, and besides can be repaired at any blacksmith shop, should breakage occur, thus obviating the necessity of sending away hundreds of miles sometimes and waiting a week for repairs. It can be packed anywhere a jack can go, the heaviest piece weighing but 100 lbs Total weight 650 lbs. It is just the Whim to open up mines in isolated camps, where steam power and experienced men are hard to get. With one horse 25 tons can be hoisted 300 feet on each shift. It is just as safe and reliable as an engine. Over 700 in use, some running six years without one dollar's expense. We make two, four and eight horse power Whims for heavy mining, also Derrick Whims and everything pertaining to horse power hoisting. Buy a good Whim and put more money into underground work is the way to open up a mine and make it pay. For circulars and cuts giving full information write to **THE WHIM CO., Denver, Colo.** (Mention this paper)

POWER & CO., Helena, Agents for Montana; RISDON IRON AND LOCOMOTIVE WORKS, San Francisco. Agents for the Pacific Coast.

A Catalogue of Scientific and Technical Books forwarded on application.  
The Scientific Publishing Co., 27 Park Place, N. Y.

### JUST PUBLISHED. THE MODERN LAW OF RAILWAYS, AS DETERMINED BY

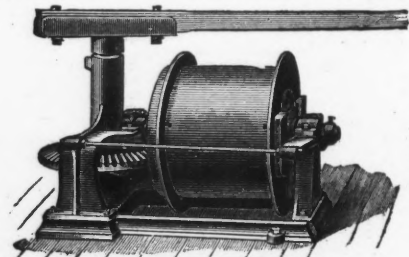
The Courts and Statutes of England and the United States,

BY  
**CHARLES FISK BEACH, JR.**

In Two Volumes, Price \$6.

For Sale by The Scientific Publishing Company,  
27 Park Place, New York.

### THE DAVIS HORSE POWER HOISTER FOR MINES, QUARRIES AND CONTRACTORS



The Hoister is built entirely of iron and steel and is the best and handiest in the market. The drum is driven by friction clutch and the load can be started slowly from the bottom with the horse in full motion. A FEATURE NOT POSSESSED BY ANY

#### OTHER HORSE HOIST.

These hoisters are built in five sizes. Capacity of machine No. 1, with one horse and single line 800 pounds, 75 feet per minute. Price complete with sheaves, \$100.

**F. M. DAVIS, Denver, Colo.**

### PRACTICAL Electrical Measurement,

(55 Illustrations.)

BY J. SWINBURNE.

One Volume, 8vo. Cloth.....Price, \$1.75

FOR SALE BY THE  
**SCIENTIFIC PUBLISHING COMPANY,**  
27 Park Place, New York.

## THE UNION WIRE ROPE TRAMWAY CO.,

117 LIBERTY STREET, NEW YORK,

MANUFACTURES AND ERECTS

TRAMWAYS AND QUARRY PLANTS AND INTRODUCES UNDERGROUND HAULAGE SYSTEMS;



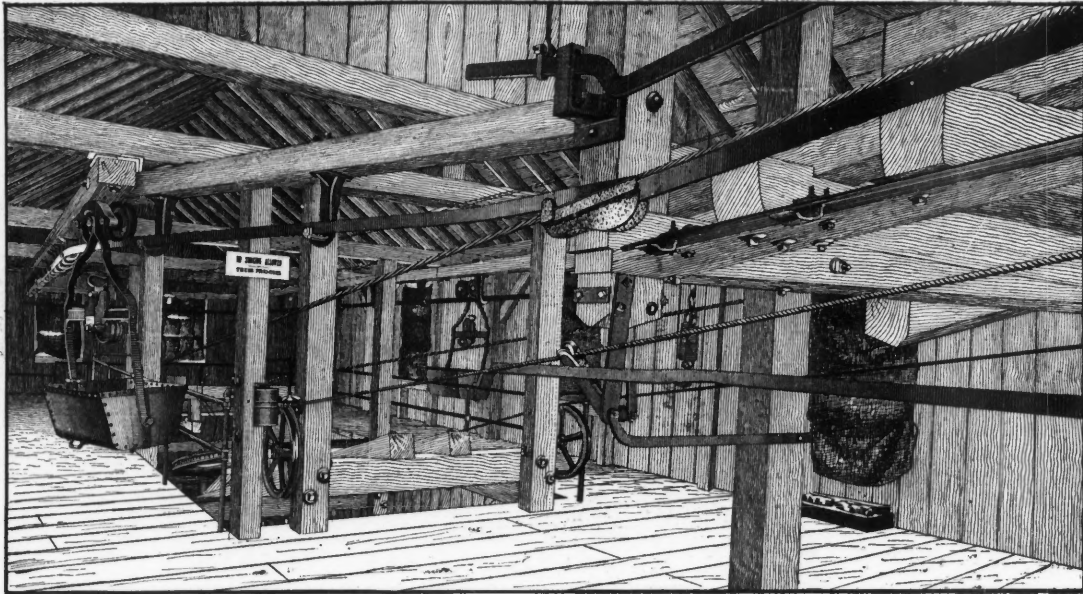
# WIRE ROPE TRAMWAYS

(OF THE BLEICHERT IMPROVED PATENT SYSTEM).

THE BEST AND MOST ECONOMICAL METHOD OF TRANSPORTATION.

Over 500 Lines already in Successful Operation, from 100 yards to 12 miles in length, and from 50 to 1,500 tons daily capacity.

ALSO MANUFACTURERS OF THE IMPROVED  
**LOCKE PATENT HOIST & CARRIAGE**  
FOR  
QUARRIES, OPEN-CUT MINES, STRIPPING, ETC.



SURVEYS MADE AND PLANS FURNISHED  
AT MODERATE RATES  
BY  
OUR OWN STAFF OF COMPETENT ENGINEERS

Wire Rope Tramway (Bleichert System) built by the Trenton Iron Company, of Trenton, N. J., for the Bi-Metallic Mining Company, of Granite, Mont. Length of line, 9,760 feet; daily capacity, 200 tons. View of interior of discharge terminal.

This cut is changed weekly.

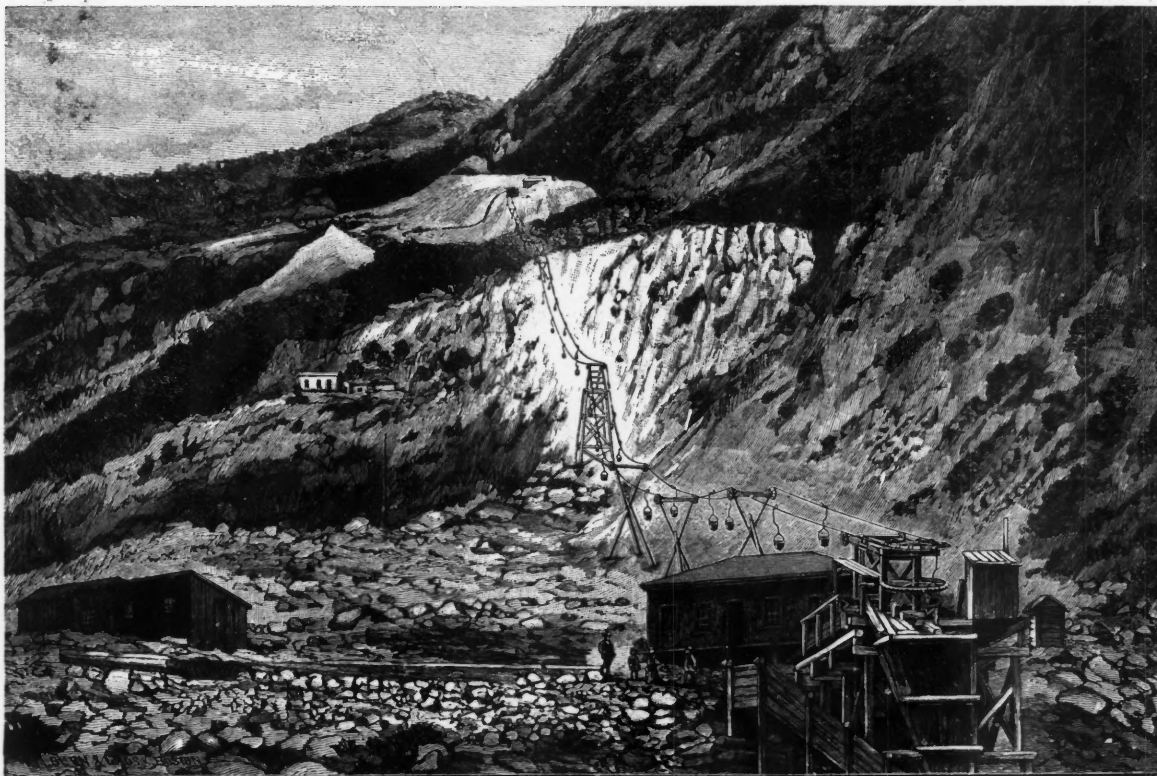
Send for Illustrated Pamphlet to

COOPER, HEWITT & CO., 17 Burling Slip, New York. or TRENTON IRON COMPANY, Trenton, N. J.

GENERAL WESTERN AGENTS: FRASER & CHALMERS, Chicago, Ill.

# HUSON WIRE ROPE TRAMWAY.

TESTED BY USE.



Can Give ABUNDANT REFERENCES AS TO EFFICIENCY

SIMPLEST AND CHEAPEST DEVICE FOR TRANSPORTATION OF ORES.

**C. W. BADGLEY & COMPANY,**

**DENVER, COLO.**

CORRESPONDENCE SOLICITED.

**LEHIGH & WILKES-BARRE COAL CO.,**  
MINERS AND SHIPPERS OF  
Wilkes-Barre Coal (from the Baltimore Vein),  
Honey Brook Coal (Lehigh),  
Plymouth Coal (Red Ash).  
GENERAL OFFICES:  
119 Liberty Street, New York.

**WHITNEY & KEMMERER,**  
Exclusive Agents, at Tide-Water, for the celebrated  
WHITE AND RED ASH COALS.  
Upper Lehigh, Sandy Run, Hazle Brook,  
Spring Brook, Harleigh, Red Ash,  
Florence, and Fairmount.  
OFFICES: (137 South Second Street, Phila.  
Room 18, Trinity Building, N. Y.  
Mansion House, Mauch Chunk, Pa.)  
**ALBERT DARLING,**  
Sales Agent for New York and New England.

**FREDERIC A. POTTS & CO.,**  
WHOLESALE COAL MERCHANTS.  
OLD COMPANY'S LEHIGH AND LUZERNE  
Shipped from Elizabethport, N. J.  
WILKES-BARRE AND PLYMOUTH RED ASH  
Shipped from Port Jobston, N. J.  
JERMYN, FROM LACKAWANNA REGION,  
Shipped from Hoboken, N. J.  
Offices: No. 26 Broadway, New York.  
PROVIDENCE, R. I., NEW HAVEN, CONN.,  
25 Westminster St. 116 Church St.  
BOSTON, MASS., 26 Exchange Place.

**WARD & OLYPHANT,**  
21 Cortlandt Street, 30 Kilby Street,  
New York City. Boston, Mass.  
**COAL.**  
Delaware & Hudson Canal Co.'s Lackawanna. Also  
Lehigh, Cumberland, and Clearfield.  
BOSTON AGENTS, DARROW, MANN & CO.

**COX & ROCKWELL,**  
Rooms 119 and 120, 1 Broadway, New York.  
ANTHRACITE AND BITUMINOUS COALS.  
Agent for Middle Lehigh Coal, mined from the Hazleton  
and Buck Mountain Veins.

**STICKNEY, CONYNGHAM & CO.,**  
AGENTS FOR  
Franklin Coal (of Lykens Valley), Susquehan-  
na (White and Red Ash), Kingston (White  
Ash), Cameron, Shamokin, Panoast,  
Wilkes-Barre, Gaylord (White and Red  
Ash), and Eureka Bituminous Coals.  
1 Broadway, New York. 19 Congress St., Boston.  
308 Walnut St., Philadelphia.

Shipped by John J. Shonk & Son.  
**HADDOCK'S PLYMOUTH COAL**  
SOLD BY  
**HADDOCK, SHONK & CO.**  
GENERAL OFFICE,  
No. 1 BROADWAY, NEW YORK.

**COXE BROS. & CO.**  
Dress Creek, East Sugar Loaf, and Beaver  
Meadow Lehigh Coals.  
General Office: Room 18, No. 120 Broadway,  
Equitable Building, New York.  
Boston, 70 Kilby Street; Philadelphia, 206 Walnut  
Street; Chicago "The Rookery"; Buffalo, Coal and  
Iron Exchange; Milwaukee, 91 Michigan Street.  
**E. B. ELY, General Agent.**

**LEHIGH VALLEY COAL CO.**  
MINERS AND SHIPPERS OF  
Spring Mountain, Spring Brook, Jeddo, High-  
land, Logan and Packer Lehigh Coals.  
**WYOMING COAL.**  
General Office, South Bethlehem, Pa.  
**WM. H. SAYRE, General Agent.**  
L. J. BARETT, Agent, No. 1 Broadway, New York.  
WILLIAM UHLER, Southern Sales Agent,  
No. 230 South Third St., Philadelphia.  
JOS. H. HORTON, General Northern and Western  
Sales Agent, cor. Main and Seneca Sts., Buffalo  
Boston Agency, No. 70 Kilby St.  
Chicago Agency, Nos. 90 & 92 Dearborn St.

IF YOU WANT  
**Scientific or Technical Books**  
WRITE FOR CATALOGUE TO THE  
**SCIENTIFIC PUBLISHING CO.**  
37 Park Place, New York.

**DELAWARE & HUDSON CANAL CO.,**  
MINERS AND SHIPPERS OF  
**Lackawanna Coal.**

SHIPPING PORTS:  
RONDOUT, N. Y. WEEHAWKEN, N. J.  
BY RAIL FROM SCRANTON, PA.

PRINCIPAL OFFICES FOR SALE OF COAL:  
21 CORTLANDT ST., NEW YORK CITY. SCRANTON, PA

**CASTNER & CURRAN,**  
SHIPPERS OF  
ECLIPSE and CAMBRIAN LEHIGH, KASKA WILLIAM Free-Burning White Ash.  
General Tide-Water Agents Pocahontas Coal Co., POCAHONTAS FLAT-TOP SEMI-BITUMINOUS COAL,  
Of the Norfolk & Western Railroad.  
No. 308 Walnut St. PHILADELPHIA, PA. No. 70 KILBY St. BOSTON, MASS.  
No. 1 Broadway. NEW YORK. No. 36 Main St. NORFOLK, VA.

**CONSOLIDATION COAL COMPANY, OF MARYLAND,**  
MINERS AND SHIPPERS OF THE SUPERIOR  
"GEORGE'S CREEK BIG-VEIN CUMBERLAND COAL,"  
For Railroad, Steamship, and General Use.  
OFFICE, 231 E. GERMAN ST., BALTIMORE. ROUSSEL & HICKS, SALES AGENTS, 71 BROADWAY, N. Y

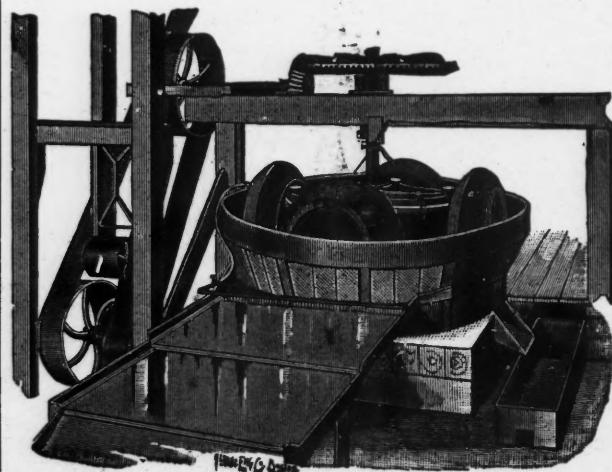
**BERWIND-WHITE COAL MINING CO.,**  
MINERS AND SHIPPERS OF THE  
**EUREKA BITUMINOUS COAL.**  
OFFICES: Bullitt Building, PHILADELPHIA, 55 Broadway, NEW YORK. 19 Congress St., BOSTON, MASS. SHIPPING WHARVES: PHILADELPHIA, Greenwich Point, NEW YORK. South Amboy, N. J. BALTIMORE, Canton Piers.

HENRY LOVERIDGE, President. H. B. NEDHAM, Secy. and Treas.

**MARYLAND COAL CO.,**  
MINERS AND SHIPPERS OF

**George's Creek Cumberland Coal**  
OF THE BEST QUALITY,  
No. 35 BROADWAY, NEW YORK.  
Shipments from Baltimore, Philadelphia and South Amboy.

**Wiswell Ore Pulverizer and Amalgamator Combined.**



The following testimonials from Mr. Marsden, of the firm of Farrel & Marsden, manufacturers of stone-breakers and ore-crushers, Ansonia, Conn., speaks volumes for the Wiswell Mill:

Wiswell Electric Mining Machinery Co.:

GENTLEMEN: After carefully inspecting your mill and seeing it in operation, I do not hesitate to say that it is one of the best, if not the best pulverizer, and most complete gold-saving machine I have ever seen.

Please accept congratulations for your success.  
S. L. MARSDEN.

**We Furnish a Complete Mill for \$2500**

Delivered on Board Cars.  
For further information, address

**WISWELL ELECTRIC MINING MACHINERY COMPANY,**

A. A. REEVE, Treas. 4 Post-Office Square, Boston, Mass.

**MINING COMPANIES AND MINE OWNERS**  
WISHING TO REACH INVESTORS SHOULD ADVERTISE IN  
**ENGINEERING AND MINING JOURNAL.**



# THE ENGINEERING AND MINING JOURNAL

Vol. XLIX., No 26.

NEW YORK, SATURDAY, JUNE 28, 1890.

PRICE 10 CENTS.

PERFORATED METALS FOR MINING SCREENS COAL & ORE SEPARATORS, REVOLVING AND SHAKING SCREENS, JIGS & STAMPS, BATTERIES, MILLING & MINING MACHINERY, PERFORATED SHEET METALS FOR ALL KINDS OF MILLING MACHINERY, CHICAGO, MANUFACTURERS OF



**WIRE ROPE.**  
Best Crucible Steel and Iron Kept in Stock. Any desired lengths furnished at once. Also STEEL SWITCH ROPES. JOHN W. MASON & CO., 52 DEY ST., NEW YORK.

## ST. LOUIS SAMPLING & TESTING WORKS,

1,225 & 1,227 Spruce St., St. Louis, Mo.



COMPLETE PLANT FOR SAMPLING AND TESTING ORES, Etc.,

On a Commercial Scale, by any Process.

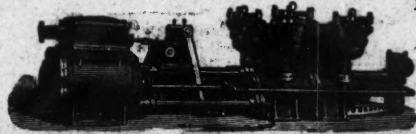
ASSAYING and CHEMICAL WORK in ALL BRANCHES.

W. B. POTTER, E.M., Manager; HENRY J. WILLIAMS, Chemist; ELIOT C. JEWETT, Assayer; P. T. NEWITT, Foreman; H. A. WHEELER, E.M., specialty: Concentration; ARTHUR TRACHER, E.M., specialty: Milling.

## WORTHINGTON MINE PUMPS

SPECIALLY ADAPTED FOR

WORKING UNDER THE HEAVIEST PRESSURES



HENRY R. WORTHINGTON NEW YORK

Branch Offices:

Boston, Philadelphia, Chicago, St. Louis, St. Paul, San Francisco

CORRESPONDENCE SOLICITED

### AIR COMPRESSORS,

Most Economical, Compound, Duplex or Single.

### HOISTING ENGINES,

Link Motion and Friction. Powerful, Durable.

### ROCK DRILLS AND PUMPS.

Morris Co. Machine and Iron Company, DOVER, N. J.

### FEED WATER HEATERS.

## The Wainwright Mfg. Co.

OF MASS.,

34 Oliver St., Boston.

## FULTON IRON WORKS

Hinckley, Splers & Hayes, San Francisco.

## Milling & Mining Machinery

SEE PAGE XXVI.

### STEEL RAILS.

Track Material, Locomotives and Cars For Mines and Industrial Enterprises, all on installment or "car trust" plan. Payment 25 per cent. cash, balance monthly—24, 36 or 60 months.

THE STEEL RAIL SUPPLY CO.,

Humphreys & Sayce, Managers. 10 Wall St., N. Y.

### Pressed Wrought-Iron Open Turnbuckles.



CLEVELAND CITY FORGE & IRON COMPANY Cleveland, Ohio.

NOW READY.

## HOWE'S METALLURGY OF STEEL.

PRICE, \$10.

THE SCIENTIFIC PUBLISHING CO., Publishers, 27 Park Place, New York.

## DIAMOND PROSPECTING DRILLS

## QUARRYING MACHINERY.

See Card of DIAMOND PROSPECTING CO., page xxix

**M**INING, **M**ILLING, **M**ARINE **M**ACHINERY OF EVERY KIND.

**U**NION **I**RON **W**ORKS, S.F. See Page xxvii

## MASON REGULATOR CO.

BY MEANS OF OUR

### PUMP GOVERNOR

On a Steam Pump you can set the speed at any number of strokes per minute, which will be maintained in spite of variation in load or steam pressure. We refer to all the pump makers.

BOSTON U.S.A.

## CLAYTON

### AIR COMPRESSORS,

Rock Drills and Mining Machinery.

For Catalogue No. 6, Estimates, etc., address

Clayton Air Compressor Works, 43 DEY STREET, NEW YORK.



## BRUSH ELECTRIC COMPANY,

CLEVELAND, O., Feb. 25, 1890.

MAGNOLIA ANTI-FRICTION METAL CO.,

74 Cortlandt Street, New York.

GENTLEMEN:—Some months ago we ordered a sample quantity of your Magnolia Metal, for the purpose of a comparative test with the best grades of other Babbitt Metals. We desired something for our Alternating Machine, which we are running at 1,125 revolutions per minute; after giving a thorough trial, we found it beyond our highest anticipation, the bearings being perfectly cool—we have found it to be the best compound for journal bearings we have ever used. We are now using it in large quantities, as you are aware, which verifies our statement that we have found it superior to all other metals we have ever put into our machines.

Yours truly, (Signed) N. S. POSSONS, Supt.

## Magnolia Anti-Friction Metal Co.,

Owners and Sole Manuf.

Main Office: New York, 74 Cortlandt Street.

Chicago Office: 41 Traders Building.

London Office: 75 Queen Victoria.



# Gems and Precious Stones OF NORTH AMERICA.

By GEORGE F. KUNZ.

Price, \$10.

This magnificent work is profusely illustrated with Colored Plates which have been pronounced masterpieces of art. As to the reading matter the critical press is quite unanimous in its commendation. No Library is complete that does not contain this great work.

### TWO CRITICAL OPINIONS:

Mr. Clarence Cook, the editor of the *Studio*, the leading art journal in New York, in the issue of April 26th, says:  
"We have received from the Scientific Publishing Company, of New York, a copy of 'Precious and Ornamental Stones of North America,' by Mr. George F. Kunz, of which we can only say at this moment that the book is a notable contribution to our knowledge of the material riches of this continent, and that merely as a piece of bookmaking it does great credit to all who have had a hand in it. The chromo-lithographic plates made for the work by Messrs. L. Prang & Co. are remarkably fine specimens of the art, brought to such perfection by this firm that nowhere in the world is work done of equal quality. As for Mr. Kunz's text, there can be nothing but praise, and his work may be cordially recommended, not only to those whose interest in the subject is confined to its scientific side, but to those who look to a book for entertainment: for here is a world of interesting facts about precious stones and their relations to mineralogy and archaeology, narrated in a straightforward, clear and lively style that can make the dinner hour and bedtime forgotten."

The *New York Sun*, in a long review of the work in its issue of April 27th, says:

"A valuable book upon a fascinating subject has been prepared by Mr. George Frederick Kunz, under the title of 'Gems and Precious Stones of North America' (The Scientific Publishing Company). It is a work both popular and scientific. It is arranged in a manner serviceable for study and reference, and is full of information calculated to interest as well as to instruct the general reader. The artistic labor expended upon the preparation of the book is deserving of high praise. It is an exceedingly handsome volume, fine in material, beautiful in typography and illustration. A series of lithographic plates, representing to us in their natural colors a number of celebrated American gems, are the work of L. Prang & Co., of Boston. They are exquisite in accuracy and finish, and deserve, doubtless, to be called, as Mr. Kunz calls them, the finest work of the kind ever published. The reader will find complete and finished information in Mr. Kunz's book. It is authoritative and captivating literature upon the subject of which it treats."

THE SCIENTIFIC PUBLISHING COMPANY, Publishers. - - 27 Park Place, New York.



Specimen of half-tone plate, made after a painting.

**F. A. RINCLER & COMPANY,**

MANUFACTURERS OF

Plates for all Printing Purposes by Various Processes,

21 and 23 Barclay Street to 26 and 28 Park Place, New York.



Our SPECIMEN BOOK of ENGRAVINGS for all ILLUSTRATIVE PURPOSES

We call your attention to our Specimen Book of Fine Illustrations, Head and Tail Pieces, Initials, etc., etc., with a view of supplying the demand for Pictures at a very reasonable cost.

These Engravings can be adapted to Illustrated Magazines, Periodicals, Books, Almanacs, Newspapers, etc.

The size of the Book is 11 x 14, 104 pages, and we shall be pleased to sell you a copy, price \$2, which amount we credit on first order for Cuts

Address all communications to

**F. A. RINGLER & COMPANY,**

21 BARCLAY STREET, NEW YORK.



NEW YORK OFFICE, 20 Nassau Street.

N. WITHERELL, Vice-President.

EDWARD BRUSH, Assistant Secretary.

GENERAL OFFICE, Kansas City, Mo.

A. R. MEYER, President and Treasurer.

R. S. TOWNE, 2d Vice-President

R. D. EVERETT, Secretary and Assistant Treas.

# CONSOLIDATED KANSAS CITY SMELTING AND REFINING CO.

PAID IN CAPITAL, \$2,000,000.

PURCHASERS OF ALL CLASSES OF  
**GOLD, SILVER, LEAD AND COPPER ORES**  
BULLION AND FURNACE PRODUCTS.

REFINERS OF GOLD AND SILVER, COMMON AND CORRODING PIG LEAD, OUR BRAND OF  
"KANSAS" AND "K, C, S. & R. CO." PIG LEAD THE MOST RELIABLE IN THE MARKET,

SALES OFFICE for all points on the Atlantic Coast, and interior points east of the lakes and the Allegheny Mountains:  
20 NASSAU STREET, NEW YORK.

SALES OFFICES FOR THE WEST:

GAY BUILDING, ST. LOUIS, MO.

ROOKERY BUILDING, CHICAGO, ILL

SMELTING WORKS:	
KANSAS CITY.....	Missouri.
EL PASO.....	Texas.
LEADVILLE.....	Colorado.

REFINING WORKS:	
KANSAS CITY.....	Missouri.

SAMPLING WORKS OF MEXICAN	
ORE CO.:	
EL PASO.....Texas.	
EAGLE PASS....."	
LAREDO....."	

AGENCIES:	
DENVER.....	Colorado.
CHIHUAHUA.....	Mexico
PARRAL.....	"
CATORCE.....	"
ZACATECAS.....	"
ESCALON.....	"
SIERRA MAJADA.....	"

BRANCH OFFICES:

CHICAGO, ILL., 459 Rookery.

ST. LOUIS, MO., 40 Gay Building.

CITY OF MEXICO, Plazuela de Guardiola.

**BURLEIGH**  
**ROCK DRILLS,**  
**AIR COMPRESSORS,**  
 General Mining Machinery.

BURLEIGH ROCK DRILL CO., Fitchburg, Mass.

**PENNSYLVANIA LEAD COMPANY.**

OFFICE: 61 Fourth Avenue, P. O. Box 1062.  
 PITTSBURG, Pa.

PURCHASERS OF  
**SILVER-LEAD BULLION.**  
 AND REFINERS OF

**SILVER AND DORÉ BARS.**  
 JOHN L. McNEIL, General Western Agent, Denver, Colo.  
 ALSO, OWNERS

**MINGO FURNACE COMPANY.**

OFFICE: 79 West First South St. P. O. Box 543,  
 SALT LAKE CITY.

PURCHASERS OF ORES.  
 F. H. OFFICER, General Agent.

**The Patent Hale Pavement**

is the best and cheapest roadway for cities and towns now in use; it is more durable than granite or asphalt and costs much less.

Descriptive pamphlet sent on application. Correspondence solicited.

Address, CHARLES CATLETT, General Manager.  
 STAUNTON, VA.

**DIAMOND ROCK DRILLS.**

For prospecting Mineral Veins and Deposits, Boring Vertically, Horizontally, or at any angle to any desired depth, taking out a Cylindrical Section or Core the entire distance, showing exact character, and giving a perfect section of the strata penetrated. Also for Boring Artesian Wells perfectly straight, round and true. Machines for Channeling, Gadding and other kinds of Quarry Work, Shaft Sinking, Tunneling, Mining, Railroad and all classes of rock-boring. Manufactured by

**THE AMERICAN DIAMOND ROCK BORING CO.,**

P. O. Box 1442. Send for Catalogues and Price List. 15 CORTLANDT ST., ROOM 24, NEW YORK

**BRUSH MOTORS.**

WRITE FOR CATALOGUE TO THE

**BRUSH ELECTRIC COMPANY,**

CLEVELAND, OHIO.

**MINING, TUNNELING AND QUARRYING MACHINERY.**

THE NEW

**INGERSOLL-SERGEANT AIR COMPRESSOR**

**ROCK DRILLS**

STONE CHANNELING MACHINES, GADDERS, QUARRY BARS,  
 COAL MINING MACHINES.



Send for Complete Priced Catalogue of Mining, Tunneling and Quarrying Machinery.

NOTICE.—Ingersoll and Sergeant Drills are manufactured only in New York City, and this company is not represented by agent or otherwise in England.

**INGERSOLL-SERGEANT ROCK DRILL CO.,**

10 PARK PLACE,

NEW YORK.

**"A TRULY OF BEAUTY IS A JOY FOREVER."**

Send for a Copy of

**GEMS AND PRECIOUS STONES.**

PRICE, \$10.

**SCIENTIFIC PUBLISHING CO., Publishers,**

27 Park Place, New York.

Rock Drilling and Air Compressing

**MACHINERY**

FOR TUNNELS, QUARRIES, MINES, RAILROADS,

And wherever Ore and Rock are to be Drilled and Blasted. Send for New Catalogue of 1889.

**RAND DRILL CO.**

23 PARK PLACE, NEW YORK, U. S. A.

BRANCH OFFICE, DENVER, COLO.: 1316 EIGHTEENTH STREET.

9947



