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CONTENTS.

	PAGE.		PAGE.
Dividends Paid by Mining Companies		The Broken Hill Mines, New South Wales	530
During October	523	Properties of Clay Pressed Wet and Dry	532
Imports of Gold	523	A New Method for the Valuation of Lubricating Oils	532
The Nottingham Colliery, Lehigh & Wilkesbarre Coal Company	523	*Stephen's Patent Vises	532
The Use of Metric Weights and Measures in Export Trade	523	*An Apparatus for Charging Blast Furnaces	532
The Essence of the Free Coinage Question	523	*An Improved Bunsen Burner	533
A New Argument Against Ore Deposition by Sublimation	524	*The Frasse Whetstone Holder	533
Correspondence	524	*The Back-Pressure Relief Valve	533
*The Straight Line Indicator	526	*The Manufacture of Sodium and Potassium	533
*Apparatus for the Rapid Determination of Carbonic Dioxide in Furnace Gases	526	*Fox's Combined Square and Mitre	533
*The Langdon Tuyere	526	*Cook's Luminous Level Tube	533
Identification of Arsenic and Antimony	526	Official Reports	534
*Prominent Men in the Mining Industry	527	Hydrate of Alumina	534
Steel Making in the U. S. before 1810	528	Dividends Paid by Mining Companies During October and From January 1st, 1891	534
*The Prospector	528	Patents Granted	534
Two New Alloys	529	Personals	535
*Tandem Tanks for Hoisting Water From Flooded Slopes	530	Obituary	535
Machine Shop of the Homestead Steel Works	530	Industrial Notes	535
		World's Fair Notes	535
		Export Notes	536
		Machinery and Supplies Wanted	536

*Illustrated.

MINING NEWS:		FREIGHTS.....544	
Arizona.....536	Wyoming.....540	METALS.....544	
California.....537	FOREIGN:	IRON:	
Colorado.....537	Canada.....541	New York.....544	Chicago.....545
Idaho.....537	MEETINGS.....542	Chicago.....545	Louisville.....545
Illinois.....537	ASSESSMENTS.....542	Louisville.....545	Philadelphia.....545
Kansas.....538	MINING STOCK	Pittsburg.....545	Pittsburg.....545
Michigan.....538	MARKETS:	CHEMICALS AND MINERALS.....541	
Missouri.....538	New York.....541	CURRENT PRICES	
Montana.....538	Boston.....541	Chemicals.....547	Minerals.....547
Nevada.....539	San Francisco.....541	Rarer Metals.....547	
New Mexico.....539	Denver.....542	ADVT. INDEX.xxvii	
New Jersey.....539	St. Louis.....542		
North Carolina.....539	Lake Superior.....542		
Pennsylvania.....539	Pipe Line.....542		
Tennessee.....540	MINING STOCK		
Utah.....540	TABLES:		
Washington.....540	Boston.....546		
	Coal Stocks.....546		

The dividends paid by mining companies of this country, which report their earnings, amounted to \$1,421,875 during October. The total for the first ten months of the year is \$14,095,990, an amount largely in excess of that paid in the same period of 1890.

The importations of gold into this country from Europe continue and have already exceeded the \$20,000,000 mark. Up to October 31, the total imports of gold for the year amounted to \$22,789,025, while \$1,962,900 has come in during the first six days of this week. The imports of silver from January 1st to October 31st amounted to \$2,363,063. The exports of gold during the same period were \$75,758,351, and of silver \$16,049,456.

The famous Nottingham colliery of the Lehigh and Wilkesbarre Coal Company, of which Mr. ELMER H. LAWALL is the efficient superintendent, has again beaten its own unrivaled record. During the month of October the colliery was operated 24 days 1 1/2 hours (10 hours constituting a day), and shipped 70,152 tons of coal. The average hoist per day was 1,318 mine cars. All of this coal came from one opening, and was hoisted a single car at a time. The hoisting apparatus consists of a pair of first-motion engines, connected directly with the drum-shaft, the cylinders, being 22 in. in diameter, with 48-in. stroke. There are two spiral cone drums, each 4 ft. 1 in. long, 7 ft. in diameter at the small end, and 9 ft. at the large end. The total hoist is 470 ft. The cage weighs 4,990 lbs.

and the car (empty) 2,250 lbs. The capacity of the car is 86 cu. ft. The best previous record was made in June of this year, when 66,714 tons, an average of 1,305 cars per day, were hoisted in 23 days 3 1/2 hours. We think that this record surpasses that of any other colliery in this country, and reflects great credit upon Mr. LAWALL.

THE USE OF METRIC WEIGHTS AND MEASURES IN EXPORT TRADE.

IN our issue of October 3d, we recalled to the attention of certain classes of manufacturers, engaged in the export trade, a matter which we have frequently emphasized in these columns, namely, the universal employment of metric weights and measures in South American countries, whose markets we are now endeavoring to control, and the pressing importance of furnishing to them machinery of metrical gauges and dimensions. It is evident that to secure a commanding position in the trade of any of these countries there must be a strict compliance with local customs and demands. That this has not been done, has been the burden of the complaints of our consular officers at foreign ports for many a year. The necessity in this particular point—metric weights and measures—is, however, so obvious that it should impress itself upon American manufacturers.

Apropos of this subject several recent reports of British consular officers are of interest. British consuls in countries as widely separated as Italy and Japan have thus warned the manufacturers and exporters of their own country that they were losing trade because they persisted in using, in their circulars and price lists, English weights and measures, which were almost unintelligible to the people of those countries, where the metric units are in general use; whereas, their French and German competitors, the former as a matter of course and the latter adapting themselves to the circumstances with the facility which has gained them such an immense export trade to all parts of the world, employ the metric system, which is familiar to everybody, and naturally attract custom. Similar warnings are uttered by the British consuls at Alexandria and Cairo, in Egypt, who declare that British manufacturers are simply playing into the hands of their rivals by continuing the use of weights and measures which to many Egyptian merchants are no more intelligible than those of China.

THE ESSENCE OF THE FREE COINAGE QUESTION.

If the so-called demand for free coinage of silver be traced to its source it will be found to originate nearly always with a small number of silver producers, or a number of those advocates of "cheap money" who a few years ago worked up the greenback "boom" and who would now prefer an unlimited amount of greenbacks to silver because it would be "cheaper" money. It is true such disinterested advocates as the attorney of the infamous Comstock mill ring poses as the champion of "the people," and would have his followers believe that the "people," and the workmen in particular, are sorely injured by not having a silver dollar which cannot be worth more than the present silver dollar, for which they can obtain a dollar in gold, but which would be in name—and probably in name only—unlimited legal tender, as the present "demonetized" silver dollar is in fact, because it is exchangeable into a gold dollar.

We maintain that if this country enacted free silver coinage its effect would be to lower the commercial value of silver bullion by removing the one great purchaser of silver for gold or its equivalent, the United States Government. Why, then, should silver producers advocate it?

Take, for instance, the Comstock mines, which produce a doré bullion containing nearly equal values at coining ratio of gold and silver; at least the whole of the silver would be absorbed in paying wages. With free coinage and legal tender silver the producer would receive in wages \$1.2929 per ounce for this silver, while now it brings considerably less than \$1.00. So it would be equivalent to a reduction of fully 30 per cent. in wages. The workman would get \$3.00 or \$4.00 a day of "good legal tender silver dollars," which would buy, perhaps, 20 per cent. less clothing or provisions than gold dollars would. The producer, instead of the whole people, that is, the Government, as at present, would make the seigniorage, and the workman would always lose, approximately, the difference between the coinage and bullion value of the silver, for no matter how much the law might say silver and gold dollars were of equal legal tender value, no one would give a gold dollar for a silver one; in fact, there would then be no gold dollars in circulation.

The Comstock mill ring, which controls nearly all the Comstock mines, would thus gain the entire difference between the market value of silver bullion in gold, which might be 80 or 90 cents an ounce, and the coinage nominal value, \$1.2929 per ounce, on all their silver; and if their silver alone would not pay the wages they would take their gold, buy silver bullion with it at 80 or 90 cents an ounce, and have it coined free into legal tender dollars, which they would pay to their workmen at \$1.2929 an ounce. Nor would the Comstock employers of labor be the only ones to do this, as experience has shown. As soon as any coin can be purchased at less than its face value and can be used at its nominal value in the payment of wages, it will be done. The poor and the wage earners,

the farmers and laborers, are those who always lose in these cases; the rich employer can always take care of himself.

The adoption of the free silver coinage would be equivalent to an enormous reduction in wages throughout the country.

A NEW ARGUMENT AGAINST ORE DEPOSITION BY SUBLIMATION.

In the columns of the Salt Lake *Tribune* of September 15th (during the visit in that city of the party of geologists from the International Congress), Mr. R. H. TERHUNE calls attention to the observed distribution of silver in the Ontario mine, as an interesting confirmation of the present general rejection of the "sublimation theory" of ore deposition. Appealing to the familiar experience of lead smelters in the formation, by sublimation of crusts of mixed sulphides in the cooler zones of the shaft furnace, Mr. TERHUNE says he has never met, in the literature of the subject, a recognition of the significance of the relative poverty of such crusts in silver. Even in smelting the richest galena of the West, the sublimate will always be relatively low in silver, though high in lead and zinc. He continues as follows:

"We find further that the galena in the great Ontario fissure vein has shown no increase in silver contents in a descent of 800 ft. in the mine. Now, it has occurred to me that if its metallic contents were a sublimate, a diminution of silver as we ascend would be apparent, the silver sulphide being so infinitely less volatile than either blende or galena. We find throughout this depth, along the Ontario vein, the relation of zinc to lead very constant.

"Having found, on the scale of a blast-furnace operation, that silver sulphide is but slightly volatile, can we not safely conclude that in the grander but slower process of nature in vein formation, if the sublimation theory were correct, we would have the same impoverished galena in cooler zones near the surface of the earth that we have in cooler zones of the blast furnace?"

In connection with this suggestive inquiry, one or two comments may be permitted.

1. In the first place, as Mr. TERHUNE himself remarks, the sublimation theory is no longer seriously advocated; so that this argument against it is superfluous. On the other hand, I do not understand that sublimation may not still be asserted, in some cases, to have taken part with other agencies in the deposition of metalliferous compounds.

2. As a general argument, Mr. TERHUNE's reasoning is open to the criticism that it would favor the notion of sublimation as the agency of deposition in silver mines in which the conditions of the Ontario are not reproduced, but the ore grows richer in silver as depth is increased.

3. But as applied to the Ontario and to similar mines, the argument rests upon an analogy which it may be worth while to examine more closely—namely, the analogy of the lead-smelting shaft furnace, in which the mixed sulphide ores are submitted in the smelting zone to a temperature not much higher than that of fusion, and certain portions of them, partly volatilized, partly only carried mechanically with the blast, are deposited on the walls, a very short distance above, as incrustations. The zone of fusion is very limited; the diminution of heat, foot by foot, upward through the furnace is both regular and rapid; and the top, a few feet above the tuyères, is kept cool by the continual addition of fresh material. Moreover, the current of gases escaping into the flues carries with it a large amount of "fume," concerning which it is, I believe, an open question how much it carries as sublimed vapor, and how much as suspended dust.

Now these conditions cannot be positively assumed as paralleled in the Ontario or any other fissure vein. In the first place, if we assume the fissure to represent a furnace, we are not sure that the heat was greatest at the bottom, and diminished regularly to the top. Nor do we know where the top was. The outcrop of the vein, as we find it, is usually thousands of feet below the former surface, and we are not led to believe that the vein was formed subsequent to this denudation. There may have been along the immense column thus comprised, "lakes of fusion," local centers of excessive heat, and consequent re-sublimations and re-depositions many. The whole of the Ontario mine as now exposed may have been in a single zone of a temperature sufficiently high to volatilize all sulphides, obliterating the differences that exist among them at lower temperatures; and the cooling agency which subsequently solidified them may have been powerful enough to do its work in the same indiscriminate fashion. But this is not to be understood as an argument in favor of the theory of sublimation. There are other considerations which negative that theory in its exclusive form. But it seems to me that neither proof nor disproof can be drawn directly from the present ore distribution, for the fundamental reason that, however the different minerals were first deposited, they have been subjected to such processes of solfataric action, solution, leaching and re-distribution as to mask the original process entirely.

Some of the suggestions I have made bear upon the question asked by Mr. TERHUNE in the same article concerning another matter. Namely, he inquires, with reference to the mines in the Alta district:

"If waters highly charged with carbonic acid have been the agency which created the great ore cavities of this region in limestone, how deep is it rational to explore for similar great deposits? In other words, how deep could carbonated waters penetrate before being neutralized and robbed of their erosive power? The district has been rich in examples of extensive oxidation; great masses of iron disulphide having been completely converted into peroxide of iron."

Since, with our present knowledge, we attribute both oxidizing and carbonating effects to surface waters only, it seems clear that the creation of cavities in limestone might be looked for at least at any depth where

oxidized pyrites were found. But to the question, "How deep?" a definite answer would involve some knowledge of two factors, both as yet undetermined—the amount of denudation which has taken place, and the amount of elevation (or, in some places, subsidence) which has accompanied or succeeded it. The present surface is not a base-line from which we can make any measurements as to the range of ancient processes of change.

Finally, we are still largely in the dark as to the real age of most of our mineral deposits. The age of the country rock inclosing them is a very different thing. Apart from intercalated beds, clearly laid down in the order of their position, we can only say that ore deposits are later in origin than the inclosing rocks; but how much later, we do not know. There is some reason to believe that most of them are comparatively recent—that is, not older than the Tertiary—as to their present individuality. But out of what still older deposits they may have been re-formed it would be difficult to say. Even the Tertiary and Quaternary periods witnessed such changes of continental level, climate, and volcanic activity that we cannot easily reconstruct for a given ore deposit the probable conditions of its formation. And the attempt to generalize in any way, about the behavior of ore deposits in depth—meaning thereby depth below the present surface—seems hopelessly premature.

R. W. R.

BOOKS RECEIVED.

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

How to Make Inventions; or, Inventing as a Science and an Art. A practical guide for inventors. By Edward P. Thompson, M. E. 161 pages. Published by D. Van Nostrand Co., New York, 1891.

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.

The Boston & Montana Consolidated Copper and Silver Mining Company.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In the *ENGINEERING AND MINING JOURNAL* of October 10th, 1891, you published a report of this company for the year ending June 30th, 1891. The company states that the average cost of producing a pound of refined copper during the year was 9.97 cents. It seems to me, however, that one very important item has been omitted from the total, *i. e.*, the annual redemption of bonds and the annual interest on the bonded debt, which together amount to \$251,359.75, or $2\frac{1}{2}$ cents per pound, making the total cost of the copper contained in a 56% matte $10\frac{1}{10}$ cents per pound. I may point out here that the expression used in the report of the company, "refined copper," is absolutely out of place, and must have a tendency to mislead stockholders. The copper contained in mattes or ores can only be called "refined" after it has gone through a process of refining and has assumed the shape of ingots, etc. The tolls of refining this kind of matte are about $1\frac{1}{2}$ cents per pound, making it plain that the actual cost of producing refined copper by this company is practically $12\frac{6}{10}$ cents.

Excluding the construction expenses at Great Falls, amounting to \$462,980.79, last year, from the cost of producing copper, the total cost per pound of copper was about 11 cents—equal to the best price which can be obtained at present, which price, however, may not be maintained in view of the resumption of work by the Anaconda, and the low value of such kind of copper in England, *viz.*, £46 10s., a parity of $9\frac{1}{2}$ cents per pound. It should be further stated that the copper product was sold last year at 11 cents per pound, which is to be understood as the price for the copper in the matte and not for refined copper. The sale is a good one and very creditable to the management or its agents.

The balance sheet for last year, if properly made out, will demonstrate a deficit of \$473,314, occasioned by the payment of dividends amounting to \$625,000. I fail to see how they have been earned.

I find the statements of assets and liabilities of the company for the year 1890-1891, using its own figures, to be as follows: 26,693,842 lbs. copper produced, costing \$2,101,313.59; construction expenses, \$567,814.70; redemption of bonds and interest, \$251,359.75; dividends paid, \$625,000; property bought, \$25,000; total, \$3,570,488.04; receipts for copper and silver were \$3,097,174.04, leaving a deficit of \$473,314.

Even under these circumstances the directors propose to pay a dividend of \$125,000 next month, while at the same time the following official notice appears in the Boston papers:

The Boston & Montana company is preparing to send out a call for a meeting of shareholders December 22d, to authorize an issue of \$500,000 seven per cent. mortgage bonds to fall due, \$100,000 in 1902, and each year up to 1907. The books will close November 26th and open December 23d. The call for the meeting covers 70 pages, under the requirement of the Montana law, that the property to be mortgaged shall be described. A clause in the call says: "The principal purpose for which the proceeds of the proposed bonds are to be used is the purchase and erection at Great Falls, Mont., of a complete electrolytic plant and appurtenances."

If my memory is correct, the last second mortgage of \$500,000, issued two years ago, and the 25,000 shares of stock issued several years ago, were to be used for the construction of the Great Falls smelting works, including the electrolytic plant.

I shall at some future time discuss the continuous issue of mortgage bonds, its bearing on the value of the property, and its danger to the shareholders.

For the present I would advise the directors to reduce in their annual reports the real estate account by taking off and charging to current expenses at least 10% of such real estate account. The Calumet & Hecla, for instance, charges the whole amount of real estate purchased toward running expenses and adds it to the cost price of its product.

NEW YORK, Oct. 29, 1891.

Q. E. D.

The Loot of the Comstock.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The yearly report of the Consolidated California & Virginia Mining Company is full of interest to those unfortunates who trusting to the "honesty" of the people in charge, have held their stock hoping for dividends. The report is significantly free from information, and the reader of it will be forced to believe that it was written rather for concealment than for information.

The report says that the mine produced during the fiscal year 86,443 tons of ore, yielding \$1,752,776.03 gross; out of this regal sum the stockholders of the mine have received the pitiful sum of \$216,000, which is 12.32% of the gross output, leaving 87.68% to pay the milling, mining, etc.

The disbursements for the year were as follows: Discount on silver, \$287,463.90; paid Comstock Tunnel Company, \$181,572.75; dividends, \$216,000; extracting 86,443 tons of ore, \$405,343.14; milling ore, \$565,563.27; balance on hand, \$98,892.31; total, \$1,754,835.37, (on hand October 1st, 1890, \$1,635.39).

The yield of silver as reported is \$922,853.69, and the discount as given above is \$287,463.90, which is 31.15% of the silver yield leaving \$635,389.79 per ounce for the company.

The battery assay of the rock for the year averaged \$26.04, and the yield per ton \$20.23, which is 77.67% of the assay value. It has been claimed that the assay of the rock is wet, and that the assay of the metal is dry, and as this means a difference of 10%, the actual yield is 87.67% of the battery assay. (Under the contract with J. P. Jones from 88% to 93% of the battery assay was saved, equal under the above comparison to from 98% to 103% of the pulp.) The cost of extracting the ore includes all prospecting, dead work, timbers, supplies, etc., done in and used in the mine for the year, and was \$4.69 per ton. THE COST OF MILLING THIS ROCK AFTER IT REACHED THE SURFACE, WAS \$7 PER TON.

The net receipts from all sources for the year are given as \$1,306,408.86, and out of this amount \$565,563.27, or 43.30% went to the mill owners. Taking the Jones contract as an example of what can be done, the profit of the mill owners on Consolidated California & Virginia ore for the year would be as follows: Received for milling, \$565,563.27; concentrates run through the little joker or left in the slime ponds (estimated), \$502,500; total, \$1,068,063.27.

From the report we learn that the rock was crushed by the Eureka and Morgan mills. Who owns these mills? The Comstock Mill Company. Who owns the Comstock Mill Company? John W. Mackay, James L. Flood and John P. Jones (Senator). Who controls the Consolidated California & Virginia mines? John W. Mackay and James L. Flood. Who is benefited by the returns from the little joker and high-priced milling? John W. Mackay, James L. Flood and John P. Jones (Senator).

At the election held at the time when this "report" was heard, not a share of stock was voted outside of the five share pieces standing in the "directors' names. It was all done by proxies; the same officers were elected in the same old farcical style, the same old reports were made and duly swallowed by the dummies, and the same old steal goes merrily on for another year.

If any stockholder of the company can get any comfort out of the way this mine is run we wish him joy. We will say, however, that as a general thing, when mining properties on the Pacific Coast are managed in this way by the ring it is usually done for the purpose of freezing out stockholders. The better the property the more rascally the management.

In the case of the Consolidated California & Virginia the past year the stockholders of the mine got 16.53% of the net receipts, while the stockholders of the mills that crush the rock got 43.30%. For whose benefit is this property worked? For the mine shareholders or for the mill shareholders?

You have repeatedly asserted in your columns that there existed an organized gang of thieves on the Comstock who made it a business to plunder the mines through a nefarious mill system. Do not these figures prove this statement? The owners of the mill company are the managers of the mine. The stockholders of the mill companies are millionaires, respected citizens and "senators." The stockholders of the mining company are paupers. "What are they going to do about it?"

J. H. TINGMAN,

SAN FRANCISCO, Oct. 22, 1891.

Secretary, Mining Stock Association.

The Free Coinage Discussion; Views of Mr. Geo. W. Cheyney.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Will you grant me space in your columns for a few comments on a letter by J. Whidden Graham, to the ENGINEERING AND MINING JOURNAL, under date of August 21st, 1891. In his definition of free coinage Mr. Graham makes the not uncommon mistake of confusing the terms bullion and money, the silver in, and out of, the dollar, the market value of the metal measured in gold, and the coin value of the same quantity when stamped by the Government. As he "avoids statistics and historical data" it would be useless to refer to past periods when conditions were reversed, and gold was the cheaper bullion metal.

I am convinced that he is in error when he says "the advocates of free coinage . . . wish the Government to raise the price of their product by declaring that a piece of metal, now bringing but 80 cents, shall be equal in value to a certain quantity of gold, that quantity now being termed a dollar." To the contrary, the advocates of free coinage desire, and are working to an end, exactly the reverse. In this connection may I suggest that, in such an argument it would be but fair to admit, the now evident fact, that for every advocate of free coinage who produces silver there are many thousands who do not, and much more dignified to meet the argument on its merits than to indulge in insinuations against the motives of its supporters. The Government now buys a piece of silver metal at—for argument I will admit, 80 cents of gold value, and by stamping it "one dollar" declares it money of that value. To this plan the free coinage advocate objects as strenuously as Mr. Graham, believing it to be directly opposed to the principle of bimetalism, under which the Government would not buy a grain of metal, but which would, notwithstanding Mr. Graham's denial, place the coinage of silver upon exactly the same plane as that of gold. Under it there could be no "forced coinage." Just as much would be coined as offered, no less, no more, and all coin would be returned to the owner of the bullion, to be by him disbursed in

the channels of trade. There would be no difference in the dollar, it would be the same we have had since 1792, and those who will receive it are not doubtful of its purchasing power.

Mr. Graham's first reason is "Free coinage of silver is undesirable because it is class legislation in its worst form."

Gold, always since the inauguration of our Government, has had "free coinage." Does the same argument apply?

Second reason: "Free silver coinage would bring about no improvement in the condition of the farmers and working men." Many thousand thinkers, writers and workers who have not followed Mr. Graham's example in "avoiding statistics and historical data," have, by studying them carefully, reached a conclusion and a belief radically opposed to such a bare assertion. "The teachings of the orthodox economists" are sadly disturbed by these same "statistics," but the masses have reached a point where they much prefer facts to dogma, and Mr. Graham can hardly have studied "historical data" to much purpose to use the words "impudent fallacy" in describing the opinion and belief of the patriot fathers, the framers of the Constitution, Washington, Hamilton, Jefferson, Clay, Webster, and the long line of economists and statesmen before 1873.

Third reason: Free coinage would be unjust because it proposes that debts, freely contracted to be paid in gold, might be paid in either silver or gold. I should like to ask Mr. Graham, if he believes that any man ever freely contracted to pay a debt in gold, whether it is not always under compulsion of a greater or less degree, measured by the necessity of the case? Also, if such an option to the debtor is unjust to the creditor, what is the status, in its relation to justice, of the dictum that compelled the debtor to pay an obligation, contracted on a gold or silver basis, in gold alone? All debts, public and private, existing in 1873 had certainly been contracted on such a basis.

Mr. Graham says it "would be class legislation, violating the common principles of honesty, by allowing debtors to repudiate 20% to 30% of their obligations." Would not the same argument describe the legislation which permitted creditors to add 20% to 30% to their obligations? Would not the inference from his argument be that if free coinage of silver will reduce the debtor's obligations 20% to 30%, did not the deprivation of silver of the debt paying attribute enhance existing obligations to a proportionate degree, and has he not himself proven one of the farmers' arguments, that free coinage of silver will help to relieve them of their crushing incubus of debts, unjustly increased by the demonetization of silver?

In his fifth reason, he says: "The principal argument in behalf of free coinage is" that it will increase the circulation of currency, but that "as the Government has no possible means of finding what amount of money is needed" free coinage is therefore undesirable. As the "orthodox economists," and apparently the Government's plan of solving that problem is to continually reduce the volume of circulation, and as Mr. Graham strongly deprecates "meddling with the currency with a view of altering the relation of debtor and creditor" and admits that the "real strength of the free silver agitation lies in the general feeling of business depression, increasing poverty, and growing discontent among farmers and the working classes generally," would it be unwise legislation to permit the people themselves to solve the problem, and, by re-establishing free coinage of silver, to permit the channels of trade to determine their power of absorption, and needs of circulation?

I should like to ask Mr. Graham if the ultimate test of the value of money is not its power to cancel a debt. If the true reason for the opposition to silver as money is not that a debt is greater in proportion as the power of the debtor to cancel his obligation is lessened, and if all debts are not greater when but gold can be used to cancel them. If silver were a legal tender for the payment of debt, would there be an opponent to its free coinage, and would it not instantly be of the same value as any other money with the same attributes?

GEO. W. CHEYNEY.

TOMBSTONE, ARIZ., October 12th, 1891.

Florida Phosphates and their Economic Use as Agricultural Manures.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: At the present moment we have no standard book or books on one of the most important branches of agricultural chemistry. I have hunted in vain through the libraries of England and this country for accounts of reliable and original research as to the presence, geological distribution and origin of phosphate of lime. The literature on this subject consists almost entirely of scattered papers published in the proceedings of various scientific societies and technical journals, and although the chemical reactions have been deeply studied I am sure that the advertisement of the Scientific Publishing Company stating that Dr. Francis Wyatt has written an exhaustive treatise on the "Phosphates of America" will be welcomed, not only by the scientific world, but by the agricultural.

While a standard work like this is in the press it may seem a work of supererogation to comment on statements published with reference to phosphates. Only during the past week, owing to my absence from the United States, has my attention been drawn to an article in the ENGINEERING AND MINING JOURNAL of September 26th, 1891, headed "Florida Pebble and Nodular Phosphate of Lime," by Prof. E. T. Cox, to which is attached as a postscript a letter from that eminent chemist, Dr. Henry Wurtz. There are some statements in Professor Cox's paper which seem to be corroborated by Dr. Wurtz which should not pass unchallenged, as the issues are vital both to the chemical manufacturer and the agriculturist.

Through the courtesy of Prof. E. T. Cox, I am also in possession of his paper published in the proceedings of the American Association for the Advancement of Science, vol. xxxix, 1890, entitled "Floridite: a New Variety of Phosphate of Lime." These two papers it is not my intention to discuss or to criticize, more particularly as Dr. Wyatt's book will be so soon in the hands of every one interested in the subject. The *cachet*, however, given by Dr. Wurtz to a statement in Prof. Cox's papers makes it worthy of notice, and as it seems misleading it should not pass unchallenged.

All will approve Dr. Wurtz' suggestion to call hard rock-phosphate (although an indeterminate mineral) *floridalite* rather than *floridite* derived according to Professor Cox from "Florida and ites—a stone," but before naming a mineral with a specific name it would seem more scientific to determine more exactly its mineralogical attributes. Dr. Wurtz is accepted as a chemical authority, and it is courteous, to say the least of

it, that he should think that "chemists" would accept his *test rigidly applied* and should write apparently solemnly the following: "The simplest preliminary criterion will be found in the suction of a bubble or two of the evolved gas into the mouth. SiF_4 is thus emphatically distinguishable from CO (pure). Any skeptical chemist will be readily convinced by the removal of the skin from his tongue if much SiF_4 be present. The odor of HF (produced by interaction with H_2O) is also readily recognizable after familiarity therewith."

The last sentence in the article by Professor Cox reads as follows: "It is, in my opinion, far more economical for the farmer to apply to his land the phosphate of lime in the form of a fine powder than to apply the acid phosphate. In this case, the more phosphate of alumina it contains the better, as it will be more readily assimilated by the plants than reverted phosphoric acid, which results from the application of superphosphates to soils containing iron and alumina."

Dr. Wurtz argues that mechanical comminution is as effective as chemical decomposition in rendering the phosphoric acid in phosphate of lime available as plant food, and that alumina instead of being a detriment is an absolute benefit. It seems curious that it should be reserved for Dr. Wurtz, although he states that the mass of remarkable and significant chemical facts in the literature of soils and fertilizers, has surprised him, and that apparently no master mind has yet reduced them to any available system of soil-science, to discover, together with Professor Cox, this curious property of alumina allied with phosphate of lime, although for at least 50 years the most prominent of English, German, French and American chemists have made exhaustive series of experiments not only in the laboratory but in the field which seems to prove the reverse. Dr. Wurtz vaguely states that certain facts well known to every chemist were published at certain times by various scientific men, and then states authoritatively that "It is undeniable that great mechanical comminution has been proved by numerous experiments to be almost, if not quite, as efficient as chemical solution, in the promotion of the absorption of phosphates by plant radicles."

If this is undeniable the great industry of chemical manure manufacture is at an end and even the McKinley Tariff cannot warm this "infant industry" into vital existence and the evidence not only of scientists and practical agriculturists of all civilized nations is worth nothing; but acid phosphate manufacturers may immediately close their works and farmers and phosphate miners, especially those of the "baser sort," take heart of grace.

I do not seriously criticize Dr. Wurtz letter at length as it does not appear as if it were written for publication, but looking at the extremely important statement made by Dr. Wurtz it is to be hoped that he will explain more fully, not only his statement but his experimental data.

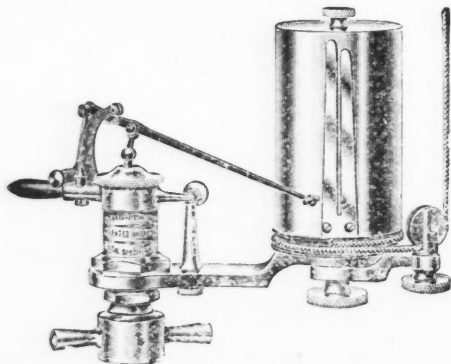
In this letter I have not attempted to deal with the vexed question as to the exact chemical reaction that takes place when a plant absorbs to itself the phosphoric acid present in the soil or applied as a manure in any shape, but without further definite proof from Dr. Wurtz and Prof. Cox. I am of opinion that acid phosphate manufacturers need not be alarmed and that farmers whose soil is lacking in phosphoric acid had better deal with them and "bear the ills they have than fly to others that they wot not off."

NEW YORK, Oct. 21.

WALTER B. M. DAVIDSON, A. R. S. M.

THE STRAIGHT LINE INDICATOR.

The peculiarity of this indicator lies in the simplicity of its parallel motion and in the auxiliary spring by which it is held up to one working surface, thus preventing the appearance of any backlash. The guiding mechanism for the parallel motion is placed as near the fulcrum as possible, to obviate the great amount of movement as found in other indicators, and to where the momentum will be the least. The straight line motion in this indicator is attained by two rocking surfaces, one attached to an upright, and the other permanently fixed on the pencil arm. The one on the upright is made circular, and the other of such form that when the lever rises and falls these two guiding surfaces roll together for a very slight distance and cause the pencil to move in a perfectly straight line throughout its full range. All that is required of the auxiliary spring is to give sufficient tension to keep the guiding surfaces in contact while

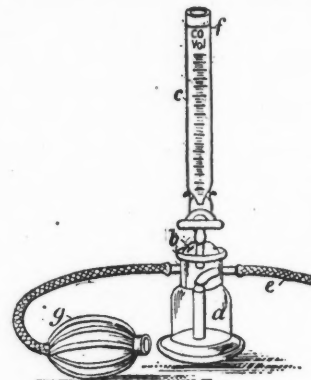


the instrument is running. This may be determined by turning on steam while the drum is stationary and noting if the pencil traverses the same vertical line. The auxiliary spring is intended also to take up all play that may appear in the joints and oblige the pencil to always follow the same path. Messrs. Hine & Robertson, of New York, who are introducing the indicator, state that the first one made was subjected to the test of being run continuously nine hours a day on a high speed engine for over a month, and showed no appreciable wear; what there may have been was taken up by the auxiliary spring, and the instrument improved, if anything, by this hard usage. The moving parts of the instrument are of the lightest possible weight, and that weight is disposed of so near the fulcrum that its little movement makes the momentum very slight and specially adapts it for the highest speeds.

APPARATUS FOR THE RAPID DETERMINATION OF CARBONIC DIOXIDE IN FURNACE GASES.

An apparatus for the rapid determination of carbon dioxide in furnace gases is described in *Thonind. Zeit.* 1891, 15, pp. 539-540. The apparatus consists of a vessel *a* having a capacity of 100 cc. and provided with an inlet and outlet tube. A graduated tube *c*, divided into cc., and fitted with a stop cock, is ground into *a* at *b*. The stopper *b* is bored at the side, so that communication between the vessel *a* and its side tubes can be made or closed.

The vessel *a* is filled with the furnace gas to be tested by drawing it in through the tube *e* by means of the rubber ball *g* in the usual way. The

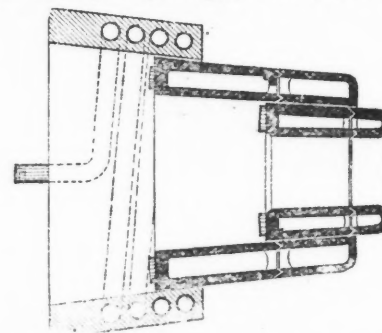


graduated tube *c* is filled with caustic soda solution of specific gravity 1.25 to the mark *f*. A blank experiment is first made by filling the vessel *a* with air free from carbon dioxide, closing the openings of the side tubes by turning the stopper *b* and opening the cock communicating with *c*. The liquid in *c* falls to a certain point, which is made the zero of the instrument. Correction for temperature and pressure is neglected, as the instrument is only intended for rough technical purposes.

In making a determination, the vessel *a* having been filled with the gas to be tested, the soda solution is allowed to flow in until absorption of carbon dioxide is complete and no more can enter. The volume of soda solution used then gives at once the percentage of carbon dioxide in the sample. Determinations made by this instrument are said to agree well with those made by more accurate apparatus.

THE LANGDON TUYERE.

Mr. N. M. Langdon, furnace manager of the Port Henry Furnace Company, Port Henry, N. Y., has been using for over a year, with satisfactory results, a tuyère designed by him, the principal features of which will be readily understood by reference to the accompanying section, for which we are indebted to the *Iron Age*. Both the tuyère and the breast are constructed in substantially the same manner. It consists of a butt and nose joined together in the manner indicated, either by soldering or brazing or by bolts. When it is desirable an extension piece, consisting of concentric shells held apart by bridges, is interposed between the butt



and the nose. Mr. Langdon states that he has used both the short and the extension tuyère. Thus far the nose piece and the extension or intermediary piece only have been new. He has used the butts of worn-out tuyères by cutting off the small end and putting on a new nose. He has not had a sectional breast in use yet, but is now making the pattern for a tuyère-breast nose piece, and will shortly have a sectional breast at work. A sectional tuyère wholly new costs \$1 to \$1.50 more than an ordinary tuyère, exclusive of royalty. When it is destroyed at the nose it can be repaired with a new piece at a saving of about 50% on a small tuyère. The economy increases with the weight, and on a breast weighing 140 lbs. to 150 lbs. would amount to 75% to 80%.

Identification of Arsenic and Antimony.—The method of separating arsenic and antimony by passing H_2S and then dry HCl gas through the tubes in which the metals have been deposited as in Marsh's test, has been modified by James T. Anderson, of Auburn, Ala., so as to be conveniently applied in cases where it is desired to identify as arsenic or antimony metallic deposits on porcelain. A drop of ammonium sulphide is added to the deposit, which converts the metal into the sulphide. Allow the excess of ammonium sulphide to evaporate, and with an ordinary mouth-blowpipe blow across the open mouth of a bottle containing concentrated HCl , directing the stream of gas into the porcelain dish upon the sulphide. If it be antimony sulphide, it will disappear entirely, while arsenic sulphide will remain unaffected in appearance.

PROMINENT MEN IN THE MINING INDUSTRY

Thomas Sterry Hunt.

The subject of this sketch, Thomas Sterry Hunt, was born in Norwich, Conn., on September 5th, 1826, of an old New England family. His ancestor, William Hunt, was one of the founders of Concord, Mass., in 1635. His maternal grandfather, Consider Sterry, of Norwich, Conn., was a civil-engineer and mathematician, and was the author of well-known text-books of arithmetic and algebra, published 100 years since, in connection with his brother, Rev. John Sterry, whose descendants have made the name honorable in our city to-day. Mr. Hunt was destined for the profession of medicine, but after preliminary studies, his love for chemistry and mineralogy led him, early in 1845, to become a special student, and afterward assistant to Prof. Benjamin Silliman in Yale College. Two years later he was appointed chemist and mineralogist to the geological survey of Canada (just then organized under Mr., afterward Sir, W. E. Logan), a position which he held for more than twenty-five years, till his resignation in 1872. His work in that capacity is well known; to him were due the investigations of the petroleum, the salt, the phosphates and the iron and copper ores of Canada; while the literary work of preparing the reports of the geological survey was his. He it was who made the first studies of the lithology and mineralogy of the crystalline rocks of the Ottawa and the upper lakes. For many years he was obliged by circumstances to devote much of his time to field-work in geology, and to the administrative duties of the survey.

To Dr. Hunt we owe the first systematic attempt ever made to subdivide and classify geologically the stratiform crystalline rocks; a work to which he has brought not only his studies throughout Canada and the United States, but those made during repeated visits to the British Islands and to continental Europe. To him we are indebted for the distinctions

Hunt in numerous papers, and is given more at length in his *Systematic Mineralogy*, just published (1891).

Dr. Hunt has done much work as a teacher and a lecturer. One of the organizers of Laval University at Quebec, he was there professor of chemistry from 1856 to 1862, where he delivered annual courses of lectures in French, and where he is still honorary professor. He was also for three or four years lecturer in McGill University, Montreal, and was professor of geology at the Massachusetts Institute of Technology, 1872-1878. Among his academic titles are those of M. A., Harvard; Sc. D., Laval; LL. D., McGill, and finally LL. D., Cambridge, England. A fellow of the Royal Society of London since 1859, he is a member of a large number of other societies, both American and foreign. A member of our National Academy of Sciences since 1873, he has been president of the American Association for the Advancement of Science, and of the American Institute of Mining Engineers, and twice president of the American Chemical Society. He was one of the founders, and the first president by election, of the Royal Society of Canada. One of the organizers of the International Geological Congress, he was its first secretary, and was a vice-president at the congresses of Paris, 1878, Bologna, 1881, and London, 1888. In connection with the great industrial exhibitions Dr. Hunt was member of the international juries at Paris in 1855 and 1867, and at our Centennial exhibition in 1876. He is an officer of the French order of the Legion of Honor, and officer of the Italian order of St. Mauritius and St. Lazarus.

Since 1878 Dr. Hunt has retired from public professional life, though much consulted on points of mineralogy, metallurgy and mining-law. Within the past three years his health has been impaired, and he has at times been very ill; but he is now enabled to resume his accustomed literary activity at his present home, the Park Avenue Hotel, New York.

During his long career Dr. Hunt has known most of the men eminent in science. Not to mention the living, there may be named among the



THOMAS STERRY HUNT.

and the designations of Laurentian, Norian, Huronian, Montalban, Taconian and Keweenaw, all of which have now passed into the literature of geology. In connection with these studies he has attempted the discussion of the great questions of the origin and the succession of these rocks. Reviewing and controverting various hypotheses, including the igneous or plutonic, the metamorphic and the metasomatic, all of which are rejected as irreconcilable with observed facts, and as violating chemical theory. Dr. Hunt has vindicated the essential soundness of the still imperfect Wernerian aqueous view, and has advanced what he has named the crenitic hypothesis. According to this, the source of the various groups of crystalline rocks above named was the superficial portion of a globe, once in a state of igneous fusion, but previously solidified from the center. This portion, rendered porous by cooling, was permeated by circulating waters, which dissolved and brought to the surface during successive ages, after the manner of modern mineral springs, the elements of the various systems of crystalline rocks. These thus mark progressive and necessary changes in the mineralogical evolution of the earth during the pre-Cambrian or Archaean ages. In the author's language in 1885, "the new hypothesis is the result of nearly thirty years of studies having for their object to reconstruct the theory of the earth on the basis of a solid nucleus, to reconcile the existence of a solid interior with the flexibility of the crust, to find an adequate explanation of the universally contorted attitude of the older crystalline strata, and at the same time to discover the laws which have governed the formation and the changing chemical composition of the stratiform crystalline rocks through successive geologic ages."

Dr. Hunt's contributions to general chemistry are numerous and important, aiming at nothing less than a complete system of chemical theory, the outcome of which, after nearly forty years of thought, and the successive publication of many papers, from 1848, was the production in 1887 of a volume entitled *A New Basis for Chemistry*, which appeared in a second and augmented edition in 1888. This was translated into French by Professor Spring, of Liège, and published in Paris in 1889, as *Un Nouveau Système Chimique*. The practical application of these new views to the science of mineralogy has been partially set forth by Dr.

departed, in this country, Robert Hare, Joseph Henry, the two professors Silliman, Charles Upham Shepard, Henry D. Rogers, William B. Rogers, Ebenezer Emmons, Edward Hitchcock, Charles T. Jackson, Francis Alger, A. D. Bache, Jacob Bigelow, John Torrey, Asa Gray, Benjamin Pierce, Agassiz, Fred. A. P. Barnard, J. Lawrence Smith, J. L. Leconte and Joseph Leidy; in England: Lyell, Sedgwick, Murchison, Faraday, Thomas Graham, Brewster, Wheatstone, Whewell, John Herschel, Benjamin Brodie, John Percy, William Siemens, Warrington Smyth; in Germany: Liebig and Heinrich Rose; in Switzerland: Alphonse Favre; in France: Elie de Beaumont, Constant-Prevost, Chevreul, Dumas, Balard, Gerhardt, Ad. Wurtz, de Senarmont, Dufrenoy, Hébert, Delesse, de Chancourtois, Biot, Victor Regnault, Moigno and Henri Sainte-Claire Deville; and in Italy: Sella, Gastaldi and Meneghini. His reminiscences of all these men, and his correspondence with many of them, would make an instructive contribution to the scientific history of the last half century.

Besides his various official reports, the list of published papers by Dr. Hunt, beginning in 1846, is over two hundred. An important volume of his, on *Azoic Rocks*, was published as Report E. by the Second Geological Survey of Pennsylvania in 1878. He has also published a volume entitled *Chemical and Geological Essays*, of which a fourth edition appears in 1891. Of his *Mineral Physiology and Physiography*, a second edition was published in 1890, and also a third edition of the *New Basis for Chemistry*. These new editions have been brought out by the Scientific Publishing Company of this city, which has also just published his latest work, entitled *Systematic Mineralogy*.

Dr. de Kroustchoff, the eminent chemist and mineralogist of St. Petersburg, has in hand a translation into Russian of a selection from the works of Dr. Hunt, including his studies of the origin and succession of the crystalline or primary rocks, the crenitic hypothesis and various related subjects, together with the greater part of the *New Basis for Chemistry*, thus comprising some of our author's most important contributions to science. The translations will be published next year, and will form the first volume of a series of foreign scientific classics.

The accompanying portrait is from a photograph by Mayall & Co., of London, taken in the autumn of 1888, just before Dr. Hunt's late illness.

STEEL MAKING IN THE UNITED STATES BEFORE 1810.*

By William F. Durfee.

In 1728 Samuel Higley, of Symsbury, and Joseph Dewey, of Hebron, in Hartford County, Conn., represented to the Legislature that the said Higley had, "with great pains and cost, found out and obtained a curious art by which to convert, change, or transmute common iron into good steel sufficient for any use, and was the first that ever performed such an operation in America." Swank gives on the authority of Mr. Charles J. Hoadly, Librarian of the Connecticut State Library, a certificate, signed by Timothy Phelps and John Drake, blacksmiths, which states that, in June, 1725, Mr. Higley obtained from the subscribers several pieces of iron, so shaped that they could be known again, and that a few days later "he brought the same pieces which we let him have, and we proved them and found them good steel, which was the first steel that ever was made in this country that we ever saw or heard of."

A patent was granted Higley and Dewey for ten years, provided "the petitioners improve the art to any good and reasonable perfection within two years from the date of this act." They do not appear to have done this, or to have continued the business of making steel.

In 1740 the Connecticut Legislature granted to Messrs. Fitch, Walker & Wyllvs "the sole privilege of making steel for the term of fifteen years upon this condition, that they should in the space of two years make half a ton of steel;" this condition not having been complied with, the privilege was extended to 1744, before which time Aaron Eliot and Ichabod Miller certified that more than half a ton of steel had been made at the furnace in Symsbury.

Some time before 1750 a steel furnace was in operation at Killingworth, in Middlesex County, Connecticut. This furnace (says Swank) was owned by Aaron Eliot, and in it he succeeded, in 1761, in converting into good steel a bar of iron, made in a bloomery fire from magnetic sand, by his father, the Rev. Jared Eliot.

It appears from returns made by the Colonial Governors in 1750, in conformity with the Act of Parliament, that Massachusetts, Connecticut and New Jersey had each one steel furnace, and Pennsylvania two; both of these were in Philadelphia, owned by William Branson and Stephen Paschal, respectively. Branson stated in regard to his steel that "the sort he made, which was blistered steel, ten tons would be ten years in selling." Paschal's furnace was built in the 1747, on a lot at the northwest corner of Eighth and Walnut Streets; this furnace in 1787 was owned by Nancarrow & Matlock, when it was visited in that year by General Washington, and said to have been "the largest and best in America." Whitehead Humphreys, who in 1770 was the owner of a steel furnace on Seventh street, Philadelphia, and made steel for the Continental army, was granted in 1786, by the Legislature of Pennsylvania, a loan of £300 for five years, to aid him in making steel from bar iron "as good as in England."

In 1777 Rhode Island "gave £60 per gross ton for good German steel made within the State." The Legislature of Massachusetts granted in 1778, to the Rev. Daniel Little, "£450, to aid in erecting at Wells [in the District of Maine] a building 35 x 25 ft., to be used in manufacturing steel."

In 1787 the manufacture of steel was commenced in the town of Easton, Massachusetts, by Eliphalet Leonard, and we are told by Bishop that "the article was made in considerable amount, and cheaper than imported steel." About 1797 steel was made at Canton, in the same State, "from crude iron, by the German process." Peter Townsend, the proprietor of the Sterling Iron Works, in New York, made in 1776 the first steel produced in that province, and his son Peter Townsend, Jr., is said to have made, at the same works, in 1810, steel "of as good quality for the manufacture of edged tools as that made from Dannemora iron."

Alexander Hamilton, in a report dated December 5th, 1791, says, "Steel is a branch which has already made considerable progress, and it is ascertained that some new enterprises on a more extensive scale have been lately set on foot." In the same year Tench Coxe, in replying to Lord Sheffield's "Observations on the Commerce of the United States" stated that "about one-half of the steel consumed in the United States is home-made, and new furnaces are building at this moment."

Swank states that "in 1805 there were two steel furnaces in Pennsylvania which produced annually 150 tons of steel. One of these was in Philadelphia County. In 1810 there was produced in the whole country 917 tons of steel, of which Pennsylvania produced 531 tons in five furnaces. . . . The remainder was produced in Massachusetts, Rhode Island, New Jersey, Virginia, and South Carolina: each State having one furnace. In 1813 there was a steel furnace at Pittsburg, owned by Tuper & McKowan, which was the first in that city."

All the steel manufactured in America prior to the year 1810 was produced either by what was called the "German method," which was conducted in a "hearth" similar to that used for a "bloomery fire," or by the "cementation process." The "German steel" was made directly from the ore or a suitable quality of "pig iron" was used. The operation, when ore was employed, consisted in removing the oxygen, and then by appropriate manipulation, together with a regulation of the blast and heat, the iron was combined with carbon derived from the fuel to such a degree as to convert the metal into a mass of crude steel; this was carefully drawn under a light, quick-working hammer into bars about an inch square; six or eight pieces of these bars were made into a "pile," welded together, and drawn into smaller bars. This process, called "refining," was repeated a number of times, and the quality of the resulting steel was designated by the terms "single," "double" or "triple refined," according to the number of weldings and hammerings. When "pig iron" was used, the operation consisted in so manipulating the metal and regulating blast and heat that a portion of the carbon in the "pig" remained in the resulting "bloom" of crude steel, which was subjected to the same "refining" as has just been described.

All the early attempts to make steel in America were in the "German manner"; but it was soon discovered that the ores and pig irons available were not of a proper quality, and attention was early directed toward the "cementation process," the details of which were fully described by Réaumur in 1722.

The operation of making "cemented" or "blister" steel consisted essentially in packing bars of wrought iron in charcoal dust in long boxes or "pots" made of sandstone or fire-brick. These "pots" were covered as nearly air-tight as possible and subjected to a high degree of heat (not, however, sufficient to melt the bars of iron), which was regulated as to temperature and duration according to the contemplated use to be made of the steel. As a rule, the higher the temperature and the longer time it was kept up, the greater the degree of carburization of the bars in the "pots" and the harder the resulting steel. When the iron is packed in the charcoal, one or more bars are allowed to project through openings in one end of the "pots"; these bars are removed at proper intervals of time, and from their appearance when cold the progress of the operation is judged. When the process of "cementation" was finished, the furnace was allowed to cool, and, as soon as men could work therein, the metal was removed from the "pots," and it was found that it had undergone a great change; instead of having a smooth surface, it was covered with a large number of "blisters" of varying size and thickness (hence the name "blister steel"), and, although when put into the "pot" the metal was very fibrous and tough, it was found on removal to be very crystalline and brittle. These changes of structure and fracture were due to the absorption of carbon from the charcoal dust in which the bars had been packed.

When steel was wanted of closer grain, firmer texture, and more reliable character, a certain number of bars of this "blister steel" were made into a bundle or "fagot" and welded together, and the resulting bar was called "single shear" steel; and if a still higher quality was required, bars of "single shear" were welded and drawn into bars called "double shear steel."

THE PROSPECTOR.

Written for the Engineering and Mining Journal by Dan De Quille.

The true prospector has the patience of the bee hunter. He is never in a hurry, except perhaps when a grizzly bear is at his heels, or a band of hostile Indians have evinced a disposition to make professional examination of his top hair. In his business "the race is not to the swift." Though slow in his movements when at work, all his mental faculties are alive and unceasingly active.

The outfit of the prospector is not costly. He carries with him a pair of blankets, coffee pot, frying pan, pick, shovel, gold pan and a horn spoon. In the way of arms, he carries nothing more than a shotgun (for small game), unless going into a region where the Indians are bad, when he takes with him a "Winchester" and a revolver. His stock of provisions consists mainly of substantial. Flour and bacon are the principal articles. To these are added beans, jerked beef, a few pounds of sugar, tea and coffee, with a little salt and pepper. To this some add four or five pounds of dried fruit—peaches, apples or pears.

With this outfit packed upon the back of a stout burro the prospector takes the field. The town left behind, his home is wherever he unpacks his donkey and lights his camp fire. All remember the excellent understanding which existed between Sancho Panza and "Dapple"; of the prospector it may be said that he and his donkey live together upon the same excellent terms. The burro would almost seem to have been created expressly for the use of the prospector. He is slow, patient and content under all circumstances. Though the tender grass about the mountain spring is a delight to his heart when he finds it, yet he very philosophically feeds on bitter and prickly shrubs that would be eaten by no other animal except the camel, when the camping place affords no better browsing. The ass is quite at home in the mountain wilds, for his forefathers were natives of Syria, Mesopotamia and the northern parts of Arabia. In the wandering life he leads with the prospector in the wilderness he becomes alert and sagacious; in him are aroused instincts and traits long dormant in his race, some portion of those qualities which in his wild progenitors evidently not a little excited the admiration of Job. He is quick to detect the approach of Indians or the presence of a "grizzly" or California lion. A veteran prospecting burro is a good guard at night. If he sees danger either from Indians or wild animals he leaves his feeding and hastens to awaken his sleeping master. As the burro greatly fears the grizzly bear he at first rushes to his master for protection when one of these animals comes prowling about; from this beginning he soon learns to give the alarm whenever he snuffs danger.

The donkey is the animal for the use of the prospector in the arid and desert regions of the Great Basin for many reasons. A great advantage is that he does not become alkali, as would a horse or mule in many sections of country. From his forefathers, the wild asses of Persia and Arabia, he inherits a taste for salt grasses and brackish water. He will drink with relish water that neither a horse nor a mule would touch.

I have said that the true prospector has the patience of the bee-hunter. I may further say that like the bee-hunter he delights in being alone when doing his work. It is only in regions where there are known to be hostile Indians that old prospectors hunt in couples or small parties. It is an axiom among miners that the more men there are in a party the less prospecting will be done. They are never able to agree upon anything that requires work. Many men, many minds. The "do-nothings" always carry the day. The solitary prospector always does the best work.

The best time for prospecting in the arid belt between the Rocky Mountains and the Sierra Nevada range is early in the spring, after a winter of heavy snowfalls, as then water for panning may be found in almost every ravine and cañon. In many detached mountain ranges so little water is to be found during the summer months that even what is required for drinking must be carried by the prospector. This being the case, it would be necessary at that season to carry gravel or any other material to be prospected by washing in pan or horn to the nearest water, probably miles away. The advantages to the prospector of having a small flow of water in the ravines, gulches and cañons of the section of country he is exploring are many, but the main advantage is in the facilities thus afforded for panning.

This panning is not done in the expectation of discovering placer diggings. The eye of the prospector usually tells him at a glance where there is hope of finding auriferous gravel. In our interior mountain ranges the pan is useful in searching for paying quartz veins, particularly such as are known as "blind ledges"; i. e., veins that do not crop above

* From *Popular Science Monthly*, October, 1891.

the surface, or which have been covered and hidden by soil and débris from higher ground.

As a cañon or ravine must cut across all veins of quartz lying in its course, if any of these contain "pay," some gold is pretty sure to be found in the material lying on the bedrock of the ravine. As even the quartz veins in which silver is the predominant metal are found in this region to carry more or less gold, the prospector who finds gold in any cañon may feel assured that somewhere above is a lode worth looking for. Thus it will be seen that the pan tells the prospector where there is ground which it will pay him to examine with care.

"Float" quartz—fragments and blocks of loose quartz rock—are also a great aid and guide to the prospector. These fragments, found in a ravine or on the slope of a mountain, tell that above is the vein whence they came. In a ravine may be "float" from several veins. If the pan has shown the ravine to contain gold, the prospector is interested in knowing the particular kind of quartz from which the gold came. With water at hand, he is not long in settling this point. Samples of the "float" are pounded up on a flat rock and roughly ground under a stone of a size and shape to be conveniently used as a muller when they are washed down in the pan or horn. Having discovered the kind of quartz which carries the gold, the prospector thereafter recognizes it at a glance, even as he walks along. Though there may be strewn along the ravine fragments of quartz from half a dozen other veins he readily distinguishes those from the vein which he wishes to find. He carries in his mind almost without a thought its color, texture, crystallization and every other "ear mark." He can even tell from the appearance of the float whether the vein from which it came is large or small, and the kind of country rock in which it will be found.

Patience is the paying virtue of the prospector. It is patience alone that leads to success. A hasty, impatient man has no right to expect to

of a philosopher. Nothing escapes his eye in his march through the wilds. He not only sees every rock and pebble at his feet, but also notes every shade of color on the slopes of the far-away mountains. Every patch of color has a meaning for him. He knows the kind of soil—decomposed rock—that makes the particular shade he sees. He is also able through color and configuration to distinguish afar ranges in which water will be found.

The prospector is able to satisfactorily test all kinds of material for gold with pan and horn, but in order to test ores for silver he generally carries with him a small bottle of nitric acid, a Florence flask and a few test tubes, or if he understands the use of the blow-pipe he depends upon that when he is in a region of smelting ores.

When rich float has been found and the prospector has camped on the trail of a vein his partner, the donkey, has a good time. He grazes about the temporary home at his ease while his master is at work. When the lode for which search is being made is one of the kind designated as "blind" the prospector frequently finds it necessary to do a good deal of downright hard work. In following the trail of the vein up the slope of the hill or mountain he presently arrives at a point where the "float quartz" disappears. It is covered by soil and débris from a higher part of the mountain. It is then necessary to start a narrow trench and carry it up the slope. When the digging is first commenced the float which had disappeared from the surface will be found at a depth of a few inches beneath the soil. As the trench progresses the depth at which the fragments of float are found steadily increases. When they are found lying on the bedrock—face of the rock of which the mountain is composed—the prospector knows that his work is almost over, that he is close upon his vein.

The foregoing is a plain, unromantic view of the prospector and his work in the mountains. Much might truthfully be said of him as the *avant coureur* of civilization, but in that light he has been so frequently



A PROSPECTING SHAFT.

succeed as a prospector. He will probably cover ten times the extent of country in a given time that would be examined by a real prospector, but finds nothing except it may be by chance. The real, born prospector is never discouraged. If he finds nothing after working over a certain tract of country he is consoled by the thought that there was nothing in it to be found. When "good indications" have been discovered he begins his siege. He is slow but sure. The majority of those who are periodically smitten with a desire to go forth on a prospecting trip and explore some new region may be called the greyhounds of the business. They hunt altogether by sight. The genuine prospector is "Old Sleuth" himself. He carefully searches until he has struck a trail—float quartz or a few grains of native gold—and that once found he never loses the scent until he has run his vein "to earth."

The prospector of the arid zone is generally a man of middle age with the constitution of the coyote. No roof except the "starry vault" covers his head of nights, and hunger has no terrors for him. On a pinch he will eat anything that flies or crawls. He fears nothing but thirst, and against this he is always on his guard. When by some mischance thirst overtakes him he makes a better fight against it than would most men. He finds moisture in the fleshy leaves of the cactus, and unhesitatingly drinks the blood of any living thing he can capture. By means of a hollow reed he is able to suck water from wet sand, and using his coffee pot and gun barrel distills alkali water which it would be death to drink as food.

It is seldom that very old men venture out into the deserts and mountain wilds as prospectors; nor do many young men care to leave the society to be found in the towns and lead a solitary, roving life in the wilderness. The inveterate prospector belongs to a peculiar type of humanity closely related to the trapper and the bee-hunter. His thoughts by day and his dreams by night are of great and rich veins of the precious metals. He is a close student of nature and generally a good deal

of a philosopher. Nothing escapes his eye in his march through the wilds. He has also been depicted as a sort of cross between Sinbad the Sailor and Baron Münchhausen, but in the solitary life he often leads for long periods of time, it would be nearer the mark to paint him as a Crusoe, his burro standing for his man Friday.

The prospector is entitled to figure as an Indian fighter more dangerous than most of those who pose in that rôle, though nearly all his fighting is after the Parthian manner—while in retreat. The stories of his Indian fights are almost invariably histories of masterly retreats—retreats deadly to his pursuers.

Two New Alloys.—F. W. Martino, Sheffield, and F. R. Martino, Birmingham, England, have invented two new alloys for the manufacture of boring and cutting tools having a hardness equal to that of tempered steel, with the further advantage of not losing their hardness when heated by friction. The following alloy is claimed to be suitable for the manufacture of boring tools such as drills, milling cutters, rymers, and the like: Pig iron, 17.25%; ferro-manganese, 3.00%; chromium, 1.50%; tungsten, 5.25%; aluminum, 1.25%; nickel, 0.50%; copper, 0.75%; bar iron, 70.50%; total, 100.00%. The following alloy is suitable for the manufacture of nail cutting blades, cutting blades for machines, cutting out tools and the like: Pig iron, 17.25%; ferro-manganese, 4.50%; chromium, 2.00%; tungsten, 7.50%; aluminum, 2.00%; nickel, 0.75%; copper, 1.00%; bar iron (Swedish), 65.00%; total, 100.00%. In making these alloys, the pig iron, ferro-manganese, chromium and tungsten are melted together in graphite crucibles under stick charcoal and calcined borax, the tungsten and pig iron being preferably melted first. The alloy so produced is then remelted in clay crucibles together with the bar iron; and the nickel, copper and aluminum are then added. The metal is this time covered with stick charcoal only. The above alloys are cast in sand molds.

TANDEM TANKS FOR HOISTING WATER FROM FLOODED SLOPES.*

By J. H. Bowden.

The water-hoisting tanks herewith illustrated have been designed for removing large quantities of water from recently-flooded mines, through their hoisting-slopes, with rapidity proportional to the capabilities of the hoisting machinery available, the tanks being adaptable to slopes of small sectional areas and varying pitches.

The following features may be of interest to those operating mines liable to be flooded.

1. The arrangement of doors on each tank by which it may be automatically filled by immersion at any point on the varying pitch of a slope, the water being retained while hoisting on the flat as well as on the steep pitches, and quickly and automatically discharged at the top.

2. The arrangement, in connection with the above-mentioned doors, of side-wheels over the rear wheels of each tank and of side-dumping tracks at the top of the hoist, for the automatic emptying and quick return of the tank.

3. The arrangement of two or more tanks, one in front of the other, so as to give as large a capacity in a single hoist as the engine power will permit, yet without making any tank too large for the sectional area of the slope, or of unwieldy length, or of such a shape that it cannot easily pass over vertical curves; and without concentrating too much weight on any one pair of wheels or on any point of the track.

The details of construction and method of operating are shown by the accompanying sketches (Figs. 1 and 2), and the following more detailed description.

At the end of each tank is a large iron door of almost the full size of the end of the tank, opening inward, so that when immersed the tanks fill almost instantly. To provide for holding the water while it is hoisted up flat pitches, a wooden door is attached to the front of each tank, opening outward. Each front door is attached to the door at the back by an iron rod, provided with a sliding link, so that the back door can open independently of the front, but the latter is held closed as long as the rear door

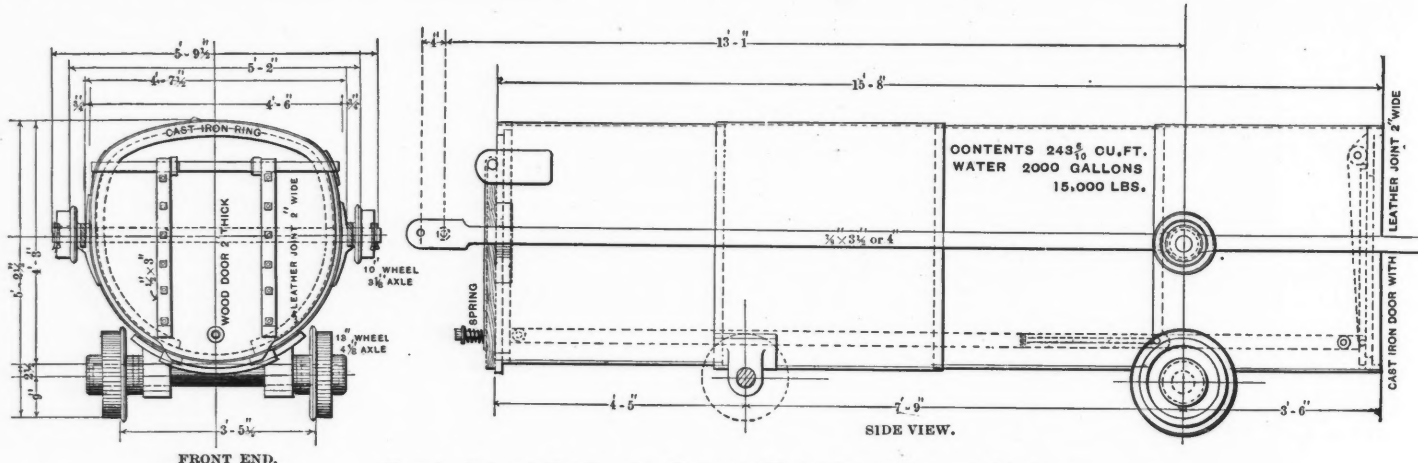


FIG. 2.—TANDEM TANKS FOR HOISTING WATER FROM FLOODED SLOPES.

is closed. This connecting rod, as shown in Fig. 2, passes through the front door and through a spiral spring in front of it, so that the amount of pressure necessary to keep the water from leaking out may be readily applied.

The tanks are mounted on self-oiling closed wheels, so arranged as to exclude water from the bearings while the tanks are immersed, and to retain the lubricant.

Each tank is provided also with side-wheels, vertically over the rear axle, which have a gauge sufficiently wide to clear all other portions of the tank; and on the surface an elevated track is provided, upon which these dumping-wheels run and thus raise the rear end of each tank as much as may be necessary to dump the water into a trough between the tracks, the tilting forward of the tanks opening the back door and releasing the front one. The tanks while emptying rest on their forward wheels and on the dumping-wheels. By having the tracks at the surface slightly up-grade, the tanks will run back when empty, as soon as the rope is slackened. To allow this dumping, the hoisting rope is attached to the tanks by a yoke reaching back on the sides and pivoting on the axle of the dumping-wheels, the tanks back of the first one being attached by eye-bars reaching from axle to axle of the dumping-wheels on the tanks. A stop is provided, to prevent the yoke on the forward tank from dropping and catching in the track when the rope is slackened.

This plan of "tandem tanks" was designed and used to hoist about 25,000,000 gallons of water which had been admitted to extinguish a mine fire in one of the Susquehanna Coal Company's mines. The slope was small in section, and 3,200 ft. long, with single track, and with pitches varying from 4° to 20°. The hoisting plant consisted of a pair of 26-in. × 60-in. direct-acting engines with cast coned-drum, 9 ft. to 12 ft. in diameter, carrying 1 1/2-in. steel rope. These engines had been previously hoisting five cars, weighing about four tons each when loaded.

In the Machine Shop attached to the armor-plate department of the Homestead Steel Works, where are made the great steel bolts to fasten the plates to the vessels, a bolt was being turned on one of the lathes recently and the workman operating it turned off a shaving 265 ft. long. Some years ago, at the Woolwich Arsenal, England, a shaving was turned off a gun measuring 171 ft., and is exhibited there as a great curiosity. The Homestead shaving will be made into a Turk's head and placed in the curio department of the works.

* Paper read before the American Institute of Mining Engineers, (Glen Summit, October, 1891.)

THE BROKEN HILL MINES, NEW SOUTH WALES.

Written for the Engineering and Mining Journal by T. A. Rickard.

Broken Hill, reached by 300 miles of railway from Adelaide (South Australia), but inside the New South Wales border, is in the Barrier Ranges, which were known as a rich but patchy mineral field long before the discovery of the silver deposits which have lately made them famous. In those days the black ridge, rising amid the desolation of the salt-bush plains, was the pasture ground of cattle and sheep. It was a cowboy, or "boundary rider," who, dreaming of a possible tin mine, planted his pegs into the ground, and in so doing marked the commencement of the history of a mine which has since made millionaires of him and his fellow stockmen. That was in September, 1883.

During the first three years the extent of the discovery was hardly realized; the outcrop was poor, the difficulties of transport were enormous, the hardships undergone were severe; the camp, in short, went through the vicissitudes common to most remotely situated mining fields, the initial difficulties being in this instance heightened by the want of men versed in silver mining.

When the mine managers trained on the gold fields ceased to throw chloride ore over the dump, when the particular knowledge needed for this kind of mining was obtained from America, and when the enterprise of the clear-headed owners of the mine commenced to have full play, then there began that development which has culminated in an output of from 175,000 to 200,000 ounces of silver per week.

As seen from the mine the surrounding country is of dreary flatness, broken only by occasional low hills. The outcrop of the lode forms a black ridge of manganic ironstone, whose irregular contour gives the name of "Broken Hill." Far away amid the haze of the heated atmosphere stretch the arid plains whose salt bush is like the sage brush and heightens the resemblance which they bear to the lava burnt deserts of Arizona. Close at hand extends the town of Broken Hill with its population of 30,000, an ordered collection of houses which, like match boxes, extend in lines of weary perspective broken by the clouds of dust which

go waltzing down the streets and in rising eddies mingle with the sulphurous smoke which the wind bears from the neighboring smelters. It is an abomination of desolation where "the dust of an earthy to-day is the earth of a dusty to-morrow." In the evening the Egyptian tints of the sunset sky, the heat of the dry ground and the wandering cyclone of yellow dust remind one of Suez and tell a tale stronger than words of the indomitable perseverance of the pioneers who first laid bare the riches hidden under such a forbidding covering. From the dreary desolation of the distance the eye gladly wanders to the intense activity of the foreground. Looking either north or south along the huge black outcrop of the lode one sees tall chimneys belching forth their white smoke, poppet heads of iron, lattice-work girders, slag heaps on dumps, railways and tramways, horses and men, making a mingled hum of busy life, among which one distinguishes the rushing sound of the blast furnace, the hiss of the steam, the clink of hammers, the clashes of machinery and the voices of the workmen. Immediately at our feet are the 13 furnaces of the "Big Mine"—the Broken Hill Proprietary—and the output from them of a ton of silver per day is a practical answer to the wherefore of all the energy and activity of the surrounding scene.

The following figures give the annual yield of the Broken Hill field up to the close of 1890: Prior to December, 1877, 10,378,883 ounces; for the year 1888, 4,020,370 ounces; 1889, 6,358,463 ounces; 1890, 7,824,605 ounces.

Originally the present mine, the Broken Hill Proprietary, consisted of seven 40 acre blocks numbered from X. to XVI. inclusive. When its value had been proved Blocks XV. and XVI. were sold in London to form the British Broken Hill Company, the parent company receiving £576,000 in cash and 80,000 full paid £5 shares. Block X. was floated in the colonies, bringing in as consideration for the transfer 96,000 fully paid shares whose nominal value was £912,000. Lastly Block XVI. was also disposed of in Melbourne for 96,000 shares of a nominal value of £432,000. It may be added that each of these offsprings of the original property has seen its shares at a premium. On January 18, 1890, the shares of the leading Broken Hill mines reached a market value of £23,259,000.

The Broken Hill Proprietary, locally known as "The Big Mine," overshadows all its neighbors both in size and output. Up to the date of the last report 654,873 tons of ore had been treated, producing 25,729,834 ounces of silver and 107,087 tons of lead, having a total value of £5,893,722. The dividends paid amount to £2,278,000, the cash bonuses to £592,000, while the holding in the subsidiary companies amounts to £5,064,000. The company has a nominal capital of 960,000 shares of 8s. each. The market value of the mine in January, 1890, rose to over 14

millions sterling; to-day it is slightly under ten millions. Up to the close of last year the average value per ton of ore was £9 7s. 7d, the average cost £4 7s. 9d., and the average profit £5 1s. 10d.

The mine has become one of the recognized sights of Australia, and is visited by large numbers of travelers of every description, from colonial governors to globe trotters. It is the custom to charge 5s. per head for the privilege of going underground, the money so obtained going to the local hospital. An old miner, a man who has been in the service of the company since its inception, is told off to act as guide, and under his charge the troops of visitors are conducted through the No. 2 level. This level is the driest, cleanest and most convenient for the purpose. As you wander through the maze of closely timbered workings the old fellow keeps up a running commentary of the most highly colored description. No wonder that the unsophisticated tourist or the colonial unversed in silver mining is astounded at what he sees and hears at Broken Hill. The Comstock method of square-set timbering comes in for a large share of admiration; and certainly, to the colonial familiar with the crooked, muddy workings of the gold mines, the clean levels and long perspective of straight-sawn Oregon pine must come in the nature of a revelation. Having done this, the regular tourist promenade, we were permitted, by the aid of a friendly letter of introduction to the general manager, to see the other deeper and more interesting portions of the mine.

The mine is worked by means of eight principal shafts, the bulk of the stopping so far done being confined to that part of the mine which is above the second level. This, which is the main gallery, extends from end to end (3,960 ft.) of the property, and is already estimated to have workings, drives and cross cuts aggregating four miles in length. The timber-

the half formed crystals of iodide and chloride of silver, the two being readily distinguishable by their color.

The walls have no marked regularity, though the foot is the better. The lode channel is subject to frequent variations in its width. The ore bodies have a varying pitch, generally southward. There is a strong suggestion in the appearance of the footwall that the ore chutes pitch with the line of intersection of the bedding of the country and the plane of the lode fissure. Included portions of country-rock are common. At one point the schist splits the lode, the former being overlaid by a body of kaolin, followed by a band of sulphide ore which southward passes into oxidized material. The line of separation, like a bedding plane, is very marked between the barren decomposed country and the high grade kaolin. Garnetiferous sandstone, in floating pieces for the most part, is often seen and is argentiferous when copper stained. These copper stains are worthy of mention, since they are found notably favorable to the presence of silver. The ore is frequently vermicular; vuggs are common and contain stalactites of siliceous manganic ore, with cerussite and the silver minerals. Frequently the ore has a sinter-like appearance over a considerable area.

This level is in the zone of oxidized ore. There are some magnificent bodies of siliceous manganic oxidized material, over which cerussite is plentifully scattered, but nowhere is there to be seen a body of oxidized lead ore such as the carbonate sand which I remember seeing at the Small Hopes in Leadville. The "kaolin ore," a term very familiar on the Barrier field, forms an important portion of the vein filling. It is usually rich in chlorides and in native silver, but it is notably free from lead and varies in hardness according to its stage of decomposition. Though by

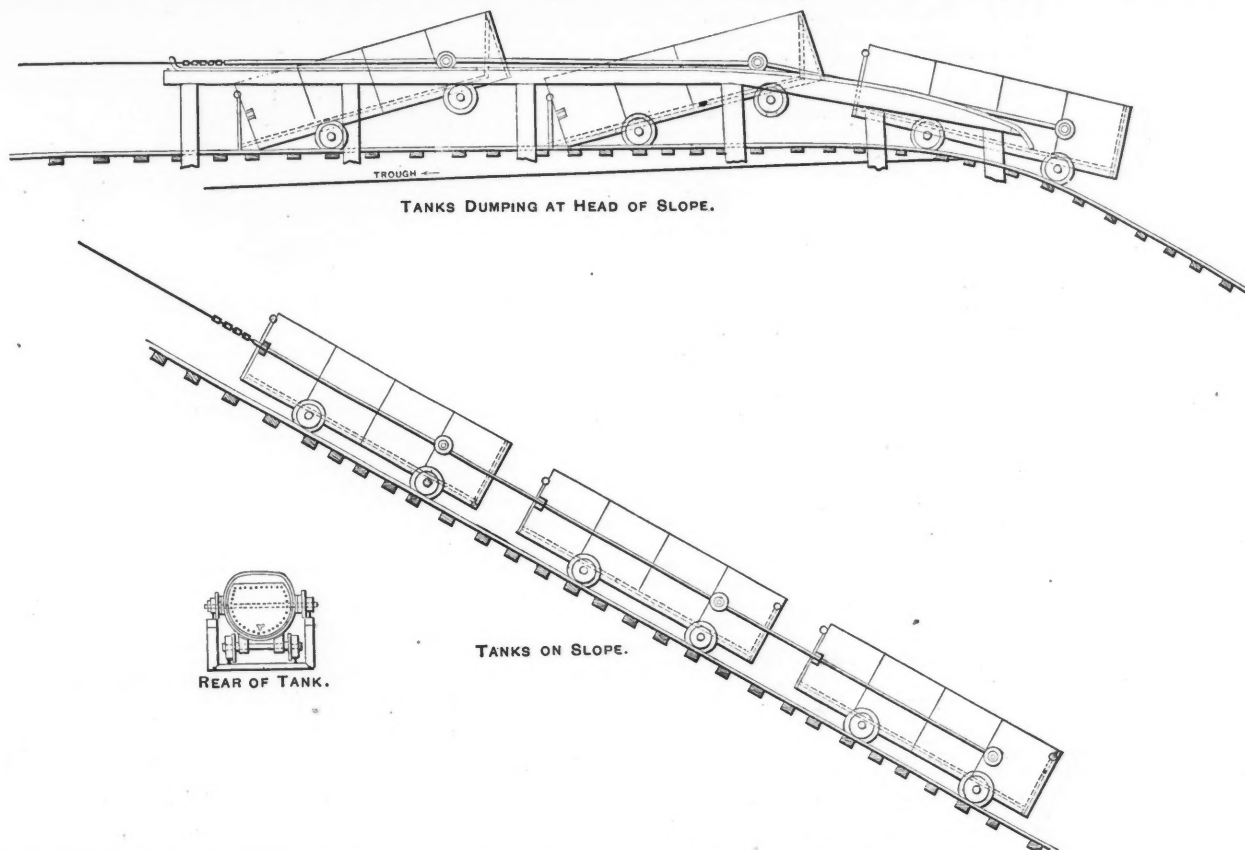


FIG. 1.—TANDEM TANKS FOR HOISTING WATER FROM FLOODED SLOPES.

ing is tremendous, the ground being very heavy. Frequently, "chocks"—layers of timber placed crosswise so as to form a solid pillar—are put where the pressure is greatest. Occasionally the old round timber placed before the advent of the American managers is still to be seen. It is the red and white gum, a far better mining timber than the best of the Oregon pine, by which it has been supplanted, but not suited to the square-set system, since it has not a straight grain, and is, therefore, of unequal strength when sawn.

This lode is not a contact deposit as was once supposed; it makes a slight angle with the dip of the country, though it apparently does agree with it in strike, which is N. 20° to 30° E. The country traversed is for the most part a fine-grained mica schist, sometimes gneissose in character and at others silicified to a quartzite. Garnetiferous sandstone also occurs. The bedding is distinct but irregular and dips westward. Diorite has been mentioned in connection with the lode, but is several miles distant in the neighboring ranges. Both north and south the lode channel becomes split up, branching out as does the Comstock and most big fissure lodes. It would be a mistake to accept the prevalent idea that the big outcrop was totally barren and did not in any way suggest the underlying treasures of silver. At Knox's old shaft the chloride bearing kaolin came up to the surface, while at Jamieson's good oxidized ores were also uncovered to daylight.

The lode as seen at the No. 2 level, whose average distance from the surface is 215 ft., is of extraordinary size and value. More so perhaps than any other modern silver mine, the Broken Hill Proprietary is enriched by a varied assortment of silver-bearing minerals scattered in splendid profusion through the ore. Block XI. is particularly remarkable. There is there an ore body 270 ft. long, averaging 200 ft. in width and carrying from 50 to 55 ounces of silver per ton, together with 30% lead. The candle light shows large faces of manganic ironstone studded with

far the largest proportion of the ore exposed at this level is oxidized, suggestions of the deeper lying sulphides are seen in the patches of galena, poor in silver and rich in blende, which begin to make their appearance.

The third level shows a great change. It has a distance from surface varying between 260 ft. and 380 ft., though usually spoken of as the 316-ft. level. Descending Macgregor's, the most southern, shaft, the flat is found cut in country-rock; proceeding along the cross-cut westward it is succeeded by a width of 60 ft. of sulphide ore, behind which is the hanging wall. This inclusion of country-rock is more than a mere horse, it is a continuation of the wedge seen in the second level and strongly suggests an important division in the lode. The cross-cut proves it to be nearly 150 ft. wide, separating the sulphide ore just referred to from a band 75 ft. wide of garnetiferous galena-sandstone which is east of the shaft. It is widest northward; going south it is found (130 ft. from this shaft) to pitch at an angle of about 30° under sulphide ore which extends nearly to the boundary. The sulphide ores are of low tenor and a very refractory character, containing for the most part from 16 oz. to 18 oz. silver and 25% to 30% lead, mixed with a large percentage of blende and occasionally pyrites. Proceeding north from Macgregor's one passes through garnet-galena-sandstone with a small patch of oxidized material, which is succeeded by a body of siliceous ore, said to be of high grade. In the last mentioned there is a large vugg lined with stalactites of hydrated iron ore, among which was found a quantity of moss copper, containing 98½% Cu. From here to McBryde's shaft (McBryde is the name of the chairman of the company) the level, with no cross-cuts, passes through siliceous ironstone very suitable for fluxing purposes. Near the latter shaft there is some very good kaolin ore abutting against the hanging wall. From McBryde's to Jamieson's the level, still without cross-cuts, is mainly taken up by garnetiferous sandstone, carrying a varying amount of blende and galena. Occasionally it shades off from mineralized country rock to pay ore,

The sulphides are loose and friable, the coarser crystalline galena is richer than the fine grained, and carries as a maximum 60 oz. Az. After about 550 ft. of garnetiferous sandstone a body of good grade kaolin is passed through, connecting with a large body of high grade kaolin extending around Jamieson's shaft. The back of the remainder of the level is in siliceous iron ore and siliceous sulphides.

Generally speaking the inclusions of country are larger at this level than the No. 2, garnetiferous sandstone is more frequent, the proportion of oxidized ore has largely decreased, to be replaced by low grade sulphides, though it is remarkable that bodies of oxidized ores occur even below this level; while, on the other hand, galena is found in the croppings. At Broken Hill the line limiting oxidation is most irregular, and the "water level" is a question about which a great deal of non-sense has been said and written.

While the stope ground practically ends at the No. 3 level, the shafts have been sunk below 500 ft., but no important development work has been carried out at the deeper levels. Some of the sinking has been done in the search for water, the want of which has at times been severely felt.

The great question which comes sooner or later to so many silver fields, that of the replacement of easily reducible oxidized ores by more or less refractory sulphides, has already come to Broken Hill. Galena, blende and garnetiferous sandstone form ore of a discouragingly refractory character. When its silver contents are low the question of its economical treatment is one which will try the resources of the ablest metallurgist. At the present time attempts are, with the enterprise characteristic of the company, being made to solve the problem.

The day of sulphide ores is rapidly coming upon Broken Hill; the magnificent output of the past year has been at the expense of the bodies of oxidized ores already uncovered and ere long it will have to undergo the experience of Leadville. Other difficulties are presented by the kaolin ores, whose "dry" character has been so far overcome by a judicious admixture with the oxidized lead ore.

To overcome these difficulties both concentrating and leaching plants have been erected. On the ore dressing plant £24,000 has been expended. It is idle now, but the tailings keep going a lixiviation plant which cost £14,721. A large amalgamation plant has since been erected.

While Broken Hill owes a great debt to the experience and ability of the American managers who brought the training of the Comstock to help the opening up of the Barrier field, it must be confessed that the methods of the Comstock have been too well repeated. The extravagance which formed so marked a feature of mining at Virginia City is being reproduced at Broken Hill. A good mine makes a good mine manager, and were it not for the unusual richness of the mine and its rapid development, the wasteful expenditure of thousands when experimental tests should have sufficed, would not have been tolerated. As it is, the leaching plant treating the tailings from idle concentration works is a sufficiently sarcastic comment upon the methods of management.

The exploration of the lode up to the time of the writer's visit was not sufficiently extensive in depth to enable any just idea to be formed of its true character. So far as can be seen it is a fissure of unusual size traversing metamorphic rocks at a small angle with their dip. The frequent inclusion of garnets among the sulphides and the inclosed fragments of garnetiferous sandstone suggest the latter rock as the one which by interchange with mineral solutions formed the lode along a line of previous fissure. The occurrence of bodies of kaolin is explained by the masses of felspar rock occasionally seen in unaltered form. It is probable that the exceeding richness of some portions is owing to secondary deposition, the mineral bearing solutions which decomposed the felspar having been enriched previously by the impoverishment of overlying portions of the lode. It is to be hoped that the New South Wales Geological Survey will ere long issue a monograph upon a lode system which is undoubtedly one of the most scientifically interesting and economically important of recent mineral discoveries.

Properties of Clay Pressed Wet and Dry.—From the examination of 25 samples of various kinds of clay, H. Liedtke has deduced (*Deutsche Töpf. und. Ziegl. Zeit.* 22, 199) that not all can be successfully pressed in the air-dried condition. A certain small percentage of water (4%—6%) retained in the air-dried state is necessary in order to obtain satisfactory results. Up to a certain point the time of pressure can be varied inversely as the pressure itself without impairing the quality of the product. Clays which when pressed wet tend to form blisters should not be pressed dry, as this objectionable tendency is enhanced thereby. The compressional strength of dry-pressed ware is greater than that of material wet-pressed, while its porosity is less. The latter difference decreases when the goods are burnt at a high temperature. The consumption of fuel is greater in the case of dry-pressed goods on account of the larger amount of raw material they contain. The small quantity of water in dry-pressed ware, before firing, takes almost as long to evaporate as the amount of water used with ware made of wet clay, although this is three or four times as much.

A New Method for the Valuation of Lubricating Oils.—One of the most important tests generally employed for determining the lubricating quality of oils is the viscosity test, for which several apparatus (notably that by Engler) have been introduced during the last few years. J. Lew, in *Dingler's Polytechnisches Journal*, 1891, 280, 16-19 and 40-44, points out, however, although some viscosimeters give satisfactory results in regard to the relative viscosity of a material, they do not determine the absolute lubricating capacity. For this latter a determination of the internal frictional resistance becomes necessary. The internal friction of the lubricating material itself and the external friction of the liquid with solid bodies are the physical properties which influence the frictional resistance of solid bodies with their lubricants. According to Mr. Lew, not sufficient attention has hitherto been paid to the fact that the internal and external frictional resistances are different, and vary in different oils and at different temperatures. He deduces formulæ and describes a method by which these coefficients may be determined and used with great advantage in the valuation of oils for their lubricating properties. He further gives tables showing the coefficients of internal friction of different oils at ordinary temperatures, and the changes which oils undergo in regard to these factors with varying temperatures.

STEPHEN'S PATENT VISES.

Stephen's patent vise, which is being introduced by Tower & Lyon, of New York, is designed for all purposes where a positive grip is necessary, and is claimed to possess several advantages over the ordinary type of vise. The largely increasing sales is evidence of its growing popularity, both here and in foreign countries. A sectional view of the new vise is shown in Fig. 2. The sliding bar *BB* works readily back and forth when the lever *H* is thrown back; the article to be held is put between the jaws, and jaw *B* is pushed in by hand;

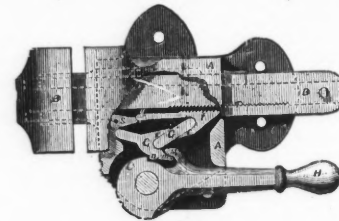


FIG. 2.

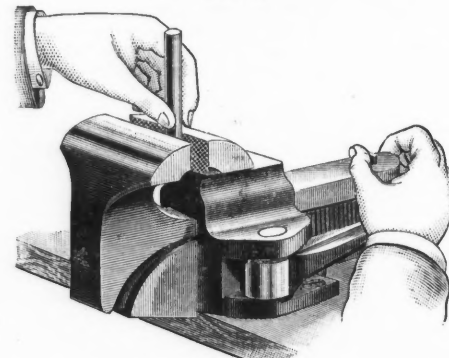


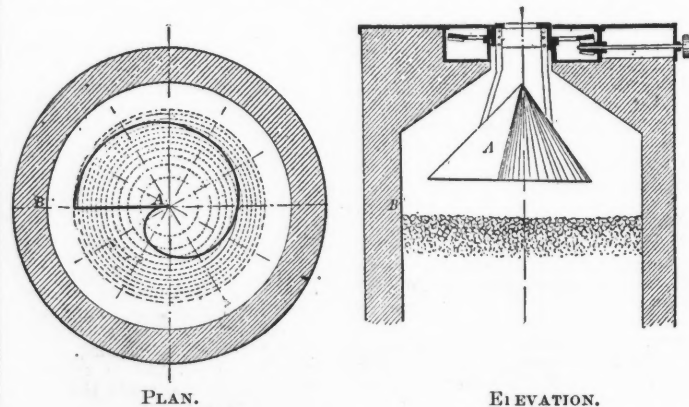
FIG. 1.

at this point the lever *H* is drawn forward; the lever hook *M* releases the toggle hook *m*, and this allows the spring *S* to act on the ratchet *t*; this, in turn, engages with the ratchet teeth *T* on the bar *B*, and at this point the shoulder *C*, on the lever, exerts its force on the shoulder *n* of the toggle *G*; thus a triple lever force is exerted by means of the toggles *GG*. The action does away with the slow motion screw, and there is also the advantage that there is no handle protruding beyond the jaws, interfering with the workman. It is also claimed that greater strength is gained in this vise, no threading being necessary on the sliding bar, while the bearings of the vise are almost directly under the jaws, it not being necessary to have the latter project over the edge of the bench, as in the old style, unless it is so desired.

AN APPARATUS FOR CHARGING BLAST FURNACES.

An improved method of charging materials into cupotas, blast furnaces, lime kilns, scrubbers and absorption towers has been devised by Mr. W. L. Wise, of London. The object of this invention is the placing of materials in the above apparatus in any desired way, thus, for instance, distributing them uniformly, irrespective even of size and density of the particles, all over the section of the apparatus.

The appliance consists of a charging cone, the periphery of whose base is formed by a curve, the shape of which is varied according to the desired purpose. Where uniform charging is desired the curve is a spiral



PLAN.

ELEVATION.

"such that any two radii forming a constant angle between them shall describe in their rotation two circles, the difference in diameter between which is constant. Each portion of the spiral corresponding to a constant angle at the centre thus generates a constant annular surface." The equation of this spiral is $r = a\sqrt{\theta}$, where r is the radius vector (varying from 0 to the radius of the furnace), a the radius of the section of the furnace, and θ the angle formed between the radius r and the initial radius.

The charge is tipped over the cone, and in falling is distributed all over its periphery; in the same time the cone makes a revolution, and the charge is thus equally sprayed over the surface of the kiln.

AN IMPROVED BUNSEN BURNER.

Messrs. Church & Sleigh, of New York, have designed a new form of Bunsen burner, which they are now introducing. The burner is so constructed that the ordinary adjusting collar is done away with, and the admission of air is regulated by the jet tube itself. The jet tube is made of brass, and is held in place by a small pin driven through a slot in its



lower end and fastened in the base tube. This construction allows the jet tube to be moved freely, and thus, by turning it to the right or left, opening or closing the air port, changing the nature of flame. The particularly important feature of this burner, as stated by the manufacturers, is the cheapness attained by the new construction, while retaining all the necessary qualities of the ordinary burner.

THE FRASSE WHETSTONE HOLDER.

A novel device for holding whetstones is being introduced by Peter A. Frasse & Co., of New York. The illustrations show the holder in its several positions: (1) closed, (2) flat, and (3) on edge. The holder may be adjusted to any stone under 8 in. in length, by centering pivotal points

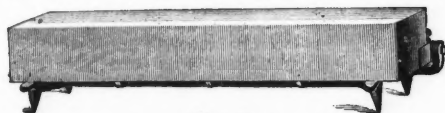


FIG. 1.

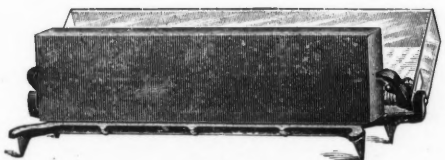


FIG. 2.

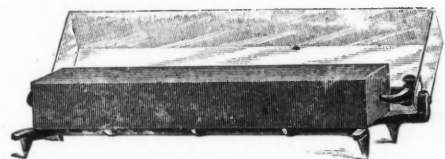
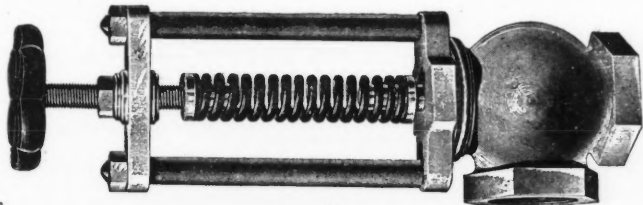


FIG. 3.

in its ends. The stone rests firmly on the base of the holder when used either on broad side or on edge; the pivotal points are held down by means of springs, and the base is supported on four pointed pins; thus the holder will not slip. The holder has a cover that protects the stone from dust. The stone may be used on all four sides; the latter being the important feature of the new device.

THE BACK-PRESSURE RELIEF VALVE.

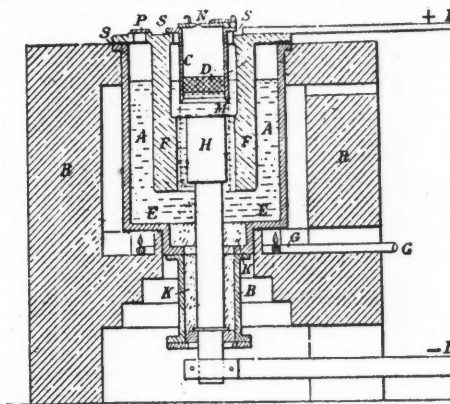
Back pressure is an important factor in all instances where confined gas or water is subject to sudden release with a correspondingly abrupt suppression of flow, as in the instance of water used to operate an elevator. In the example cited a uniform pressure is exerted on the pipe when the elevator is in motion; the positive throttling of the flow or exhaust necessarily subjects the pipes to an excessive strain. The McNab & Harlin Manufacturing Company, of New York, has recently introduced a valve designed to relieve this excess of strain automatically. The



arrangement is as follows: The pressure is at all times direct against the valve in a line with the stem and spring. The amount of pressure that the valve will withstand is regulated by compression or release of the spring, by means of the handwheel, as the case may be. The exhaust or overflow water may be carried, if necessary, from the side opening in the valve through a pipe to any point desired. The valve is claimed to be particularly adapted for use on water mains and on large cylinder engines, where the exhaust is used for heating purposes.

THE MANUFACTURE OF SODIUM AND POTASSIUM.

An improved electrolytic process for the manufacture of sodium and potassium has been invented by Mr. H. Y. Castner, of London, England. He states that fused caustic soda or potash at as low a temperature as possible is decomposed by an electric current. When the temperature is high the power of the bath to absorb both the metal and oxygen becomes very great, and practically no decomposition takes place. The material, therefore, should not be heated to a temperature higher than 20° above its melting point, and at the same time facilities should be given for the rapid separation of the liberated metal from the bath. The apparatus used consists of an iron vessel *A*, mounted in brickwork *K*, in which the caustic soda is melted by heat supplied by means of the gas burner *G*. The vessel is provided by one or more base pipes or extensions *B*, adapted

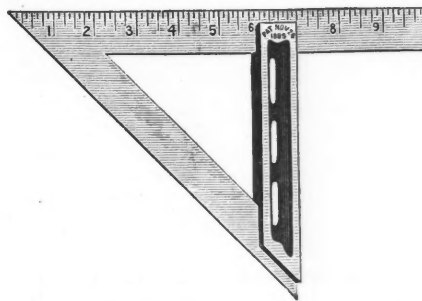


to receive the negative electrode *H*, which is made of metal, the space *K* being filled with molten caustic, which becomes set and seals *H* in position. Above this electrode is suspended a tubular iron receptacle *C*, provided with a lid *N*, and with a cylindrical piece of iron wire gauze *M* attached to its lower end. This gauze surrounds *H*, and rests between it and *F*, the positive electrode. *P* is an opening for the escape of gas, and for the insertion of a thermometer, and *S* is an asbestos or other insulating medium. The current is supplied through *I* and *L*.

The size of the electrodes and their distance apart should be in proportion to the quantity of current. If they be larger than necessary the elements will be subjected to a greater chance of being absorbed by the bath and recombining with a consequent waste of electrical energy. On the other hand, if they are too small the resistance will increase and the bath become overheated just at that part where an elevated temperature is most objectionable. When the decomposition takes place the liberated metal rises and floats on the surface of the caustic in *C*, whence it is removed by a finely perforated spoon which allows the caustic to drain through while retaining the metal. Fresh caustic is added to the bath from time to time so that the process may be worked continuously.

FOX'S COMBINED SQUARE AND MITRE.

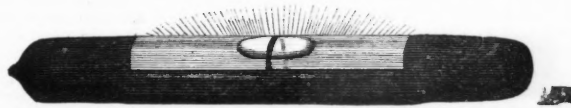
This instrument is a combination of a try-square, mitre and straight edge, so designed that there is no adjustment needed, and nothing to get



out of order. It is particularly adapted for general use from the fact that it may be dropped without losing the angle, or being otherwise injured by the fall. The form of the instrument, which has been placed on the market by Wiebusch & Hilger, of New York, is clearly shown in the cut.

COOK'S LUMINOUS LEVEL TUBE.

A novelty in the hardware trade is a luminous level tube, which is being made in sizes corresponding with the ordinary level tube, from which it differs only in being backed by a phosphorescent compound which is in



turn covered by a water-proof lacquer. The level can, consequently, be used as well in the dark as in the light, and will no doubt be much appreciated by mechanics working in poorly lighted shops. The Luminous Level Company, of New York, is introducing the new device.

PERSONAL.

Mr. E. E. Olcott, mining engineer and metallurgist, of New York, has just returned from a professional trip to Canada.

Capt. J. R. De Lamar has resigned his position as World's Fair Commissioner from Idaho, on account of stress of private business.

Mr. Andrew Carnegie, a son of the late Thomas Carnegie, has entered the laboratory of the Edgar Thomson Steel Works at Bessemer, Pa.

Mr. J. L. Morris, of the Britton Iron and Steel Company, has accepted the superintendency of the American Tin Plate Company at Ellwood, Ind.

Mr. H. M. Curry, of Carnegie Bros. & Co., Limited, Pittsburgh, Pa., has gone to Panama, Republic of Colombia, on business of the company.

Dr. G. W. King, of Helena, Mont., surgeon of the Montana Company, Limited, is visiting this city. He will return to Montana about the middle of the month.

Mr. A. R. Thomson, mining engineer, of Spokane Falls, has just returned from a two months' sojourn in the Seven Devils District, Southern Idaho, where he has been engaged upon professional work.

Hon. J. P. Randol, of San Francisco, Cal., manager of the Quicksilver Mining Company, of New Almaden, was elected one of the Board of Directors of the Bank of California for the ensuing year at the recent meeting of the shareholders.

Mr. William Harper, superintendent of the Broken Hills Proprietary Company's mines, at Broken Hill, New South Wales, Australia, arrived at San Francisco, Cal., on the 29th ult., and will inspect the Comstock and other mines on the Pacific coast.

Mr. Riehard Hancock, lately connected with the Mountain Lodge Gold Mining Company, of Sierra County, Cal., has been appointed by Messrs. J. Taylor & Sons, of London, England, general superintendent of a gold mine in the Malay Peninsula.

Hon. John S. Baker, of Tacoma, Wash., who is largely interested in the Tacoma Smelting Company, is inspecting his extensive mining interests in Idaho and British Columbia. He is accompanied by Mr. Geo. Milliken, mining engineer of the Northern Pacific Railway Company. They will spend two months among the mines before returning home.

OBITUARY.

John H. Cameron, of the St. Louis *Age of Steel* and the St. Louis *Lumberman*, died last week of heart disease at Louisville, Ky.

James E. Lewis, superintendent of the Erie Iron Works at Cleveland, O., died on the 3d inst. soon after reaching his office. He became unconscious while on the way to the works in his carriage, and died soon afterward of heart failure.

Edward Y. Townsend, President of the Cambria Iron Company, died of heart disease on the 5th inst. at his country home at Bryn Mawr, Pa. He had been in poor health for some time, and for nearly two months he had been unable to attend to business. Mr. Townsend was born at West Chester, Pa., in October, 1824. His early education was acquired at the school of Anthony Bolmar at West Chester. At the age of 18 he entered the firm of Wood, Abbott & Co., a Philadelphia dry goods house doing an extensive business in the South and West. When the firm of Wood, Abbott & Co. was dissolved and that of Wood, Bacon & Co. formed he was made a partner. He continued in the firm until the acquisition of a large interest in the Cambria Iron Company by R. D. Wood and his brother, Charles S., and others, who organized the firm of Wood, Morrell & Co., in which Edward Y. Townsend was made a partner. The firm was re-organized in 1862, with Charles S. Wood as president and Mr. Townsend as vice-president. He filled this office until Mr. Wood's death in 1873, when he was promoted to the presidency. The great Johnstown flood, which destroyed the company's works, gave Mr. Townsend a shock from which he never fully recovered.

INDUSTRIAL NOTES.

The Eagle Iron and Steel Company has been organized to operate the old rolling mill at Ironton, Ohio.

The Pennsylvania Steel Company's blast furnace No. 4, at Steelton, Pa., which has been idle for several months undergoing repairs, has been blown in.

The Illinois Steel Company's South Chicago Works produced 34,338 tons of steel rails in October, which is stated to be the largest month's output in the history of these works.

The Carrie Furnace Company's furnace No. 2 at Rankin Station, near Pittsburgh, Pa., which has been out of blast for two months for relining and other repairs, was blown in on the 26th ult.

The Homestead Steel Works 119-in. plate mill (Carnegie, Phipps & Co., Limited), Homestead, Pa., produced during October 4,800 tons of finished plates. This record has been exceeded only once before, the product for October, 1890, being 5,200 tons.

The Monongahela Iron and Steel Company's new muck mill at Hays Station, on the line of the P. V. & C. railroad, a few miles from Pittsburgh, was put in operation last week. For the present only muck iron will be manufactured, but it is the intention of the company to manufacture bar iron later on.

The Solvay Process Company, of Syracuse, N. Y., the great manufacturer of soda by the Solvay ammonia process, is putting up a number of coke ovens to experiment with ammonia recovery from coke-oven gases. As a large consumer of ammonia, it desires to test the question, what future there is in coke manufacturing as a source of supply.

James Leffel & Co., Springfield, O., builders of the famous James Leffel water wheel, report that 18 large water-wheels were recently ordered by one firm. The turbines of this large order are to be used for driving a fine wood pulp mill, now under contract for construction in Wisconsin. This mill is situated near large quantities of suitable timber, and where ample water power can be had.

J. W. Penfield & Son, of Willoughby, O., have issued a neat pamphlet descriptive of their various clay-making machines. The text of the book is principally devoted to a practical discussion of the suitability of brick as a paving material; also a comparison of the different kinds of bricks that may be used for that purpose. Several cuts illustrate properly laid brick pavements and typical brick machinery.

The Joliet Sheet Rolling Mill Company has been organized to erect at Joliet, Ill., a plant for the manufacture of iron and steel sheets. The general manager of the enterprise will be Samuel Fewtrill, who has for many years been connected with the Joliet Steel Works. At a meeting held last week in Joliet many of the prominent business men of the city were in attendance and subscribed liberally to the stock of the company. A site comprising some 20 acres has been secured in a favorable location.

The American Ore Machinery Company, of New York, manufacturers of the Nord Dry Pulverizers, have just advised us as follows: "A gentleman in Johannesburg, South Africa, states that he saw our advertisement in your paper. We also had last week letters from Brisbane and Melbourne, Australia, bearing like testimony to your extended circulation. Our experience certainly is abundant proof that the *ENGINEERING AND MINING JOURNAL* is by far the best medium we know of for reaching all foreign countries. In Europe, for example, there are only four countries that we have not heard from, viz.: Turkey, Greece, Rumania and Bulgaria."

The Mason Regulator Company, of Boston, Mass., have arranged to issue a treatise entitled "Common Sense in Making and Using Steam." This book is the second in a series on mechanical subjects, treated in a popular manner by competent writers. The book in question has as its primal object the enlightenment of steam users and plant owners, with suggestions in reference to proper location for best effect; also chapters devoted to fuels, feed water, lubrication, etc. The last pages of the book will contain various tables of the efficiency of steam and other useful mechanical data in a condensed form.

The armor plate tests at Indian Head, Md., on the 31st ult., resulted in a victory for the low carbon nickel-steel plate made by Carnegie, Phipps & Company, Limited, of Pittsburgh, Penn. Three plates were tested, the other two being, viz., a high-carbon nickel-steel plate and a low-carbon Harvey process steel plate, both made by the Bethlehem Iron Company. Each plate was $10\frac{1}{2}$ in. thick. They were lined up together, the Carnegie, Phipps & Company plate in the middle. Each plate was solidly backed and bolted and furnished with strip plates to represent the contiguous plates of a ship's armor. The gun, a 40-calibre 6 in. breech-loading rifle, was under a bomb cover, even the few feet of muzzle protruding being covered with sandbags. The greatest rapidity was exhibited in the firing, while time enough was allowed between shots to photograph the plates, take measurements of the depth of penetration, width of bulge, and height of fringing. The record is as follows:

First Shot.—A plate, nickel-steel, high-carbon; Bethlehem. Fired at upper left-hand corner. The point of the projectile pierced the rear of the plate, the projectile rebounding clear of the plate to a distance of 15 ft. Projectile found in perfectly sound condition. Depth of penetration, 13 in., width of bulge, 8 in. A uniformly circular fringe about 1 in. in height was raised. Result normal. Striking velocity, 2,075 foot seconds. Projectile, a 6-in. Holtzer armor-piercing. Charge, 41 lbs. of powder.

Second Shot.—Plate, nickel-steel, rolled, and of low carbon; Carnegie, Phipps & Company. Fired at upper left-hand corner. Shot penetrated to a depth of $11\frac{3}{4}$ in., measuring from base of projectile to face of plate. The shot formed an effectual plug in the hole. Bulge and fringe same as in first plate. Muzzle velocity, projectile and charge same as in first case.

Third Shot.—Plate, low carbon steel, treated with Harvey process; Bethlehem Steel Company. Fired at upper left-hand corner. Projectile penetrated to base of point and broke off outside the face of the plate.

Projectile parts could not be found. Velocity, 2,073 foot seconds. Projectile and charge same as before.

Fourth Shot.—Plate, nickel-steel, high carbon; Bethlehem. Fired at upper right-hand corner. Projectile penetrated to a depth of $9\frac{3}{4}$ in., the base breaking off in the same manner as against the Harvey plate. Bulge and fringe same as in case of first shot. Velocity, projectile, and charge same as before.

Fifth Shot.—Plate, nickel-steel, rolled, low carbon; Carnegie, Phipps & Company. Fired at upper right-hand corner. Projectile penetrated to a depth of 9 in. from the face of the plate to the base of the projectile. Projectile served as an effectual plug, as in former instance. Condition of shell, good. Bulge, $18\frac{1}{4}$ in. in diameter. Velocity, projectile, and charge same as before.

Sixth Shot.—Plate, low carbon steel, Harvey process; Bethlehem Company. Fired at upper right-hand corner. Projectile penetrated to a depth of $2\frac{3}{4}$ in., measured from face of plate to the forward end of the interior cavity. Body of shell broken up. A radial crack caused in plate, running from edge of circle to upper right-hand corner, with a depth of 5 in. Velocity, projectile and charge the same.

Seventh Shot.—Plate, nickel-steel, high carbon; Bethlehem Company. Fired at lower left-hand corner. Projectile penetrated to a depth of 13 in., same as in the case of the first shot. The projectile rebounded in an injured condition and fell to the rear at a point 15 ft. from the front of the plate. Bulge and fringe of the same dimensions as the two previous shots at this plate.

Eighth Shot.—Plate, nickel steel, low carbon; Carnegie, Phipps & Co. Fired at lower left-hand corner. Projectile penetrated until about $2\frac{1}{2}$ in. of base was left showing. Depth of penetration $14\frac{3}{4}$ in. Bulge 18 in. in diameter. Fringe regular and $1\frac{1}{2}$ in. in height. Projectile formed a perfect plug. Velocity, projectile and charge same as before.

Ninth Shot.—Plate, low carbon steel, Harvey process; Bethlehem Company. Fired at lower left-hand corner. Projectile penetrated to a depth of $9\frac{3}{4}$ in. Bulge $16\frac{3}{4}$ in. wide. Little fringe showing and that very fine and brittle. This shot developed a crack, running from lower edge of point of impact to the lower left-hand corner of the plate. Velocity, projectile, and charge same as before.

Tenth Shot.—Plate, nickel-steel, high carbon; Bethlehem Company. Fired at lower right-hand corner. Projectile penetrated a depth of $10\frac{3}{4}$ in. Bulge $17\frac{1}{4}$ in. wide. Fringe regular, with two radial cracks running to the right and measuring respectively 3 in. and 4 in. in length. Projectile rebounded and found broken up. Velocity, projectile and charge same as before.

Eleventh Shot.—Plate, nickel-steel, low carbon; Carnegie, Phipps & Co. Fired at lower right-hand corner. Projectile penetrated to a depth of $13\frac{1}{2}$ in., forming a perfect air-tight plug. Bulge $17\frac{1}{2}$ in. in width. Fringe regular and $1\frac{3}{4}$ in. in height. Velocity, projectile and charge same as before.

Twelfth Shot.—Plate, low carbon steel, Harvey process. Fired at lower right-hand corner. Projectile penetrated about two-thirds of its own length. Bulge nil. Fringe nil. Projectile after entering appeared to have expanded, enlarging the aperture.

On the conclusion of the twelfth shot the 6 in. breech-loading rifle was dismounted, and in its place was put an eight-inch breech-loading rifle, and the test was continued:

Thirteenth Shot.—Eight-inch rifle. Plate, nickel-steel, high carbon; Bethlehem Company. Fired at center of plate. Projectile penetrated to a depth of $15\frac{1}{2}$ in., measured from base of projectile to face of plate. Two serious cracks developed, one leading from edge of circle to upper left-hand corner, and extending clear through the plate, and the other from the edge of the circle to the lower right-hand corner. The projectile rebounded from the plate to a distance of 54 ft. Projectile used, Firmini. Weight of projectile, 210 lbs. Weight of charge, $74\frac{1}{2}$ lbs. Muzzle velocity, 1,850-foot seconds.

Fourteenth Shot.—Plate, nickel-steel, low carbon; Carnegie, Phipps & Co. Fired at center of plate. Projectile penetrated, leaving a distance of $\frac{3}{4}$ in. from the base of the projectile to the face of the plate. No cracks developed, except a light one a fraction of an inch in depth and not more than 3 in. in length. Face of plate to all appearances perfectly sound. Velocity, projectile and charge same as previous shot.

Fifteenth Shot.—Plate, low carbon steel, Harvey process. Fired at center of plate. Projectile penetrated to a depth of 23 in. Plate badly cracked in many directions. Demolition of plate assured. Bulge, $22\frac{1}{2}$ in. Fringe, nil.

At the end of the last shot the test ended. As will be observed from the above, the victory lies with the Carnegie, Phipps & Co. plate. Up to the firing of the first 8-in. shot the Bethlehem nickel steel, high carbon plate showed the best results. In this respect it showed similarly to the Creusot all steel plate in last year's test. Then it was only when the 8-in. gun was put to work that nickel-steel showed a better face than all steel.

WORLD'S FAIR NOTES.

The State of Idaho has applied for 10,000 sq. ft. of space in the Mines and Mining building for a display of minerals.

The Quebec Steamship Company, operating the New York, Bermuda & West India Line, has agreed to bring government exhibits to the fair free. Half rate is granted on the exhibits of individuals.

A \$10,000 model of a stamp mill for milling copper, now the property of the State Museum, of Michigan, will be shown at the World's Fair. It is a model which was made and presented by the Calumet and Hecla Mining Company.

The great imitation coast-line battleship, which is to constitute and contain the Government's naval exhibit, is in an advanced state of construction. It will be all inclosed before winter weather sets in and all of the interior work will be completed by spring.

The number of intending exhibitors who have applied for space at the exposition reached 1,623 on October 24th. This is a much larger number than the Centennial had at a corresponding

early date. The number does not include any foreign applications, all of which are made to their respective national commissions.

The roof iron work on the Mines and Mining Building has been much advanced. Nine out of the ten great cantilever trusses for the central arched roof are now placed. More than 1,500,000 lbs of steel and iron will enter into the construction of this building. This week "staff" filling will begin on the sides.

The Board of Control of the World's Fair has decided that exhibitors from Latin American countries may display their goods in either of the departmental buildings or in the collective exhibit of the Latin American nations. The assumption heretofore has been that such exhibits would be given place in the Latin American department.

Customs regulations for foreign exhibits to the fair are being prepared by Assistant Secretary Spaulding, of the Treasury Department. These regulations are substantially the same as were asked for by the foreign commissioners who recently visited Chicago. Mr. Spaulding says that he has no doubt that the regulations will be found entirely satisfactory to foreign exhibitors.

California is the first state to respond to Chief Buchanan's request that each state contribute the trunks of three of its most characteristic trees, to be used in constructing a rustic colonnade for the Forestry building. California's contribution includes a sugar pine furnished by Towle Bros. & Co., of Alta; a redwood, by J. F. Cunningham, of Santa Cruz, and a sequoia, by Smith Comstock, of Tulare.

There is to be new a kind of staff used in the ornamentation of the Fine Art Palace. Some time ago bids were asked and received for the staff work. In the meantime the Medusaline Manufacturing Company, of New York and Chicago, had entered the contest with a different preparation and since then all previous bids have been declared off. This new staff is more expensive than the ordinary staff, but is susceptible of being molded into the forms of material which usually require hand cutting and polishing.

Mr. Thomas A. Edison, the famous electrician, has applied for 35,000 ft. of space, or about one-seventh of all that the Electricity building contains. "I have it from Mr. Edison himself," said Chief John P. Barrett, "that this display at the Fair is to be the greatest achievement of his life. In talking of his application for space Mr. Edison admitted that he was asking for a large section of the building; but every inch will be put to good purpose," he added. "I shall not waste a foot of the area assigned to me, but will present a series of the most interesting electrical inventions ever produced." I happen to know," added Mr. Barrett, "that Mr. Edison is doing just as he says. He is making an almost innumerable list of novel and spectacular exhibits. Other electricians are not idle. We are already crowded for space in our building, and if the demand continues as it has begun I don't know how we will accommodate all the exhibitors."

Florida's exposition building will be a full-sized reproduction of Fort Marion, which was built at St. Augustine in 1620, and is believed to be the oldest building in the United States. It is of stone and covers a space of about 150 ft. square. The walls are 20 ft. high and 9 ft. thick at the base. It is a rectangular structure, the interior court being about 75 ft. square. Within the fort are 24 rooms. The reproduced structure on the fair grounds will be frame, covered on the outside with the phosphate rock of Florida, to give it the appearance of stone. The walks on the parapet and within the inner court will be covered with the celebrated pebble phosphate of Florida. This use of the material will constitute the State's phosphate exhibit. The old fort is encompassed about with a deep moat. This moat will also be reproduced, and will constitute a sunken garden, in which will be shown all the tropical plants of Florida—the pineapple, banana, rice, sugar cane, oranges, &c. It is contemplated to partition off a portion of the moat and fill it with water and have there several alligators and, perhaps, crocodiles. Several of the old Spanish cannon that once did service at the fort will be taken to Chicago.

EXPORT NOTES.

An important submarine cable soon to be laid is that between Pernambuco, in Brazil, and Senegal, in Africa. A British company is the promoter of the project. It is expected to be in operation in six months.

The Spanish-American Transportation Company, recently incorporated, will place upon the route between New Orleans or Mobile and Colou (Aspinwall) a line of fast steamships for freight and passenger traffic.

The Old Alcalde furnace, at Rusk, Tex., recently shipped 300 tons of first class foundry pig iron to Mexico. This is said to be one of the largest consignments of pig iron ever sent from the United States to the Republic of Mexico.

Trade in Siam is increasing, says Mr. S. H. Boyd, U. S. Consul-General at Bangkok, but nothing is imported direct from the United States but

kerosene oil. All, or nearly all, of the flour used there is from Hong Kong, and has the California brand. Corn meal, flour, bacon, and groceries, properly canned, ought to be supplied from the United States.

A keen competition between American and Russian petroleum, in the Straits Settlement, has been going on for some years, says Mr. R. Wildman, U. S. Consul at Singapore, in a recent report, and in 1890 for the first time Russia outstripped the United States; 12,000 cases more were received that year, the total import being 882,300. Of this, the United States sent 436,900 cases and Russia 444,900 cases.

The New York and Brazil Steamship Company was incorporated at Charleston, W. Va., on the 31st ult. The concern is composed of New York and Brazilian capitalists, and has an authorized capital of \$3,000,000. The president is Judge A. J. Dittenhofer; the vice-president is ex-Postmaster-General Thomas L. James; the treasurer is John N. Hayward, and the directors are Messrs. Dittenhofer, James Hayward, Frank S. Gray, Rufus R. Wilson, Wylie J. Rouse, and Meyer Hillman.

The Mexican International Steamship Company has been organized in Philadelphia, to run a line of steamships between Philadelphia and Mexico, via Havana. The following are the officers of the company: William B. Bement, president; George E. Bartol, secretary and treasurer; James W. Porch, general manager. The capital stock of the company is \$500,000. It is expected that the first ship will sail about January 1. The ships will be chartered vessels, of about 2,500 tons capacity, and the ports at which they will touch are Progreso, Campeche, Frontera, Vera Cruz, Tuxpan and Tampico, on the Gulf coast of Mexico, calling at Havana, Cuba, each way.

"I doubt if there are 20 American commercial houses in all Mexico," says Mr. E. O. Fechet, U. S. Consul at Piedras Negras; and "there is probably a German house in every town of fair size in the Republic. The heads of these houses, as a rule, come to Mexico as junior clerks; one might call them commercial apprentices sent out by the great German houses of Hamburg and Bremen. These men speak Spanish, know the Mexican people socially and study their commercial needs, and are keen, shrewd traders. Every German commercial house is a center from which to watch the trade of a large district; credits can be intelligently given with a minimum risk, and are much longer than can ordinarily be secured in the United States, running from 9 to 15 months. Commercial agencies might profitably be established in the larger towns by the co-operation of several large manufacturers. Samples, not price lists, should be the equipment of such agencies; Mexicans, like other people, like to see what they may buy. The heads of such agencies will soon learn whom to trust and give credits on sales accordingly; they should be fully posted as to freights, modes of packing, customs duties, and final cost to buyer."

Mr. Frank D. Hill, U. S. Consul at Montevideo, speaking of American trade prospects in Uruguay, in a recent consular report, says: "A passive, unprejudiced observer on the spot would often be tempted to think that we are not, after all our protestations to the contrary, over-anxious for a larger share of the River Plate trade. Most traveling men whom I have met this year have belonged to the class of bold, zealous young men of ideas, who seem to have induced the heads of their firms at home to allow them to make this South American trip as a sort of venture. Nearly all have been hampered by the inexorable necessity of husbanding their allowances with closest care, while their competitors, representing great English, French, and German houses, travel and live in a way befitting the interests they represent. Parsimony in these matters is, at the present juncture, ill advised. Every traveling agent must do missionary work for the next few years, in order to even get for his line of goods a standing—much less to get control of the trade—and liberality in his personal expenditures will be amply repaid. Our share (about \$5,000,000 out of over \$60,000,000 in 1889) of Uruguayan trade is manifestly small and plainly much less than we should have. We hear much of the United States 'competing' for this trade. She does not, however, at present 'compete' at all with her European rivals. She furnishes what Uruguay cannot else where get—lumber, petroleum, agricultural machinery, etc.—and she takes from Uruguay hides, hair, and a little wool. I have no doubt that we can compete successfully in many lines of goods, notably cotton fabrics, after adequate means of transportation shall be established. I have no confidence whatever in such enterprises as 'floating exhibitions' as a means of increasing trade by calling attention of foreign merchants to our products. I am assured that not over 200 persons went out into the harbor here to look at the much advertised Spanish floating exhibition which came here last year. The vessel lies to day in this port embargoed by creditors, the goods having been sold at auction. I do not believe that we can gain a foothold in trade here by any such devices. My impression is that our people do not display the same talent as salesmen that they do as manufacturers. We are prone to think that what 'goes' in New York and Chicago will, perforce, meet acceptance in Buenos Ayres or Valparaiso,

and that if the native or local taste differs from ours we may 'educate' it to an appreciation of the proper thing. This last is a most erroneous assumption. Our goods must be made, marked, and packed to meet, not the desires, but the demands, of these markets. If we do not care or cannot do it they will buy of those who will and can. All the countries of Europe are bidding for South American trade and she takes her choice among all comers. The atmosphere here is charged with European influences. There are few Americans and fewer Americanisms. Europe here, as elsewhere, fears us as a rival of great potential strength, and her merchants, who now handle our goods, cannot be relied upon to take any part in extending our trade. We need American houses, branches of establishments in home cities, under the control of live, earnest American managers."

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, and his address will be furnished to any one desiring to supply him.

Any one 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 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.

All these services are rendered gratuitously in the interest of our subscribers and advertisers; the proprietors of the "Engineering and Mining Journal" are not brokers or exporters, nor have they any pecuniary interest in buying or selling goods of any kind.

GOODS WANTED AT HOME.

2,430. Wood and metal working machinery and tools for car works. New York.

2,431. A round and flap hoop machine for kegs, barrels and tierces. Virginia.

2,432. A second-hand hoisting engine, 30 to 40 H. P. double cylinders and double independent drums (or two smaller engines), to be used for hoisting from two shafts 150 ft. apart. Also a sinking pump, capacity of lifting 200 gallons a minute, a distance of 225 ft., with necessary piping. Machinery must be in perfect condition and very cheap for cash. Georgia.

2,433. A small diamond drill, hand or steam. New York.

2,434. A good second-hand hot blast dry kiln of 5,000 to 6,000 ft. daily capacity of 1-in. green lumber. North Carolina.

2,435. A 35 or 40 H. P. engine for saw mill, and an exhaust fan or blower for three machines in planing room. West Virginia.

2,436. A hot water heating plant, electric bells, electric lighting by water power and a hydraulic passenger elevator for a 100-room hotel. Florida.

2,437. Boiler and belting. Ohio.

2,438. Electric plant for ice bottling and cold storage company. Tennessee.

2,439. A wind mill. Virginia.

2,440. Wooden tanks. Virginia.

2,441. Machinery for making corn brooms. Virginia.

2,442. Tools for foundry and machine shops. Virginia.

2,443. A cord wood saw. North Carolina.

2,444. Dredge, steam shovel, washing, drying and conveying machinery for phosphate mining. New York.

2,445. Stonecutters and blasting tools to be used in procuring and dressing rock and ore specimens. North Carolina.

AMERICAN GOODS WANTED ABROAD.

2,417. Steel engravings. A Spanish correspondent wants to know the cost of putting up an establishment for engraving and printing bank bills, bonds, etc., on a moderate scale. New York.

2,419. A correspondent who is largely interested in the mining industry of South Africa wants catalogues and price lists of everything connected with mining or milling, and in all branches of gold, silver, copper, coal, petroleum, etc. South African Republic.

2,424. A stove polish machine of about 100 lbs. an hour output. Canada.

2,429. A dredging machine for constructing about 50 miles of dike, averaging 15 ft. high, for reclamation of land from spring overflow; soil sandy and gravelly, with little or no rock; timber and saw mills near. British Columbia.

GENERAL MINING NEWS.

ARIZONA.

Work upon the north-south railroad through Arizona is being vigorously prosecuted between Phoenix and Prescott.

A railroad from Globe, to connect with the

Southern Pacific at Tucson or another point, is among the probabilities.

COCHISE COUNTY.

TOMBSTONE MILL AND MINING COMPANY.—This company, operating under the management of Mr. George W. Cheyney, is shipping steadily about 500 tons of ore per month to El Paso, Tex.

GILA COUNTY.

BUFFALO COPPER COMPANY.—The Buffalo mine at Globe, which has been worked under lease by Alex. Trippel, Henry Lyman and others, has been bonded.

CALIFORNIA.

SAN DIEGO COUNTY.

SALTON SALT COMPANY.—A survey of the new fresh water lake that formed in the Colorado Desert early this year has been completed by this company, whose property at Salton has been greatly damaged by the water. This company, with other sufferers, is desirous of cutting off the inflow of water from the Colorado River, thus restoring the desert to its former condition, and the survey was made for the purpose of determining the feasibility of constructing a levee between the river and the present lake bed. Manager Durbrow of the company says the main break through which a large body of water is constantly flowing is 15 miles below Yuma. The other openings in the river bank are about 35 miles down the river from Yuma, and to effectually stop the flow of water it would be necessary to extend the proposed dike for some miles between these two sections. The depth of the main crevasse was found to be as great as the depth of the river itself, and, therefore, all hope that the waters of the lake would subside when the river became lower in winter—the stream being highest when fed in summer by the melting snow of the mountains—was necessarily abandoned. A careful measurement showed that 1 800 cu. ft. of water flows through this large crevasse every second, although the water of the river is now much lower than it was in mid-summer, and yet the total amount of water pouring into the lake is not equal to the rapid evaporation caused by the intensely hot sun of the desert region. The present greatest depth of the lake is 34 in., and the water is falling at the rate of a quarter of an inch per day; but even should the evaporation be complete a rise of the Colorado River will refill the lake. A considerable amount of property was damaged or destroyed by the formation of the Salton Lake, but it is probable that no attempt to reclaim it will be made at present by the expensive method of building an immense dike along the river bank, and nature's course will not be interfered with unless greater interests are endangered.

COLORADO.

BOULDER COUNTY.

TREMBO.—A rich strike of telluride ore is reported in this mine at Gold Hill, not far from the Harsfal. This property has been lying idle for years, and was not considered worth anything until the present owners took hold of it. The mine is but 55 ft. deep. Levels are being run east and west at a depth of 50 ft. The vein cut is about 10 in. wide, and the pay streak 2 to 4 in. Assays of the ore have run from 99 oz. gold and 140 oz. silver up to 2,000 oz. gold and 450 oz. silver per ton.

GILPIN COUNTY.

NEW CALIFORNIA, LIMITED.—The September output amounted to 394 tons, yielding 182 oz. of gold, valued at £580. Mining and milling expenses amounted to £660. Expenditure on exploration and development work was £100.

TOPEKA.—According to the Central City Register Call, a mining deal was closed at Central City on the 23rd ult., by which this group of mines in Russell district was transferred by its owners, Edward W. Williams and Charles L. Harker, to Henry P. Lowe, Percy C. Hamilton, and others, of Chicago, for \$100,000. The group consists of the Topeka, Concession, Connemara, and two other claims. The Topeka claim covers 1,248 ft. on the vein patented, and the Connemara 1,300 ft. patented. The principal development consists of a main shaft 500 ft. deep and at an angle of 45°. The surface of the vein was worked out to a depth of from 90 ft. to 125 ft. in early days, and some \$350,000 worth of ore is said to have been taken out. The purchasers propose to organize the Argyle Gold Mining Company, which will develop the property.

HINSDALE COUNTY.

GOLDEN FLEECE.—According to local papers, the owners of this mine are very chary about giving any information regarding the property. However, it is reported that they struck a larger and richer body of ore there last week than has ever shown up in the mine before.

LAKE COUNTY.

(From our Special Correspondent.)

A. Y. AND MINNIE.—About 1,000 tons of lead carbonate ore is being mined and shipped from these mines each month. No attempt is being made to break any of the immense reserves of sulphide, hence the mill is lying idle. A great deal of prospecting in the four ore chutes goes on, now ever, and the outlook for large shipments soon is good. These can be made anything the management chooses, when contracts are effected.

CONTINENTAL CHIEF.—The 100-ton concentrat-

ing mill has been started up, and is giving great satisfaction. Some trouble was experienced at first from lack of water, but an ample supply is now insured. Two inclines—one under the other—are being driven through the ore body, the distance between these being about 67 ft.

LITTLE CHIEF MINING COMPANY.—In No. 6 Pittsburg the lessees have struck a good vein of lead carbonate ore, inclosed in the main iron ore body. The shaft is down about 260 ft., and in a drift run to the north, a raise was sent up, which cut the vein about 35 ft. above this drift. The company is doing but little more than prospect work, though it is understood that contracts have been made for large quantities of argentiferous iron.

MAID OF ERIN SILVER MINES (LIMITED).—More than 1,500 tons of ore were shipped from these mines during the past week, the value of which approximated \$30,000. The two headings from the bottom of the Adams Discovery shaft are being rapidly driven out into Wolfstone ground, the breasts having reached a point within 100 ft. of the Standard shaft on that property. Some extremely rich ore is being met with in the so-called "crooked drift" in the Maid of Erin ground, native and leaf silver being frequently encountered in bunches.

NEW ENGLAND MINING COMPANY.—Drilling has begun in the Ohio Bonanza shaft of this company, and the porphyry-lime contact is expected to be met with at about 600 ft. from the surface. The shaft is now down 455 ft., and in stringers of steelgalena ore.

ST. LOUIS.—About 800 ft. from the mouth of the tunnel on this mine a raise was made, which disclosed a vein of siliceous gold ore dipping rapidly to the south. It was thought best to drive the tunnel ahead to intercept this ore on its dip, and this work is now going on, the tunnel having already attained a length of 920 ft. It is expected that the vein will be met in about 30 ft. of further driving. Meanwhile, some ore is being mined from the south workings from the raise, which ore is concentrated to reduce the cost of hauling to the smelters, by a system of sluice boxes, the resulting product paying quite well.

TERIBLE MINING COMPANY.—Shipments from the Ward shaft of the Adelaide are continuous, and now average 35 tons a day. This is of a dry siliceous nature, the silver value of which is, however, quite good.

OURAY COUNTY.

PAYMASTER AND AMERICAN GIRL.—The sale of the Paymaster and American Girl groups of mines near the Guston and Silver Bell mines, Red Mountain, has been consummated. The properties were owned and sold by F. Durgy, of Ouray, to James Hopkins, of St. Louis, Mo., and L. A. Dunham, of Denver. The two groups include 8 claims and are located in the midst of the great ore belt of Red Mountain. The consideration is not made public, but it is said to be approximately \$300,000. Mr. Hopkins is president of the American-Nettie company, and represents St. Louis capitalists, while Mr. Dunham represents ex-Governor Grant and others, of Denver. Extensive operations, it is said, are to be begun immediately. In addition Messrs. Hopkins and Dunham purchased the Puzzle and Scotch Chief, adjoining the American-Nettie on the gold belt. These properties were owned by Colonel Nash and others of Ouray. The consideration for the Puzzle and Scotch Chief is said to be between \$30,000 and \$50,000. An English syndicate, it is said, has been figuring on these Red Mountain properties for some time past, but was no nearer closing the deal than when it began.

PITKIN COUNTY.

LITTLE RULE MINING COMPANY.—The control of this company has passed into the hands of Messrs. Taylor & Rathvon, of Denver. Mr. C. N. Perkins, who held a majority of the stock, disposed of it on private terms. Messrs. Taylor & Rathvon assumed the management of the property on the 1st inst.

SAN MIGUEL COUNTY.

BELMONT CONSOLIDATED GOLD-MINING COMPANY.—In speaking of the Belmont mine on the Savage Fork, of Marshall basin, the Telluride Journal gives the following description of the mine and the mill that is being erected upon the property: "It is worked by several tunnels, also a cross-cut 300 ft. long, which gives a depth of 340 ft. on the vein. About 900 ft. of development work has been done in the ore body. The vein has an average width of 8 ft., consisting of gold-bearing quartz, averaging \$20 a ton. A mill, consisting of crushers, duplex rollers, three 5-ft. Huntingtons and six Frue vanners, is being erected below the mine, and the ore will be transported by a 1,600-ft. gravity tramway. The power will be furnished by a 3-ft. Pelton water wheel under a 670-ft. head from 2,200 ft. of pipe, driving the 250-H. P. dynamo, and connected with the mill by 2½ miles of wire."

SUMMIT COUNTY.

(From our Special Correspondent.)

ROBINSON CONSOLIDATED MINING COMPANY.—The 16th and 17th levels of the main incline have now about 4½ ft. of fine lead ore disclosed in them, and are being rapidly connected. About 100 tons of this ore is now broken in the mine, and hoisting will be resumed at once. Shipments are continuous, though a slight delay has just occurred, through the breaking of the wire hauling rope.

The main tunnel has advanced about 2,700 ft., and near the breast a streak of ore has just been encountered, and it is more than probable that the Giant ore chute will soon be cut into. This has been the objective point of all this work.

FLORIDA.

The meeting of phosphate miners recently held at Ocala, Fla., was attended by about 100 persons interested in the industry, among whom were representatives of 37 phosphate mining companies. A committee appointed to formulate a plan reported recommending that all organized companies or individuals engaged in the mining of phosphates in the State be invited to meet in convention at Ocala, Fla., on November 19th, for the purpose of formulating plans for concert of action and controlling the output.

IDAHO.

(From our Special Correspondent.)

ELMIRA.—This mine at Bauner turned out 4,000 oz. of fine silver hulsion last week. The regular yield is from 400 to 700 oz. per day.

WOLVERINE.—The vein at the 500-ft. level is said to be larger and richer than at any other point and furnishes ore faster than the stamp mill can reduce it. An addition will probably soon be made to the present 20-stamp mill. The 3,500-ft. tunnel, which will be used as a working tunnel, will tap and drain the Banner mine.

CUSTER COUNTY.

DICKENS-CUSTER MINING COMPANY, LIMITED.—At the third ordinary general meeting of this company in London, on the 14th ult., the chairman stated that the titles to all the company's property had been finally placed in its own name, that the mill was in good working order, and that the company had over £6,000 at its bankers and did not owe a farthing. The mines are looking better and prospects, generally, are considered favorable.

OWYHEE COUNTY.

SILVER CITY REDUCTION COMPANY, LIMITED.—The statutory meeting of the shareholders of this company took place in London on the 10th ult. Mr. H. Cavanagh presided, and in the course of some remarks upon the position of the company said that it was registered on June 13th last, with a nominal capital of £10,000 in 10,000 shares of £1 each. No promotion money was paid to the vendors, but the company directly entered into an agreement with the contractor to furnish the company with a plant capable of reducing 30 tons of ore per day, for the sum of £4,000 in cash and £2,000 in fully paid shares in the company. A plant had already been secured which would treat about 10 tons per day, which would have to be enlarged by the contractor during the next spring, the earliest period at which he could commence such operations. Meanwhile, the company was in the satisfactory position of being possessed already of a plant to commence business with, and did so commence by crushing ore on September 1st for the Poorman Mines, Limited, an English company whose property was in close proximity to the mill. Their company had entered into a contract to crush the ore of the Poorman Mines, Limited, and from reports received there was an abundance of ore to come from this source for treatment. They had no concern about the extraction or hauling of the ores, or about the milling values, but charged so much per ton for their treatment only, and ran no risk of incurring had debts in respect of work done. It was the intention of the manager at the works to secure other contracts also from other private owners of mines in the district for the crushing of their ores, and, if necessary, to increase the plant to about the capacity of 30 tons per day estimated for by the contractor. The company's plant was situated in the midst of very many mines, and there was every reason why they should look forward to a lengthened period of success and prosperity, accompanied by a substantial rate of interest upon the money invested in the undertaking.

SHOSHONE COUNTY.

(From our Special Correspondent.)

BUNKER HILL & SULLIVAN MINING AND CONCENTRATING COMPANY.—This company, which suspended operations for a short time recently on account of an accident to the tramway, has resumed work. The contract for the erection of a 350 ton addition to the dressing works has been let, which will give the mine when completed a concentrating capacity of 750 tons of crude ore per day. Five years ago the capacity of this mine was but 50 tons per day.

CEUR D'ALENE SILVER LEAD MINING COMPANY.—The quarterly statement of the Poorman mine at Burke, just published, for the months of July, August and September shows the following: Total receipts, \$126,000; running expenses, \$76,000, leaving a profit of \$50,000. Superintendent Clark says: "The 500 level west has 3½ ft. of good milling ore, and the 500 east has 4 ft. of very clean ore which will assay 70% lead, with the usual amount of silver. The last car shipped assayed 62% lead and 32 oz. silver." The electric plant will probably be in operation in another month.

GETTSBURG.—The owners are preparing to put in an Ingersoll power drill. The vein of galena ore is said to be 25 ft. wide.

KNICKERBOCKER.—The Knickerbocker people feel confident that the Nellie vein crosses the Knickerbocker, and are making preparations for active work.

LAST CHANCE MINING COMPANY.—This company has resumed operations and its concentrator is again running.

LITTLE CHOP.—Wharton Brothers and W. A. Abernethy have bonded this mine for \$62,500 to Messrs. P. W. Dillon, D. T. Anderson, and A. W. McMonan. Two per cent. of the above sum was paid down, and sureties were given that the mine would be worked continuously for one year. The Little Chop is an extension of the Mammoth, from which unusually high grade ore is being taken. The mine, which is but a prospect as yet, is close to the Standard, and about half a mile from the Tiger. Men, tools and supplies will at once be sent to Burke, and development work will be pushed with vigor.

NELLIE.—A 4-ft. vein of gray copper ore, assaying 800 oz. silver per ton, was struck in this mine at Osborn about 4 weeks ago. The shaft in the main tunnel and two crosscut tunnels has been filled with the rich ore taken from the vein, none of it having been displayed on the dump. The strike has been kept very quiet, and no one but the miners admitted to the tunnel under any circumstances. This mine has paid ever since it was first opened.

PAYMASTER.—This mine has been bonded for \$36,000, the bond running until June 1, 1892. This property is supposed to be on the same vein as the Hunter mine on Mill Creek, near Mullan.

TIGER.—This company is operating at Burke and is now erecting a hoisting engine of 1,600 ft. capacity at its new working shaft, now down 400 ft. This shaft is located about 100 ft. south of the old working tunnel.

UNION.—This mine is ready to ship ore, but owing to its ore bin lying between the Union Pacific and Northern Pacific tracks and both roads wanting to carry the ore, neither will let the other have the business. A compromise is, however, soon looked for.

WAR EAGLE.—A good body of ore has been struck in this mine, and the owners are well pleased with the outlook.

YOU LIKE MINING COMPANY.—The annual election of directors of the company was held at Mullan last week. Ore is being shipped to Helena and Omaha and arrangements have been made with the Tacoma smelter to take part of the output. Three gangs of men are at work and arrangements have been made to put in steam drills for driving the lower tunnel.

ILLINOIS.

Dr. Lindahl, State Geologist, has discovered kaolin in large quantities in Southern Illinois, particularly that section of the State in the vicinity of Union County. The clay is said to be of excellent quality for the manufacture of porcelain.

KANSAS.

LEAVENWORTH COUNTY.

United States Attorney J. W. Ady began an important civil suit in the United States Circuit Court of this State at Topeka on the 5th inst. The amount involved is several million dollars. He demands of the Leavenworth Coal Mining Company a full accounting of every ton of coal mined by it on the military reservation since 1868. In 1860 the Assistant Quartermaster at Fort Leavenworth leased to Ewing, Denman & Co., of Leavenworth, the privilege of mining coal under all the lands owned by the Government at the military reservation. As a consideration the company agreed to furnish all the coal required by the Government departments at that place free at the mouth of the shaft, and to pay a royalty of $\frac{1}{2}$ of a cent per ton for all other coal mined there. The lease was set aside on the ground that the officer exceeded his power. In 1868 Congress passed a special act selling 20 acres of the reservation for a small sum and confirmed the lease for sixteen years, or until 1884. Ewing, Denman & Co. afterward incorporated as the Leavenworth Coal Mining Company, which has been mining coal under the reservation lands. The output of the mines has been enormous. The allegations state that the company has never made any report to the Government or furnished coal for the troops or Government officers and has never paid any portion of the royalty. The United States Attorney demands that the value of the coal required by the Government during that time and the $\frac{1}{2}$ cent per ton royalty during the lease be paid over to the United States, and that the full value of all coal mined under Government land since its expiration in 1884 be paid over. He also asks for an injunction to prevent the company from continuing the business of mining during the pending of the suit.

SALINE COUNTY.

ACME CEMENT-PLASTER COMPANY.—This company of Salina, Kan., which is furnishing much of the material used in the preparation of the staff for the World's Fair buildings, held a meeting last week at which it was decided to transfer the company's headquarters to Chicago. The company is incorporated under the laws of Illinois, with \$500,000 paid up capital. The officers are: President, W. W. Wat-son; vice-president, O. P. Hamilton; secretary and treasurer, M. J. Wells; directors, G. W. Clowson, Paul Franke, J. A. Finkler, A. M. Claflin.

MICHIGAN.

The Supreme Court by a decision directing the Auditor General to reapportion the state tax between Dickinson, Menominee, Iron and Marquette counties, practically upheld the act creating the first named county. In this county is located the Chapin, Ludington, Hamilton and other important mines of the Menominee range.

COPPER.

The outputs of mineral made by the different Take mine during the month of October were as follows:

	Tons.	Lbs.		Tons.	Lbs.
Allouez.....	140		Kearsarge.....	100	
Atlantic.....	209	1,205	Osceola.....	302	
Calumet & Hecla.....	4,229		Peninsula.....	117	
Centennial.....	90		Tamarack.....	910	
Central.....	100	760	Quincy.....	570	990
Copper Falls.....	80*		Wolverine.....	47	
Franklin.....	200	1,900			
				7,125	1,955

* Estimated.
CENTRAL MINING COMPANY.—This company's October output of 100 tons is to be compared with 86 tons of the previous month. We learn from Mr. John Stanton, who has just returned from a visit to the mine, that it is looking much better on the 28th and 29th levels. Explorations on the Northwest vein have been discontinued owing to the poor showing made in the quite extensive opening.

PENINSULA COPPER MINING COMPANY.—An ENGINEERING AND MINING JOURNAL reporter learns from the office of this company, No. 80 Broadway, that the decision reached some time ago to either sell the property or shut it down has been reconsidered. It is still on the market, but instead of being shut down in lieu of a purchaser it will be continued in operation. This change in policy has been brought about by the improved condition of some of the lower levels. No. 1 shaft is being sunk to the twelfth level, and other development work is being carried on.

WOLVERINE MINING COMPANY.—We learn from Mr. John Stanton that Nos. 1 and 2 shafts on this company's property are being sunk to the 6th and 3d levels respectively. The mine is looking well. The product of 47 tons last month is not as great as was expected, owing to the fact that development work did not permit of a complete section of rock.

(From our Special Correspondent.)

RED JACKET, Nov. 2.

CALUMET & HECLA MINING COMPANY.—Work at the electric station is progressing. Two pumps have been put up and tested. Everything seems to be working well. A complete telephone system, reaching all parts of the mine, both surface and underground, is in operation. A new arc light circuit has been constructed.

No. 5 shaft, Calumet branch, has been eliciting much interest lately. It is now a few feet below the 41st level. From the 40th level down it has been in a remarkably rich run of ground. Many of the pieces of rock have been at the very least half copper.

Mineral is being shipped regularly to the new smelting works near Buffalo.

TAMARACK, JR., MINING COMPANY.—Your correspondent recently explored the diggings of this company's mine with Capt. James Cruise, the mining superintendent. The shaft is now down 2,680 ft. The lode was cut at about 2,500 ft. from the surface, and 15 or 20 ft. below that another crosscut was started west to the lode. Sixty feet below that another crosscut was run west, and at 2,640 ft. a crosscut to the third level was started. The levels will be 60 ft. apart perpendicularly, and 100 ft. on the pitch of the vein. At the point where the vein was cut, the rock was not of the very best quality throughout the entire width of the vein. In the winze that was sunk from the first to the second level, the rock was much better, and kept improving as it was opened out. The drifts in the first level were run about 50 ft. each way. The ground is as good as was expected in this drift. The second level is a revelation. The south drift is now in about 43 ft., and is looking well. The south part of the mine is supposed by every one to be almost proved by the ground in the Calumet & Hecla lying in close proximity. In No. 5 shaft of the latter mine they are working at the 41st level, or 4,100 ft. on the incline. This would be nearly 2,500 ft. perpendicularly, or in other words just about on the same level in the lode that the Tamarack, Jr., struck the lode. This is conclusive proof to the miners at the Lake that the south block of ground in the property is as good as that in the Calumet & Hecla. For the reason that this part of the mine is considered proved work has been pushed more rapidly in the north drifts. The north drift in the second level is now in about 275 ft. It is full of copper and over 9 ft. in width. The ground through the whole drift was estimated by Capt. Cruise to carry at least 5% mineral. The drifts at the third level are in about 40 ft. each way, and are looking well. At the second level landing the tram road is nearly finished. The new rockhouse will be ready for duty soon. The rock will be taken to the Tamarack mill until a new mill for the company has been erected. Foundations for the new engine house which will contain the regular engine for this shaft are well under way. It will be a double direct Corliss hoist, resembling the hoisting engine at No. 2 shaft of the Tamarack mine.

IRON—GOGEBIC RANGE.

BESSEMER CONSOLIDATED IRON COMPANY.—The foreclosure sale of this company's property took place last week. The interests involved were the Iron King, Bonnie, Blue Jacket, First National and Valley—the old Burton properties. They were bid in at \$50,000 by G. D. VanDyke, of Milwaukee, attorney for W. W. Wright and the new trustee for the American Loan and Trust Company.

MISSOURI. JASPER COUNTY.

(From our Special Correspondent.)

JOPLIN, Nov. 2.

There was no change in the ore market during the past week, zinc ore continuing to rule at an average of \$22.50 per ton. Lead ore was in good demand at \$23 per 1,000.

Following are the sales from the different camps as far as reported:

Joplin mines, 1,327,620 lbs. zinc ore and 304,710 lbs. lead; value, \$21,935.
Webb City mines, 613,950 lbs. zinc ore and 63,970 lbs. lead; value, \$8,379.50.
Cartersville mines 2,009,950 lbs. zinc ore and 161,580 lbs. lead; value, \$26,832.
Zincite mines 215,300 lbs zinc ore and 2,380 lead; value, \$2,688.
Lehigh mines 141,360 lbs. zinc ore; value, \$1,762.
Oronogo mines 95,280 lbs, zinc ore and 19,670 lbs. lead; value, \$1,377.25.
Carthage mines 350,000 lbs. zinc ore; value, \$4,287.50.

Galena (Kans.) mines, 978,000 lbs. zinc ore and 171,050 lbs. lead; value, \$14,288.

District, total value, \$81,549.25.
Aurora, Lawrence County mines, 360,000 lbs. zinc ore, 680,000 lbs. silicate and 285,000 lbs. lead; value, \$14,452.50.

Lead and zinc belt; total value, \$96,001.75.

The thousand-acre tract of land has been the center of attraction during the past week, and today there are 10 organized mining companies operating on the land, besides not less than 80 individual prospectors. A number of shafts are producing zinc ore at a depth of 28 to 35 ft. These surface deposits are what is attracting so much attention among the prospectors and miners, as it enables them to get quick returns for their labor. Many of the miners predict that this land will be as great a producer as the noted Pitcher field of 15 years ago. The Pitcher field is now a part of the Oswego Mining Company's land, and in the early days was noted for its large deposits of surface lead and zinc ore. Some of these old abandoned mines have been recently reopened and sunk to a greater depth, and the second run of ore has proved as productive as the first.

The Wilcox & McCarty concentrating plant now being erected on the Brooks land west of Joplin will soon be completed, and when in running order the mine will make a large production, as there is a large amount of concentrating ore in sight.

MONTANA.

ANACONDA MINING COMPANY.—This company has \$12,500,000 capital stock and \$7,000,000 bonds outstanding, but as Mr. Haggin finds that bonds upon mining property are regarded as of no especially increased value in this country, compared with mining shares, he is moving to increase the capitalization to \$25,000,000 for the purpose of taking up the bonds. These bonds have never been generally distributed and are in \$100,000 pieces.

The worst mining accident of the year in Montana took place at the Anaconda mine on the morning of the 4th inst., when seventeen miners were killed. At midnight, when the shifts change, a cage full of miners returning from work arrived at the surface. Their places were at once taken by nineteen men, and the cage was started downward. The rope had been unwound but a couple of times from the drum of the winding engine, when there was a sudden snap and a cry of horror from the shaft in which the cage had but a moment before disappeared. The rope had broken, and the cage with its nineteen inmates was precipitated to the bottom of the shaft. It was some little time before any assistance could be given. The shaft down which the men had plunged was useless, and other ways of getting at the place where they had fallen were roundabout. Fortunately there was some help for the dead and dying men in the mine itself. A number of miners who were through work and waiting to be hoisted to the surface were at the bottom of the shaft waiting for the cage to take them out. Amid them, narrowly missing some, the cage dashed. It broke, and before their eyes were the mangled bodies of the companions whom they were awaiting. There was little, however, that could be done. Of the 19 men who made the fearful ride 17 were dead, their forms crushed out of all semblance to those of human beings, while of the two who were yet breathing had no hopes of recovery.

BOSTON AND MONTANA CONSOLIDATED COPPER AND SILVER MINING COMPANY.—At the annual meeting of the stockholders of this company, at Butte City, on the 29th ult., 80,153 shares were represented, and the following were unanimously elected trustees: A. S. Bigelow and A. W. Spencer, of Massachusetts; Franklin Fairbanks, of Vermont; Charles Van Brunt, of Massachusetts; Leonard Lewisohn and H. Wallerstein, of New York; Tho mas Couch, of Montana.

for the construction of substantial piers and docks. It was stated that the Reading had no financial interest in the improvements it was making, which had nothing to do with its coal trade, but that it was acting for other parties. The announcement now, that Mellon Bros. & Carnegie are going to establish a new pipe line which will cost from \$2,000,000 to \$2,500,000, is naturally coupled with the Marcus Hook improvements. Marcus Hook is situated just above the Delaware state line. Immense quantities of both crude and refined oil are shipped from Philadelphia to all parts of the world, and it is presumably to secure a portion of this export trade that Mellon Bros. & Carnegie have planned their pipe line. It will tap the new oil fields in Southwestern Pennsylvania and West Virginia, which have proved so wonderfully productive.

TENNESSEE.

On the night of the 31st ult. the convicts working in the mines at Briceville and Coal Creek, 305 in number, were released by an armed body of miners. The latter surrounded the stockades and demanded the release of the convicts, and the guards of the latter seeing that resistance was useless complied. The stockade at Briceville was afterward burned. The convicts at these two places were employed by the Tennessee Coal Mining Company. On the 1st inst. 155 convicts at Oliver Springs were liberated in similar manner and the stockades, hospital, and other buildings at that place were burned. The mines at Oliver Springs are operated by the Cumberland Coal Company, which suffered a loss of \$15,000. The convicts were given citizens' clothing and aided to make their escape, most of them going into Kentucky. The miners threatened to attack the Tracy City and the Inman prisons, and extra guards were placed at those points, but at this writing no more acts of violence have been committed. The situation is regarded as very serious, however. Governor Buchanan has offered a reward of \$25 for the capture of each of the convicts that have escaped and \$5,000 for the arrest and conviction of the leaders of the mob, which released them; also \$250 each for the arrest and conviction of those who participated in the riots. A large number of the escaped convicts have already been recaptured.

UTAH.

In reference to the reports, from Salt Lake City, that the owners of the Cove Creek sulphur mines had guaranteed the Denver & Rio Grande Western Railway a shipment of over 100 tons of sulphur daily if the road were extended to that point, mention of which was made in our issue of October 3d, we are informed that these reports are incorrect.

IRON COUNTY.

BLAIR MINING COMPANY.—According to the Salt Lake *Herald*, this company will be incorporated shortly by George S. Blair and Robert S. Campbell, of Salt Lake, J. T. Hammond and Ed. Hansen, of Logan. The properties to be developed by the company are situated in the Pinto mining district, seven miles from Iron City. The prospects were discovered and opened 20 years or more ago by the father of George S. Blair, but while the indications were very promising, work was abandoned because of the distance of the wagon haul at that time. Some few weeks ago, however, the old claims were relocated and a number of men put to work upon them. A vein of ore 18 in. wide was uncovered, which has been traced for a distance of 5,000 ft. An assay gave 768.57 ounces silver and \$3.01 gold per ton. Mr. Blair says the entire vein will average at least \$100 per ton, and that the ore can be laid down at the smelters in Salt Lake for \$15 per ton. A force of men is now at work on an incline which is being run, and it is expected that shipments will soon be commenced.

SALT LAKE COUNTY.

YOSEMITE MINING AND MILLING COMPANY.—The suit of J. E. Galigher, W. H. Remington and George M. Scott vs. this company, of Bingham, came up before Judge Anderson at Salt Lake City on the 28th ult. In this case the plaintiff seeks to have judgment entered against the company in the sum of \$40,995.87, with interest amounting to \$36,411.13, being at the rate of 12% and costs of suit. It is alleged that \$13,515.57 thereof, are due on a certain promissory note, given by the defendants to the plaintiffs, Remington and Scott, September 13th, 1888, for \$11,673.89, with interest; \$21,030.60 thereof, is alleged to be due as to the amount, with interest, paid by Remington and Scott on a certain sale of property to defendants, October, 6th, 1888, as purchasers thereof in trust for the defendants; \$6,449.70 thereof is alleged to be due as the amount expended by plaintiffs for the care and preservation of the mining property of the defendants over and above all moneys received by them, as the issues and profits since October 6th, 1888. Plaintiffs asked therefore that the usual decree may be made for the sale of all said property according to law; that the proceeds of the sale, or so much thereof as may be necessary to satisfy the same, be applied in judgment of the costs of this suit and expenses of sale, for the amount due for such sale and promissory note and for the sum expended by plaintiffs in the care and preservation of the property in question. The defendants say that since filing their supplemental answer, about April 28th, 1891, plaintiffs have

continuously held and worked the mines in "the same careless, improper, imprudent, improvident, neglectful and unmineralike manner," very seriously injuring defendants to the extent of \$10,000; that they have extracted therefrom, marketed and sold in large quantities first class ore, alleging the quantity to be 700 tons, of the total value of \$175,000; also second class ore, extracted and transported reaching about 6,000 tons of the total value of about \$30,000. They ask that the plaintiffs be held to account for the ores both extracted and shipped to the value of \$475,000; also for \$7,500 unnecessarily expended and lost through their imprudent handling and concentrating of second class ores. The plaintiffs during said period, they say, have furnished no monthly reports of their operations, and defendants have been consequently kept in ignorance of their operations, receipts and disbursements. After some discussion, Judge Anderson referred the case to D. C. Lyle to try all the issues and report his findings to the Court.

SUMMIT COUNTY.

ANCHOR MINING COMPANY.—A survey for a tramway line from the Anchor tunnel to the union concentrator is being made by this company. Another party of surveyors is measuring the quantity of water in the lakes above Bonanza flat, owned by the company. It has been determined to connect the lakes and survey a pipe line from the lakes to the division line between Snake Creek mining district and Uintah mining district near the White Plain discovery, where a distributing reservoir, to hold 1,000,000 gallons of water is to be constructed. This is being done, says the Park City *Miner*, under an arrangement recently made between Mr. Ferry, manager of the Anchor Company, and Mr. Chambers, superintendent of the Daly and Ontario. This pipe line will be continued so as to serve with water the Chambers, Daly West, Mecars, Daly Nos. 1 and 2 and the Ontario Nos. 2 and 3. The surplus water will be furnished to the Park City Water-Works Company by a branch pipe.

TOOELE COUNTY.

UTAH.—A one-sixth interest in this mine in the Fish Springs district was sold for \$20,000 at Salt Lake City on the 24th ult. The property was one of the first discovered in the camp. Its croppings were rich, and it has been a paying shipper from the moment a pick was first struck in the ground.

WASHINGTON.

The United States Geological Survey is about to undertake a survey of the State.

(From our Special Correspondent.)

Tin has been discovered on Peshastin Creek near the base of Mount Stuart in Central Washington by Henry Bush, of Seattle, and R. A. Vaughn, of Snohomish. The find is in two parallel ledges lying between two heavy walls of porphyry. The ore is reported to assay 4% to 8% tin.

KITTITASS COUNTY.

(From our Special Correspondent.)

ROSLYN.—October 15th was a red letter day in the history of Roslyn, the output being greater than any other day in its history, the total amount mined was 3,475 tons, No. 2 producing 1,907 tons and No. 3, 1,568 tons. This coal is worked by means of drift and tunnel, but a shaft is contemplated. The coal does not contain as great amount of carbon as that of Whatcom and Skagit counties.

KING COUNTY.

(From our Special Correspondent.)

SEATTLE COAL & IRON COMPANY.—The strike at Gilman inaugurated March 12th has been declared off by the strikers themselves, who after fighting for seven months find themselves defenceless. The company has announced that all except certain agitators will be re-employed provided they sign an annual contract. The miners of the Oregon Improvement Company are also working and the trouble between operators and miners dating from last spring appears to be settled.

OKANOGAN COUNTY.

(From our Special Correspondent.)

Mr. T. J. Sanyard discovered recently within three miles of Ruby a quartz ledge carrying \$13 per ton in gold and \$7 silver. This ledge is located on Anaconda Mountain, one half mile from Salmon Creek. There is plenty of water for mining purposes and a force of men is already at work developing the claim.

IVANHOE.—About 14 tons of assorted ore was recently shipped from this mine which assayed 325 oz. per ton in silver. The expense of mining, milling and transportation is so great, being between \$75 and \$80 per ton, that it is not practical to ship any but the highest grade ores. There is as much as 1,500 tons of ore on the dump that will average \$75 per ton.

JOHN ARTHUR.—At a depth of 90 ft. the shaft struck a 6-ft. ledge in which a streak of 2½ ft. of the ore assayed, it is said, some 700 oz. silver per ton. The mine is owned by J. I. McDonald, of Ellensburg, and James Robinson, of Conconully. The ore carries black sulphurets of silver. Three shifts of men are at work and the number is to be increased as soon as possible.

OKANOGAN MINING AND REDUCTION COMPANY.—The five-stamp mill is running day and night,

and the outcome of each clean-up shows the ore in both the War Eagle and Black Bear mines to be getting richer as work in the mines progresses. When the company shuts down this winter it will put in a 10 stamp mill. A rich strike was made in the Black Bear recently. The vein is 2 ft. wide, and running through it is a streak which assayed \$985 in gold and \$1.70 in silver per ton.

STEVENS COUNTY.

(From our Special Correspondent.)

CAPITOL.—Mr. R. J. Davis, one of the principal owners of this mine, located about sixty miles north of Spokane, is contemplating the location of a paint works at Spokane, providing he can get sufficient encouragement from Spokane people. The development at the mine shows a ledge 25 to 50 ft. wide developed by several tunnels, which are about 200 ft. in length, and shafts sunk to a depth of 30 ft. There are seven openings all in ore. The ore carries from 50% to 58% of iron, and is free from phosphorus, titanite acid, or sulphur. A soft ore is also found that can be used for mineral paint. At present three carloads per week are shipped to Tacoma smelter, where it is used as a flux. It brings \$2.50 more per ton than any other fluxing iron ore in the state. The owners claim to be able to mine 50,000 tons of ore within 50 ft. of the surface. If Mr. Davis can not make favorable arrangements for a site at Spokane, he will build his paint works at the mines.

DAISY.—A part interest in this mine, near Colville, has been sold to Mr. I. N. Terry, of Utica, N. Y., for \$15,000 cash. Mr. Terry has been working the mine hitherto under a bond. Three weeks ago a 3-ft. vein of ore was struck, assaying about 80 oz. in silver per ton. The vein is now 6 ft. wide, and increasing daily both in width and in grade. Work is being pushed as rapidly as possible, and new machinery will soon be purchased. The ore is free milling.

OLD DOMINION MINING COMPANY.—This company is pushing the work on its new concentrating mill as rapidly as possible, and hopes to have it running by Dec. 1. Fifty men have been put to work on the plant and about the mine.

QUEEN MINING COMPANY.—This company has been organized with the following officers: J. T. Hamilton, president; O. B. Nelson, vice president; Geo. E. Adams, secretary; W. H. McFarlan, treasurer. The capital stock is \$600,000, divided into 60,000 shares. As soon as the necessary machinery is secured work will commence and be continued through the winter. The mine John L. is located at Fort Spokane, near the Colville Indian Reservation.

WHATCOM COUNTY.

(From our Special Correspondent.)

A syndicate composed of Tacoma and Eastern capitalists has quietly secured leases upon nearly the whole Nooksack Valley, which lies between Fairhaven and the international boundary; this company has ordered a complete oil-rig from Pennsylvania. Before passing judgment upon the probabilities of finding oil in this county, D. J. Wynkoop, who assisted Prof. John F. Carrll in the survey of the oil regions of Pennsylvania, made extensive and thorough examinations. This company leases for a term of 50 years, promises to start immediately and expend no less than \$1,000 every year, and further agrees that in case it succeeds in striking oil one-eighth of the product goes to lessor.

BELLINGHAM BAY & BRITISH COLUMBIA RAILROAD COMPANY.—This company, which now controls several thousand acres of the land upon which coal was first discovered in this State, has begun exploration with a diamond drill three miles north of Fairhaven. When coal was discovered in 1852 work was immediately commenced and continued until 1878, when, on account of quantity of gas, the mines were abandoned.

BLUE CANYON COAL COMPANY.—The construction of the railroad to tide water has been commenced and the contractors are under bonds to complete it in 60 days; the franchise of the railroad company has been secured, and the citizens of Bellingham Bay have guaranteed amounts sufficient to cover all damages to private parties.

WYOMING.

ALBANY COUNTY.

(From our Special Correspondent.)

LUCKY SIX MINING COMPANY.—Blasts, drills and picks are making things lively in the La Plata district. More than 50 tons of \$60 ore are on the Brooklyn dump, and three tons a day are being added to the pile. A steam hoisting plant has been secured, and is now en route to the camp, and will be in place inside of five days, when a night shift will be put on. The shaft shows ore of good shipping quality all the way down. Water having come in so as to interfere with development, a pump has been bought and will be placed in position at the same time as the hoisting apparatus. The company proposes to sink the shaft 125 ft. further as soon as possible.

CARBON COUNTY.

(From our Special Correspondent.)

Work on the S. W. Dorny stamp mill, at Gold Hill, is progressing finely. Ten additional stamps have been bought, making this a 20-stamp mill instead of 10. Negotiations are being made for the establishment of an electrical power plant two

sags from its own weight, the small chippers, being utterly unable to sustain any such burden. While prices are easily advanced, owing to the sensitive condition of the market, they are as easily broken for the same reason.

The leading stock has declined during the past week 32 cents. On early call 230 shares were sold for \$4.80, and in the afternoon regular session that figure was beaten down to \$4.50 under the sale of 1,020 shares.

Ophir, which sold last Thursday for \$3.20, opened to-day at \$2.70, and declined later to \$2.55 under moderate sales. Mexican ruled this afternoon at \$2, in contrast with \$2.30, the ruling price a week ago. Sierra Nevada is quoted at \$1.60, and Union Consolidated at \$3.

Of the Middle Comstocks Savage continues to be most in demand, selling this morning for \$1.80, and this afternoon in regular session at prices varying from \$1.80 down to \$1.60, with 925 shares sold. A week ago it was selling steady at \$2.35. Of the other middle stocks, Best & Belcher is ruling at \$2.30; Gould & Curry, \$1.40; Hale & Norcross, 95 cents, and Chollar, 85 cents.

Of course the Gold Hill and south end stocks have suffered, in common with the other Comstocks, from the break in prices. Bullion is ruling to day at \$1, a decline of 35 cents during the week; Con. New York at 25 cents; Exchequer at 45 cents; Justice at 40 cents; Kentucky at 15 cents; Lady Washington at 15 cents; Occidental at 40 cents; Overman at \$1.20, and Yellow Jacket at \$1.35. All show a proportionate decline on the week's trading.

The Bodies have been in request the last day or two, Bodie Con. selling for 50 cents, Bullion for 10 cents, and Mono 30 cents.

Of the Tuscaroras the only stock quoted to-day has been Nevada Queen, at 35 cents. The showing being made at the mines will, however, probably soon cause a movement in this group of stocks, although, for reasons heretofore mentioned, trading will be on a gambling rather than a speculative basis.

The Quijotoa stocks, with the exception of Peer, have been ignored. That stock is selling at 10 cents, with limited sales. What the future may bring it is impossible to say, but as the year draws to a close it will be a surprise to no one here if prices generally do not reach a lower point than yet obtained.

SAN FRANCISCO, November 6th. [By telegraph.] To-day's quotations show a slight advance. They were as follows: Best & Belcher, \$2.55; Bodie Consolidated, 50c.; Belle Isle, 30c.; Bulwer, 10c.; Chollar, 80c.; Consolidated California & Virginia, \$5 1/2; Eureka Consolidated, \$1.40; Gould & Curry, \$1.45; Hale & Norcross, 85c.; Mexican, \$2.15; Mono, 30c.; North Belle Isle, 45c.; Navajo, 15c.; Ophir, \$3.25; Sierra Nevada, \$1.95; Union Consolidated, \$1.95; Yellow Jacket, \$1.35.

St. Louis, Nov. 4.

(From our Special Correspondent.)

Mining matters were brisk during the past week, and business was decidedly an improvement on that of a week ago. Prices seemed to be going a trifle higher on the whole and many trades were made in stocks which have long been idle on the call.

American & Nettie opened at 52 1/2c., with a sale of 200 shares, and later 1,000 shares sold at 53 1/2c. On Friday 200 shares sold at 60c. @ 70c., and later in the week 75c. and 73 1/2c. was obtained on sales amounting to 200 shares. The stock appears very strong, and is in very good demand.

Silver Age opened at 32 1/2c. and closes at 45c. Only on one day was there any trading, 600 shares being sold. On Monday the stock was quoted at 47 1/2c. to a very strong demand.

Central Silver, as usual, had a very good business and at a very big increase in price. From an opening of 5 1/2c. the stock is now quoted at 9 1/2c., with a lively trade. Sales for the week amounted to 11,600 shares, the greater part going at 7 @ 10c.

Montrose, while still low, was in fair demand, and a small amount of buying was done. The stock opened and closed at the same figure, 20c. At one time the stock was quoted at 17 1/2c. Sales aggregate 2,100 shares.

Elizabeth was quiet and fluctuated only a few cents in price. It closes at the opening figure, \$1.60. During the week it sold at \$1.60 @ \$1.70, 500 shares going at the latter figure; 1,450 shares changed hands this week.

Granite Mountain was again traded in, with a better market than last week. Opening at \$20, 90 shares sold followed later by a sale of 35 shares at the same figure. On Friday 65 shares sold at \$20, though at the close of the day the market was weak at \$19.75. On Monday the stock sold at \$20.25, 65 shares changing hands, and to-day the market is very firm at that figure.

Yuma was very quiet, and only one sale of 500 shares at 30 1/2c. was made. To-day the stock is quoted at the opening figure, 35c.

Small Hopes opened at 70c. and closes at 80c. During the week 200 shares sold at 80 @ 82 1/2c. Adams was firm at \$1.90 and Bi-metallic at \$34.

Next Thursday the annual election of the Mining Exchange for officers for the next year takes place. The following constitute the official ticket: R. D. Kohn, President; B. O. Clark, Vice-president; Ernst Michaelis, Treasurer; with the Board of Directors as follows: J. J. Mulally, Geo. M. Huston; A. H. Bauen and W. H. Hensden.

The following delegates have been appointed to represent St. Louis at the Mining Congress, to be held at Denver, November 18: R. D. Kohn, P. J. McMorrow, A. Singer and B. O. Clark. At a public sale of Mickey Breen Stock, 1,000 shares sold only at 26c. @ 27 1/2c. to Mr. Sonderman.

Denver.

Prices and sales for the week ending October 31st, 1891:

Table with columns: Company, Opening, H., L., Closing Bid, Sales. Lists various mining companies like Alleghany, Amity, Bangor, etc., with their respective prices and sales volumes.

Lake Superior Iron, Gold and Silver Stocks.

(Special Report by A. M. Helmer, Milwaukee, Wis.)

Table listing various iron, gold, and silver stocks such as Gogebic Range, Anvil, Ashland, Aurora, Bessemer Consolidated Bonds, etc., with prices and sales.

PIPE LINE CERTIFICATES.

(Specially reported by Watson & Gibson.)

There has been but little news from the oil regions for the past week and but slight material changes in the oil markets. With the large production still shown in the fields of Western Pennsylvania and Ohio it is not probable that higher prices will be recorded for some time to come. This, coupled with the general indisposition of the largest consumers to make an active market, tends to keep out all the smaller traders who used to look to this commodity as their favorite speculation.

CONSOLIDATED STOCK AND PETROLEUM EXCHANGE.

Table showing consolidated stock and petroleum exchange data for Oct. 31 and Nov. 2, including opening, highest, lowest, closing prices and sales in barrels.

NEW YORK STOCK EXCHANGE. Table with columns: Opening, Highest, Lowest, Closing, Sales. Shows data for Oct. 31 and Nov. 2.

Total sales in barrels..... 50,600

ASSESSMENTS.

Table listing various mining companies and their assessment details, including company name, number of shares, when levied, date of office, day of sale, and amount per share.

MEETINGS.

California Water and Mining Company, at the office of the company, No. 47 Broadway, New York, November 19th at 12 o'clock noon.

Occidental Consolidated Mining Company, at the office of the company, Room 69, Nevada Block, No. 309 Montgomery street, San Francisco, Cal., November 16th at 1 P. M.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Nov. 6. STATEMENT of shipments of anthracite coal (approximate) for the week ending October 31st, 1891, compared with corresponding periods of last year:

Table showing coal trade review data: Regions (Wyoming, Lehigh, Schuylkill), Tons shipped for Oct. 31, 1891, Nov. 1, 1890, and the difference.

PRODUCTION OF BITUMINOUS COAL, for week ending October 31st, and year from January 1st.

Table showing production of bituminous coal for Eastern and Northern shipments, comparing weekly and yearly production in 1891 and 1890.

WESTERN SHIPMENTS.

Table showing western shipments of coal for Pittsburgh, Westmoreland, and Monongahela, comparing weekly and yearly production in 1891 and 1890.

Grand total.... 457,721 17,561,689 15,055,781 PRODUCTION OF COKE on line of Pennsylvania R. R. for the year ending October 31st, 1891, and year from January 1st, in tons of 2,000 lbs.: Week, 114,453 tons; year, 3,521,736 tons; to corresponding date in 1890, 4,454,879 tons.

Anthracite.

The production for the week ending the 31st inst. was the largest in the history of the trade, viz., 1,112,366 tons, an increase of 261,062 tons over the corresponding period in 1890. The production for the four entire weeks in October in tons was

NEW YORK MINING STOCKS QUOTATIONS. DIVIDEND-PAYING MINES. NON-DIVIDEND-PAYING MINES.

Main table of New York Mining Stocks Quotations, listing companies like Alice Mont., Argenta, Aspen, etc., with columns for dates (Oct. 31, Nov. 2, Nov. 3, Nov. 4, Nov. 5, Nov. 6) and sales.

*Ex. dividend. †Dealt at in the New York Stock Ex. Unlisted securities. ‡Assessment paid. §Assessment unpaid. Dividend shares sold, 8,150. Non-dividend shares sold, 17,950. Total shares sold 26,100.

BOSTON MINING STOCK QUOTATIONS.

Table of Boston Mining Stock Quotations, listing companies like Atlantic, Mich., Bodie, Cal., Bonanza Development, etc., with columns for dates and sales.

Dividend shares sold, 3,081. Non-dividend shares sold, 3,429. Total shares sold, 6,510.

COAL STOCKS.

Table of Coal Stocks, listing companies like American Coal, Cambria Iron, Cameron Coal & I. Co., etc., with columns for dates and sales.

‡ Ex-dividend. Total shares sold, 261,149.

San Francisco Mining Stock

Quotations.

Table of San Francisco Mining Stock Quotations, listing companies like Alpha, Alta, Belcher, etc., with columns for closing quotations from Oct. 30 to Nov. 5.

DIVIDEND-PAYING MINES.

NON-DIVIDEND PAYING MINES.

Main table with columns for Name and Location of Company, Capital Stock, Shares, Assessments, Dividends, and Date and amount of last dividend. Includes entries for Adams, Alice, Alma & Neil Wood, etc.

G. Goddard, S. I. Iver, L. Lead, C. Copper. * Non-assessable. + This company, as the Western, up to December 1st, 1881, paid \$1,400,000. † Non-assessable for three years. ‡ The Deadwood previously paid \$275,000 in eleven dividends and the Terra \$75,000. § Previous to the consolidation of the Copper Queen with the Atlanta, August, 1885, the Copper Queen had paid \$1,350,000 in dividends. ¶ This company paid \$190,000 before reorganization in 1890. ** This company acquired the property of the Raymond & Ely Company which had paid \$3,075,000 in dividends.

STOCK MARKET QUOTATIONS.

Table with columns: Aspen, Oct. 31, Bid, Asked. Lists various stock prices for Aspen, including Argentinum Juniatia, Aspen Deep Shaft, etc.

Table with columns: Baltimore, Md., Nov. 5, Bid, Asked. Lists various stock prices for Baltimore, including Atlantic Coal, Balt. & N. C., etc.

Table with columns: Birmingham, Ala., Nov. 4, Bid, Asked. Lists various stock prices for Birmingham, including Ala. Coal & Iron Co., Ala. Con. C. & C. Co., etc.

Table with columns: Pittsburg, Pa., Nov. 5, Bid, Asked. Lists various stock prices for Pittsburg, including Allegheny Gas Co., Bridgewater Gas Co., etc.

Table with columns: Trust Receipts, Sales, H, L. Lists sales for American Cotton Oil, National Lead, etc.

Table with columns: Trust Stocks, Nov. 6, Price. Lists various stock prices for trust companies like Am. Cotton Oil, Am. Sugar Refineries, etc.

Table with columns: St. Louis, Nov. 4, Closing Prices, Bid, Asked. Lists various stock prices for St. Louis, including Adams, Colo., American & Nettie, etc.

Table with columns: Helena, Mont., (Special report by SAMUEL K. DAVIS.) Lists various stock prices for Helena, including Bald Butte (Mont.), California (Castle), etc.

Foreign Quotations.

Table with columns: London, Oct. 24, Highest, Lowest. Lists various foreign stock prices for London, including Amador, Cal., American Belle, etc.

Table with columns: Paris, Oct. 22, Francs. Lists various stock prices for Paris, including East Oregon, Ore., Forest Hill Divide, etc.

CURRENT PRICES.

Large table listing various chemical and mineral products and their current prices, including Acetic Acid, Ammonia, Asbestos, Barium, Bismuth, etc.

Table listing various mineral products and their prices, including Marble Dust, Metallic Paint, Mineral Wool, Mica, Naphtha, Nitric Acid, etc.

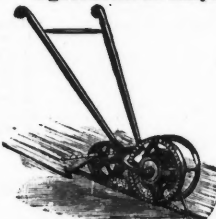
**NEW YORK PRICES CURRENT
NOVEMBER 7, 1891.**

In the interest of the extension of the markets for American manufactures the ENGINEERING AND MINING JOURNAL has secured the services of gentlemen thoroughly acquainted with the export trade and with foreign markets, and it offers its services to foreign buyers who may desire information concerning any article whatever of American manufacture. No charge will be made for these services, either directly or indirectly through commissions on goods purchased. The proprietors of the ENGINEERING AND MINING JOURNAL are neither commission merchants nor exporters, but they have many sources of information, both at home and in foreign countries, and place these at the service of manufacturers and exporters here and of importers and consumers in other countries.

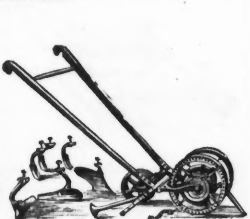
The names and addresses of the manufacturers of goods quoted in this list can be obtained by applying at this office.

Discounts are for Wholesale Export Only.


Agricultural Implements.




"Planet, Jr." No. 2 Seed Drill, \$9.
Dis. 30%.



Combined Drill Cultivator and Plow, etc., \$12.
Dis. 30%.




"Fire Fly" single-wheel Hoe, Cultivator and Plow, \$5.



"Fire Fly" Hand Plow, \$2.50.
30% discount, f.o.b. New York.



All Steel Horse Hoe and Cultivator combined, with wheel, \$6 75-100 net.



All Steel Plain Cultivator.
With wheel, \$4.50; without wheel, 60c.

HAY FORKS.

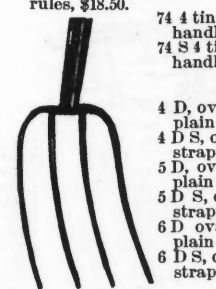
Standard Spading Forks.
Solid Steel Shanks, Gold Bronze Finish, Patent Overcaps.
Per doz.

8 D 4 light angular tine, iron D, plain ferrules, \$17.00.
8 D S 4 light angular tine, iron D, strapped ferrules, \$18.50.
11 D 4 light angular tine, iron D, plain ferrules, blue, half polished, \$16.00.
13 D 4 light angular tine, iron D, strapped ferrules, blue, half polished, \$17.50.
15 D 5 tine, angular, iron D, plain ferrules, \$24.00.
17 D 5 tine, angular, iron D, strapped ferrules, \$25.50.

Flat Tines.

D 4 tine spading fork, flat tine, iron D, plain ferrules, \$17.00.
D S 4 tine spading fork, flat tine, iron D, strapped ferrules, \$18.50.

74 4 tine spading fork, flat tine, 4 ft. handles, plain ferrules, \$16.00.
74 S 4 tine spading fork, flat tine, 4 ft. handles, strapped ferrules, \$17.50.
Dis., 65 and 5% and 2½.



Manure Forks.

4 D, oval, 4 tine, 13 in. tine, iron D, plain ferrules, \$13.50.
4 D S, oval, 4 tine, 13 in. tine, iron D, strapped ferrules, \$15.00.
5 D, oval, 5 tine, 13 in. tine, iron D, plain ferrules, \$20.50.
5 D S, oval, 5 tine, 13 in. tine, iron D, strapped ferrules, \$22.00.
6 D, oval, 6 tine, 13 in. tine, iron D, plain ferrules, \$23.50.
6 D S, oval, 6 tine, 13 in. tine, iron D, strapped ferrules, \$25.00.
Dis., 65 and 5% and 2½.

PLOWS.

Reversible Oneonta Clipper.

16. Oneonta Clipper, Reversible, Iron beam Cutter, \$14.
" Oneonta Clipper, Reversible, Iron Wheel and Cutter, \$15.
18. Oneonta Clipper, Reversible, Iron Beam Cutter, \$15.
" Oneonta Clipper, Reversible, Iron Beam, Wheel and Cutter, \$16.
Hard Metal, Reversible, Iron Beam Cutter, \$16.

17. Hard Metal, Reversible, Iron Beam, Wheel and Jointer, 17
19. Hard Metal, Reversible, Wood Beam Cutter, Wheel and Jointer, 16
20. Steel Mould Board, Reversible, Wood Beam Cutter and Cutter, 15
Iron Beam Plows.
Two-horse Sod and Stony Land, 8.50 plain.
Curtis's Sod Two horse, 11.50
" " " " 13.00 cutter.
" " " " 14.25 wheel & cutter.
Subsoil Plows.
Two-horse 9.50 Draft Rod.
11.00 Wheel and Draft Rod.
Hitchcock's Potato Digger and Shovel Plow.
Improved adjustable handle shovel plow, 7.00
Hitchcock's Potato Digger, 8.00
" and shovel plow, 10.50
Dis. 30%.

HOES.

Blade Solid Shank Hoes.

Field, 7 x 5 in., selected handles, \$8.00
" 7½ x 4½ " " " 8.00
" 8 x 4½ " " " 8.00
" 8½ x 4½ " " " 8.00
" 8 x 5 " " " 8.00

Field Socket Hoes, \$9.00
Dis., 65% and 5%.

RAKES.

The S. R. N. Improved.
20 Teeth, \$28.00
22 " 29.00
24 " 30.00
26 " 31.00
Dis., 33%.

Chieftain Lock Lever
No. 1, \$16.00
No. 2, 16.00
No. 5, 15.00
Iron wheels, \$1 extra.
With Pole, Double Tree and Neck Yoke, \$1 extra.
22 cubic feet packed, 400 lbs. gro., 225 lbs. net.



Golden Farmer Self-Dumping Rake, \$19.00; 22 cu. ft., 430 lbs. gro., 250 lbs. net.
Chieftain Hay Tedders, \$27.00; 700 lbs. gro., 450 lbs. net.
Potato Diggers, \$5.00; 100 lbs. gro., 60 lbs. All net cash, f.o.b. ship New York or Boston.

RAKES (GARDEN).

Malleable Iron Garden Rakes, Per Doz.

Plain.	
8 teeth, 6-ft. handles, straight shank	\$5.00
10 " " " " " "	5.50
12 " " " " " "	6.00
14 " " " " " "	6.50
16 " " " " " "	7.00

For braced goods, add 50 cents per dozen to list.

Cast Steel Garden Rakes, Per Doz.

Plain.		Braced.	
8 teeth, 6-ft. handles	\$8.00	\$9.50	
10 " " "	9.00	10.50	
12 " " "	10.00	11.50	
14 " " "	11.00	12.50	
16 " " "	12.00	13.50	

Lawn Rakes and Gravel Rakes same price as Garden Rakes.
Discounts on Rakes from list.
The P. H. & M. Co., 60 and 10%
W. & C. Mfg. Co., 70%
S. F. & T. Co., 70 and 5%
G. T. Co., 70 and 5%
Phila. S. H., 60, 10 and 5%.

SCYTHES (GRASS).

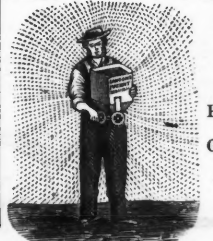
Waldron's pattern, oiled, \$3.50
Silver steel, painted, 5.50
Western dutchman, bronzed and painted, 9.00
Clipper, polished web, 9.00
Fine cutlery steel, full polished, 10.00
All steel, full polished, 11.00

Grain Scythes.

Waldron's pattern, oiled, 11.25
Silver steel, painted, 11.25
Clover, oiled, 11.25
Clipper, bronzed and painted, 11.50

Lawn Scythes.

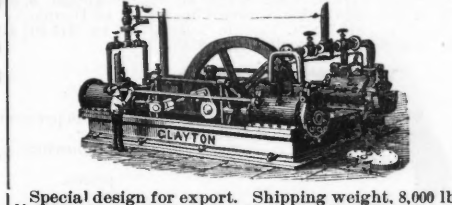
Clipper, bronzed and painted, 9.0
Dis., 40 and 10%.



SOWER, BROADCAST SEED.

Per dozen, \$30 f.o.b.
Gross wt., 110 pounds per dozen
Net wt., 75 pounds per dozen.

Air Compressors.
Clayton Duplex Air Compressors.



Special design for export. Shipping weight, 8,000 lbs. No one piece weighing over 300 to 400 lbs. Size No. 3½. Steam cylinders, each 12 in. diameter; air cylinders, each 12 in. diameter, and stroke, 13 in.; capacity, six 3 in. rock drills. Price, \$3,000 f.o.b. New York. Dis., 20%.

Anvils.

Eagle anvils.		Weight about	
No. 000	Weight about	No. 4	Weight about
" 00	¼ lb. \$1.00	40 lbs.	\$4.25
" 0	1.75	50 "	5.00
" 1	2.25	60 "	5.50
" 2	2.75	70 "	6.00
" 3	3.00	80 "	7.00
" 4	3.75	90 "	8.00

Anvils weighing 100 to 800 lbs., 10 cts. per lb. Discount 15 and 10%.

Arms and Ammunition.

Wood Powder. ¼ kegs. ½ kegs. 1 kegs.
Kegs, 25 lbs. ½ keg. 6¼ lbs. cans
Trap for first quality arms only, \$19.50
9.85 trap, 8.69 let'd grades.

A, for large bore, \$17.00
C, for general use, \$4.35
D, fine for small bore and rifles, \$7.75
E, very fine for small bore rifles and gallery shooting, \$8.50
Dis., 20-5 and 5%

Bullet Breech Caps, per lb. 1.60
Conical Bullet Caps, 1.75
Discount Per cent.

Rim Fire Cartridges, 60
Military Rim Fire Cartridges, 15
Central Fire Pistol and Rifle Cartridges, 40
Central Fire Metallic Cartridges for Target and Sporting Rifles, 30
Military Cartridges, Central Fire, 30
Lefauchaux Cartridges, 60



38 S&W

Gatling Cartridges, 25
Primed Shells and Bullets, 20
Friction Cannon Primers, 20
Primers, 33c.
Percussion Caps, F. C., per M., 42½c.
U. M. C., 45c.
Musket, 60
Brass Shot Shells, U. M. C., 1st qual., 65
Club brand, 65

Paper Shot Shells.

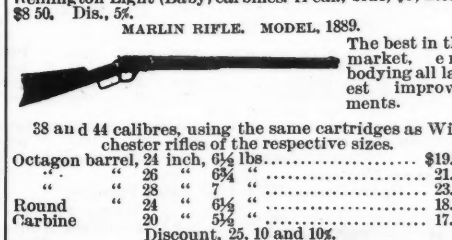
U. M. C. CO. WATERPROOF PAPER SHOT SHELL CLUB BRAND

14, 16 and 20 ga. Club brand, 30, 10 and 10 per cent.
10 and 12 ga. Club brand, 33%, 10 and 10 per cent.
Gun Wads, 20 and 10 per cent.

RIFLES.

Colts' Lightning Magazine.

40 / 60 and 45 / 60 calibre octagon barrel, 10 lbs., \$15.38
" " " " round " 9¼ " 14.25
" " " " carbine " 9 " 14.25
32, 38, and 44 calibres, octagon " 7¼ " 13.50
" " " " round " 6¾ " 12.38
" " " " carbine " 6¼ " 12.38
" " " " baby carbine, 5¼ " 12.38
22 calibre, rim fire, octagon barrel, 15.38
round, 14.25
Remington Light (Baby) carbines, 44 cal., blue, \$8; nick., \$8 50. Dis., 5%.

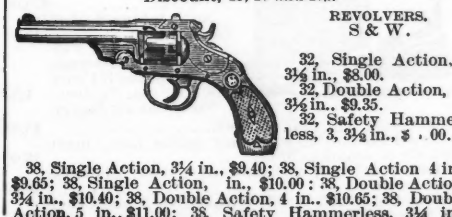


MARLIN RIFLE. MODEL 1889.

The best in the market, embodying all latest improvements.

38 and 44 calibres, using the same cartridges as Winchester rifles of the respective sizes.

Octagon barrel, 24 inch, 6¼ lbs., \$19.50
" " 26 " 6¾ " 21.50
" " 28 " 7 " 23.50
" " 24 " 6¼ " 18.50
Carbine 20 " 5½ " 17.50
Discount, 25, 10 and 10%.



REVOLVERS. S & W.

32, Single Action, 3, 3¼ in., \$8.00.
32, Double Action, 3, 3¼ in., \$9.35.
32, Safety Hammerless, 3, 3¼ in., \$.00.
38, Single Action, 3¼ in., \$9.40; 38, Single Action 4 in., \$9.65; 38, Single Action, in., \$10.00; 38, Double Action, 3¼ in., \$10.40; 38, Double Action, 4 in., \$10.65; 38, Double Action, 5 in., \$11.00; 38, Safety Hammerless, 3¼ in.,

VARNISH FLAT.

No. 1. 1 1/2. 2. 2 1/2. 3. Dis. X. \$0.48 \$0.72 \$0.96 \$1.20 \$1.40 25%
 No. 1. 3. 5. 7. 9. Dis. X. \$0.25 \$0.40 \$0.60 \$0.85 \$1.20 25%
 XX. 0.40 0.75 1.10 1.40 2.00 25%

WHITE-WASH.

No. 6. 7. 8. Dis. Pure. \$1.25 \$1.60 \$2.00 25%
 2.40 4.00 6.00 25%

SHOE.

8. 9. 25. 15. 26. Dis. Per gross. \$11.50 \$12.50 \$15 \$18 25%
 Per gross dis., 25%. 27. 29. 35. \$20.00 \$24.00 \$28.00 \$33.00

HORSE PATENT.

Per gross, dis., 25%. \$18.00 \$20.00 \$24.00 \$30.00

Per gross, dis., 25%. Wood back \$12 \$15 \$18 \$24
 Per gross, dis., 75%. Leather back \$24 \$31 \$35 \$42 \$54

SCRUB PATENT.

Per gross, dis., 25%. \$12.00 \$16.00 \$18.00

Per gross, dis., 25%. \$6.50 \$8.50 \$12 \$14 \$18

SHAVING.

Per doz., dis., 25%. \$0.36 \$0.60 \$1.00 \$1.50 \$2.50

COUNTER.

Per doz., dis., 25%. \$3.00 \$4.00 \$5.00

Elevator Buckets.

Malleable Iron Buckets. Suitable for Extra Heavy Work. For Coal, Ore, Broken Stone, etc.

Length.	Width.	Capacity in pints.	Price.
4 1/2	3	3 1/4	\$0.40
6	4	11 1/4	50
7	4 1/2	21 1/4	65
8	5	31 1/4	80
10	6	51 1/4	1.10
12	7	71 1/4	1.50
14	8	91 1/4	1.60
16	9	111 1/4	2.00
16	8	133 1/4	2.25

Discount, 45%.

Carriages, Etc.

Windsor Surrey. Open, \$120. Canopy top, \$145. Leather extension top, \$185. Pole or shafts.

Cut under Surrey. Canopy top, \$185. Leather extension top, \$220.

Brewster Spring. Open, \$55. Rubber top, \$76. Leather top, \$100.

Runabout. \$65.

Buckboard. \$30 : shafts

Roller Chains.

Made of malleable iron, with malleable iron and steel pins.

These chains are made up with riveted pins, but coupling pins can be inserted at any interval desired.

The price of the chain includes the attachment links when not occurring but once in every foot.

No.	Working strain.	Pitch of link.	Width of link.	Size pin.	Price per foot.
52	500	1 1/2	1 5/8	10/16 Malleable iron	\$0.35
55	500	1 3/4	1 7/8	11/16 "	.35
77	800	2 1/4	2 1/2	3/8 "	.45
70	800	2	1 1/2	3/8 "	.45
9	700	3	1 3/4	3/8 "	.50
88	1,200	2 5/8	2 1/8	7/16 "	.65
17	1,200	2 9/16	2	7/16 "	.70
18	1,400	3	2	7/16 "	.80
12	1,500	3 1/4	2 7/16	1 1/8 "	.90
1	2,000	3	3	5/8 Steel.	1.20
2	1,800	3 11/16	2 5/8	5/8 "	1.10
126	2,500	6	3 1/2	1 1/8 "	1.30
103	1,800	3 3/4	2 3/4	5/8 "	1.20
3	2,000	4	3 1/4	1 1/8 "	1.30
114	2,000	4 3/8	3 1/4	1 1/8 "	1.30
124	2,900	4	3 3/4	5/8 "	1.70
5	3,000	5	3 3/4	5/8 "	1.85

Discount, 45%.

Roller Carrier Chains.

Is used extensively for heavy driving purposes.

No.	Working strain.	Pitch of link.	Size pin.	Price per foot.
21	700	2 1/4	3/8 Malleable.	\$ 40
22	1,000	3 1/8	7/16 Steel.	65
23	1,400	4	1 1/8 "	90
24	2,800	6	2 1/8 "	.25

Disc., 20%.

MEY-OBORN DETACHABLE CHAIN BELTING.

Made in 22 sizes to work on Standard Sprocket Wheels.

No.	Links per foot.	Size pin.	Working strain.	Price per foot.	No.	Links per foot.	Size pin.	Working strain.	Price per foot.
25	13.3	3-16	75	.13	67	5.02	11-32	700	.30
33	8.6	7-32	200	.12	75	4.6	3-8	800	.35
34	8.6	7-32	225	.13	77	5.02	3-8	800	.35
35	7.4	15-64	250	.14	78	4.6	27-64	1,000	.40
42	8.75	1-4	300	.16	83	3.	33-64	1,200	.45
45	7.4	1-4	350	.16	85	3.	31-64	1,300	.50
50	12.	3-16	200	.17	88	4.6	15-32	1,200	.75
52	8.	19-64	400	.25	103	4.	37-64	1,300	.80
55	7.4	19-64	450	.22	108	2.55	5-8	2,000	.80
57	5.02	5-16	600	.24	146	2.	13-16	2,800	1.40
62	7.63	11-32	950	.30	124	3.	3-4	2,500	1.30

Disc. 25%.

Crucibles.

Battersea Crucibles, Triangular.

No.	Height.	Width.	Crucibles, Triangular.	Crucibles, Covers.
S.	4 1/2	4 1/2	\$1.00	\$0.50
T.	4	3 3/4	0.80	0.50
U.	3 1/2	3 1/4	0.60	0.40
V.	3 1/4	2 3/4	0.45	0.40
W.	2 3/4	2 3/4	0.35	0.30
X.	2 1/2	2 1/4	0.30	0.30
Y.	2 1/4	2 1/4	0.25	0.30
Z.	1 3/4	1 3/4	0.20	0.30

Battersea Muffles, any size, made to order. See illustration in advertisement. Discount, 15%.

Cutlery.

KNIVES-TABLE.

Japanned iron handles, \$10.70 per gross pairs.

Cocobola Ebony Bone handles, handles. \$10.70 \$12.00 \$15.35 gross pairs.

Solid bone handles, 4.80 per dozen pairs.

Celluloid handles, 7.35 per dozen pairs. Forks are made to match all above patterns, with either three or four prongs. Discount 25%.

BUTCHERS'-COCOBOLA HANDLES.

4 and 1/2 in.	5 in.	5 1/2 in.	6 in.	6 1/2 in.	7 in.	8 in.	9 in.	10 in.
1.15	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20

Per dozen.

1.15 1.20 1.30 1.40 1.70 1.90 2.35 3.00 3.70 5.00

1.15 1.60 1.70 2.00 2.35 2.80 3.25 4.00 .00

20.00 2.15 2.30 2.35 2.70 3.00 3.50 4.25 5.00 7.50

2.00 2.15 2.30 2.35 2.70 3.00 3.50

Discount 25 and 10 %.

HUNTING-EBONY HANDLES.

5 1/2 in. 6 in. 6 1/2 in. 7 in. 8 in. 9 in. Per Dozen.

2.70 3.00 3.50 3.55 4.00 5.00

2.55 2.70 3.00 3.30 3.55 4.00 5.00

Discount, 25 and 10 %.

Putty knives, cocobola handles. \$1.30@1.50

SHEARS.

TAILORS'-JAPANNED OR NICKEL HANDLES.

Per pair.

12 in.	6.40
12 1/2 in.	7.00
13 in.	8.00
13 1/2 in.	9.00
14 in.	10.00
14 1/2 in.	11.00
5 in.	12.00
16 in.	14.00

Discount, japanned, 60 %; nickle, 45 %.

BENT TRIMMERS.
Per dozen.

6 in.	13.00	10 in.	27.00
7 in.	15.00	11 in.	30.00
8 in.	17.00	12 in.	33.00
9 in.	22.00		

PAPER AND BANKERS'.
Per dozen.

9 in.	18.00	13 in.	36.00
10 in.	25.00	14 in.	42.00
11 in.	27.00	16 in.	54.00
12 in.	32.00	18 in.	50.00

BARBERS—Per dozen.

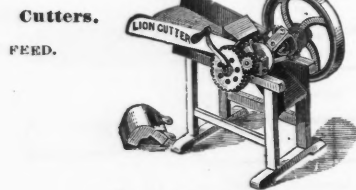
7½ in.	15.00	9 in.	18.00
8 in.	16.00	9½ in.	20.00
8½ in.	17.00		

BUTTON-HOLE.
5 and 5½ in., 14.00 per dozen.

Disc int. japanned, 70 and 10% nickel, 60 and 10%

PRUNING.
1 B., 9 in., 24 per dozen; 2 B. 3½ in., 21; 3 B., 7¾ in., 9.80.

PRUNING SHEARS FOR LONG HANDLES.
No. 1, \$36 per dozen; No. 2, \$30 per dozen.
Discount, 40 and 5%.



Prices, etc., on application. VEGETABLE-GALE'S.

Size.	Weight of Fly Wheel Pounds.	Will cut per hour. Pounds.	Price
No. 1½	20	1,500	\$12
No. 2½	32	1,700	15
No. 3½	32	1,700	15
No. 4	42	2,000	18
No. 5	50	3,000	25
No. 10	65	8,000	35

30% dia.

Drill—Portable Hand Rock.
Price, \$225.
Dis., 25 and 2½%.

Electrical Appliances.

20,000 ohm Testing Generator.....	\$10.00
Pony Magneto Bell	6.00
Standard Magneto Bell	7.50
Standard Extension Bell	4.00
Pony Extension Bell	3.00

Discount 40 per cent.

Electroplate.

	Extra plate, per doz.	Double plate, per doz.	Triple plate, per doz.
Oyster forks.....	7.00	9.00	11.00
Sugar shells.....	9.00	11.00	13.00
Sugar tongs.....	25.50	31.50	37.50
Butter knives, twist or reversed handles.....	10.50	12.50	14.50
Nut picks.....	4.75	6.00	7.25
Pie knives, engraved blades.....	42.00	51.00	60.00
Soup ladles.....	48.00	60.00	72.00

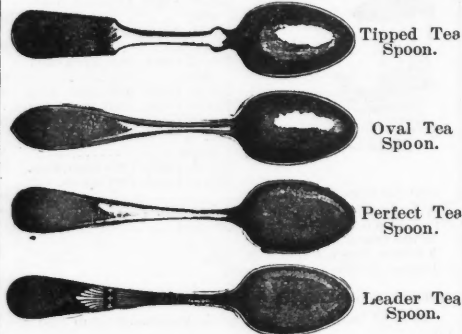
Dis. 60 and 2%.
Aesthetic medium fork.

Tea spoons.....	7.50	Table spoons.....	15.00	Medium forks.....	15.00 per gross.
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Discount, 30 and 5%.

Children's sets on cards, 3 pcs. 4 pcs.
Leader pattern, as per cut..... 21.00 24.00 doz. 60 and 5%
Aesthetic pattern, as per cut..... 5.75 7.25 doz. 30 and 5%

SPOONS, FORKS, ETC., BEST PLATE ON HARD WHITE METAL



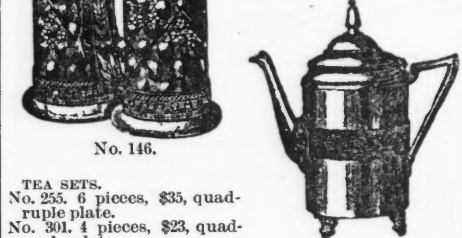
	5 oz. or extra plate—Tip	Perfect and Oval.	Leader.
Tea spoons.....	4.25	4.50	4.75 per doz
Dessert spoons.....	7.50	8.00	8.50 " "
Table spoons.....	8.50	9.00	9.50 " "
Coffee spoons.....	4.25	4.50	4.75 " "
Dessert forks.....	7.50	8.00	8.50 " "
Medium forks.....	8.50	9.00	9.50 " "

Discount, 60 and 5%.
Spoons and forks, German silver, tipped pattern.
Tea spoons. Table spoons. Medium forks. 22.50 45.00 45.00 per gross.
Discount, 60 and 2½%.
Spoons and forks, made from brass, and silver plated or a coating of hard, white nickel.
CASTERS.



1,200—Dinner. Dis., 60 and 5%. 232—Breakfast.

PICKLE DISHES.
No. 144. 12 in. high, \$3.50
No. 66. 10½ in. high, \$2.50 sorted colored glass.
No. 155. 12 in. high, \$4, sorted colored glass.
No. 146. 12½ in. high, \$9; ha decorat ea glass.
No. 156. 12 in. high, \$6; hand decorate l ss.



TEA SETS.
No. 255. 6 pieces, \$35, quad-ruple plate.
No. 301. 4 pieces, \$23, quad-ruple plate.
No. 1847. 6 pieces, \$42, quad-ruple plate.
Dis., 60 and 5%.

Engineering Instruments.

Full Engineer's Standard Transit.	
7 in. graduated circle	\$255
6 in. " "	245
5 in. " "	235
4 in. " "	225
Standard Engineer's Level, improved centre and seat attachment, 18 in. telescope	
Plain railroad level, 18 in. telescope.....	

Dis., 5%.

Explosives.

Dynamite, 75% Nitro-Glycerine, per lb.....	.32
" 60% " "25
" 40% " "20
Blasting powder A, per keg 25 lbs.....	\$2.40
" B, " "	1.90
Sporting powder, standard brands per keg 25 lbs.....	5.00
" " " " " 12½ lbs.....	2.75
" " " " " 6½ lbs.....	1.50
" " " " " 6¼ lbs.....	3.00
" " " " " per can 1 lb.....	.60
" " " " " 1 lb.....	1.00

Discounts special for quantity.

Safety fuse, cotton, 12 M ft. in case.....	\$2.85	per M
" " single tape, 6 M ft. in case.....	3.85	" "
" " double tape " "	4.85	" "
" " triple tape " "	5.60	" "

Discount 17½%.

Detonating caps, triple force, 25 M. in case.....	\$5.00	per M.
" " quintuple force, 25 M. in case.....	7.50	per M.

Electrical exploders, 4 ft. wires..... \$3.00 per 100

" " 6 "	3.54	" "
" " 8 "	4.08	" "
" " 10 "	4.62	" "

Discount 15%. Long lengths to order.

Magneto Blasting Machines.....	No. Capacity.	
" " " " 1 V. 8 holes		\$17.00
" " " " 2 V. 20 "		25.00
" " " " 3 L. 20 "		25.00
" " " " 3 V. 30 "		30.00
" " " " 4 V. 60 "		50.00

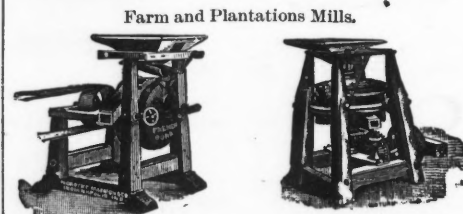
Discount 15%.
Blasting cables..... \$5.00 each, discount 40%
reels..... 5.00 " " 20%

Flouring Mill Machinery.

20-inch New Era Mill for Wheat, Corn, and Middlings.

Size.	Power.	Pulley.	Capacity.
Inch. H. P. Inch. Bush.			
20 4 to 10 14 x 7 12 to 40			

Speed. Weight. Price.
Lbs. Price.
500 to 800 660 150

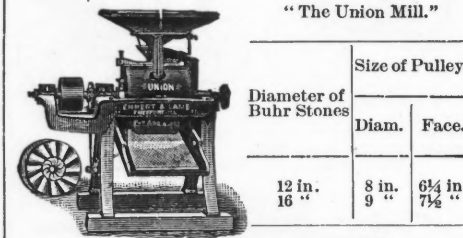


Farm and Plantations Mills.

Diameter of burrs.	Power to drive.	Size of pulley.	Capacity per hour.	Revolutions per minute.	Weight.	Price.
14 in. 2 to 4 H. P.	8 x 5½	4 to 14 bushels	600 to 1200	370 lbs.	\$100	
18 in. 4 to 10 H. P.	11 x 6½	8 to 40 bushels	400 to 700	600 lbs.	130	

GRINDING MILLS.

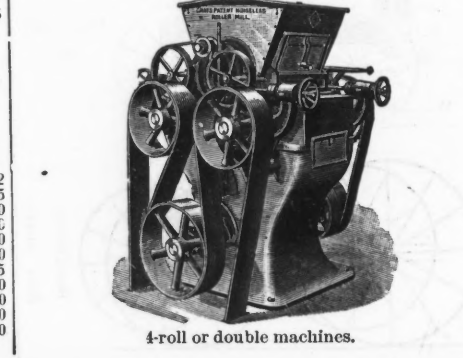
"Daisy," without Shaking	Bolt, 170 pounds, 9 cubic feet, \$40.	Discount .25 per cent.
"Daisy," with Shaking	Bolt, 185 pounds, 9 cubic feet, \$48.	



"The Union Mill."

Horse Power	Capacity in Bush's	Speed	Without Bolt	With Bolt	Sack-ing Elevator, Extra.			Extra Metal Buhrs
					\$90.00	\$105.00	\$15.00	
8 to 10	12 to 30	1200 to 1500	160.00	178.00	17.50	\$1.20 pair	1.50 "	
10 to 15	20 to 50	1000 to 1600						

NOISELESS ROLLER MILLS FOR FLOUR MILL USE.





Miners'.
Brass, Collar and Breast in
one piece, Spout and Body
in one piece.
Price, \$8 per gross net.

Demmler Bros.
"Cherry" Miners' Lamps, double spout..... Doz. \$2.00
" Drivers " single " 2.70
" " " " " 2.50



Harp, complete, with square tin
shade, per doz., \$9.50.
Complete, with Burner and chimney,
per doz., \$1.50.
Hurricane lanterns 25 cents extra
with guards.
875, 3/8 wick, without guards, per
doz., \$5.00.
876, square safety lifting globe, per
doz., \$5.50.
877, 3/8 wick, safety lifting globe, per
doz., \$6.75.
Nickel plated diamond reflector road
ing lamp, 30 candle-power, \$13.50 per
doz., net.
Illuminated night clock, \$27. per doz.

PAPER LAMPS.

Lined with oil proof composition.

No. 0. Height, 2 1/2 in., per doz. \$1.00
No. 1. " 3 " " 85
No. 2. " 3 3/4 " " 1.25
No. 3. " 5 " " 1.50
No. 4. " 6 1/2 " " 1.75



Laundry Appliances.

"Empire." Length, 10 in. x 1 1/4
in. dia. \$63 per doz.
"Empire." Length, 11 in. x 1 1/4
in. dia. \$74 per doz.
"Empire." Length, 12 in. x 1 1/4
in. dia. \$84 per doz.
"Empire." Length, 12 in. x 1 3/8
in. dia. \$87 per doz.
"Empire." Length, 14 in. x 2 1/4
in. dia. \$156 per doz.
"Empire." Length, 14 in. x 2 1/4
in. dia. \$220 per doz.
"Empire." Length, 16 in. x 2 1/4
in. dia. \$360 per doz.
Dis., 40%.

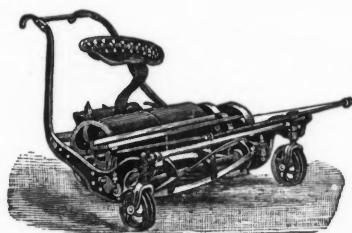
EMPIRE
CLOTHES DRY-
ING BARS.
\$10 per doz.
Dis., 40%.

Closed Open for use.

Lawn Mowers. Forward Cut Mowers.

n. Lbs. In. Lbs.
0 Weight, 30 1/2 \$13.00 16 Weight, 33 \$19.00
2 " 31 1/2 15.00 18 " 41 21.00
4 " 36 17.00 21 " 34.00
Dis. 60 and 5%.

10 in. 12 in. 14 in.
\$13.00 \$15.00 \$17.00
16 in. 18 in. 20 in.
\$19.00 \$21.00 \$23.00
24 in. \$30.00.
Geared at both ends.
Dis. 60 and 10 and 5
and 5%.



New Excelsior Horse Lawn Mower.

15 in. cut, without shafts or seat \$65.00
20 " with shaft and seat 110.00
35 " " " " 135.00
40 " " " " 170.00
Horse boots, per set 12.00
Dis. 50%.

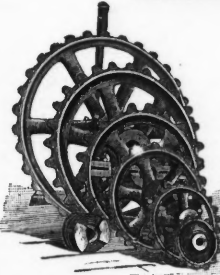


Excelsior Three-
Blade Mower and
Roller.
8 in., \$11.00; 1 in.,
\$13.00; 12 in., 5.00;
14 in., \$17.00; 16 in.,
\$19.00; 18 in., \$21.00;
20 in., \$23.00
Dis. 60% and 5%
cash 30 days f.o.b.
New York.

Link Belting.



Price per running foot, net.
No. Price No. Price
25.....\$0.13 78.....\$0.40
32......13 83......45
33......12 85......50
34......13 88......50
35......14 95......60
42......16 103......75
45......16 108......70
51......20 106......90
52......25 107......80
55......22 108......80
57......24 109......90
62......30 114......1.10
66......30 122......1.50
67......30 124......1.30
75......35 146......1.40
77......35



Sprocket Wheels.
Bored, Set-Screwed or
Key-Seated.
In ordering always
state which are the driv-
ing, and which the driven
wheels.
Wheels made in halves
split) or with large hubs,
and solid webs, can be
furnished, for which an
additional charge is
made.
Discount, 40%.

Locks.

YALE PATENT.
RIM STORE LATCH.
Per doz.
3 x 5 in., 4 keys..... \$18.00
2 1/2 x 4 in., 3 keys..... 39.00

RIM NIGHT LATCH.
Spring lock, 3 keys..... 18.00
Dead lock, 3 keys..... 25.00

CUPBOARD
Dead Lock.....10.80
Spring Lock.....13.80

CHEST LOCKS.
Plated nose..... 19.20
Brass "..... 18.00

DRAWER LOCK.
Plated nose..... 10.20
Brass "..... 9.00

ENOBLOCKS.
5 x 3 3/4..... 22.50
5 x 3 3/8..... 20.00
4 1/4 x 3 3/8..... 13.25
3 1/2 x 3 3/8..... 10.50

STANDARD LATCHES.
Dead locks.
3 3/4 x 2 3/4.....24.00
2 1/2 x 3 3/8.....14.00
1 3/4 x 2 3/8.....12.00

NIGHT LATCHES.
3 1/4 x 3 3/8..... 20.00
2 1/2 x 3 3/8.....18.00

DRAWER LOCKS.
2 x 1 1/2, two tumblers.
Plated nose..... 7.50
Brass "..... 6.00
Three tumblers.
Plated nose..... 9.00
Brass "..... 7.50

RIM FLUSH DRAWER LOCK.
2 in. diameter.
2 tumblers. 3 tumblers.
Plated nose..... 7.50 9.00
Brass "..... 6.00 7.50

BRONZE SPRING PADLOCK.
2 flat steel keys.
In.
1.....11.00
1 1/4.....12.00
1 1/2.....13.50
2.....14.50
2 1/4.....16.00
2 1/2.....17.50
Subject to special net prices; no dis-
count.

YALE KEYS.

Machinery—Foot Power.

Engine Lathes
8 in. swing, 20 in. bet. centers, 36 in.
bed, 240 lbs. weight, \$60.
8 in. swing, 30 in. bet. centers, 46 in.
bed, 260 lbs. weight, \$70.
8 in. swing, 36 in. bet. centers, 52 in.
bed, 280 lbs. weight, \$75.
Boxing for export, \$2.50 extra :
f.o.b. at Cincinnati, 25 % dis.

SAWS AND LATHES
Victor Scroll Saw, Cuts to 3 Inches.
24-in. swing, with 12 saw blades ...
Dis., 20%.

Empire Scroll Saw, Cuts to 3
Inches.
24-in. swing, drill and tilting
table.
Price, boxed..... \$25
Dis., 20%

The Acme Combination Saw.
Hand or steam power.
Adjustable table and gauges.
Price, boxed..... \$40
Scroll saw attachment..... 10
Boring attachment..... 10
Moulding attachment..... 10
Dis., 20%.

Paragon Self Feed Rip Saw.
Two changes of speed; three
changes of feed.
Price, with one 10 in. saw, \$50.00
Dis., 20%.

Diamond Mortising Machine.
Will mortise 1/4 to 1 in. wide, 3 in. deep.
" cut tenons 1/4 to 3/4 thick, 3 in. wide.
Price, with 3 chisels..... \$25.00
Dis., 20%.

The "Star" Lathe.
Swings 9 x 25 in., hack geared
screw cutting.
Feeds in or out, right or left. Ad-
justable Tail Stock for Tapers.
Price, No. 1..... \$75.00
Dis., 20%.

Challenge.
Hand Circular Rip
Saw.
Cuts 3/4 thick, 19 in.
wide.
Price \$50.00.
Dis.,

**Scroll and Circular saw Combined
Combined Machines.**
Combined circular scroll saw
and boring attachment—2 cir-
cular saws, 12 assorted scroll
saws, boring attachment, and
self-centering drill chuck..... \$50.00
Combined circular and scroll
saw—2 circular and 12 scroll
saws..... 40.00
Circular saw—1 extra rip and 1
cross-cut saw..... 35.00
Counter shaft for steam power..... 10.00
Dis., 35%.

Foot Power Forner.
\$20.00; Knives extra, \$1.00 each.
Dis., 35%.

Mortising Machine.
\$22.00; Chisels, \$1.00
each.
Dis., 35%
Blind Slat Chisels, 3 set bits, \$5.00.
Dis., 20%.

Tenoning Machine.
Price, \$25.
Dis., 35%.

Velocipede Scroll Saw,
Without boring attachment..... \$20.00
With
1 doz. saw blades, } Included, Dis., 35%
1 3-16 bit.

THE "LIBERTY" JOB PRINTING PRESS

Table with columns: No. of press, Size of chase, Price. Includes items like No. 2-7, No. 2a-9, No. 3-10, etc.

Two sizes built extra strong for boxmakers, embossing, etc.

Table with columns: No. of press, Price. Includes items like No. 3a-11, No. 4-13, No. 5-14 1/2.

Fountains, either size, \$25 extra, if ordered with press. Steam fixtures, either size, \$15 extra.

THE AMERICAN CARD AND BILL HEAD PRESS.

Table with columns: No. of press, Price. Includes items like No. 5-4 x 6, No. 7-6 x 9, No. 8-8 x 12.



THE "LIBERTY" PAPER CUTTER.

Cuts 30 inches. Extra knife. Dis., 12% and 5%.

THE "LIBERTY" TYPE CASES.

Table with columns: Name, Outside Measurements. Includes items like Full size, Hooker size, 1/4 size, Enlarged size, Wood type, Mammoth.

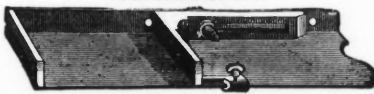
Cabinet case sides extend 1 1/2 to 3 inches. In ordering cabinet cases, state whether high or low fonts are wanted.

THE "LIBERTY" STEEL SHOOTING STICKS.

Bright, \$1 each. Nickelplated, \$1.25 each. Dis., 40%.

Table with columns: Name, Price. Includes items like Midget planer, Small Maple, Large, Midget, Proof planer, faced with cloth.

COMPOSING STICKS.



GROVER'S PATENT AND UNION.

Table with columns: Size, Price. Includes items like 6 in. screw of news, 8, 10, 12, 14, 16, 18, 20.

Pulley Blocks.

Table with columns: Capacity, Price. Includes items like 1/2 ton, 1 ton, 1 1/2 tons, 2 tons, 3 tons.

Table with columns: Capacity, Price. Includes items like 500 lbs., 1000, 1500, 2000, 500.

Table with columns: Capacity, Price. Includes items like 21, 22, 23, 25.



WESTON CRAB SAFETY BRAKE, HANDLES CAN NOT FLY BACK. Each. 21...\$35.00, 22...45.00, 23...65.00, 25...100.00

Pumps.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 101, Fig. 99 1/2.

Standard and cylinder for 1 1/2-in. Iron Pipe, Dis., 55%. Fig. 118.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 120, Fig. 121.

Standard and cylinder for 1 1/2-in. Iron Pipe, Dis., 55%. Fig. 118.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 133.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 275.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 277.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 278.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 279.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 280.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 281.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 282.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 283.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 284.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 285.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 286.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 287.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 288.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 289.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 290.

Table with columns: Fig. No., Dia., Suction, Cap. stroke, Price. Includes items like Fig. 291.

Roofing.

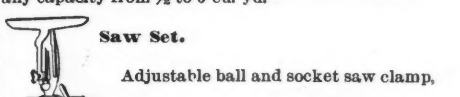
Table with columns: Gauge, Price, Per square. Includes items like CORRUGATED IRON, No. 18, painted red.

Railroad Dumping Cars and Carts.



Table with columns: Cars, Gauge, Cap. Net, Cap. Net, Cap. Net. Includes items like Side Dumping, Revolving, Bottom, Tunnel, Mine, Plantation, Logging, Hand, Push, R.R. Construction, Carts, Plantation and Railroad Wagons, McEwen Patent Dumping.

*These cars built of any gauge from 18" to 56 1/2" and of any capacity from 1/2 to 6 cu. yd.



Adjustable ball and socket saw clamp, Japanned, \$14 per doz.

Saws.

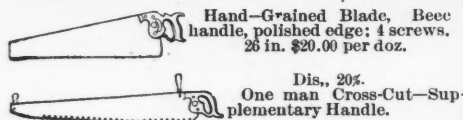
PATENT GROUND AND TEMPERED SOLID TOOTH CIRCULAR SAWS.

Table with columns: Diameter, Thickness, Price each, Extra for each additional gauge, heavier. Includes items like 12, 14, 16, 18, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76.

Circular saws to cut metal or ivory, 50% advance. No extra charge for saws one gauge thicker than list. Circular saws beveled one gauge without extra charge up to 44 inches; 44 inches and larger, beveled two gauges without extra charge. Dis., 45%.



Hand--London Spring Steel four brass screws. 26 in. \$30.00 per doz. Dis., 20%. Hand--Skew Back Saw, Apple Handle: 5 screw. 26 in. \$22.00 per doz.



Hand-Grained Blade, Bee handle, polished edge; 4 screws. 26 in. \$20.00 per doz. Dis., 20%. One man Cross-Cut-Supplementary Handle.

Great American, \$2.75 \$3.00 \$3.50 \$4.00 \$4.50 \$5.00 \$5.50
Champion Tooth, 2.35 2.60 3.15 3.50 3.85 4.25 4.65
One man cross cut handles, \$4.50 per doz. Dis., 45%.

Sash Chains.



No. A. "Giant" metal, 15c. ft. wts. not over 125 lbs.
No. 1. "Giant" metal, 12c. pr. ft. wts. not over 75 lbs.
No. 2. "Giant" metal, 10c. pr. ft. wts. not over 40 lbs.
No. 0. "Giant" metal, 8c. pr. ft. wts. not over 25 lbs.
No. 1. Red metal, 10c. pr. ft. wts. not over 40 lbs.
No. 2. Red metal, 8c. pr. ft. wts. not over 30 lbs.
No. 0. Red metal, 6c. pr. ft. wts. not over 15 lbs.
No. 1. Steel, 8c. pr. ft. wts. not over 75 lbs.
No. 2. Steel, 6c. pr. ft. wts. not over 30 lbs.
No. 0. Steel, 4c. pr. ft. wts. not over 15 lbs.
No. 1. Steel, black enameled, 9c. pr. ft. wts. not over 75 lbs.
No. 2. Steel, black enameled, 7c. pr. ft. wts. not over 30 lbs.
No. 0. Steel, black ena'd, 5c. pr. ft. wts. not over 15 lbs.
Fastenings for hanging a window of 2 sashes for Nos. 1 and 2 chains, consisting of 4 hooks, 4 rings, 4 sash irons, a set, 18c. per set.
Fastenings for hanging a window of 2 sashes for No. 0 chains, 14c. per set.
Dis. on "Giant" metal chain..... 40 10 10%
" " Red metal chain..... 40 10 10%
" " Steel "..... 40 10 10%
" " Fastenings..... 40 10 10%

Scales.—Discount on scales, 45%.



Postal scales.
No. 1, capacity 1/2 to 9 oz. \$3.00.
No. 2, capacity 1/2 to 12 oz. \$4.00.
No. 3, capacity 1/2 to 34 oz. \$6.00.
No. 4, capacity 1/2 oz. to lbs., \$8.00

Druggists.
Capacity. Scoop. Capacity. Scoop.
1-16 oz. to 8 lbs. Tin. \$10.00 | 1-16 oz. to 8 lbs. Brass. \$11.00
Even balance trip scales, seamless scoop, with weights.
No. 1, capacity 1/2 oz. to 2 lbs., tin scoop, \$5.50
brass scoop, \$4.50.
No. 2, capacity 1/2 oz. to 4 lbs., tin scoop, \$6.50;
brass scoop, \$7.50.
No. 2 1/2, capacity 1/2 oz. to 18 lbs., tin scoop, \$11;
brass scoop, \$12.50.



Counter.
Capacity. Scoop. Capacity. Scoop.
1/2 oz. to 36 lbs. Tin. \$10.00 | 1/2 oz. to 36 lbs. Brass. \$12.00

Grocer.
Capacity. Scoop. Capacity. Scoop.
1/2 oz. to 62 lbs. Tin. \$12.00 | 1/2 oz. to 62 lbs. Brass. \$14.00

Meat or Butter Scales, with Slab.
1/2 oz. to 62 lbs., with Single Beam..... \$14.90
Double "..... 15.90

Shears. The Patent "Eureka"
No. 1 cuts round metal up to 1/4 in. steel to 1/2, \$12.
No. 2 cuts round metal up to 1/4 in. steel to 3-16, \$20.
Discount, 25%.

Steel Wire Mats.
Galvanized Steel Wire.
No. 2. Size 16x24. Each. \$1.50
No. 3. " 18x30. " 2.00
No. 4. " 22x36. " 3.00
No. 5. " 26x48. " 4.50
No. 6. " 30x48. " 5.25
No. 7. " 36x48. " 6.50
No. 8. " 36x60. " 8.00
No. 9. " 36x72. " 10.00
(Style A) "Hartman Flexible."
Brass mats "list" double the price of galvanized Style A) for similar sizes.
3 doz. lots, dis. 33 1/2%
6 doz. lots, dis. 40%
12 doz. lots, dis. 40 and 5%.

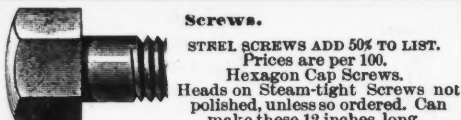


Table with columns for Diam. head, Length, Diam. screw, and Thread to in. Includes sub-sections for Screws and Mills from Solid Bar.

Dis., heads ground, 60 and 10%; dis., heads black, 60, 10 and 5%; dis., heads extra finish, 50 and 10%; dis., heads case-hardened, 55% and 10 dis.; dis., heads polished after hardening, 45 and 10%.

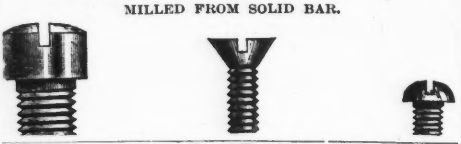


Table for screw specifications: Diam. Head, Length, Diam. Screw, and Threads to inch. Lists various diameters and lengths.

Head on Bevel and Button Head Screws, 1-16 larger in diameter than above specifications. Price, according to size of head. Discount, 50 and 10%; case hardened, 45 and 10%; case hardened and polished, 35 and 10%.

Spades and Shovels. JONES Patent plain black solid cast-steel shovels and spades. Patent solid steel shovel.

Table for spades and shovels: No., D. or long handle sq.-point shovels, No. Black, Pol's'p.

Pt. plain back solid cast steel shovel. 25. D or long handle round-point shovels.3 16.25 17.25

Patent solid cast steel spade. 28. D or long handle spades.....2 6.00 17.0 29. " " " " " " 3 16.50 18.0

Patent plain back solid cast steel. 25. Long round joint shovel No. 2.....15.50 16.50 27. " square No. 2.....15.50 16.50

GRAY'S CAST. Patent plain back solid-steel shovels and spades. 50. D. or long handle sq.-point shovels.2 \$12.00 \$13.00 51. " " " " " " 3 12.75 14.00 52. " " " " " " 3 12.75 14.00 55. D. handle spades.....2 12.25 13.25 56. " " " " " " 3 13.00 14.25

Patent solid corrugated cast steel scoop.

SCOOPS. Jones' patent plain back solid corrugated cast steel scoops.

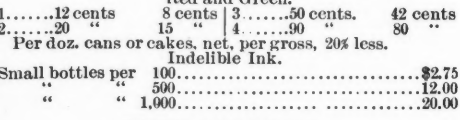
Table for scoops: No., D. or long handle solid cast steel scoops, Price.

Boxed f.o.b. New York, Boston or Montreal. The solid shovels, spades and scoops are made from cast steel bars by a recently patented process, the blade and strap being in one piece, not welded. All goods are American patterns.

Stencil Inks. Black. No. Per can. Per cake. No. Per can. Per cake.

Small bottles per 100..... \$2.75 500..... 12.00 " 1,000..... 20.00

STENCIL COMBINATIONS. Contains Alphabet, Figures, Brush, and Ink.



1/2 inch, per doz..... \$4.80 3/4 " " " " " " 5.40 1 " " " " " " 7.50 1 1/4 " " " " " " 8.40 1 3/4 " " " " " " 10.00 2 " " " " " " 10.00 2 1/2 " " " " " " 15.00 Dis., 20%.

Tools. ARTISANS. Chisel (Mason). Stone, 5 and 8c. lb., net. Mill Picks. Cast steel, 2 to 3 lb. \$22 per doz. Dis., 60 and 5%.

Stone Axes, Cast Steel. All sizes, 50c. per lb. Dis., 70 and 10%.

Ship or Top Mauls, Steel Face 4 to 8 lbs., 28c. per lb.

Steel Wedges, wood, 1s qual., 5c. lb.

Cooper Froes. 8 in. 3 doz. \$12.00 10 in. 3 doz. 13.50 12 in. 3 doz. 14.00 14 in. 3 doz. 14.50 16 in. 3 doz. 15.00 Discount, 60%.

Five lbs. and over, 40c.; with teeth, 45c.; 3 to 5 lbs., 45c.; with teeth, 50c.; under 3 lbs., 50c.; with teeth, 55c. Nos. 40 and 41, spalling or stone hammer, 5 lbs. and over, 36c.; 3 to 5 lbs., 40c.; under 3 lbs., 45c. per lb.

Nos. 40 and 41, spalling hammers, 9 to 20 lbs., steel face per lb., 17c. Dis., 70 and 10%.

Dis., 50, 10 and 5%.

Steel Wedges, wood, 1s qual., 5c. lb.

