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In the next issue of the ENGINEERING AND MINING JOURNAL we will describe with elaborate illustrations the ore deposits of the Aspen District, Colorado, and the faults which have occasioned some of the great lawsuits.

The index for Volume XLV. of the ENGINEERING AND MINING JOURNAL, which closed with our last issue, accompanies this number of the JOURNAL. Should any subscribers not receive it, they will please notify us promptly to that effect.

ALUMINUM AND MAGNESIUM.

The progress which has been made within the past year or two in the metallurgy of aluminum and magnesium may be estimated by the remarkable reduction in their price—aluminum from about \$20 per pound to its present wholesale price of about \$4 per pound, and magnesium from about \$40 per pound also to \$4.

In the case of aluminum the reduction in the price of the pure metal has been due to the reduction in the cost of making sodium by the

Castner and similar modifications of the old Deville process, and to a semi-electrical method in use in some of the European works. The chief uses of aluminum are in the forms of alloys, in which form the Cowles electric process, which reduces alumina in the electric arc with copper, forming an alloy which is sold in ingots containing accurately any desired percentage of aluminum, has reduced the cost of this metal to a lower point than is possible by any of the methods which make it through sodium.

Moreover, the Cowles process has for some time past been producing these alloys in large quantities and of remarkably high strength and elasticity, as has been amply shown in the tests made on the United States testing machine at Watertown, Mass., and in English works.*

The properties developed in these alloys seem to adapt them specially for such uses as propeller blades, gun castings, torpedo tubes and parts of machinery exposed to unusually heavy work, and to pump barrels, screen mesh and other applications where incorrodibility as well as strength is requisite. It seems probable that aluminum alloys are destined to replace steel in many of these as well as other important uses, so that the metal in this form appears to have made a wide and important market.

Either pure or as an alloy of iron it is also receiving quite an extended application in casting steel in the manner and for the purpose in which it is used in making miter castings of wrought-iron; that is, to lower the fusing point of the alloy and thus secure greater fluidity at any temperature above that point, and also for removing oxygen from the molten metal. It is difficult to say how extensive this use has become, but it is known to have been adopted recently in several important steel castings.

Pure aluminum has not yet received extensive application, owing chiefly to its comparatively high price; but the recent reduction in this, and the probability that at an early day it will be produced at a far lower cost by methods now under test, makes its extensive adoption in the near future almost assured.

Magnesium in many respects does not promise as wide application in the future as does aluminum. It oxidizes too readily to be well suited for the chief uses where its low specific gravity would make it desirable, and it alloys with but few metals in a commercially useful form. Nevertheless the trade in magnesium has increased fourfold within the past six months, owing to so apparently insignificant a cause as its extensive introduction into photography, where it is employed to produce a brilliant illumination for taking photographs at night, or in mines and caves. Some efforts have been made also to alloy it with other metals, but its exceedingly low fusing point (about 770° F.) renders this extremely difficult, and several violent explosions attended the experiments. The only successful result was with nickel, which an admixture of from three to five per cent of magnesium renders homogeneous and dense, the latter quality being especially remarkable, as nickel and its alloys are very frequently more or less porous.

The extreme lightness of magnesium, its specific gravity being only 1.75 as against 2.6 in the case of aluminum, makes it the most desirable metal known for optical instruments, from which its use is prevented only by its cost, which is now about four dollars per pound. It is also more durable than aluminum in situations where it is exposed to the influence of alkalis, which attack it much less readily. But its easy fusibility and oxidation will never permit it to become a rival to aluminum.

EXTENDED USE OF SOME OF THE RARER MINERALS.

The values of some of the rarer minerals used as gems are so enormous that the idea of counting them by the ton would seem very absurd, yet the production of diamonds in South Africa last year amounted to more than a ton in weight, or, to be exact, 3,596,036 carats, valued at about \$21,300,000. In other words, 2497 pounds Troy, valued at \$2530 per pound, or more than \$17,000,000 per net ton. Yet even these prices are less than those for some rubies of fine quality, which are, however, not found "by the ton" as diamonds are.

These values would reward a good deal of prospecting, but unfortunately they depend on the very difficulty in finding the stones, so that they don't pay the prospector, who can not wait long enough for the reward that might come after a long continued search.

Many of what are now comparatively common and inexpensive minerals were a few years ago extremely rare, and since they have not the qualities which would always make the diamond popular and valuable, they entered into use and found a ready market only when diligent search had found them in such quantities as to reduce their cost.

There are many useful and not very rare minerals, some of which are worth prices that, if applied to the ton of ore, would appear immense, and which are yet so little known to prospectors and miners that they might walk over them or throw them in the waste dumps without ever suspecting their value.

Among the so-called rare minerals which are almost unknown to prospectors, but which are attaining considerable importance, are those

* See ENGI. EEING AND MINING JOURNAL, June 30th, 1888, page 476.

containing the earths zirconia, thoria, glucina and several other substances that are now in good demand. At the last meeting of the New York Microscopical Society, Mr. GEORGE F. KUNZ, the able mineralogist of Messrs. TIFFANY & Co., of this city, exhibited sand from Brindletown, Burke Co., N. C., containing monazite, which is a phosphate of cerium, lanthanum, didinium and thoria, of which it contains from 0 to 17 per cent, and also exhibited monazite sand from Caravelhas, Brazil. He stated that the demand for these minerals had greatly increased of late, owing to the rare earths, zirconia, thoria, glucina, etc., which they contain, and which are now used for the mantle or hood of the new incandescent gas burner invented by Dr. CARL AUEB, called the "Welsbach" light.

This increased consumption has led to a search by the collectors and dealers in England, Germany, France, Russia, Norway, and Brazil, and more especially in the United States, and so thorough has the search been that the prices of minerals which were considered rare a short time ago are now quoted at one-tenth to one-hundredth of former figures.

The minerals containing these earths are: Lanthanite, sipylite, tysonite, uranorite, orangite, thorite, cleveite, beryl, yttrantalite, alvite, erdmannite, cerite, monazite, xenotime, fergusonite, aeschynite, allanite, zircon, eudialyte, euxenite, samarskite, gadolinite, and bodenite. Of these beryl, cerite, monazite, xenotime, allanite, and zircon have been obtained in large quantities. Sipylite, orangite, and thorite are especially sought for.

Monazite has been found at the following localities: at Villeneuve, Ottawa County, Canada, a crystal of 14½ pounds; Alexander County, N. C., at Millholland's mill; Amelia County, Va., in 20-pound crystals; Norwich, Conn.; Ural Mountains, Tavetch (var. turnerite), Mount Sorel (var. turnerite), Binnenthal, Switzerland, Southern Ural, Rivér Samarka, Arendal, Norway, but at all these localities the occurrence is of mineralogical interest only. In Burk, Polk and McDowell counties, North Carolina; at Glace Mine, Georgia, and at Caravelhas, Bahia, Brazil, it can be obtained in the form of sand in commercial quantities.

In the North Carolina gold gravels of Rutherford, Polk, Alexander, Burke, McDowell and Mecklenburg counties, monazite is found in considerable quantities in small brown or greenish or yellowish brown monoclinic crystals, associated with chromite, garnet, zircon, anatase, corundum, menacanthite, xenotime, fergusonite, epidote, columbite, samarskite and other materials. With these associations have been found several of the North Carolina diamonds, and from these localities will be furnished tons of monazite within the next twelve months.

The Brazilian monazite is found at Caravelhas, Bahia, where its existence was made known about 8 years ago by Dr. ORVILLE A. DERBY, geologist of Brazil. It occurs in large quantities as a beach sand almost free from other minerals, as if concentrated. As it occurs on the coast, it can easily be shipped directly to any point desired, and over six tons have already been sent to the United States.

The Meredith Freeman estate on Green River, Henderson County, North Carolina, is one of the best zircon localities, and for twenty-five years was in the hands of Gen. T. L. CLINGMAN, who mined 1000 pounds in 1869, believing firmly in the incandescent properties of zircon. Unfortunately for him, when the time for utilizing this mineral had at last arrived, Gen. CLINGMAN had forfeited his leases.

At Anderson, in Anderson County, S. C., zircons are found in immense quantities loose in the soil under similar conditions to those in North Carolina. They evidently come from a decomposed feldspathic rock. The crystals are generally remarkable for their perfection, weighing occasionally several ounces. The recent demand has also brought to light the existence of enormous quantities of zircon in the Ural Mountains and in Norway.

Although in Canada, in Renfrew and adjoining counties, immense crystals have been found, single crystals being up to 15 pounds each, yet they are so isolated that it would be impossible to obtain them in any quantity.

As already stated, the use of the Welsbach incandescent light has created a new demand for these minerals, and with rare prudence the parties interested quietly gathered a stock before the demand was generally known. It is said that there have now been accumulated more than 25 tons of zircon, 10 tons of monazite, 6 tons of cerite, and thousands of pounds of samarskite and other minerals. As a consequence zircon is now offered at less than 10 cents a pound, monazite at 25 cents, and samarskite at 50 cents, and many of the uncommon minerals at equally low rates. It is said that the zirconia in one ton of zircon would, if used alone, make half a million Welsbach burners, but several other minerals are mixed with it to produce varied and beautiful effects of color in the light.

TRAINING SCHOOLS FOR PROSPECTORS AND MINERS.

Education should be that preparation which will best fit every one to perform the duties of life, and since this is of interest to the whole community, and it is far easier to teach the young than the old, this

education should, where practicable, be given in the public schools and to the young.

Every civilized country has found that in the great struggle for industrial existence it is the fittest that survive, and since no permanent prosperity can be based on anything but productive industry, the effort in every country is to increase the efficiency and productive capacity of labor.

Intercommunication between countries has become so easy and inexpensive that the conditions of the labor market in one are quickly known and profited by in other countries. So that the tendency is always towards an equalization of wages in all countries. It is not necessary that the day's pay should become the same, but the comforts of life which can be procured with the products of a day's labor are gradually becoming equalized the world over. Labor, like gold, flows in where it is best rewarded, and the tendency is thus to equalize the conditions of production in different countries.

One by one the industries grow up to the point where they can more than supply home markets, and then of necessity their further expansion can only come through the slow growth of consumption at home or by competing in other markets with the goods produced in other countries. When this arrives, not only must the cost, but the quality, of the goods be taken into account.

This is why in nearly all foreign countries the greatest possible efforts are now being made to increase the skill of workmen by giving them better technical training, so that they may be able not only to produce more to the day's labor, but produce goods of better quality that will "take" in the common markets of the world.

In Germany and France particularly is the interest in technical training being pushed as never before. Industrial schools are being organized in nearly every department of industry, and already great benefits are becoming apparent in the better and more attractive goods that are made as well as in the increased efficiency of the better instructed and more intelligent workmen. In France the public schools are being used to give this technical instruction, and it is said with excellent results.

We do not now propose to discuss the advantages of this technical training of workmen engaged in the manufacturing industries, nor to that still more important subject, the technical training of women for the occupations of their lives, a subject almost wholly neglected in our present system of education; but we will limit our suggestions to one subject—the training of prospectors and miners.

It is, of course, true that no American expects to spend his whole life in any one occupation in a subordinate position, and so probably few young men expect to be prospectors all their lives. Nevertheless it is very important for the individual, and also for the country as a whole, that the army of men who so arduously, and frequently so heroically, spend the best years of their lives in the work of prospecting for minerals, should be well prepared for the successful performance of their work.

What prospector cannot recall the many moments of bitter disappointment he has endured when he learned of the discovery by some one else of valuable ore in the very rocks over which he had often walked in his vain and weary search for the fortune that was lying under his feet, in full view, but for the cloud of ignorance that obscured his vision. There are few more important occupations than that of the prospector, and there is none that requires and produces a fuller development of the perceptive faculties.

If a small collection of minerals were kept at the schools in the mining districts, and some instruction were given on their properties, modes of occurrence, values, etc., with the specimens and practical lessons in the field, to enforce the instruction, as in the Kindergarten system, what an impetus it would give to prospecting, and what an immense advantage it would prove to miners and prospectors in being able to learn the values of the minerals with which they are but little acquainted.

There is in nearly every camp some one who could and would devote attention to such a collection, and if qualified persons were engaged to visit the several mining camps in succession and give a course of plain, practical lectures, and lessons in the field, on prospecting and mining, the cost, which could be borne by the school districts, would be as nothing compared with the practical benefits that would result to the state and community. We shall refer to this subject again, and in the meantime shall be pleased to receive the views and criticisms of our readers on our proposition to establish training schools for prospectors and miners.

THE PROBLEM OF UNDERGROUND HIGH TENSION ELECTRIC WIRES.

The New York Board of Electrical Control has taken summary measures with one of the electric light companies, practically ordering it to abandon its business, or lay its conductors in the subways constructed under the authority of the Board. If it is intended by this measure to bring on a legal contest, in which the relations and rights of the parties may be judicially determined, we have nothing to say, except that the

same end seems likely to be attained in a more dignified manner by another process, namely, a suit to be brought by the Corporation Counsel against electric light companies operating dangerous wires overhead. That suit, as we understand it, will permit some result securing the adequate protection of the aerial conductors—a matter over which the Subway Commissioners have unfortunately no jurisdiction.

But as a mere display of energy, or as an order to which obedience can be expected, this action of the Board is absurd. They have provided no system in which electric arc-light currents can be operated. So far as we can learn, they have not even "devised," still less actually tried, any arrangement whatever, by which the distribution of light can be made to private consumers. Their "system," if it deserves the name, is simply a more or less protected hole in the ground; and their late action simply amounts to a command that the electric light companies shall get into this hole and invent some way of using it. It strikes us that it is the Board that will be "put in a hole," when the matter shall have gone a step further.

The reports which are so eagerly accepted by the daily press, of successful underground arc-light systems, have very little foundation. One of them adduces the city of Philadelphia as an example. It has even been asserted that in Philadelphia the electric arc-light wires and the telephone wires are operated successfully in the same conduit. This is not the case. The conduits containing the high-tension conductors are, not only separate from the others, but are kept as far away as possible. Moreover, the arc-light conduits and conductors have not yet proved satisfactory. The most that the electricians are willing to say is that they think they know where the main trouble has been, and hope they will be able to overcome it by new devices. If the nature of the trouble were merely economical, and concerned the companies and their subscribers only, the community might wait with equanimity, while the sufferers found either relief or ruin. But the defects of the underground high-tension systems concern the public safety. Apart from the question of induction, affecting other conductors, there is the far greater danger due to the frequent failure of insulation, and consequent leakage, and "short-circuiting" through inflammable materials. We know of several instances in which not only the insulating material itself, but also the conduit, has been thus burned up. The greatest danger from these subterranean leakages, however, is the firing of explosive mixtures of gas and air, such as accumulate so easily in all open spaces underground in our streets. We understand that in the New York conduits there are instances in which the gas-pipes actually traverse the manholes. To carry high-tension currents through such places is wanton folly.

Such manholes are so likely to contain explosive mixtures of air and gas that no prudent engineer will suffer a workman to descend into one of them with a lighted candle, until it has been thoroughly ventilated with a fan. This is easy enough, when the risk is only to be taken at a given time, in the manner just mentioned. But every manhole and connection in a high-tension conductor is peculiarly liable to failure of insulation, which may result in flame. This risk is continuous; and until it has been more adequately provided for, no one can truly say that the problem has been solved.

In the city of Washington, after at least eight years of constant experiment, there are now 5 miles of electric conductors underground, used for street-lighting. The Engineer Commissioner of the District writes under date of June 23d, 1888: "Although the experiment has not proved completely satisfactory, the results are believed to warrant its continuance and justify its gradual and careful extension."

Two years ago, it was reported by the proprietors of a certain patented system that it was in completely successful use in Washington. Personal inspection at that time led us to doubt the completeness of this success; and we now learn that the system referred to is not even the one which, although not completely satisfactory, is worth an experimental continuance. In other words, the present system is a new thing, not two years old.

But all the systems of this kind which have been even partially successful are, we believe, alike in this: they do not accommodate temporary or changing consumers. A company having a long contract to light the streets can perhaps lay a conductor underground in such a way that it will work safely and durably. But a way of effecting new connections, taking out branch-wires, etc., without destroying the efficiency and safety of the system has yet to be found. There is as yet absolutely nothing which has stood a reasonable test in practice.

On the other hand, the dangerous nature and condition of the overhead conductors of many companies are evident. Unfortunately, the law gives to the Subway Commissioners no jurisdiction over this case. They can order conductors to be put underground when they have devised a suitable plan and means. Until that time, the electric light wires are beyond their control. It seems to us, however, that the city authorities have clearly the power to deal with these companies and force them to employ better protection for their wires. A vigorous en-

forcement of this requirement would be more to the point than the dramatic, but futile, demonstration of the Subway Board.

We notice that the Brooklyn Board has approved for experiment a plan presented by the Edison Illuminating Company, for high-tension as well as low-tension underground conductors. The bill authorizing this company to enter Brooklyn was passed by the Legislature and vetoed by the Governor. The application now before the Aldermen will be refused, unless that body can be made to feel the public indignation. The obstacles to the solution of the underground electric lighting problem in Brooklyn are therefore DAVID B. HILL and the Aldermen of the city, to whom might be added, perhaps, those newspapers that spend their force in denouncing the Subway Commissioners for not having been able to override the Governor and the Aldermen, or for not being willing to hurl a *brutum fulmen*, just for fireworks. *

NATURALLY FORMED MUMMIES FROM MEXICO.

In the Ethnological Department of the California State Mining Bureau, are now on exhibition four mummies, which form the subject of a paper by Dr. Winslow Anderson in a recent bulletin published by the Bureau. These interesting remains were discovered by Signor S. Margheri on the eastern face of the Sierra Madre Mountains, Mexico, in a cave, the mouth of which had been so skillfully sealed with adobe plaster and natural rocks from the mountain, as to almost escape detection. At the extreme end of this natural sepulchre these bodies, a man, woman, little boy, and infant girl, of which no inscriptions or other evidences exist to reveal their race, had been placed with faces turned toward the rising sun. No artificial means of preservation had been employed. They were simply wrapped in burial shrouds, woven of various materials, cotton, hair and grasses, and their mummification had been brought about by the natural action of the extremely dry atmosphere of that region, which prevents decay. They have dried in the sitting posture, with hands crossed and knees drawn towards the chin, and are remarkably well preserved, the brain, heart, lungs, abdominal and pelvic viscera being intact, and dried to a solid consistency. The man is large and well developed, with a large head and broad shoulders, but has small hands and feet, with high-arched instep. The woman is even better preserved. A heavy suit of hair still remains; her hands and feet are small, the latter measuring only 8½ inches in length, and her skull gives unmistakable evidence of a high degree of intelligence. The facial angle of the man is 71 degrees, and of the woman, 69 degrees. The skull of the little boy, who is supposed to have been about seven years of age, is unusually well-shaped, and indicative of no meagre mental capacity, and the facial angle is 71 degrees. These cranial features are superior to those of the inhabitants of the same region to-day. Moreover the hair of the woman is soft, silky, and brown in color, wholly unlike that of the Indian races. In some respects these bodies approach the Aztec type; but, whatever the race may have been, it was one of superior development. The mummies were secretly transported from Mexico, to avoid trouble with the superstitious Indians of that locality, and were purchased by Mr. J. Z. Davis, who presented them to the California State Mining Bureau.

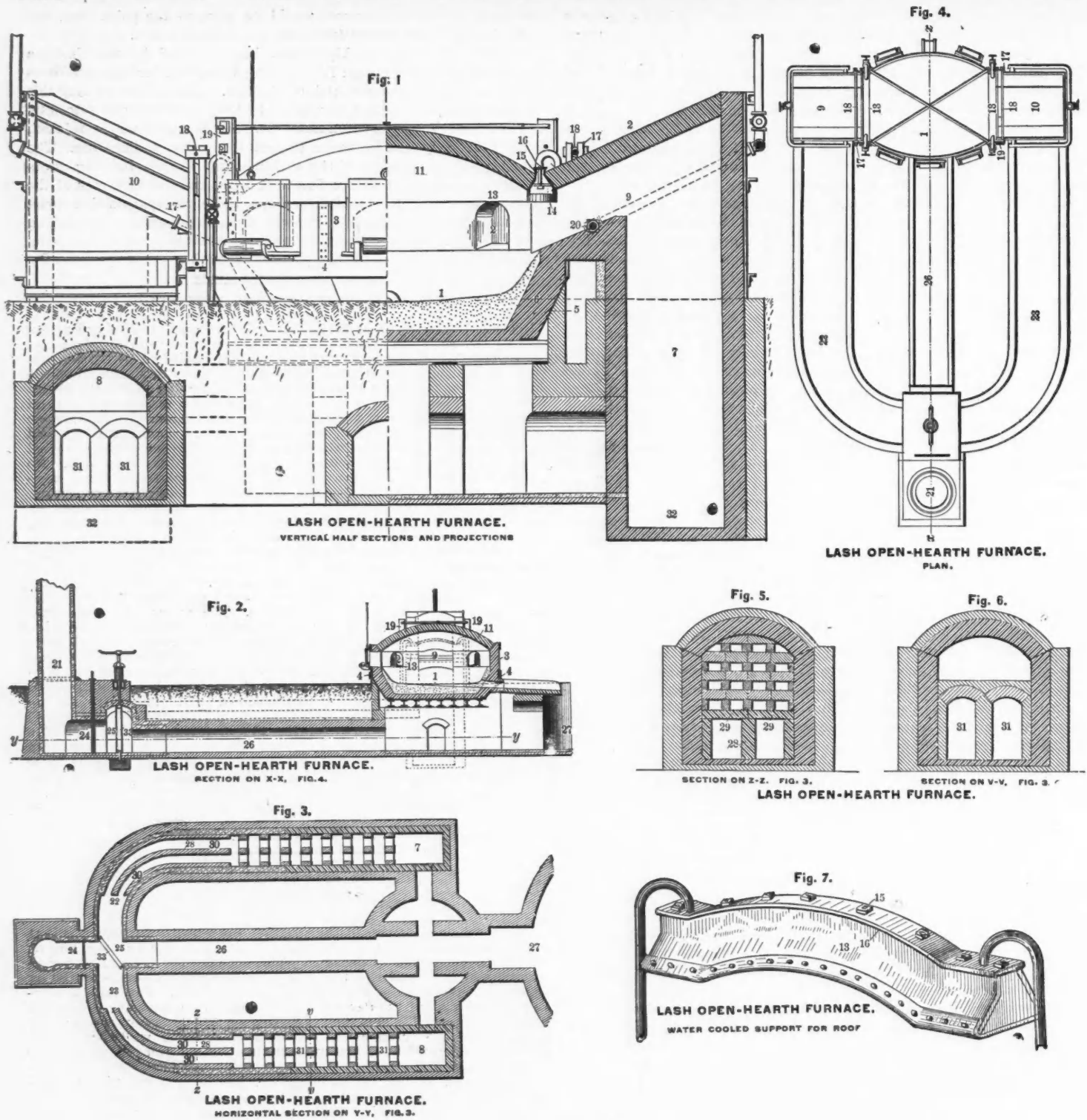
THE LASH OPEN-HEARTH FURNACES.*

By Alfred E. Hunt.

One of the chief defects of the original open-hearth furnace was that a large portion of the superincumbent weight of the furnace and its charge was supported by the brick walls, between the gas and air regenerators, which were at the upper part of the regenerators, softened by being subjected often to intense heat on both sides. This fault is obviated in nearly all of the newer designed furnaces by incasing the hearth in a plate-iron shell. This shell is carried on iron beams extending completely across the furnace and resting upon exterior walls or columns which are independent of the more highly heated and perishable parts of the furnace underneath.

Natural gas, in the favored regions, has been a great boon to the open-hearth steel manager; he no longer has to spend a very valuable portion of his time "poking the gas man to poke his fires." The gas is carried to the furnace in an even flow through a 3 inch gas-pipe, which branches off to both ends of the furnace in 2-inch pipes. The delivery and reversing of the gas is regulated by ordinary globe gas valves placed in the circuit. The ends of the pipe are incased in the brickwork and open into the flats of each end of the furnace from the opposite side walls by leaving out the space of a header in the fire-brick at the ends of the pipe. This gaseous fuel is not diluted to fully 60 per cent of its entire bulk with inert nitrogen, as is Siemens gas, which has to be conducted in pipes of 4 feet diameter to one of the furnace gas regenerators to be preheated. Natural gas is conducted directly to the ports of the furnace, as it was found that preheating decomposed it and soon filled the checker work of the gas regenerators with deposited carbon. The use of cold gas is much more than compensated for in the heat produced by the combustion of the concentrated fuel and by avoiding the large amount of nitrogen which is present in Siemens gas. Natural gas melting furnaces are now built so that both of the regenerators at each end of the furnace are connected with the air inlet valve, or they are built with only one regenerator at each end of the furnace for preheating the air. In this case the air valve and air regenerators are built larger, with 60 per cent greater capacity than when using Siemens gas. Natural gas is supplied in the service mains to melting furnaces in the vicinity of Pittsburgh with a pressure of about 8 ounces, and this pressure is adjusted in the service-pipes by regulators ordinarily furnished to the plants by the natural gas companies, and which they place with their connection to their mains at some suitable point about the plant. The pressure, as regulated by the

* From a paper entitled "Some Recent Improvements in Open-Hearth Steel Practice," read at the Boston meeting of the American Institute of Mining Engineers.



valves at the large-sized Lash furnaces, is at present only about 1 ounce or 1½ inches of water pressure as the gas goes into the melting furnace. The lighter the pressure, so long as the flow is kept uniform and steady, the better the combustion, and the more intense the heat. The steady uniform flow of natural gas has made it peculiarly applicable as a fuel for melting in open-hearth furnaces, and has been a very potent cause of the growing reputation for regularity and uniformity, as well as for superiority in other ways, of the open-hearth steel made in the natural gas districts.

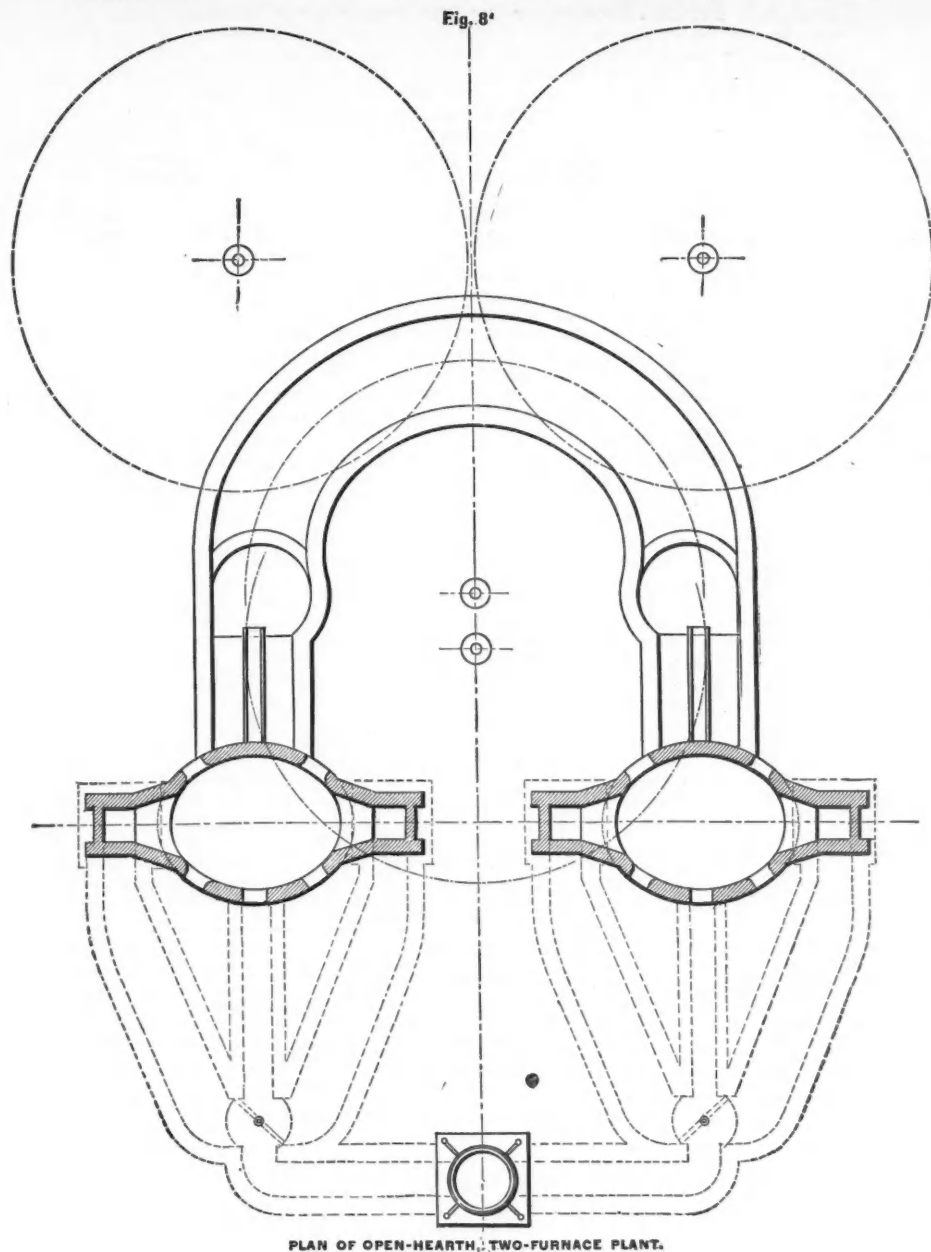
The tendency up to within the past year has been to increase the size and capacity of open-hearth steel furnaces, and the newer furnaces have been of 30 and 40 tons capacity, instead of 5 and 7 tons, as were those built at first. Except for special purposes, where large steel castings are to be made, the writer believes the limit of size has been reached. Experience with the large furnaces has led to the growing conviction at present that furnaces of about 15 to 20 tons at the maximum, are the most economical and produce the best steel.

The latest improved Lash open-hearth furnace plant the writer believes to be the best yet devised. It is peculiarly adapted to the use of natural gas, and there are, at the present writing, 12 furnaces now erected in Pittsburg on the Lash system, four of 40 tons, five of 30 tons, one of 20 tons and two of 15 tons, and there are four 15-ton furnace buildings. See Figs. 1, 2, 3, 4, 5, 6 and 7, in which the parts are numbered for reference.

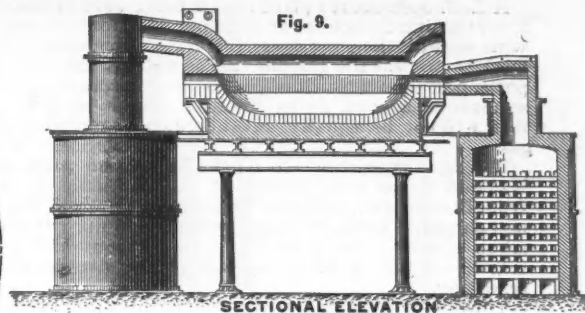
The hearth of the furnace (1) is made circular or, preferably, elliptical, with major axis of eighteen feet of hearth inside the linings and minor axis of fifteen feet for a fifteen ton furnace. This hearth is supported on

beams resting on suitable walls or piers of such a height that the charging doors are accessible from the ground level. The retaining shell of one half inch thick steel plates extends from the top of the side walls down to a broad connecting band (4) a short distance below the charging-doors; from this the shell slopes inward to the bottom plates of the hearth. The lining of the hearth conforms to the shape of the shell, and since the bottom plates and supporting beams prevent any vertical movement downward, the conical shape of the outer walls of the lower portion of the melting chamber prevents almost all of the outward movement due to the expansion of the lining, thus preventing the rupture of the lower side-walls of the furnace.

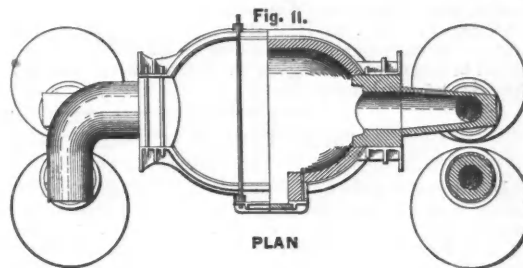
The single flues (9) in natural gas furnaces at either end of the melting chamber are 5 feet wide and are simply large passages inclined down toward the bath at a pitch of about 4 inches to the foot, to give the flame a strong guide downward upon the metal. In order to provide a firm support for the arched roofs of the melting chamber and flues leading into it, a water-bosh, fig. 7, made of ½-inch thick steel plate, is put in the form of a keystone in the arch of each roof, that of the melting chamber (15) and that over the downtake flues (2) butting against the plates of the inclined sides of the water-bosh, which in this way acts as a double skew-back or keystone. This bosh is 1 foot wide at the bottom and 5 feet long. It is stayed inside at proper intervals by transverse bars, and, although exposed on its under side to the intense heat of perhaps 3000 degrees Fahrenheit of the flue leading directly from the melting chamber, is found to work admirably; the writer has seen the under side of one of these water skew-backs after being in service for several



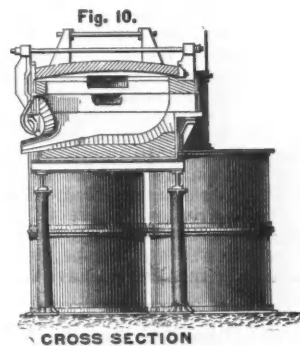
PLAN OF OPEN-HEARTH, TWO-FURNACE PLANT.



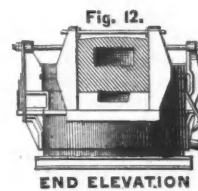
SECTIONAL ELEVATION



PLAN



CROSS SECTION



END ELEVATION

months and having made over 100 heats in the furnace, which has stood perfectly, the scale being hardly detached from the surface of the metal. These water skew-backs are provided with 1-inch pipes (16) feeding water at 5 pounds pressure and leading out the waste water which is hardly lukewarm.

The side walls of the flues are held in place by suitable plates, angles and backstays (16, 17, 19) and the other walls of the furnace are also stayed from opposite sides by means of plates reaching upward from the surrounding bands of the melting chamber and diagonal rods (18). Natural gas is led into the sloping flues by wrought-iron pipes (10-17) which enter the brick-work near the "four corners" of the melting chamber. The gas being much lighter than the air, mixes with it in its downward rush into the furnace.

The stack (21) is placed in such a manner that the flues leading from each end of the hearth (22-23), which have checker work in them, alternately act as regenerators to preheat the air before it enters the furnace. The lower end of the stack is connected by a short flue (24) with a four-way chamber (25), to which the flues (22-23) from each end of the furnace converge and to which the air-duct (26) delivers. This air-duct (26) leads out from the ladle-pit (27) and passes directly under the hearth in this way, not only heating the air but giving a free circulation under the hearth and preventing an excessive heating of the bottom. Along the middle of the flues (22-23) leading from the central four-way chamber (25) to the opposite ends of the furnace is placed checker-work of fire-brick supported on tiles (28), so that the bottoms of the flues are clear openings (29), giving a stronger draft; but as there is a constant tendency of the heated air to ascend there is a thoroughly uniform heating of the air entering the furnace by this arrangement.

The front portions of the flues are provided with a series of double arches, which not only serve to strengthen the side walls and tops of the flues, but also to increase the heating surfaces. The up-takes (7) are extended down below the points of entrance of the chimney flues, in this manner forming pockets (32) for the reception of any cinder, dust or other matter that may be drawn over from the furnace-chamber and preventing this material from going forward toward the stack and clogging the checker-work (31) in the chimney flues (22-23). Suitable openings are provided in the brick work, so that by taking down the brick bulk-heads these cinder pockets may be easily opened and cleaned out.

The four-way chamber (25) has the air-duct (26) leading into it permanently open, and is fitted with a three-way valve (33) alternately connecting the flues (22-23) leading to each end of the furnace with the chimney (21) and with this air-chamber (25), in this way reversing the furnace on the well-known Siemens principle. This three-way valve (33) is hollow and is kept cold by a stream of water running through it, preventing the warping or burning out of the valve, or with Siemens gas furnace, the direct loss of fuel by leakage to the chimney.

The tap-whole of the melting furnace (34) is at about the ground level, and the metal is conducted through an inclined spout (35) some 10 feet in length to the ladle-pit (27). The ladle, after being filled, is lifted by a crane and transported to an auxiliary semicircular casting pit, only about 4 feet lower than the ground-level in which the ingot molds are set. The front of the furnace is provided with three cranes, so located that they cover their entire pit space, the ladle and ladle-pit and the furnace melting-chamber, so that if a movable roof be put on the furnaces, large pieces may be swung in on to the furnace hearth.

The great advantages of the Lash furnaces are:

1. They have all the ordinary and important operations around the furnace on one ground-level, the three doors on the back side of the furnace and the two on the front or tapping side being all accessible for charging or for repairs to the furnace. A record of five hundred consecutive heats, of 50,000 pounds of stock each, shows that each were charged in an average of twenty-four minutes per charge, twelve men, or all hands about the furnace, doing the charging from all five doors, which are balanced and arranged to open by levers in the pulpit under the control of the crane boy.

2. The ladle and the tap-hole are easily accessible from the ground level, thus avoiding all swinging platforms and stages.

3. The gas and air-flues are so arranged as to be entirely isolated from the melting chamber and hearth except where the flues enter the furnace, thus doing away with the necessity of thick brick walls which are subjected to heat on both sides; the masonry being of uniform thickness throughout, much unequal expansion and bulging is prevented.

4. The chimney flues, regenerators, three-way valve and ladle-pit are all on one level, about 10 feet below the ground level, and easy of access for repairs.

5. The free access of air all around the flues and furnace-chamber prevents their being unduly heated at any time.

A Lash open-hearth plant is now being built by the Wetherell Brothers Steel Casting Company, at Thurlow, Pa., for the use of producer gas, with modifications necessary for the double sets of flues and checker-work to preheat the gaseous fuel as well as the air and double sets of ports, and the air over the gas for their entrance into the furnace. There seems to be no reason why the Lash system of furnaces, suitably modified, will not be equally advantageous for producer gas as for natural gas.

The rapidity with which repairs have been made upon Lash furnaces is one of the most important of their advantages. In two weeks' time, from heat to heat, a 30-ton furnace was repaired, the bottom taken out, and the brick-work, from the ground level up, put in entirely new, with seven masons working on day turn, without any night work except in tearing out the brick work, and in the five days making bottom and reheating.

Thirty-ton furnaces have been shut down and cooled off after the heat on Saturday, the furnace allowed to cool on Sunday, the roof and side walls torn out on Monday, the brick relaid on Tuesday and Tuesday night, gas turned on Wednesday morning, and the furnace charged, with good results, by Thursday noon. That is, a rebuilding of the lining of the entire melting chamber from the hearth up, and of the side walls of the flues leading to the down-takes, with a loss of time of only five days from heat to heat.

AMERICAN METHODS OF COPPER SMELTING.

In the last number of the *Revue Universelle des Mines (et) de la Metallurgie* is a highly complimentary mention of Dr. Peters's "Modern American Methods of Copper Smelting." It says: "We note the publication of an American treatise upon the metallurgy of copper by the dry method, which possesses great interest at this moment, when enterprises having copper for their object are attracting universal attention. The interest is rendered still greater on account of this work being entirely original, and being occupied with the metallurgy of copper in a country which ranks among the greatest producers of that metal, and, furthermore, because it is written by a practical metallurgist, whose has in it made a résumé of the fruits of a long experience. That which distinguishes the treatise of Dr. Peters is the number of carefully executed designs of furnaces, which often depart widely as to form and construction from those employed in the manufactories of Europe; the numerous estimates for construction which accompany the designs; as well as the net cost in detail of the metallurgical operations which are there described. This work has obtained a grand success in the United States, where it was published in parts by the *ENGINEERING AND MINING JOURNAL*. There is no doubt that its success will be very rapid also in Europe, where the special processes in the metallurgy of copper in America have remained until now unknown."

A Steel Railroad Car.—The Steel Car Company, which, it is said, will soon erect works near Chicago, is constructing a fire-proof steel car at Boston. Greater strength, together with a reduction of the dead weight, are anticipated from these cars, and the dangers of telescoping and of fire are hoped to be lessened. There is nothing to burn except the upholstery, and even that consists largely of unflammable material. The car now being built contains an observation room, parlor, smoking room, buffet, ladies' and gentlemen's toilets, etc., and is promised to be as handsome as those finished in wood.

Rivetless Steel Sleepers.—Mr. H. Hopkins, according to the *Colliery Guardian*, has invented a rivetless steel sleeper for railroads. The lips or jaws, for holding the rail in place, are stamped out of the solid plate, and are stiffened by corrugations or brackets which are also raised from the solid plate out of the hollow at the back of each jaw. A center strip is provided for the rail to rest upon, dispensing with all rivets and loose parts. These sleepers can be laid rapidly, and they are claimed to be especially adapted to use underground in mines.

The Longest Run on Record of a Spiegel Furnace.—Mr. G. C. Stone, of the New Jersey Zinc and Iron Company, Newark, N. J., reports that one of their two furnaces recently blew out after the longest blast ever made at the works, and the longest run on spiegel that has yet been made, being three years and two days. The product was:

	Tons.	Cwt.	Pounds.
First year	3840	10	70
Second year	3443	13	57
Third year	3600	8	79
Total	9874	12	94

The average yield of ore was only 31.5 per cent. The spiegel averaged 19.55 per cent manganese. It required 2 tons, 9 cwt., 22 pounds of coal to the ton of iron, and made about 6000 pounds slag to each ton of iron.

Coating Sheet-Iron with Lead.—Patents have been granted to Mr. Francis J. Clamer, of Philadelphia, for coating sheet-metal plates with lead, the principal features in the process being the manner in which the plates are previously cleaned. Mr. Clamer holds that the usual treatment in an acid bath only removes a portion of the impurities, and after this preliminary cleansing he places the sheet-metal in a bath of cyanide of potash and water. A galvanic current is then passed through the solution, the plate being made the anode. The surface is rendered perfectly clean by this process, and then it is further treated in a bath of chloride of zinc, made by dissolving metallic zinc in hydrochloric acid, which prepares it for the more ready adhesion of the lead.

To the molten lead, in which the plates are finally immersed, sal ammoniac, arsenic and phosphate of lead are added, the first ingredient serving to drive out absorbed gases which would form bubbles under the surface of the coating, the arsenic giving to the coating a greater hardness, and the phosphate of lead increasing the fluidity and permitting an even distribution of the lead over the plates. A working plant in Philadelphia is said to have demonstrated the success of the method, and to show that leaded iron and steel can be produced cheaper than galvanized plates.

Perino's Process for the Wet Extraction of Copper.—*Engineering* notes the invention, by Dr. Joseph Perino, of Charlottenburg, of a new process for the extraction of copper from sulphurous ores without previous roasting. It is based upon the action of nitrate of iron direct upon raw ores, with or without an intermixture of sulphides of iron and other metals. It is claimed that when the pulverized ore is mixed and heated with nitrate of iron, the copper sulphide is completely converted into sulphate, and may then be leached out with water. The copper sulphide is attacked before the sulphides of other metals, and by preliminary tests of the ore to be treated, a barely sufficient amount of nitrate of iron may be used, and thus effect the removal of the copper without altering other constituents present. The reaction is said to be effected with a temperature as low as 150° C. (302° F.), and the operation is conducted in earthenware vessels. The copper is precipitated from solution with metallic iron, and the nitrate of iron required is prepared from the residual iron liquor by addition of nitrate of strontium or lime. Arrangements are made for condensing and saving the nitrous fumes that come off in the process, and it is claimed that the loss is so small, that with the regeneration of the various compounds used, the deficiency can be made good by an occasional addition of from 5 to 8 per cent of fresh nitrate of lime. It will be interesting to see what the results will be in a large working plant.

Prices of Rare Alloys.—The *Iron Age* publishes the following quotations, but they are, in general, far above what these metals and alloys can be bought at: "P. W. L. Biermann, of Hanover, Germany, who makes a specialty of the manufacture of metal alloys, has sent us the following quotations: F.o.b. Hamburg and Bremen, net cash: Aluminium metal, in lots of 100 kg., 49 marks per kg.; aluminium brass, 300 marks per 100 kg.; 2½ per cent aluminium bronze, 300 marks; 5 per cent aluminium bronze, 400 marks; 7½ per cent aluminium bronze, 560 marks, and 10 per cent aluminium bronze, 670 marks per 100 kg. He quotes 5 per cent ferro-aluminium, 550 marks, and 10 per cent ferro-aluminium, 650 marks; 1½ silicon bronze, 300 marks, and silicon bronze for conductor wire, 260 marks; 3 per cent silicon copper, 550 marks, and silicon copper, running from 3 to 4 per cent, 650 marks; manganese copper, 80 per cent, is quoted 475 marks, while 4 per cent manganese bronze, rolled, is offered at 250 marks, and 15 per cent pure manganese bronze is quoted 290 marks. Metallic cadmium sells at 620 marks; phosphor-copper of 10 per cent is quoted 320 marks, and for 15 per cent material 450 marks, while phosphor-bronze sells at 190 marks. Nickel bronze, No. 200, is quoted 180 marks per 100 kg.; Wolfram metal, 94 to 98 pure, 400 marks; chromium, 1200 marks, and Rose's metal, melting at 195° Celsius, 1500 marks, and Wood's metal, melting at 173° Celsius, 1600 marks. A number of different alloys for brasses and Babbitt metal are also quoted, which are, however, of less interest than those named."

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

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

- PATENTS GRANTED JUNE 26TH, 1888.
- 384,953. Salt-Drier. C. Talleyrand Bartlett, Warsaw, N. Y.
 384,967. Gas-Pressure Regulator and Cut-Off. George S. Faulkner, Indianapolis, Ind.
 384,972. Steam-Boiler. Prosper Haere, Brussels, Belgium.
 384,975. Apparatus for Welding Tubes. James Hemphill, Pittsburg, Pa.
 384,991. Automatic Pipe-Coupling. James F. McElroy, Lansing, Mich.
 384,994. Well-Drilling Machine. John F. Moore, Fort Worth, Tex., Assignor to the Fort Worth Iron Works Company, same place.
 384,998. Pump-Rod for Windmills. Daniel E. Nettz, Jefferson, Wis.
 384,999. Wire-Bending and Forming Machine. Samuel T. Newman, Danbury, Conn., Assignor of two thirds to the Hat Wire Company, same place.
 385,007. Car-Brake. Abram Reese, Pittsburg, Pa., Assignor to the Reese Safety Brake Company (Ltd.), same place.
 385,022. Apparatus for Electric Welding. Elihu Thomson, Lynn, Assignor to the Thomson Electric Welding Company, Boston, Mass.
 385,034. Electromotive Railway. Granville T. Woods, Cincinnati, Ohio, Assignor to the Woods Electric Company, same place.
 385,040. Lubricator. William A. Carey, Malden, Mass.
 385,049. Manufacture of Shafts and Ordnance. John H. Flagler, New York, N. Y.
 385,053. Electric Railway. Rudolph M. Hunter, Philadelphia, Pa., Assignor to the Electric Car Company of America, same place.
 385,054. Apparatus for Removing and Setting Rolls. William R. Jones, Braddock, Pa.
 385,038. Apparatus for Removing and Setting Rolls. William R. Jones, Braddock, Pa.
 385,067. Electric Cut-Off. Charles G. Perkins, Hartford, Conn.
 385,068. Dynamo-Electric Machinery. Anthony R. Czekaus, London, Eng., Assignor to the Electric Car Company of America, Philadelphia, Pa.
 385,072. Device for Mixing Air and Gas for Furnaces. Henry Schlimme, Lebanon, Pa., Assignor of one half to Jacob H. Grove, same place.
 385,097. Electric Railway. G. Herbert Condit, Philadelphia, Pa., Assignor to the Electric Car Company of Pennsylvania.
 385,102. Boiler. Francis W. Dean, Cambridge, Mass., Assignor of one half to Erasmus D. Leavitt, Jr., same place.
 385,104. Pump Attachment. Thomas Duffley, Rosemount, Minn.
 385,109. Tube and Mode of Making the Same. David A. Garver and Clarence H. Straight, Bryan, Ohio.
 385,112. Nail Plate Feeder. John C. Gould, Chicago, Ill.
 385,113. Steam Engine. Johann C. Gräbner, Kupferhammer, and Henri Ruperti, Brackwede, Assignors to K. and Th. Möller, Kupferhammer, Prussia, Germany.
 385,121. Carburetor. Chester S. King and Edward G. Brown, Smethport, Pa.
 385,122. Friction-Coupling. Otto Kromer, Sandusky, Ohio.
 385,128. Nut-Machine. Alfred Marland, Pittsburg, Pa.
 385,148. Pipe-Coupling. James S. Stewart, Philadelphia, Pa., and Frederick Stone, Brooklyn, N. Y.
 385,152. Governor. Joseph W. Thompson, Salem, Ohio, Assignor of one half to the Buckeye Engine Company, same place.
 385,173. System of Electrical Distribution. Thomas A. Edison, Llewellyn Park, N. J.
 385,187 and 385,188. Nut-Machine. Frederick Lackner, Pittsburg, Pa., Assignor to Thomas Ne-iv, Edwin Bindley, and John Bindley, all of same place.
 385,198. Air-Brake. Harvey S. Park, Chicago, Ill.
 385,211. Electrical Pumping Apparatus. Frank J. Sprague, New York, N. Y.
 385,224. Air-Brake. Edward Andrews, Pottsville, Pa., Assignor of one half to William G. Matz, same place.
 385,226. Rotary Cylinder Engine. John S. Barden, Warren, R. I.
 385,229. Ore-Smelting Furnace. Caleb W. Barry, Keokuk, Iowa.
 385,235. Process of Manufacturing Oxide of Iron. Arthur C. Bradley, Brooklyn, N. Y.
 385,247. Apparatus for Annealing Wire. Fred. H. Daniels, Worcester, Mass.
 385,248. 385,249, 385,250, and 385,251. Apparatus for Charging Billets, Bars, etc., into Furnaces. Fred. H. Daniels, Worcester, Mass.
 385,254. Battery-Zinc. John Doyle, Hoboken, N. J., Assignor to himself and C. Coles Dusebury, Lake Mahopac, N. Y.
 385,266. 385,267. Anti-Friction Journal-Bearing. John W. Hyatt, Newark, N. J.
 385,273. Balanced Governor-Valve. Philip S. Kingsland, Chicago, Ill.
 385,287. Pipe-Coupling. John Story, Castle Shannon, Pa.
 385,309. Electric Battery. Ernest M. Hewett, Newton, Assignor to Daniel W. Crosby, Trustee, Boston, Mass.
 385,309. Process of Amalgamating Zinc. Ernest M. Hewett, Newton, Assignor to Daniel W. Crosby, Trustee, Boston, Mass.

THE METALLURGY OF STEEL.*

By Henry M. Howe.

(Continued from page 458.)

Snakes, sinuous markings on steel plates, are probably due to external cracks, which are drawn out into irregular serpentine shapes as the ingot is rolled now longitudinally, now diagonally, now transversely.

Internal Cracks.—Just as the too rapid contraction of the shell in cooling causes surface cracks, so its too rapid expansion in heating causes internal ones. If a cold ingot be placed in a hot furnace, the shell of the ingot expands and may elongate so rapidly that the expansion of the slowly heating interior cannot keep pace with it, when internal cracks form as shown at C, Figure 41, often with a loud report. These cavities on forging become elongated as at D, and may break through to the surface, causing incurable defects, sometimes so serious that the ingot must be cut to pieces. From this cause the proportion of cracked or "second quality" rails is greater when rail ingots are allowed to cool, than when they are charged into the heating furnace while still hot from teeming. Ingot which for any reason are allowed to cool should not be charged into a hot furnace. They should either be charged when the furnace is cool (say on Sunday night or early Monday morning) and be gradually heated with it, or else be preheated to redness in a comparatively cool auxiliary furnace, and then be transferred to the regular white-hot heating furnace.

Thus, in order to guard against cracks both external and internal the ingot should be placed in the heating furnace as soon after casting as possible. Some would teem the steel into moulds standing close to the heating furnace. A more practicable plan is that of the Pittsburgh Steel Casting Company, in which the steel is cast in moulds standing on a car, which is raised by a hydraulic jack immediately after teeming, and drawn by a locomotive to the side of the heating furnace, where the moulds are stripped, and the ingot immediately charged. As the wheels of the car are liable to become clogged with the metal splashed in teeming, it might be better to cast the ingots in a group on a single base plate, which could then be quickly raised by a crane and placed on a car. But these matters may be considered more advantageously elsewhere.

Both for given volume and for given cross-section, the longer the ingot the more liable is it to acquire cracks, both external and internal: in other words, short stumpy ingots are less liable to cracks than long and than thin ones.

Hammering between Flat Dies is liable to cause a central pipe-like crack in round steel bars: hence it is better to employ swedges, or, if possible, grooved rolls.^a It is said that this same tendency is met in rolling round bars by Simond's rolling machinery,^b in which the pressure appears to be applied along two lines diametrically opposite, just as in hammering between flat dies.

Let us now consider the means of preventing blowholes and pipes.

§ 227. A SINKING HEAD (rising or feeding head) raises the pipe to a more or less harmless position, but probably does not directly affect its volume. If it affects

the volume and position of the blowholes it should be through increasing the ferrostatic pressure within the ingot. Usually the walls of the sinking head are of the same material as the mould, and simply form a continuation of it. In order that the sinking head shall sink and feed efficiently it must not only be so wide that it will not freeze across till the ingot beneath has completely solidified, but its volume must be such that it will preserve molten up to this point enough metal to fill the cavity due to the contraction of the ingot's interior.

If the maximum volume of pipe is as we have estimated 11% of the volume of the hot ingot, and if from one-third to one-half the volume of the sinking head is available for feeding, then the greatest needed volume of sinking head should be from about 20 to about 28% of the total volume of the hot ingot or casting including the sinking head itself, or from 25 to 38% of the volume of the casting proper excluding the sinking head. The volume of sinking head actually employed, and the proportion of the ingot or other casting which is rejected on account of unsoundness in certain cases, are given in Table 78. As pipes in rail ingots are partly effaced in the subsequent rolling, while in castings proper (*i. e.* those which are employed without forging) they remain of their full initial size, special pains are taken to avoid them in castings: and we note that the proportion of sinking head by weight is much smaller in rail ingots than in castings proper, varying in the former between the narrow limits of 5.6 and 9.75%, while in the latter it runs from 17.6 to 25%. That portion of the top of the rail ingot which is subsequently cropped off on account of unsoundness is for convenience here classed as a sinking head: and with it may be included the crop end of the rail made from the steel next the top of the ingot. Formerly many works cropped from the bloom only 5% of the weight of the ingot: but this brings the upper end of the upper rail uncomfortably near the porous or piped region of the ingot top: and as the rail receives the hardest usage at its end, the impact of the approaching wheel, it is better to crop off 7.5%: the subsequent rail cropping removes another 1% of the top end.

Since the above was written I learn that at one American Bessemer works 10% of the weight of the ingot is cropped from its upper end, and about 1% more in the upper cropping of the upper rail.

Some Bessemer rail ingots from a well known American works have been cut in two longitudinally, when a very deep and rather narrow pipe was found, somewhat as in Figure 37, § 224. It would be manifestly impossible to remove this by cropping. Indeed, the unsoundness of the crop end of the rail ingot is due probably more to imprisoned gas bubbles which have risen from below, than to the pipe proper. Crucible steel ingots are usually very narrow, and are cast in iron moulds. The large proportion of their weight which is rejected on account of piping harmonizes with the deductions in § 225.

Hot-Top Sinking Head.—When iron moulds are employed, the sinking head will solidify relatively slowly, and so feed the more efficiently if its walls be of clay or other poorly conducting substance (as in Figure 42), especially if this be previously heated, as in the Terre Noire practice of casting steel projectiles.^c

The feeding of the sinking head may be assisted in steel as it is in iron castings by working a rod up and down through it, to break through any bridging that may occur

* Copyright by the Scientific Publishing Company, 1887.

^a Cf. Metcalf, Trans. Am. Soc. Civ. Engineers, XV., p. 290, 1887.

^b Described in the Iron Age, XLI., p. 269, 1893, and in Stahl und Eisen, VIII., p. 255, 1898.

^c Holley, Metallurg. Rev. II., p. 379, 1878.

TABLE 78.—SINKING HEAD AND CROPPINGS, ETC., FROM TOP OF STEEL INGOTS AND CASTINGS, REJECTED FOR UNSOUNDNESS.

Number.	Description of Ingot or casting.				Weight of portion rejected from top of ingot or casting, per 100 of total weight.	Volume of sinking head per 100 of total volume of casting + sinking head.
	Name of works.	Size of ingot.	Bloom cropping.	Crop'ng of upper end of upper rail.		
<i>American Bessemer rail ingots:</i> Weight of croppings per 100 of weight of ingot.						
1..	A.	14" × 14"	7.5	1.00	8.5	
2..	B.	10" × 10"	9.0	0.75	9.75	
3..	C.	14" × 14"	7.84	0.74	8.58	
4..	D.	14.5" × 14.5"	5.3	0.67	6.47	
5..	E.	14" × 14"	8.63	0.75	9.38	
6..	F.	14" × 14"	5	0.60	5.60	
<i>Crucible steel ingots:</i> Weight of upper portion rejected on account of pipe, per 100 of total weight of ingot.						
7..	Saw steel				30	
8..	Mild steel				10 to 20	
9..	High carbon steel				20 to 35	
10..	Badly melted steel				100	
<i>Ordnance ingots.</i>						
11..	U. S. Navy, reject at least				30	
12..	U. S. Army, reject at least				33.3	
13..	<i>Miscellaneous ingots</i> (Walrand)					16.7
14..	(Chernoff)				16.7 to 25	
<i>Castings proper.</i>						
15..	Terre Noire, 10" projectiles					20 to 25
16..	6" steel cast gun, Pittsburgh Steel Casting Co. ..				17.6	25.5
17..	Plain cylindrical castings for rolls, Norway Iron Works, Boston					25
18..	Mild castings, 0.5 to 10 lbs., weight of sprue per 100 of total				25	
19..	Do. do. do. castings weighing 10 to 100 lbs. ..				10	
20..	Cast-iron guns, U. S. Army				16.7	

1 to 7. Private notes.

8 to 10. Wm. Metcalf, private communication, January, 1888.

11, 12. Capt. D. A. Lyle, U. S. Army private communication, Feb. 25, 1888. 11. Ingots weighing up to about 21 tons. At least 20% by weight is rejected from the top and at least 5% from the bottom. The lower end is the breech end. 12. At least 33.3% of the total weight of the ingot is rejected from the top end, and at least 6% from the lower end.

13. Walrand, Van Nostrand's Eng. Mag., XXXIII, p. 357, 1885.

14. Chernoff, Revue Univ. 2nd. Ser., VII., p. 145, 1880.

15. Terre Noire solid steel castings for projectiles mould proper of iron, walls of sinking head of hot sand. Holley, Metallurgical Review II., p. 379, 1878.

16. 6-inch cast steel gun of the Pittsburgh Steel Casting Co., private communication, Wm. Hainsworth, Jan. 28th, 1888.

Total weight of head when cast, estimated at

when cold,

Total weight of gun including sinking head, estimated at

The composition and properties of the metal of which this gun consists are given in Table 50.

17. G. H. Billings, private communication.

18, 19. P. Ostberg, private communication. These numbers seem to me surprisingly low.

20. Capt. D. A. Lyle.

either in the sinking head itself or the upper part of the ingot, and so to maintain a passage through which feeding may occur. But this as well as the "hot-top" sinking head

Fig. 42



Hot-top sinking head, (Walrand).

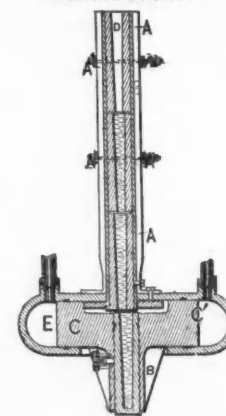
rather encourages the late escape of gas, which leads to the formation of blowholes. For if the top of the ingot be allowed to solidify rapidly, or better still if its solidification be hastened by pouring water on it, the upper crust bottles up the gas set free within the ingot, the gaseous pressure within rises and thus tends to prevent the further evolution of gas.

Special Forms of Sinking-Head.—If a series of moulds be placed one above another, with perforated diaphragms of refractory material between, each ingot serves as a sinking-head to the next lower one and the piping may be concentrated in the upper ingot. This arrangement suggests itself most readily for tyre and similar ingots: but recent inventions aim to apply it to common pyramidal ingots as well. This is done by lowering the ingot as soon as its crust has solidified, and casting a second on top of it. They unite in the center, and the second feeds the piping of the first. In the case of small ingots, the cold-shut due to intermittent teeming makes it easy to separate the ingots, which is done while they are still so hot as to be weak: should the cold-shut be insufficient, some

special device is employed. The steel is thus cast in continuous notched bars, later broken at the notches. Each ingot should have nearly the same composition as the steel fed to its pipe, as otherwise it will be heterogeneous; this means that successive ingots must have closely similar compositions.

In Boulton's arrangement, which consists essentially of a vertical frame A A, in which four moulds are held in column by spring clamps, a mould with a bottom is first filled, standing in the position occupied by the empty mould D in Figure 42, A. A perforated asbestos diaphragm is now placed upon it, and on this an empty bottomless mould, when both moulds are forced down by appropriate mechanism, the empty mould now occupying the position originally held by the first mould. The second mould having been filled, it receives its asbestos diaphragm, a third mould is placed upon it, all these are pushed down, and so on.

Fig. 42 A. BOULTON'S CASTING ARRANGEMENT.



A A, frame of I beams, held together by spiral springs. B, pocket, holding the lower mould. C, C', rams for breaking lower ingot away from next higher one. D, empty mould, ready to receive the next lot of steel. E, hydraulic cylinder for moving the ram C.

After three moulds have been filled, matters stand as in Figure 42 A, a fourth mould being now in position for teeming, and the first having reached the pocket B. The ram C in the hydraulic cylinder E is now forced against the first mould, breaking its ingot away from that in the second mould, as shown. The opposite ram C' returns the first mould to its former position, the column of moulds and ingots is again forced down, and so on. The asbestos diaphragms which separate the ingots make it easier to break them apart.^a

Hinsdale uses a single, stationary, bottomless, water or steam-cooled mould. The ingot is drawn down by mechanism as soon as its crust has solidified, till only its upper end remains in the mould, when a second is cast upon it, uniting with it in the centre and feeding its pipe, yet readily detached later.^b In order that the top of one ingot may fully close the bottom of the mould while the succeeding ingot is being cast, there must be little or no taper: hence difficulty in drawing the weak tender ingot through the mould, and danger of cracking and bleeding.

(TO BE CONTINUED.)

NOTE.—The publishers of the ENGINEERING AND MINING JOURNAL will thank the readers of this article if they will promptly call attention to any inaccuracies they may observe in it.

^a J. B. D. A. Boulton, U. S. Patent 365,902, July 5th, 1887. Messrs. Spaulding and Jennings, West Bergen, New Jersey, who have one of Boulton's machines, write me (April 25th, 1888) that they regard it as successful. The first cast in it was made on December 20th, 1887.

^b W. R. Hinsdale, priv. com., April 21-26th, 1888. U. S. Patent Application, 222,371.

PERSONAL.

The Ohio Institute of Mining Engineers will hold its summer meeting at Logan, Ohio, beginning July 11th.

Mr. A. J. Carroll, for thirty-two years superintendent of the Steubenville (O.) Gas and Coke Company, has resigned. Mr. J. Gwym, of Fostoria, O., succeeds him.

Dr. Francis Wyatt has been called to Montreal, Canada, to advise upon the construction of an extensive sulphuric acid and chemical plant in the vicinity of that city.

Mr. William Cowan, the vice president of the Corliss Engine Works, at Providence, R. I., it is said, will succeed the late Mr. George H. Corliss in the management of the works.

Mr. J. B. Cooper, son of James R. Cooper, superintendent of the Detroit & Lake Superior Smelting works, has assumed charge of the extensive smelting plant at Bridgeport, Conn.

Mr. H. P. Cooper, formerly manager for the Carbon Iron and Pipe Company at Parryville, Pa., has accepted the position of Superintendent of the Pottsville Iron and Steel Company's furnaces, Pottsville, Pa.

Mr. M. N. Forney, editor of the *Car-Builders' Dictionary* and of the *Railroad and Engineering Journal*, will contribute the railroad article in *Scribner's* for August, entitled "American Locomotives and Cars."

The Emperor of Japan has conferred upon Professors John Milne, James Maine Dixon and Julius Scriba, of the Imperial University, the fourth class decoration of the Rising Sun, and upon other educators of Japanese rising sons the fifth class decoration of the same order.

The Swedish engineers, architects, chemists and other technical workers have organized the "Swedish Engineers' Club of Philadelphia." Mr. Backstrom was elected President, Leo Bergmark Vice-President, and F. Ludahl Secretary. It is proposed to bring about a union between the New York and Philadelphia clubs.

Mr. R. T. Frechville, ex-Mining Commissioner of Great Britain for Cornwall, is reported to be in San Francisco, accompanied by Mr. Dowling, the well-known mining expert. Their ultimate destination is Alaska, where some mining properties will be visited and reported upon in the interest of foreign capitalists, represented in London by the firm of John Taylor & Sons.

Mr. Charles A. Ashburner, mining engineer, of Pittsburg, Pa., is said to have received an offer from the Shah of Persia to take charge of the government engineering corps now being organized in that country. It is stated that at present nothing but turquois is mined in Persia, and the Shah expects to discover valuable deposits of coal, iron, petroleum, and possibly the precious metals.

The Canadian Phosphate Company, Limited, has secured the services of Mr. Joseph Lanson Wills, M.E., F.C.S., of London, as managing engineer and chemist. It is expected that his large experience of phosphate mining will enable him to materially reduce the cost of production now rendered so onerous by the "cobbing" process. He is now on his way to the mines at Buckingham, Quebec.

The Hon. H. W. Sage has agreed to pay for the new Cornell University library building, Ithaca, N. Y., if the University is defeated in the Fisk will case. In other words, he advances without interest \$225,000, the cost of the building. If the suit goes against the University Mr. Sage does not get his money back; but if the decision is favorable to the University, Mr. Sage is to be reimbursed.

Capt. Nat. D. Moore, of the firm of Moore, Benjamin & Co., is about to leave the Gogebic Range permanently, to locate at Kingston, Canada, where he intends to begin anew the arduous task of acquiring a fortune. Captain Moore leaves a range, where he made and lost a million or so, without a dollar. He was one of the pioneers of the Gogebic Range. When the reaction in values set in, it found Moore and his associates loaded down with properties that they had bought at fancy prices for speculative purposes, and for which they were heavily indebted. They found it impossible to "unload" and went to the wall. Moore soon found himself stripped of all he had made, and has since been endeavoring to get a fresh start in the Gogebic District, without success. So he goes to Canada to seek fresh fields and diggings new.

INDUSTRIAL NOTES.

The buildings of the Buffalo Cast Iron Pipe Company, in Buffalo, N. Y., were burned on the 3d inst.

The Reading hardware works, Reading, Pa., were burned on the 2d inst. The loss is estimated at fully \$350,000. The works will be rebuilt at once.

The Kimberly Mill, at Sharon, Pa., which has been idle since March 14th, will be put in repair at once and will resume work not later than August 1st.

The Joliet Steel Company, of Joliet, Ill., has ordered an electric plant, using the Waterhouse arc and incandescent system made by the Waterhouse Electric and Manufacturing Company, of Hartford, Conn.

The Bethlehem Iron Company, Pa., on the 2d inst. made a 150-ton casting, being the base for the steel compressor in the new gun works. This is thirty tons heavier than the recent big cast, and is the largest ever known to have been made. It will take three weeks to cool.

Work has been stopped on the new charcoal furnace of the Montgomery Furnace and Chemical Company, at Montgomery, Ala. A considerable part of the furnace has been built and a large part of the charcoal and wood alcohol plant is finished, but it is stated that the furnace itself will not be completed this year.

According to reports \$700,000 was placed in bank at Birmingham, Ala., to be used in the erection of three new blast-furnaces in that vicinity. The furnaces are to be seventeen feet each. The projectors of the enterprise are H. F. Debardeleben, of Birmingham, and parties from Charleston and Savannah. Work is to be begun immediately.

The Westerman Iron Rolling Mills, situated on the Fifteen Mile Creek, a mile from Lockport, N. Y., were burned on the 3d inst. The fire caught in the roof from the high chimney about noon, and in fifteen minutes the entire mill was burned out so that nothing but the rafters remained. The warehouse to the right was burned as was also the bridge crossing the creek. The firm state that the works will be rebuilt and be running in 60 days.

The Harvey Steel Company is a new organization which is about to purchase a site for works at Jersey City, N. J. The company consists of H. A. Harvey, President; Theodore Sturges, of the Oxford Iron and Nail Company, Secretary; B. G. Clarke, of the Thomas Iron Company and the Lackawanna Coal and Iron Company, Treasurer; Mr. Percy R. Pyne, of Moses Taylor & Co., being also interested in the concern. The company will build works to make steel under the patents of H. A. Harvey, who is well known as the inventor of machinery for the manufacture of cut and rolled wood screws.

The Freeman Wire Company, East St. Louis, has purchased the plant of the Illinois Wire Company, adjoining its barbed wire mill. The present capacity of the Freeman barbed wire mill is about 32 tons daily, which will soon be increased by the addition of ten or a dozen new machines now in process of building. The wire mill was to be started up July 1st, on 1000 tons of imported rods, and run double turn to a capacity of 30 tons in 24 hours. While the bulk of the product will be converted into barbed wire, it is not the intention of the company to limit its manufacture to sizes adapted for that purpose, but to make all sizes of market wire from No. 9 down to No. 20.

The following firms have signed the scale of the Amalgamated Association of Iron and Steel Workers: Apollo Iron and Steel Company; Akron, O., Iron Company; Mingo Junction, O., Iron and Steel Company; Lookout Rolling Mill Company, Chattanooga, Tenn.; Carnegie, Phipps & Co., at Homestead; Scottsdale Iron and Steel Company, Scottsdale, Pa.; P. H. Laufman & Co.; Aurora Iron and Steel Company, Aurora, Ind.; Maumee Company, of Toledo; Howard Harward Company, of Cleveland; Republic Iron Works; Oliver Bros. & Phillips; Lawrence Iron Company, of Ironton, Ohio, and the two firms at Findlay, Ohio; Moorehead Bros. & Co., of Sharpsburg.

Singer, Nimick & Co. have resumed work with non-union men, the firm agreeing to restore a 10 per cent reduction recently ordered. The Amalgamated officials say that if any of their men go to work they will be expelled. The majority of the skilled workmen there are members of the Knights of Labor. The firm employs 800 hands, and its decision to resume in defiance of all labor organizations has caused the biggest sensation since the strike began. Several departments of the works were in operation to-day, but no puddlers appeared. An attempt to start up the rest of the mill will probably be made on Monday. The firm will hire men as individuals and upon no other conditions. The men who agree to go to work must renounce their organization.

The Jackson Furnace Company has been incorporated with a capital stock of \$25,000 by W. H. Peters, C. E. Murdock, George Peters, Jas. F. Peters and John Peters, Sr., to operate the Huron furnace property, at Jackson, Ohio, which has been purchased. The purchase includes 235 acres of coal land. There is a shaft mine at the furnace from which coal will be obtained without the labor of transporting it. Ore and limestone from the Lawrence furnace lands will be used. Huron is a 25-ton hot-blast furnace, size 50 x 13 feet, which was remodeled seven or eight years ago and has been idle for some time past. The new company propose to have the furnace in blast by the 1st of August. John Peters, Sr., was made President of the company, J. F. Peters Vice-President and W. H. Peters Secretary and Treasurer. The last-named gentleman will have charge of the property.

Further particulars have been received in reference to the failure of the Cartwright Iron-Works, of Alikaima, Ohio, to which we referred in our last issue. A press dispatch from Steubenville, Ohio, says the liabilities will reach \$60,000. It is said that the company held a large block of Graff, Bennett & Co.'s paper, upon which they could not realize. This, with the inadequate size of the plant, precipitated the failure. The company have only about \$7000 personal property above the value of the plant, upon which there is a mortgage of \$9000 held by the Miners' and Mechanics' Bank, of this city. This bank sold the company the plant for \$12,000 originally. The assignee has issued time certificates to the employes

for their wages, which they have negotiated for 50 cents on the dollar. It is now feared that the personal property will not be sold for much more than to pay the employes, to whom there is owed \$3500, and the costs of assignment.

A new manufacturing concern, the Aluminum Brass and Bronze Company, has been organized, with a capital of \$250,000, for the manufacture of aluminum and the alloys of silicon, under the Cowles patents. At the first meeting of stockholders, held in Waterbury, Conn., recently the following officers were elected: F. J. Kingsbury, Sr., President; William Powe, Treasurer, and F. J. Kingsbury, Jr., Secretary. Dr. Waldo will be Electrical Engineer and Charles S. Moss Mechanical Superintendent. A location has not yet been decided upon, but Bridgeport is talked of as the place for erecting factories. The company is encouraged by the success that the companies abroad have met with. It controls the exclusive rights, under the Cowles patents, of the alloys of aluminum in sheets, rods, and wire. Experiments have already been made at the Scovill Manufacturing Company's; from the first the Staudard Time Company has used the wire, and says it wants no other. The Sprague Electric Railway and Motor Company are also using the silicon bronze wire.

The suits brought at Pittsburg, Mass., against the Hudson Iron Company, to which we referred in our last issue, were the first cause under the Employers' Liability act passed in 1877. The company's furnaces are at Hudson, N. Y., but the mines are at West Stockbridge, Mass. The case closed on the 3d inst. in a disagreement of the jury. The plaintiffs claimed that under the act defendants were guilty of gross carelessness in not providing proper machinery, and defendants set up the plea that going by bucket was at the option of the men. It appeared in evidence that shovelers, such as these plaintiffs were, were allowed no discretion, but had to go by the bucket while the miners went by chutes. The Knights of Labor have furnished money for prosecution of the company as a test case. Chief Justice Brigham, of the Superior Court, held that if defendants furnished an ordinary safe machine they had discharged their duty. The jury stood nine for a verdict to three for acquittal. The latter held that there was option afforded to plaintiffs to get in to the mine. A new trial will be had.

The Pittsburg Steel Casting Company, Pittsburg, Pa., has signed a contract to furnish some heavy castings for the cruiser Maine, now building at the Brooklyn Navy Yard. Among the pieces to be cast is the stem post. This forms the forward part of the keel and the bow. One arm of it is twenty-six feet four inches long, the other thirteen feet ten inches. The shape is nearly that of a right angle. At the widest point it measures forty-two inches, and the thickness throughout will be twelve inches. The estimated weight of the monstrous piece of metal, the largest ever cast in Pittsburg, is seventeen tons. So odd is the shape that it is feared that no railroad entering in Pittsburg will contract for its shipment. Superintendent Pitcairn, of the Pennsylvania Railroad, will send an engineer to examine the model, and if it can be safely shipped the pattern will be sent on at once. In any other case it will have to be shipped by water around by New Orleans. The total cost of the work will be about \$70,000.

CONTRACTING NOTES.

Machinery and supplies wanted. See page xiv. Contracts open will be found on page xix. New contracts this week: No. 951, Wrought-Iron Bridge; No. 952, Water-Works; No. 953, Asphalt; No. 954, Bridge; No. 955, Cast-Iron Pipe.

GENERAL MINING NEWS.

Shipments of iron ore from the mines of the districts mentioned below for the season up to and including June 29th, as reported by the *Marquette Mining Journal*, were as follows:

	Tons. 1888.	Tons. 1887.
Marquette, Marquette District.....	120,784	213,227
St. Ignace, " " " " " " " " " "	40,922	36,333
Escanaba, " " " " " " " " " "	238,145	274,310
" Menominee District.....	283,838	353,727
" Gogebic District.....	60,735	
Ashland, " " " " " " " " " "	211,269	253,645
Two Harbors, Vermillion District.....	61,309	74,625
	1,015,962	1,177,867

TENNESSEE COAL, IRON AND RAILROAD COMPANY.—Official reports to us show that during June the company received from the mines of the Tracy City division 11,269 tons of coal, 14,881 tons of coke, making a total for the first half of 1888 of 89,228 tons of coal and 80,072 tons of coke.

ARKANSAS.

PULASKI COUNTY.

Activity is constantly increasing on the Fletcher manganese range. Four different Chicago companies are now at work preparing for the shipment of ores, and a railroad is being built to the mines, which will be completed in ninety days. A general average of the ores gives 40 per cent. manganese, 3 per cent. iron, and .012 phosphorus. It is said there are 500,000 tons of ore in sight already, and that the veins, some of which are eight feet wide, have clearly defined foot and hanging-walls. Large deposits of bog manganese have been found in the low-lands of the same region.

CALIFORNIA.

MONO COUNTY.

STANDARD CONSOLIDATED MINING COMPANY.—The company has just issued the following statement: May

1st, balance on hand, \$68,999.15; bullion bar, 687, \$8 508.52; total, \$72,508.67. Dividend No. 74, \$5,000; expenses, mine, \$14,830.22; insurance, legal expenses, etc., \$2,660.80; total, 28,490.52. June 1st, balance on hand, \$49,018.15.

NEVADA COUNTY.

At the copper mine at Spenceville, recently purchased by Woeler & Pietzsch, a new and ingenious method of working the ore has been introduced, which was originated by Mr. Woeler, who was in the employ of the old company for many years.

Instead of running the solution through a series of cylinders to catch the copper they have constructed a sluice box about 200 yards long which is filled with old iron, through which the sulphuric acid solution is run; the iron is replaced by the copper which is precipitated to the bottom.

Mr. Woeler also devised a process by which he can refine copper cement, making it into pig copper 98 to 99 per cent fine, losing only 3 to 5 per cent in the operation. He uses common furnaces and crucibles. This company's smelting is said to be the only practical work of the kind done on the Pacific Coast. All cement is generally sent to Baltimore or New York to be refined.

The owners are at present employing only five men, and are working up a pile of about 175,000 tons of burnt ore. They expect to raise ore from the bank in about eight months.

CHAMPION.—This copper mine, situated two miles north of Spenceville, owned by C. C. Bitner and Charles Pietzsch, will soon be worked.

ORIGINAL EMPIRE MILL AND MINING COMPANY.—Suits have been begun in the Superior Court, Grass Valley, by Mrs. Mary F. Shields, Mrs. Martha J. Trebilcock and John H. Paul against this company to recover in the aggregate \$87,000 for fatalities and injuries resulting to workmen in the company's employ by the explosion of March 14th. Plaintiffs claim that Geo. W. Starr, superintendent of the Empire mine, was negligent and careless in permitting powder to remain in the dry-house, which caught fire and thereby caused the explosion.

COLORADO.

CLEAR CREEK COUNTY.

INTER OCEAN.—The Inter Ocean lode, located on line of the Idaho tunnel, is being worked by Cowen & Scofield. A 40-foot shaft has been sunk, and a three-inch streak in the bottom worth from \$188 to \$250 per ton has been found.

LAKE.—This mine in Virginia Cañon is now shipping about 40 tons of ore per month.

MARY FOSTER.—This mine on Cascade Creek has been sold to the Granite Mountain people in St. Louis for a consideration of \$40,000.

EL PASO COUNTY.

WESTERN COAL AND MINING COMPANY.—This company, of Kansas, has filed a statement with the county clerk showing that the principal office of the company will hereafter be in Colorado Springs.

GILPIN COUNTY.

The case entitled the People ex rel. Wolpert et al. vs. Rogers et al., which is the suit brought by the farmers to enjoin the mill men of Gilpin County from running tailings into Bear Creek, will come up for hearing in the Supreme Court in September. The Denver Mining Industry says that there does not appear to be a great deal of interest in the matter, though it is a very important suit to the mining men of the State.

LAKE COUNTY.

We have received the following statement, which shows the gold bullion deposited at the United States Mint, Denver, during June, 1888: Gross weight deposit for month, 8423.39 ounces; net weight deposit for month, 8234.95 ounces; net weight base removed, 197.44 ounces; average per cent base removed, .023 per cent; average fineness gold, .788; average fineness silver, .178. Making a total for the month of gold of \$137,419.95; silver, \$1,168.66, a total of \$138,588.61.

ADAMS MINING COMPANY.—The company has refused to renew its ore contracts or make new ones, on account of the low price now paid for lead, and, consequently, is making no shipments at present.

BREECE MINING COMPANY.—In an interview with a representative of the ENGINEERING AND MINING JOURNAL, Mr. A. Bradstreet stated that for the past three years, instead of sinking the shaft, the company had mined an iron ore found near the surface, which is peculiarly adapted for the manufacture of steel rails, and which has been regularly purchased by the Colorado Coal and Iron Company for this purpose. The orders run from 600 to 1300 tons per month. The mining is done by a contractor, who pays all the expenses of labor, etc., and the ore is simply sold at an advance to the Coal and Iron Company.

The board of directors have decided to sink the old shaft deeper, in the hope of finding a body of silver ore. This will probably be done by August next, when the surplus water has been evaporated by the sun, thus saving the expense of pumping.

The company has ample funds, between \$20,000 and \$30,000, to perform the work. Mr. J. H. Fletcher, the superintendent, will have charge of the work.

ST. KEVIN MINING COMPANY.—Mr. G. Hassell, the president of the company and owner of eight tenths of the stock, said to an ENGINEERING AND MINING JOURNAL representative: "Owing to certain internal troubles, until now we have steadily refused to give, except to bona-fide stockholders, any information concerning the work and prospects of our mine. The new 10-stamp mill of the Hassell Milling Company, which is leased by the St. Kevin Company, is in opera-

tion, and concentrates are being shipped every other day to the Pueblo Sampling Works. Ten more stamps for this new mill have been ordered from the Colorado Iron Works at Denver, and will be delivered July 7th. From April 25th till a few days ago we suspended active work in the mine, owing to the large amount of low-grade ore which we had on hand and which we could not easily dispose of. However, now that we have our mill in operation, we have resumed mining. We know that on every level there is ore of great richness. Recent assays of 11-ton carloads show 46 and 50 ounces silver. At present we have levels at 50, 75, 100, 150, 200, 250 and 300 feet, and the next 50 feet is being rapidly sunk."

PITKIN COUNTY.

The ore shipments from Aspen for the week ended June 30th amounted to 1760 tons, of which Denver got 713 tons, Pueblo 258 and Leadville 789.

IDAHO.

LEMHI COUNTY.

VIOLA MINING COMPANY, LIMITED.—The Viola Smelting Works at Nicholia offer a \$16 rate on dry ores delivered at Camas stations on the Utah & Northern Railroad.

MILLS COUNTY.

ORO FINO LIMITED COMPANY.—The purchasers of the Oro Fino group of mines have registered in London under the name of the Oro Fino Limited Company. Local papers state that, judging from the way the owners are pushing matters, Silver City will soon be a lively camp. A new mill-site has been located in town and the work of preparing the same for a mill begun; fifteen hundred cords of wood advertised for, and bids for hauling 150,000 pounds of mill machinery are asked for. Arrangements are also being made to put up a bucket tram to transport ore to the mill from the mine, one and a quarter miles distant. Everything is now about arranged to begin taking ore out of the mine. Three hundred feet of T rail track have been put in on the third level, and many important improvements have been made at the mine to enable them to work economically. The winze connecting with the Sinker tunnel is nearly completed, and is being sunk through rich ore. As soon as this is finished they will have good air in the tunnel, and it will be pushed with three shifts, operating with a diamond drill, trying to reach the rich chute of ore known, it is said, to be about one hundred feet ahead.

IOWA.

The miners of the Des Moines District have accepted 90 cents per ton for the coming season. This is the employers' figure, the miners having asked for \$1.

WITBREAST FUEL COMPANY.—The statement for May shows net earnings of \$16,502, an increase of \$11,007, or 22½ per cent. For eleven months of the current year the net earning were \$147,200, an increase of \$22,071, or 17½ per cent.

MICHIGAN.

COPPER MINES.

ALLOUEZ MINING COMPANY.—Since the assessment the Calumet News has had several inquiries as to the condition of affairs at this mine, and says: The buildings at the mine, as well as at the stamps, the hoisting machinery, the railroad track, the skip roads, etc., are badly in want of repairs, but they are not, with the exception of the hoisting machinery, likely to require much of the assessment to put them in good working order.

Since the owners have resumed control of the mine, two lifts have been sunk in No. 2 shaft, which is now down to the 18th level. The 17th level has been drifted south some 100 feet, but it will require to be drifted another 150 feet before it reaches the rich shoot of copper which the tributaries met with in drifting on the 16th, the level above, and which gave every promise that it would continue down.

It is intended to connect the lower levels with the No. 1 shaft, which at present has not reached the 9th level, although the 10th, 14th, 15th and 16th levels are extended further south than it. When these connections are made, and having so much ground opened ahead, and by the aid of that well-known hustler, Capt. Ned Roscorla, who has charge of the underground workings, we feel sure that this mine can soon be placed on the dividend list, and without any further call on the pockets of the shareholders than the assessment now demanded, which is payable on July 25th.

We lately saw some very rich rock taken from the twelfth level, south, of No. 2.

From the character of this vein it is necessary, in order to make it pay, to work it on a large scale, and to call in the aid of the latest improvements in hoisting machinery, etc.; but if this is done there can not, we think, be any fear as to the result.

CALUMET & HECLA MINING COMPANY.—The work of unwatering the mine is now progressing quite satisfactorily. The Worthington condensing pumps are doing good work. The trouble with them was due to the water in the mine being too hot to condense the steam rapidly enough. The steam pipe made it so warm that the men could not work in No. 5 Calumet. Mr. Duffey, who was sent here by the Worthington Company, made no alterations whatever; but General Manager Whiting ordered the water skips to work in the same shaft with the pumps. The leakage from the water skips cools the shaft and water in the bottom to such an extent as to make it possible to work the pumps. A mechanical device attached to the pumps by the mine machinists overcame the vapor that interfered with the working of the pumps to a great extent and really made their work a success. In the United States Court at Grand Rapids, on the 3d inst., a non-suit was taken in the case of Joseph Chandler vs.

the Calumet & Hecla Mining Company. The defendants held some land in Houghton County, valuable for its deposits of copper, which they held by grants fifty-two years old. Under a later grant from the State of swamp lands, Mr. Chandler claimed a title to the land and brought a suit in ejectment. The case was called on the 3d inst. Neither the plaintiff nor his attorney appeared, and a non-suit was taken. The suit was brought in November, 1887, and was referred to in our issue of November 19th and December 3d of the same year.

IRON MINES.

MIKADO IRON MINING COMPANY.—At a recent meeting of the board of directors several changes were made in the official management of the company. Maj. R. N. Roberts, of Waupaca, Wis., was elected President and director to succeed Jay A. Hubbell, resigned; L. J. Perry, of Ironwood, Mich., was elected Secretary and Treasurer to succeed M. Van Orden, resigned; and L. L. Wright, of Ironwood, Mich., was elected a director to succeed J. B. Sturgis, resigned. L. J. Perry was chosen General Manager. The board unanimously voted to remove the general offices of the company from Houghton to Ironwood, Mich. These changes are the result of the recent purchase of the control in the Mikado by a party organized by Captain Perry. The price paid was \$25,000. In the present state of the ore trade the company will make no effort to ship ore.

NANAIMO.—This mine, in the Crystal Falls District, has been seized by the sheriff on executions amounting to \$17,000, at the instance of parties who have been advancing money to keep it in operation. Labor claims to the amount of \$25,000 are also outstanding. Money to pay laborers was advanced during the winter by Tod, Stambaugh & Co., for which they took security on the ore as it was mined. They have now taken possession of the stock pile and are shipping it. The company is pretty badly involved, according to all accounts. An assessment made to provide means to relieve it of pressing embarrassment a short time ago has not been paid.

MONTANA.

DEER LODGE COUNTY.

BRUNSWICK MINING AND REDUCTION COMPANY.—The company has been organized with a capital stock of \$2,000,000, shares \$5 each, for mining and reducing ores in Deer Lodge County, the principal office to be at Granite. The incorporators are: Thomas Treveaille, Thomas Coulter, William Souden, John Hickey, Richard Francis, Nicholas Francis, Thomas Tonkin, Joseph Richards and Joseph Lutney.

LEWIS & CLARKE COUNTY.

HELENA & LIVINGSTON SMELTING AND REFINING COMPANY.—The work of excavating for the foundation of the works has commenced. An electric light plant has been ordered, and when it arrives will be set up on the grounds, which will be illuminated at night, and a night and day shift worked until the building is completed.

MONTANA COMPANY, LIMITED.—Mr. R. T. Bayliss, the manager, has contradicted the report that a rich strike had been made in a letter to the Helena Independent. He says: "No new strike has been made in this mine for many months. The ore-body to which the reports refer as the new discovery in the Cruise level is not a parallel vein, but is a part of the Drum Lummon lode, and although it has only lately been opened up at this point, it has been worked in this and other levels of the mine, and has furnished many thousands of tons during the past three years. Further still, I regret to state that it is only a low-grade ore-body, and yields ore only fit for the purposes of the low-grade mills."

NEVADA.

We have received the following from our special correspondent:

The mine at Tybo, Nye County, is producing quite largely and shipping to Salt Lake City for treatment. From all accounts prospects are very good in that quarter. A company with a little capital could make a nice income by erecting a furnace and refinery and buying an interest in the Dimick and Sly mines. I hear that they have an old speiss and matte dump out there containing about 5000 tons of \$30 stuff. Besides this there are many smaller mines in the vicinity which would contribute good smelting ores.

At the Purcell mine, at Seligman (owned by Seligman Bros. & Church, of New York, I believe), they have tried Krom's dry concentrating, but some difficulty has been experienced with dust. I hear Krom passed through lately to investigate the matter.

The mines at Spencer Mount, Elko County, are attracting attention. They have just started a 40-ton smelter. The property is managed by a St. Louis corporation, with Lewis as president.

Now that the Eureka reduction works have combined on a rate, there is no competition, and consequently less incentive to low grade ore miners and prospectors.

ELKO COUNTY.

Messrs. Hyman, Hart and Schussler, representatives of San Francisco capitalists, are now at Tuscarora, where they contemplate heavy investments. Mr. Schussler is consulting engineer of the Spring Valley Water Company of San Francisco, and will report upon the feasibility of supplying Tuscarora with water from some of the numerous mountain streams on the other side of Independence Valley.

NORTH BELLE ISLE MINING COMPANY.—At the annual meeting of this company held at San Francisco recently the following officers were elected: E. Scott, President; F. A. Berlin, Vice-President. John W. Pew was reappointed Secretary and W. C. Price Superintendent. The financial statement showed re-

ceipts during the year of \$585,926.19. The disbursements, including \$200,000 in dividends, amounted to \$585,193.41, leaving \$732.72 cash on hand, but there is a bullion shipment valued at \$41,000 on the way. The product of the mine during the last year amounted to 3015 tons of ore, yielding bullion of the gross value of \$64,955. The average assay value of the battery samples of the ore was \$214.64 per ton, and it was reduced at a fifteen-stamp mill, which crushed an average of 12½ tons per day. The mill was shut down on June 19th for the purpose of putting in a new boiler and making repairs, but this work will be completed on or about July 7th. Superintendent Price concludes his annual report with the statement that there remains in sight considerable ore on the different levels that will grade between \$100 and \$150 per ton, and there is already developed several thousand tons of ore that will be handled as concentrating ore. During the year there has accumulated on the dumps between ten and twelve thousand tons of ore that is estimated at \$30 per ton, but the nature of the rock is such as to make it difficult to determine its actual value until a milling test of it is made. A concentrating plant with a capacity of 100 tons per day is being constructed, and will be completed in a short time. The prospect work has been forwarded to an extent that at a nominal cost the value of large areas of unexplored territory can be ascertained. If the next few weeks prospecting on the 400 level strengthens the situation as now anticipated, it will justify the opening of another level at an early date. The following report was received on the 27th inst.: "Since writing the annual report, face of drift on 400-foot level has materially improved. It now shows 3 feet of more than \$200 ore."

ESMERALDA COUNTY.

It is stated that an English company has purchased on Walker River, near the mouth of Rough Creek, a tract of land for the purpose of erecting a large reduction works suitable to work the ore around Aurora.

EUREKA COUNTY.

EUREKA CONSOLIDATED MINING COMPANY.—The committee of the San Francisco Stock and Exchange Board, appointed to investigate the affairs of this company, referred to in our issue of June 30th, has made a report vindicating the management of this mine from all the malicious charges lately current. The statement presented by the company shows for eight months ending May 31st, 1888, an output of \$380,351.86 in bullion from the mine. Eight dividends, amounting to \$100,000, have been paid, and the available assets still on hand June 20th amounted to \$94,395.75.

LINCOLN COUNTY.

The small copper furnace at Bristol, erected recently by C. L. Roe, was fired up a short time ago, and a three days' run made, the result of which was 7 tons of bullion, containing 95 per cent. copper, produced from 14 tons of ore. The bullion carries but \$2 per ton in silver. This experimental run resulting successfully, the furnace will be fired up again as soon as it is relined. It is stated that the copper ore on which the furnace has been running was mined upwards of ten years ago.

STORME COUNTY—COMSTOCK LODGE.

We condense the following from the Virginia City Chronicle:

CHOLLAR MINING COMPANY.—The 20 additional stamps added to the Chollar mill complement are ready to drop, but the dynamos for operating them by electric power have not yet arrived.

GOULD & CURRY MINING COMPANY.—The weekly shipments amount to about 229 tons of ore, battery samples of which show an average assay value of \$24.03 per ton. Eldorado Tunnel, the southeast drift from the top of upraise, is now in fair grade milling ore.

OCCIDENTAL MINING COMPANY.—The Excelsior Stamp Mill has recently been leased by this company, which, with the Atlanta, furnishes a combined daily crushing power of 50 tons. With the pre-ent assay value of the ore maintained, the bullion yield of the mine should reach \$15,000 per month.

SAVAGE MINING COMPANY.—The recent ore development on the 500 level, stripped by the south drift, is higher grade than that heretofore extracted, assays showing an average value of \$35 per ton. Stopes will be immediately opened in this development for the extraction of ore. The stopes from the 400 down to the 900 level are yielding the usual grade.

NEW MEXICO.

The Flagler reduction works, of Silver City, are undergoing many changes and improvements, and by the middle of this month will probably be ready to sample, treat and buy ores of all kind. A smelter is one of the latest improvements to the plant, while the sampler is something, the need of which has been long felt in this country. The fixation process will also be used where it is to the advantage of the ore to be treated by that method.

PENNSYLVANIA.

COAL.

The Schuylkill Coal Exchange, Pottsville, publishes the following report, dated July 3d:

The collieries drawn to return prices of coal sold in June, 1888, to determine the rate of wages to be paid, make the following returns: W. Shenandoah Colliery (P. & R. C. & I. Co.), \$2.38; Tunnel Colliery (P. & R. C. & I. Co.), \$2.24; Richardson Colliery (P. & R. C. & I. Co.), \$2.37; Turkey Run Colliery (P. & R. C. & I. Co.), \$2.28; Shenandoah City Colliery (P. & R. C. & I. Co.), \$2.31. The average of these prices is \$2.31½, and the rate of wages therefore, is six (6) per cent below \$2.50 basis.

These charters were issued from the State Department at Harrisburg on the 2d inst.: The Elk Coal and Coke Company, of Philadelphia, capital, \$150,000; the Philipsburg Coal and Land Company, of Philipsburg, Center County, capital, \$28,600.

The litigation which has been going on for some years between the Cummings' estate and the Lehigh Valley Railroad Company for possession of a tract of land north of Montana, near Mt. Carmel, has been decided in favor of the Cummings' estate by the Supreme Court. Some valuable coal veins have been discovered on it.

BELLEVUE.—An extensive caving in of this colliery, at Scranton, occurred on the third inst., and many miners who were working in the mine at the time had a narrow escape from being crushed to death. The fall of roof covers a vast area of surface, and has damaged a number of houses and destroyed the streets and sidewalks along Main street. The damage to property on the surface is considerable.

LEHIGH & WILKES-BARRE COAL COMPANY.—A fire was discovered in the western portion of the workings of the Hollenbach mine at Wilkes-Barre on the morning of the 3d inst. The entire force fought the fire all day, and in the afternoon succeeded in subduing the flames. The damage will be considerable. During the past four months the company has been driving a tunnel through the rock from the Ross vein to the Red Ash deposit in its great Nottingham colliery at Plymouth, and has just reached the coal. The rock was of the hardest known to the cutters, and the time consumed in the work is very short considering the volume that had to be removed. The seam was found in excellent shape.

WYNN COKE COMPANY.—This company, of Uniontown, has made an assignment, growing out of the disappearance, it is said, of Maj. A. B. DeSaulles, one of the principal owners. The assignment is made to his brother, Louis DeSaulles. The liabilities are about \$15,000. The coke plant is supposed to be worth \$25,000.

TENNESSEE.

STEWART COUNTY.

The Cumberland Iron-Works property, at Dover, has been sold to Northern capitalists for about \$200,000. The property consists of about 46,000 acres of land, several hundred acres lying on the Cumberland River, which are considered the best farming lands in the county. Iron ore is found in and near the Bear Spring furnace. The works were operated before the war.

UTAH.

SUMMIT COUNTY.

ONTARIO SILVER MINING COMPANY.—The following is an extract from Prof. J. E. Clayton's report contained in the company's report for the year 1888: "One year ago I made a careful study of the Ontario mine, both from a geological and economical standpoint, giving my views on the condition of the mine, and its future prospects of long continued prosperity as a dividend-paying property. The last year's operations show that the estimated reserves were much larger than was supposed, which you will see by comparing the statement of the work done in the mine during last year's operations with the report issued one year ago. It is a remarkable fact that the Ontario mine has always given a larger output of ore from its reserves than any one has ever estimated them to contain. The last year's work proves that the ground cut and under-run, ready for stopping, will yield at least 50 per cent more ore than it was estimated to contain one year ago. All the new work done in the western portion of the mine last year gives increased confidence in its productiveness. The seventh, eighth, ninth and tenth levels west of shaft No. 3 are looking much more promising than they did one year ago. The four levels above named will have to be driven 1875 feet further to reach the west end line of the Ontario ground. This block of new ground (1875 feet long by nearly 500 feet deep) measured on the plane or dip of the lode, will supply your present milling capacity for nearly four years. The vein is unusually large in the face of all four of the levels above referred to, and the ore seams are strong and good, and as the 600-foot level carried good ore beyond the end line for several hundred feet into the Daly ground, it is safe to estimate this whole block of virgin ground as fully up in quantity of ore to any of like dimensions heretofore worked out. The spur vein, No. 1, to its intersection with the south or Daly vein, and thence westerly to the Daly Company's line, has carried good ore almost the entire distance of over 1400 feet in length, down to the 600-foot level. Hence, we have here a block of virgin ground extending down from the 600-foot level to the 1000-foot level that ought to give a full supply of ore, at present rate of reduction, for three years; making a total of seven years' supply of ore in these two blocks of virgin ground above the 1000-foot level. From my intimate knowledge of these two great lodes and the characteristics of the ore deposits in them, I can predict with confidence that these blocks of virgin ground will fully sustain the estimates of their productiveness. There are still larger quantities of ore yet to be stope out above the 600-level. The estimates will probably not fall short of a two years' supply for the mill. This makes eight or nine years' supply of ore above the 1000-foot level, at the present rate of reduction."

FOREIGN MINING NEWS.

JAPAN.

The Japanese government has resolved to sell the Miike coal mine, which has long been a source of loss to the government, at the same time that its manage-

ment for government account was adversely affecting private enterprise in coal mining in Japan. The government declares that the agents who have worked the mine alone derived profit from it. The reserve price is four million yen, but it is stated that about one million yen more should be spent by the purchaser in developing and reforming the whole system of the works. With reference to the future of the mine, the *Choya Shimbu* states that the whole quantity of coal is estimated at 230,000,000 tons, enough to last for 230 years at 1,000,000 tons per annum; that it is the greatest mine in Japan; and that when the Takashima mine is worked out (which the *Choya* expects will be the case seven or eight years hence) Miike alone will furnish the coal for export to Shanghai and Hong Kong.

SOUTH AMERICA.

UNITED STATES OF COLOMBIA.

Our special correspondent sends us the following: On May 20th the Mal Paso mine, near Honda, shipped its month's product of 42 pounds of gold. The adjoining mine, the Oritá, sent for its month's work 48 pounds, and the Organos mines in the southern part of the state sent 21 pounds. The recent "clean-up" of La Rica mine, in the western part of the state, produced 16 pounds.

Things in a mining way are very quiet just now. Another mine is being opened by the American Mining Company. They have a property near the famous Marmato mine, in the State of Antioquia. Chas. E. Stacie is Superintendent.

Mr. A. Harpending has asked the government for concessions on salt and machinery for a 30-ton smelter to be erected at or near Santana, presumably to work the ores of the Cristo and Boconéme mines.

There are some prospects of forming companies in France to work the Plata Vieja and Agua Bonita mines, located west of Honda.

The Frias, Calamonte, and Santa Maria mines keep up their shipment of three hundred dollar concentrates.

The Gallo mine at Ibaguá has just added 80 new stamps to its milling capacity. This is a free-gold mine, averaging two ounces to the ton.

Furnaces are soon to be fired on a cinnabar mine in Central Tolima, with a daily capacity of 200 pounds. This is good news to the consumers of quicksilver, for that article costs here about one dollar gold per pound. Many gold mills are run here without using quicksilver, depending on blankets alone to save the gold.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, July 6.

Statistics.

Production Anthracite Coal for week ended June 30th and year from January 1st:

Tons of 2240 lbs.	1888.		1887.
	Week.	Year.	Year.
P. & Read RR. Co.	131,921	2,693,759	3,845,061
Cent. R. R. of N. J.	77,407	2,486,860	2,404,536
L. V. RR. Co.	46,468	2,872,529	3,494,917
D. L. & W. RR. Co.	117,951	3,087,512	2,586,544
D. & H. Canal Co.	71,663	2,052,584	1,829,465
Penna. RR.	75,645	1,968,855	1,524,659
Penna. Canal Co.	44,183	751,851	688,385
Penna. Canal Co.		148,807	140,913
Total	565,238	16,062,757	16,514,480
Decrease		451,723	
Increase		7,539	

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

Production for corresponding period:

1883	14,401,622	1885	13,175,500
1884	13,739,099	1886	14,709,981

Production Bituminous Coal for week ended June 30th, and year from January 1st:

EASTERN AND NORTHERN SHIPMENTS.

	1888.		1887.
	Week.	Year.	Year.
Phila. & Erie RR.	371	32,711	5,990
Cumberland, Md.	66,552	1,717,366	1,985,429
Baltimore, Pa.		88,266	105,392
Broad Top, Pa.			
H. & Broad Top, RR.	5,269	181,903	176,080
Clearfield Region, Pa.			
Snow Shoe	2,703	65,972	84,759
Karhaus (Keating)	2,834	73,966	96,364
Tyrone & Clearfield	60,346	1,714,385	1,026,938
Tipton	656	30,108	4,713
Alleghany Region, Pa.			
Gallitzin & Mountain	15,875	447,494	542,207
Pocahontas Flat Top Coal.			
Norfolk & West. RR.	29,979	789,484	585,647
Kanawha Region, W. Va.			
Ches. & Ohio RR.	27,066	885,179	751,191
Total	211,651	6,024,834	5,374,719

* Tons of 2240 lbs.

WESTERN SHIPMENTS.

Pittsburg Region, Pa.			
West Penn RR.	8,073	198,334	158,149
Southwest Penn. RR.	1,605	50,898	67,513
Pennsylvania RR.	7,830	152,457	108,297
Westmoreland Region, Pa.			
Pennsylvania RR.	29,654	870,643	738,150
Monongahela Region, Pa.			
Pennsylvania RR.	11,817	202,285	263,261
Total	58,979	1,474,617	1,275,370
Grand total	270,630	7,499,451	6,600,089

Production of Coke on line of Pennsylvania RR. for week ending June 30th, and year from January 1st, in tons of 2000 pounds: Week, 70,448 tons; year, 1,828,880 tons; to corresponding date in 1887, 1,653,793 tons.

Anthracite.

As stated in our last, the demand for anthracite continues very active in anticipation of the increased price which is expected to be made on the 15th. As we then stated, the advance will probably be as follows:

Table with 2 columns: Item and Price. Includes 'On Broken', 'Egg', 'Stove and Chestnut' with prices like 10c advance to \$3.85 per long ton.

The producers who have sold out all that they can deliver between now and the 15th have already advanced their quotations, so that prices have already felt the effect of the anticipated decree.

Pea and buckwheat coal are still a drug, and are selling at almost any price. Pea coal is down to \$2.25, and buckwheat as low as \$1.90 alongside, which would be about \$1.70 f. o. b.

The production of coal still continues large, and during the month of June will considerably exceed the output of June last year. Up to the 25th of June the output this year was 15,600,000 tons, in round numbers, or about 110,000 tons more than in the corresponding period last year.

Since the bituminous output has also greatly exceeded that of 1887, there can be no question that the general business of the country is in a satisfactory condition, so far as the extent of the business is concerned. Never before in the history of this country has so much coal been consumed; and even in some parts of the country prices are lower than they were a year ago, the Eastern trade has been a little better on the average, so that no general complaint can be made.

The iron business in the East is still very dull, and takes but a small amount of anthracite. This, however, we believe, will shortly be improved, for all the indications are that the general market will improve after the end of July or the middle of August.

Bituminous.

The soft coal trade continues to be rather dull owing to the fact that nearly all of the large contracts are taken. The inquiries are not frequent, and there is a good deal of cutting in prices, so that the f. o. b. quotations, which are nominally \$2.60, are in reality about \$2.25 to \$2.50, and in some cases even below \$2.20.

The inquiry that we made in our editorial pages some weeks ago concerning coal for the Panama Canal has evidently resulted in business. In fact, the canal has made quite heavy purchases here, and during the month of June no less than 16,000 tons of American soft coal were delivered at Colon. The immense advance in freights on English coal, some of the last charters having been made at 29s. from Cardiff, would bring the cost of English coal up to about \$9.50 to \$9.75 per ton at Colon. Freights from Philadelphia and Newport News are quoted at from \$4 to \$4.25, making the price at Colon about \$6.75, some of the coal having been sold here as low as \$2.50 f. o. b. This allows of such a wide margin in favor of American coal that we expect to see this trade develop, and finally to see our American coals absorb the entire market.

Unfortunately the Panama scheme is not likely to last very long, for it seems incredible that the French should continue to sink their money in such an utterly hopeless enterprise. But while it lasts, our American coal producers will have a good market for a very considerable amount of their output.

Boston.

July 5.

[From our Special Correspondent.]

The market for anthracite coal at this port is showing a little more signs of life. This seems to be due to two reasons: dealers are in need of more coal, as they have been out of the market for some time, and then some confidence is beginning to be placed in the talk of an advance about the middle of July. The fact of the advance in prices to the Western trade has been mainly responsible for the growth of this sentiment. The talk is of a 25-cent advance all round. Prices are rather firmer than they have been, and the indications now point to a decidedly better movement from the Eastern market in the immediate future. The easier tendency in freights noted below will help decidedly to this end.

No improvement can be mentioned in the line of bituminous coal. There is less cutting going on, but chiefly because there is so little desirable trade left to compete over. Quotations remain nominally as before at \$2.50 to \$2.60 f. o. b. Delivered prices on a considerable lower basis are talked about, however.

Although freights have unquestionably been tending downward for some little time past, it has been in large vessels only that any noticeable change is felt. Small vessels are as scarce as ever. The new colliers have all been of large tonnage of late, and there is a better demand than supply, both for light draught vessels and barges. Most all of the barges draw a great deal of water, as they are altered over vessels of deep draught, generally speaking.

We quote vessel rates, exclusive of discharging: New York, 70@80c.; Philadelphia, \$1@1.05; Baltimore, \$1.10@1.15; Newport News and Norfolk, \$1.05@1.10; Richmond, \$1.15@1.25. Provincial, \$1.60@1.75.

The Provincial freights are from Cape Breton, as no foreign coal is coming from the Bay of Fundy this year, at least thus far, and very little from any port. The few cargoes that have arrived are worth about \$2.70 delivered, which is a slight advance on last year's figures.

In retail coal circles the city of Boston bids have been the latest topic of interest. Agreeably to the combination rules, all bids were at the same figures, two parties bidding for the whole city and others bidding for various sections. In one respect the rules of the combination were violated, as a bid coming from a concern called the Boston Coal Company offered 90

days option when all others were for 30 days only. The prices were for the city proper. Roxbury, Charlestown and South Boston: Broken, \$5.35; Egg, \$5.60; Stove, \$5.85; for Dorchester, West Roxbury and Brighton prices were uniformly 25 cents higher. On canal coal bids were \$9.95 and \$10.25. For one cargo of soft coal a bid of \$3.97 was made.

The new coal trade exchange is now fully organized, with the following officers: Horatio Wellington, President; George F. Stebbins, Secretary; E. H. Baker, Treasurer. The exchange is now in good running order.

Buffalo.

July 5.

[From our Special Correspondent.]

On July 2d and until further notice the prices of anthracite coal will be as follows:

Table with 3 columns: Item, Price at Buffalo, Price on Niagara River board. Includes 'Gra e, per gross ton', 'Egg', 'Stove', 'Chestnut'.

The retail price here delivered per 2000 lbs.: Grate and Egg, \$4.85; Stove and Chestnut, \$5.10; No. 4, \$5.35, and Pea, \$3.75. These prices show the locked for advance, although it is 10 cents more than was talked of.

The following item from a local newspaper is pertinent: "The advance in the price of coal for July delivery, which was ordered by the anthracite shippers at their last meeting, applies to all points where hard coal is sold, and is not merely westward from the mines, as the heavy shipments in that direction might suggest. There has never been anything approaching the rate at which coal is going west by lake at present, and unless the apprehensions of some vessel men are met in the rapid decline of shipments early in the fall, the amount moved by the close of navigation will be something astonishing."

The bituminous coal trade continues demoralized, as per last report, although dealers say that there is some chance for improvement in the near future, but do not say what the chances consist of.

Coke trade unchanged; average business.

Lake freights on coal strong. The rapid handling of cargoes here has caused many vessels to seek this port for coal tonnage as well as the inducement of the higher rates prevailing. All crafts are taken on arrival or by telegraph before leaving other Lake Erie ports. "The stocks of coal here plenty," said a vessel agent this morning, "freights are very firm, and the demand continues excellent."

The shipments by lake westward from June 28th to July 4th, both days inclusive, aggregated 95,615 net tons, namely, 52,100 to Chicago, 20,580 to Milwaukee, 8300 to Duluth, 450 to Toledo, 1300 to Bay City, 700 to Menominee, 1950 to Washburn, 1000 to Manitowoc, 250 to Saginaw, 1500 to Superior, 2500 to Marquette, 500 to Green Bay, 2250 to Gladstone, 1810 to Sheboygan, 25 to Port Dover and 500 to Detroit. Total shipments thus far this season (including vessels from Tonawanda not reported at the Custom House) 845,615 net tons. The rates of freight were \$1 to Chicago and Racine, 90c. to Milwaukee, 75c. to Duluth, 50c. to Toledo, 40c. to Bay City, 95c. to Menominee, 90c. to Manitowoc, 75c. to Washburn, 50c. to Detroit, 85c. to Escanaba, 90c. to Sheboygan, 75c. to Superior, 90c. to Green Bay, 75c. to Marquette, 50c. to Saginaw, 40c. to Dover and 75c. to Gladstone.

Seamen's wages on the lakes have been reduced 50c. per day in consequence of the low rates of freight prevailing.

Receipts of coal by canal, fourth week in June, 7459 net tons; the shipment, 708 net tons.

Canal freights on coal to eastward points entirely nominal. Shippers making their own bargains in consequence of the extraordinary demoralization in transportation charges by this water route.

A Duluth dispatch says there is a serious blockade at Connor's Point near that port. Vessels are lying five deep at the coal docks awaiting turn for unloading.

Statistical.—Receipts of coal at this port this year by lake none. Shipments westward by lake for month of June 398,680 net tons, as compared with 281,100 tons in 1887 and 196,610 tons in 1886; for the season thus far this year 798,000 net tons, as compared with 630,970 tons in 1887 and 501,070 tons in 1886. The receipts of coal by canal for June 19,645 net tons, as compared with 11,359 tons in 1887 and — tons in 1886; the shipments 1622 net tons, as compared with 997 tons in 1887 and — tons in 1886. Total receipts thus far for the season 20,821 net tons, as compared with 12,314 tons in 1887 and 15,810 tons in 1886; shipment's 2333 net tons, as compared with 1597 tons in 1887 and 6019 tons in 1886. These figures show a large increase this year over last of lake shipments and also of receipts by canal.

Pittsburg.

July 5.

[From our Special Correspondent.]

Coal remains quiet with moderate local demand. Amount loaded for shipment first water, 12,000,000 to 13,000,000 bushels. As there was no June rise, we are entitled to one in July. The year's shipments so far have been large.

Table with 2 columns: Item and Price. Includes 'First pool', 'Second pool', 'Third pool' with prices like \$4.75, \$4.25, \$3.75.

Connellsville Coke.—To say that the coke trade prospects are worse than the trade itself is saying a great deal, yet it expresses the situation accurately. Orders continue to fall off, and prices are weak at a dollar.

The shipments show a falling off over one hundred cars per day.

The nominal rates are: Blast furnace, \$1; to dealers, \$1.10; foundries, \$1.25.

New freight rates: From Ovens to Pittsburg, 70c. per ton; to the Mahoning and Shenango Valleys, \$1.35; East St. Louis, \$3.20; to Cleveland, \$2.80; to Chicago, \$2.75.

FREIGHTS.

Vessel rates for ore from Marquette, Mich., to lower lake ports have been reduced to \$1.10.

The latest actual charters to July 5th, per ton of 2240 lbs:

From Philadelphia to:—Alexandria, .85; Annapolis, .65; Bangor, .85@1.05; Bath, Me., 1.00; Beverly, 1.05; Boston, .90; Charlestown, .75; Charleston, .75@.80; Com. Point, Mass., 1.00@1.05; Fall River, .85@.90; Gardner, Me., 1.00; Gloucester, 1.00; Lyon, 1.30; Marblehead, 1.10; Milton, 1.20; New Bedford, .80@.90; Newburyport, 1.15@1.25; Newberne, .80; New Orleans, .25; New York, .90; Norfolk, .65@.70; Portland, .95@1.0; Portsmouth, N. H., 1.05; Providence, .85@.90; Quincy Point, 1.05; Richmond, Va., .75@.85; Saco, Me., 1.20; Salem, Mass., .90; Saugus, 1.15; Savannah, .90@1.00; Washington, .85; Wilmington, N. C., .85.

From New York to:—Bath, Me., 80@.90; Beverly, .90; Boston, .80; Bridgeport, Conn., .55; Cambridge, Mass., .80; Cambridgeport, .80; Chelsea, .80; Com. Pt., Mass., .80; E. Boston, .80; E. Cambridge, .80; E. Greenwich, R. I., .75; Fall River, .75; New Bedford, .80; Newburyport, .95; New Haven, .55; Newport, .75; New London, .70; Norwalk, Conn., .55@.60; Portsmouth N. H., .90; Providence, .75; Salem, .80.

From Baltimore to:—Bangor, Me., 1.10; Bath, 1.10; Boston, 1.10; Bridgeport, Conn., .90; Charleston, .70; Fall River, .90; Galveston, 2.90@3.00; New Bedford, .90; Newburyport, 1.30; New Haven, .90; New London, .90; New York, .85; Portland, 1.05; Portsmouth, N. H., 1.10; Providence, .90; Richmond, Va., .60; Salem, Mass., 1.05; Savannah, .90@1.00; Williamsburg, N. Y., .85@.95.

* And discharging, 3c. per bridge extra. † Alongside. ‡ And towing.

MARKETS.

NEW YORK, Friday Evening, July 6. Prices of Silver per ounce troy.

Table with 8 columns: Date, Sterling exchange, Lond'n Pence, N. Y Cents, July, Sterling exchange, Lond'n Pence, N. Y Cts. Includes rows for June 30, July 2, 3.

Foreign Bank Statements.—The governors of the Bank of England, at their weekly meeting, made no change in its rate for discount, and it remains at 2 1/2 per cent. During the week the bank lost £453,000, and the proportion of its reserve to its liabilities was reduced from 42 2/3 to 43 2/5 per cent, against a reduction from 43 to 38 3/5 per cent in the same week of last year, when its rate for discount was 2 per cent. The weekly statement of the Bank of France shows a loss of 2,700,000 francs gold and a gain of 200,000 francs silver.

Copper.—During the week just passed, the copper market has continued to grow stronger in tone for lake brands, and quotations have again to be raised, more especially as regards deliveries for the later months of the year. The representatives of the syndicate are now openly in the market bidding prices up, but as, in reality, no transactions have taken place, it would seem as if they have now secured the absolute control of almost all the lake companies' production. The closing quotations for lake are: Spot, 16 6/5; July, 16 6/5; August, 16 60; September, 16 50; October, 16 45; November, 16 35; December, 16 30.

Outside brand sales still comparatively neglected and rather slow of sale, and the present quotation for good casting copper is about 15 2/5.

The London market for Chili bars has been very steady throughout the week, with no important fluctuations in quotations, and, according to cable advices, the closing prices to-day are: Spot, £81 2s. 6d., and three months futures £78, being virtually the same as a week ago. It is stated that a meeting of merchants took place in London a few days ago, at which it was proposed to include in Chili bar contracts all kinds of copper if the quality was equal or superior to Chili bars; but for various reasons the proposition was negative. The mere fact, however, that such a step has been contemplated clearly shows that the feeling is pretty general that at the present time the Chili bars quotations do not indicate the real state of the copper market in general.

Boston & Montana Consolidated Copper and Silver Mining Company product of fine copper June, 1888: 1st week, 278,677 pounds; 2d week, 364,540 pounds; 3d week, 435,379 pounds. Total, 1,078,596 pounds.

The exports of copper from New York during the week were as follows:

Table with 3 columns: Destination, Quantity, Value. Includes 'To Liverpool', 'By S. S. City of Chester', 'By S. S. Adriatic', 'By S. S. Italy', 'To Havre', 'By S. S. In Bretagne', 'To Hamburg', 'By S. S. Rugia', 'To Hamburg', 'By S. S. Rugia'.

* Part silver bearing.

Tin.—Since our last report a very strong and decided upward movement has taken place in this mar-

ket. The comparatively low range of prices and the recent heavy deliveries have brought about a considerable reduction in the visible supplies (the decrease during the past two months amounting to a total of about 9000 tons), and the shipments from the East, as we intimated last week, are also expected to be much smaller during the next few months. These influences appear to have had their due weight with speculators and consumers, and since Monday last the market has continued to rise, and after a very fair amount of business the market closes firm at: Spot, 19.25; July, 19.25; August, 19.25; September, 19.40, being a rise of about 2c. since last week. In London the market has also had a very important advance, closing to-day at £88 for spot and £85 15s for three months' futures, against last week's quotations of £76 5s. and £76 15s., respectively.

Lead has also been firmer in tone and a rise in quotations has resulted, but this market does not show very much spirit, as beyond the ordinary current requirements of consumers there is, with the exception of one large and well known operator, nobody apparently disposed to go into the thing at present figures, and as it is quite understood that the Western smelters may at any moment come forward with the supplies, which they have been holding back until prices improved a little, we fail to see much prospect of any further marked improvement in this market for some time to come. Our closing quotations to-day are: Spot, 4.05; July, 4.07½; August, 4.1½.

The London market has also been stronger, and a substantial rise has taken place since last week, when we quoted Spanish £12 2s. 6d., and English £12 7s. 6d. Our cable advices to-day report a firm market at £12 15s. for Spanish, and £13 for English, but this has failed to have much influence on our domestic market.

Messrs. John Wahl & Co., of St. Louis, telegraph to-day as follows: There has been considerable inquiry for both hard and soft lead, in consequence of which sellers have been asking a little more, but only a moderate amount of business has been transacted. Sales will probably amount to 750 tons, at prices ranging from 3.67½@3.85, the latter figure being the value at the close.

Sulphur—No change of interest can be reported in this article, and we give the present quotations as follows: domestic, 4.50 to 4.55; foreign, 5.05 to 5.10.

Antimony is also without any movement, with Cookson's 12½; Hallett's, 9.75 to 10.

The New York Metal Exchange on the 5th inst. obtained a verdict of \$7000 against the New York Elevated Railroad Company for damage to its property in Pearl street.

Chemicals.—There is practically no change in the chemical market since our last report; the sales are small and only to supply current wants. Prices, however, are firmly held at old figures, dealers being enabled to maintain them well owing to light stocks.

Caustic soda ash, 48 per cent, still lacks animation. The spot stock is almost nothing and holders continue to demand 1.30@1.35c. for it in small quantities. Futures are a little more active, though trade is not at all brisk. We continue to quote 1.22@1.25.

Carbonated soda ash, 48 per cent, continues quiet on the spot. The stock being very light dealers demand 1.25@1.30c. in a small way ex store. Futures are a little more animated, and we hear of some sales at 1.22½@1.25, according to quantity, etc. High test is neglected and the quotations are altogether nominal.

Caustic soda, 60 per cent, continues dull and depressed, the demand being very light. The stock on the spot is small, and for goods ex store holders demand 2.40@2.50c. Goods for future delivery are now offering at 2.35, but without attracting the attention of buyers. High test (70@74 per cent) is dull and without change in price, 2.20@2.22½ will buy small lots ex store. These figures would probably be shaded considerably on a large order for future delivery.

English sal soda is duller, but the price is maintained well at former figures. Spot quotations range from 1c. to 1.10 according to quantity and seller, while goods for future delivery are offering at .95@.97½; there is little demand for future delivery.

American sal soda is without change, a fair amount of business being done, and the prices maintained as heretofore.

Bleaching powder continues dull; the price is maintained, however, at 1.90@1.95c. for best Liverpool brands. Newcastle bleach is procurable at 1.80@1.85c. We hear of very little business done in future deliveries, and the quotation for spot goods would probably be shaded considerably for a large order.

The acid market has not materially changed during the past week. Acetic acid is in very slight demand, all sales being of small quantities to supply current wants of consumers. There is no change in the quotations, though they are more or less nominal at 2½@2½c.

Sulphuric acid continues to move fairly and prices are held firmly at 90@95c. per cwt. for large lots, and \$1@1.10 for smaller quantities of 66 degree acid.

Oxalic acid is without change. The market is dull and more or less unsteady. Sales are making in small quantities only for consumers' immediate wants. We note no change in quotations, which remain at 6½c. for large large lots and one half a cent more small quantities. Nitric and muriatic acids continue to move fairly, though the demand is not brisk. We note no change in quotations, which are firmly maintained, as given in our current price list.

The increasing activity noted last week in the fertilizing chemical market continues, and quite a little

business has been done in the way of contracts for goods to be delivered during the fall and winter. Most of the inquiry is in the way of ammoniates and potash salts, blood, tankage and muriate heading the list. We continue our quotations of the principal chemicals and fertilizers as follows: Dried blood (city), low grade, 2.20@2.25 per unit; high grade, 2.35@2.40 per unit; tankage, high grade, \$24@25 per ton; low grade, \$18@21 per ton. We also quote tankage at 2.22½ per unit of ammonia and 18c. per unit of bone phosphate. Fish scrap is scarce, as the supply left over from last year is small, and there have been very few fish so far this season. Holders realize \$24@25 f.o.b. factory. Sulphate of ammonia is \$3.15@3.20 per cwt. Steamed bones, \$20@22 per ton. Dried Charleston rock is \$6 per ton, f.o.b. at mines; undried, \$5 per ton. Refuse bone black is \$17 per ton, guaranteed over 70 per cent. bone phosphate. Dissolved bone black is 90c. per unit for available phosphoric acid and acid phosphate; 75c. per unit for available phosphoric acid.

High grade sulphate of potash is firm at 2.20 on basis of 90 per cent. sulphate of potash.

Double manure salt continues somewhat dull, but the market is firm, and the price is well maintained at 1.05.

Muriate of potash is firm and in good demand. We note no change in quotations since our last writing. Spot lots are held at 1.80@1.85 as to quantity, sail shipment at 1.75, and prompt steamer shipment at 1.77½@1.80.

Kainit is very firm, but the market is rather dull. The price on the spot is high owing to the small quantity at present in store. Holders demand \$10@11 per ton for small parcels. Shipment is offering at \$8.75@9.50, according to quantity, etc.

Nitrate of soda is quiet, and the market is somewhat dull. The very large arrivals of late have depressed the market on futures somewhat, and we hear of little or nothing doing. On the spot goods are procurable at \$2.07½ ex store, and \$2.15 ex vessel. Futures are more or less nominal at \$2.02½.

Brimstone is high on account of the high rates of freight from Sicily. The amount on the spot is very small, and holders demand \$26 per ton in a small way. Future shipments are attracting little attention just at present, and we quote \$19.75@20, according to date of shipment and quantity. We hear of some sales of goods to arrive this month at \$22.50. Thirds are attracting little attention; we quote \$19.25 per ton for future shipment.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, July 6.

The situation is practically unchanged, with no apparent prospect of an early relief from the condition of dullness, approaching stagnation, which has characterized the iron market for several weeks past.

There is, however, a steady but small demand for American pig-irons, but the orders received are almost exclusively of a hand-to-mouth nature, and no disposition has yet been shown on the part of buyers to make contracts for future delivery. As we have frequently pointed out, the pig-iron market is being "drummed" to an unusual extent; even some of the largest and strongest companies are sending out agents to solicit orders. Such anxiety to sell does not tend to make buyers confident that bottom has been reached, although it is pretty evident that very few furnace companies could afford to sell their iron at lower rates than those now prevailing. Standard No. 1 foundry irons still sell at \$18@18.50, and some choice brands are held firmly as high as \$19.50 at tide-water. As a rule stocks in consumers' hands are very low, and a large part of the orders given are for immediate delivery.

Scottish irons remain very quiet, with prices unchanged.

Bessemer pig and spiegel are very dull, with quotations purely nominal in the absence of business.

Steel rails are quoted nominally \$30 at Eastern mills and \$31 at Chicago, a relatively much lower price. There is very little new demand from strong purchasers. The new sales have been very light. The total amount of orders booked for 1888 delivery will aggregate about 900,000 tons. Several mills are closed and likely to remain idle a month or two.

Structural iron, bar and plate iron are all in a very weak and unsatisfactory condition. The Pittsburg labor troubles have not caused any apparent quickening demand on the Eastern mills; on the contrary, they have contributed to the general depression. Prices are nominally unchanged, but are weak all around.

The latest news from Pittsburg indicates that those mills with work ahead will agree to the terms of the Amalgamated Association. Thirteen companies are reported to have signed the seal, including Carnegie Brothers & Co. Singer, Nimick & Co.'s mill has started with non-union men. On the other hand, many concerns will doubtless be glad to avail themselves of the opportunity of lying idle until there shall be a better demand for their products.

Old rails and scrap iron are almost lifeless.

Nails are very quiet, and several mills are closed.

The Bethlehem Iron Co. report that their new works for making heavy steel forgings, under the government contracts for ordnance, will be ready to put into operation within six weeks from the present time.

Louisville.

July 3.

[Reported by HALL BROTHERS & CO.]

The week has been active in negotiations, and some large sales have been made. The same difference exists between the views of the different furnacemen. A prominent Tennessee furnace will probably blow out in a few days for repairs, which will take a large

supply from the market. There is as yet no visible effect from the shut-down of all the mills by reason of the disagreement between the iron workers and the association. The principal buying of the week under review has been by some car works, who had orders ahead, and some of the other classes of consumers have also been buying in a moderate way. Quotations for cash, f.o.b. cars Louisville, will be found in our weekly register of prices.

Pittsburg.

July 4.

[From our Special Correspondent.]

The situation remains about the same as last week, no change for the better being expected until capital and labor shake hands and compromise the pending difficulties. The strike that we feared at the date of last letter has taken place. Thousands of workmen have quit work for the present. Some of the mills have signed the Amalgamated scale, but not before a number of reductions were made at the suggestion of the mill owners, thus giving employment to a large number of men. Both sides express confidence in the result of their side being successful in the end. Of course, there will eventually be a settlement, but when taking these matters into consideration it has to be expected the demand for iron would fall off. The only wonder is that under existing circumstances the demand has been well maintained for so long a period. As usual, opinions of interested parties show a wide difference, each side being able to satisfy themselves that its opinion is the correct one.

Dullness and inactivity prevail in all departments of trade. The stock of iron on hand is not large. There is, however, no scarcity, provided the price is satisfactory to both parties. A number of furnaces are still out of blast and will remain so until the labor question is made satisfactory. The price of coke is not in the way, in fact, it is being disposed of below first cost. There is little probability of any change for the present, the supply being largely in excess of the demand. We hear of coke-works being shut down at various points, leaving a large number of men to seek employment elsewhere; the last one reported being that of the Stewart Iron Company, at Uniontown. The outlook all round is not a healthy one by any means. An improvement is certainly very desirable.

Iron Ore.—We can report the following sales of Bessemer Lake Superior ore:

40,000 Tons Bessemer Ore on Lake Docks	4.50 cash
20,000 Tons Bessemer Ore on Lake Docks	4.50 cash
25,000 Tons Bessemer Ore on Lake Docks	4.50 cash

Coal and Coke Smelted Lake Ore

1000 Tons Bessemer	17.54 mo.
700 Tons Gray Forge	14.25 cash
500 Tons Bessemer	17.75 c. sh.
600 Tons No. 1 Mill	14.25 cash
500 Tons No. 2 Foundry	15.75 cash
100 Tons No. 1 Foundry	16.75 cash
150 Tons Gray Forge	14.06 cash
500 Tons of Bessemer	16.00 cash

Coke, Native Ore.

100 Tons Gray Forge	14.50 4 mo.
25 Tons No. 1 Foundry	16.50 cash

Steel Billets.

3000 Tons Billets, delivered	28.25 cash.
2000 Tons Billets, delivered	28.25 cash.
2000 Tons Billets, delivered	28.25 cash.
500 Tons Billets, delivered	28.25 cash.

Muck Bar.

500 Tons Good Neutral July	26.50 cash.
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Steel Wire Rods.

200 Tons American lines	42.50 cash
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Steel Bloom Ends.

300 Tons Bloom Ends	17.25 cash.
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Philadelphia.

July 6.

[From our special Correspondent.]

Opinion in the Eastern iron trade inclines to the conclusion that there will be a gradual resumption in the Western iron mills towards the close of the month and that there will be no perceptible benefit on prices from the temporary suspension, owing to the sufficiency of stocks in hand in Eastern and Western markets. Nor do Eastern manufacturers believe there would be any permanent benefit from the reduction in wages, as competition would crowd prices farther down and make it even more difficult than it is for Eastern mill owners to hold their own. Buyers so far have not been troubled in the least over the possibility of a prolonged struggle or over resulting scarcity. They have done nothing more as yet than to cover wants from two to three weeks ahead at bottom prices. Mill owners have made no effort to make business, and see no relief in the near future from the pressure within and without. Prices are unchanged. Repairing is going on in nearly all the mills in the eastern and middle districts. A few mills on plate iron will start up on the 16th inst., as there are orders and inquiries for a great deal of ship and boat material. There is more confidence in busier times this fall, owing to the inquiries that have been made within six days, but plain bars will not profit as much by it as other kinds of iron. The materials most wanted are structural shapes, plates, sheets and tubes, as well as certain grades of merchant steel, but even for these manufacturers are not fully assured at this writing that the activity promised will come. There will be very little done until after the trade can discount Western strike probabilities. In pig-iron there is scarcely anything doing in Northern or Southern irons. Under other circumstances the present oversold condition of Southern furnaces making iron that would readily sell here would help to harden prices, but as it is, crude iron keeps low and draggy for all but a few brands which are always in demand. Eastern forge iron buyers will do nothing until they can see their way clearer than they do now. Some people are inclined to predict an improving tendency, but the reasons are not distinct. Quotations show

no change at all. So far as the rest of the trade goes there is no news. Steel rails are depressed, and Western mills are doing nearly all the business.

FINANCIAL.

NEW YORK, Friday Evening, July 6. It would be pleasant and refreshing in this warm weather to be able to report a better market for mining stocks, but we cannot do so much as we desire it.

Security has entirely disappeared from the list; no dealings were reported this week.

Lacrosse shows a few sales at 9@10c; Cashier at 8@9c.; Little Chief, one at 24c.

Amador, Middle Bar, Astoria and Hollywood were about the only active stocks on the list.

Quicksilver Preferred was not dealt in until yesterday, when some 300 shares changed hands at from \$36@37.

The business in Brunswick amounted to 2300 shares, and the price declined from 16 to 14c.

Standard was neglected and was only dealt in at the beginning of the week, at from \$1.35 to \$1.20.

The Silver King Mining Company has levied its first assessment, amounting to 50c. per share, and to this is due the recent decline in the price of the stock.

It is stated that the ore in this mine has, within the last year, deteriorated greatly, and the heavy discount on silver has made it impossible to reduce it except at a loss.

A downward tendency marked the price of Shoshone, which went from 17@13c. Holyoke shows a small business at 5c., and Proustite at from 95@11.10.

San Sebastian came out only on Saturday, when it sold at from 72 to 74c.

The Tuscarora stocks are neglected. North Belle Isle is quoted at \$3.90, Belle Isle at 60c., and Tornado at from 40c. to 50c.

Consolidated California and Virginia has just declared a dividend of 50 cents per share. The stock was neglected, selling at from \$10.50 to \$10.75.

Sutro Tunnel went from 13 to 8c. Union Consolidated was firm at \$3.70 to \$3.90. Mexican advanced from \$3.85 to \$4.10 and later declined again to \$3.75.

Julia was steady at 50c. Bullion at from \$1.50 to \$1.60. Sierra Nevada at from \$3.75 to \$4. Ophir at \$7.38.

Pipe Line Certificates.

Messrs. Watson & Gibson, brokers, 49 Broadway, report as follows for the week:

The petroleum market has shown very little animation for the greater part of the past week, and the trading in crude certificates has been very limited.

Table with columns: Opening, Highest, Lowest, Closing, Sales. Rows include Consolidated Stock and Petroleum Exchange, and New York Stock Exchange.

Meetings. Buffalo Consolidated Gold Mining Company, Sierra City, Cal., August 4th. Dividends. Bridgewater Gas Co., of Pennsylvania, has declared a dividend.

IMPORTATIONS AT NEW YORK FROM JUNE 27 TO JULY 2, AND FROM JAN. 1 TO SAME DATE.

Large table with multiple columns: Spelter, Steel Sheets, Billets, Forgings, etc., Tons, Week, Year, Corres. date 1887, etc. Lists various import categories and their quantities.

EXPORTS.

Table with columns: Copper, Copper Matte, Tons, Pounds, Week, Year, Corres. date 1887. Lists export categories and their values.

CURRENT QUOTATIONS.

Table of current quotations for various commodities including chemicals, building materials, and metals. Items listed include Sulphur, Flour, Crude Brimstone, Tannin, Vermillion, Vitriol, Zinc Oxide, Bricks, Haverstraw, Building Stone, Granite, Slate, and various metals like Aluminum, Bismuth, Cadmium, etc.

Table of current quotations for building materials and metals. Items include Bricks, Haverstraw, Building Stone, Granite, Slate, and various metals like Aluminum, Bismuth, Cadmium, etc.

Table of current quotations for steel and iron products. Items include Steel Blooms, Steel Billets, Steel Nail Slabs, Steel Wire Rods, Structural Iron and Steel, and various iron pipes and fittings.

Table of stock market quotations for various companies and locations including Baltimore, Md., Birmingham, Ala., and Pittsburg, Pa. Lists companies like Atlantic Coal, Balt. & N. C., and Allegheny Gas.

Table of current quotations for lime and other building materials. Items include Lime, Portland Cement, and various types of bricks.

Table of current quotations for various types of metal. Items include Iron, Steel, and various alloys.

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DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

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

G. Gold. S. Silver. L. Lead. C. Copper. * Non-assessable. † This company, as the Western, up to Dec. 10th, 1881, paid \$140,000. ‡ N. N. assessable for three years. § The Deadwood previously paid \$275,000 in eleven dividends, and the Terra \$75,000. ¶ Previous to the consolidation in Aug. 1884, the California had paid \$31,320,000 in dividends, and the Con. Virginia, \$42,350,000. ** Previous to the consolidation of the Copper Queen with the Atlanta, Aug. 1885, the Copper Queen had paid \$1,350,000 in dividends.

NEW YORK MINING STOCKS QUOTATIONS.

DIVIDEND-PAYING MINES.

NON-DIVIDEND-PAYING MINES.

Table with columns: NAME AND LOCATION OF COMPANY, June 30, July 2, July 3, July 4, July 5, July 6, SALES. Lists various mining companies like Adams, Alice, Argenita, etc.

Table with columns: NAME AND LOCATION OF COMPANY, June 30, July 2, July 3, July 4, July 5, July 6, SALES. Lists various mining companies like Alta, Amador, American Flag, etc.

*Independence Day †Assessment unpaid. ‡Dealt in at the New York Stock Ex. Unlisted Securities Dividend shares sold, 7,275. Non-dividend shares sold, 79,930. Total New York, 87,205

BOSTON MINING STOCK QUOTATIONS.

Table with columns: NAME OF COMPANY, June 29, June 30, July 2, July 3, July 4, July 5, SALES. Lists companies like Atlantic, Bodie, Bonanza Developm't, etc.

Table with columns: NAME OF COMPANY, June 29, June 30, July 2, July 3, July 4, July 5, SALES. Lists companies like Allouez, Arnold, Aztec, etc.

*Ex-dividend. †Independence Day. Boston: Dividend shares sold, 4,330. Non-dividend shares sold, 16,199. Total Boston, 20,529.

COAL STOCKS.

Table with columns: NAME OF COMPANY, Par val. of sh'rs., June 30, July 2, July 3, July 4, July 5, July 6, Sales. Lists companies like Barclay Coal, Buck Mt. Coal, Ches. & O. R.R., etc.

San Francisco Mining Stock Quotations.

Table with columns: COMPANY, June 29, June 30, July 2, July 3, July 4, July 5. Lists companies like Alpha, Alta, Belcher, etc.

*bid †asked. ‡Independence Day. Of the sales of this stock, 12,156 were in Philadelphia, and 44,270 in New York. Total sales, 113,343.

*No sessions of the San Francisco Stock Exchange.

