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Medical Department of the Colorado F. & I. Co.

Employees Contribute \$1 Per Month Each and Receive Medical Attendance and Care in Hospital in Case of Injury or Illness

BY LAWRENCE LEWIS*

Since 1881 the Colorado Fuel and Iron Company and its predecessors have maintained through the coöperation of their employees a highly successful medical department. Not counting several years of unorganized effort, it has also carried on since 1901, through its sociological department, welfare work unequaled by any other corporation in America and exceeded in the whole world, perhaps, only by that of the Krupps at Essen, Prussia. This Colorado corporation, which also carries on operations in Wyoming, New Mexico and Utah, besides following some well-worn paths, improved methods of housing employees for example, has also been the pioneer for industrial betterment in a

which have direct effect upon sanitary and social conditions. Some, at an altitude of four or five thousand feet, amid the sage brush, cactus and yucca of the plains and scrubby piñon of the foothills, are parched by hot winds and chafed by sand storms. Others, clinging to mountain sides, eight to ten thousand feet above the sea, or sunk deep in lonely valleys and cañons, amid the columbines, silver-tipped firs and stately pines, are drenched with torrential rains and chilled by 20-ft. snows. Some camps are completely isolated; others are near towns like Walsenburg, Trinidad, Cañon City, Florence and Pueblo, with their temptations to dissipation and vice.

department. A company house, near the small iron furnaces then under construction by the Colorado Coal and Iron Company south of what was then the frontier village of Pueblo, was converted into a hospital in which were accommodations for 15 patients. During the 26 years since then this medical department, under Dr. Corwin's guidance, has kept pace with the growth of the iron and fuel industry in the far West and has survived two complete changes in ownership and management.

Starting with two physicians who had charge of the health of a couple of hundred men engaged in construction work at Pueblo, the medical department has been increased in size and efficiency un-



MAIN BUILDING, MINNEQUA HOSPITAL, PUEBLO, COLORADO

number of other directions, having, for instance, established and fostered the only system of free kindergartens in coal-mining camps in the world.

POLYGLOT COMMUNITIES

On the company's payrolls are representatives of 32 nationalities, including Americans, Italians, Austrians—a term which as used in Colorado is roughly synonymous with "Huns" as used in Pennsylvania and includes all Slavs of Central Europe, but especially those of Austria-Hungary—Mexicans, Irishmen, Englishmen, negroes, Japanese, Welshmen, Scotchmen, Germans, Swedes, Poles, Greeks, Frenchmen, Swiss, Belgians, Finns, Hollanders, Russians, Rumanians, Montenegrans, Norwegians, Indians, Spaniards, Danes and a few other nationalities.

The various communities scattered over a region larger than Germany differ radically in topography and climate, both of

The variety of local conditions, the wide separation of the various camps and plants, the magnitude of the field, the diversity of nationality and language among employees, with the accompanying suspicion and hostility, combine to make the task of medical and welfare work exceedingly difficult.

Dr. Richard Warren Corwin, of Pueblo, Colorado, is both chief surgeon of the medical department and superintendent of the sociological department. His principal assistants in these departments are respectively Dr. W. T. H. Baker, assistant chief surgeon and superintendent of the Minnequa hospital; Dr. C. V. Marmaduke, superintendent of the steel-works dispensary; and Dr. Walter Morrill, assistant superintendent of the sociological department and formerly of the South End settlement in Boston.

EVOLUTION OF THE MEDICAL DEPARTMENT

In April, 1881, Dr. Corwin, with one assistant surgeon, organized the medical

til at present it employs 42 resident camp surgeons, hospital surgeons, specialists and consultants besides a full corps of trained nurses, attendants and specially trained laborers—a total of 112 persons regularly employed—who safeguard the health and attend to the injuries and illnesses of 17,000 employees and their families, an aggregate of about 70,000 people in 38 camps and plants in four commonwealths. Having outgrown successively two central hospitals, the department now maintains, besides the magnificent Minnequa hospital at Pueblo, with accommodations for 210 patients, a dispensary at the Minnequa steel plant, two emergency hospitals in remote camps and dispensaries and resident surgeons at all its properties. During the year ended June 30, 1905, there were treated by this department, 73,224 separate cases which ranged in importance from slightly bruised fingers and colds to abdominal operations and pneumonia.

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SUPPORTED BY EMPLOYEES

The medical department is supported by the employees. One dollar is deducted from the monthly pay of each person on the rolls, from the heads of departments to the humblest laborer. However, if a man works for less than three days he makes no contribution; if he works for more than three days and less than seven he contributes only 50c. Nevertheless, if an employee is hurt after working for but 10 minutes, as has sometimes happened, or if he falls sick after only a day's labor, he is entitled to and receives the best of experienced surgical and medical treatment, nursing and board at the hospital until he completely recovers. An Italian has been in the hospital and about the grounds in a wheeled chair for 13 years. He had worked only 14 days in one of the mines when he sustained an incurable injury of the spine. He will be cared for at the hospital for the remainder of his life. Another Italian with a similar injury, who



RICHARD WARREN CORWIN, M. D.

had worked for only a few months, was cared for during five years until his death.

In a large number of cases persons afflicted with incurable diseases have applied to the company for work, evidently with the intention of insuring their care after they should become helpless. In all such cases when they had actually been employed before final incapacity, they have been cared for. In order to obviate this as far as possible, however, and to reduce the danger of infection of their co-workers, a system of physical examination of all persons applying for clerical positions in the general offices and about the mines has been put in effect. In hiring miners and common laborers, also, superintendents and foremen have been cautioned to employ only those who seem to be in good health, although it has not been found practicable to have all these given a rigid physical examination.

In the camps where no other doctors are available, but not at the steel works,

the dollar a month contributed to the hospital fund by employees covers medical and surgical attention for their families also, except in cases of diseases which are the results of dissipation. Under the rules employees are not entitled to receive funeral benefits; but in many cases a certain amount is often contributed by the company when an employee dies. Absolutely every cent of the hospital fees is expended by the company for the purposes of the medical department; and any deficits, such as rarely occur, are made up from other funds. The money for the construction and equipment of the Minnequa hospital, more than \$300,000, and that for the new steel-works dispensary was thus advanced.

ORGANIZATION OF THE DEPARTMENT

The work of the department may be classed under four heads: (a) general practice at the mines; (b) first aid to the injured and preventive work at the steel-works dispensary; (c) effecting cures at the hospital; and (d) general sanitary betterment and education of the men and their families in the elements of hygiene.

Each of the coal- and iron-mining and coking camps has a company surgeon who is either resident in the camp or makes daily visits thereto. In consideration of a fixed salary paid by the department, he treats all classes of cases except diseases due to dissipation and injuries from violations of laws or ordinances. Sometimes these company doctors have two, in a few cases three, adjoining camps to look after. Besides their regular daily visits they make emergency calls at all hours of the day and night in heavy rains and through snows such as only those who have seen a winter in the hills can appreciate.

THE STEEL-WORKS DISPENSARY

At the steel works dispensary, situated about 100 ft. from the main entrance to the Minnequa works, where nearly 5,000 men are employed, 26,043 cases were treated during the year ended June 30, 1905. Less than half of these were injuries; most of the cases were of minor affections. As the function of the hospital proper is the care of serious cases of disease and injury, so the function of the dispensaries is the prevention of sickness and the prompt treatment of minor injuries which, if neglected, might prove serious. Accordingly the men are encouraged to consult the physicians in charge about even trifling aches and pains. Indeed one of the great advantages of the medical department, as conducted by Dr. Corwin, is that each employee makes a fixed monthly contribution which covers all attention. Consequently the employee does not hesitate, on account of expense, to consult a physician in the early stages of an ailment, when it can best be combatted.

By night as well as by day a physician is constantly in attendance at the steel-works dispensary, between which and all parts of the plant there is telephone communication. Stretchers are in accessible and well known places in all parts of the works so that an injured man can be carried at once by his comrades to the dispensary where emergency treatment can be given and where in cases of extreme necessity even amputations can be made. The ambulance can be summoned from the hospital so as to reach the dispensary in ten minutes after an accident to an employee.

THE CENTRAL HOSPITAL

The Minnequa hospital at Pueblo, the headquarters of the department, is situated about three-quarters of a mile from the steel works in the midst of an elevated tract of 20 acres adjacent to Lake Minnequa. It was occupied in August, 1902, but in the summer of 1906 consid-



JULIAN ABBOT KEBLER

erable enlargements and improvements were made. This hospital embodies the results of 20 years' experience in this field and of a careful personal inspection by the chief surgeon of all the leading hospitals in America and Europe. No expense was spared in providing all the latest improvements and inventions and every facility for the treatment of employees. Dr. Adolf Lorenz, the celebrated orthopedic surgeon of Vienna, after a careful examination, declared this hospital was equal in equipment and management to any in Europe or to those in America he had visited and, for its purpose, was the finest he had ever seen. During the year ended June 30, 1905, 1,160 patients were treated in the Minnequa hospital proper. This does not include the 805 cases treated at the hospital dispensary nor the 26,043 at the steel-works dispensary. Emergency hospitals are also maintained at Fierro, New Mexico, and Sunrise, Wyoming, respectively the extreme southern and northern camps.

SANITARY WORK AND EDUCATION IN HYGIENE

Extensive sanitary betterments at the various camps and plants as well as education of the people in matters of hygiene are accomplished by the medical in cooperation with the sociological department. Many unsanitary outbuildings have been removed and others destroyed; cess-pools are cleaned and filled; dwellings in some of the company's camps are screened to exclude disease-disseminating insects; wells and cisterns are frequently cleaned and inspected; dumping of filth and refuse into streams is prevented and the water supply improved and protected from contamination; garbage and litter are collected regularly, from receptacles conveniently located about the camps, and burned; and the camps are regularly policed.

By means of placards posted conspicuously and printed in English, German, Spanish and Italian; and by monthly lectures by the company doctors often illustrated by stereopticon views, the two departments impress upon employees the necessity of keeping their bodies, dwellings, food and clothing clean and call attention to the causes of disease and how they can be avoided. One surgeon recently reported: "Persistent instruction regarding the benefits derived from boiling drinking water has had its effect. A few years ago people did not appear to understand what was meant and were indifferent when they were asked to sterilize water; now when we are called to visit a case, whether in an American or foreign family, an apology is rendered and excuses made for the oversight or neglect of giving, to sick or well, water that has not been properly purified."

In connection with the sociological department, sanitary regulations have been put in effect in many camp barber shops which have also in many cases been induced to put in baths for the workmen. At Redstone a wash and changing house has been erected near the coke-ovens by the company. It contains a shower bath and two closets besides 24 white enameled cast-iron wash basins supplied with both hot and cold water. The cement floor is so laid that it can be flushed daily. Expanded metal lockers are arranged all around the room. Similar places have been installed by the company in other camps, notably at the iron mines at Sunrise, Wyoming, where the changing house and baths were installed under the personal direction of the manager of iron mines, J. D. Gilchrist.

ATTITUDE OF THE WORKMEN

Labor agitators not connected with the company have on various occasions loudly denounced the alleged injustice of the arrangement by which the men, who support the department by their monthly contributions, have no voice as to how

the money shall be spent; nor any representation, even in an advisory capacity, in the management; and are not informed, even by means of printed financial statements, as to how, in detail, the funds are expended. But the efficiency of the department and the benefits derived from it are generally recognized by the employees themselves.

As far as I have been able to ascertain by talking with the men, most employees realize that the department affords a cheap although a compulsory form of insurance. For a premium of \$12 a year the workman, and in the camps, his wife and children also, has the benefit of medical attention and, in case of sickness or injury, is cared for until complete recovery. Moreover, like the Chinese, he pays his doctor only so long as he is well and able to work—for the contribution of hospital fees stops during his incapacity. I have heard from the employees themselves no serious complaints, but much enthusiastic praise.

Analyses of Pig Lead

The following analyses were made recently by the Technical Analysis Department of Osaka, Japan. The table is almost self-explanatory. It is only necessary

| | 1. | 2. | 3. | 4. | 5. | 6. |
|-----------------|-----------|-----------|-----------|-------------------|-----------|-----------|
| | SELBY. | TRAIL. | SMELTER. | ENGLISH CHEMICAL. | B.H.P. | ENTHOVEN. |
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Lead..... | 99.9579 | 99.9890 | 99.9762 | 99.9693 | 99.9853 | 99.9851 |
| Insolubles..... | 0.0040 | trace | trace | trace | trace | trace |
| Bismuth..... | 0.0300 | none | 0.0046 | trace | none | 0.0048 |
| Cadmium..... | trace | none | 0.0002 | 0.0007 | trace | trace |
| Nickel..... | 0.0001 | trace | trace | 0.0003 | none | trace |
| Cobalt..... | none | none | trace | trace | trace | trace |
| Silver..... | 0.0010 | 0.0025 | trace | 0.0020 | 0.0009 | 0.0015 |
| Manganese..... | 0.0008 | none | 0.0003 | none | none | none |
| Copper..... | none | 0.0003 | none | 0.0097 | none | none |
| Antimony..... | none | none | 0.0137 | 0.0149 | 0.0108 | 0.0160 |
| Tin..... | 0.0004 | 0.0007 | none | none | 0.0004 | none |
| Arsenic..... | 0.0024 | 0.0020 | 0.0090 | 0.0002 | none | none |
| Zinc..... | 0.0003 | 0.0002 | trace | trace | 0.0001 | trace |
| Iron..... | 0.0027 | 0.0053 | 0.0039 | 0.0029 | 0.0025 | 0.0026 |

to remark that the Selby lead is a well-known American brand, produced at San Francisco, Cal. The identity of analyses Nos. 3 and 4 is not stated. Analysis headed B. H. P. is of Australian lead, made by the Broken Hill Proprietary Company. The lead entitled "Trail" is made by the electrolytic process by the Consolidated Mining and Smelting Company of Canada. This is the only electrolytic lead among the analyses. It is to be remarked that this is the highest grade of lead among the lot, being not only highest in lead, but also free from bismuth. Analyses Nos. 3 and 6 are of English brands.

At the Gundling mine, opened in the sheet ground, at Joplin, Mo., it has been found that a 12-ft. hole can be drilled with a cross-bit (star bit) in the same time as a 10-ft. hole with a chisel bit. With two machine-drills, 150 tons of ore are broken down per day.

Tin Mining in the Malay States

Consul-General D. F. Wilber, of Singapore, furnishes the following review of the tin-mining industry from a local newspaper: The gradual introduction in the Malay peninsula of modern machinery and systematic mining methods, such as hydraulic work, dredging, and so on, will soon pretty solidly supplement the ordinary open workings of the Chinese mining towkay. We have by no means exhausted the tin-mining capabilities of the peninsula, even if the rate of Chinese alluvial mining is slackening. And even outside the Federated Malay States in the Siamese provinces on both sides of the peninsula there are good prospects of a largely increased activity in tin production.

Copper in the French Congo

D. Levat, the well known French engineer, last year investigated the copper resources in the Kouilou-Niari basin, French Congo. Among his conclusions are the following: None of the known deposits can be immediately mined; none of them reveals an extraordinary wealth. Prospecting is in its infancy. Results hitherto obtained are not calculated to produce a fever, considering estimates of expenses

for railways; nor are they discouraging, considering that only a small portion of the copper basin has been explored, and attention only directed to mines already worked by the natives. All these ores, except some exceptionally rich ones which can bear cost of carriage, must be treated on the spot, and consequently involve construction of a railway to import coal and coke. Motive power can easily be obtained by electric transport from the waterfalls which abound.

Consul-General Robert J. Wynne, of London, reports that the prohibition against carrying petroleum through the Suez canal, which has been in existence for many years, has been removed. What this concession means to the users of this commodity, says the London *Telegraph*, will appear when it is stated that no less than 250,000 tons of petroleum are brought in bulk yearly to Europe from Borneo and Sumatra.

Practice at the Osceola Mill, Lake Superior

The Nordberg Steeple-compound Stamp and Improved Methods of Handling Pulp Have Reduced Costs to 16 Cents Per Ton

B Y L E E F R A S E R *

The minimum stamping expense for a ton of rock attained by any practice in the Lake Superior copper district of Michigan is 16.4c., the record for the year 1906 at the mills of the Osceola Consolidated Copper Company. In 1850 and until about 1880 all work was done by gravity stamps at a cost of from \$1.50 to \$2 per ton, but with the introduction of the Ball steam stamp, about 1881 or 1882, the cost was materially decreased, until it had been lowered to 37c. per ton by the Atlantic company. The stamping expense at present varies anywhere from 17c. to 30 or 35c. per ton.

The three most important alterations and improvements upon the old practice

the low-pressure cylinder is superimposed upon the high-pressure cylinder. Live steam is admitted to both ports of the high-pressure cylinder. The exhaust steam is piped to a nearby reheater where its temperature is increased by about 12 deg. F. It then enters the low-pressure cylinder where the steam acts only on the down stroke of the piston, a constant vacuum being maintained upon the lower side of the head.

The introduction of crushing rolls with a 16-in. face and 36 in. in diameter permitted the use of a screen with $\frac{5}{8}$ -in. round holes in the mortar box of the stamp. Formerly the holes in the screen were $\frac{3}{8}$ and $\frac{3}{16}$ in., requiring finer work

is distributed to the concentrating apparatus, while about 200 tons of oversize is returned to the crushing rolls.

The product from the rolls first passes through a double trommel, the first screen having $\frac{3}{8}$ -in. round holes, with diameters 28 and 40½ in., while the inclosing screen has $\frac{3}{16}$ -in. round holes and diameters of 38 and 50½ in. The trommels are 60 in. long.

THE JIGS

The roll discharge is fed directly to the inner screen; the oversize, 70 tons, is fed to one double 2x3-ft. jig, from which there is a sieve discharge removing 19 per cent. of the value. The hutch



THE OSCEOLA MILL

made at the Osceola Consolidated Copper Company's mills are: the compounding of the steam stamps; the introduction of crushing rolls, and in the use of a new classifier or distributor. Besides these, a number of changes of less importance have been made.

CRUSHING

The steeple-compound stamp, 15½x32x24 in., designed by the Nordberg Manufacturing Company, is capable of crushing from 750 to 800 tons of rock per day, an increase over the crushing efficiency of the single stamps of from 200 to 250 tons per day. Steeple-compound stamps have been introduced only within the last two years. In the construction of the heads

on the part of the stamp head and decreasing its capacity.

The copper rock is dumped from 40-ton cars into mill bins of 450 tons capacity from which it is fed directly to the stamp. The stamp is fitted with a hydraulic discharge for the removal of lump copper; about 7 per cent. of the total value of the mill product is removed in this way. Everything else passes through the $\frac{5}{8}$ screen into two launders provided with two hydraulic discharges removing 14 per cent. of the value. Only coarse copper is extracted, No. 1 size being the minimum. Each launder from the stamp runs to a conical trommel with $\frac{3}{16}$ -in. round holes, 60 in. long, with the small diameter and large diameter 28 and 40½ in. respectively. Of the under size 550 tons goes to the classifiers from which it

product, which is inconsiderable, goes to the finishing jigs, while the tailings go by way of the elevator back to the crushing rolls. The undersize from the $\frac{3}{8}$ -in. screen goes to the outer $\frac{3}{16}$ -in. screen, from which 200 tons undersize goes to the classifiers and jigs, the oversize being sent back to the rolls.

The overflow from the distributing boxes runs into settling tanks, while the overflow from the tanks is sent by pump to the slime tanks and the settlings are fed back to the jigs.

No tail jigs are provided in this concentration, as is done in the Tamarack mills where a similar system is used, and although no appreciable loss is now sustained by sending the tailings from the head jigs directly to the dump, in case of accident to the jig the screen might be

*Webster street, Saginaw, Mich.

come overloaded with copper, with consequent loss. The case of the Tamarack is somewhat different, for the conglomerate rock makes finer slimes than the amygdaloid, making it necessary to use increased precaution. Of the total value, 5 per cent. is removed in skimmings, size Nos. 1 to 4, while the hutch goes to two head and tail finishing jigs, where 8 per cent. of the value is removed. The hutch from the head is size No. 3, while that from the tail jig is No. 4. The tails go to the dump.

FINISHING

The overflow from the separating or classifying boxes for the roughing jigs,

Any overflow from the tank for the Wilfley concentrating table returns to the slime tanks, while 20 tons is fed by spigots to the table. A recovery of 5 per cent. of the value in No. 4 copper is made by the Wilfley, while the tailings are returned to the slime tanks. The heads from the Wilfley are rejigged.

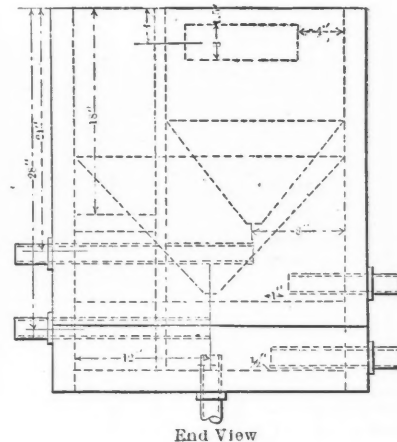
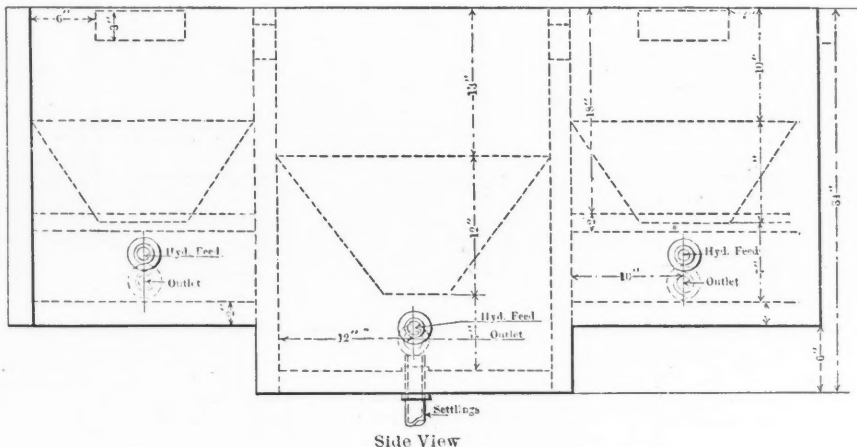
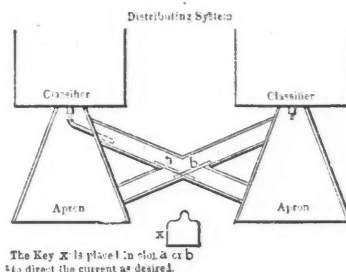
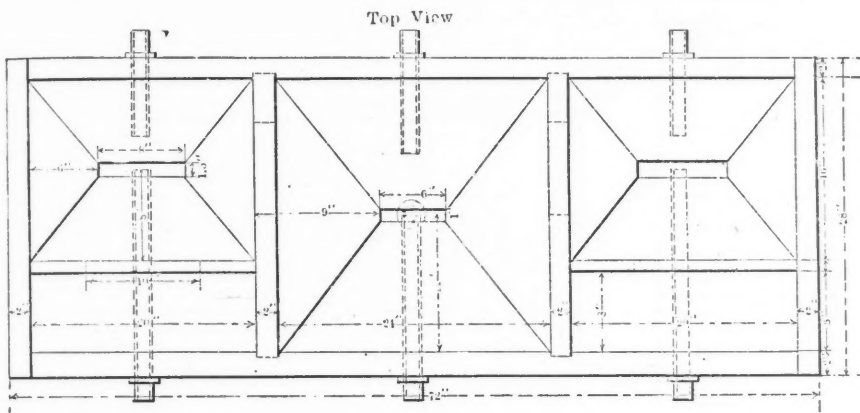
Of the material 440 tons is fed through spigots to eleven 2x3-ft. head jigs from which 7 per cent. of the value is removed by skimming. The tails go to the same number of 2x3-ft. jigs, while the hutch work from both jigs is conducted to the finishing jigs.

Before entering the finishing jigs the hutch product, 22 tons, passes into four

watering boxes and is treated in the same way as hutch from the head jigs with the exception that no hydraulic discharges are used, these being efficient only in the extraction of heavy copper. The product from the tail-jigs finishings is of fine size, No. 3 and No. 4.

IMPROVEMENTS IN DISTRIBUTION

In the method of distributing the discharge to the jigs radical changes have been made. In the old-style separator the flow entered one end, going directly to the settling tanks and slime tables from the other. It was fed by spigots to the four jigs, but the copper recovery from the first was much greater than



CLASSIFIERS AND DISTRIBUTING DEVICE

amounting to 112 tons, is conducted through wooden launders to two slime tanks. Should at any time the amount of overflow become excessive and too great for handling by the usual facilities, an overflow to four unwatering boxes is provided. The slimes are fed by spigots to six Evans round tables, 17 ft. in diameter in decks of two each, while the overflow of 20 tons goes to the dump. The headings from the round tables are pumped to a settling tank, later to be treated on a Wilfley, while 120 tons of tailings passes through settling runs to the dump.

unwatering boxes. The overflow is carried down to the four next boxes while the remainder is fed to four hydraulic discharges by which 18 per cent. of the total value is removed. The flow then passes to the jigs, which give a hutch product containing 8 per cent. of the total value, with No. 2 copper the minimum size. The tailings then pass similarly to two more sets of unwatering boxes and settling boxes and jigs, after which they are conducted through settling runs to the dump.

From the tail jigs 395 tons goes to the dump, while 20 tons of hutch goes to un-

watering boxes. It was necessary to skim the first jig once per hour, while the second and third jigs were skimmed once in five hours and the fourth jig once every two or three weeks. There was danger that at any time one of the spigots would be clogged up, thus sending some of the copper to the slime tables, where it could not be regained, for the water will wash off all heavy particles into the tail launder.

In the construction of the present distributors shown in the accompanying illustration, the problem of an even distribution and an elimination of the princi-

pal chances of loss through obstruction to the spigots has been solved. The discharge from the trommels flows directly into the unwatering boxes, the heavy stuff settling to the bottom immediately and passing out to the jigs, while the fine stuff goes with the overflow to the settling box which is placed between the unwatering boxes to take the overflow from each. The overflow from the settling box goes to the slime tanks, but the heavier particles sink to the bottom and pass through a spigot to the jigs.

Before the settlings can pass through the spigot, however, they undergo hydraulic classification. A jet of water is admitted through a pipe, with its outlet under the slot in the bottom of the box. All settlings must pass through this narrow slot before going to the jigs and must be of sufficient weight to drop

is done every hour or two this means a constant changing of the valves and the amount of flow. The regulations must in every case be precise, and if not right will permit the loss of copper. It is essential to have the adjustment of the valves constant to obtain the best results.

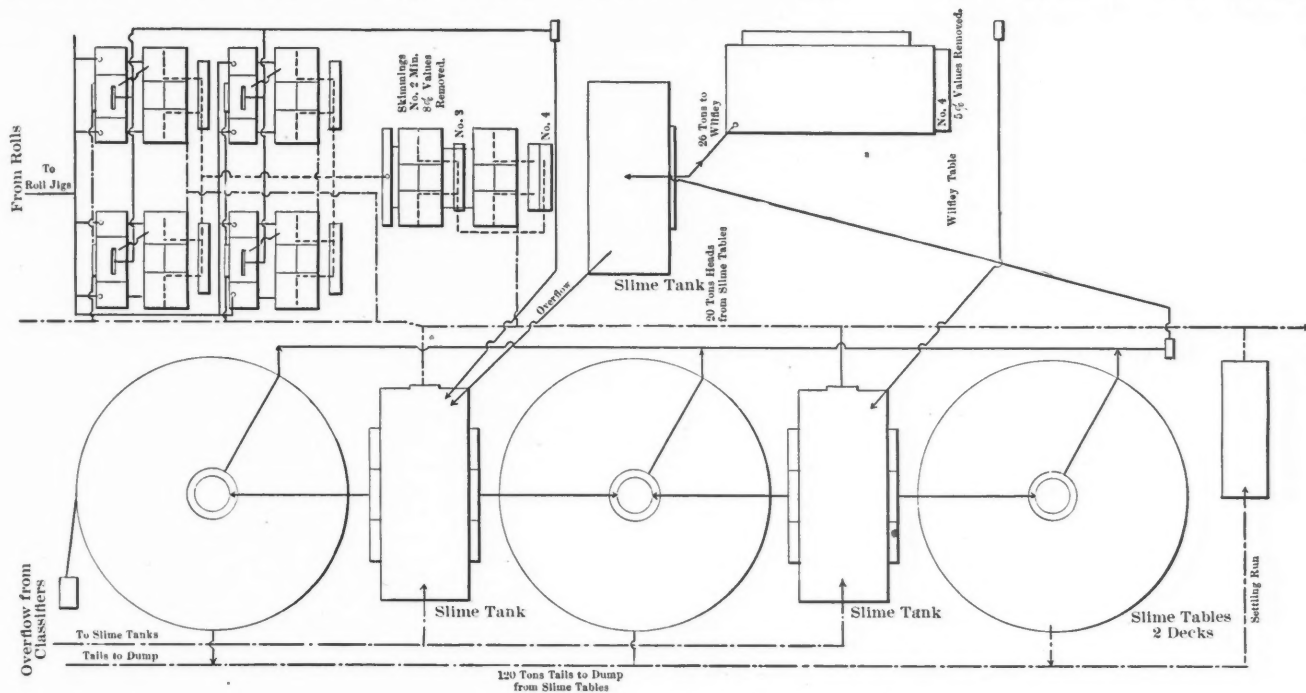
Cross boxes have been placed between the two aprons of the head jigs, permitting the discharge to be run upon the other jig. A curved pipe is put over one end of the spigot, while the other enters the box as shown in the sketch.

In draining the hutch box before skimming, it was necessary heretofore to pull out the plug regulating the outlet, but a pipe is now attached to the bottom of the box permitting all hutch and water to be drained back to the slime launders. This obviates the necessity of changing the adjustment of the plug.

is now applied. He said in an interview last week:

"There is no disposition on the part of the leading officials of the companies manufacturing rails to discuss the questions which have arisen concerning the quality of rails manufactured and in use in this country. Undoubtedly the superior officers of the railroad companies have the same disposition. I do not think any charges of intentional neglect on the part of manufacturers or railroad managers have been authorized by any officials who are in control of their respective properties. Neither is willing to admit that this company has failed to use every reasonable precaution against accident nor disposed to charge any other company with intentional failure to perform every known duty.

"It should go without saying that every



JIGS AND SLIME APPARATUS AT THE OSCEOLA MILL

through the upward current of water from the pipe. If they are light and fine they will be carried out with the overflow. In this way all loss from the plugging up of the spigots is practically eliminated.

These and other minor improvements render the practice of the Osceola mill more successful than that of any other plant in the district.

The Steel-rail Question

REGULATION OF FLOW

Every precaution has been taken to establish a constant velocity and volume in the flow of water used for concentration. The practice requires 30 tons of water per ton of rock. All water is pumped to a tank from which it is drawn to the mill, thus maintaining a practically constant head. Several devices have been invented to obviate the closing and opening of the valves regulating the flow of water to the boxes and jigs. It is necessary whenever a jig is skimmed to shut off the water and when skimming

According to E. H. Gary, chairman of the United States Steel Corporation, it is probable that in the near future, representatives of the leading railroads and steel manufacturing companies in this country will begin an exhaustive joint examination into the quality of steel rails now being furnished to the railroads. Mr. Gary's attention had been called to a report that a committee of prominent railroad men had been organized for the purpose of obtaining from the manufacturers a more reliable and serviceable rail than

one interested is desirous of adopting every reasonable method for safety. It is probable that the leading railway officials and the leading officials of the manufacturing companies will soon personally, or by competent representatives, make a thorough and exhaustive study of the whole situation, at which time every important question relating to the quality of rails and the operation of railroads as applied to the use of rails will be discussed, and with the hope on the part of all concerned that there will be a unanimous decision which should not be questioned by any one. I do not hesitate to say that if it is practicable to manufacture a better rail than the one now in use our companies will make it."

Deposits of monazite sand, richer in thorium than the Brazilian, are reported to have been discovered in the Urals.

Mechanical Production of Low Temperatures

Principles of Refrigerating Processes Which May Be Used
for Cooling Deep Workings and in Sinking by Freezing

BY SYDNEY F. WALKER*

The use of the freezing process for sinking shafts is steadily increasing, and the problem of the increased heat at the continually increasing depths to which both coal and metalliferous mines are being sunk is gradually rendering the problem of the mechanical production of low temperatures of increasing interest. Refrigeration and the artificial production of ice have been in vogue for about twenty-five years. Broadly stated, the mechanical production of low temperatures is dependent upon the ability to convert certain substances from the gaseous to the liquid state, and their return to the gaseous state, by the abstraction of heat from the substances to be cooled. The process consists practically in abstracting the heat from the substance that is to be cooled, and transporting it to the cooling water of the condensing plant.

There are three substances now employed that can be converted from the gaseous to the liquid state, and *vice versa*, with comparative ease, viz., ammonia, carbonic acid and sulphurous acid. Other substances have been employed. Ether, for instance, was employed somewhat largely in the early days of mechanical refrigeration, and is still to a certain extent in India, owing principally to the very low pressures required. Compressed air has also been employed, and is still to a certain limited extent, but compressed air is very much less efficient than either of the other refrigerants named, mainly because, owing to the large power required, no attempt is made to liquefy it. It is merely compressed to a certain pressure, dried, and allowed to expand. Probably compressed air will be found to be the readiest agent for dealing with the high temperatures met with at great depths in mines, since the whole apparatus can be installed underground, and run by an electric motor.

COMPRESSED-AIR PLANT

In view of the possibility of compressed air being used for lowering the temperature in the workings of deep mines, or for similar purposes about a mine, it may be useful to shortly describe the apparatus. It consists of the usual air-compressing cylinder, with its reciprocating piston, and an expanding cylinder, which also has a reciprocating piston, the two pistons being connected to the same crank shaft, their cranks being usually 90 deg. apart.

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Cooling and drying apparatus of various forms completes the plant. One form consists of a cylinder, nearly filled with glass marbles. A fine spray of water is delivered to the top of the mass of marbles, and gradually trickles down over them, passing through the interstices between them, and the air to be cooled enters the cylinders at the bottom, passing up over the surfaces of the marbles, meeting the spray of water, and being cooled and depositing its moisture.

From the cooling cylinder, the air passes into the expanding cylinder, where it works the reciprocating piston, the work performed upon this piston going to assist the work of the engine or motor driving the compressor, the motor thus having only to supply the difference between the two.

In the expanding cylinder the air is cooled to whatever temperature may be desired. It is claimed by makers that it is cooled to as much as 100 deg. below the freezing point. From the expanding cylinder, the cooled and expanded air is driven into the chamber or other place to be cooled, and in regular cold-storage work is usually drawn off again by means of a duct, provided for the purpose, to the compressor, recompressed, re-cooled, expanded, and so on.

The great source of loss, quite apart from the inefficiency of the method of compressing and expanding air, is that by conduction through the walls of the pipe, or duct, through which the cooled air passes to the chamber or object to be cooled. This duct is made as short as possible, and it is also well insulated thermally, but in spite of that, considerable loss too often results.

Another method is that employed in the Allen dense-air machine, made by H. B. Roelker, of New York. In this apparatus there are two important points of difference from that previously described. The air, after being cooled, is carried in small pipes into the space to be cooled, much in the same way as the ordinary refrigerating agent, ammonia or carbonic acid, is, and it is brought back, after circulating through the grid of pipes, to the compressor, the grid of pipes in which the air circulates corresponding to the expansion coils of the ordinary compression or absorption apparatus.

In addition, the air is cooled on leaving the compressor, by being passed through a coil of copper tube, immersed in a cylinder, through which water is kept circulating. Further, the return air from the

chamber that has been cooled is caused to cool the air on its passage from the cooling coil to the expansion cylinder, by circulating in pipes round which the air from the compressor passes, the arrangement being similar to that employed with cooling water and steam in the surface steam condenser. The apparatus has also an auxiliary air compressor, consisting of a small cylinder with piston and auxiliaries, the object of the arrangement being to charge up the system, when it is first put into service. The air, it will be understood, circulates continually round and round, through the compressor, the copper cooling coil, the returning air cooler, the expansion cylinder, the cooling coils, back to the compressor again, any loss being made up, when required, by the auxiliary compressor.

This apparatus appears to be very suitable for cooling the workings of deep mines, since the air-cooling pipes could be carried into the workings, and arranged in any convenient manner. One difficulty that will present itself to mining engineers is the possibility of breakage of the pipes. This could probably be overcome by the employment of flexible metallic tubes, either wholly or for connecting straight lengths of ordinary iron pipe.

THE COMPRESSION SYSTEM

The process of producing low temperatures consists in abstracting the heat from the substances to be cooled by the expansion from the liquid to the gaseous state of one of the refrigerants named. With ammonia, there are two systems available, known respectively as the compression and the absorption system. With carbonic and sulphurous acids, only the compression system can be employed.

In the compression system the apparatus consists of a compressor, a condenser, and what are known as expansion coils, or sometimes as the evaporator, or the evaporating coils. The apparatus forms a complete closed circuit, just as an electric circuit, the refrigerant passing continuously from the compressor to the condenser, thence to the evaporator, thence back to the compressor. The compressor consists of a cylinder with a reciprocating piston, much as in an air compressor, except that the fitting of the piston of the compressor is much more carefully carried out, and special arrangements are made in connection with the bearings of the piston rod, that no leakage of the refrigerant shall take place.

Clearance plays an important part in the

compression system, and consequently it is reduced to the very smallest dimensions. One of the methods employed to accomplish this is: the ends of the compression cylinder are made dome-shaped, and the piston is made in the form of two hemispheres which move closely up to the cylinder ends. Another method employed is: the crosshead of the piston rod is provided with special springs, which enable it to go right up against the cylinder end. The reason for these precautions with regard to piston clearance in the cylinder is, that if a portion of the refrigerant remains in the cylinder, after compression, it immediately commences to expand, when the piston commences its return stroke, and the quantity of refrigerant

the delivery valve opens, and the hot compressed gas is driven into the condenser. The condenser consists of a number of pipes, sometimes formed into a coil, inside of a tank, sometimes formed into a grid. In either case, water is continually passing over the surface of the condenser pipes, the refrigerant being gradually cooled as it passes inside of them, and finally becoming liquid.

From the condenser the liquefied refrigerant passes through a valve, sometimes called the regulator, and sometimes the evaporating valve, to the evaporating coils. The passage of the liquid from the condenser to the evaporator is controlled by the regulating valve, which is practically a stop valve of a special construc-

sary to enable it to resume the gaseous condition, first from the pipes in which it is inclosed, and through them from whatever they may be immersed in, as say, a tank containing brine, a tank containing water that is to be made into ice, or the air of a cold store. Thus it will be seen that the heat from water, say, that is to be made into ice, is delivered to the refrigerant in the process of expansion, and it is conveyed by the refrigerant, via the compressor, to the condenser, where it delivers up the heat it has abstracted, to the cooling water of the condenser, in the process of condensation.

FORMS OF CONDENSER

There are two principal forms of con-

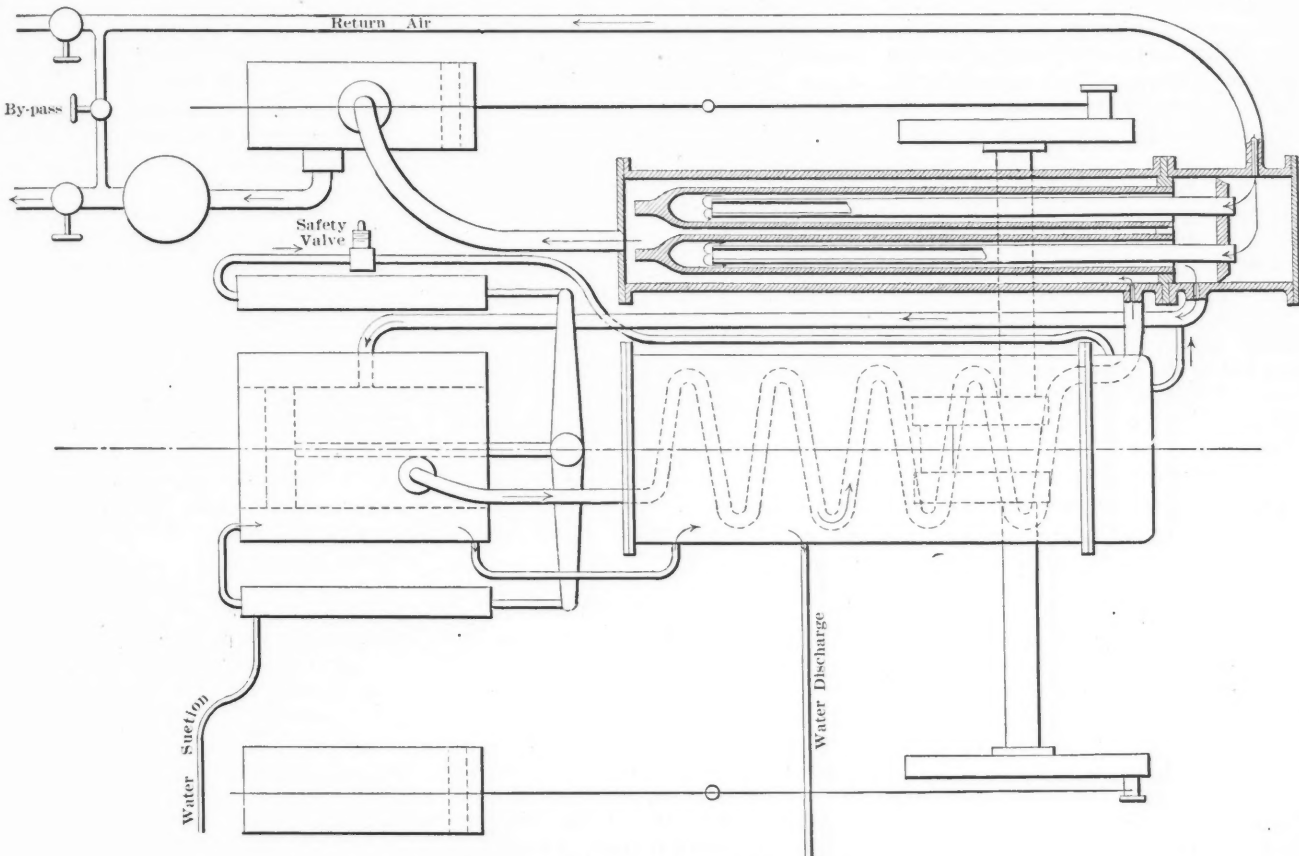


DIAGRAM OF ALLEN'S DENSE-AIR MACHINE

taken in at the next suction stroke is so much less.

The method employed by the Delaberge company for the purpose is as follows: a quantity of oil is injected into the compression cylinder, at a certain period of the stroke, filling up the clearance place, and this is pumped out of the cylinder, with any refrigerant it may have absorbed, the two being separated in an apparatus provided for the purpose, and the oil used again.

The working of compression plant is as follows: On its suction stroke the compressor draws a certain quantity of the refrigerant, in the gaseous state, from the evaporator coils. On the compression stroke it compresses it to a certain pressure, and at a certain period of the stroke,

tion. A minute turn of the valve handle allows sufficient liquid to pass and a very small difference in its opening or closing is sufficient to control the evaporation in the evaporating coils.

A receiver is sometimes interposed between the condenser and the regulating valve. The evaporating coils also consist of pipes, in which the refrigerant circulates, as a liquid when it first enters, and then as a gas, the pipes being sometimes formed into a coil, and immersed in a tank, and sometimes into a grid. It is usual for the refrigerant to enter the evaporating coils at the bottom, and to leave at the top. From the evaporating coils, as already explained, the refrigerant passes back to the compressor.

The refrigerant obtains the heat neces-

denser employed with refrigerating apparatus, known respectively as the submerged and the evaporative. They correspond roughly to the two forms of the surface steam condenser, though in the inclosed form of the latter it is usual for the water to pass through the pipes, the steam passing outside, while with refrigerating condensers the gas always passes inside the pipes, and the cooling water on the outside.

In the submerged condenser, the pipes, usually formed into a coil, are immersed in a tank, through which cooling water is kept continually circulating, by means of a pump, usually driven by the same engine as the compressor. The coldest cooling water entering at the bottom of the condenser tank meets the coolest gas or

liquid which has passed through the remaining coils, and been gradually cooled on its way, the warmest cooling water, that which has been gradually warmed by passing over the surface of the condenser pipes on its way, passing out at the top of the tank, and meeting the hottest gas coming over from the compressor.

In the evaporative condenser, the pipes are formed in a grid, a water pipe being placed above the topmost pipe, and a trough usually below the bottom pipe. The water is forced out of perforations in the pipe above the condenser, and is allowed to trickle down over the surfaces of the pipes in which the refrigerant is passing, and is collected in the trough at the bottom.

The cooling effect in the evaporative condenser is partly from the difference of temperature between the water and the gas inside the pipes, but is more from the heat abstracted from the water by the evaporation which goes on, as the water descends, the atmosphere absorbing the vapor that is formed, and the major portion of the heat required to form it into vapor being abstracted from the pipes in which the gas is passing, and thence from the gas itself. It is not possible to apply the counter current system with the evaporative condenser, since the refrigerant must fall to the bottom, from whence it is drawn off by pipes at different parts of the grid.

THE USE OF BRINE

Brine is used for delivering the low temperature created by the evaporation of the refrigerant, for two principal reasons. It is more easily controlled, especially where a certain temperature has to be maintained, and in certain cases it avoids the possibility of damage from the escape of the refrigerant itself. This applies more particularly to ammonia, and especially to where it is employed in the carriage of produce, or in the making of ice.

In the case of freezing for shaft sinking, up to the present time it has not been possible to apply what is known as the direct expansion method, owing to practical difficulties. Cooling by brine has always hitherto been employed. In my opinion, however, it should by no means be impossible to employ direct expansion. By direct expansion is meant the direct application of the cooling influence of the expanding refrigerant in the water to be frozen, or the air to be cooled, as against its indirect application by cooling brine, the cold brine being employed for the purpose. One of the usual engineering controversies has been waged round the question of direct expansion vs. brine cooling. Direct expansion is more efficient, that is to say, it requires less power in the compressor, and it avoids the necessity of a brine pump. On the other hand as explained, the saving is often counterbalanced by the increased convenience of the brine method.

By brine is meant water in which a salt, preferably calcium chloride, has been dissolved. Common salt has been employed, but is now rarely so, because of its chemical action upon the pipes in which it has to circulate. Magnesium chloride is also used. Calcium chloride has practically no action upon iron, providing it be fairly pure; but it has an action upon the zinc covering in galvanized iron, and therefore galvanized-iron pipes should not be employed. Where galvanized-iron pipes are employed, hydrogen gas is generated, which sometimes leads to trouble.

Brine is employed in place of water, because it is necessary that the liquid which is employed to transport the heat from the body to be cooled should not itself freeze at the low temperature which it is necessary for the cooling agent to assume. Whenever a salt is dissolved in water, the freezing temperature of the solution is lowered. Thus, with calcium chloride, a solution containing 5 per cent. by weight reduces the freezing point of the water to $27\frac{1}{2}$ deg. F.; 10 per cent. reduces it to 22 deg., 15 per cent. to 15 deg., 20 per cent. to 5 deg., and 25 per cent. to -8 deg. F. In the freezing process for sinking, the brine has to be carried at a temperature of nearly zero F.

The usual arrangement, where brine circulation is employed, is for the expansion coils to be immersed in a tank, through which the brine is kept circulating, the warmed brine from the substance to be cooled coming continually back to the tank, passing through it, over the surface of the expansion coils, and re-emerging at its low temperature.

WATER FOR CONDENSING

The provision of water for the condenser of the refrigerating plant is one of the most important points in the apparatus. The lower the temperature of the cooling water, the higher is the efficiency of the plant; that is to say, the smaller is the power required by the compressor. It is usual to deliver the gas from the compressor to the condenser, at a pressure whose temperature corresponds to about 10 deg. above that of the cooling water.

The work the compressor has to perform, and therefore the work the engine driving it has to perform, increases with the pressure. Hence the higher the temperature of the condenser cooling water, the higher the pressure to which the gas must be compressed, and the greater the power required in the driving engine. At the other end of the apparatus it is usual to regulate the quantity of the refrigerant passing into the expansion coils, so that its pressure at the end nearest the suction valve of the compressor is that which corresponds to a temperature 10 deg. below that of the brine it is cooling, or 20 deg. below that of air when it is employed to cool a cold store.

As with steam, each pressure of the refrigerant corresponds to a certain tem-

perature, and it is usual to provide gages, one at the entrance to the condenser, a second at the exit from the expansion coils, which are marked in pressures, and also on another circle, usually in another color, in corresponding temperatures. It will be seen further that the lower the temperature required from the refrigerant, as for cooling the brine in the case of sinking by freezing, the greater the power again that is required from the engine driving the compressor. The power required in the compressor for the sinking by freezing process is much in excess of that usually required for making ice under ordinary conditions, even in hot climates, owing mainly to the very low temperature to which the brine has to be reduced.

PROPERTIES OF THE DIFFERENT REFRIGERANTS

The three substances that are employed as refrigerants have widely different physical properties. The most important property a refrigerant can possess is the quantity of heat it will absorb in passing from the liquid to the gaseous state, that is to say, its latent heat. Ammonia possesses a latent heat of 555 B.t.u. per lb., carbonic acid 123 and sulphurous acid 171 B.t.u. per lb., these figures being at 0 deg. F.

The latent heat of each of the substances decreases with increasing temperature, and *vice versa*. The relative volumes in cubic feet of a pound of each substance at the same temperature are: ammonia 9.1, carbonic acid 0.277, and sulphurous acid 7.35.

The volumes of the different substances increase with increased temperatures, and *vice versa*. The pressures to which the different refrigerants must be compressed, before delivery to the condenser, also vary considerably. For comparison, the relative pressures are taken at 0 deg. F., the actual pressures of the gases when delivered to the condenser being much higher. At 0 deg. F., ammonia has a pressure of 30 lb. per sq.in., carbonic acid 310 lb., and sulphurous acid 10 lb. The process of the conversion of the gas into liquid is twofold. The molecules of the gas are first brought close together, by compression, heat being liberated in the gas in the process, and secondly, the latent heat due to the gaseous state, and the heat liberated in the gas by compression, are moved by the action of the cooling water. In practical work, with ammonia, condenser pressures range from 120 lb. per sq.in. up to 180 lb., the latter being common. With carbonic acid the pressures range from 800 lb. per sq.in. to 1200 lb. The higher pressures are necessary in hotter climates, with hotter cooling water.

There is the usual rivalry among refrigeration engineers, as to which of the three refrigerants is the most economical. For practical purposes there is really little to

choose. Though ammonia has a much higher latent heat, the specific gravity of carbonic acid being so much greater, when volumes are taken, and volumes are dealt with in the compressor, the advantage is on the side of carbonic acid.

Again, the pressure to which ammonia must be compressed is much less than that to which carbonic acid must be, but on the other hand, the quantity of carbonic acid required is much less than the quantity of ammonia.

It is sometimes supposed that ammonia is the safest of the three refrigerants, because an escape of the gas is supposed not to be harmful, while the escape of carbonic acid is. This is a mistake. A small percentage of ammonia in the atmosphere is distinctly bad, and a comparatively low percentage is poisonous. The pungent odor of ammonia which gives warning of its escape, is a point in its favor.

On the other hand, a small percentage of carbonic acid in the atmosphere is ab-

gaseous condition, while a pound in passing from the liquid to the gaseous carries off 500 units, or thereabouts, and as the gas occupies the space that should be occupied by the liquid, the result is a considerable lowering of efficiency.

THE ABSORPTION SYSTEM

The absorption system depends for its work upon the fact that water dissolves ammonia gas. Water, as is well known, dissolves all gases, but ammonia is the only one of the three refrigerants named, to which the absorption system has been applied. According to the modern view of the process of the solution of a gas, or a solid in a liquid, the gas or the solid in the process of solution, changes to the liquid state, the gas surrendering its latent heat to the liquid, and the solid taking up from the liquid whatever heat it may require to become liquid.

The quantity of ammonia that water will dissolve varies in a certain ratio,

livering up to the liquid its latent heat, and gradually increasing the strength of the solution. The specific gravity of a weak ammonia solution differs from that of a strong, and this fact is taken advantage of to carry the strong solution as it is formed, over to the generator.

In the generator the solution is maintained as strong as possible, and it is heated, usually by steam pipes, the heat causing the ammonia gas to be delivered from the surface of the solution, much as steam is delivered from the surface of water, under the action of heat. The gas, which comes away from the solution, passes to the condenser, where it is condensed, and the remainder of the process, the passage to the evaporator and so on, is exactly the same as in the compression system.

Certain accessories are required with the absorption system, as follows. As in a steam boiler there is a mechanical action, when heat is applied to the water,

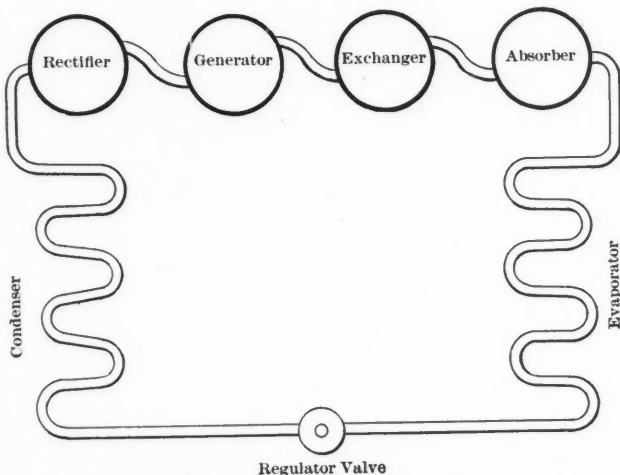


DIAGRAM OF ABSORPTION PLANT FOR PRODUCTION OF LOW TEMPERATURES

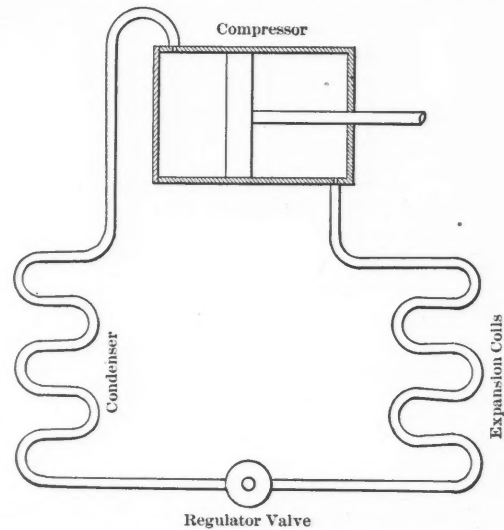


DIAGRAM OF COMPRESSOR PLANT FOR PRODUCTION OF LOW TEMPERATURES

solutely harmless, and even a comparatively large percentage produces only certain results, to which many of us who work in close offices are only too well accustomed. The fact that the escape of carbonic acid does not declare itself by its smell, is against it, but for another reason. A certain quantity of the refrigerant, whichever may be employed, is necessary for the efficient working of any compression plant. If the refrigerant leaks out, and there is even a small shortage, the efficiency of the system is enormously reduced. It will be understood that the work of cooling is performed by the refrigerant in the operation of passing from the liquid to the gaseous state. If the plant is short of the refrigerant, a certain quantity of the gas passes through the regulating valve with the liquid, and as the gas has practically no cooling properties, one pound of ammonia say, carrying off less than half a heat unit, when passing through the expansion coils in the

roughly in inverse proportion to the temperature. Thus at 32 deg. F., water will take up nearly 90 per cent. of its weight of ammonia, while at 212 deg. it will only take up about 7½ per cent., the quantity falling at first very quickly, the proportion at 122 deg. F. being 28½ per cent., and then more slowly. These two properties are taken advantage of in the absorption system, to avoid the necessity for compressing the gas mechanically. Really the gas is compressed on its way to the condenser, by the volume of the gas which is constantly being delivered from what is called the generator.

There are two principal portions of the apparatus, known respectively as the generator and the absorber. In the absorber is a weak solution of ammonia, and it is to the absorber that the gas returns from the evaporating coils after having done its work in cooling the water or the air, etc. The returning ammonia gas is dissolved in the weak solution in the absorber, de-

which causes minute globules of water to come away with the gas. A certain quantity of steam also comes away, and the accessory apparatus are required to present the gas to the condenser, free of water and of steam. The accessories consist of a rectifier, an analyzer, and an exchanger.

The office of the analyzer, which consists of baffles placed in the path of the gas, is to catch the globules of water, and to deliver them back to the solution from which they came. In the rectifier the gas is subjected to a certain amount of cooling, the object being to reduce the steam, and any watery vapor that may be present, to a temperature at which they can no longer exist as either steam or vapor, and are therefore returned to the generator as water, the gas passing on, freed from the watery vapor. The office of the exchanger is to assist the two objects that have to be sought for in the absorber and the generator.

The temperature of the absorber must be maintained as low as possible, in order that it may continue to dissolve the gas as it comes over, and this, notwithstanding that the gas is continually delivering heat to the liquid in which it is dissolved. On the other hand, the temperature of the generator is kept as high as possible, so that the gas may continue to come away freely. The exchanger is an apparatus, very much on the lines of a steam surface condenser. The liquid on its way from the absorber to the generator, passes through a set of pipes, and that passing from the generator to the absorber passes around them, the result being that some of the heat from the liquid passing from the generator is delivered to that passing from the absorber, the liquid arriving at the generator at a higher temperature, and that arriving at the absorber being at a lower temperature. Both liquids are usually subject to a further process of cooling, in passing through the exchanger.

SINKING BY FREEZING

There is no practical reason why either of the above systems, the compression system with either of the three refrigerants, or the absorption system with ammonia, should not be employed for generating the low temperature required for freezing the ground for sinking. In both cases, the two important requisites are steam for driving the compressor or for heating the generator in the absorption system and a good supply of cooling water.

Compression plants are made in almost all sizes, and are made to compress in one and two operations, sometimes with compound engines, the two cylinders working the two compression cylinders, sometimes with single cylinders, or as convenient. The compressor also may be driven by an electric motor or by belt from any convenient steam engine, but when made up in one plant with the steam cylinder, especially with carbonic acid, the compression cylinder is usually mounted on the same bed plate as the engine cylinder, and is often driven from the tail rod of the steam piston.

The electric motor has one great advantage over the steam engine for driving the compressor, in that if the steam engine works expansively, the energy delivered to its piston is gradually lessening as the piston moves outward, while the resistance in front of it is gradually increasing, and the energy delivered by the piston is least when the resistance of the compressor is greatest. With an electric motor or a steam turbine the energy delivered to the piston of the compressor would be uniform throughout the stroke.

According to the *Moniteur du Pétrole Roumain*, April 14, 1907, the production of petroleum in Russia in 1906 was 8,173,051 tons.

Diamond Mining in Brazil

Consul-General G. E. Anderson, of Rio de Janeiro, reports that there has been a considerable increase in the movement of diamonds from the Diamantina district of Brazil to the United States, although the bulk of the output continues to go to Paris and London. The establishments of a concern for cutting and finishing the stones at Diamantina has led to a change in the course of export, and the contract of one of the American mining concerns to purchase the output of other concerns at Diamantina is likely to lead to a still further increase in the American imports.

What the output of Brazilian diamond fields at the present time really is cannot be given with any degree of certainty. Owing to the policy of the state government in its attempt to tax the stones on export no records of the finds or of the sales are kept. A private record kept by a diamond mine owner in Diamantina shows that in one district of that field over 4800 carats of stones were bought from the original holders from Sept. 14 to Nov. 14, 1906. This period was probably an average one, and the output of this particular territory therefore will average about 2400 carats of stones per month. There are two other similar mining fields in the same country, and while the output of the two combined will not exceed that of the first-named district, it seems very probable that the total output of the Diamantina country at present is about 5000 carats a month, worth on an average perhaps something over \$40 per carat for mine-run stones in the rough. The income of the Diamantina district from its diamonds at the present time is about \$200,000 a month.

CRUDE METHODS TO BE SUPPLANTED

This output of Diamantina diamonds seems to be altogether the production of mining with native means and methods from the so called "servicoes" which represent no faithful or effective test of the value of the country. These "servicoes" are bands of workmen organized into squads, sometimes by a large number of workmen themselves agreeing to work together for a season and dividing the output and sometimes by men with capital enough to hire men for a season. In the dry season the river beds are worked, in the rainy season the uplands are worked. Rude sluices and wooden pans represent the machinery employed and there is no doubt that a large number of stones are missed in the process. Large numbers of stones are bought from Brazilians inhabiting the surrounding country, and there is no means at present of testing what mining property is worth or how much capital, time, labor, and expenditure the present output represents. Nor is there any means of telling how many

people are actually engaged in whole or part time in the work.

The mining companies now installing plants in the Diamantina country are almost altogether American. Practically all of them are engaged in getting in their dredging machinery and preparing for active work on a more or less extensive scale. The trouble, expense, labor, and time necessary to accomplish even the more simple tasks in this line can be fully appreciated only by those who have engaged in the work. Diamantina can now be reached in two days by fast mule back from the end of the railroad, and in the course of a short time a public service of diligences will offer more improved means of making the journey, but the difficulty of transporting heavy machinery in such sections as a mule can carry over mountainous country is apparent.

STABILITY OF MINING COMPANIES

In a report from this consulate-general under date of May 18, 1906, attention was called to the fact that several, if not many, so called Brazilian diamond mining concerns selling stock in the United States were little more than frauds and that there was need of careful scrutiny, on the part of investors, of propositions dealing with gold and diamond mining enterprises in Brazil. The unusually large number of letters received following the publication of that report demonstrated that a good many investors had received the advice too late. It is only fair to the companies now prosecuting work at Diamantina in good faith, however, to call attention to the fact that they are working in good faith, in line with statements made in that report, and that because there have been some frauds in the business all the concerns are not to be included in that category. Companies which before were in more or less questionable position have made some effort and generally succeeded or probably will succeed in ridding themselves of undesirable elements. Without in any way or to any degree passing upon the merits of their property or their prospects it is probably safe to say that the companies now actually at work in the Diamantina country on the whole are going to give investors a fair run for their money. The necessity of investors giving attention to the former report, however, is none the less pressing.

The output of semiprecious stones in Brazil has increased considerably. Contrary to general opinion, these stones do not come, in general, from the diamond country. Of the \$90,000 or so of declared exports of semiprecious stones last year about four-fifths came from the port of Rio de Janeiro, coming generally from states farther south. Prices generally here seem to have no advantage for American importers over those for as fine or finer stones in the western United States.

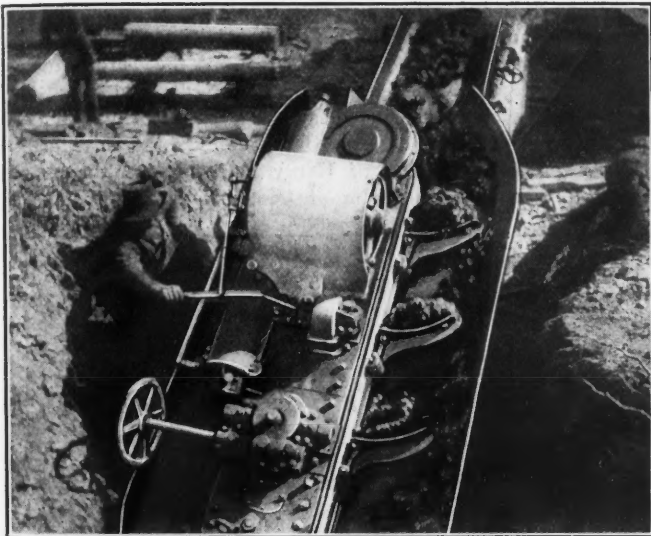
The Park Automatic Loader

The Park machine mucker, or automatic loader as it is now called, is a device for transferring loose dirt and broken rock from the ground or tunnel floor to cars by mechanical means. It is manufactured by the Railway Materials Company of Chicago, and has been in use for some time for loading crushed stone, coal, coke, gravel and other loose material on the surface; and in the under-

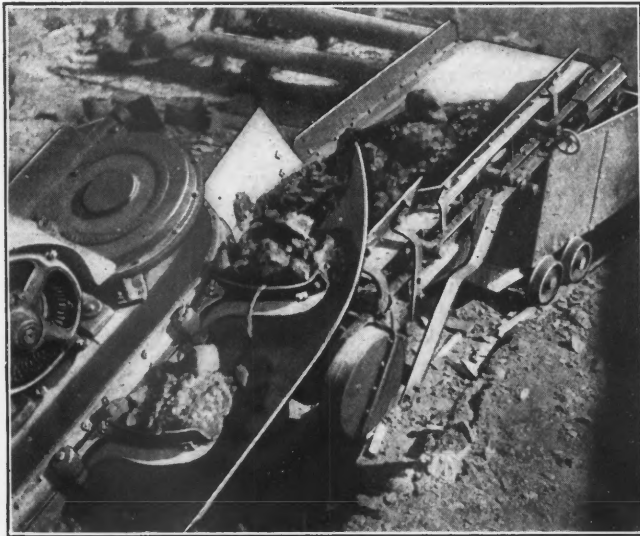
ing the machine is taken from any convenient electric circuit, and the truck carrying the loading mechanism is brought to the work by its own power and is steered and manipulated in a manner suggesting a steam roller.

The machine, which is the invention of Thos. M. Park, is capable of doing the work of a steam shovel in the narrow space of a tunnel, and is built in two sizes, the larger being 6 ft. 6 in. high and 5 ft. 6 in. wide, while the smaller machine is about 5 ft. 6 in. high and 4 ft.

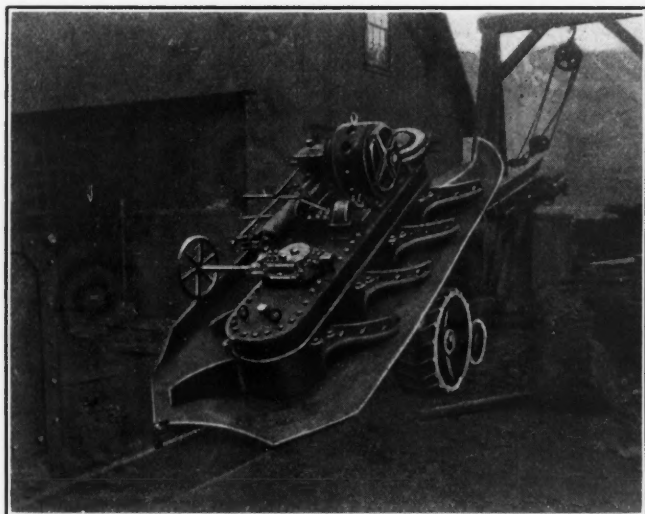
machine and 12 in. on the smaller. The machine is guaranteed to handle 16-in. cubes and has handled rocks larger than 24-in. cube and weighing 700 lb. The shovel apparatus consists of a heavy interlocking endless chain of a tensile strength of 150,000 lb., revolving about a sprocket wheel at the head and a traction wheel at the foot, and carrying projecting scoops or shovels every 4 in. Rollers reduce the friction and all bearings are protected from grit and broken rock. The nose of the machine is raised



TOP VIEW OF MACHINE IN OPERATION



FROM SHOVEL PLATE TO CONVEYER BELT



SHOWING SHOE PLATE AND CONTROL LEVERS



DISCHARGE INTO MINE CAR

ground workings of the Gold Lions Mines Company at Red Mountain, Colo., and other mines it is in successful operation loading muck at the breast after blasting, in a fraction of the time required to clean up by hand.

The essential features of the machine are a heavy steel truck driven by an electric motor, a steel shoe-plate and traveling scraper arms for gathering the material from the ground, and a short and wide conveyer belt for transferring the muck to the car. The power for operat-

ing the shovels and propelling the machine in any desired direction, and with a 3-h.p. motor for driving the conveyer. The machines are necessarily of massive steel construction, the larger size weighing 15,000 lb. and the smaller 12,000 lb. The shovels project 18 in. on the larger

or lowered by means of a hand wheel to suit the contour of uneven ground, but the machine naturally gives the most economical results on a smooth surface.

The machine was originally designed to work on a track without the conveyer-belt attachment. In this form it loaded iron ore into charging buggies at the Murray plant of the American Smelting and Refining Company, the average time of loading the one-ton buggies being 10 seconds.

Manganese in India

United States Consul E. H. Dennison reports that there is a boom in the manganese industry of India. Many discoveries are being made and the ore seems to be pretty well distributed throughout western and southern India. Some rich deposits have been discovered six miles outside the Mysore frontier in the Bellary district, assaying an average of 54 per cent. of manganese. All the ore from Mysore and Goa is shipped from Mormugoa, which possesses facilities for loading direct from the wharves. During 1906 there were 343,346 tons of manganese ore shipped from Bombay, as compared with 213,860 in the previous year. It is expected that 1907 will see a large increase over these figures.

According to one of the largest shippers in Bombay the manganese ore mined in India varies from 40 to 53 per cent. manganese, silica 3 to 12 per cent., and phosphorus from 0.2 down to 0.03 per cent.

The manganese ore industry is at present suffering from lack of proper transportation facilities. The mines are all situated off the lines of railways and the ore is freighted in bullock carts to the nearest station. Owing to the general prosperity of the country there has been a shortage of freight cars on all lines and all industries, including that of manganese ore mining, have suffered thereby. There are thousands of tons of this ore piled up at various railroad points for which no cars can be obtained.

Minerals in Rumania

Minerals and precious metals are said to abound in Rumania, but thus far only salt and petroleum are obtained. According to a recent consular report, the petroleum industry is advancing rapidly and will probably become one of the most important sources of revenue. Large tracts of supposedly petroliferous lands are as yet unexploited, and other sections are only just beginning to be worked. At present the production of petroleum is chiefly from the district of Prahova. There is said to be \$30,000,000 capital invested in this industry, mostly by German, Dutch, French, Italian and American interests. An American company has established a plant near Ploesti. The next few years will see a great increase in the capital invested, for the production of oil has greatly increased in recent years.

According to a recent British consular report, a British company is developing a mercury mine at Sisme, in Konia, Turkey, and furnaces are soon to be put in operation. Old workings for mercury are reported at several places in this province. According to a recent American consular report mines of mercury are being opened in Algeria and are said to promise well.

The San Vicente Mine, Spain

BY EDWARD WALKER

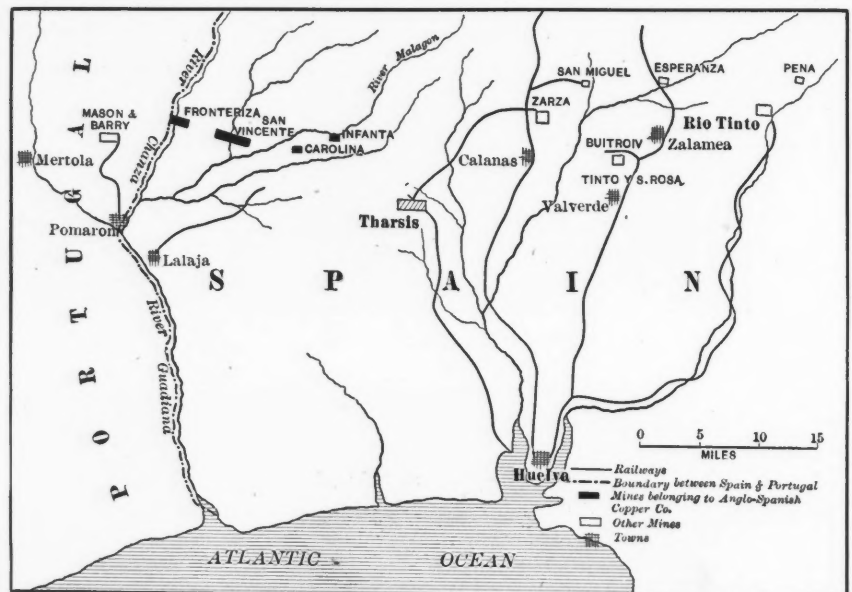
In an article published in the Journal on Dec. 22 last, I gave some account of the new development of copper and sulphur properties in the south of Spain. Since then another mine has been actively reopened by means of English capital. This is the San Vicente, which is situated about half way between the Tharsis mine and the properties over the border in Portugal belonging to Mason & Barry. The accompanying map shows the district between Rio Tinto and Mason & Barry.

For quite a dozen years, it has been difficult to interest English or French investors in Spanish copper properties, for there has been a general inclination

business has been done. The owners of the new properties have gradually managed to come to the front by their own efforts, and to secure the necessary capital to work their deposits on their own account.

THE SAN VICENTE ORGANIZATION

The San Vicente mine has just been floated in London as the Anglo-Spanish Copper Company. So long ago as 1883, a company was formed in London for the purpose of the flotation by Mr. Yglesias and his fellow owners. In those early days, there were other difficulties in the way of raising the necessary capital, and later on, the before mentioned handicap, played some part in causing delay. The present flotation has been carried through by the instrumentality of Henry Bath & Sons, the metal merchant of London and Liverpool, and



MAP SHOWING LOCATION OF SAN VICENTE MINE

to argue that these unworked properties were no good, because Mason & Barry and Tharsis, being in want of new properties would have taken them up readily enough if they were. The Mason & Barry properties have for a long time been known to be of limited extent, and though Tharsis is not so near exhaustion, the company has certainly been examining many new mines in Spain and elsewhere. It is therefore necessary to explain how it comes to pass that no local properties have been taken up by these two big firms. In the first place, the owners of the other properties knowing the need of their big neighbors have attempted to squeeze them and extort a high price, and secondly, the thoughts of Tharsis and Mason & Barry have traveled in a different direction and have deluded them into the idea that they could get new properties as cheaply as they acquired the old ones. Neither side would give way, and consequently no

several chemical firms in Lancashire are interested in the company.

The new company owns, besides the San Vicente, several other mines and prospects. One is the Fronteriza, which is still under water, but which was reported on very favorably twenty years ago by several eminent engineers. Others are the Valrubio, the Carolina, and the Infanta, which has not so far been developed to any extent.

THE MINES

About eighteen months ago, W. B. G. Rivington was sent out to examine the properties, and he spent the greater part of the year doing development work at the San Vicente. The work has been done by Mr. Rivington and his predecessors by means of an adit level about 1500 ft. long and varying from nothing to 100 ft. below the surface. The accompanying section and plan of the workings shows the work done to

date, and the position of the orebodies so far opened up.

There are four orebodies. Of these, Nos. 1 and 4 are low in copper, and the other two carry sufficient copper to warrant their treatment on the spot. The orebodies have been sampled systematically, and typical samples may be given. Sample 1, taken on orebody No. 4, gave $\frac{1}{2}$ per cent. Cu. and $48\frac{1}{2}$ per cent. sulphur, over 3 ft. Sample 2, on orebody No. 3, gave 4-2-3 per cent. copper and 50 per cent. sulphur over $10\frac{1}{2}$ ft. Sample 3 on orebody No. 3, gave $3\frac{1}{2}$ per cent. copper and $47\frac{1}{3}$ per cent. sulphur over 25 ft. Samples 4, 5, and 6 on orebody No. 2, gave copper $2\frac{1}{2}$ per cent., and sulphur 49 per cent. over widths varying from 13 to 30 ft. Sample 7 on orebody No. 1, gave less than $\frac{1}{2}$ per cent. copper and 45 per cent. sulphur over a width of $11\frac{1}{2}$ ft. All these samples gave small quantities of gold and silver

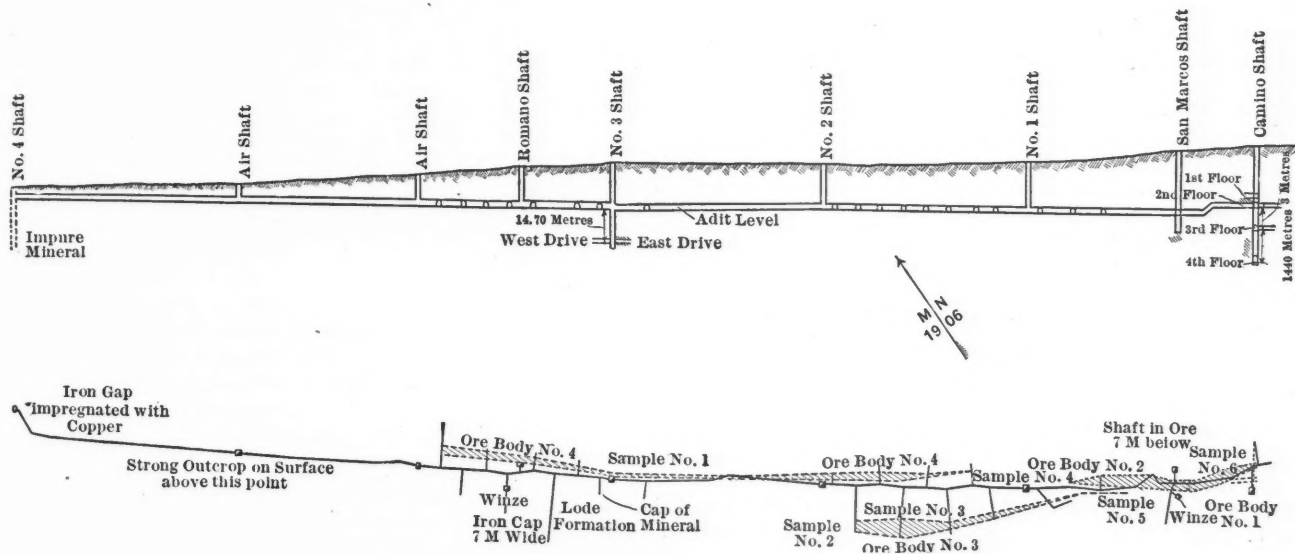
Phosphate Rock in the West

The discovery of important phosphate deposits over a considerable area in southeastern Idaho, southwestern Wyoming, and northeastern Utah has opened up a new industry in the West. The future of the industry is, however, shrouded in uncertainty as it is largely dependent on the granting of such rates by the railroads as will enable the manufactured product or raw material to be sold at a profit in Australia, Honolulu, Japan, and the Middle States, the home market on the Pacific coast not being at present extensive enough to warrant large development. This phase of the subject is recognized by F. B. Weeks and W. F. Ferrier, of the United States Geological Survey, who have investigated these deposits and reported about them in "Contributions to Economic Geology, 1906."

Prospecting has been carried on at a number of widely separated localities.

those beds which can be developed at the least cost and which lie nearer the railroad shipping points are worked. In Utah the phosphate series has been found some distance south of Bear lake, in the vicinity of Woodruff. The beds also outcrop in Weber canyon, about $1\frac{1}{2}$ miles below Croydon, and in some of the side canyons. None of these beds is at present worked. The Union Pacific railroad, which follows the course of Weber river, will make possible a rapid development in this region.

The phosphate series consists of alternating layers of black or brown phosphate material, shale, and hard blue or gray compact limestones. The limestones are in the main very fossiliferous. The phosphate series is in places about 90 feet thick. The beds vary in thickness from a few inches to about 10 feet, but wherever they are of this extreme width they are broken by thin layers of shaly material poorer in P_2O_5 . The main phosphate bed



SECTION AND PLAN OF SAN VICENTE MINE

averaging one or two pennyweights of gold and 3 oz. of silver per ton.

It is estimated that the known and probable ore so far developed at San Vicente, amounts to over 200,000 tons, with practical certainty that the bodies continue in depth. It is proposed to erect a smelting works capable of dealing with 200 tons a day, working on ore that will average $3\frac{1}{2}$ per cent. copper. The lower-grade ore averaging 2 per cent. or so will be exported to alkali works, at the rate of 100 tons a day. Whenever possible the sulphur ores of very low copper contents will be exported but at the present time they are not likely to be worked, owing to the plentiful supply of better ore. The costs of mining, smelting and handling materials are similar to those ruling at Esperanza given in detail in my previous article.

The strike of the beds follows the general northwest-southeast trend of the ranges along which they outcrop. In Idaho the beds outcrop along the Preuss range, extending from the line of Bannock and Bear Lake counties in a southeasterly direction along its west face. A probable southern extension of these beds near the Idaho-Utah line is found on the plateau east of Bear lake, where the overlap of upper Mesozoic sediments has been eroded. East of the Preuss range, in the Sublette range, in Wyoming, are similar beds which follow the southerly trend of this range to Smiths Fork. The deposits are found in oolitic beds of the upper Carboniferous rocks.

This general region is drained by Bear river and its tributaries. The Oregon Short Line Railroad follows the valley of Bear river and affords the only means of transportation to market. At present

is from 5 to 6 ft. thick, and is almost entirely oolitic in structure and high in P_2O_5 . All the sections that have been examined show one and some of them two beds which are of commercial value.

The exports of ore from Rhodesia through the port of Beira for the year ended Dec. 31, 1906, were as follows, the corresponding figures for 1905 being stated in parentheses: Concentrates, 2,884,150 lb. (2,536,737); chrome iron ore, 6,743,003 lb. (551,808); calcined ore, 15,312,697 lb. (nil); copper matte, 555,050 lb. (nil); tungsten ore, 26,948 lb. (nil). The "calcined ore" was chiefly calamine.

The kingdom of Bavaria in 1906 produced 1,381,176 tons of stone coal, 140,290 tons of brown coal, and 202,541 tons of iron ore. There were in operation 14 collieries, 27 ore mines and one salt mine.

Some New Points in the Geology of Copper Ores*

BY JAMES F. KEMP†

During the past year or two cobalt and silver have been the metals most prominently in the foreground in Ontario; but south of the national boundary and in other parts of the world, copper has occupied the center of the stage. The growth of electrical applications and the increasing consumption of brass have made the market well-nigh insatiable. Copper mining has greatly increased and with the growth of new districts and with widening experience, we have found it necessary to modify some of our old-time conceptions.

Twenty-five years ago when the classes in the mining schools were taught the mineralogy of the ores of copper, it was chalcopyrite that was esteemed the principal mineral. Of course the importance of the native metal on Keweenaw point was appreciated, but we used to define an ore as "the compound of a metal and a mineralizer such as sulphur or oxygen"—and the native form, even though abundant in one locality, was thus ruled out. Experience with the lenticular beds or veins, in the slates and schists along the Appalachian belt from Sherbrooke, Quebec, to Ducktown, Tennessee, and the historic orebodies of the Rio Tinto district in Spain, whose geological relations are similar, gave good ground for the esteem in which chalcopyrite was held. It was considered, moreover, to be the original mineral from which the others were generally believed to have been derived. Observers of those days were perfectly familiar with the oxidized zone, and with the zone of enrichment, at the level of the ground-water. At the latter horizon the Ducktown mines had taught all of us in America that rich black ores were precipitated, but the dark mineral was for many years believed to be the oxide, tenorite or melaconite, until W. H. Weed proved it to be chalcocite. Chalcocite was esteemed to be rather uncommon and when we students saw it at all, it was chiefly in crystals from the old copper mine at Bristol, Connecticut, an enterprise that had impressed its shareholders rather by the lack of copper than by its abundance.

LESSONS FROM RECENT WORKINGS

Today, on the contrary, in the United States and Mexico, chalcocite furnishes much the largest part of the copper produced, and for some years to come its relative importance bids fair to increase rather than diminish. Butte, Morenci, Bisbee, Globe, and Cananea derive most of their output from it, while Bingham and

Ely will soon be concentrating the glance from the porphyries on an enormous scale.

So far is chalcopyrite from being the principal and original mineral at Butte, that on the one hand it is rather uncommon and on the other it is one of the latest of the secondary minerals, since we find it in veinlets cutting covellite. Alike at Butte and in Arizona the original mineral appears to be a lean copper-bearing iron pyrite, which is then, by secondary enrichment, oxidized in one place and deprived of its copper, only to gain the latter elsewhere in the form of chalcocite, which brings the lean original up to grade.

In later years, and for a period lasting well up to the present, we have laid great and just emphasis on the processes of secondary enrichment by the descending surface waters. We believed that the new chalcocite and other minerals were deposited at the level of the ground-water and for a limited distance below it. That is, we gradually grew to recognize the necessity of a greater diffusion of the descending copper solution throughout the quiet ground-water than we had at first thought either necessary or probable. But in the issue of the *Mining and Scientific Press*, for February 23, 1907, page 236, we learned that a cross-cut in the Berlin claim at Butte had cut a great body of glance, at 1800 ft. from the surface, and that in the Neversweat, at 2400 ft., a similar occurrence had been noted. Even before this it was generally reported that a cross-cut from the shaft at 2000 ft. in the Speculator claim had intercepted these rich ores in a still different lode.

Various suggestions tending to reorganize our old views either have been made or may be made in consequence of these discoveries. The hillside on which the copper mines are situated at Butte rises gradually to the north from the valley of Silver Bow creek, or more steeply to the west from the same creek at Meaderville. In the latter area shafts are said to have found the bed-rock under 600 ft. of overlying loose material. Obviously, as the valley was excavated by erosion, and as the former representative of Silver Bow creek established the low point of the ground-water upon its bed-rock, the subterranean water-level must have risen from this point, in the hill, roughly following the surface, but at a flatter slope. The present outcrops of the copper veins are from 500 to 700 ft. above the present valley, or from 1100 to 1300 ft. above the bed-rock. To estimate the ancient level of the ground-water, we must diminish 1100 to 1300 by such figures as will allow for its rise, roughly parallel with the surface. Whatever assumptions we may make, moreover, regarding wall-rock and vein-matter removed by erosion, will operate to further raise the ground-water level. It certainly can scarcely have been lower than 800 to 1000 ft. below the collars of the present shafts. The re-

cently discovered bonanzas are from 1000 to 1500 ft. below this level, and according to our old ideas of the diffusion of the descending copper-bearing solutions, they must have penetrated at least 1000 to 1500 ft. of standing water. This seems unlikely.

SECONDARY ENRICHMENT

On the other hand we may raise the question, could the ground-water have been so irregular in its distribution that no standing body of it intervened to stagnate the descending water? This seems unlikely. Again, is chalcocite necessarily a secondary mineral? May it not be of original deposition? Experience thus far leads us to think that the presumption of its secondary nature is well grounded.

Most reasonable of all would appear to be W. H. Weed's suggestion of secondary enrichment by uprising solutions of copper, set in action perhaps by the late rhyolite. From these no lean pyrite of primary deposition thus far observed would be too deep to escape, although solutions of oxidized copper salts, such as bring about enrichment by descending surface waters, are not what we associate with waters uprising from the depths. Mr. Weed applies his conclusions especially to the enargite at Butte, but as the glance is being found deeper and deeper we may at least raise the question whether its lower deposits may not also have been introduced from the depths.

Ten years ago, or even less, great apprehension was felt about the persistence of ore in depth. The newly appreciated doctrines of secondary enrichment from above had emphasized and increased the misgivings, and much experience corroborated them. Rio Tinto was most often cited, where in the San Domingo vein or lense, 4 to 5 per cent. of copper had been obtained at the surface; 2 per cent. at 260 ft.; 1½ to 1¼ per cent. at 325, and 1¼ per cent. at 425 ft. In the Dionisio, there was 4 per cent. at the surface, 2 per cent. at 650, and 2½ per cent. at 1500 ft. In the last citation there was a ray of comfort, but the general result was decidedly discouraging. At Butte too, the general yield of the ores has gone down. A few years ago it was 5 to 6 per cent.; now it is 3 to 4 per cent. In Arizona, 15 to 20 per cent. was not uncommon twenty years ago. The ores run 6 to 7 per cent. now, and the glance in the porphyries 3 per cent. as it goes to the mill. Improved transportation and milling processes are responsible for bringing lower and lower ores within the range of profit, and, as we must realize, there is the tendency steadily to reduce the general average; but if, at Butte, 40 per cent. ore occurs in great stopes at 1800 ft., and 60 per cent. ore at 2400 ft., we may raise the question as to whether the old-time generalization is as sweeping as we formerly thought.

*From advance sheets of the *Jour. Can. Min. Inst.*, Vol. X, Toronto meeting, 1907.

†Professor of geology, Columbia University, New York.

CHARACTER OF DEPOSITS

Reverting again to the time-honored conceptions of the lenticular orebodies or *Kieslager* of the slate and schist of the Appalachian belt and of Rio Tinto, many of us will recall that these were esteemed our typical deposits. But in later years developments in the southwestern United States, in Mexico, and in Queensland, have proved the frequent occurrence and great importance of garnet zones produced by contact metamorphism in limestone along intrusive rocks. Bisbee and Morenci, in Arizona; San Pedro, New Mexico; Aranzazu and San José, Mexico; Chillagoe, Queensland; and many more have shown the importance and wide distribution of this type. Garnet, vesuvianite, wollastonite, and diopside, are the associated minerals, and the orebodies are of irregular shape. They often need secondary enrichment to bring them up to grade. They are not lenses, as are the ores at Thedford and Rio Tinto; nor veins as at Butte; nor beds as at Mansfeld; nor impregnations of shattered rock as at Nacosari; but are a new type when compared with our old conceptions.

One of our tendencies in earlier years was to connect orebodies, especially of copper, with basic eruptives. Keweenaw point and Sudbury gave good support to these inferences. It was also natural to infer that as iron and the other bases increased in rocks, therefore copper, lead, and other metals would do the same in less degree. But recent experience is just the opposite in the case of copper. Globe, Arizona, with its diabase, and the Nikolai and other greenstones of the northwest coast are almost the only basic ones that appear in the newer districts. On the contrary, we find quartz-bearing rocks of various kinds and more especially a fairly acidic variety midway between syenite and diorite, called monzonite. Bingham, Ely, Bisbee, Morenci, Nacosari, and the granite at Butte, all afford a similar experience. The great deposits of northern California are in rhyolite porphyries. We cannot but reflect that the acidic magmas are richest in dissolved vapors, that they probably in cooling yield relatively abundant magmatic waters; and that being at the outset copper-bearing, the orebodies are perhaps due to these characteristics.

CHANGE TO COPPER IN DEPTH

But the most striking feature of the last year or two is the tendency of mines first worked for other metals to yield copper in depth. From Butte we learn that the silver mines along the Rainbow lode, in which, in the upper workings, no copper was found, are now showing as much as 3 per cent. at 1000 ft. The old Black Rock claim, once a silver mine and a participant in the famous Black Rock-Niagara apex suit, is

being revived and deepened for copper; and others are actually yielding the red metal. The Cable gold mines, farther west in Montana, now supply 3 per cent. ore to the Washoe smelter. Bingham, once a lead-silver camp, has changed to copper. From Leadville the same report has been coming for some years, that much copper was found with the unchanged sulphides in depth. At Red Mountain, where, near the surface, lead-silver was formerly the yield of the ore, now, in the 1100-ft. adit into the mountain, copper has been found. In North Carolina, some gold mines of former years have become copper mines today. Most striking of all, at the great Mt. Morgan gold mine of Queensland, the diamond drill, at 75 ft., has shown great bodies of copper-bearing sulphides, which now go to the furnace, as the earlier gold ores went to the mill.

We have for years known that lead above often passed into zinc below. We may perhaps now add a still deeper copper zone, when, in the uprising waters that brought in the ore, copper was present with the other two. Gold above may also change to copper below, or be associated with it, and apparently not always because copper once general throughout the vein has passed downward with the atmospheric waters.

An interesting corroboration is thus afforded of views advanced by W. H. Weed in the paper already cited, of which one of the closing paragraphs is: "Ascending hot-spring waters, if metalliferous, may deposit different ores with an orderly vertical distribution. Existing veins now mined often show this arrangement of metallic sulphides."

Mining in Nicaragua

Consul E. W. Trimmer, of Cape Gracias á Dios, Nicaragua, reports that the mining industry in that district continues to show a steady improvement. Plants for the treatment of tailings by the cyanide process have been installed at several mines, and results have proved so satisfactory as to warrant a large increase in capacity. The output of gold bullion from this district now amounts to about 5000 oz. monthly. The electric power plant installed by one company has been in successful operation since February, 1906, and a new generator is now on the way and will be used to supply power to a group of mines. Transportation has been so much improved since the river steamer of the United States & Nicaragua Company was put in commission that it is now possible to get machinery and supplies into the mines at a fair cost.

The ore-bearing limits of the district have not yet been ascertained, but the lo-

¹Trans. Amer. Inst. Min. Eng. Vol. XXXIII, p. 754, 1903.

cation within the last two years of many ore deposits at distances of 20 to 30 miles from the main properties warrants the belief in a fairly continuous ore-bearing zone along 50 miles or more of the foothill region, with a width of from 12 to 20 miles. Owing to the thick tropical growth, prospecting as it is known in the United States is impossible. Natives as guides and machete men are necessary. Several rich placer deposits have been discovered and worked out by crude methods, but in the opinion of mining men the present and future prosperity rests on the large bodies of medium-grade milling ore.

Rich shoots of oxidized ore have been found at some of the mines near the surface, but below that point very little work has been done; in fact, there is not a hoisting engine in the district. Sulphide ores occur in large quantities, carrying from \$8 to \$40 per ton in gold; in addition there are sulphides of iron, zinc, copper, and lead. The mines are at an altitude of 1500 ft. above sea level and distant about 250 miles by river, or 100 miles in an air line, from the coast. For many reasons this is not considered a desirable country for a penniless miner, labor being performed very cheaply by natives, but for a mining man who can command a few thousand dollars the district is considered by engineers on the ground to be a promising field.

The new Nicaraguan mining code seems to meet the approval of all interested; by its terms miners are allowed to import everything required for the mines free of duty. Almost the entire mountain country is virgin land open to location, and while one large Pittsburg company has a mineral grant covering almost the entire district, it now grants prospectors terms which are almost as favorable as could be obtained from the Government. No known coal or oil exists in the district, but the multitude of small streams, with falls and rapids, make possible the use of hydro-electric plants for power purposes.

In the treatment of a zinc ore by the usual smelting process, a content of lead and silver (and also gold) in the ore can be recovered if it be desired. As to whether the recovery will be attempted, or not, is chiefly a question of extractions and costs. The first step in the metallurgical treatment of zinc blende is a roasting of the ore down to about 1 per cent. sulphur. In this process the loss of zinc is small, being seldom more than 2 per cent. in bad practice, and ordinarily in good practice considerably less than 1 per cent. The losses of both lead and silver, however, are heavy; the silver loss is likely to be 10 to 12 per cent. in the roasting of a 10-oz. ore, while the lead loss is fully 10 per cent.

Suggestions for Mine Staff Organization

Plan for Apportioning Duties and Responsibilities of Members of the Operating Force and Conducting the Work of the Departments

BY J. BOYD AARONS*

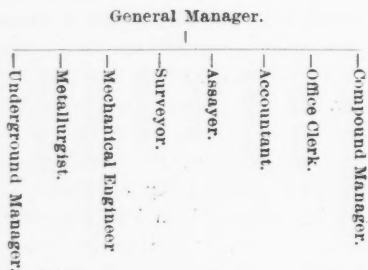
The purpose of this paper is to outline the organization of a Mine Staff, particularly that of a gold mine, following somewhat the system adopted in military organizations. But after outlining the duties and responsibilities of the various officers, the military analogy is not further pursued. A rigid, inflexible system of organization should not be attempted, for the reason that better work will generally be secured by giving each department head a certain amount of latitude.

GENERAL MANAGER'S STAFF

The general manager is directly responsible for the entire working of the mine. He appoints his own staff and assigns to each member of it his particular duties and sphere of action, each entirely responsible to himself for the efficient working of his department. All reports, correspondence, etc., from the mine are issued by the general manager alone, to whom also all outside communications are addressed or referred.

A clerk in the general manager's office has charge of all the mine's technical books, such as the assay books, the tonnage books, mill and cyanide-plant books, development records; and it is the duty of this clerk to enter each day, in these books, all working returns. He makes no alterations without the authority of the general manager, who attends himself to such matters as reconciliation of tonnages between the underground and mill departments, etc. This clerk will be instructed to allow the head of each department free access to the books recording the returns of his own department.

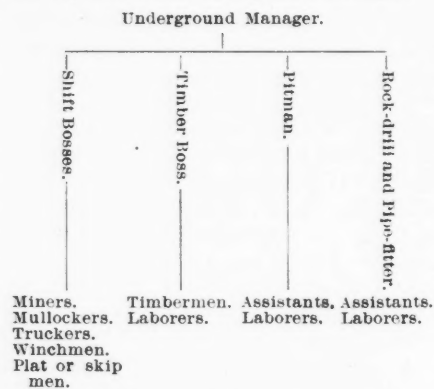
The general manager's staff is suggested in the accompanying table. It is understood that, in the case of a small mine, such a staff would be reduced by the fusion of two or more of the departments; but the full staff, with each department independently, would be necessary for the efficient working of the larger mines.



*Mining engineer, Kanowna, West Australia.

UNDERGROUND DEPARTMENT

The underground manager is responsible to the general manager for the economical working of everything underground. He is responsible for the safety of the underground workings and for all appliances therein. He delegates to his shift bosses and foremen the appointment and dismissal of the men working under them. But he reserves the right to veto any appointment, or to hear any complaint made by any of the men. He will see that all the men in his department are informed that, in case of dismissal, they may appeal to himself, and that, if dissatisfied with his decision, they may appeal directly to the general manager. This, however, does not apply where native or coolie labor is employed; when of this class, delinquents are reported to the compound manager.



The underground manager hands in to the general manager's office a daily return showing the quantity of ore, waste, and water raised during the day, and the places from which it has been taken. This return is generally spoken of as "tonnage or truck tallies."

He is supplied from the general manager's office with a daily list of samples taken, with full particulars of each sample, together with the result of the assay on each.

In conjunction with the surveyor, he submits a monthly report of progress.

The underground manager should generally accompany the general manager on his daily visit to the underground workings.

At the end of each month the underground manager is supplied from the accountant's office with a tabulated statement showing the month's costs against his department. This sheet shows the total amount of money expended and the cost per ton for each class of underground work; it also shows how each amount is made up (by wages, explosives, steel,

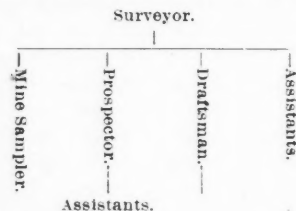
candles and sundry stores, costs of power, pumping, timber, assaying and sampling, repairs).

The "underground books" kept in the general manager's office are always open to inspection by the underground manager.

SURVEYING AND SAMPLING DEPARTMENT

The surveyor is responsible for the upkeep of all the plans, for all underground measurements, and for the efficient sampling of the mine, following out a system prescribed by the general manager. He has charge also of surface prospecting work.

The samples taken under the supervision of the surveyor are handed in to the assayer's office with a distinctive mark or number only. It is the duty of the surveyor to see that the general manager's office is supplied with a list of samples taken each day. This list will contain the distinctive mark or number of each sample, the place from which it was taken, the width the sample represents; or, if a bulk-sample, the number of trucks, skips, or tons which the sample represents. Special work, or the taking of check samples, may entail the appointment directly by the general manager of a special sampler.



The surveyor supplies a monthly return (in conjunction with the underground manager) showing the work done in development, and the amount, in tons, mined, arrived at in two ways: (1) by skip, or truck tallies; (2) by calculations based upon measurements of excavations.

The underground books are always open, to inspection by the surveyor.

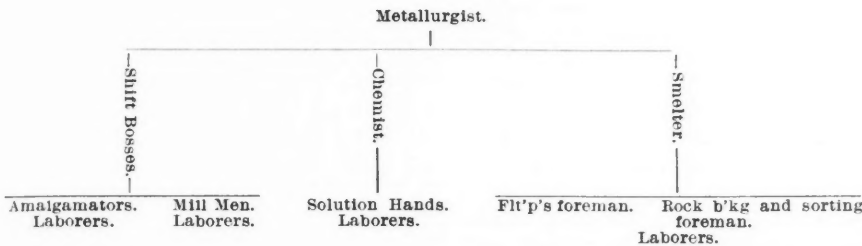
The accountant supplies the surveyor with a monthly statement showing the costs against his department, including costs per sample.

METALLURGICAL DEPARTMENT

The metallurgist is responsible for the economical treatment of the ore, taking charge of it from the moment it is landed on the surface until the residuum is dumped. His staff consists of three shift bosses, a chemist to assist him in experimental work, and a smelter to supervise

the "clean-up." (In many reduction works, however, a greater number of shift bosses is required, the different parts of the works being sometimes too widely separated to permit of one shift boss efficiently supervising the work. But wherever possible, only one man per shift should be responsible to the metallurgist for the running of the plant.)

departments. Where other metals besides gold are sought the assayer returns the amount of each metal present in each sample. He also retains for future reference a check sample of every sample turned into his office. He returns to the general manager's office a daily list of all samples, with their distinctive marks or numbers, and their results.



With regard to the employment of the men, the same conditions apply as in the underground department, with this important exception: the metallurgist must be personally acquainted with every man engaged for his work.

All samples taken in the mill are, as far as possible, taken automatically. The samples are handed in to the assay office, distinguished by numbers only, and a daily list of these samples, with full particulars, is supplied to the general manager's office. The metallurgist, in return, receives from the general manager's office a daily list of the samples, with their results.

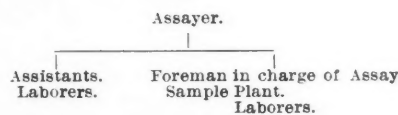
The metallurgist furnishes the general manager a daily return showing the quantity, in tons, of ore delivered to the mill, the tonnage of the residues dumped, the amount of amalgam (if any) deposited in his safe, the working times of each portion of the plant, together with explanations of any stoppages. His monthly statement shows the tonnages milled, arrived by two methods: (1) Skip, truck, or weigh-bridge tallies; (2) by calculations from residues dumped. It shows also the total run of each portion of the plant; the weight of the bullion recovered and its sources—by amalgamation of original ore, by amalgamation of concentrates, by cyanidation of concentrates, sands, slimes, etc.; the weight of accumulations, such as untreated concentrates, sands, slimes, slags, etc. The statement also includes an estimate of "gold in suspense," that is, an estimate of gold accumulated on copper plates, in zinc boxes, etc.

The metallurgist is supplied from the accountant's office with a monthly statement showing total and average costs for each branch of the treatment. The metallurgical books, kept in the general manager's office, are always open for inspection by the metallurgist.

ASSAY DEPARTMENT

The assayer is responsible to the general manager for a correct estimation of the amount of fine gold present in each sample landed in to his office from the various

As already mentioned, samples handed in to the assay office are distinguished only by a mark or number. But the assay work is facilitated and cleaner work assured if unusually high- or low-value samples are distinguished. If this practice were carried out by the various departments, the risk of erratic assays would be diminished, special apparatus being used for high-value samples.



Questions as to duplicate and check assays are left to the assayer. Being responsible for the accuracy of his reports, he must take his own precautions to insure the correct working of his office.

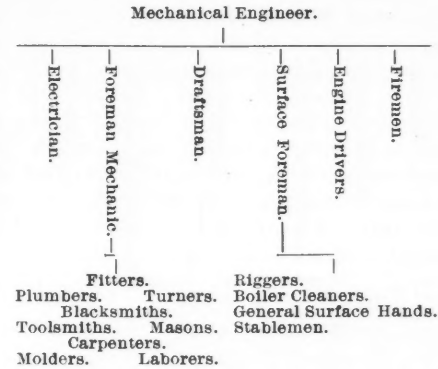
The assayer is supplied by the accountant with a sheet showing the total cost for the month and the costs for each assay.

MECHANICAL DEPARTMENT

With a small mine, some of the above departments would be merged in that of the mechanical engineer, who would himself combine the duties of engineer, electrician, surface foreman, and foreman mechanic, and having under him only fitters, blacksmiths, carpenters, toolsmiths, engine drivers and firemen, and the general surface hands.

It is the duty of the mechanical engineer to see that all the machinery on the mine is kept at the highest point of efficiency. He is directly responsible for every engine on the mine; and no part of the mechanical plant should be stopped without his knowledge, except in the ordinary course of work, or in emergencies.

The items of repairs to each department, shown on the monthly cost sheets, reflect on the work of the mechanical department. For instance, if the milling costs become high on account of extensive repairs, the explanation is sought not from the metallurgist, but from the mechanical engineer.

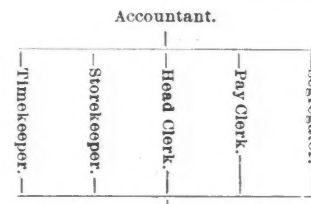


The mechanical engineer supplies daily returns to the general manager's office, showing the run of each portion of the machinery, causes of stoppages, and adding any "general remarks" that may be necessary. His monthly return shows the amount of fuel and water consumed, the horse-power developed, and the load carried by each engine; additions to plant, particulars of repairs, etc., and the present condition of each part of the plant. All ropes and cables are under the care of this department, and are specially mentioned in the mechanical reports.

The mechanical books are always accessible to the mechanical engineer; and he receives from the accountant's office a statement showing the distribution of the month's power costs.

ACCOUNTANT'S OFFICE

The accountant is responsible to the general manager for the management of all the commercial affairs of the mine, and for the keeping of all the mine books, other than the technical books before referred to. All outgoing communications and correspondence referring to commercial matters are signed by the accountant as well as by the general manager. These include commercial reports and copies of accounts sent to the head office. Checks should be signed by both accountant and general manager. All orders for supplies are issued by the accountant, but must be countersigned by the general manager.



(Assistants where volume of work renders them necessary.)

The accountant instructs the storekeeper generally in regard to his duties; in no case should any stores be issued without an order signed by a responsible officer. A list, signed by the general manager, of persons authorized to issue store requisitions, should be posted at the store. The storekeeper is responsible to the accountant for the proper keeping of all the store books.

The timekeeper is instructed by the

accountant to keep an accurate record of the time worked by each man in the mine. A system of timekeeping, which should be strictly adhered to, is instituted by the general manager and the accountant. This system should provide for checks on the timekeeper; that is, shift bosses and foremen should hand in to the office every day time sheets showing the work each man is engaged on, and the length of time he worked. Every man on the mine should be known to the timekeeper or his assistants; and if a search system be necessary the work caused by it is superintended by the timekeeper.

The accountant sees that the general manager is supplied with a daily return showing the number of shifts worked in each department, the total number of shifts worked, and the amount of money expended in wages for the day.

The accountant is responsible for all payments made from the mine.

Records of bullion, gold registers, and records of gold realization, not being regarded as technical details, are kept by the accountant.

At the end of each calendar month the accountant determines the total and average costs of each department. All technical details, such as tonnages (milled or mined), development footage, hours run and horse-power generated (for determining and distributing power costs), number of samples taken and assays made, are supplied to him from the general manager's office.

The segregator assists the accountant in the distribution of the wages.

THE COMPOUND

The compound manager is responsible for the maintaining of discipline in his province, for the equitable distribution of food, for the just satisfaction of complaints, and for the keeping of the compound in a sanitary condition. He is required to make a daily report to the general manager of the number and the condition of the boys in the compound; and, under the direction of a medical officer, he looks after the compound hospital.

The general manager should not make the compound manager responsible for the supply of the labor. This, as with all other sources of supplies, should be attended to directly by himself.

The compound manager is given as many white assistants as may be necessary; who will control the compound police, cooks, scavengers, etc.

Other duties that may devolve upon the compound manager vary with the country in which the mine is situated, the laws and customs governing the working of mines there, and the nature of the labor employed, white, native or coolie; and these conditions vary so greatly that all the compound manager's duties under the varying circumstances cannot be definitely outlined.

GENERAL CONSIDERATIONS

The most difficult part of the work of organization is the determination and limitation of the various departments. For instance, it is difficult to decide whether the sorting department should be under the metallurgist or the underground manager; or whether the mill engines should be in charge of the metallurgist or the mechanical engineer. But since these questions are of the utmost importance, some scheme of organization should be adopted.

The various officers should be required to make all important communications *in writing*, whether addressed to the general manager, or to the head of another department.

In the absence from the mine of the general manager or superintendent, another official temporarily assumes his duties and responsibilities.

New Caledonia Mines

According to a recent British consular report a large proportion of the mining labor of New Caledonia is at present of Asiatic origin, principally Japanese, with a few Indian coolies, and Javanese, some Tonkinese and a fair sprinkling of Loyalty Island natives.

EXPORTS OF ORE

| Year. | Nickel | Chrome. | Cobalt. |
|-------|---------|---------|---------|
| 1903 | 73,360 | 21,437 | 8,292 |
| 1904 | 98,655 | 42,197 | 8,964 |
| 1905 | 125,289 | 51,374 | 7,919 |
| 1906 | 130,688 | 57,367 | 2,487 |

Nickel—The production of nickel ore in 1906 was 130,688 metric tons, valued at £156,825, against 125,289 metric tons (£225,520) in 1905. In 1905 the ore for statistical purposes was valued at 45 frs. per ton and now is calculated at 30 frs. During 1906 several contracts were made for forward deliveries of large quantities of nickel ore during the next three years, some 60,000 tons of which has been purchased outside the nickel combination, the ore being destined for the Continent. Nickel ore could be produced much cheaper if the demand were greater and sales of ore sure, as mines once opened would then be able to keep on, in place of which the rule has been that after some two or three years producers have had to throw all their men out of work and wait for a contract before proceeding again.

Chrome—With the exception of the Tiebaghi mine and the Lucky Hit, no serious development has taken place in chrome of late; the production in 1906 was 57,367 metric tons, against 51,374 metric tons in 1905. This industry is at present virtually in the hands of one firm.

Cobalt—The demand for cobalt ores has fallen off greatly, so much so that the production for 1906 only reached 2487 metric tons, as against 7919 metric tons in 1905 and 8964 metric tons in 1904. The present price for cobalt ore of 4 per cent. grade is about 90 frs. per ton, with but few

buyers, unless the grade exceeds 4½ per cent., when a small rise per tenth of unit is allowed, varying from 2s. 6d. to 3s. 6d. per tenth from 4½ per cent. upward.

Owing to the mining law which came into force last July some thousands of acres have been abandoned by the Nickel Company and others, and there is no doubt that 1907 will see a still further reduction in the mining areas of the colony, owing to the stringent measures adopted by the administration and the want of a market for the product of the mines. The mining law compels the owners of mining lands to work their properties or else pay a double rent per annum if they fail to do so after a certain period; this is tantamount to forcing production on a limited market, and as the whole of the nickel produced in New Caledonia is virtually the product of about eight or nine mines and the chrome the product of only two mines, one gets a fair idea of the result of trying to force production on the world's markets, when it would be possible to more than double the present production with the greatest of ease, if necessary, in any of the three leading minerals for which the colony is noted—viz., nickel, chrome and cobalt.

Flooding the Homestake Mine

Some details of the work of flooding the workings of the Homestake mine, Deadwood, S. Dak., in order to gain control of the fire which started on the 600-ft. level on March 25, are given in the *Pioneer Press*, St. Paul, Minn. The order to flood the mine was issued on April 22. The workings are 1550 ft. deep and there are more than 100 miles of underground channels. The space to be filled amounted to 68,393,621 cu.ft. and required 507,000,000 gal. of water. The natural inflow of water into the mine filled it to the 1100-ft. level, and from there up the filling was supplied from the surface.

Water was turned in from the Ellison shaft, the open cut and the old Lincoln shaft was opened for this purpose. By means of a flume water was brought in through a tunnel at the north end, and a great part of Whiteweed creek was turned in through the Savage tunnel by a flume 3200 ft. long, 20 in. wide and 30 in. deep.

This gave a volume of water equal to about 7500 gal. per min., and this, with the mine water and the additional supply caused by heavy rains and snow, brought the water about 80 ft. on the 300-ft. level on May 29, thirty-seven days after flooding was begun.

A conservative estimate places the loss of bullion output at \$1,000,000. This does not include the cost of flooding, unwatering and repairs. The mine will be unwatered by means of 10 skips of a combined capacity of 10,000 gal., or, if steadily employed, 5000 gal. per minute.

Summer Meeting of the Coal Mining Institute

Of Unusual Interest Were Discussions of Coking and Non-coking Coals and of the Problem of Waste in Mining

SOME OF THE PAPERS PRESENTED

The summer meeting of the Coal Mining Institute of America was held in the Supreme Court room, at the court house at Pittsburg, Penn., June 11 and 12, 1907. The several sessions were highly interesting although attended by less than one-third the members. Valuable discussions followed the reading of each paper, and much light was thrown on the various questions and problems that were presented.

President Keighley in his opening address dealt generally with the sociological and technical conditions surrounding the coal-mining industry. One of the interesting statements in this address was "that the greater part of the trouble that occurs among employees in coal-mining towns is due to the excessive use of liquor sold at the different saloons." In dealing with this problem Mr. Keighley condemned the present practice of permitting saloons on or near coal properties and suggested that if no other remedy could be found, it might be well for the operating companies to establish or run their own saloons; or as a counter move have certain laws enacted limiting the profit of those selling liquor, to 6 per cent. on the capital invested. This plan of doing away with the profits accruing to the trade, it was said would make the business so unattractive that few saloons would exist. The plan suggested was said to be in successful operation in certain parts of the United States.

One of the most interesting and important papers read before the Institute was that submitted by Fred C. Keighley, general superintendent, Oliver & Snyder Steel Company. A brief abstract of this paper follows:

WHY IS IT THAT SOME COALS COKE AND OTHERS DO NOT?

Coke is used for different purposes, and consequently it is essential that various cokes should contain different qualities. Manufacturers object when coke contains more than 1 per cent. sulphur. Time, however, is changing the opinion originally held so that the same operators, who 10 years ago, required that coke should contain less than 0.75 per cent. sulphur, are now satisfied if the sulphur content is as low as 1 per cent. It is impossible to judge all cokes according to their chemical analysis, for if the consumer is a manufacturer of fine castings he would not object to as much as 1 per cent. phosphorus; on the other hand, if the manufacturer is producing bessemer pig iron,

he would require that the coke be low in phosphorus.

NEARLY ALL COALS CAPABLE OF BEING COKED

The seams mined in West Virginia, Pennsylvania and adjoining States are nearly all capable of being coked, although some coals produce better coke than others. Anthracite coal comes near to being an ideal coke; semi-anthracite is partly coked while in succeeding order, we have bituminous and splint bituminous coals, which have been less subjected to natural coking conditions. Splint coals are often chemically constituted the same as bituminous coking coals; however, it has long ago been proved that the chemical constituents of any coal do not form a sure index of its coking quality. In this relation, Mr. Keighley claimed that it is most important to consider the physical properties of any coal when determining its coking qualities.

PHYSICAL PROPERTIES THAT DETERMINE THE COKING QUALITIES OF A COAL

From long experience and observation, Mr. Keighley believed that those coals having a laminated or horizontal bedding are not so easily cokable as coal that comes from a seam where the bedding is vertical. The two varieties may have the same chemical constituents and still produce an entirely different grade of coke. Where the bedding is vertical, as in the Connellsville seam, we have the highest type of coking coal. In certain parts of Ohio where the bedding is horizontal, the coal, although showing the same analysis, is difficult to coke.

The peculiar and excellent cell structure of Connellsville coke is due to the physical nature of the coal. Even in the same basin, it is true that mechanical movements of the earth have been sufficient to influence and change the physical properties of the same seam.

The coal on the East side of the Connellsville basin is prismatic or fingery, while on the west side of this same basin, the earth movements have been sufficient to convert lignite into bituminous coal. One of the most important facts recently proved is that by crushing or pulverizing any coal, we may destroy its laminated structure and thus make it possible to coke the pulverized product. In this way it will eventually occur that certain coals now considered non-cokable, will be first crushed and made to produce good qualities of coke.

It is also true that a better grade of

coke is often obtained by mixing lean coal with a richer product. For this reason it is probable that the future will see coke plants located at railroad centers so as to mix different coals before coking. The Connellsville bed, which is 9 ft. thick, differs considerable in quality in different parts of the seam. It has been found in this particular case, that better coke is produced when the lean portions are mixed with the richer coals.

Moisture, sulphur and phosphorus are generally considered objectionable in any coking coal, although in certain instances, the two latter elements fill necessary needs. Phosphorus imparts fluidity to coal and often acts as a flux to some of the refractory elements.

As to the presence of ash, it is true that there could be no coal or coke without this constituent. Ash forms a nucleus around which carbon is deposited, and is to a coal what the skeleton is to the human body.

The coking properties of certain coals is therefore due principally to the position or angle at which the atoms in the coal seem to lie; it is therefore necessary before attempting to coke certain coals, to crush or pulverize the lumps so as to change the position of the atoms in relation to each other or in other words the physical properties of the coal. When the coal is laminated or has a horizontal structure, the gases cannot so readily pass up through the charge; on the other hand, when the structure is vertical, it is possible for the gases to pass up through the coal. It is necessary for the gases to permeate all the atoms and make a thorough mixture. This one fact is probably responsible for the success or failure that follows attempts to coke many coals. Experience has shown that even Connellsville coal can be better coked when crushed.

In one instance where two grades of coal were produced from the same seam, Mr. Keighley's attention was called to the fact that the coal in the middle of an oven was extremely rich, while the lean coal had rolled off to the side; as a consequence of this condition, the lean coal made poor coke around the edges, while the richer coal in the middle also made an inferior coke. When this coal was crushed and mixed, the coke produced was of an excellent quality. Again in certain cases, it has been noted that the different qualities of the same seam often separate in the coke, and form a different cell structure.

Investigations of the Waste in Mining and Preparation of Coal†

BY EDWARD W. PARKER*

During the first two years of the operation of the Geological Survey Coal Testing Plant, at St. Louis, Mo., the principal line of investigation followed was that to some extent directed by the law, which provided for "the testing of the coals and lignites of the United States to ascertain the most economical methods for their utilization."

LOSSES THROUGH WASTEFUL METHODS

The study of the most economical methods for the utilization of our coal resources has naturally suggested an investigation which would lead toward the most economical methods in the mining operations, and the prevention, as far as possible, of the waste incidental to the mining of coal and its preparation for market or for utilization. As all mining men are probably aware, there is more coal wasted per ton of coal sold or used in the United States, than in any other country on the face of the globe. The principal reason for this has been in the bountiful supply of mineral fuel with which nature has provided us, and because of this great supply we have been reckless and extravagant in the way we have mined our coal, as we have been almost criminally wasteful in the destruction of our forests. It was estimated, some quarter of a century ago, that we recovered barely 40 per cent. of the coal stored in the hills for our use. This was certainly true of the anthracite region of Pennsylvania. Coal was so plentiful and cheap that it was not considered worth while to incur the slightly increased cost of mining, which would have been necessary in order to insure a greater percentage of recovery. It is well known that millions of tons of coal, worth many more millions of dollars, have been irrevocably lost through these wasteful mining methods.

We have been improving in our behavior, driven to it largely by the approaching exhaustion of some of our rich coal beds, due to the "hogging" method of mining. But there is still more improvement to be accomplished. I have been informed that in one of the important coal-producing districts of western Pennsylvania there is now left in the mine from three to four feet of coal, for the reason that if it were mined out with the rest of the bed, the quality of the coke made from it would be reduced to below that of "standard" Connellsville. And yet, so I

am informed, this unmined bench is a usable fuel, and well adapted to steam raising or other uses than coke making. But the operators are mining coal for coke making, and the coal unmined is lost for all time.

It must be remembered that neither the Geological Survey nor any other branch of the Federal Government, is contemplating any system of mine inspection or espionage. The survey has taken up the study of waste in coal mining, not for the purpose of securing preventive or other legislation, but simply for the purpose of publishing information that will help the operator and the miner to secure a larger percentage of the coal in the ground, and also a smaller proportion of slack or screenings, when the market requires screened coal and the fines are practically valueless.

CHARACTER OF THE INVESTIGATIONS

The survey began this investigation about the first of the present calendar year, so there are as yet no results that can be given to the public. I think it is possible, however, that many coal men may be interested in the character of the investigation. In the first place, the field work is being done by a few young men who have been especially trained and instructed. When the usual survey requests for statistics of production were mailed, about the first of January last, a circular letter defining the proposed investigation was inclosed and operators were asked to let us know of any problems in the matter of mining waste which they had encountered, in order that we might have the benefit of any suggestions made thereby. The replies to these circulars showed that a general desire exists to cooperate with us, and many valuable suggestions for the outlining of the work were received.

The young men who have been sent to the field to collect the detailed information desired, have had experience with geologic parties in the examination of geological conditions, in the taking of samples for analyses, and in making sketches and taking notes. The work was begun in Illinois, and has been extended into the southwestern field, into western Kentucky and into Colorado. It will be taken up in Pennsylvania, Ohio, West Virginia, Indiana, etc., during the present summer.

METHODS OF OPERATION

In entering a certain district the field men are furnished with a list of mining operations, supposed to be typical of that district, and a list of men known to be interested in the subject. The field men have with them schedules of inquiries, but these are not printed in a form to have filled out by the operator or superintendent. They are made to serve as a guide in the asking of questions, the replies to which are written in a note book, and

made the basis for a report to the office.

The young man making the investigation at a particular colliery first notes the name of the mine and its location, according to district, county, and State, and the railroad or other transportation line on which it is located. He notes also the name by which the bed is commonly known, such as Pittsburg No. 8, Upper Freeport, Lower Kittanning, etc. He observes the character of the opening, as to whether or not mining is carried on by drift, slope, or shaft, and ascertains also the average depth from the bottom of the seam, below the surface. Entering the mine, he makes notes covering the general system of mining practised, whether by long-wall, retreating or advancing, or by room-and-pillar, double or triple entry, etc. If panels are used, he notes the number of rooms to a panel, and also where possible, secures copies of mine maps brought as far as practicable, to date. He visits two widely separated parts of the mine, and measures two general sections of the coal bed, making notes as to the character of the roof and floor, the partings and benches, and the bony and impure coal. These men are instructed to obtain samples of all the slate, bone, and other material thrown into the gob, taking separate samples from each portion of such discarded material which, in their judgment, might possess some fuel value. If it happens to be bone which he is sampling, the field man is authorized to take the samples either from the gob or from the dump, whichever, according to his own judgment, furnishes the best opportunity for sampling and also for possible future utilization. Samples of the roof and floor are also taken.

It might be of special interest to note here that the Geological Survey coal testing plant, at St. Louis, has recently made some tests of bony coal from West Virginia. This bone is entirely wasted, except for such small portions of it as might be used by miners for their own domestic needs. One of these samples contained 28.08 per cent. of ash; the other, 43.74 per cent. of ash. The only tests made were in the gas producer, and these tests showed that in the first case 1.48 lb. were used per electrical horsepower per hour developed at the switchboard, and in the other case, 1.95 lb. were used. These results are exceedingly interesting, showing as they do, an efficiency equal practically to that of Illinois or Indiana coals used in the producer, and from two to two and a half times the efficiency of Illinois or Indiana coals when used in the steam engine. They also show a much less consumption of coal per unit of power than is obtained from the very best steam coals under boilers. It is by the gathering and compiling of such information, and the making of these tests that the Geological Survey hopes to show the usefulness of this investigation of coal-mining waste.

†Presented before the Coal Mining Institute of America, June 11, 1907, by permission of the Director of the U. S. Geological Survey.

*Statistician, United States Geological Survey, Washington, D. C.

CAUSES OF WASTE

Another item which the field men are told to study carefully is the relation between the width of pillars, and the width of rooms. One of the principal reasons for the loss of coal in mining operations is driving too wide rooms and leaving too narrow pillars, with the result that the pillars are crushed and lost before it is possible to withdraw them. Our experience so far has been that while the initial cost per ton may be a little greater, the percentage of total recovery is much greater when wide pillars are left to support the roof and are then robbed out, allowing the roof to fall in behind. We are gathering figures covering the percentage of loss which is entailed by these different systems.

When pillars are robbed the men are instructed to ascertain what percentage of the coal is left, after robbing, and if not robbed, what is the total amount of loss represented by the coal left as pillars. The men are also instructed to ascertain whether the roof breaks through to the surface, and the thickness of the rocks affected by the roof-fall. Where any benches are left unworked in the mine, as in the case previously referred to, the field men are instructed to secure careful measurements as to the amount of coal left in these benches which is thus lost beyond recovery.

Another cause of waste is the actual method of mining. If the coal is undercut by hand or by pick, or if the undercutting is done in the fire clay, there are different percentages of coal wasted. This is particularly the case where the slack coal is not a merchantable product. It is claimed, in some districts, that a large amount of waste is caused by shooting the coal from the solid, the miners using large quantities of powder or other explosive, and making large amounts of small coal, sometimes endangering the property and lives of the men, but, from the miners' standpoint, securing a much larger amount of coal to the unit of labor expended upon it. This is a subject of much controversy between operators and miners, and if the efforts of the survey can bring about a better state of affairs, they will not have been made in vain.

There is still another cause of waste in coal mining which pertains to some fields and not to others. This arises from the payment of the miners on the mine-run or screened-coal basis. In Pennsylvania and West Virginia, Virginia and eastern Kentucky, and in some parts of Tennessee and Alabama, where the slack coal produced in mining is used for making coke, there is no question but that the miners should be paid by the run-of-mine, but where the market requires screened coal, and the slack is either wasted or sold at prices far below the cost of mining, the payment for mining on the basis of mine-run coal would undoubtedly tend toward waste. Miners are human, and if they are

paid as much for slack as for the prepared size coal, the temptation to use an excess of powder and thus blow down a larger supply of coal and at the same time make an excessive amount of slack, is very apt to be indulged in.

The proximity of other coal beds, particularly above the one being worked, may be adversely affected by the mining operations, and is another factor carefully noted. There are some beds in Pennsylvania which, in the earlier days of mining in that State, were considered rather thin for a profitable working, and have been irrevocably lost because of the settling of the strata due to the workings below them. Some day in the not so very remote future, the useless sacrifice of these beds will be greatly deplored.

Included in this investigation is also a study of the methods of preparing the coal for shipment, the ascertaining of whether or not all sizes are marketable at all seasons of the year, and if not, the proportion of the different sizes sold and wasted. We have also taken up the study of mechanical means of preparing and cleaning the coal by breakers, slate pickers, washers, etc., by collecting all possible data regarding the improvement in the quality of the marketable product which has been effected by washing, and thus abating waste. Large amounts of coal which were formerly wasted because of their impure character, are now being made marketable by washing.

A Brief Study of Social Conditions in the Bituminous Coal Region of Pennsylvania †

By C. L. FAY*

To have a reasonable conception of the sociology of the mining town it is necessary that we study the social condition of the whole region, and that we consider four classes in their relation one to the other, viz.: the native-born inhabitants, the English-speaking miners, the foreign-speaking miners and the employers.

A generation ago this region was a great stretch of agricultural and lumber interests. The communities were composed mainly of native-born citizens, sons of sturdy pioneers, raised under the influence of American institutions, filled with patriotism and recognizing a high moral standard.

The development of the mining industry wrought many changes; the country soon lost its former identity, and the mines changed local aspect and environment. Many of the landholding native citizens disposed of their property to the

†Read before the Summer Session of the Coal Mining Institute of America, Pittsburgh, Pennsylvania, June 11, 1907.

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coal companies and removed with their families to the larger centers of population. Those remaining had entirely new conditions under which to live.

The demand for laborers in the mines caused men of other lands to avail themselves of this opportunity to improve their condition. The advent of the foreigner made a peculiar intrusion upon the native Americans. A closer watch upon property became necessary; and in many instances they were prevented from doing as they had been heretofore, that is, going in and out at all times of the day or night without fear of danger. The school life of American children was changed considerably, for they had to mingle with the children of the newcomers. As a consequence it is scarcely to be expected that the native population could look with any particular favor upon the people who to them were intruders upon their American rights and institutions. Sunday, the day cherished by this native-born people, became a day for riot, revelry and carousal. While it was not necessary that they participate in these things, still it was impossible for them to escape the disagreeable and oftentimes revolting and dangerous results.

The second class under consideration, the English-speaking men from Scotland, England, Ireland and Wales, formed the real basis of the social life of the early mining towns, and by thrift, study and perseverance became the dominating factor in the upbuilding of the great mining industry, until today this class occupies the responsible places, from the least office to the greatest. These people readily adapted themselves to American principles, became loyal citizens and the ruling class in the mining communities.

THE FOREIGN-SPEAKING MINER

The foreign-speaking man, like the English-speaking immigrant, came to meet a recognized demand; and came, too, without intention or desire to burden a community or intrude upon the rights of others. In order to better understand something of him, we must recognize the conditions under which he lived in other lands, and discover the training and control that through generations had made him what he was.

He was downtrodden and oppressed; was the least of several classes, and had no identity; this latter had been lost in the state of serfdom. His conceptions of liberty were such that here they meant license. A part of his training had been to observe many holidays, and it was necessary to meet him with such prejudices and ignorance.

As he enters these one-time agricultural towns he is not received with any particular warmth or welcome by the earlier residents. It is not long before he learns he is a "Dago" or "Hunky." No high ideals are placed before him, nor are our American institutions and principles of

patriotism made intelligible to him, but he meets the need in the mines. He makes a wage which he never before has known. His natural tendency is to congregate in colonies speaking his own tongue. There he is exploited by alert schemers and money-getters, easily becoming their prey. It is not long before he is revelling in drunken brawls, being incited by the liquor interests to additional drinking tournaments upon every possible excuse. Naturally this course leads him to the county jails, which become crowded beyond their capacities. The inbred class prejudice of these people is easily fomented. They readily come to look upon all employers as lords and tyrants, and, because of their numbers, under leadership they become a mighty factor in the political and industrial economy of Pennsylvania. The second generation of this class, the children born in this country, show marked development; and the more ambitious are looking toward the responsible places now held by the English-speaking class, and in some instances are looking toward the positions of authority in civic affairs. Thus we find the third class under consideration, in its new-found wealth and liberty.

THE EMPLOYER

The fourth class, the employer, has an important part in this analysis. In meeting the imperative demands from ships of commerce, ships of war, railroads, steel mills, innumerable smaller industries and the fireside, he has sought—and not without profit—the riches of Mother Earth, and has furnished the means of power and warmth to the needs of a remarkable generation.

To operate the mines it became necessary to find more men willing to labor underground than was supplied by this country and the English-speaking immigrants. The serf of other lands found a hearty welcome and a place on the "pay-roll." (Indeed, in some places the demand is not yet fully met.) In the heat of the construction and development of the great coal industry it was enough for the employer that the miner could dig coal. The former was busy with the promotion of the huge mining enterprises, engrossed in the experiences of money-making and in the improvement of personal and family environment. He was in a whirl of affairs from out of which he could see his great undertaking only as a complex machine, the miner forming a legitimate part that seemingly required little attention. True, in some instances and at certain times he might think of the employee and his family in regard to their personal needs and conditions, and give aid in individual cases here and there, but such matters usually were outside the vision of the employer. That there was a real need that serious thought and care be given by him to the mind and character of the employee was out of the ques-

tion. At many places where drunken brawls, resulting in fights and murders, became unbearable, also limiting the operation of the mines, the superintendents and foremen introduced severe measures, invoking, as far as was possible, the arm of the law, and attempted also to prevent the "beer-wagon" business and other evils, in self-protection. But these expedients were combative only, not, as a rule, remedial, and in many cases were but temporary. In other instances, where the operation of the mines was limited by general or local strikes, the employers in some districts met with representatives of the men, and a diplomatic battle would ensue until a bargain finally would be made and a working agreement entered into for a year or more.

As certain causes led the miner to believe his employer a tyrant, so certain experiences led the operator to look upon the employee as unreasonable and greedy, a spirit of conflict being the result. Many policies found place in the minds of both employer and employee. Among the more radical was, on the one side, the spirit to "crush," and, on the other side, the spirit to "force." These conditions are gradually changing, however, as the employers and the more intelligent among the employees come to realize that back of all this there is a cause which must be dealt with wisely, seriously and with patience.

THE MINING TOWN

When we consider, then, the sociology of the mining town, we must have in mind these four classes, their relation one to the other, their past history, and history of the communities.

The type of town varies so greatly that while similar conditions obtain more or less, yet each place has its peculiar local social problem.

There is the town without a church, or other place for wholesome entertainment or recreation, nor any visible means to promote plans that will result in the moral education of the men. Eighty-five to ninety per cent. of the men are foreign-speaking, and the town has poor sanitary conditions. Surely there is little in such a community to preserve, develop or repair the human machinery. Then there is the town with its church, or churches, its Y. M. C. A. building, or a club building and athletic grounds, its various societies for the good of men, its more modern houses, cleanliness and higher moral tone. The population may include all four of the classes here considered. Then there are the towns ranging between these two extremes. The greater number, however, are nearer the former standard than the latter.

It is safe to predict that the next five to ten years will witness very marked changes in the coal industry, and with this further development the tendency will be toward more economical mining. At the

same time the work will become more difficult as the lower seams are reached. New methods will be introduced. Greater skill will be required. More trained men will be needed; and with this change and growth, the social needs of the mining communities will be closely related and should not be lost sight of in the general advancement.

NECESSARY REMEDIES

The remedy for present undesirable conditions at many places, is apparent. It is education both moral and technical; it is adequate mediums for social betterment; it is better sanitation; it is legislation that will properly control the liquor traffic; it is enforcement of that legislation, and it is reasonable discipline that may for a time need to be rigid to such a degree as to appear severe.

The problem becomes an imperative demand that appeals to every intelligent American citizen and has a just claim upon the thought, time and resources of the employer, and calls also for a ready response and constructive interest on the part of the employee.

In dealing with this problem there should be the same honesty of purpose, sagacity and conservatism as is manifested in the development of the great industrial enterprises and institutions of our country.

Colliery Experimental Work of the Geological Survey*

BY CLARENCE HALL†

From the data collected by the Fuel Testing Department of the United States Geological Survey, it appears that the large explosions in mines are caused by fire-damp or coal dust which has been ignited in many cases by blown-out shots. I have recently returned from a tour of inspection in Europe, and found that they have been working on this subject for 15 years. In Europe the mine owners, the miners, the government and the manufacturers of explosives all cooperate in the effort to prevent the dreadful explosions.

From our investigations so far, the United States is behind Europe in safeguarding the lives of the men in mines. England and Belgium have had for years splendid experimental stations, and in these countries there are but few casualties in the mines. The Belgium mines are notorious for the presence of fire-damp, yet that country has enjoyed a wonderful immunity from these terrible explosions.

PERMISSIBLE EXPLOSIVES

As a result of the experiments in Eng-

*From a paper read at the meeting of the Coal Mining Institute of America, Pittsburg, Penn., June 11 and 12, 1907.

†Explosives Expert, U. S. Geological Survey.

land, there are a number of "permissible explosives," and these must be used by the miners in the blasting of coal, and no others. They also have in Belgium what is known as the "limit charge," which must not be exceeded on pain of severe penalty. In the various States here there are but few regulations, and none in many States, when it comes to the kinds of powder to be used.

My investigations have thus shown there are explosives made which will not ignite fire-damp or coal dust, even when a blown-out shot has resulted, provided the miner does not exceed the "limit charge."

All explosives, if used in too large quantities, will ignite fire-damp or dust, and for that reason they have the limit charge. They have some explosives the "limit charge" of which is 900 grams; others in which 700 grams is considered the safety limit; and many are limited to 500 grams. All safety explosives are characteristic in the fact that they give a very low temperature at their ignition point, and produce a very small flame and of short duration.

I think we will have the support and co-operation of the miners, operators and manufacturers of explosives in this country, and expect to see on the market in a very short time a number of safety explosives.

EXPERIMENTS PLANNED

We have completed our plans for an experimental station at which tests of the various dynamites and powders used in blasting coal will be made with a view of determining accurately their safety in the presence of the deadly fire-damp, and perhaps equally deadly coal dust. Explosives of all sorts will be hurled by means of a mortar into a mammoth boiler-plate cylinder, which has previously been filled with gas, and the effects will be carefully noted. If ignition fails after severe tests, the explosives will be known as "permissible explosives," and their use will be urged upon the mine owners of the country.

In addition, there will be important experiments in rescue work. One part of the station will be fitted up as a miniature coal mine, and miners and operators will be taught the art of saving the lives of fellow men. We are positive that in serious gas explosions in mines hundreds of lives could be saved were it possible for the rescue party to enter immediately after the accidents. As it is now, the deadly fire-damp often holds the men back for hours, while their comrades are slowly being suffocated or burned to death.

In our investigations so far we have found an apparatus in Europe which when worn by the members of a rescue party, enables them to enter any place where there is gas. At the experimental station the miniature mine will be filled with dense smoke and practical demonstrations in the saving of life with this apparatus will be made.

A definite location for the experimental station has not been selected, but it is probable that the station will be in the Pittsburg district. The construction of this station will approach as near as possible the working conditions of a mine, and will be erected along the lines of the English and Belgium stations. It will consist of an explosive laboratory where the analyses will be made of all explosives now being used in this country. All the explosives which have passed the tests successfully will be published. At regular intervals analyses will be made, and if any deviation is noted from the original analyses, the explosive will again be tested, and if it should not pass it will be stricken from the list and mine operators notified. We do not expect the manufacturers of explosives would alter the composition of the original explosive for the purpose of reducing the cost of manufacture, but these precautions will be taken to protect the lives of miners.

EXPLOSIVE GALLERY

In addition to the laboratory there will be an explosive gallery in which the explosives are to be tested, and will be in the form of a cylinder 100 ft. long and 6 ft. 4 in. in diameter, lying on the ground. An explosive mixture of fire-damp and air in one case, or coal dust and air in another, will be pumped into the cylinder and the explosive to be tested will be shot into it from one end by a big steel mortar, so that the flame and products of combustion will go right into the fire-damp. If the station is erected within the Pittsburg district, natural gas will be used for testing purposes.

The cylinder is to be made of heavy boiler plate. Safety valves will be placed all along the top, and will be left unfastened in such a manner that whenever there is an explosion the valves will fly open on their hinges. A series of port holes on the side, covered with one-half-inch glass, will enable those conducting the experiments to witness the explosions from the observation house, which is to be parallel with the cylinder itself.

While these tests are being conducted, operators and miners will be invited to be present. In this gallery the limit charge of all explosives will be determined.

SAFETY LAMPS AND TAMPING

There will also be a lamp gallery in which all safety lamps will be tested. The lamps will be placed in the gallery and the explosive mixture of gas will be drawn through the gallery at different velocities. The gallery is so constructed that the lamp can be placed at any angle to the current. It has been demonstrated in Europe that there is a vast difference in the safety and efficiency of safety lamps. Some lamps will stand the horizontal current, but on a slanting current at high velocity in less than five minutes will cause an explosion.

We will have apparatus for testing the strength of explosives. While the safety of the explosive is of great importance, we cannot overlook the fact that the efficiency of the explosive must always be considered. Other apparatus for determining the rate of detonation and the duration of the flame will be installed. Photographs of the length of the flame will be determined by the camera at night.

I might mention a suggestion made to me by a prominent coal operator when I was in the Indian Territory, about ten days ago. He suggested that we would make a series of tests in the gallery using different kinds of tamping—clay, slack coal, dry and with different percentages of water. He believed if the slack coal was saturated with water the temperature at the ignition point of the explosion would not be sufficient to vaporize all the water and consequently there would be no ignition of the tamping, which might produce disastrous results. I consider his suggestion a very valuable one, and it will be one of the first experiments made at the station.

"Coalite"—A New Fuel

According to a newspaper published at Newcastle, England, a good deal of interest is now being centered in "coalite," which is a new fuel made from coal by subjecting the latter to a partial distillation, much the same as in the manufacture of illuminating gas or of coke in by-product ovens, but not carrying the distillation so far.

It is claimed that the new fuel makes no smoke and develops something like twice the heat of coal, while a "coalite" fire lasts 40 per cent. longer than an ordinary coal fire. Moreover the by-products are said to be richer than those obtained in the manufacture of coke. Out of a ton of coal, about 70 per cent. of "coalite" is obtained, but its calorific power being much greater than that of the coal, the ton may be said to have suffered no loss in value, while at the same time the gas and a vast range of by-products have been extracted. Contracts are said to have been entered into for the sale of upward of two million tons of coalite per annum for consumption in London alone.

Of course, there is a good deal of nonsense in the above claims. The gas and tarry products cannot be driven off from the coal without taking away from the calorific value of the original coal. However, it may be that the carbon remaining after the elimination of the volatile matter may be capable of being burned at an increase in efficiency as compared with the original coal which may offset the loss of part of its heat units. But there cannot be anything especially new in the process, except perhaps in connection with the apparatus employed for the manufacture.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

Rubber valves are used in ordinary pumps when handling cold water, but brass or other suitable material is required for hot water or oil.

Compressors used for mining, tunneling and air lift-plants should be simple in construction, durable, and easily repaired. The wearing surface should be large and adjustments should be provided for taking up wear. The clearance spaces should be reduced to the minimum and air cylinders water jacketed.

The successful operation and value of a condensing apparatus depends directly on the maintenance of a high vacuum. This condition can be obtained only by an air pump that takes full strokes and the condensing chambers should be equipped with an improved device for applying the cooling water, thereby obtaining the most efficient results.

Installation of plant, either mining or milling, must be carefully considered with respect to the probability of reimbursement of the first cost of the plant. If there be only 100 tons of ore to be hoisted out of a shaft it is both better engineering and better business to raise it by windlass than to buy a steam hoist, and this same principle obtains throughout mine operation.

The power exerted by a steam engine during a single stroke of the piston is due directly to the difference in the pressure on the opposite sides of the piston. The value of a vacuum of 26 in. of mercury to an engine is equivalent to a net gain of about 12 lb. of average pressure per sq.in. of the piston area. The amount of power thus gained bears nearly the same ratio to the power developed by the engine when non-condensing as 12 lb. does to the mean effective or average pressure of the steam in the cylinder.

The Lehigh Valley Coal Company plans to erect a new breaker at Jeanesville, Penn., and ground has already been broken for the structure. The building will be 129x110 ft. Although the operations at Jeanesville have been practically abandoned for years past, it is known that there is a vast amount of coal there, which will now be prepared for market. It is rumored that when the new breaker is completed the Yorktown breaker will be abandoned, the intention being to send the coal from that mine to Jeanesville for preparation.

The grade and character of steel is usually known by the per cent. of carbon it contains. Steel used in structural work varies in tensile strength from 55,000 to

70,000 lb. per sq.in. of sectional area, and from 0.10 to 0.25 per cent. of carbon. When steel contains 0.15 per cent. carbon, it is considered "soft"; when 0.15 to 0.30 per cent. of carbon is present, the steel is known as "medium"; above this percentage of carbon it is called "hard steel." Steel below 0.10 per cent. carbon is capable of doubling back without fracture after being chilled from a red heat.

Under normal conditions, condensing engines require from one to one and a half gal. of condensing water per minute per indicated horse-power. Surface condensers for compound steam engines require about 2 sq.ft. of cooling surface per horse-power, ordinary engines will require more surface according to the economy in the use of steam. It must be remembered that the air pump should be set lower than the condenser in order to get satisfactory results. Roughly speaking, a good condenser will save one-fourth of the fuel consumed, or in other words, increase the power of the engine one-fourth, the fuel consumption remaining the same.

To find the diameter of pump plungers to pump a given quantity of water at 100 ft. piston speed per min., divide the number of gallons by 4, then extract the square root, and the result will be the diameter in inches of the plungers for single double-acting pumps; for duplex double-acting pumps, divide by 8 before extracting the square root. To find the number of gallons delivered per minute by a single double-acting pump at 100 ft. piston speed per min., square the diameters of the plungers, then multiply by 4. For duplex double-acting pumps, multiply by 8. For example, a 10-in. duplex pump will deliver $10 \times 10 \times 8 = 800$ gal. of water per min. at 100-ft. piston speed.

Unlined linen hose is best adapted for mine work when in short lengths. "Mill hose" is better than unlined hose for long lengths, but the ordinary best quality, smooth, rubber-lined hose is superior to the "mill hose," having less frictional resistance. Use double lines of hose and a Siamese nozzle for a long distance and a hot fire. A double line, 1000 ft. long, delivers a 1¼-in. stream with the same force as a single line 287 ft. long. Small streams should be used for a small fire, but for larger hot fires use a 1¼-in. or 1¾-in. stream. When a stream is effective it always makes a black mark wherever it hits and cools the burning coal. Small streams are converted into steam before touching the fire.

The amount of scale-forming matters in

any river water varies from season to season and from day to day; in wet season or after a rain, water will be found to be comparatively pure, as the scale-forming matters are diluted by rain water. In a dry season the impurities in water are highly concentrated as its volume decreases. Water found in coal mines is apt to contain a large amount of sulphuric acid; if such water is used in a boiler, it will quickly corrode the boiler. Water highly charged with carbonic-acid gas will also corrode the boiler. Water containing chlorides of calcium and magnesium should not be used in boilers, inasmuch as the hydrochloric acid (which is set free by heat) will attack the boiler.

To insure the successful running of a pump, the suction supply must be steady and full. If the suction pipe is long, the size of the pipe should be increased to counterbalance the increase in the internal friction. The run pipes should be as straight as possible, using round bends instead of elbows and Y's instead of T's. Suction pipes must be perfectly air tight. Even a small leak will prevent proper running of a pump. On high suction lifts provide a foot valve and a strainer. A pump should never be placed more than 20 ft. above the level of the water. The stuffing boxes should be loosely packed. Boiler-feed pumps should be run slowly and constantly. In case of trouble with a pump, always make sure that the water valve and pipes are all right before examining the steam end.

All natural waters contain more or less mineral matters, either in suspension or in solution, and the relative degree of purity depends on the locality in which they occur. The impurities are divided into general classes; first, corrosive impurities; second, scale-forming impurities, and third, alkaline impurities. The corrosive impurities are: Sulphuric acid, carbonic acid, sulphate of iron, sulphate of copper, chlorides of calcium and magnesium. The scale-forming impurities are chiefly: Carbonates of calcium, magnesium and iron; and sulphates of calcium and magnesium. The alkaline impurities are: Carbonates, sulphates and chlorides of sodium and potassium. Waters containing a large quantity of either sodium or potassium in the form of chloride or carbonate are very difficult to purify; neither of these latter impurities can be removed, except by distillation; but water containing these salts can be greatly improved and rendered fit for boiler use by removing the other impurities which the water contains.

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The Anthracite Suit

The petition which was filed by the Government in the United States Circuit Court in Philadelphia, on June 12, to dissolve the combination which is said to exist among the coal-carrying railroads in New York and Pennsylvania and the leading anthracite coal companies, is a direct attack under the anti-trust law against an alleged conspiracy in restraint of trade, including an agreement for the marketing of the product and fixing the price thereof. It has been distinctly the tendency in American industries for several years to aim at such monopolies, which attempts have met with more or less success. Irrespective of whether there is any agreement, illegal or otherwise, among anthracite producers and common carriers, the fact is undeniable that the price for anthracite coal has been for many years, and is still, fixed in some way; and that there has been no competition manifested by differences in price at which coal is obtainable. In other words, the sellers fix the price, which may change from month to month, or from period to period, and the consumers have only the option between paying the price asked or going without what is in this case an article of necessity. In so far as the consumers of domestic coal are concerned, the understanding extends to the retail dealers, or they have local understandings of their own. In most cities and towns of the Atlantic seaboard one price is quoted by all the local dealers. At the beginning of May a small reduction is made, sufficient to induce the consumers to carry the stocks which otherwise the dealers and producers would have to carry; but as the autumn approaches the price goes up, attaining a maximum in the winter, and so the circle is completed year after year.

From the standpoint of the producers this is an ideal condition. The Standard Oil Company has aimed to achieve the same thing in the marketing of petroleum products, and in general has succeeded, although it is occasionally subject to local competition. The United States Steel Corporation fixes the price for steel products. The American Smelting and Refining Company fixes the price for lead, but although both those concerns are by far the largest producers in their respective industries, there is sufficient outside production to afford competition, if the outside producers choose. However, up to the

present time they have not so chosen, but their complacency has rested upon a generally rising market, in the case of lead at least, and the general acceptance of a fixed price has not yet stood the test of a seriously declining market. Somewhat different conditions exist in the copper market, wherein the attempt to establish a fixed price has not met with general acceptance, except for very brief periods, and then only in a general way. In the anthracite market the regulation of price has stood the tests of many kinds of adverse conditions.

However, the intention of the present suit must not be confused by pointing out merely the similarity in the end aimed at, viz., the regulation of price. In the case of the anthracite companies the Government charges that they have entered into illegal agreements for the restraint of trade, while some of the other trusts that we have mentioned, which are simply very big companies, probably have done nothing whatever that is illegal. The defense of the anthracite companies will doubtless be that during the former times of unrestrained competition a dangerous commercial condition existed, which was so bad that two of the railways were compelled to go into bankruptcy, while the competition from all quarters led to coal being forced upon an overstocked market at consequent cutting of prices to an extent that jeopardized many of the anthracite investments. A similar situation was among the reasons for creating other trusts. The American Smelting and Refining Company was the successor of an association which had previously been organized to do away with the disastrous competition among the Colorado and the Utah smelters. The United States Steel Corporation was organized to ward off a threatened war in the steel trade. Whatever may be said in defense of such a policy, which in its results to the trusts themselves has certainly been a successful one, it will be an unfortunate day when competition is eliminated from our industries. As the *Evening Post* remarked in connection with the anthracite suit: "If there is any good basis for the Government's assertions, a virtual monopoly in a necessary of life has been created. It may be a benevolent monopoly; the facts on that point remain to be proved. But the experience of markets is that the benevolence of monopolies can never be safely left to their own devices. The State may

not destroy them, but it cannot ignore the duty of supervising and restraining them."

British Smelters and the New Employers' Liability Act

In addition to being included in the Alkali Act, as mentioned in a recent article, the British smelters have other difficulties to face in complying with the provisions of a new employers' liability act, which comes into force on July 1. Their inclusion in the Alkali act will not give rise to much trouble or inconvenience, but the employers' liability act is causing the smelters a good deal of anxiety. The act was passed last year in the interest of the labor party, and its provisions are very stringent. It provides that if an employee meets with any accident or contracts any disease in the course of his employment, due to the employment itself, the employer shall be liable for full wages during the period of disablement, however long; and in case of death the employer is saddled with heavy compensation. This act, of course, affects all trades and occupations, even domestic servants being included.

Among smelters the evil effects of lead poisoning is receiving the chief attention of the Government authorities, and very strict and inconvenient inquiries are being made by the officials. The inconvenience arises from the examination of processes usually kept secret, for the presence of even a Government official in such works is not at all relished. The lead smelteries and white-lead works are especially affected by this act, and even the zinc works are being worried on the subject. In the South Wales zinc works symptoms of lead poisoning are occasionally met with, but the cases are never severe, and a fortnight's rest is usually sufficient for recuperation. As a matter of fact, the blende used in most of the works rarely has a large lead content, ores containing more than 2 per cent. not being usually bought.

Some of the zinc smelters are now medically examining their men with the object of ascertaining which of them are especially liable to lead poisoning, and discharging such men before the act comes into force. This is a distasteful method to have to adopt, but owing to the difficulty in ascertaining the ultimate burden imposed by the act, the employers can hardly be blamed. The South Wales smelters, both in copper and zinc have hitherto been, as a rule, friendly with their men,

and there are at the present time a considerable number of pensioners who have worked all their lives at the furnaces until they were unable to work any longer. Under the protection of a favoring law, the men's illnesses and disablements might grow rampantly. It is possible that even the good Samaritan might have passed by on the other side also, if he had been by law made liable to keep the man that fell among thieves for the rest of his life.

Coal Mine Inspectors in Pennsylvania

The bill making all persons holding mine-foreman certificates under the law relating to anthracite coal mines eligible to candidacy for the office of mine inspector, which was introduced in the legislature of Pennsylvania at the instigation of the Miners' Union, passed the legislature, but on June 12 was vetoed by Governor Stuart. Our readers will bear in mind that we opposed the bill at the time its introduction was talked of. The reasons given by Governor Stuart for his veto are the same that we advanced in our editorial upon the subject several months ago, and indeed the language of the governor's message followed closely what we said. It is unnecessary, therefore, to make further comment than to express our gratification that the proposed law has been vetoed in so positive a manner, in which the colliery operators, managers and superintendents, together with the miners who have no petty interests of their own to further, will heartily join us.

Another bill vetoed by Governor Stuart is the one providing for additional inspectors in the anthracite districts. "Under the present law," says the governor, "there are 20 inspectors in the anthracite region, and the purpose of this bill is to increase the number to 30." The governor states that he is of the opinion that there is no necessity for this large increase in the force of inspectors. This also is a proper veto. Adequate inspection is highly to be desired, but until the present force of inspectors is developed to the proper degree of efficiency in the exercise of the duties of their offices, which at present they are not (for reasons which it is not necessary to discuss at the present time), it would be useless to increase the number. The attention of the State of Pennsylvania should be directed toward organizing the present body of mine inspectors so that it

will accomplish the most of which it is capable; after that it will be time to consider adding to the number if the work to be done proves more than the present inspectors can successfully handle.

Electrostatic Separation in Wisconsin

We have called attention, both editorially and through a series of important technical contributions, to the striking manner in which the process of magnetic separation has developed the zinc district of Wisconsin into an ore producer of great consequence. We have also referred to the introduction of the electrostatic process of separation in that district, which after a more or less extensive trial was abandoned. The failure of the electrostatic process, if it be considered a failure, was due rather to poor judgment in the location of the plant than to the demonstration of the inapplicability of the process. As a matter of fact, the process gave an excellent separation of the blende and marcasite, at a cost which would be moderate in a properly designed plant of suitable size. Consequently, it is interesting to receive the report that the electrostatic process is to have another trial in the Wisconsin field. If this be made under suitable conditions, and prove successful, it will add not only to the production of zinc ore, but also to the production of sulphur ore, which now is worth \$4 to \$6 per ton, and is produced by the electrostatic process in a good marketable form.

IN OUR ISSUE of last week we published an interesting article by Mr. Walker on the smelter smoke question in Great Britain. The new law, to which he calls attention, does not seem to worry the smelters very much. So far as our information goes, none of them has been required to do anything as yet. Indeed, the Cape works is probably the only one that may be requested to comply with the terms of the new law. However, at present everything is in suspense, and it is difficult to prophesy what eventually may be done. The steel works and tin plate works behind Swansea give out far more smoke than the smelters, yet they do not come under the new law at all. The lack of interest in the matter is evidently due to the fact that the smelter smoke question is not a serious one in Great Britain.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

The Elmore Vacuum Flotation Process

An editorial in the JOURNAL of May 11, 1907, on the Elmore vacuum process makes it appear that its readers would be interested in learning something about the operating cost of the process. An actual statement covering the costs at any one mine would in no wise serve as a criterion of the costs at another mine since such costs are dependant upon the character of the ore and upon the accessibility of the mine to sources of supply.

The items involved in the costs of operating outside of crushing, are oil, acid, labor, power, wear and tear. The treatment of every ore is more or less a study by itself, some requiring more acid or more oil than others. In general it may be stated that the operating costs on ores that are well suited to the vacuum process are about the same as the costs of a modern water concentrating plant. Items involved in the costs vary as follows: Crude oil, 1 to 3 gal. per ton of ore; sulphuric acid, 1 to 20 lb. per ton of ore; labor, one attendant per shift in a plant of 200 tons capacity or less, there being no manual labor involved. The wear and tear is so slight as to be practically almost negligible and is principally confined to the vacuum pump.

As an example of the very low concentrating cost in one instance, attention is called to the Tywarnaile mine in Cornwall where the vacuum process is in commercial use and is employed in concentrating copper ore from dumps, which assays only 0.5 per cent. copper. At this plant the total labor cost chargeable to concentration is the wages of one boy per shift. Three quarters of a gallon of crude oil is used per ton of ore. No sulphuric acid is required, the mine water having a sufficiently acid reaction. The entire power cost does not exceed 2.5c. per ton of ore concentrated. This cost is unquestionably an unusually low one, but for a suitable ore under ordinarily favorable conditions the cost should fall well below 50c. per ton.

In a few instances, especially in remote regions or where an extra amount of oil or acid is required, the cost may slightly exceed 50c. per ton, but in such cases the extra cost is lost sight of, owing to the high efficiency of the process and the high grade of the concentrate obtained. On ores where high recovery by water concentration is out of the question the

vacuum process frequently gives an extraction of 15 to 40 per cent. better than is possible by other methods, so that with a \$10 ore the gain is from \$1.50 to \$4 a ton, thus easily offsetting a few cents extra expense that might be caused by the character of the ore or by the remote location of the mine.

When operating on a sufficiently large scale (100 tons and upward) the sulphuric acid required (very weak acid only being needed) may be manufactured at the mine by utilizing the sulphurous acid gases from roasting furnaces and the acid obtained at a cost of \$5 per ton or 0.25c. per lb., a further gain being thus secured by reducing the weight of the concentrates to be shipped to market and by bringing them up to a higher grade, which are items of much importance where mines are at a long distance from market and from sources of supply.

F. H. PRENTISS.

Denver, Colo., June 7, 1907.

Roasting for Magnetic Concentration of Zinc Ore

In reference to C. C. Mathey's comment regarding my article in the JOURNAL of March 30 on "Roasting for Magnetic Concentration of Zinc Ores," I will make a few remarks which will end the discussion on my part.

(1) The facts and figures of tests, etc., given in my article are simple and accurate, although they are not on the high plane of efficiency claimed by Mr. Mathey in the above mentioned comment regarding the Dahl Lead and Zinc Company's roaster.

(2) It is a simple fact that a steel building, such as put up by Mr. Mathey over roasting plants in the Wisconsin district, does not cost more than a wooden one.

(3) Quoting from Mr. Mathey's letter, "it is enough to say that none of the roasters built by Mr. Trego at the Mills mine, Square Deal mine, Roosevelt mine and the Platt mine is now in operation." Such a problem as this cannot be set aside in any such sweeping manner and I feel sure that your readers want some reasons when such important subjects are under discussion. As a matter of fact, the Mills roaster is running whenever they have the ore which they wish to treat in that manner. The Square Deal roaster is also handled under the same conditions. Several mines which have cylindrical roasters also are operating under the same conditions.

It is information that the mining public wants, and not such a discussion as this. They will find the information given in my article as nearly correct as I was able to obtain it, but I fear no roaster has ever turned out a tailing product on these ores assaying as low as 0.8 per cent. zinc on a sample weighing more than a few ounces. I should like to see the figures on the recovery under such abnormal conditions. I also wish to state that I am no longer interested in the Wisconsin district, except in the way of information and helpful knowledge.

F. H. TREGO.

4137 Ellis avenue, Chicago, Ill., June 4, 1907.

The Terrible Mine, Ilse, Colo.

Referring to the article by Robert E. Brinsmade in the JOURNAL of May 4, it appears to me that he deduces his conclusion as to the probable failure of the ore to continue to considerable depth from insufficient evidence. At the time when he was at the mine the latter was full of water up to 90 ft. from the surface. Consequently he did not examine the mine below that level and his statement that in the lowest workings (on the 250-ft. level) the cracks were smaller than at the surface, which he presents as a confirmation of his theory, is not based upon evidence observed by himself. The failure of Mr. Brinsmade to mention his authority for that statement was evidently an oversight; but, nevertheless, attention should be called to it, because there are mining engineers who hold a theory as to the occurrence of ore in this mine that is different from what has been advanced by Mr. Brinsmade.

It may be interesting to state that the mine is at present being pumped out, and as soon as possible will be subjected to a thorough examination with a view to continuing development work in it. The geological question is certainly a very interesting one, but it cannot be satisfactorily solved without an actual investigation of the lower levels.

M. B. A.

Denver, Colo., May 15, 1907.

The Mount Lyell company, of Tasmania, intends to erect a large establishment for the acidulation of phosphate rock. The works will have a capacity of 20,000 tons per annum. The purpose of this plant is to utilize sulphuric acid which will be manufactured as a by-product in the smelting of Mt. Lyell ore.

New Publications

FACTS ABOUT THE SOUTH. By Richard H. Edmonds. Pp. 72. 6x9 in.; paper; 25c. Baltimore, 1907: Manufacturers Record Publishing Company.

LIST OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY (EXCEPT TOPOGRAPHICAL MAPS). Pp. 65. 6x9 in.; paper. Washington, 1907: Government Printing Office.

A PRACTICAL TREATISE ON THE GAS AND GASOLINE ENGINE. Pp. 108; illustrated. 6½x7½ in.; paper, 50 cents. Warren, Penn., 1907: Jacobson Machine Manufacturing Company.

MITTEILUNGEN AUS DEM KÖNIGLICHEN MATERIALPRÜFUNGSAMT ZU GROSSLICHTERFELDE. Herausgegeben in Auftrag der Königlichen Aufsichtskommission. Pp. 100; illustrated. 7½x10½ in.; paper. Berlin, 1907: Julius Springer.

LEITFADEN FÜR DEN GEOLOGIE—UNTERRICHT AN BERG—UND HUTTENSCHULEN UND ANDEREN TECHNISCHEN LEHRANSTALTEN. By Wilh. Maucher. Pp. 167; illustrated. 6x9 in.; cloth, 2.50 marks. Freiberg in Sachsen, 1907: Craz and Gerlach.

REPORT OF THE STATE BOARD OF GEOLOGICAL SURVEY OF MICHIGAN FOR THE YEAR 1905. Alfred C. Lane, State Geologist. Pp. 638; illustrated. 6x9 in.; cloth. Lansing, Mich., 1906: Wynkoop, Hallenbeck, Crawford Company, State Printers.

WEIR EXPERIMENTS, COEFFICIENTS AND FORMULAS (REVISION OF PAPER No. 150). By Robert E. Horton. U. S. Geological Survey, Water Supply and Irrigation Paper No. 200. Pp. 192; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

MARYLAND GEOLOGICAL SURVEY. THE PHYSICAL FEATURES OF CALVERT COUNTY. By G. B. Shattuck, B. L. Miller, J. A. Bonsteel, R. T. A. Burke, C. F. Von Herrmann, N. C. Grover, L. A. Bauer and H. M. Curran. Accompanied by topographical and geological maps. Pp. 227; illustrated. 6½x10 in.; cloth. Baltimore, 1907: The Johns Hopkins Press.

THE CLAYS OF WISCONSIN AND THEIR USES. By Heinrich Ries, with A Report on Molding Sands, by H. Ries and F. L. Gallup. Wisconsin Geological and Natural History Survey, Bull. No. XV, Economic Series, No. 10. Pp. 259; illustrated. 6x9 in.; cloth. Madison, Wis., 1906: Published by the State.

Contents. Origin and properties of clays. Methods of brick manufacture employed in Wisconsin. The geology of Wisconsin clays. The Wisconsin clays, their properties and uses. Tests of Wisconsin brick.

Large Magnetic Separating Plants in Norway

BY N. V. HANSELL*

A few data concerning two new Gröndal plants being erected in northern Norway may be of interest. One is at Syd Varanger, on the shore of the White Sea close to the Russian line and on the 70th parallel of latitude. The only way of reaching the place is by steamer around Nord-Cape. The ore is a magnetic iron ore occurring in the form of an immense hill estimated to contain about 400,000,000 tons above water level. This mass of ore stretches two and a half miles, with an average width of more than 600 ft.; the ore is lean, containing not more than 35 per cent. iron.

The separation is to be done by the Gröndal methods, the separating plant to be connected with briquetting plants. Extensive development is now being carried on. Railroads, docks and dwellings are being constructed, and the quarries are being equipped with steam shovels and the most modern machinery. The separating and briquetting plant will take care of 1,200,000 tons of crude ore yearly, from which there will be produced 600,000 tons of briquets. The plant will contain 56 Gröndal ball mills, 200 Gröndal separators and 20 Gröndal double briquetting kilns. The first shipments will be made in the spring of 1909. Most of the product will be exported to Germany.

At Salangen, a little north of Narvik, also in the extreme north of Norway, extensive preparatory work for opening some very large but lean iron-ore deposits has been carried on for some time. The conditions here are similar to those at Syd Varanger. A Gröndal plant, with an estimated capacity of 300,000 tons of briquets yearly, is being erected. This property is being opened by some German iron works, and will be ready for shipments next spring.

Tin Mining in Siam

According to a recent British consular report the chief industry of the monthon of Kedah is tin mining. In the south of Kedah, where the main range of mountains which forms the backbone of the federated Malay States still extends, there is some mining, and there is also a little in the hills which separate Perlis from Setul, from which were exported about 900 pikuls of tin ore, or 54 tons. Probably not more than 200 tons was exported from Kedah. The real mining area extends from the island of Tongkah (or Junk Ceylon), where hitherto most work has been done, and the mainland opposite

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as far as the Burma frontier. Although hitherto the mainland has not been prospected as much as at Tongkah, there is reason to believe that it is no less rich in ore. The absence of roads and communications retards progress, and it is generally understood that the government intends to rectify this as soon as possible and turn its attention to developing this rich province.

The exportation of tin, including metal and the metallic content of ore (estimating the latter at 65 per cent.) from the monthon of Puket is about 4000 long tons per annum. In 1906 the export from the island of Tongkah alone amounted to 18,476 pikuls (1109 tons) of smelted tin, and 30,635 pikuls (1839 tons) of tin ore. The Straits Trading Company has a branch establishment at Puket, the capital of Junk Ceylon, and headquarters of the monthon of the same name. It exported 21,164 pikuls (1270 tons) of tin ore in 1906 to its smelting works in Penang. It is probable that, owing to smuggling and the want of sufficient revenue officers, 25 per cent. more ore is exported from the mainland than is accounted for in the official returns of the mines department. It is estimated that returns for the year ending March 31, 1907, will show a considerable increase over those for the previous year, which amounted to 4231 tons.

A contract has been made with Captain Miles, of Tasmania, by the government for dredging the harbor at Tongkah. The bed of the harbor is supposed to be rich in ore and Captain Miles will have the right to the tin on condition of dredging a dock 1200x850 ft. in extent and not less than 20 ft. deep at low water, and of making a channel of the same depth therefrom to the deep-water anchorage.

Earnings of Mining School Graduates

Prof. H. L. Smyth, of the Lawrence Scientific School, in collecting information concerning the occupation and success of the graduates of the division of that institution devoted to mining and metallurgy, found that of 25 men 11 were superintendents of mines. The average earnings the first year after graduation were \$878; in the second year the average salary was \$1456, and this was increased in the third year after graduation to \$1900. The average age of the 25 graduates who replied to letters of inquiry is 28 years and the average present salary is \$2387 per year.

The production of magnesite at Eubœa, Greece, in 1906, was 32,000 metric tons. The two companies working the deposits, viz: the Société d'Entreprises and the Société des Travaux Publics ta Communaux have recently been combined.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Robert Hawxhurst, Jr., is at present traveling in Chile and Bolivia.

Washington B. Vanderlip has left New York to examine mining properties in North Carolina and Georgia.

Frank H. Probert, of Los Angeles, Cal., was married to Miss Jessie Agnes McGaw, on May 25, at Washington, D. C.

N. F. Clark, consulting electrical engineer for the Calumet & Hecla mine, has been in the lake district for a few days.

George Morgan, vice-president and secretary of the Eastern Mining Company, Masbate, P. I., is on his way to the United States.

Robert T. Hill, mining geologist, of New York, has gone to Cobalt, where he expects to remain a week or 10 days on professional work.

Edwin C. Holden, mining engineer, of New York, has gone to Sonora on professional business. He expects to be absent about a month.

H. A. Buehler, assistant State geologist of Missouri, has resigned to engage in professional work. His resignation will take effect July 1, 1907.

E. E. Carter, who has been associated with the Sullivan Machinery Company, has resigned to accept a position with the Traylor Engineering Company, New York.

J. Parke Channing, president of the Tennessee Copper Company and expert for the Lewisohns, spent several days in Butte recently and left for Alaska on June 11.

Fred. G. Farish sailed from Genoa on June 5 on his way to the Dutch East Indies to examine mines in Celebes. He will return to the United States about September 15.

Geo. W. Maynard, of New York, arrived at Whitehorse, southern Yukon, on May 14. He is examining a number of copper properties under bond to W. S. Thomas, of Harrisburg, Penn.

Hon. Frank Cochrane, Ontario Minister of Lands, Forests and Mines, will leave about July 1 for a visit to the principal settlements in Northern Ontario, to investigate complaints made by settlers who are threatening secession from the Province.

Ormond Higman, chief electrical engineer of the Canadian Inland Revenue department, is investigating conditions in the electric power houses at Niagara Falls, Ont., in connection with the enforcement of the Dominion Act respecting the exportation of electricity.

John B. Hobson, manager of the two Guggenheim companies operating in the Cariboo district, B. C., has gone up to

Quesnel Forks to direct the season's hydraulic work on the property formerly owned by the Consolidated Cariboo Hydraulic Mining Company.

A. K. McDaniel, of the Montana Consolidated Copper Company, of Basin, Montana, has been in Denver for several weeks in connection with the construction of the new 150-ton concentrating plant, to be erected. The Denver Engineering Works has secured the contract.

V. F. Marsters, Chief of the Geological Commission of Peru, is at present making investigations along the coast of Peru from Pisco to the southern boundary with Chile, the chief subject for investigation being the deposits of niter, talc, coal, mica and other non-metallic minerals.

H. H. Claudet has returned to Rossland, B. C., after several months' absence in Colorado and Mexico. He installed two Elmore Vacuum Oil Concentration plants in Mexico, one each at Nacozari and San Luis Potosi, and one at Denver, Colo. Two similar plants are to be installed in the Kootenay district, B. C., and one in the Lake Superior district, Ont.

Obituary

Henry G. Hanks, a pioneer of California, and ex-State mineralogist, died at Alameda, Cal., June 12. He was a native of Ohio and was 81 years of age.

Societies and Technical Schools

Wisconsin State Mining School—A bill appropriating \$30,000 for the establishment of a mining school at Platteville, Wis., was passed by the State senate on June 4 without a dissenting vote.

American Water Works Association—The twenty-seventh annual convention of the association will be held June 17-22, at City Hall, Toronto, Canada, with headquarters at Hotel King Edward. There will be a technical program, entertainments and an exhibit of appliances.

School of Mines, Bendigo—The prospectus for 1907 of this school at Bendigo, Victoria, Australia, Donald Clark, director of the department of mines and metallurgy, contains a list of the courses given, dates limiting terms, and fees required in the concentrating plant, for assays and analyses, and the requirements of the various courses.

Sheffield Scientific School—Hammond Hall, the new metallurgical laboratory at Yale University, was completed, June 11, by the installation of the last of the machinery for the plant. The stamp mill and concentrating and cyanide plants, presented by John Hays Hammond, director of the department of mining engineering, have been erected and prepared for operation.

Iron and Steel Institute—The autumn meeting of the institute, Bennett H. Brough, secretary, will be held in Vienna, on September 23, 24 and 25, 1907. The sessions will be held at the headquarters of the Society of Engineers and Architects, Eschenbachgasse, No. 9. There will be discussions of papers, and visits to the imperial palace at Schönbrunn, the Hoch-Schneeberg, and to works in Bohemia, Styria, Moravia and Silesia.

Industrial

The Bristol Company, Waterbury, Conn., in bulletin No. 57, May, 1907, describes its line of recording voltmeters, with price lists and chart sections.

The Ridgway Dynamo and Engine Company, Ridgway, Penn., has appointed Samuel W. Hay's Sons, No. 302 Farmers' Bank building, its Pittsburg sales agents.

The American Blower Company's vertical self-oiling engine, built by Allis-Chalmers Company, Milwaukee, Wis., is illustrated in leaflet No. 2031 A, issued by the Allis-Chalmers Company.

The Power and Mining Machinery Company, Milwaukee, Wis., has recently furnished crushing machinery of unusually large capacity, including one No. 8 McCully crusher to the Crystal Falls Iron Company, Michigan; five No. 7½ crushers to the Nevada Consolidated Copper Company, Utah, an equal number of the same type to the Utah Copper Company, Utah, and one No. 5 to the Carnegie Steel Company, Pennsylvania.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Crane Company, Chicago, Ill. Crane Specialties. Pp. 96, indexed, illustrated, paper, 4x6½ in. 1907.

Harrell Pneumatic Pump Company, Chicago, Ill. Advance pages of General Catalogs. Pp. 10, illustrated, paper, 6x9½ in. 1907.

Minneapolis Steel and Machinery Company, Minneapolis, Minn. Brochure No. 101. Twin City Corliss Engine. Pp. 32, illustrated, paper, 6x9½ in. 1907.

Barrett Electric Manufacturing Company, Cincinnati, Ohio. Bulletin No. 5. Type E Motors and Generators. Pp. 10, illustrated, paper, 7½x10 in.; April, 1907.

Construction News

Campo Morado, Teloloapan, Guerrero, Mexico—The Reforma Mining and Milling Company will install machinery for lead smelting and refining, matte smelting, calcining. Cables will also be required.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives
at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 12—A number of mining companies in this State have met and taken action in the matter of reducing their capital stock. A recent State law makes an annual license tax necessary, and this is based on the amount of capital stock of the respective companies. When the capital stock is not over \$10,000, the license is \$10 per annum; over \$10,000 to \$20,000, it is \$25; \$20,000 to \$250,000, it is \$50; over \$250,000 to \$500,000, license is \$75; over \$500,000, the annual license tax is \$200. When it is more than \$5,000,000, the license is \$250. Some of the older companies were given large capital stocks, but this plan will no longer be adopted in view of this license tax, which must be paid yearly. If the corporations become delinquent, the Secretary of State reports the names to the Governor and he declares their charters forfeited. Some amendments to the original law were adopted in March of this year. Already many hundreds of corporations have been wiped out of existence by failure to pay the tax, and others are reducing their capital stock.

The law provides that five men, without salary, shall be appointed to act as advisers to the new State department of engineering. It was at first proposed to have representatives of different interests, including one who should be a hydraulic miner. This was not carried out, however, as all of those appointed are "valley men," none being from the mountains. Those who will serve as advisers are: Alex. Gordon, H. W. Weinstock and T. B. Hall, of Sacramento; George W. Patterson, of Stockton, and M. J. Boggs, of Colusa. There are no miners among the appointees.

After what looked like a final agreement had been reached, one of the machinists' unions held out, and the settlement of the ironworkers' strike was put off a week. Today, however, the last of the unions gave in and the agreement goes into force. Many thousands of men will at once resume work in the foundries and machine shops of this city.

E. W. Emmons has been convicted of the crime of obtaining money under false pretenses in selling Mrs. M. E. Hurst 500 shares of the stock of the Drummer Boy Gold Mining Company at \$1 per share. Emmons was tried once before on the same charge, but the jury, after being out over 24 hours, failed to bring in a verdict and was discharged. Emmons was accused of having exploited a property in

Siskiyou county and of having duped women by the sale of stock.

Many protests have been made by residents of towns on both sides of San Francisco bay against the construction of the new Selby smelter at Point San Bruno, south of San Francisco. So strong has the agitation become that it is understood that the Guggenheims, who are building the smelter, will abandon the enterprise, even after having spent over \$400,000 upon it, and will construct the new smelting plant on the Mexican coast.

Members of the Anti-Débris Association and supervisors of Yuba and Sutter counties have recently been at Oroville, consulting with the dredge owners and examining the local situation. They have come to the conclusion that further damage to the Feather river need not be feared under existing conditions. There is nothing being done in the river proper, for the reason that the boat which was formerly used for erecting the landlocking walls was destroyed in the March freshet. Two boats of a similar type are being built for the work, but they cannot be completed until fall. It is expected that the new boats will build 200 ft. of the walls per month when they are finished.

It now looks as if Greenhorn creek, which is filled with débris from the old hydraulic mines at You Bet, Nevada county, will shortly be worked by a dredge. George L. Hay, of Grass Valley, and others have bonded the property. About six miles of Greenhorn have been obtained, together with 80 acres carrying the famous Blue Lead channel. Tests have already been made and found satisfactory, but more extensive operations in this line will be made shortly. The gentlemen associated in this deal have great faith in the dredge scheme and are confident that as the dredge moves up stream it will pile up sufficient restraining dams to hold in check all débris. This summer, it is announced, operations will be well under way.

Many promising gold properties are being opened up in the East Avawatz range, two miles east of Crackerjack, San Bernadino county, several new camps having been established. While this range has as yet been barely scratched in the search for the yellow metal, the results obtained seem to warrant the belief that the East Avawatz will soon rival the balance of the Crackerjack district. The purchase of the Clearwater springs by Crackerjack people last week means the early installation of a water system for the town and surrounding mines. The

springs are located about four miles west of Crackerjack.

The Bully Hill Mining Company, of Shasta county, has commenced the work of remodeling the De La Mar smelter that has stood idle considerably over a year, pending the completion of the railroad connecting with the Southern Pacific above Kennett. One furnace has been torn down, and the converter stands, and considerable of the machinery has been removed. The machinery and converters will be used again, but the general plan of the smelter will be changed largely and made up to date in every particular.

Investigations of interest to the mining population of Trinity county are in progress. The United States Geological Survey will make a contour map of the county. Surveyors have been taking elevation at Mount Bally and about Weaverville to determine the heights of some of the larger mountains of the county. The preliminary work of the contour map was begun some months ago. Simultaneously an investigation is in progress to determine the sources of the great deposits of gravel in the Weaverville basin.

From the information gathered at the construction camps it is certain that Bodie, Mono county, will be connected by rail with the outside world by Nov. 1, and possibly six weeks earlier than that date. The force of 400 men, which Contractor McLain is using in southern Nevada, is to be placed on the work of connecting the present gap. The train service will extend from Bodie to Mina, where transfers will be made to the Southern Pacific, and to the Tonopah & Goldfield Railroad.

The new hoisting plant of the Midas Mining Company, at Knob, Shasta county, has been completed and is in operation. While the new shaft was under construction, Harrison gulch, or Knob, was very dull for a year or more. Now, however, the camp is reviving, and the company is putting on every miner that comes along and is sending away for more.

It is reported that Blackburn and Peer, who are operating an ore-separating machine on the ocean beach, near Watsonville, on Monterey bay, have received an order for 4000 tons of magnetic iron ore from the Pacific Smelting and Steel Company, of Los Angeles. This is the largest enterprise for utilizing "black sands" ever started here.

After three years' litigation the ranchers near Benicia and Glen Cove, on Carquinez straits, have reached a friendly settlement against the smelting company for damages alleged to have been caused

by the fumes from the reduction of lead ores. A month ago, after little or no progress had been made in the settlement of the various suits which were on the calendar of the Solano County Superior Court, the claims of all of the plaintiffs were taken up by an attorney and after several conferences with the smelter people secured the settlement which has been announced as satisfactory to those who brought the suits. The various damage suits against the smelter will now be dismissed, and as the injunction is in full force, and the smelter people are using every effort to erect a preventative it is believed that the nuisance will be abated. The claims paid are said to have aggregated \$30,000.

Salt Lake City

June 14—The name of the Crown Point Mining Company, with property in the Tintic district, has been changed to the East Tintic Mining Company. The Utah-Yerington Mining Company has been organized with headquarters at Provo, and will develop property in the Yerington, Nev., district. John Roundy, of Provo, is president.

The first and second sections of the Utah Copper Company's new Garfield concentrating mill, are in operation, and it is expected that by July 1 the third section will be in commission. Each section has a capacity of 500 tons of ore daily. The initial unit, containing six sections of 500 tons each, will in all probability be in operation about August 1.

The directors of the Utah mine, at Fish Springs, Utah, and who own a controlling interest in the stock, have given an option on a majority of the stock on the basis of \$2.50 a share. The company is capitalized for \$100,000, of an equal number of shares.

The May Day Mining and Milling Company, operating in the Tintic district, has acquired the Uncle Sam, Cora, Inez and Humbug No. 2 fractional claims from the Uncle Sam Consolidated Mining Company, the consideration being 400,000 shares of the capital stock of the May Day company, the shareholders of the latter having authorized an increase from 400,000 to 800,000 shares. The Uncle Sam company still retains some valuable territory, and will continue the production of ore as heretofore. It is the owner of the Humbug group, and a one-fourth interest in the Richmond Anaconda mine.

Mining conditions in the Gold Springs district of Iron county, are very satisfactory at the present time. Much activity is being displayed, particularly by the Jennie Gold Mining Company.

The Nevada Douglas Copper Company, Salt Lake, which owns mines in the Yerington, Nev., copper district, will soon be operating with power drills. The electric transmission line of the Truckee General Electric Company, will be connected up June 15, by which time the Nevada Doug-

las company will be ready for the reception of power. All of the heavy mine equipment ordered a number of months ago, is on the ground, and in process of installation.

The Nevada Hills Mining Company has declared a dividend of 10c. a share on the issued stock, amounting to \$75,000, payable June 20. The company is only about a year old, and has paid \$225,000 to shareholders. The mine is situated at Fairview, Nevada, but the headquarters of the company are now in Salt Lake City.

Another suit has been filed in the Federal court at Salt Lake, against the Utah Consolidated, United States Smelting, Refining and Mining and Bingham Consolidated Mining and Smelting companies by a farmer, F. P. Carlisle, who also represents a number of others for damages to the amount of \$101,330.82 to lands, crops and live stock said to be caused by smelter smoke.

The North Bingham Consolidated Mining Company has been organized to develop a group of six lode mining claims situated in North Bingham. The officers and incorporators are: Jesse Knight, president; William W. Mathews, vice-president; W. Lester Mangum, secretary and treasurer; William Christopherson and J. William Knight, with headquarters at Provo.

Samuel Newhouse recently made a statement to the effect that the Newhouse Mines and Smelters corporation would soon declare its initial dividend. The directors will meet in New York during the early part of July for that purpose, and it is stated that the initial payment will probably be made early in the coming autumn, which will amount to 50 cents a share, or on the basis of \$2 a share annually.

The old Lincoln mine, in the Lincoln district, Beaver county, has been sold, and will be rehabilitated. The company owns the first patented mining claim in Utah, and in the 70s was an important producer of silver-lead ore. The lower workings have been under water for a number of years. Arthur Rice, a mining engineer of Denver, is to be the superintendent.

The ore and bullion settlements reported by Salt Lake banks last week amounted to \$358,000.

The minority stockholders of the Honerine Mining Company, who called a meeting recently to enter a protest against the levy of a 20-cent assessment by the board of directors, have reached the conclusion that this method is probably the best for obtaining funds with which to meet the corporation's outstanding obligations; these amount to approximately \$300,000. During the past ten months the Honerine company has marketed 58,000 tons of ore, from which a net profit of \$68,000 was realized.

June 17—There is no reason for alarm concerning conditions at Utah Consolidated, and there is no doubt that stories

given circulation in the East are misleading to shareholders as well as to the public. From authoritative sources it is learned that there are no disturbances on the 800-ft. level, that everything is regular and that there is nothing to indicate that the ore deposits do not continue. The Utah Consolidated and Yampa lines are entirely separate and the statement to the effect that there has been faulting which has thrown the Utah Consolidated orebody into the Yampa is simply preposterous. While it is true that the upper levels have been worked out to a large extent, and the days of cheap mining, operating through tunnels and handling ore by gravity, are over, the Utah Consolidated mine is certain to be a producer and a dividend payer for many years to come. In future it will be necessary to use pumps and to hoist ore, which of course will mean increased mining costs. Ores on the 800-ft. level are said to be slightly lower in value, but conditions are far from discouraging. The management has not only begun sinking on the ore but the development of virgin territory to the west of the present workings is also being given attention. There has been no change in the plans to build a smelter of larger capacity than the present one.

Denver

June 14—Work on the new drainage tunnel at Cripple Creek has been begun by the contractors, Charles Stream and Charles Lund. An intermediate shaft will be sunk to a depth of about 700 ft. and when this has reached a certain depth work will be commenced on both sides. For the present operations will be carried on from the portal on one side, with a force of 30 men.

The El Paso Consolidated Gold Mining Company has declared a dividend of one cent per share, amounting to \$24,500, payable on June 25, which makes the total paid by this company \$1,300,000.

The directors of the Work Mining and Milling Company will hold a meeting June 14 and will, it is stated on good authority, declare a one cent dividend aggregating \$15,000. The Little Clara lease continues to be profitable and is the main source of revenue.

Judge J. W. Schaefer, in the El Paso District Court, has sustained the motion of the Portland Gold Mining Company, requiring James F. Bruas in mandamus proceedings to specify the relief demanded in his suit in which he seeks an examination of the books and of the mine.

There is a shortage of men in the Cripple Creek district at present, especially of skilled machine and timber men and the demand is growing.

Although the average value of the Leadville ores, produced during May has increased, the tonnage did not come up to expectations; the total was only about 70,000 tons.

After litigation since 1879, the commissioner of the general land office decided the dispute between the Ely Mining and Land Company and the Clipper Mining Company, in favor of the latter. The suit, which involved the title to about 35 acres of mineral land, was originally commenced in the District Court at Leadville, thence to the State Supreme Court, then through the Federal Court to the land office, to the Secretary of the Interior and again back to the Leadville land office. At the latter, the Register decided for the Clipper Company and the receiver for the other side, the decision of the Register being approved now.

An open-shop program has been agreed upon and posted by the mine owners in the Silverton district and taking effect at once a modified wage schedule has been put in force. There will not be any discrimination between union and non-union men. The schedule refers to those employed in the mills as well as at the mines.

At a meeting in Omaha of D. O. Clark, manager of the Union Pacific Coal Company, and Thomas Gibson, president of district 22 of the United Mine Workers, a temporary settlement was made of the strike at Rock Springs, Wyoming.

Nearly 200 delegates, from the metalliferous mining States of the West and British Columbia are in Denver at present, attending the annual meeting of the Western Federation of Miners.

The Cañon City Mica Mill and Mining Company has contracted with the Royal Gorge Mica Mining Company for a large amount of the raw material. It is stated on good authority that the plant of the United States Mica and Milling Company will be moved to Aurora, Illinois, the raw material to be shipped to that point.

There is considerable talk in regard to the construction of a pipe line from the oilfields near Lander, Wyoming, to Denver.

The Newhouse tunnel is at last on a self-supporting basis. About three quarters of the projected distance has been completed and the line of Gilpin county has been crossed.

On July 1 the United States Reduction and Refining Company will pay a dividend of \$1.50 per share on its preferred stock amounting to \$591,871, and the Iron Silver Mining Company, Leadville, will pay 10c. per share or \$50,000. It is also stated here that the Guggenheim Exploration Company will on that date pay \$2 per share, a total of \$425,000.

Toronto, Ont.

June 14—The question of the validity of the special act of the Ontario legislature confirming the title of the Cobalt Lake Mining Company to the bed of Cobalt lake came up on a hearing of the suit brought by the Florence Mining Company, which lays claim to the location on the ground that a prior discovery gives them a statutory right. The suit was pending

when the legislature intervened and passed an act giving the Cobalt Lake Company a clear title.

It is contended on behalf of the Florence Mining Company that this legislation is *ultra vires*, and the company has petitioned the Canadian Government to disallow it. Judge Britton, before whom the case was being tried, refused to hear the full argument until the act had been considered by the Government at Ottawa, stating that the measure was one which seemed to imply confiscation. Further proceedings therefore stand over until the Dominion government either disallows the act, or permits it to become law by lapse of time, one year being the period within which the power of disallowance can be exercised.

Great irregularities have occurred in connection with the staking and recording of claims in the Larder Lake area, which will render the work of inspectors in passing claims one of almost insurmountable difficulty. Owing to the country being un-surveyed prospectors were unable to give specific descriptions of their locations, many of which are simply described as being next to claims previously staked out. Moreover the locations are of all sizes, some greater and others less than the prescribed acreage. To make matters worse, several thousand of these claims have never been recorded in the Haileybury record office, the papers being merely filed away. A great many prospectors are now going into the district to work on their claims or to make the discoveries that will enable them to pass inspection, which in many cases could not possibly have been at the time of staking.

James Mountford, a financial agent of London, England, who was in Toronto on his way to Cobalt, with a view to making investments, dropped dead in the entrance of the provincial Parliament buildings, on June 5, owing to heart disease.

Considerable losses have been occasioned at the Nipissing mine by the stealing of ore by employees, which is largely bought by unscrupulous parties for the salting of wild-cat claims. To put a stop to the practice detectives were engaged whose operations resulted in the arrest of eleven men on June 3, eight of them being employees. Ore was found in boxes and bags in the bunk houses. The following day the accused were brought up for trial and three of them convicted, one receiving a sentence of one year's imprisonment, and the other two, six months each. Other arrests are likely to follow.

London

June 8—Some of the British Columbian companies controlled in England are more or less at a standstill. The Rossland-Kootenay Company, which was one of the Whitaker Wright derelicts, has not been able to do anything at all in the way of business during the past two years, in spite of the energetic endeavors of Wil-

liamson Milne, the chairman, and of Bedford McNeill, the consulting engineer. The properties are being nursed carefully until such time as some adjoining mine cares to utilize the company's resources of low-grade fluxing ores.

The Snowshoe Gold and Copper Mines, Ltd., is in a somewhat similar position. During the last two years the mine has not been worked by the company and the negotiations for leasing it to the Consolidated Mining and Smelting Company of Canada have not been very satisfactory. The mine has certainly been worked for short periods under these conditions, but a final agreement with the latter company has not been arrived at. Efforts are still being made to further develop the property and about 30,000 tons of ore have been extracted during exploring operations recently. The ore runs very low, not being more than 1½ per cent. copper and 1⅓ dwt. of gold per ton. At the present time there is no great prospect of the mine improving at all.

The Tomboy Gold Mines Company, of Telluride, Colorado, is doing well at present, and a sum of \$96,000 is to be spent out of profits in remodeling the metallurgical plant so as to increase the extraction by a dollar a ton. Developments at the 2100-ft. level are opening up well and there is every likelihood of great bodies of ore being found. Work at the lower levels has been interfered with to some extent by the opening of the 2100-ft. level, and during the last year stoping has been confined to the 1200-ft. level, where ore richer than the average is found. It is probable, therefore, that the financial results for the year ended June 30 will be rather better than shareholders should look to for continuance. The estimated divisible profit for the year now coming to a close is about \$672,000, and out of this dividends amounting to \$540,000 will be paid. In the course of a month or two the lower levels will be in a condition ready for stoping, and after that the monthly profit will be rather less, amounting to about 38,400.

It comes as somewhat of a disappointment to hear that the Fremantle smelter in West Australia is to be given up. A year ago the prospects of the smelter were not over bright, owing to the richer gold ores from Kalgoorlie not being received by the smelter nowadays, and owing to the lack of supply of ores from South Australia and New South Wales. It was hoped, however, that Mr. Kaufman's efforts in opening up new mining districts in West Australia would help to keep the smelter occupied. These expectations have not been realized and so the operations are to cease. The smelter has had a hard struggle in its time. For 10 years from its commencement it lost money, and additional capital had often to be subscribed. During the last five years, however, profits have been made and dividends distributed.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

Tombstone Consolidated—A pumping station has been established at the 1000-ft. level with room for four station pumps, each having 2,500,000 gal. daily capacity. The mill is grinding 200 tons per day.

YAVAPAI COUNTY

Arizona Copper Company, Ltd.—Production for the month of May was 1380 tons (2000 lb.) of copper.

Arkansas

SCOTT COUNTY

Witte Coal Company—The property of this company at Coaldale, including mines in operation, and a lease on 1000 acres of coal lands, has been purchased by the Hiawatha Coal Company. Jerome Sengel has been appointed superintendent.

California

AMADOR COUNTY

Defender Mining Company—This company is drifting at the 240-ft. level to strike a point where three ledges are expected to unite.

Tom and Dick—This mine at Defender is being examined by S. P. Sharpless and other Eastern men with a view to its purchase.

BUTTE COUNTY

Mammoth Channel—G. H. Richards, of Goldfield, Nevada, is organizing a company to work this channel near Oroville.

CALAVERAS COUNTY

Iaszy Bird—This mine is shipping large quantities of sulphurets to the Selby smelter.

Reed—This gravel mine, near San Andreas, has been bonded to J. J. Hickey and Charles Lamb, who have assumed charge of operations.

DEL NORTE COUNTY

Quartz—Isaac Sembower and A. L. Eastman, of Arcata, have found one large ledge and other smaller ones, on Bluff creek, near the Siskiyou county line.

HUMBOLDT COUNTY

California Mining and Dredging Syndicate—This new company has leased the extensive holdings of the Orleans Bar Gold Mining Company, of Orleans Bar. H. de C. Richards will continue as general manager. The hydraulic ground will

continue to be worked and probably some dredging will later be done in the bed of the Klamath river, at that point.

INYO COUNTY

Gold-Bullfrog Mining Company—This company has purchased in Lee district, the Lee-Combination and Lee Washington properties. H. W. Preston is manager. The new mill for the Lee properties will have a capacity of 100 tons a day, with a 60-ton cyanide plant.

LASSEN COUNTY

Lassen Mining Company—The force in the Golden Eagle has been reduced to a minimum at Hayden hill, and the mine is virtually closed for the present. Scarcity of labor is given as the main cause. This has been the only productive mine in the county.

MADERA COUNTY

Minarets—One hundred and ten mining locations have been made at the Minarets in the high mountains. These mines have been located several times and subsequently abandoned.

NEVADA COUNTY

At You Be—J. S. Goodwin is preparing to erect a 20-stamp mill to crush the cemented gravel from the Nevada claim.

Marcotte—The tunnel in this mine, Washington, has opened up good quartz and Fred Marcotte is about to install a 5-stamp mill.

Mayflower and Yuba—These properties at Maybert are being operated by a new company. The mill has been rebuilt and 10 stamps added, and an aerial tramway will connect with the Mayflower mine and the Yuba mill. The latter mine will be pumped out this summer, after lying idle many years.

PLACER COUNTY

Evening Star—It is expected that this mine, which has been idle some years, will soon resume operations.

Southern Cross—R. J. Trimble, superintendent of this mine, at Towles, is putting it in shape for active work, and will soon be running the mill night and day.

Three Star—On the 1200-ft. level the vein is three feet thick, and is paying handsomely.

RIVERSIDE COUNTY

Blue Bur Mining Company—This company has purchased, through its manager, Ralph R. Blewett, 13 claims in the eastern

part of the county, near the Colorado river.

SAN BERNARDINO COUNTY

Big Five Mining Company—The Hale mines owned by this company at Vanderbilt are being reopened. Numbers of miners are coming into the new town of Leastalk, near Vanderbilt.

Granite Wells Mining Company—This Los Angeles corporation is working on a desert property 45 miles north of Barstow and 25 miles from Johannesburg.

SHASTA COUNTY

Mammoth Smelter—This smelter at Kennett has closed down for repairs. Four new blowers have been added.

Mammoth Copper Mining Company—It is reported that this company will put in a converter plant at its smelter, at Kennett. It is expected that the new blast furnaces will be ready for operation by August, which will double the present smelting capacity.

Summit Group—This group under bond to the Stauffer Chemical Company, of San Francisco, is being rapidly developed. Considerable new machinery is being put in, including a compressed air plant, drills, etc.

SIERRA COUNTY

Bonanza King—L. C. Crane and other Nevada men, have bonded this mine in the north bank of the Middle Yuba river.

El Dorado—This quartz mine, on Kanaka creek, near the Tightner, is being opened by H. L. Johnson. It was worked for many years, but has of late been idle.

Oriental Gold Mining Company—This company has opened the old Oriental mine, and it is expected to begin to pay dividends this summer.

Wisconsin Mining Company—This company, at Forest, has opened a large gravel channel, and will connect with the ground of the North Fork Company. J. L. Liddell is superintendent. The ground formerly belonged to the Slattery Bros.

SISKIYOU COUNTY

Arbuckle & Temple—This quartz mine, on Sugar creek, near Callahan, has been sold to men from Eureka. F. H. Heinze, the superintendent, will soon put up a mill.

McKean—At this mine, Callahan, the ledge has widened to 5 ft. Forty men are at work, but 100 would be employed if they could be obtained.

Medina Mining Company—This company at Oro Fino, did not live up to the

conditions of the bond, and the property has reverted to the original owners.

TRINITY COUNTY

Bear Tooth—This mine, in New River district, has been started up for the season, with F. P. Burris in charge.

Bonanza King Mining Company—At this mine, Jos. Porter, superintendent, a large reservoir intended to impound 100,000 tons of tailings, has been completed. The first clean-up at the new mill has been made.

Sykes—This gravel mine at Trinity Center is hydraulicking day and night on a 60-ft. bank. A nine-ounce nugget was found recently.

TUOLUMNE COUNTY

Eagle-Shawmut Mining Company—At this mine, owned by John Rosenfeld's sons, of San Francisco, a large vein has been uncovered at the 2500-ft. level. The same vein has been cut at the 1200-ft. level. At the deeper point the vein carries six feet of solid sulphurets.

Colorado

LAKE COUNTY—LEADVILLE

Bartlett—In sinking the shaft below the tunnel level a good body of ore has been opened. Several carloads recently sent to the smelter yielded \$20,000 per car. The shaft will be sunk deeper.

Delaware Shaft—Good progress is being made in sinking this shaft of the Rebate Mining Company, Rock hill. The shaft has entered the solid formation and should reach the blue lime by the middle of July. The shaft is being sunk to the southwest of the Crecentia. The Alhambra shaft, further to the south, is now down 504 ft., and is in the contact.

Fryer Hill—The different mines on this hill continue to keep up the daily output of iron and silicious ores. The Fitzhugh and the Jimmie Lee continue to ship high-grade silicious ore. Pockets of native silver are found in both properties.

Jay Bird Group—Eastern capitalists were in the camp during the week looking over this group, California gulch, consisting of the Jay Bird, Grover Cleveland, Eurydice, Frank and California Gulch claims.

Late Season—The snow in the timber is from 8 to 10 ft. deep. It will be a month before claims above timber line can be reached. The mines in the district dependent on wagon haulage, are also suffering for it is impossible with the present condition of the roads to haul half of the output.

Mammoth—A good body of ore has been opened in this property in the northwest lower drift; the orebody is now 8 ft. wide and 6 ft. high. The ore was first struck in the bottom of the drift, and is gradually rising as work is pushed. A difference of opinion exists as to whether it is

an independent shoot, or the continuation of one of the Fryer hill orebodies to the north.

Mosquito Range—On account of the backwardness of the season but little work is being carried on in this section. The only mine that is working a force of men is the London; the output for the month is in the neighborhood of 2500 tons.

Idaho

BEAVER DISTRICT

Father Lode Mining Company—The properties belonging to this company have been bonded to W. A. Nicholls, of Spokane, for \$60,000. The company owns the Brittle Silver, Nipsic, Romola Fraction, Father Lode, Kearsarge and Lackawanna claims.

Charles Dickens—A body of concentrating ore has been struck in the lowest level of this mine. As soon as more jigs and tables arrive the mill will work double shift.

COEUR D'ALENE DISTRICT

Coeur d'Alene Vulcan—A long crosscut tunnel will be run on this property, which comprises seven claims adjoining the Argentine on the west, the Killbuck on the south and the Chicago-Boston on the east. The group extends from the Argentine into Lake gulch and is traversed by three ledges, the central one of which is the Argentine vein. C. F. Ruddy is manager and Eastern capitalists control the property.

Illinois

JOLIET

New Coke Plant—Plans are announced for the erection of 280 coke ovens at Joliet. The Illinois Steel Company will expend \$2,300,000 on this industry in the next two years. The annual output will be 800,000 tons of coke to supply four blast furnaces.

Indiana

GRANT COUNTY

Cummings Coal and Coke Company—This company, Marion, has incorporated to do a mining and coking business in southern Indiana. The directors of the new company are: J. B. Ratterman, Isaac A. Ayers and W. W. McGuffin.

GREENE COUNTY

Excelsior Oil and Gas Company—This is the name of a new corporation, Linton, organized by Elmer Yeomans, Oscar Vanleve, A. M. Beasley and other prominent coal mine operators. The company has secured 5000 acres of land north of Linton and will drill a large number of oil wells. The company has ordered machinery and will employ the idle miners to drill the wells. Completed wells in this district are excellent producers.

Kentucky

HOPKINS COUNTY

Midland Coal Company—This company, composed of Kentucky and Indiana capitalists, has purchased about 2800 acres of coal land near White Plains. One mine will be opened one-half mile south of White Plains and another one a mile west of that place on the Illinois Central railroad.

Louisiana

CALCASIEU COUNTY

Union Sulphur Company—A flood, caused by heavy rains, interfered with operations at the mines at Sulphur City, near Lake Charles, about the end of May, but the newspaper reports of damage to the mines were greatly exaggerated. As a matter of fact, production was checked for only four days, and shipments for only two days. There has been no loss of any wells through settlement of the ground or otherwise. As the sulphur is extracted, the ground naturally settles, but not until after the expected extraction of sulphur has been effected. Up to the present time, settlement has occurred over an area of about one-fourth of a square mile, the maximum settlement having been 12 ft. The natural elevation of the land at this place is about 18 ft. above sea level.

Michigan

HOUGHTON COUNTY

Allouez—The No. 2 shaft is sinking at the rate of 100 ft. a month. It is now down 300 ft.

Atlantic—The shaft is down 487 ft. on section 16, having been sunk 82 ft. during May. It is passing through a broken formation.

ONTONAGON COUNTY

Adventure—Superintendent Brady has advised that work on the upper part of the mine be stopped, and that all energy be devoted to surface explorations in the hope of opening up better paying veins.

Mass Mining Company—This company has started diamond drilling on the Riddle Farm. This tract is to be explored thoroughly in view of opening on the Baltic lode.

Michigan—The mill at Keweenaw Bay will soon be ready for the machinery. It will in all probability be ready for operation in November. Michigan is at present using one head in the Atlantic mill, and is stamping about 500 tons a day. The production for May was 166 tons.

Missouri

ZINC-LEAD DISTRICT

New Production—The week ending Saturday, June 1, 1907, marked the largest week's new production in the history

of the Missouri-Kansas district. There were nine new mills started in the district that week but only four of them sold their zinc ore; two sold only lead ore and three sold nothing, preferring to hold the ore in hopes of a higher price. By the four mills 210 tons of zinc ore was sold, one of these had two carloads or 60 tons left in the bins, another had nearly one carload. One of those not selling has 200 tons in the bins and the others have probably 50 tons. These nine mills will produce from 500 to 600 tons of ore when in good running order, which will be shortly. The mills are the Big Three, Joplin; San Gabriel, Hyde Park; Alabama, Duenweg district; and the Church-Mitchell, Luke & Ash, Continental, Rhea, and Ice Plant, in the Webb City section. These mills will more than offset the curtailment due to the flooding of the mines at Badger. The Badger district produces about 300 tons per week.

Kramer Mining Company—J. W. Burgess has closed a deal with this company conveying one-half interest in a 200-acre farm north of Carl Junction, about eight miles northwest of Joplin, at a consideration of \$25,000. This tract of land adjoins a 300-acre lease now held by the same company. The Burgess land has been prospected by drilling and every hole has shown an orebody of the same character from 175 to the 225-ft. level. A shaft shows a sheet formation, more similar to that found in the Webb City district than any other place in the entire district. The Kramer company has let a contract to F. W. Caulkins, of Webb City, for the erection of a concentrating plant of 500 ton capacity, modern in every particular, to cost \$30,000. The company is composed of the Kramers of "Cascaret" fame.

Rex Mining and Smelting Company—This company, operating southeast of Joplin, has decided to do deep drilling for the deep runs of ore which it is thought underlie the present workings. The first hole will be put down north of the big mill; it is intended to sink to a depth of 500 to 600 ft. The Granby Mining and Smelting Company is also doing deep drilling on the land at Leadville hollow northwest of Joplin.

Montana

BUTTE DISTRICT

Amalgamated—All subsidiary companies have filed their annual statements with the county assessor for taxation of net proceeds, the reports covering the year ended May 31. They show net proceeds: Boston & Montana, \$7,049,988.28; Anaconda, \$5,819,184.52; Butte & Boston, \$1,249,467.03; Trenton, \$481,623.96; Parrot, \$141,730.80. Total, \$14,741,994.59. Washoe had no net proceeds, its earnings having gone into improvements. Parrot shows a decrease of \$135,284.20 over 1906 and Trenton a decrease of \$59,906.04, while

Boston & Montana shows an increase of \$891,878.28, Anaconda \$55,919.52 and Butte & Boston \$173,577.03. North Butte showed net receipts of \$3,271,213.67, an increase of \$1,423,203.67 over 1906, and Coalition showed a total net of \$1,432,760.55, an increase of \$397,555.55. The seven companies show a total ore extraction of 4,008,799 tons, to which can be added 124,608 tons by the Washoe, 264,431 by the Original, 2061 by the Reins and 3170 by the Alice. Neither La France Copper, East Butte nor Pittsburg & Montana made returns, which indicates that they did not make expenses, although La France reported net proceeds of \$149,000 for the year ended May 31, 1906. The Original reported net proceeds of \$663,259.51 for this year.

Butte & Bacorn—The company is concentrating its work to the Calumet, having stopped sinking the Belinda after reaching a depth of 840 ft. The Calumet will touch the 1000-ft. level about June 14, and after a station is cut and a pump installed crosscutting north and south will be prosecuted.

Copper Exploration—All work on this property has ceased and the pumps pulled from the 1000-ft. station. About 2000 ft. of crosscutting was done at the 1000-ft. level without the discovery of ore.

Davis-Daly—The crosscut from the 1800-ft. station of the Original has passed through the vein intersected 1600 ft. south recently. Manager Palmer reports the vein 25 ft. wide and containing a lot of commercial copper ore. He says drifting will begin east and west in this orebody soon. Sinking has been resumed in the shaft of the Mt. Moriah and will be continued from the 600- to the 1000-ft. level. Drifting east from the 500-ft. station of the Smokehouse continues, and the company expects to go about 100 ft. more before striking commercial ore. The shaft on the Colorado is 850 ft. deep.

Ida Montana—This company, composed principally of lake country men, has struck 6 ft. of good copper ore southeast of its shaft at a depth of 250 ft.

Raven—The company is finishing its preliminary work preparatory to sinking the shaft from the 700- to the 1000-ft. level. The shaft is on an incline and will be carried down with the pitch of the vein.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Combination—The Consolidated Mines Company has issued a quarterly report which gives an account of operations in the Combination since Feb. 1 last. On the second level the most important and significant development has been on the main vein in the direction of the Reilly bodies of the Florence. On the third, or 180-ft. level, the south drift No. 220, has advanced 100 ft. under the body in the second level. The company has ordered plans for a new 100-stamp mill.

Jumbo Extension—The Jumbo Wonder Company, operating a lease on the Poloverde claim, has cut a vein in a drift from the 75-ft. level. It has every appearance of being a continuation of the famous Velvet vein. The Higginson Leasing Company has developed a large body of highgrade ore in the 232-ft. level. The vein is dipping to the Mohawk ground. Last week the first shipment from the new strike was made.

Kewanas—The water troubles have been overcome since the pumping plant has been completed. Drifting and crosscutting is being done at the 400-ft. level, and crosscuts are being run from several of the upper levels. In addition to the operations of the company there are eight leasing companies developing the mine. The shaft in the O'Keefe lease, which is down to the 300-ft. level, is in country carrying promising quartz stringers.

Laguna—The shaft is down over 140 ft., and will be continued to the 500-ft. level before crosscutting is commenced. This property is owned and operated by the Consolidated Mining Company, which aims at picking up the Red Top vein at depth on the dip. The mine is well equipped with a power sinking plant.

Mayflower—The high-grade shoot cut in the 300-ft. level, continues to develop well, and there is every prospect of its continuing to the 400-ft. level.

Mohawk—Large bodies of shipping ore have been opened up in this property. The ore in the stopes between the 300-ft. and 450-ft. levels is the richest yet encountered in the mine.

Mohawk-Jumbo—The Mohawk-Jumbo Leasing Company has developed a 6-ft. vein at the 410-ft. level of high value. Ore is being sacked for shipment.

NYE COUNTY—BULLFROG

Pocahontas—Crosscutting is being continued from the 120-ft. level to catch one of the surface veins on the dip. Within the past few days a promising vein has been cut in a surface trench. The ore is contained in a black quartz, which resembles that found in the Taylor mine, which adjoins the Pocahontas, and carries rich telluride ore.

NYE COUNTY—TONOPAH

Jim Butler—Ore running high in value has been struck in the Wandering Boy shaft. The ore is a black silver sulphide, similar to that found in the West End, Midway and Montana mines. The orebody is large.

Midway—The break on the 450-ft. level has been picked up, and in following the vein a rich shoot has been encountered. The company has resumed shipping ore to the smelters. Large ore reserves have been developed since the suspension of shipping.

Montana—Large ore reserves are opened up in different portions of the

mine, and good progress is being made with the erection of the new surface plant.

Tonopah Extension—Some of the richest ore in the camp is being broken in the north ledge between the 400- and 600-ft. levels. The construction of a mill near Tonopah is still under consideration.

WHITE PINE COUNTY—ROSEBUD

Brown Palace—No. 1 tunnel is in 200 ft., and it is estimated that it will require driving 100 ft. farther before the ledge is reached.

Dreamland—The new shaft has been sunk to a depth of 30 ft. It is in a 6-ft. vein. The old shaft is 56 ft. in depth.

Durango Girl—This property has been purchased by the Rosebud Development Company. Development work will be commenced immediately. This mine consists of four claims and a fraction.

New Mexico

Kelly—This mine of the Tri-Bullion Mining Company, is making rapid progress on its new plant. It has a hoisting capacity of 1000 tons daily.

Magdalena Tunnel Company—This company has bought Utica Nos. 1, 2, and 3, mining claims, situated in the Magdalena district. This adds valuable ground to the company's extensive holdings.

New Jersey Zinc Company—This company has purchased the Morris-Lily and the Little Floe mining claims, in the Magdalena district, the consideration being \$30,000. The property lies west and down the mountain from the Graphic and Kelly mines.

Pennsylvania

ANTHRACITE COAL

Anniversary of Use of Anthracite—One hundred years ago the first shipment of anthracite coal was made from Plymouth, and arrangements are being made to celebrate the anniversary of that event. Abijah Smith shipped the first cargo in an ark floating down the Susquehanna river. The discovery made six months after this by Jess Fell, of Wilkes-Barre, that the coal would burn in an open grate, with intense heat and without an air blast, brought many orders.

Archbald Coal Company—This company, Scranton, has been organized with a capital of \$25,000.

Division Mine Foremen—Thomas R. Thomas, Olyphant, has been appointed division mine foreman by the Delaware & Hudson Company, and Richard Beer has been appointed to a similar position for the Carbondale district.

Harwood Electric Power Company—This company, chartered by the Pardee interests, will issue bonds for \$2,000,000 for the extension of its business, it being proposed to build an immense power

house to furnish power, light and heat in Schuylkill, Columbia, Northumberland, Carbon and Berks counties. The company makes use of the culm at the Harwood mines to generate the power.

Hubert Coal Company—This company will develop the large tract of land on Broad mountain, about four miles from Pottsville, known as the Susanna Silliman and Henry Tiel tracts. A few days ago a mortgage to the Scranton Trust Company was recorded in the Schuylkill court house for \$200,000 to cover bonds for this amount. The bonds expire in 1922. The tract was originally leased by Frank G. Clemens and covers an area of 640 acres. A large breaker will be built by the company this summer.

Lehigh Valley Coal Company—This company is building a large breaker at Jeansville, 129x110 ft. The operations of the company have been abandoned for many years. A new colliery will also be built. Upon the completion of the new breaker the Yorktown colliery breaker will be abandoned, the intention being to deal with all the coal at the new breaker.

Lehigh Valley Changes—A number of important changes have been announced by the Lehigh Valley Coal Company. G. W. Barrager has been appointed district superintendent of the Drifton division, A. H. Lewis of the Lehigh division and Edgar Kudlick engineer of both divisions.

Pennsylvania Coal Company—A compressed-air motor exploded while being charged in the No. 14 colliery of this company at Fort Blanchard, killing two men and seriously injuring seven others.

South Dakota

CUSTER COUNTY

Clara Belle—Work at this property is being pushed in an effort to locate the course of the old vein by an incline shaft 250 ft. from the old shaft. The shaft has been sunk 250 ft. and 500 ft. of drifting has been done.

Dundee Group—Ore assaying high in silver has been discovered on this property, owned by Frank Ames, and adjoining the Meritt ground, near Custer peak. The vein was but a few inches wide at the surface, but now shows a good width. It is found in the quartzite.

Mica—A new mica mine has been discovered two miles north of Custer. The vein is now 15 ft. wide and one wall has not yet been encountered. The property is owned by Chas. Baty.

Niagara—This group of claims, east of Hill City, is now under bond to Don McGonigal and Jack Hazlett, and work is being pushed with three shifts of men. The main vein is 14 ft. wide and shows good value. It is opened by a shaft.

Saginaw Mining Company—This company is working 25 men in the shaft, saw-

mill and in mill construction. The mill will have a capacity of 100 tons per day.

LAWRENCE COUNTY

Strike Called Off—The strike of miners and mill men in the Black Hills that has tied up mining for the past five months has been called off. The operators agreed to grant the eight-hour day upon condition that the men should consent to a reduction of 25c. a day for the first three months of work; thereafter the men to receive their former scale of wages. During this 90 days the miners will receive \$3.25 a day and muckers and shovelers \$2.75. The principal mines affected by this settlement are the Mogul, Golden Reward, Imperial, Dakota, Golden Crest, Gilt-edge Maid, Maitland, Lundberg Dorr and Portland Clinton.

Branch Mint Company—This company has nearly finished construction work at its mill. Fifty men are at present employed in mine and construction work.

Globe—The controlling interest in this ground has passed into the hands of Dr. Cornell, of Elkton, Mich., who will push work. The orebody on the ground consists of a fissure vein intersecting the formation almost at right angles. The vein is at the present depth 7 ft. in width. A mill will be built.

Golden Crest—The annual meeting of the Golden Crest was held at Two Bit and the following old officers re-elected: Robt. L. Bailie, Detroit, president; Edwin Henderson, Detroit, vice-president; Fred Mc. L. Strout, Deadwood, vice-president. These three constitute the board of directors. At a special meeting of the company it was decided to increase the capital stock from \$1,000,000 to \$5,000,000 and to authorize the issuing of bonds to the amount of \$250,000. The proceeds of the sale of bonds will be used to increase the capacity of the wet-crushing cyanide mill from 50 to 250 tons per day.

Utah

BEAVER COUNTY

Tahisman—This company marketed five cars of ore last month. Of this number, four were silver-lead and the fifth zinc ore.

IRON COUNTY

Jennie Gold—This company has reached the 300-ft. level and is driving for the vein at that point. The mine has been opened on the levels above from which ore is being extracted.

JUAB COUNTY

Tintic Ore Shipments—Shipments last week amounted to 169 carloads, the contributing mines and respective amounts being: Ajax, 4; Bullion Beck, 8; Beck Tunnel, 12; Centennial Eureka, 52; Colorado, 11; DePue, 6; Eagle & Blue Bell, 1; Eureka Hill, 1; Grand Central, 6; Go-

diva, 2; Lower Mammoth, 5; La Clede, 1; May Day, 4; Ridge & Valley, 8; Scranton, 6; Tintic Iron, 11; Uncle Sam, 6; Yankee Consolidated, 8; miscellaneous, 2.

Albion—This Alta company is conducting a vigorous campaign of development and is not making regular ore shipments. The management contemplates providing its own facilities for treatment. William Hatfield, of Provo, is manager.

SALT LAKE COUNTY

Columbus Consolidated—A drift on the 400-ft. level from the No. 3 shaft has encountered a vein of high-grade ore about a foot in width. The mine is situated at Alta.

Markham Gulch Mill—This Bingham plant is giving good satisfaction and is still running ore from the Utah Apex mine.

South Columbus—The management of this Alta mine is preparing to inaugurate regular ore shipments and expects to market 500 tons within the next 60 days. Recent development has disclosed high-grade copper ore containing silver.

Utah Apex—Physical conditions at this property are better than they have ever been. The management has made the statement that a mill of 400 tons daily capacity could be kept running indefinitely on low-grade ore developed in the mine.

SUMMIT COUNTY

Park City Shipment—During the month of May the mines of Park City were represented at the smelters by 8556 tons of ore, the contributing mines and respective amounts being: Daly West, 2440; Ontario, 562; Silver King, 1639; Keith Kearns, 672; American Flag, 126; Uintah Treasure Hill, 20; Daly Judge, 1889; other mines, 1208.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

Crow's Nest Pass Coal Company, Ltd.—Following the settlement of the strike of the employees of the coal companies of southwestern Alberta and the British Columbia section of the Crow's Nest Pass this company has resumed work at Coal creek and Michel, but men are not yet obtainable in sufficient numbers to allow of working to full capacity. The directors have appropriated \$1,250,000 for further development and expansion. Fully 500 more men will be required.

Giant-California Mining Company, Ltd.—This new incorporation has acquired the Giant and California mines, at Rossland, and W. Y. Williams has been appointed mine manager. The California mine has lain idle several years. The Giant was owned by an English company, which shipped 4344 tons of ore before suspending operations in 1903. The properties are situated a short distance west of the Le Roi mine.

Consolidated Mining and Smelting Company, of Canada—This company, Rossland, of which W. H. Aldridge, of Trail, is managing director, has purchased six 12-ton electric locomotives from the Jeffrey Manufacturing Company, of Columbus, Ohio, for underground work in the mines. Three are for the Centre Star-War Eagle gold-copper mines, at Rossland; two for the St. Eugene lead-silver mine, at Moyie, East Kootenay; and one for the Snowshoe copper-gold mine, at Phoenix.

Granby Consolidated—This company is operating the hoisting engine recently installed at its new Victoria shaft, Phoenix. It is a Rand 250-h.p., double-conical-drum engine, driven by a Westinghouse 3-phase variable speed induction motor; the capacity is 1000 ft. of 1½-in. steel rope. A B. W. Hodges is manager of the company's copper mines.

Pacific Coal Company—This company, Lewis Stockett, manager, which also owns the Bankhead colliery, Alberta, is putting in a 250-h.p. Rand duplex engine, for operating a ventilating fan at the coal mine it is opening at Hosmer, Crow's Nest Pass.

Le Roi No. 2, Ltd.—The "H" vein in the Le Roi No. 2 company's mine, at Rossland, is believed to have been discovered on the 900-ft. level. Drifting at that depth is in progress, the vein is reported to look promising. Assays so far give a lower gold value than on the 700-ft. level, but copper is about the same.

Payne Consolidated Mining Company, Ltd.—The Payne mine, group of mineral claims, concentrating mill, etc., situated near Sandon, in the Slocan district, were offered for sale by auction in Montreal, Quebec, on June 5. For several years operations on the property has been restricted to mining and milling on a small scale by lessees. The Payne was one of the earliest and most valuable locations made in the Slocan and during the company's days of prosperity an aggregate of \$1,363,000 was paid in dividends.

The Dominion Copper Company, Ltd.—This company now supplies compressed air from a central power house at its Idaho mine, Phoenix, Boundary district of British Columbia, to four of its mines, the Idaho, Brooklyn, and Stemwinder, all adjoining properties; and the Rawhide, distant about a mile from the power-house. The air is compressed by a Rand 25-drill, duplex, tandem-compound engine, electrically driven, and having a capacity of about 2800 cu.ft. per min. of free air. A full equipment of Rand Little Giant machine drills has also been put in at each mine. W. C. Thomas, of Boundary Falls, is general manager for this company.

ONTARIO—COBALT DISTRICT

Cobalt Ore Shipments—The record of weekly ore shipments from Cobalt to the smelters was broken the week ending

June 8, with a total of 1,066,900 lb. from the following mines: Coniagas, 441,780 lb.; O'Brien, 64,520; Nipissing, 196,930; Drummond, 44,090; Kerr Lake (Jacobs), 94,000; Trethewey, 61,000; Silver Queen, 124,580; Foster, 40,000 lb. The total shipments from Jan. 1 to June 8 were 8,672,456 pounds.

Cobalt Lake Mining Company—A 13-drill compound air and steam compressor, furnished by the Rand-Jenckes Company, of Sherbrooke, Quebec, is being installed. Work on No. 2 vein has in the meantime been abandoned. About 20 tons of niccolite ore, showing 23 per cent. nickel and 34 per cent. arsenic, but no silver, are ready for shipment.

Floyd Location—A find of millerite carrying 64 per cent. nickel has been found on this property, which lies about 5½ miles northwest from Cobalt town. It was found in a seam at about 38 ft. depth. A steam plant is in operation.

Green-Meehan—There has been a great deal of dissatisfaction expressed with regard to the management of this mine, Cobalt, the stock of which has for some time been steadily depreciating. At a directors' meeting, on May 30, Manager Chas. O'Connell presented a report attributing slow progress to adverse weather conditions and delay in the delivery of plant. A crew of 15 men were at work. Total shipments had been about 90 tons of graded ore, realizing about \$65,000, and 24 tons low grade. It was decided to discontinue shipping for the time being and to carry on systematic development work.

Kerr Lake Crown Reserve—A ditch is being dug from Kerr Lake across the Silver Leaf property, which will reduce the level of Kerr lake by about one foot.

Nipissing Gold and Silver Mining Company—This company, of which C. R. Chisholm, of New York, is president, has just purchased several properties in Cobalt and adjacent mining areas. N. B. Brown, manager, will start work at once on a location in Coleman township, where a vein about 4 in. wide showing surface silver has been traced about 200 ft. Development will also be undertaken on a claim in Tudhope township, in an Elk lake area.

Ontario & Quebec—The second shaft is now down 50 ft., with ore showing similar in quality to that in the first shaft. Native silver has been found on the adjoining property.

St. Denis Abitibi Mine—Two cobalt and silver veins have been uncovered in Lending, Cobalt area, one of which has been traced for 300 ft.

Silver Bird Mine—A vein of calcite and smaltite with good silver contents has been struck at 115 ft. in this mine. The company has 22 men at work.

Rochester—A small steam plant is in operation and a hoisting engine and 25-h.p.

boiler are installed. Two good veins have been found. The shaft on the main vein is down 90 ft., a crosscut of 10 ft. being necessary at the 75-ft. level to follow the vein. The veins cross each other and will be connected by drifting. Native silver was found a short distance below the surface. There is much niccolite in the ore, but little cobalt.

ONTARIO—EAGLE LAKE DISTRICT

Grace Gold Mine—J. H. Caslor, of Buffalo, president and manager of this company, Eagle Lake district, announces that operations will be resumed with the opening of navigation. The stamp mill under construction is expected to be finished July 1. About 35 men will be employed.

QUEBEC—BLACK LAKE DISTRICT

American Asbestos Company—This company is pushing work in two quarries. The big mill produces from 20 to 25 tons of asbestos per day. The entire plant is operated by electric current. The company has acquired the Montreal & Glasgow and the Manhattan properties, which have not been operated for more than 10 years, and has about 60 men at work developing. At present the deposits yield considerable crude asbestos No. 1; some of the rock is hauled to the big mill.

Dominion Asbestos Company—The foundations for the new mill of this company are almost completed. The mill will treat about 300 tons of rock per day, yielding about 20 tons of mill fiber. The company recently bought about 275 acres of asbestos ground from the Standard Asbestos Company.

Montreal & Glasgow—The old mill is at present dismantled; some of the parts will be used in the construction of a new milling plant at East Broughton. This was the first mill erected for the purpose of mechanically separating asbestos from the gangue.

New Mills—Two new mills have recently been erected about 6 miles from Coleraine station, one by Boston people and the other by manufacturers of Providence, R. I. The properties on which these companies are operating are considered new ground outside the Thetford-Black Lake asbestos belt, but are reported to be as rich as those of the latter field.

Standard Asbestos Company—This company has installed another Cyclone pulverizer. The daily output of mill fiber is from 16 to 20 tons. The quarry which is near the mill has been extended westward. About 80 men are at work.

NOVA SCOTIA

Maritime Coal, Railway and Power Company—This company has purchased the entire property of the Canada Coal and Railway Company extending from Maccaro, Nova Scotia, to the company's coal dock on the Bay of Fundy, and including 17 square miles of coal-bearing

land besides an extensive submarine area held under lease from the Provincial Government, also 12 miles of railway fully equipped. A policy of active development will be pursued by the purchasing company.

YUKON

Gold Dredges—There will be at least nine gold dredges operating in the Yukon this season: the Canadian Klondike Mining Company's electrically operated dredge with a capacity of 3000 cu.yd. per day, working on the Boyle concession; the Bonanza Basin Gold Dredging Company's steam-driven dredge, stated capacity 3750 cu.yd. per day, working near the mouth of Klondike river; the Lewes River Dredging Company's steam dredge, capacity, 1200 cu.yd. per day, operating on Bonanza creek; Ogilvie Dredging Company's steam dredge, capacity 400 cu.yd., working on Klondike river; the Forty-mile Dredging Company's dredge, similar to that of the Bonanza Basin Company, working on Forty-mile river; another dredge to work in the Forty-mile district; and three dredges of the Yukon Consolidated Goldfields Company.

Yukon Consolidated Goldfields Company—This Guggenheim organization, which last summer commenced the construction of a hydro-electric plant, on Little Twelve-mile river, for the purpose of supplying electric power for the operation of its gold dredges, and the excavation of a big ditch from Twelve-mile river to its area of gold-bearing ground on Hunker and Bonanza creeks, expects shortly to have three steam shovels at work on the ditch. The power station, transformer station, and a 33,000-volt transmission system 30 miles in length were practically completed several months ago.

MEXICO

CHIHUAHUA

Parral Mines, Ltd.—This company having passed through liquidation, has been reorganized under the title of the New Parral Mines Syndicate. Operations are to be resumed. A cyanide mill will be built.

GUADALAJARA

Lerma Mines, Development and Power Company—This company has been organized in Philadelphia to work mines in the Tequila district and to install a hydraulic-electric power plant on the Santiago river. A concession on the river north of Tequila has been secured and development of the mining property has been begun.

GUERRERO

Elnita—The stamps at this property of the Rio del Oro Exploration Company, Placeres del Oro, began dropping on May 11. Forty men are at work taking down ore.

La Lucha—The chief vein on this property of the Compañia Minera La Columbia y Anexas is improving at depth. A small stamp battery, a Chilean mill and cyanide plant are working regularly, and new boilers, and additional cyanide plant and battery of stamps are being installed.

Siam

According to the *Echo des Mines*, April 29, 1907 (through *Min. Journ.*, May 4), in Siam tin is mined principally in the provinces of Puket and Kedal by two English and one Dutch companies. The annual production is about 5000 metric tons. Vast districts are yet unexplored, though probably their mineral wealth is considerable. In these places the government is constructing roads and improving the existing ones.

Tasmania

The results of working at the Briseis Tin Mines in Tasmania during 1906 have been very satisfactory. The amount of gravels treated at the company's mine was 401,800 cu.yd. yielding 1018½ tons of black tin; and the output from No. 1 mine was 214,190 cu.yd. yielding 389½ tons of black tin. The respective yields of metallic tin were 746 and 285 tons. The Briseis Company takes 58 per cent. of the No. 1 output leaving 42 per cent. to the owners of the property.

The total net proceeds of working received by the Briseis Company were £168,123, and the net profits were £128,557. Out of this £7000 has been written off and £5000 has been spent in purchasing an adjoining property from the Ringarooma Company, besides £20,000 placed to reserve. A balance of £58,193 was brought into profit and loss account from last year. For 1906 dividends amounting to £112,500 have been distributed, on a paid up capital of £600,000 and £42,000 carried forward. The future prospects of the company are in no way different from last year. The estimated life of the mine is only a few years, but as the facts on which the estimate is based are by no means certain, the life may be longer than is anticipated.

Cartagena, Spain

Messrs. Barrington & Holt report prices for Spanish ores for the fourth week of May, 1907. Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d. @ 10s. 3d.; low phosphorus, 10s. 9d.; specular ore 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market. For iron pyrites, 40 per cent. iron and 43 per cent. sulphur, 11s. 9d.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, June 19—Little new business is reported but mines are producing well up to capacity. The warm weather of the past few days will undoubtedly affect the general tone of the market, which at this time of the year is usually extremely dull. In the Alabama fields the question of a new wage scale comes up for consideration this week, and will probably be settled amicably and with few delays. The western markets are easy, and are taking fair amounts of coal. The activity of the iron furnaces and the steel industries naturally keeps the coal production up to full capacity, but domestic lines show the usual dullness at this time.

The bituminous trade shows activity in certain places, but is dull in others. The scarcity of vessels materially affects coastwise and Sound trade, and freight rates are easily maintained at their present high figure.

Scarcity of labor in the Welsh coal fields has forced manufacturers in Portugal and Italy to purchase coal in the United States, and the Italian Government, through its ministry of marine, has begun to contract for American coal and has closed for 20,000 tons of bituminous coal for the use of the navy.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to June 8, were as follows, in short tons:

| | 1906. | 1907. | Changes. |
|-----------------|------------|------------|--------------|
| Anthracite..... | 1,786,277 | 2,466,569 | I. 680,292 |
| Bituminous..... | 13,823,037 | 16,431,039 | I. 2,608,002 |
| Coke..... | 5,594,927 | 6,152,322 | I. 557,395 |
| Total..... | 21,204,241 | 25,049,930 | I. 3,845,689 |

The total increase this year was 17.1 per cent.

New York ANTHRACITE

June 19—The usual dull condition of the summer season is now prevalent in the Atlantic trade, and this condition is likely to be accentuated if the present spell of warm weather continues. This statement may be qualified somewhat in that there continues to be a rather pronounced activity in the sale of small steam sizes. Car supply remains without further improvement. We quote prices as follows: Broken, \$4.45; egg, stove and chestnut, \$4.70; pea, \$3.10; buckwheat, \$2.60; rice, \$1.90; barley, \$1.60—all f.o.b. New York harbor.

BITUMINOUS

The Atlantic seaboard soft-coal trade is dull in some places, but fairly active in others. This activity, where existing, is due to lack of facilities to fill orders coming from that particular territory. The salient feature of this week is the continued shortage of water transportation. Most of the orders now being filled are upon season's contracts and very little new business is in sight.

Trade in the far East is calling for considerable quantities of coal and shippers apparently are having difficulty in keeping orders from this territory from accumulating. The maintenance of winter freight rates indicates that the demand for vessels must be large.

Trade along the Sound is quiet and it is a question whether the high rates on Sound barges have not affected the taking on of coal at this time.

Trade in New York harbor is quiet and prices are inclined to be weak. Good grades of steam coal are quoted at \$2.50@2.60, f.o.b. New York harbor shipping ports.

The all-rail trade is quiet, all consumers being apparently well supplied. Transportation from mines to tide is slower than it should be, requiring from 10 days to two weeks. Car supply is up to demand, except in a few instances.

In the coastwise vessel trade, vessels are scarce and in large demand. Rates are unchanged from last week and are quoted as follows: From Philadelphia to Boston, Salem and Portland, \$1.05@1.10; Providence, New Bedford and the Sound, \$1; Lynn and Bangor, \$1.30; Portsmouth, Gardiner and Saco, \$1.15; Bath, \$1.10. We hear of season charters for the balance of the year at \$1.05 and discharge and loading and discharging clause.

Birmingham

June 17—Summer has not interfered so far with the coal market in Alabama. Effort is still being made to improve the production in coal and these efforts will, within two months, show much success. By that time it is believed that several of the new mines of the Pratt Consolidated Coal Company will be in full operation. The railroad being constructed toward Walker county is fast nearing completion and the new mines will furnish a good traffic. The miners are doing well and more and more money is being distributed. Two large coal companies were

organized during the past week in Walker county, one with \$50,000 capitalization and the other with \$10,000. The Birmingham Iron Company is pushing the work on its mines at Mulgay. This mining camp promises to be the largest modern mine in the State; the mines and property will be equipped with electrical machinery.

The production here in time will be pushed up to 2500 to 3000 tons. Other companies in Alabama are making preparations for an increased production. There is a demand for every ton of coal that can be mined, while outward shipments are of some consideration. Good prices prevail. The new wage scale of the union miners is under consideration this week and will no doubt, be agreed upon. The commercial coal companies deal only with the union miners, except the Alabama Consolidated Coal and Iron Company. The miners' organization now contains only about three thousand members, a difference of nearly eight thousand being shown since 1904 when the strike at the mines of the iron companies began. The difference in membership is explained by the secretary of the State organization in that many of the miners who were out on strike did not have to pay dues and since the strike has been declared off they have not renewed their membership and are not yet paying dues though claiming affiliation. The district is still receiving labor from foreign countries and from this country and as fast as the men come in they are given employment.

Chicago

June 17—The wholesale coal market is gradually showing signs of the usual summer weakness. Heretofore the active demand for domestic coals, due to cool weather, and the foresight of consumers in laying in stocks, has given the coal trade an active business. The needs of steam coal consumers also has been large. Though consumption is still large, the coming of warm weather and the shipment of more coal to market than can readily be disposed of, brings the local market face to face with its chronic evil—accumulation of coal on tracks, causing demurrage.

There are hopeful signs that the Illinois and Indiana operators will proceed to relieve the situation by shipping less coal. Eastern mines, at the same time, must do likewise, if the market is to continue firm. Fine coals are strengthening as is natural, with the advance of summer. Prepared

sizes of bituminous coal are weak, and the market can take care, safely, of very little of this kind of coal.

Prepared sizes from Illinois and Indiana mines bring \$1.80@2.10 for standard products; run-of-mine from the same mines sells for \$1.60@2 and screenings are in active demand at \$1.35@1.65.

Of eastern coals smokeless is probably the most active, though the dull season is evidently opening for that also. Run-of-mine from New River and Pocahontas mines brings \$3.15@3.35. Hocking Valley is somewhat dull at \$3.15, with the probability of a lower price. Pittsburg ranges \$2.90@3 for 1¼-in. lump and Youghiogheny sells for about \$3.20 (¾-in.), with the demand not active for either.

Anthracite, coming forward in good quantities by lake, is not in large demand, most of the coal moving now being that contracted for on May prices. The usual summer inactivity seems to have overtaken the market.

Pittsburg

June 18—Most of the mines in the district are in operation this week, as the car supply is excellent. Prices remain about the same on the basis of \$1.20 for mine-run coal at the mine, but there has been a decided drop in the price of slack. On contract sales have been made at 85c., but during the week a number of sales were made at 60c. for early delivery. Coal from the river mines is being shipped as fast as it is mined, as the rivers are still navigable. Several tows went out last night and today and some large tows of empty coal-boats and barges were returned from lower ports.

Connellsville Coke—The coke market is stronger, although some spot coke can be bought at a low price. The H. C. Frick Coke Company has contracted for the entire output of several independent concerns for 1908. For second half furnace coke is quoted at \$2.65 to \$2.75 and foundry coke is firm at \$3.25. The *Courier* in its summary for the week gives the production of both fields at 420,467 tons. The shipments aggregated 14,596 cars, distributed as follows: To Pittsburg, 5211 cars; to points west of Connellsville, 8514 cars; to points east of Connellsville, 871 cars.

Iron Trade Review

New York, June 19—The market for pig iron continues dull and quiet so far as new business goes. Production goes on steadily and shipments are up to the limit of capacity. But they are not as regular as heretofore, due to the change of freight rates operative in June, and because some consumers underestimated their second-quarter needs and are asking for July quotas in June. Others are requesting a suspension of shipments for the time

being. Southern iron is being sold into the second quarter of 1908, but there has been no forcing of business.

Western pig iron is easy and shipments are going forward regularly. Shipments of English pig iron are being made to Baltimore, New York and Philadelphia, and an advance in freight rates from 5s. 6d. to 7s. 3d. has taken place.

Little business is being done in pig-iron certificates on the Produce Exchange and prices remain unchanged.

Little new business is reported in steel shapes and products, the mills being still much behind on their orders and working full capacity. This is especially true of wire products and steel-sheet mills.

Scrap iron and steel is easier and inactive, but prices easily maintain their past level.

Baltimore

June 17—Imports of ferromanganese for the week were 706 tons; of manganese ore, 660 tons; of ferrosilicon, 506 casks; Receipts of iron ore were 11,800 tons from Cuba. Other imports included 3000 tons of iron pyrites from Spain; 5000 bars, 389 cakes, and 486 ingots of copper. Exports included steel in billets, nails, wire and pipe and copper in miscellaneous form.

Birmingham

June 17—Alabama pig-iron manufacturers are now selling a little iron into the second quarter of the coming year. The same price is given as that being sold for first-quarter delivery, \$18.50 per ton, No. 2 foundry. The statement is reiterated that there is no forcing of the market and that the business is coming in quietly though steadily of its own volition; little iron is to be had for delivery during the third quarter of the present year. A few sales are still being made for fourth-quarter delivery. Iron for delivery during the third quarter of this year is quoted at \$22.50 per ton, No. 2 foundry, \$21.50 per ton for the fourth quarter and after that \$18.50 per ton. The production is showing a little improvement. Furnaces which were blown in during the past fortnight are doing as well as could be expected. The Sloss-Sheffield Steel and Iron Company will blow in their Hattie furnace in the Sheffield district by June 25; the Philadelphia furnace by July 1; and the No. 4 North Birmingham furnace by August 1. All three furnaces are being improved considerably. This company only has three furnaces in blast at present and the lack of iron is being felt.

There is little spot iron being dealt in by Alabama iron manufacturers, the companies in many instances being behind on business booked some weeks previously. Spot iron is still being quoted above \$23.50 per ton, No. 2 foundry.

All indications point to the production in this State being somewhat greater than it was in May. Iron ore is still scarce,

and development is still going on in the orefields.

No change is reported in the steel situation. The large plants are in full operation and the products are being handled promptly.

Chicago

June 17—The tone of the iron market is not lively, but there are as yet no signs of weakening of prices. Sales are almost wholly in small quantities, for delivery as soon as the iron can be shipped. Contract making is apparently entering the dull summer season, the tendency of melters being still to hold off in the expectation of a drop in prices. There are some users of iron, however, who deem it prudent to contract now not only for fourth-quarter needs, but also for the first quarter of 1908. Selling agents profess to see in the market only signs of continued steadiness and say they are not actively seeking business. With general conditions of business so good as they are now, the market seems unlikely to weaken materially. The tone of sales for all branches of the iron-products market is remarkably strong.

For third- and fourth-quarter delivery No. 2 Southern iron is quoted at \$20@21.50 Birmingham, the higher prices obtaining for the earlier deliveries, and the lower for later deliveries in the year. For the first quarter of the coming year \$18.50@19 prevails. Northern iron for the last quarter brings \$25.50@26. For delivery within the next thirty days Southern is quoted at \$22.50@23, or \$26.85@27.35 Chicago. Northern iron on the same condition of delivery brings \$26.50@27. Lake Superior charcoal, scarce, sells for \$27.50 spot delivery.

Coke is plentiful, with no notable surplus subject to demurrage conditions. Connellsville 72-hour sells for \$5.85, and West Virginia 72-hour for \$5.40.

Cleveland

June 17—The scrap-iron market has attracted considerable attention during the week on heavy sales of old steel rails. Railroad offerings of this material brought around \$17.50@18.75.

Heavy tonnages have been handled down lake this week in iron ore. Lake rates remain about the same, but a heavy demand for tonnage is noticeable. The Detroit river was partially blockaded by the sinking of two vessels, but a heavy stream of ore has been piling up on the Cleveland and Lorain docks. Indications point to a movement of 6,000,000 tons this season.

The pig-iron market has been fairly active, with a better inquiry for deliveries during the first half of 1908, with sales for that delivery at furnaces at \$21.50 and slightly better. Deliveries for last half are quoted as follows: No. 1 foundry, \$24.50; No. 2, \$24; No. 3, \$23.50; Besse-

mer, \$23.90; No. 2 Southern, \$24.35; and Gray Forge, \$22.50.

The machinists' strike still continues in a number of Cleveland plants, but indications point to a quick settlement, as the strikers show signs of weakening. All of the shops have been operating on reduced help, but are now nearly back to the full quota again.

Coke has been a feature of strength in the manufacturing industry on heavy buying of furnace quality. Prices carry a range from \$2.15@2.25 for spot delivery, with late deliveries at \$2.25@2.50, with a nominal market at \$2.35. Foundry is bringing \$3.25 for last half.

The coal market continues rather weak with a small run of sales. Supplies in the city are heavy, and are not being reduced. Pittsburg No. 1 slack is quoted at \$1.50 on track, run of mine at \$1.85 down to \$1.75, and $\frac{3}{4}$ lump from \$1.90@1.95.

Philadelphia

June 19—Comparative inactivity is the feature of the pig-iron market; forward buying has reached its limit for the present. Inquiries for both domestic and foreign iron, which were made two or three weeks ago, are not being pressed. In several instances concerns which have booked additional work have not covered this new business, as has been the custom. The oversold condition makes producers indifferent to the course of the market. It is only the tail end of productive capacity that has to be disposed of and the producers know that even should prices weaken, they have very little to lose. Some effort at re-selling is no sign of weakness, but only a disposition to get rid of high-priced pig and take chances on lower prices later. Foundry is moving in small lots. Mills are well protected by contracts for forge. Foreign iron is not so strong and contemplated purchases, by a few large consumers, have been side-tracked. Basic is quoted at \$23@24, according to fourth- or third-quarter delivery. No. 2 foundry for similar delivery is \$25@24. Gray forge, \$22.50@23. English No. 3, \$22.50.

Steel Billets—There is no change in conditions. Business is good. Prices are unchanged. Some grades of foreign steel have sold at \$38. It is understood that the mills are gradually catching up, but on the other hand there is business in sight for mid-summer, the disposition of which means the choking up of mills, badly as ever.

Bar Iron—Conditions of demand in western markets have favored this market by influencing a number of larger consumers to anticipate autumn demands. The retail demand has also improved, and the entire bar mill industry is in a most vigorous condition. Steel bars are well oversold.

Sheet Iron—About the same conditions and influences surround the sheet-iron in-

dustry, and buyers are anxious to carry supplies in stock.

Pipes and Tubes—An enormous amount of business is being quietly done in the way of renewing contracts. Premium prices continue to be paid for early deliveries, and this sort of business is on the increase. The mill people are giving assurances respecting prompt delivery for the summer and autumn.

Plates—The plate mills of this territory feel perfectly safe against competition from outside sources in view of the enormous volume of business in sight in western territory. Local demand is good, and prices are closely bordering premium rates because of the policy of so many small buyers who prefer to pay a little more, in order to get plates just when they need them.

Structural Material—The most of our recent business has been in small lots for local requirements at satisfactory prices. A great deal of construction has to be completed during the next four months, outside of railroad requirements, and orders for this class of work are coming along. The office people say that a large amount of business is shaping up which will probably be ready for figuring about August.

Steel Rails—Rail makers are figuring on considerable trolley-line work for 1908 delivery, to say nothing of work for delivery this fall and early winter. Details as to the financing of trolley-line construction have been completed, and the prosecution of work will now be rushed.

Standard sections are being ordered daily in large and small quantities.

Scrap—Steel scrap has still the right of way, and the supply is below the demand. All kinds are moving a little more freely than for some weeks. Recent sales of railroad scrap have eased demand somewhat. Machinery scrap is scarce at \$21. Long and short scrap is offered at \$19.50; old iron rails are nominally \$28.

Pittsburg

June 18—The inactivity in the iron and steel markets is attributed by several producers to what they term the usual mid-summer dullness. This seems to be stretching a point somewhat to cover the apparently unfavorable conditions, as summer has not actually commenced. About the only new business of any consequence noted for several weeks was the placing of orders for 5800 steel cars by the United States Steel Corporation a week ago for delivery before Oct. 1. As the car-making concerns early in the year announced that they were filled with business for the entire year, it is evident that some railroads have canceled orders. The report that there had been extensive cancellations by railroads is denied in some quarters and the explanation is made that these new orders merely take the place of 6000 cars canceled by the Wabash, and that the Steel

Corporation is prepared to take the place on the order books of the car concerns for any further cancellations. It is announced that the National Tube Company, a subsidiary of the corporation, will need some railroad cars before the close of the year. However, specifications in finished lines are not as large as they were early in the second quarter, and while there were offers of premiums for plates, sheets and structural material early this year, deliveries are improved and only regular prices are being paid.

There is no weakness in the established prices in any line, and it might be possible to obtain a higher price than is named for prompt deliveries of merchant pipe and boiler tubes. The National Tube Company is filled with business that will keep all of its plants running steadily all year. Unless there are cancellations or postponements of orders, the mills of this district will be kept fairly busy until well into the fourth quarter. The steel-bar trade is regarded as one of the encouraging features from the fact that the agricultural-implement makers have come into the market for fully 200,000 tons, or nearly their entire requirement for the year beginning July 1. They paid the full price of 1.60c. Pittsburg, and the early buying is taken as an indication that they have confidence in good crops for this year. Since it curtailed its structural-steel production and began putting its steel into billets, the Cambria Steel Company has sold fully 40,000 tons, the Carnegie Steel Company placing an order for 10,000 tons.

The wage conference between representatives of the Amalgamated Association of Iron, Steel and Tin Workers and the Republic Iron and Steel Company ended on June 14 after a four days' session without reaching a settlement. This does not mean that a strike will occur when the present agreement expires on June 30, as it is probable a board of conciliation will be appointed to adjust the differences, and the mills will be kept in operation pending a settlement.

The conference on the Amalgamated Association's new scale and the American Sheet and Tin Plate Company opened this morning. A demand is made for an increase which will not be granted. It will be explained that the tin workers received an advance of 6 per cent. this year under the sliding scale that was not warranted by conditions. Tin plate was advanced in price 30c. a box, but the manufacturers did not benefit, as the increase was absorbed by the advance in the price of pig tin. No trouble in arriving at an agreement is feared, as it is believed the workers will be willing to make some concessions.

Pig Iron—There is no change in the market and prices for spot delivery continue weak, and \$24 and less can be done on bessemer iron at the furnace. For third quarter and last half \$23.50 is still quoted, but there have been no sales on which to

base a quotation. A number of inquiries have been received for small lots of No. 2 foundry iron, but so far only one sale, 100 tons, for June delivery has been recorded. The price was \$24.50 at furnace. It was re-sale iron which is said to be the cause of the decline of 50c. a ton from the spot quotation that has prevailed for several months. Gray forge is quiet, and it is believed \$21.50. Valley furnaces, could be done for June delivery.

Steel—The bessemer-billet market is easier and \$30, Pittsburg, is quoted. Open-hearth billets are still scarce and are quoted nominally at about \$33. Steel bars remain strong at 1.60c. and plates at 1.70c.

Metal Market

NEW YORK, June 19.

Gold and Silver Exports and Imports

At all United States Ports in May and year.

| Metal. | Exports. | Imports. | Excess. |
|----------------|-------------|--------------|------------------|
| Gold: | | | |
| May 1907.. | \$4,505,444 | \$ 2,641,879 | Exp. \$1,863,565 |
| " 1906.. | 5,722,148 | 34,911,028 | Imp. 29,188,880 |
| Year 1907.. | 12,410,407 | 20,216,984 | Imp. 7,806,577 |
| " 1906.. | 28,354,322 | 60,168,698 | Imp. 31,814,376 |
| Silver: | | | |
| May 1907.. | 4,326,216 | 3,496,458 | Exp. 829,758 |
| " 1906.. | 5,539,546 | 4,405,959 | " 1,133,587 |
| Year 1907.. | 23,858,610 | 18,809,468 | " 5,055,142 |
| " 1906.. | 28,918,841 | 19,916,816 | " 9,002,025 |

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York
For week ending June 8 and years from Jan. 1.

| Period. | Gold. | | Silver. | |
|-----------|--------------|------------|------------|-----------|
| | Exports. | Imports. | Exports. | Imports. |
| Week..... | \$ 5,530,588 | \$ 45,224 | \$ 980,298 | \$ 17,951 |
| 1907..... | 10,227,122 | 5,615,351 | 17,128,436 | 760,249 |
| 1906..... | 5,718,521 | 44,431,197 | 27,909,550 | 918,212 |
| 1905..... | 33,118,146 | 5,268,759 | 14,308,575 | 1,719,789 |

The joint statement of all the banks in the New York Clearing House for the week ending June 15, shows loans \$1,139,755,900, a decrease of \$1,689,200; deposits, \$1,114,272,300, a decrease of \$4,869,200, as compared with the previous week. Reserve accounts show:

| | 1906. | 1907. |
|--------------------|---------------|---------------|
| Specie..... | \$185,357,000 | \$210,056,200 |
| Legal tenders..... | 83,761,900 | 73,026,500 |
| Total cash..... | \$269,118,900 | \$283,082,700 |
| Surplus..... | \$ 7,073,375 | \$ 4,514,625 |

Specie holdings of the leading banks of the world, June 13, are reported as below, in dollars:

| | Gold. | Silver. | Total. |
|---------------------|---------------|---------------|---------------|
| Ass'd New York..... | ..... | ..... | \$210,056,200 |
| England..... | \$175,018,655 | ..... | 175,018,655 |
| France..... | 544,815,250 | \$198,568,335 | 743,383,585 |
| Germany..... | 177,510,000 | 59,170,000 | 236,680,000 |
| Spain..... | 77,600,000 | 128,090,000 | 205,690,000 |
| Netherlands..... | 26,672,500 | 28,179,000 | 54,851,500 |
| Belgium..... | 16,656,665 | 8,328,335 | 24,985,000 |
| Italy..... | 161,455,000 | 24,723,500 | 186,178,500 |
| Russia..... | 581,520,000 | 32,390,000 | 613,910,000 |
| Aust.-Hungary..... | 228,000,000 | 63,520,000 | 291,520,000 |
| Sweden..... | 20,720,000 | ..... | 20,720,000 |

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to June 6:

| | 1906. | 1907. | Changes. |
|--------------|-------------|------------|----------------|
| India..... | £ 8,245,113 | £5,445,244 | D. £ 2,799,869 |
| China..... | ..... | ..... | ..... |
| Straits..... | 1,750 | 491,862 | 1. 490,112 |
| Total..... | £ 8,246,863 | £5,937,106 | D. £ 2,309,757 |

Imports for the week were £138,000 in bullion and £7000 in Mexican dollars from New York. Exports were £130,710 in bars and £57,000 in Mexican dollars to India, a total of £187,710.

Prices of Foreign Coins

| | Bid. | Asked. |
|---------------------------------|---------|--------|
| Mexican dollars..... | \$0.52½ | \$0.54 |
| Peruvian soles and Chilean..... | 0.47 | 0.50 |
| Victoria sovereigns..... | 4.85 | 4.87 |
| Twenty francs..... | 3.85 | 3.89 |
| Spanish 25 pesetas..... | 4.78½ | 4.80 |

SILVER AND STERLING EXCHANGE.

| June. | Sterling Exchange. | Silver. | | June. | Sterling Exchange. | Silver. | |
|-------|--------------------|------------------|----------------|-------|--------------------|------------------|----------------|
| | | New York, Cents. | London, Pence. | | | New York, Cents. | London, Pence. |
| 13 | 4.8700 | 66½ | 30½ | 17 | 4.8725 | 67½ | 30½ |
| 14 | 4.8700 | 66½ | 30½ | 18 | 4.8735 | 67½ | 31½ |
| 15 | 4.8710 | 67½ | 30½ | 19 | 4.8730 | 67½ | 31 |

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

| June. | Copper. | | | Tin. | Lead. | Spelter. | |
|-------|--------------------|----------------------------|--------------------|------|-------|------------------------|-------------------------|
| | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | London, £ per ton. | | | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 13 | 24 @24½ | 22½ @23 | 95 | 41½ | 5.75 | 6.40 @6.45 | 6.25 @6.30 |
| 14 | 23½ @24½ | 22½ @23 | 97½ | 42 | 5.75 | 6.40 @6.45 | 6.25 @6.30 |
| 15 | 23½ @24½ | 22½ @22½ | ..... | 42½ | 5.75 | 6.40 @6.45 | 6.25 @6.30 |
| 17 | 23½ @24½ | 22½ @22½ | 97½ | 42½ | 5.75 | 6.40 @6.45 | 6.25 @6.30 |
| 18 | 23½ @24½ | 22½ @22½ | 99½ | 43 | 5.75 | 6.40 @6.45 | 6.25 @6.30 |
| 19 | 23½ @24½ | 22½ @22½ | 99 | 43½ | 5.75 | 6.40 @6.45 | 6.25 @6.30 |

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b.s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—There have been further transactions, about the same in volume as last week, in electrolytic copper for export, near-by delivery, at further concessions in price, and there have been some small transactions in Lake copper and casting. In so far as domestic business is concerned there has been the same stagnancy as for many weeks previous. The general condition of the market remains unchanged, the sellers who withdrew some

time ago still maintaining the same position. There have been rumors of negotiations with the large consumers, which may end the dead-lock, but if there have been any such negotiations they have not gone far. In the meanwhile we are now very near the time at which all of the producers will have filled their contracts, and the question is largely to what extent consumers may have proved to have overbought. There is a growing conviction that an early reduction in the so-called official price for copper will take place. On this account producers and second-hands have become urgent in their efforts to effect sales. The close is weak at 23¾@24¼c. for Lake and 22¼@22¾c. for electrolytic. The market for casting during the week has been 21¼@21¾c.

The spot position of the g.m.b.'s market had become so oversold that the bull operators utilized the opportunity to make a drive against the bears, which resulted in an advance of the spot position to about £99, and the decrease in the statistics of 500 tons facilitated the aforesaid campaign. The close is easy at £99 for spot, £93 15s. for three months'.

Refined and manufactured sorts we quote: English tough, £102; best selected, £106; strong sheets, £113.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The advance in London has had but very little effect upon the New York market. Buyers covered fairly freely on the recent break, and having no confidence in a higher market, are now disposed to await developments. The close is cabled as easy at £187 10s. for spot, £181 10s. for three months'.

The New York market has been steadily advancing, closing at 43½c.

Lead—The price for desilverized remains steady at 5.75c., New York, and 5.67½c., St. Louis. Corroding brands are 0.1c. higher.

A corner in June deliveries caused a great deal of excitement in the London lead market, and business was done at as high as £22, which is a record price for upward of a generation. On the same basis, futures sold at £1@£1 10s. less. There is much less activity at the end of the week, but the market is still very unsettled. Quotations at the close are £20 15s. for Spanish lead, and £21 for English.

Spelter—Business with consumers has been of small volume and there is now a tendency to buy only from hand to mouth, probably a direct reflex of the weaker iron and copper markets. Quotations at the close are substantially unchanged at 6.40@6.45c. New York, 6.25@6.30c. St. Louis.

So far, the low prices prevailing in Europe have not stimulated the demand, and the close is barely steady at £24 10s. for good ordinaries, £24 15s. for specials.

Antimony—After the big drop of last week the market has become extremely dull, but is still soft, with supplies of metal freely offered. Quotations are 12@13½c. for Hungarian and outside brands, while for other grades the market is nominal at 13@14c. for Hallett's, and 16c. for Cookson's.

Platinum—A slight appearance of strength in the market has checked the decline in prices, which remain unchanged from last week and are quoted as follows: Ordinary metal, \$26 per oz.; hard metal, \$28.50. Scrap is worth \$20@21.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Wisconsin Ore Market

Platteville, Wis., June 15—The price of 60 per cent. ore remained about the same as last week, selling from \$48@48.50, while lead was the same as last week. The buying of ore remained steady throughout the week and a large portion of next week's tonnage has already been sold, there being no surplus in the bins.

The local producers express themselves quite strongly that the present zinc ore price will be maintained throughout the summer, providing the supply of cars meets with the demand of the producers. The continued rainy weather the early part of the week, showed a slight inclination toward a material dropping off of the tonnage, but the continued fair weather that set in the last part of the week has added very much toward bringing up the tonnage for the entire week. Taken as a whole, the zinc market has held its own for the past two months.

All the lead that was produced was reported sold, while dry bone and sulphur suffered no material change.

Shipments of the district, by camps for the week ending June 15 were as follows:

| Camps. | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|------------------------|---------------|---------------|------------------|
| Platteville | 170,000 | ..... | ..... |
| Buncombe-Hazel Green.. | 598,800 | ..... | ..... |
| Benton | 409,915 | ..... | ..... |
| Linden | 234,260 | ..... | ..... |
| Highland | 198,000 | ..... | ..... |
| Mineral Point | 192,500 | ..... | ..... |
| Galena | 161,600 | ..... | ..... |
| Livingston | 124,000 | ..... | ..... |
| Cuba City | 50,000 | ..... | ..... |

Missouri Ore Market

Joplin, Mo., June 15—Zinc prices were unchanged at \$51 per ton for the choicest ore, on an assay basis of \$46 to \$48 per ton of 60 per cent. zinc. The average price was \$43 per ton, on account of heavy sales of low-grade ores.

As high as \$78 per ton was paid for a few bins of lead ore by one buyer, while the representatives of three of the purchasing agents were offering only \$73 at the close of the week. The average price was \$74.56.

The shipment of the week represents approximately the output capacity of the district since the new concentrating mills have been placed in commission, increasing the output 600 to 750 tons per week, and placing it 350 to 400 tons per week higher than before the flooding of the Badger mines. These mines are being rapidly drained and should be in operation not later than the latter part of July. Providing the old mines continue with an average output the production this summer will be approximately 1000 tons per week larger than last summer, or about 6300 tons.

Following are the shipments of zinc and lead from the various camps for the week ending June 15:

| | Zinc, lb. | Lead, lb. | Value |
|--|-------------------|------------------|------------------|
| Webb City Carterville. | 3,001,200 | 354,150 | \$83,808 |
| Joplin | 2,924,060 | 308,390 | 61,741 |
| Galena-Empire | 1,565,420 | 102,280 | 39,788 |
| Alba-Neck City | 1,016,220 | 2,480 | 24,988 |
| Duenweg | 802,600 | 150,000 | 24,480 |
| Prosperity | 597,090 | 83,840 | 17,174 |
| Oronogo | 428,770 | 84,530 | 13,108 |
| Granby | 575,000 | 75,000 | 10,850 |
| Spurgeon | 337,400 | 107,470 | 10,776 |
| Aurora | 316,290 | 39,350 | 8,575 |
| Baxter Springs | 278,680 | 27,260 | 7,278 |
| Badger | 191,980 | ..... | 4,703 |
| Sarcoite | 170,640 | ..... | 3,924 |
| Zincite | 149,370 | ..... | 3,511 |
| Carthage | 147,380 | ..... | 3,510 |
| Stott City | 115,810 | ..... | 2,606 |
| Cave Springs | 87,720 | ..... | 2,018 |
| Sherwood | 37,660 | 12,410 | 1,319 |
| Totals | 12,743,290 | 1,347,160 | \$324,157 |
| 24 weeks | 290,690,950 | 45,587,040 | \$8,656,598 |
| Zinc value, the week, \$274,030; 24 weeks, \$6,802,316 | | | |
| Lead value, the week, 50,127; 24 weeks, 1,854,282 | | | |

| ZINC ORE AT JOPLIN. | | | LEAD ORE AT JOPLIN. | | |
|---------------------|-------|-------|---------------------|-------|-------|
| Month. | 1906. | 1907. | Month. | 1906. | 1907. |
| January .. | 47.38 | 45.84 | January .. | 75.20 | 83.53 |
| February .. | 47.37 | 47.11 | February .. | 72.83 | 84.58 |
| March | 42.68 | 48.66 | March | 73.73 | 82.75 |
| April | 44.63 | 48.24 | April | 75.13 | 79.76 |
| May | 40.51 | 45.98 | May | 78.40 | 79.56 |
| June | 43.83 | ..... | June | 80.96 | ..... |
| July | 43.25 | ..... | July | 74.31 | ..... |
| August | 43.56 | ..... | August | 75.36 | ..... |
| September .. | 42.58 | ..... | September .. | 79.64 | ..... |
| October | 41.55 | ..... | October | 79.84 | ..... |
| November | 44.13 | ..... | November | 81.98 | ..... |
| December | 43.68 | ..... | December | 81.89 | ..... |
| Year | 43.24 | ..... | Year | 77.40 | ..... |

Chemicals

New York, June 19—The general chemical trade is without special features. Business holds very active, with no new developments.

Copper Sulphate—Demand continues to have a firm tone. Few sales are reported outside of regular consuming lines. There have been a few calls for the salt from agricultural sources, but this trade generally purchased all its requirements early in the spring. Prices remain at \$7.50 per 100 lb. for carload lots and \$7.75 for smaller amounts.

Nitrate of Soda—The market shows no change over last week. The demand is good and spot nitrate is practically out of the market, there being no vessels discharging at the moment. Prices have not changed and are 2.55c. for 96 per cent., 1907 delivery, with 95 per cent. at 2.47c. For next year's delivery quotations for

these grades are 2.55½c. and 2.50c. respectively.

Mining Stocks

New York, June 19—The market for mining shares was generally dull and inactive with prices low. There seems to be little or no interest taken in trading and transactions are practically professional and confined to a small volume of business.

Amalgamated was weak and sold down at the close to \$82½, a loss of \$2 from last week's close. American Smelting common closed at \$115¼, and the preferred at \$104¾, both showing a loss. United States Steel common closed at 32¾ and the preferred at \$97¾. The curb was listless and little interest was displayed in the Cobalt stocks.

The Nevada stocks, dealt in on the curb, showed more activity but prices had a tendency to decline. The volume of business was greater with these than with the silver stocks.

Boston

June 18—Mining stocks were better for part of last week, but reached their lowest point Monday, June 17. Pressure has been apparent in spots, but as a rule there has been a fractional lowering of prices. Many stocks are selling at the lowest prices of the year, notably Calumet & Hecla, which touched \$75, against a high price of \$100 a share early in the year. The features have been Utah Consolidated, Old Dominion, Bingham Consolidated, North Butte and Copper Range.

Persistent selling of Utah Consolidated caused a further drop of over \$5 in the price of the stock to \$48.50. It has since recovered to \$50, ex-dividend. Although denials have been made regarding the leanness of the ore at depth, the response has been very feeble in the market. Bingham Consolidated is off \$2 to \$13 on free offering and no support. Old Dominion also suffered a \$4 break to \$41, on the sale of a block of the stock in a narrow market. Subsequently it recovered to \$43.

Copper Range is about the same tonight as a week ago, selling at \$76.25. The Baltic has increased its dividend to \$10 semi-annually. Copper Range owns all but 341 of the 100,000 shares. Several mining companies will soon take dividend action and it is expected that Osceola will increase its dividend to \$8. The stock closes the same as a week ago at \$125. North Butte fell \$3 to \$75.50 and Mohawk is off to \$75.50, ex-dividend. U. S. Smelting is about the same at \$49. Earnings of this company are said to be at the rate of \$7 on the common stock. Amalgamated receded \$3 to \$81, recovering to above \$82. Calumet & Arizona has varied from \$152 to \$154. Estimated earnings during the current six months are \$3,400,000, out of

which \$2,000,000 has been paid in dividends. The Shannon Copper Company has recently sold about 300 acres of land to the Arizona Copper Company for a smelter site. The curb has followed the general market.

Colorado Springs

There has been a fair amount of trading on the local mining exchange the past week, but prices have been weak and declining, with the exception of the stock of three or four companies that have declared dividends. These stocks have held their own. There is a general feeling among the brokers that the summer slump is on and that prices will continue to decline until September.

STOCK QUOTATIONS

| NEW YORK June 18 | | BOSTON June 18 | |
|------------------------|---------|-----------------------|--------|
| Name of Comp. | Clg. | Name of Comp. | Clg. |
| Alaska Mine..... | 1 1/8 | Adventure..... | 1/8 |
| Am. Nev. M. & P. Co. | 8 1/2 | Allouez..... | 1/8 |
| Amalgamated..... | 55 | Am. Zinc..... | 34 |
| Anacosta..... | 8 | Arcadian..... | 4 1/2 |
| Balakala..... | 8 | Atlantic..... | 1 1/2 |
| British Col. Cop..... | 2 1/2 | Bingham..... | 13 1/2 |
| Buffalo Cobalt..... | 2 1/2 | Boston Con..... | 15 1/2 |
| Butte & London..... | 24 | Calumet & Ariz.* | 154 |
| Butte Coalition*..... | 2 1/2 | Calumet & Hecla* | 770 |
| Butte Cop. & Zinc..... | 2 1/2 | Centennial..... | 24 1/2 |
| Cobalt Contact..... | 2 1/2 | Con. Mercur..... | 38 |
| Colonial Silver..... | 2 1/2 | Copper Range..... | 76 1/2 |
| Cum. Ely Mining..... | 8 | Daly-West..... | 15 |
| Davis Daly..... | 12 | Franklin..... | 13 |
| Dominion Cop..... | 5 1/2 | Greene-Can..... | 15 |
| El Rayo..... | 75 | Ile Royal..... | 15 |
| Foster Cobalt..... | 75 | La Salle..... | 13 |
| Furnace Creek..... | 8 1/2 | Mass..... | 4 1/2 |
| Giroux Mine..... | 14 1/2 | Michigan..... | 4 1/2 |
| Gold Hill..... | 14 1/2 | Mohawk..... | 75 1/2 |
| Granby, New..... | 1 1/2 | Mont. C. & C.(new) | 2 1/2 |
| Greene Gold..... | 1 1/2 | Nevada..... | 77 1/2 |
| Greene G. & S..... | 75 | North Butte..... | 77 1/2 |
| Greenw'r & D.Val..... | 3 1/2 | Old Colony..... | 43 |
| Guanajuato..... | 212 1/2 | Old Dominion..... | 125 |
| Guggen. Exp..... | 50 | Osecola..... | 18 1/2 |
| Hanapah..... | 1 1/2 | Parrot..... | 113 |
| McKinley Dar..... | 6 1/2 | Phoenix..... | 4 1/2 |
| Micmac..... | 17 | Quincy*..... | 101 |
| Mines Co. of Am..... | 3 | Rhode Island..... | 18 1/2 |
| Mitchell Mining..... | 8 1/2 | Santa Fe..... | 16 1/2 |
| Mont. Sho. C.(New) | 4 1/2 | Shannon..... | 101 |
| Nev. Utah M. & S..... | 11 1/2 | Tamarack*..... | 18 1/2 |
| Newhouse M. & S..... | 2 1/2 | Trinity..... | 66 |
| Nipissing Mines..... | 1 1/2 | United Cop., com. | 10 1/2 |
| Old Hundred..... | 2 1/2 | U. S. Oil..... | 48 1/2 |
| Silver Queen..... | 2 1/2 | U. S. Smg. & Ref..... | 42 1/2 |
| Stewart..... | 2 1/2 | U. S. Sm. & Re., pd.* | 49 1/2 |
| Tennessee Copper..... | 3 1/2 | Utah Copper..... | 7 |
| Union Copper..... | 6 1/2 | Victoria..... | 7 |
| Utah Apex..... | 13 | Washington..... | 8 |
| West Columbus..... | 13 | Winona..... | 7 |
| | | Wolverine..... | 7 |
| | | Wyandotte..... | 7 |

N. Y. INDUSTRIAL

| | |
|---------------------------|---------|
| Am. Agri. Chem..... | 16 1/2 |
| Am. Smelt. & Ref..... | 115 1/2 |
| Am. Sm. & Ref., pf..... | 104 1/2 |
| Bethlehem Steel..... | 29 1/2 |
| Colo. Fuel & Iron..... | 83 |
| Federal M. & S., pf..... | 17 |
| Inter. Salt..... | 17 |
| National Lead..... | 98 |
| National Lead, pf..... | 98 |
| Pittsburg Coal..... | 24 1/2 |
| Republic I. & S..... | 24 1/2 |
| Republic I. & S., pf..... | 24 1/2 |
| Sloss-Sheffield..... | 510 |
| Standard Oil..... | 510 |
| Tenn. C. & I..... | 32 1/2 |
| U. S. Red. & Ref..... | 97 1/2 |
| U. S. Steel, pf..... | 97 1/2 |
| Va. Car. Chem..... | 60 |
| Va. I. Coal & Coke..... | 60 |

ST. LOUIS June 15

| N. of Com. | High. | Low. |
|--------------------|--------|--------|
| Adams..... | 30 | 20 |
| Am. Nettie..... | .06 | .04 |
| Center Crk..... | 2.50 | 2.25 |
| Cent. C. & C..... | 67.00 | 66.00 |
| C. C. & C. pd..... | 78.00 | 75.50 |
| Cent. Oil..... | 110.00 | 100.00 |
| Columbia..... | 7.00 | 5.00 |
| Con. Coal..... | 26.00 | 24.00 |
| Doe Run..... | 140.00 | 130.00 |
| Gra. Bimet..... | .25 | .20 |
| | 16.00 | 14.00 |

S. FRANCISCO June 12

| Name of Comp. | Clg. |
|-------------------------|------|
| COMSTOCK STOCKS | |
| Belcher..... | .26 |
| Best & Belcher..... | .70 |
| Caledonia..... | .15 |
| Chollar..... | .08 |
| Con. Cal. & Va..... | .67 |
| Crown Point..... | .20 |
| Exchequer..... | .30 |
| Gould & Curry..... | .15 |
| Hale & Norcross..... | .43 |
| Mexican..... | .45 |
| Ophir..... | 1.90 |
| Overman..... | .12 |
| Potosi..... | .60 |
| Savage..... | .34 |
| Sierra Nevada..... | .28 |
| Union..... | .05 |
| Utah..... | .75 |
| Yellow Jacket..... | .20 |
| TONOPAH STOCKS | |
| Golden Anchor..... | .30 |
| McNamara..... | .08 |
| Montana-Pitts.ex..... | .23 |
| North Star..... | .17 |
| Rescue..... | .06 |
| GOLDFIELD STOCKS | |
| Black Ants..... | .30 |
| Blue Bull..... | .47 |
| Columbia Mt..... | 2.75 |
| Comb. Frac..... | .11 |
| Conqueror..... | 1.25 |
| Daisy..... | 4.25 |
| Florence-Mohawk..... | 1.05 |
| Grandma..... | 6.65 |
| Great Bend..... | .10 |
| Red Hills..... | .38 |
| St. Ives..... | .99 |
| BULLFROG STOCKS | |
| Amethyst..... | .26 |
| Bonnie Claire..... | .40 |
| Mayflower Con..... | .38 |
| Montgomery Mt..... | .15 |
| Original..... | .08 |
| MANHATTAN STOCKS | |
| Gold Wedge..... | .05 |
| Manhattan Mg..... | .07 |
| Pine Nut..... | .09 |
| Ruby Wonder..... | .25 |
| Stray Dog..... | .16 |
| Yellow Horse..... | .04 |

NEVADA June 19

| Name of Comp. | Clg. |
|------------------------------|-------------|
| TONOPAH STOCKS | |
| Tono'h Mine of N..... | 13.25 |
| Tonopah Exten..... | 1.62 1/2 |
| Montana Tonop'h..... | 3.00 |
| Belmont..... | 3.12 1/2 |
| Tonopah Midway..... | 1.30 |
| West End Con..... | .85 |
| Jim Butler..... | .95 |
| GOLDFIELD STOCKS | |
| Sandstorm..... | .40 |
| Kendall..... | .30 |
| Red Top..... | 2.50 |
| Jumbo..... | 2.50 |
| Goldfield Mining..... | 1.55 |
| Dia'dfield B. B. C..... | 1.00 |
| Atlanta..... | .44 |
| Mohawk..... | 12.00 |
| Silver Pick..... | .48 |
| Laguna..... | 1.00 |
| BULLFROG STOCKS | |
| Mont. Shoshone C..... | 8.00 |
| Tramps Con..... | .58 |
| Gold Bar..... | .58 |
| Bullfrog Mining..... | .17 |
| Bullfrog Nat. B..... | .21 |
| Homestake Con..... | .. |
| MANHATTAN STOCKS | |
| Manhattan Con..... | .48 |
| Manhat'n Dexter..... | .13 |
| Jumping Jack..... | .12 |
| Stray Dog..... | .15 |
| Indian Camp..... | .05 |
| COLO. SPRINGS June 15 | |
| Name of Comp. | Clg. |
| Acacia..... | 9 1/2 |
| Dante..... | 4 1/2 |
| Doctor Jack Pot..... | 7 1/2 |
| Elkton..... | 55 |
| El Paso..... | 43 |
| Findlay..... | 60 |
| Gold Dollar..... | 7 1/2 |
| Gold Sovereign..... | 4 1/2 |
| Isabella..... | 22 |
| Index..... | .. |
| Jennie Sample..... | 8 |
| Jerry Johnson..... | 87 |
| Mary McKinney..... | 5 |
| Pharmacist..... | 1.20 |
| Portland..... | 8 1/2 |
| Un. Gold Mines..... | 80 |
| Vindicator..... | 18 |
| Work..... | 18 |

New Dividends

| Company. | Pay-able. | Rate. | Amt. |
|-----------------------------------|-----------|--------|-----------|
| Am. Smelters Sec., pf, B..... | June 1 | \$1.25 | \$375,000 |
| Baltic..... | June 15 | 10.00 | 1,000,000 |
| Beck Tunnel Con..... | .. | 0.10 | 40,000 |
| Bunker Hill & Sullivan..... | June 4 | 0.60 | 180,000 |
| Butte Coalition..... | June 26 | 0.50 | 500,000 |
| Calumet & Arizona..... | June 20 | 5.00 | 1,000,000 |
| Camp Bird, Ltd..... | June 26 | 0.12 | 98,400 |
| Central C. & C., pfd..... | July 15 | 1.25 | 23,438 |
| Federal M & S..... | June 15 | 5.00 | 300,000 |
| Federal M & S., pf..... | June 15 | 1.75 | 210,000 |
| Iron Silver..... | July 1 | 0.10 | 50,000 |
| Lower Mammoth..... | May 31 | 0.05 | 9,500 |
| Mohawk, Mich..... | July 10 | 5.00 | 500,000 |
| National Lead..... | July 1 | 1.25 | 186,318 |
| National Lead, pfd..... | June 15 | 1.75 | 261,820 |
| North Butte..... | June 10 | 2.00 | 800,000 |
| N. Y. & Hon. Rosario..... | June 23 | 0.10 | 15,000 |
| Quincy, Mich..... | June 10 | 4.50 | 93,750 |
| Sloss-Sheffield, pfd..... | July 1 | 1.75 | 117,250 |
| Texas & Pacific Coal..... | June 29 | 1.60 | 30,000 |
| U. S. Cast Iron Pipe & Fdy..... | June 1 | 1.00 | 150,000 |
| U. S. C. I. Pipe & Fdy., pfd..... | June 1 | 1.75 | 262,500 |
| U. S. Reduction & Ref., pfd..... | July 1 | 1.50 | 59,187 |
| Utah Con..... | July 15 | 1.50 | 450,000 |
| Va. Car. Chem., pfd..... | July 15 | 2.00 | 360,000 |

Assessments

| Company. | Delinq. | Sale. | Amt. |
|---------------------------|---------|---------|--------|
| Benson, Cal..... | June 9 | June 29 | \$0.10 |
| Bullion, Nev..... | June 10 | July 2 | 0.05 |
| Etna King, Cal..... | June 8 | July 1 | 0.03 |
| Forty-nine G. Pl., U..... | June 26 | July 15 | 0.01 |
| Honerine, Utah..... | June 25 | July 20 | 0.20 |
| Jenny Lind, Cal..... | June 8 | June 25 | 0.03 |
| Mabel Gravel, Cal..... | June 3 | June 25 | 0.10 |
| New Red Wing, Utah..... | June 11 | June 29 | 0.02 |
| Nev. Superior, Utah..... | June 17 | July 5 | 0.10 |
| St. Joe, Utah..... | June 13 | July 3 | 0.02 |
| Sierra Nevada..... | May 28 | June 18 | 0.10 |
| Utah, Nev..... | May 27 | June 17 | 0.05 |
| Wasatch, Utah..... | June 17 | July 2 | 1.25 |

Cabled through Hayden, Stone & Co., N. Y.

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

| Month. | New York. | | London. | |
|----------------|-----------|--------|---------|--------|
| | 1906. | 1907. | 1906. | 1907. |
| January..... | 65.288 | 68.673 | 30.113 | 31.769 |
| February..... | 66.108 | 68.835 | 30.464 | 31.852 |
| March..... | 64.597 | 67.519 | 29.854 | 31.325 |
| April..... | 64.765 | 65.462 | 29.984 | 30.253 |
| May..... | 66.976 | 65.981 | 30.968 | 30.471 |
| June..... | 65.394 | .. | 30.185 | .. |
| July..... | 65.105 | .. | 30.113 | .. |
| August..... | 65.949 | .. | 30.529 | .. |
| September..... | 67.927 | .. | 31.483 | .. |
| October..... | 69.523 | .. | 32.148 | .. |
| November..... | 70.813 | .. | 32.671 | .. |
| December..... | 69.060 | .. | 32.003 | .. |
| Year..... | 66.791 | .. | 30.868 | .. |

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

| Month. | NEW YORK. | | LONDON. | |
|----------------|--------------|--------|---------|--------|
| | Electrolytic | Lake. | 1906. | 1907. |
| January..... | 18.310 | 24.404 | 18.419 | 24.825 |
| February..... | 17.869 | 24.869 | 18.116 | 25.236 |
| March..... | 18.361 | 25.065 | 18.641 | 25.560 |
| April..... | 18.375 | 24.224 | 18.688 | 25.260 |
| May..... | 18.475 | 24.048 | 18.724 | 25.072 |
| June..... | 18.442 | .. | 18.719 | .. |
| July..... | 18.190 | .. | 18.585 | .. |
| August..... | 18.380 | .. | 18.706 | .. |
| September..... | 19.033 | .. | 19.328 | .. |
| October..... | 21.203 | .. | 21.722 | .. |
| November..... | 21.833 | .. | 22.398 | .. |
| December..... | 22.885 | .. | 23.350 | .. |
| Year..... | 19.278 | .. | 19.616 | .. |

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

| Month. | 1906. | 1907. | Month. | 1906. | 1907. |
|---------------|--------|--------|----------------------|---------------|-------|
| January..... | 36.390 | 41.548 | July..... | 87.275 | .. |
| February..... | 36.408 | 42.102 | August..... | 40.608 | .. |
| March..... | 36.682 | 41.313 | September..... | 40.516 | .. |
| April..... | 38.900 | 40.938 | October..... | 42.852 | .. |
| May..... | 43.313 | 43.149 | November..... | 42.906 | .. |
| June..... | 39.260 | .. | December..... | 42.750 | .. |
| | | | Av. year..... | 89.819 | .. |

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

| Month. | New York. | | London. | |
|----------------|-----------|-------|---------|--------|
| | 1906. | 1907. | 1906. | 1907. |
| January..... | 5.600 | 6.000 | 16.850 | 19.828 |
| February..... | 5.464 | 6.000 | 16.081 | 19.531 |
| March..... | 5.850 | 6.000 | 15.922 | 19.703 |
| April..... | 5.494 | 6.000 | 15.959 | 19.975 |
| May..... | 5.685 | 6.000 | 16.726 | 19.688 |
| June..... | 5.780 | .. | 16.813 | .. |
| July..... | 5.750 | .. | 16.528 | .. |
| August..... | 5.750 | .. | 17.109 | .. |
| September..... | 5.750 | .. | 18.266 | .. |
| October..... | 5.750 | .. | 19.350 | ..</ |