THE MINES MAGAZINE

AROUND THE WORLD WITH THE MINERAL INDUSTRIE

Featuring—

METALLURGY OF CAST IRON
UTILITY OF MULTIPLE CORRELATION
MILLION DOLLAR BALL MILL SHIPMENT
PETROLEUM INDUSTRY IN 1949
NEW PRESIDENT AT "MINES"
ATOMIC ENERGY NEWS

FEBRUARY • 1950

VOLUME XL NO. 2

PERSONAL NOTES

Maynard F. Ayler, '45, Geologist for The California Company, has been transferred to their Denver office in the U. S. National Bank Building. His new mailing address is Box 780, Denver 1.

Byron B. Boatright, '22, Vice-President of Conroe Drilling Company, is addressed Box 755, Austin, Texas.

Martin P. Brown, '36, has been transferred from Bremerton, Washington, to China Lake, California, with address Box 303. He is Civil Engineer for Naval Shipyard.

Thomas L. Chapman, '06, has recently moved to Redwood City, California, where he is addressed 1893 Bay Shore Highway.

Wai Suey Chin, '49, is taking graduate work in Chemical Engineering at the University of Texas and resides at 1909 Red River, Apt. 5, Austin, Texas.

Burton E. Coles, Jr., '49, Reservoir Engineer for the Atlantic Refining Company, has a new residence address, 6611 Kenwell Street, Dallas 9, Texas.

Haskell R. Collins, '39, is Product Controller, Carrier Corporation, residing at 114 Fordam Road, Syracuse, N. Y.

J. W. R. Crawford, III, '48, Field Geologist for The California Company, is at present in Casper, Wyoming, with address Box 837.

P. W. Crawford, '22, has been transferred by Frontier Refining Company from Lusk to Cheyenne, Wyoming. His address is, 1905 East Lincolnway.

James R. Cross, '49, has another change of residence address, to 2977 Courtland Blvd., Shaker Heights 27, Ohio. He is Junior Engineer for Standard Oil Company (Ohio).

Major Vincent L. Denunzio, '23, has moved to California since his retirement, now making his home at 165 E. Avenue, Coronado.

Lloyd H. Donnelly, '31, has moved his residence to 1250 Sherman Street, Apt. 201, Denver.

The moving of the main offices of The Dorr Company from New York City to Barry Place, Stamford, Conn., has affected the mailing addresses of *Frank A. Downes,* '13, Vice-President in charge of Research and Development, *Donald Dyrenforth,* '12, Manager, North American Sales and *E. R. Ramsey,* '12, President; the three now having the new address.

Lincoln F. Elkins, '40, Special Projects Engineer for Sohio Petroleum Company, has a new office address in Oklahoma City, 1300 Skirvin Tower.

William H. Erickson, '47, completed his work at the University of Virginia Law School, and has returned to Denver with business address 626 University Building.

Walter A. Funk, '03, Retired, resides at 3151 East Colorado Street, E. Pasadena 8, Calif.

Lee W. Gibson, '40, Independent Oil Producer and Consultant in Reservoir Engineering, has moved from Huntington Beach to Riverdale, California, with post office address Box 34.

Horace N. Goodell, '42, has been transferred by the Union Oil Company, for whom he serves as District Geologist, from Laramie, Wyoming, to Denver, where he is now addressed Paramount Building, 1631 Glenarm Street.

George W.Hoffman, Jr., '48, Junior Engineer for Continental Oil Company, is now located in Ponca City, Oklahoma, and may be addressed in care of the company.

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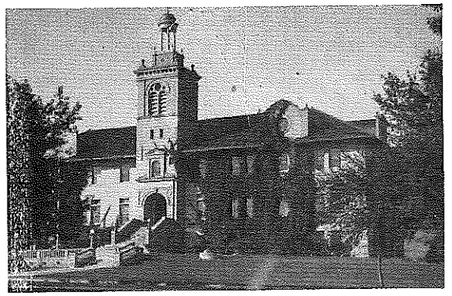

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DR. JOHN W. VANDERWILT

Succeeds

Ben H. Parker

as

"Mines" President

DR. JOHN W. VANDERWILT

Dr. John W. Vanderwilt, well-known consulting geologist of Denver, has been named president of the Colorado School of Mines to succeed Dr. Ben H. Parker, who has submitted his resignation to take effect April 1. Announcement of the change was made by Lester C. Thomas of Denver, president of school's board of trustees. In making the announcement he said, "The board of trustees of the Colorado School of Mines has accepted Dr. Parker's resignation with reluctance and regret in view of the outstanding service he has performed in his term of office. The board realizes, however, its good fortune in being able to obtain such a distinguished geologist, educator, and administrator as Dr. Vanderwilt to direct the school. This is especially true, since he will retain some of his consulting work in the field of mining and engineering geology as his time allows, thereby continuing his professional contacts with the mineral industry."

The new president is a former member of the faculty of the Colorado School of Mines as well as of the University of Colorado. He is presently a member of the board of trustees of the School of Mines from which position he has resigned, effective March 20. Born in Oskaloosa, Iowa, Dr. Vanderwilt was graduated from Penn College there. He then attended the University of Michigan where he received the master's degree. In 1927 he received the degree of doctor of philosophy from Harvard University.

Recently Dr. Vanderwilt has been doing consulting geologic work with offices in the Midland Savings Building, Denver. He has been a consulting geologist for the Climax Molybdenum company for some time and has also served on the Board of Experts of the Bureau of Reclamation. In the summer of 1949 he spent three months in Norway doing geologic consulting under the Marshall Plan.

Dr. Vanderwilt is a member of the Phi Beta Kappa, honorary scholastic fraternity, and of Sigma Xi, honorary scientific fraternity, as well as having a membership in many mining and geologic societies.

The Vanderwilts have three children. Bill, a graduate of the University of Colorado, Boulder, is now doing graduate work at the University of California, Berkeley, where he is taking a major in physics. Christine is in Tucson, Arizona, where she is taking special work at the University of Arizona. Joanne is a junior at the University of Washington, Seattle.

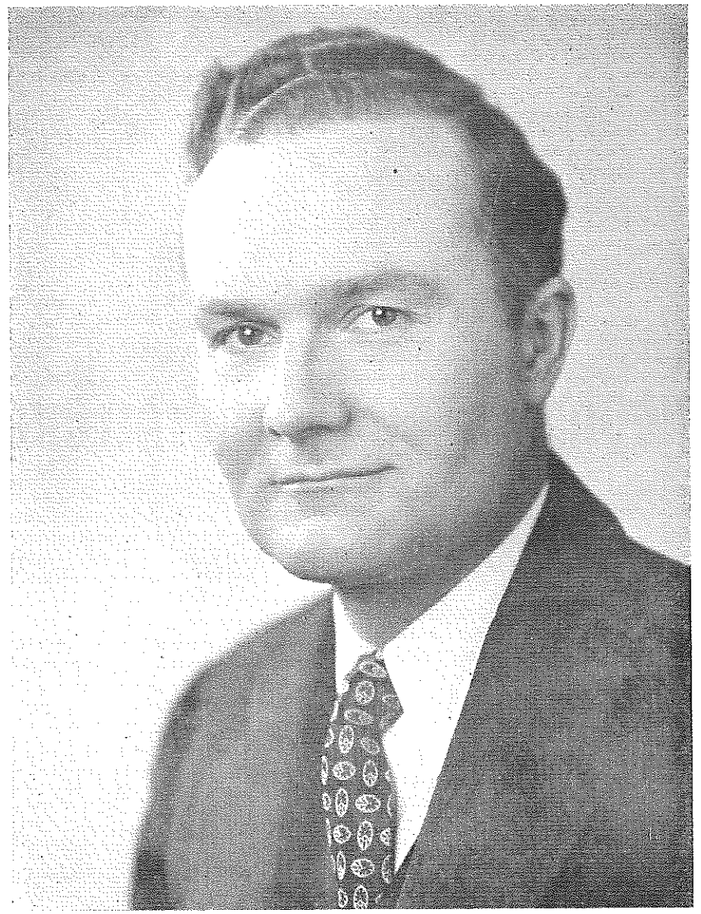
Dr. and Mrs. Vanderwilt expect to move to Golden about the time Dr. Vanderwilt assumes his new duties, April 1.

Dr. Parker accepted the presidency of the school in 1946 after the resignation of Dr. M. F. Coolbaugh. At that time he was vice president of the Frontier Refining company and will return to that company when he leaves the school. He was graduated from the School of Mines in 1924 and received the degree of doctor of science in 1934.

From 1933 until 1943 Dr. Parker was associate professor of geological engineering at the school, except for one year when he served as assistant chief geologist for the Argentine government.

"MINES" DESERVES BETTER STATE BACKING*

By
DR. BEN H. PARKER, '24



DR. BEN H. PARKER

As I prepare to leave the presidency of the Colorado School of Mines for private industry, I feel that I can comment more frankly than I could previously on the school's problems and the responsibility of the state toward the solution of these problems.

It seems unnecessary to remind the readers of The Denver Post of the world-wide fame that the school has attained for one reason alone —the fulfillment of its objective of producing thoroughly trained mineral engineers. Throughout the world there is no other institution of higher education that covers the field of mineral engineering and confines its activities to training in that field.

It is sometimes said that the reputation of the Colorado School of Mines increases with the distance from the school. Although I do not believe that such a statement is true, it is doubtful that Colorado residents are entirely aware of the benefits that the state receives from the location of the world's outstanding mineral industry school within its borders.

Certainly all recognize the value of having graduates of the school to locate, produce, and process the mineral wealth of Colorado. Not so apparent, perhaps, are the benefits the state receives from having its emissaries from the Colorado School of Mines in positions of responsibility, not only in the United States but around the world.

Without doubt the tendency of these Golden graduates to think first of Denver mining machinery manufacturers when they require equipment has made Denver the mining machinery capital of the world and continues to keep it in that position.

An additional contribution of the school to the welfare of the state is the enrollment of students from throughout the United States in the summer sessions, both on the campus and at the field camps near Pueblo and at Idaho Springs and Rangely. These students from other states not only more than pay for the cost of their instruction in the summer session, but the much higher tuition they pay in the regular semesters actually reduces the cost of training Colorado residents.

With these benefits in mind, it is most disheartening to look back on the history of the Colorado School of Mines and realize that for more than half a century the contribution of the state to the support of the school has been most meager. It is only in the last few years that a beginning has been made toward providing the support that it should have. The success of the school in the face of these financial imitations has resulted largely from the loyalty of its faculty, which always has included authorities in their fields who could have substantially increased their earnings in private industry.

Many who are unacquainted with mineral-engineering training do not realize that such training is high-cost education because of the expense of the necessary labora-

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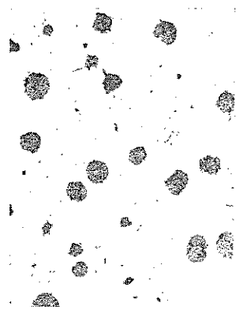
*Guest Editorial in The Denver Post.

▼ Fig. 1—Flake graphite iron, unetched. (Courtesy Mr. D. J. Reese).



▼ Fig. 2—Spheroidal graphite iron, unetched. (Courtesy Mr. D. J. Reese).

▼ Fig. 3—Flake graphite iron, etched. (Courtesy Mr. D. J. Reese).

▼ Fig. 4—Spheroidal graphite iron, etched. (Courtesy Mr. D. J. Reese).

ADVANCES IN THE METALLURGY OF CAST IRON

By
CLYDE O. PENNEY, '36
Metallurgist
C. S. Card Iron Works Co.

The advances in the metallurgy of cast iron have been so tremendous that it would be impossible to cover all of them in the pages of this magazine. Therefore, I have selected three of the more recent developments, two of which are briefly discussed. The major portion of the paper is devoted to a more detailed discussion of the third development, which I personally consider to be the most significant.

One of the important developments in recent years in the field of cast iron metallurgy is the use of oxygen-enriched blasts for cupola operation (1)*. By enriching the cupola blast with pure oxygen, there is an increase in melting rate, an increase in tapping temperatures, a reduction in melting losses, and a reduction in the amount of coke required. The addition of pure oxygen in the amount approximating 10 per cent of the blast volume will result in an increase of about 20 per cent in the melting rate, a reduction of 4 per cent in the melting loss, and an increase of about 100 degrees, Fahrenheit, in the tapping temperatures.

Use of Oxygen

The cost of oxygen for purposes of enrichment is a variable, depending upon the quantity used, and must be worked out for each cupola, based on its own individual operating conditions. In general, we may say that a foundry consuming 25 tons of oxygen per month at a unit cost of 30 cents per 100 cubic feet must add to its melting cost anywhere from $3.75 per ton of metal melted for 4 per cent enrichment up to $8.25 per ton of metal melted for 10 per cent enrichment of the cupola blast. A large foundry consuming 800 tons of oxygen per month at a unit cost of 14½ cents per 100 cubic feet will be required to increase its melting cost anywhere from $1.81 per ton of metal melted for 4 per cent enrichment up to $4.00 per ton of metal melted for a 10 per cent enrichment of the blast. Obviously, the question of enriching the cupola blast continuously, intermittently, or not at all, resolves itself into a matter of the economics of operation for each individual foundry.

The intermittent use of oxygen to enrich the cupola blast for short periods of time has proven to be an excellent corrective procedure for such cupola ailments as bridging, decreasing metal temperatures, decreasing melting rates, etc.

Radioactive Isotopes in Research

The second outstanding development is the application of the principles of atomic energy including the use of radioactive isotopes for purposes of research in cast iron metallurgy. The use of the radioisotope Cobalt 60 has already found application in the foundry for continuously indicating the level of liquid metal in the cupola which in turn leads to a more uniform metal composition (2).

It would be entirely feasible to impregnate the cupola lining with a radioisotope of a suitable nature, place Geiger counters on the slag tap and obtain valuable information as to the extent and rate of lining consumption during cupola operation.

Another possibility would be to include a suitable radioisotope in the metallic charge, the fluxing charge, or both; then by the use of proper instruments, one could study the slag-metal reactions going on in the cupola during normal operation, and thus obtain a more accurate picture of this particular phase of cast iron metallurgy.

Other studies which could be undertaken with the help of radioisotopes would be segregation in iron and steel castings, location and distribution of various elements in solid solutions, studies on cyaniding, nitriding, carburizing, etc. In fact, the possibilities for research are practically limitless with this new metallurgical tool.

Production of Nodular Graphite Structures

The third major development in cast iron metallurgy is, in my opinion, the greatest advance in the field in the last 25 years. It is the production of nodular graphite structures in gray cast iron in the as-cast state. By a suitable treatment of the cast iron in the molten state, the graphite structure may be changed from the normal flake graphite as shown in Figs. 1 and 3, to the spheroidal or nodular graphite shown in Figs. 2 and 4. Figs. 1, 2, 3 and 4 are all micrographs of the same base iron.

The development of nodular graphite structures in gray cast iron was the next logical step in a long series of advances in cast iron metallurgy, which began with the establishment of accurate control of the carbon and silicon content of cast iron. Then came, in rapid succession, the use of high-steel mixtures in cupola charges, the development of ladle inoculation techniques to obtain random distribution of the graphite flakes, the introduction of alloying elements, singly and in various combinations, to strengthen the matrix of the iron, and finally, this most recent development, namely, the production of as-cast nodular graphite structures.

* Numbers in parentheses refer to publications cited in the references at the end of this paper.

The entire Metals industry is very much indebted to the British Cast Iron Research Association, and to H. Morrogh, who is a member of that organization, for much of the development work leading to the application of this process on an industrial scale. True, many others have been working in this field for a long time, but to Morrogh and the British Cast Iron Research Association must go the major portion of credit for developing the process to the point at which it has become industrially feasible.

Nodular Structures by Cerium

Morrogh produced these nodular cast irons by adding cerium to the molten metal just prior to casting (3). However, there are certain requirements with respect to metal composition which must be fulfilled before these nodular cast irons can be successfully produced with cerium. These requirements are as follows:

1. The iron must solidify gray without the cerium addition.
2. The iron must be of hypereutectic carbon content; that is, the carbon content should exceed the value 4.3 1/3 (per cent silicon plus per cent phosphorous).
3. Silicon content should be in the range from 2.3 to 7 per cent.
4. Sulfur must be below 0.015 per cent.
5. Phosphorous must not exceed 0.6 per cent and should be below 0.1 per cent.
6. Alloying elements present have no effect, provided the iron will still solidify gray without the cerium addition.
7. Enough cerium must be introduced to secure 0.02 per cent cerium dissolved in the metallic matrix.

Of these seven requirements, those concerning carbon and sulfur are by far the most important.

The first major function of cerium when added to molten cast iron, seems to be that of a desulphurizer, and it continues to act in this capacity until the sulfur content of the iron is reduced to about 0.015 per cent. At this point, the cerium enters into solution in the molten cast iron, where it functions as a very powerful carbide stabilizer, and when this dissolved cerium is in excess of 0.02 per cent, it produces the nodular graphite structures.

Cerium metal may be added to molten cast iron in several ways. It may be added as the pure element cerium, but this method is too expensive to find industrial application. Various other forms have been used successfully, the most promising of which is misch metal containing from 43 to 50 per cent cerium, the balance being rare earths together with small amounts of iron and manganese. Misch metal dissolves readily in the iron at temperatures above 2200 degrees, Fahrenheit, produces no explosive or violent reaction with the molten iron and is quite effective in the production of the nodular graphite structures although it remains a rather expensive addition agent.

At this stage of development, the American Cast Iron Pipe Company became interested in the process and undertook an extensive program of experimental work to increase the store of metallurgical knowledge in this most promising field of research (5). Immediately they were able to duplicate the results of the British Cast Iron Research Association using Cerium, and following additional experimental work, were able also to produce these nodular graphite structures using magnesium in place of cerium.

Nodular Graphite Structures By Magnesium

C. K. Donoho, Chief Metallurgist for the American Cast Iron Pipe Company, has found that the presence of 0.03 to 0.10 per cent magnesium dissolved in the iron produces the desired nodular graphite structures, and also gives the optimum range of physical properties. Too little magnesium results in a mixed structure containing some nodular graphite and some flake graphite. Too much magnesium will increase the hardness and brittleness.

Magnesium has a decided advantage over cerium, in that magnesium is effective when added to low carbon, high phosphorous, high sulfur irons; whereas cerium, as previously stated, is effective only on high carbon, medium phosphorous, very low sulfur irons. Pure magnesium metal, when added to molten cast iron, is effective in producing the nodular graphite structures. However, it is violently explosive in its reaction, and elaborate precautions must be taken to protect foundry personnel and property.

G. E. Holdeman and J. C. H. Stearns of the Dow Chemical Company have conducted a series of investigations on the treatment of cast iron with magnesium for the production of nodular graphite structures (8). A number of their investigations have been particularly concerned with a study of various magnesium alloys for use in introducing the magnesium to the iron. In their experimental work, they devoted special attention to the degree of reactivity, the magnesium recovery and the efficiency of the alloy in producing the nodular structures.

Nodular Structures By Magnesium Alloys

The results of these experiments by Holdeman and Stearns are quite significant. They found that an alloy containing 20 per cent magnesium and 80 per cent antimony would burn rather quietly when added to the surface of cast iron. In fact, this particular alloy can be immersed in the molten iron without any noticeable reaction. Unfortunately, the alloying efficiency, or the magnesium recovery if you prefer, is low, and the graphite produced is rather coarse and quite unsatisfactory.

An alloy containing 55 per cent magnesium and 45 per cent aluminum readily produces the nodular graphite structures with a good recovery of magnesium, but has a rather high degree of reactivity, being almost explosive in its violence.

An alloy of 20 per cent magnesium and 80 per cent aluminum is much less violent in its reaction, but it is also less effective in producing the nodular graphite structures, and is less efficient with respect to the retention of magnesium by the iron.

An alloy which contains 90 per cent magnesium and 10 per cent lithium is only moderately high in reactivity and is moderately effective in the production of the nodular graphite structures. Magnesium-zinc alloys are not at all satisfactory because of a high degree of reactivity, a low percentage of magnesium retention and the complete absence of nodular graphite in the irons to which they have been added. Magnesium-bismuth alloys, like magnesium-zinc alloys, are ineffective in the production of nodular irons and are highly reactive.

Recent experimental work by E. T. Myskowski and R. P. Dunphy of the Naval Research Laboratory is encouraging in that they have been quite successful in producing nodular irons through inoculation with an iron-silicon-magnesium alloy containing approximately 8 per cent magnesium in a 50 per cent ferrosilicon carrier (10). They have found that the iron may be tapped into a ladle directly on top of this alloy with the complete absence of any violent or explosive reaction.

In the work conducted by Donoho, various alloys of magnesium were studied in an attempt to increase the recovery of magnesium and reduce the violence of the reaction when treating the molten iron in the laddle (5). Donoho found that magnesium-zirconium and magnesium-titanium alloys were completely ineffective in producing nodular irons. In every case, after treatment with these alloys, the iron was found to have the flake-type graphite, with no trace whatsoever of the nodular structure, and with no

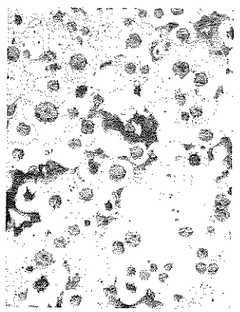
▼ Fig. 5—Microstructure of pearlitic nodular iron, as cast. X200. (Courtesy Professor Albert De Sy).

improvement in the physical properties.

Similar results were obtained with magnesium-calcium and magnesium-manganese alloys. Apparently, even in the presence of magnesium, the introduction of such elements as zirconium, titanium, calcium and manganese destroys the nucleating mechanism which normally operates to produce the nodular graphite structures.

A very interesting theory concerning this nucleating mechanism has been advanced by Albert De Sy, Professor of Metallurgy, University of Ghent, Belgium (4). Professor De Sy suggests that the crystal system of the nuclei suspended in the molten iron is the determining factor as to whether the graphite will be of the flake type or the nodular type. If the nuclei crystallize in the hexagonal system, there will be flake graphite. If the nuclei crystallize in the cubic or tetragonal system, a nodular graphite will result. It is a very interesting hypothesis, and is worthy of further investigation by research metallurgists.

The two most promising alloys developed by Donoho were copper-magnesium and nickel-magnesium (5).

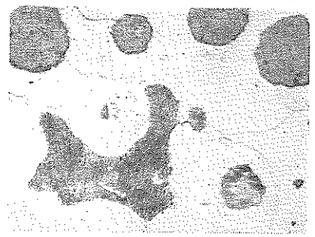


▼ Fig. 6—Microstructure of ferritic nodular iron, as cast. X100. (Courtesy Professor Albert De Sy).

However, when using these alloys, it was found that as the percentage of magnesium increases in the alloy, the violence of the reaction also increases in intensity, and again becomes explosive at approximately 50 per cent magnesium regardless of whether it is alloyed with copper or with nickel.

An alloy containing 20 per cent magnesium and 80 per cent copper or nickel will give good recoveries of magnesium and will be quite effective in producing the nodular graphite structures. It will burn quietly on the surface of the iron with little or no violence.

The alloy containing 20 per cent magnesium and 80 per cent nickel is a little more violent in its reaction than the alloy which contains 20 per cent magnesium and 80 per cent copper; probably because the magnesium will volatilize and explode the still solid nickel, whereas the copper will melt before the magnesium volatilizes. Recoveries of magnesium are somewhat better with the nickel-magnesium alloy than with the copper-magnesium alloy.

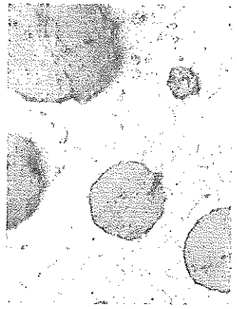


▼ Fig. 7—Microstructure of ferritic nodular iron, as cast. X300. (Courtesy Professor Albert De Sy).

At the present time, alloys containing 30 per cent magnesium, the balance being either copper or nickel, appear to represent the top limit of magnesium content permissible in the inoculant. A 30 per cent magnesium alloy will be somewhat violent in its reaction but can be used safely if certain precautions are taken.

Magnesium, like cerium, serves first as a desulphurizer when added to high-sulfur irons. However, since magnesium is much less expensive than cerium, it may prove more economical to add extra magnesium to remove the sulfur rather than resort to a more expensive desulphurization treatment with soda ash, as is required in high surfur irons when using cerium.

If castings are poured immediately after treatment with magnesium or cerium, they will exhibit the desired nodular graphite structures. The longer the metal is held in the ladle after treatment and prior to pouring, the greater is the tendency for the metal to revert to the normal flake-type graphite structure. Donoho reports that he has been able to hold the metal as long as 15 minutes after treatment with magnesium and still produce completely nodular graphite structures in the iron (7).

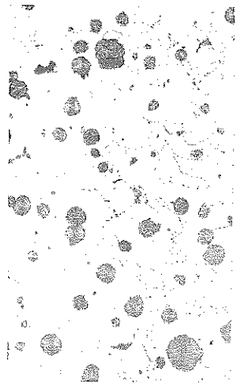


▼ Fig. 8—Microstructure of ferritized nodular iron, annealed. X300. (Courtesy Professor Albert De Sy).

Physical Properties of Nodular Irons

The increase in the value of various physical properties of the nodular irons over those of the flake graphite irons is almost phenomenal as far as cast iron metallurgy is concerned. The strength and ductility of the nodular irons are far superior to those of the flake graphite irons, are somewhat superior to those of malleable iron and approach the strength and ductility of cast steel.

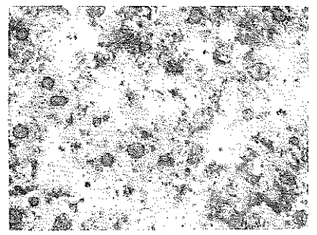
Professor Albert De Sy points out that the matrix of these nodular irons has a marked influence on their physical properties (11). He has found that a nodular iron with an as-cast pearlitic matrix as shown in Fig. 5, will have a tensile strength of approximately 120,000 psi. However, this iron will have an elongation of only 2 to 3 per cent (American A test bar), with no reduction of area. Such an iron can hardly be classed as ductile.



▼ Fig. 9—Microstructure of nodular graphite iron with as-cast matrix almost completely ferritic. Nital etch. X100. (Courtesy Mr. C. K. Donoho).

A nodular iron with over 90 per cent ferrite in the as-cast matrix is shown in Figs. 6 and 7. Such an iron will exhibit a tensile strength of approximately 80,000 psi with an elongation of 10 to 15 per cent (American A test bar).

If, as is shown in Fig. 8, the matrix of the as-cast nodular iron is completely ferritized by a subsequent anneal, a ductile material will be produced having a tensile strength of approximately 75,000 psi with an elongation of 20 to 25 per cent (American A test bar), a reduction of area of 25 to 30 per cent and a Brinell hardness of 150 to 160. This material, in the as-cast state, is a true nodular iron with the characteristic nodular graphite structure, the subsequent anneal being of a ferritizing, not a nodulizing, nature. Therefore the material is still considered to be a cast iron and not a malleable iron.



▼ Fig. 10—Microstructure of cupola iron which was treated with 50 Cu—50 Mg alloy. Nital etch. X100. (Courtesy Mr. Gosta Vennerholm).

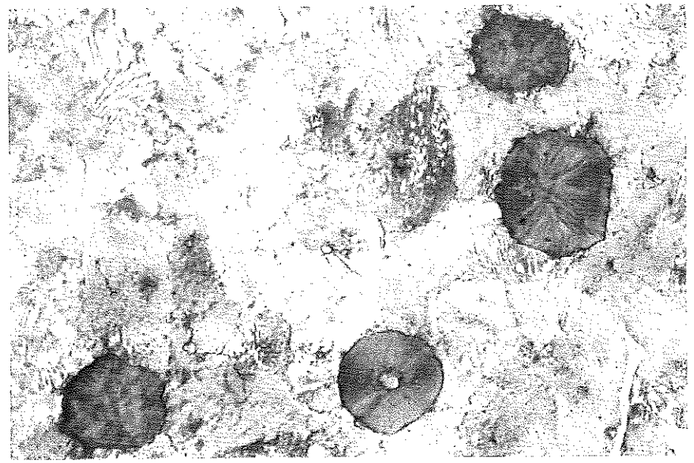
In the experimental work of C. K. Donoho, an iron was produced containing over 90 per cent ferrite in the matrix, as shown in Fig. 9. This iron, which exhibited the best as-cast ductility of all his experimental irons, had the following physical properties (7):

Tensile Strength, psi	75,600
Yield Point, psi	51,100
Elongation in 2 in., per cent	18.6
Reduction of area, per cent	15.1
Brinell Hardness	179
Modulus of Elasticity, psi	23,000,000

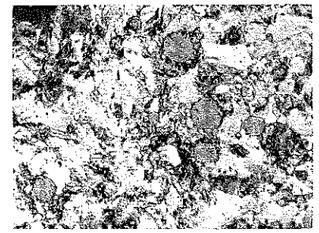
After receiving an anneal at 1350 degrees, Fahrenheit, for one hour, followed by air-cooling, this same iron possessed the following physical proptries:

Tensile Strength, psi	71,500
Yield Point, psi	50,000
Elongation in 2 in., per cent	23.4
Reduction of area, per cent	26.1
Brinell Hardness	163
Modulus of Elasticity, psi	22,000,000

Gosta Vennerholm, Metallurgist, Ford Motor Company, has spent considerable effort on research in this field of nodular cast iron and has also found that the matrix of the iron exerts a very marked influence on the physical properties (7). He reports that a conventional cupola iron, when treated with an alloy containing 50 per cent magnesium and 50 per cent copper, will exhibit the nodular graphite structure with a wholly pearlitic matrix as shown in Figs. 10, 11, 12 and 13. Such an iron will have a tensile strength of 80,000 to 105,000 psi with an elongation rarely exceeding 1½ per cent.



▼ Fig. 11—Microstructure of cupola iron which was treated with 50 Cu—50 Mg alloy. Nital etch. X500. (Courtesy Mr. Gosta Vennerholm).

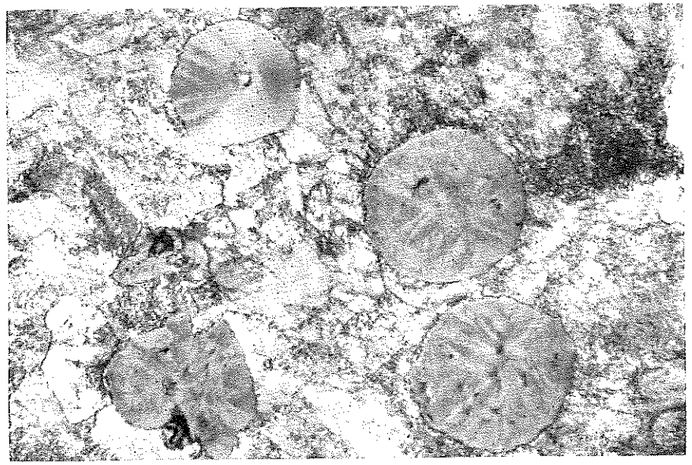


▼ Fig. 12—Microstructure of blast furnace iron which was treated with 50 Cu—50 Mg alloy. Nital etch. X100. (Courtesy Mr. Gosta Vennerholm).

As previously stated, cupola irons usually have a rather high sulfur content which requires the addition of excessive amounts of magnesium to produce the nodular graphite structures. To avoid this difficulty, Vennerholm used a direct blast furnace iron of the following analysis:

Carbon, per cent	3.80—4.10
Manganese, per cent	1.00—1.25
Silicon, per cent	1.25—1.50
Phosphorus, per cent	0.22
Sulfur, per cent	0.04

This blast furnace pig iron was remelted in an electric furnace and treated with an alloy containing 50



▼ Fig. 13—Microstructure of blast furnace iron which was treated with 50 Cu—50 Mg alloy. Nital etch. X500. (Courtesy Mr. Gosta Vennerholm).

per cent magnesium and 50 per cent copper, resulting in the microstructure shown in Figs. 14 and 15. This iron, like the cupola iron, exhibited a tensile strength of 80,000 to 105,000 psi with an elongation of approximately 1½ per cent.

By use of the electric furnace, Vennerholm produced an iron of the following composition:

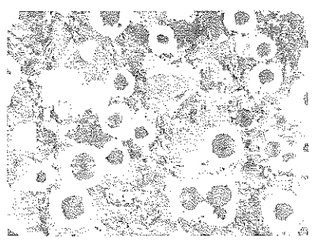
Carbon, per cent	3.72
Manganese, per cent	0.33
Silicon, per cent	1.98
Phosphorous, per cent	0.02
Sulfur, per cent	0.019

This iron, when treated with 0.35 per cent magnesium in an alloy containing 50 per cent magnesium and 50 per cent copper, exhibited the microstructure shown in Figs. 16 and 17. The physical properties of this iron in the as-cast state were as follows:

Tensile Strength, psi	80,000
Yield Point, psi	60,000
Elongation in 2 in., per cent	8
Brinell Hardness	192

After annealing this iron for a period of 2 hours at 1320 degrees, Fahrenheit, it presented the microstructure shown in Fig. 18, and had the following physical properties:

Tensile Strength, psi	60,000
Yield Point, psi	42,500
Elongation in 2 in., per cent	16
Brinell Hardness	138



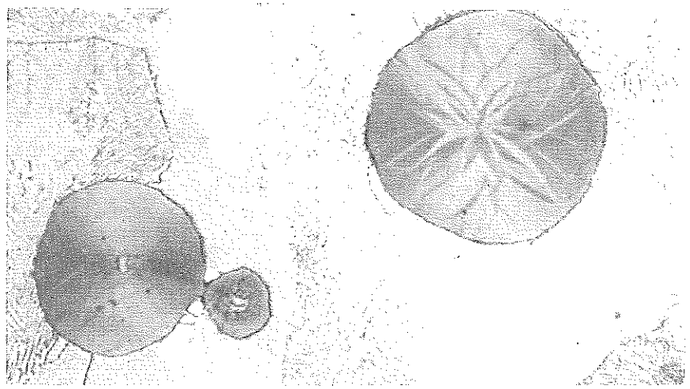
▾ Fig. 16—Microstructure of low phosphorus, low sulfur, low manganese iron which was melted in electric furnace and treated with 50 Cu—50 Mg alloy. Nital etch. X100. (Courtesy Mr. Gosta Vennerholm).

After heating this iron for 5 hours at 1750 degrees, Fahrenheit, cooling to 1320 degrees, Fahrenheit, and holding at this temperature for 2 hours, the following physical properties were obtained:

Tensile Strength, psi	56,000
Yield Point, psi	40,000
Elongation in 2 in., per cent	18
Brinell Hardness	131

It may readily be seen that practically nothing was gained by the lengthy heat treatment.

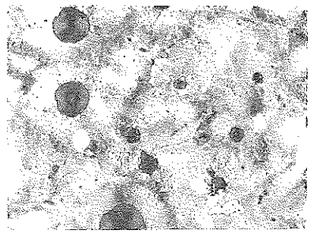
In general, it may be said that tensile strengths of the order of 20,000 to 40,000 psi in normal flake-type graphite irons will be increased to 70,000 to 120,000 psi in the nodular irons (8). After a simple, low-temperature, heat treatment, an elongation of as much as 20 per cent can be obtained, while still retaining a tensile strength of approximately 70,000 psi. The modulus of elasticity of ordinary cast iron will be approximately 13,000,000 to 19,000,000 psi; whereas, the modulus of elasticity of nodular irons will be approximately 25,000,000 psi. Nodular irons exhibit an increase in toughness over ordinary cast irons and have approximately the same weldability. The machinability and casting properties of nodular irons are excellent. Although there is no decrease in fluidity, there is some increase in shrinkage, which necessitates the use of heavier risers on castings poured with nodular irons.



▾ Fig. 15—Microstructure of blast furnace pig iron, remelted in electric furnace and treated with 50 Cu—50 Mg alloy. Nital etch. X500. (Courtesy Mr. Gosta Vennerholm).

Costs of Nodular Iron

The cost of producing nodular irons is, of necessity, somewhat higher than the cost of producing flake graphite irons, because of the added expense of the magnesium alloy used for treatment of the metal. At the present time, the cost picture is rather confused because so little is known about either the economic limitations of the process, or the economic relationship of the various factors involved in the production and application of these nodular irons.



▾ Fig. 14—Microstructure of blast furnace pig iron, remelted in electric furnace and treated with 50 Cu—50 Mg alloy. Nital etch. X100. (Courtesy Mr. Gosta Vennerholm).

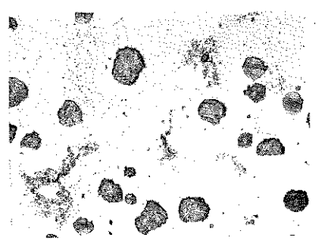
D. J. Reese, Metallurgist, International Nickel Company, reminds us that the cost per ton for the production of nodular iron will be dependent upon such factors as the tonnage produced, the type of furnace used, the cost of raw materials and fuels for that furnace and the type of metal being produced (7). At the present time, the best average figure is approximately $5.00 per ton of hot metal, for the production of the nodular irons alone, without attempting to develop or achieve any other objectives. In order to attain the highest possible strength and ductility in these nodular irons, it is necessary to maintain an accurate control of the melting operation, and to exercise a very careful selection of the proper type of raw materials to be charged to the furnace. The attainment of these objectives will increase the cost of the nodular irons to approximately $20.00 per ton of hot metal. However, we must also remember that accompanying this increased cost is a marked increase in the physical properties, resulting in tensile strengths of 70,000 psi with yield points of 50,000 psi and elongations of 25 per cent. Undoubtedly, there will be considerable clarification of this item of cost as we learn more about this new engineering material.

Field of Application of Nodular Iron

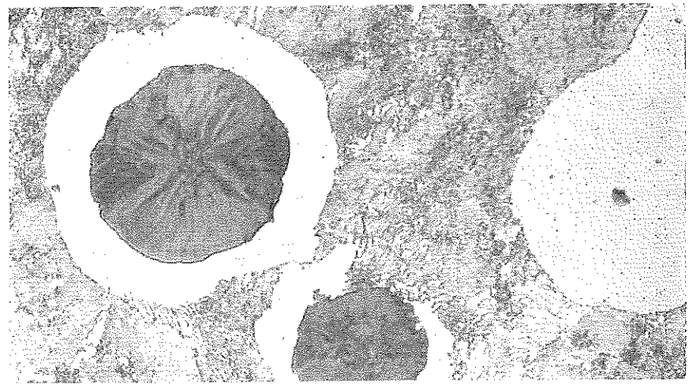
The potential field of application for nodular irons is practically limitless. There is no reason to believe, at the present stage of development, that nodular cast iron will replace malleable iron in every field of application. The malleable iron industry will, no doubt, keep abreast of current technological advances through the application of magnesium treatments to its irons. Such treatments will have a marked effect on the industry, and will alter considerably many time-honored requirements of the malleable industry, such as rigid chemical specifications, section thicknesses which will solidify white in sand molds, lengthy periods for subsequent heat treatment, the expenditure of a large number of man-hours of time per ton of castings produced, etc.

Fields of application for these nodular irons include, among others, the automotive, railroad and agricultural industries (6). They may find application in rolling mill equipment, machine tools, pumps, crankshafts, compressors, valves and machinery in general. Other fields which offer an opportunity for application of nodular cast iron include marine equipment, electrical equipment, textile machinery, pipe, railroad car wheels, and such items as ingot molds, furnaces, engines and other parts operating at elevated temperatures.

As I stated previously, it is my opinion that the development of nodular graphite in the as-cast condition is the greatest advance in the field of cast iron metallurgy in the last 25 years. Although a great deal of work has been done, we have, in reality, merely crossed the threshold. The work yet to be done in this field of nodular irons will constitute an active area of research for many years to come. The best method of introducing magnesium to molten iron in production foundries needs to be developed. Considerable time and effort must be expended in investigating other elements and alloys, singly and in various combinations, to determine their applicability for the production of nodular cast iron. Unlimited possibilities for research exist in the heat treatment of these irons. We must investigate many different types of nodular cast irons to determine how they are affected by such heat treatments as normalizing, drawing, quenching, tempering, annealing, induction hardening, etc.—all at various temperature levels, various time intervals and in varying combinations with one another. We have gathered considerable information on the strength and ductility of these irons. However, before we can realize the greatest benefit from the application of these nodular irons in the field of engineering, we must obtain a wealth of data on such properties as wear, corrosion resistance, damping capacity, fatigue, thermal resistance, machinability, weldability, etc. The behavior of this material, when introduced to the chilled iron industry, offers a very rich and promising field for both short and long term research.



▾ Fig. 18—Microstructure of the same iron as shown in Fig. 16 and 17, after a two hour heat treatment at 1320 degrees, Fahrenheit. Nital etch. X100. (Courtesy Mr. Gosta Vennerholm).



▾ Fig. 17—Microstructure of low phosphorus, low sulfur, low manganese iron which was melted in electric furnace and treated with 50 Cu—50 Mg alloy. Nital etch. X500. (Courtesy Mr. Gosta Vennerholm).

I believe that the possibilities for this material are unlimited. I feel that every sales engineer, every designer, every fabricator, every metallurgist, every foundryman, in fact everyone who is in any way connected with the metals industry should keep abreast of the developments in this field so that he is ready at all times to utilize this material for the welfare, the benefits and the advancement of mankind.

Acknowledgment

The author wishes to thank the American Foundrymen's Society, and especially Mr. C. R. McNeill of the Editorial Staff, AMERICAN FOUNDRYMAN, for valuable assistance in the preparation of this material.

Special acknowledgment and appreciation goes to the following men for their courtesy in supplying the micrographs used in this article:

Figs. 1, 2, 3 and 4 through the courtesy of Mr. D. J. Reese, Metallurgist, International Nickel Company, New York.

Figs. 5, 6, 7 and 8 through the courtesy of Mr. Albert De Sy, Professor of Metallurgy, University of Ghent, Belgium.

Fig. 9 through the courtesy of Mr. C. K. Donoho, Chief Metallurgist, American Cast Iron Pipe Company, Birmingham, Alabama.

Figs. 10 to 18 inclusive, through the courtesy of Mr. Gosta Vennerholm, Metallurgist, Ford Motor Company, Dearborn, Michigan.

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THE LADY AND THE MINE (or) MAN'S LAST REFUGE

By MRS. L. D. ANDERSON

I have followed my mining engineer husband from job to job over much of the civilized, (and I use the word loosely) world. I have been content by his side snow-bound for months on end in high mountain mining camps. I have sweltered happily with him in desert heat miles from the nearest town. I will continue to follow him wherever he goes from the Andes to the Arctic Circle, from Baguio to Bolivia; but there is one vast region which the soles of these little feet will never tread again. Never again will I venture beneath the surface of the earth—not even in a subway. Henceforth and forever more I will leave the nether regions to moles, miners, and leprechauns.

The reason for this never-to-be-shaken resolve involves a story which I would like to pass on as a warning to other overly curious "miners'" wives.

Not very long ago, my husband was working at one of the remote, isolated mining camps high in the mountains of our West. In a moment of madness, I, along with several other "miners'" wives, conceived the brilliant idea of going down into the mine on a sort of tour of inspection.

Our husbands objected strenuously, saying that it wasn't safe and mentioning the old miners' superstition to the effect that the presence of a woman invariably ruins a mine. But we overruled their objections and permission was obtained for us to go down into the mine. I am happy to report that the mine did not appear to suffer in the least from the encounter; I cannot say the same for myself, however.

"Well, here you are girls; sign your life away," said the Superintendent, with a grin which wasn't exactly calculated to inspire confidence. I noted that the slip of paper he handed us to sign was a release, absolving the company from any responsibility in the event of an accident in the mine. At this point I began to doubt the wisdom of the whole idea.

Looking around at the other girls, I couldn't help being amused at the costumes they had donned for the occasion, until I realized that my own ensemble wasn't exactly what one would wear in the Easter parade, either. Clad in old slacks or jodhpurs, heavy, hard-toed shoes, rubber coats, hard-boiled safety hats which were *not* designed by Lilli Dache, and electric hat lamps with batteries which fastened around the waist, we were ready to go down into the mine.

"Get on the cage and keep your elbows inside," advised our elevatorman, (or "cager" as the miners call him) as he closed a heavy wire gate that wedged us tightly together. Then, without warning, he jerked on a piece of rope and the bottom dropped from under us as the cage plummeted down the shaft. My stomach pushed up into my throat and my breathing stopped, but the descent didn't seem to be bothering the men so I swallowed a few times and managed to relax a bit, that is, until we came to a place where the shaft cut through a stream and some of the icy water hit me on the back of the neck. I stifled a scream and blessed the rubber coat I was wearing. Without those coats we would all have been drenched.

"First level, second level, third level," chanted the cager as we whizzed past spots of light. Then, suddenly, we stopped. My knees buckled and I would have fallen to the floor if we hadn't been jammed so tightly together. The hat lamp battery, which I was to learn to hate as the day wore on, gouged me in the stomach and gave me the first of the many black and blue marks I got that day.

▼ Mrs. Anderson models the ensemble worn by the well-dressed lady mine visitor.

"That hoistman is sure cutting her short today. I'll have to talk with him," remarked the Super who was our guide through the mine. Then he told us that the cager rings a certain number of signal bells informing the hoistman where he wants to go, and the hoistman, then, hoists or lowers him to that place.

We stepped off the cage into a large room where the exposed wall and ceiling timbers lent a sort of "Old Colonial" effect. It must have been very old Colonial for the water was dripping from the ceiling in a hundred places. I found out that the leakage was from the several small underground water-courses through which the shaft had been cut.

Three hallways, dark and endless opened off the room. I learned later that the room was a "timbered shaft station" and the hallways were "drifts" or "crosscuts." To me they were just tunnels.

The Super started walking through one of these tunnels and we single-filed after him. We were walking on a train track that was much narrower than the railroad tracks I had seen. There were stretches of track that were wet and slippery and stretches that were dry; sometimes there was nothing to walk on except unevenly spaced ties. All the time my lamp-battery kept bouncing up and down adding new bruises and sore spots to my already extensive collection.

I thought we would never quit walking. Those boots were threatening to pull my legs off at the hips. A swap of boots for muddy feet would have felt good then. And that battery just dug out chunks of flesh.

When we did stop it was in a pandemonium of dust-laden fog and deafening noise. Up front, someone, probably the Super, was violently waving a light. The noise stopped abruptly but my ears continued to ring.

"How's it going, Bob?" asked the Super.

"Fine," replied Bob. "Visitors?"

"Yes, some of the ladies wanted to see what a mine looked like."

"This is a heading and this is an automatic. Bob drills a round of holes, and shoots them. Then the next shift mucks up," explained the Super. Later I learned that the "automatic" was the air drill that made all the noise and that "shooting" a hole means loading it with dynamite and explod-

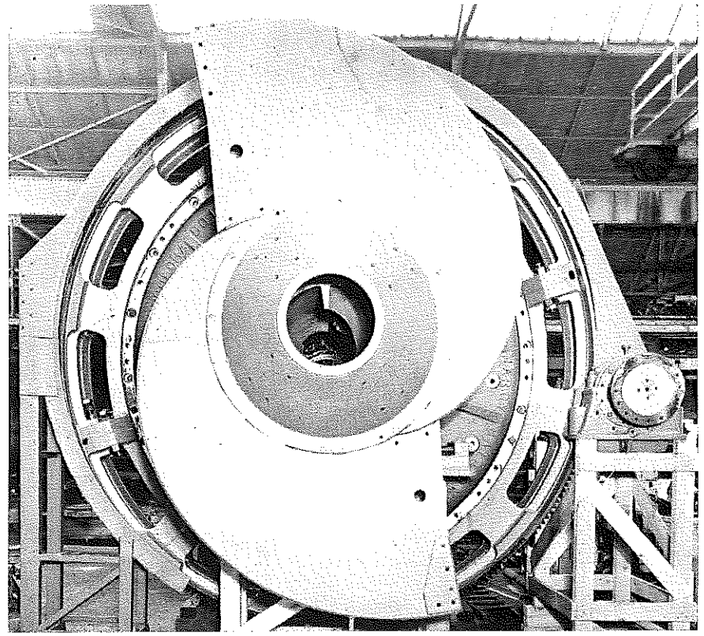
(Continued on page 20)

DENVER FIRM SENDS MILLION DOLLAR GRINDING MILL ORDER TO SOUTH AMERICA

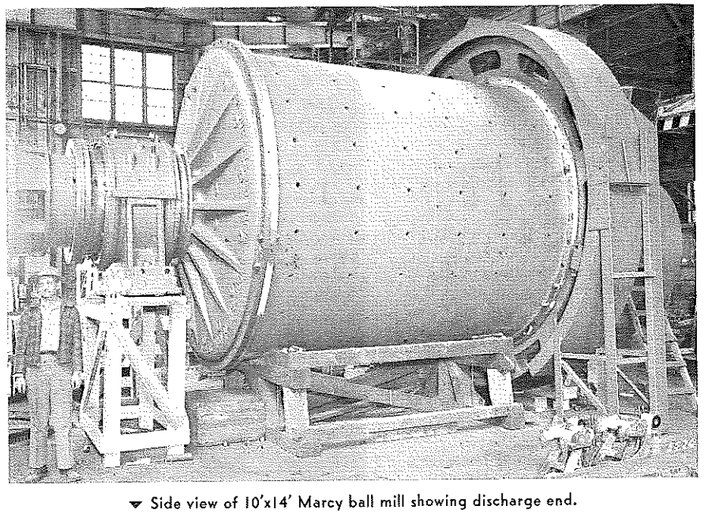
On Thursday, December 1, 1949, seven flat cars left Denver carrying approximately one-quarter of what is said to be the largest single order of grinding mills ever placed with any manufacturer.

The order, consisting of twenty-five large ball and rod mills, was sold to a copper mining company in Chile and amounts to over a million dollars worth of equipment. There are nine ball mills, nine rod mills and seven regrind ball mills ranging from six to ten feet in diameter and from twelve to fourteen feet in length. Each mill is equipped with its own electric motor, some of them as large as 800 horsepower, giving a total connected horsepower of 16,150. Total weight of the mills and liners will amount to 6,200,000 lbs.

The units were made by the Mine & Smelter Supply Company of Denver, Colorado, and will equip one-third of the Chilean plant, the total cost of which will be about 172-million dollars. The plant is being constructed for the development of a very large low-grade copper deposit. This means that immense tonnages must be handled and every pound of the ore must be pulverized into a powder before the metallic values can be released. The large ball and rod mills do this. From the pictures, it can be seen that they are nothing more than large cylinders, the rod mills being filled with rods and the ball mills with balls. Through their cascading action as the mill revolves, the mixture of ore and water is reduced to the proper size of particles for further treatment.



▼ Shop photograph of feed end of 10'x14' Marcy ball mill showing drum and double scoop feeder.



▼ Side view of 10'x14' Marcy ball mill showing discharge end.

Each rod mill and each ball mill working in tandem will accomplish this job. The rod mill will take the feed direct from the crushing plant and the ball mill will do the final grinding. Each such two-machine unit will handle more than 2500 tons of ore a day.

The smaller mills in the order will have different functions such as regrinding ore, grinding limestone for lime hydration and grinding silica slurry for smelter flux.

Shipments will continue until spring over a 10,000 mile route by rail to New Orleans and from there by ship to Chile. Due to the tremendous size of the mills, it was necessary to get special railroad clearance and the shipments will have to be routed over lines with no tunnels and very few bridges.

The expenditure of such a large sum of money by a company for grinding equipment for the development of a deposit of low-grade ore is indicative of the importance which grinding processes have assumed in large scale ore production.

During the past fifty years, the demand for metals such as copper, lead, zinc, molybdenum, iron, vanadium, etc., has continually grown. At the same time, mining from a greater depth and milling at high wage rates

(Continued on page 20)

SUMMARY OF THE FINANCIAL TRANSACTIONS OF THE PETROLEUM INDUSTRY IN 1949

By
JOSEPH E. POGUE
FREDERICK G. COQUERON
The Chase National Bank
Petroleum Department
New York

While earnings of thirty U. S. oil companies in 1950 are expected to be less than in 1949, their cash requirements for capital expenditures likewise will be lower, thus enabling them to maintain present dividend rates fairly well, according to Joseph E. Pogue and Frederick G. Coqueron of the Chase National Bank's petroleum department. They are the authors of a financial survey of the petroleum industry for 1949 which was released by the bank Jan. 12, 1950.

Despite a drop in income of $526 million or 28 percent in 1949, the 30 oil Companies, which comprise two-thirds of the industry, were able to increase dividends by $87 million or 18.5 percent over 1948 because capital expenditures were lower by some $279 million or 10.8 percent.

Dividends in percent of net income for the 30 Oil Companies rose to 41.3 percent in 1949 from an extremely low ratio of 25.1 percent in 1948 when capital requirements were at a maximum. According to Mr. Pogue and Mr. Coqueron, the petroleum industry, like many other industries, was able to pay its stockholders a larger percentage of net income in 1949 and still maintain a high rate of capital formation.

The financial survey also shows the sources of outside capital raised by the 30 Oil Companies and by other oil companies during 1949. The combined financing transactions of both groups amounted to $868 million compared to $1,167 million in 1948, a reduction of $299 million. Of the outside capital secured during the past year, 97.1 percent was borrowed and 2.9 percent came from common stock. None was raised by the sale of preferred stock.

The money borrowed during 1949 amounted to $843 million and was obtained as follows: insurance companies—56 percent; public investors and others — 24.5 percent; banks — 19.5 percent. About two-thirds of the aggregate banks loans were provided by New York banks.

Financial Data of 30 Oil Companies

	Actual 1948	Estimate 1949	Change 1949 from 1948
	(Million Dollars)		(Percent)
Earnings	1,877	1,351	—28.0
Cash Dividends Declared—			
Preferred	7	7	—
Common	464	551	—
Total	471	558	+18.5
Dividends in Percent of Earnings	25.1	41.3	—
Capital Expenditures	2,591	2,312	—10.8

GRINDING MILLS

(Continued from page 19)

has increased enormously. Therefore, operating costs have come in for some serious study, particularly by copper producers such as the Chilean company receiving the present order. It has been determined that grinding absorbs the highest percentage in the total cost of production.

Since the early part of the century, the Mine and Smelter Supply Company has supplied Marcy ball and rod mills to more than twenty copper companies throughout four continents. It is estimated that if all of the Marcy Mills furnished to the mining industry operated at one time, over 300,000 tons of crude ore would be ground each twenty-four hours.

The present high degree of efficiency in grinding techniques and the many improvements in grinding equipment have played a very important part in making possible the utilization of lower-grade ore deposits throughout the world, so necessary to supply the metal needs of an ever increasing demand from modern civilization.

THE LADY AND THE MINE

(Continued from page 18)

ing it to break up the rock.

We left the heading, and, after walking some distance, arrived at the foot of a ladder leading up into the darkness. The Super began climbing, and we followed. Every few steps we had to crawl through a small opening in a floor. These floors are supposed to catch anyone who falls off the ladder. I discovered that the narrow openings are also handy for catching onto one's lamp battery and almost pulling one off the ladder.

At every floor, we girls had to stop and rest, it was so hot and hard to breathe. But not for long; the Super seemed to be just bursting with energy and we were soon up and at it again.

Ages later we got into a stope. Here, I learned, the rock that carried the valuable minerals was broken by shooting it with dynamite as in the heading. After the ore was broken it was carried to the shaft on cars (hence the track along which we had stumbled earlier). From the shaft, the ore was sent to a mill where the valuable minerals were concentrated.

As we started through the stope, I discovered that I needed all my concentration to negotiate the broken rocks which made up the floor of the stope. Meanwhile, that instrument of torture, my lamp battery, kept banging away indiscriminately at the equatorial regions of my anatomy.

Down some more ladders we went and then we walked and walked through a tunnel until I was ready to crawl away into some dark corner of the mine and die. Eventually, when I was just about done in, I saw the Super turn off from the tunnel into our starting station.

We had to wait a few minutes for the cage and I just dropped in my tracks. The cold stone floor felt like a feather bed, but just when my ill-used muscles were beginning to relax a little, down came the cage and the Super herded us aboard like so many cattle. Up through the icy waterfall, and, then, there it was . . . daylight, the most beautiful sight in the world.

In unison, we girls breathed a long sigh of relief; right then and there we came to a unanimous if unspoken agreement that we would never again invade the last domain of the male of the species. Since that time I have even been chary of going into a basement.

THE UTILITY OF MULTIPLE CORRELATION

A NEW TOOL FOR STATISTICAL ANALYSIS

By WARREN H. YARROLL, '34

Metallurgist, Geneva Steel Company

My purpose in this article is to acquaint you with a relatively simple mathematical innovation which, in my opinion, constitutes a key method of approach to solving many of the problems that exist in the fields of agriculture, mining, metallurgy, manufacturing, merchandising, medical science, all research work, and economics. It has the power to turn every type of full-scale operation into a research laboratory ideally suited to the solving of its own problems. It is a tool of such vast importance that it may prove to be the means, in future years, of obtaining answers to many of the complex problems with which industry is faced in daily operations.

One does not have to think long about the matter to concede the truth of the statement that most of the effects we note in this world are each the composite function of several variables. The size of a farmer's crop is probably a function of rainfall, mean temperature during the growing season, fluctuation of temperature, percentage of available nitrogen, phosphorous, and potassium in the soil, and the organic matter content and porosity of the soil. In mining, the grade of ore, the cost of mining, transportation, milling or smelting, and the market prices of the contained metals are among the factors which spell success or failure. Some of the factors contributing to the saleability of an item of merchandise might be selling price, color, size, quality, weight, shape, packaging, display, the time of year, part of the country, and percentage of people in the vicinity with a need or desire for that type of merchandise. There is, of course, no end of examples which could be cited to demonstrate this simple truth.

It is self-evident that before a person can give any intelligent consideration to ways and means of controlling an effect, whether it is good or evil, he must be in possession of at least the following information:

1. The causes contributing to the effect.
2. Whether the relationship between each cause and the effect is direct or inverse.
3. The number of units variation brought about in the effect by a unit change in the cause.
4. The relative importance of the causes in contributing to the variation in the effect in normal experience.

The time-honored way of studying cause and effect, of course, has been to study the effects of variations in the factor under consideration while all the other factors are held at fixed values. While this method of approach must be given credit for having produced many practical results in research laboratories, it has the major shortcoming that the attempt to hold all variables but one at fixed values in most practical operations is either very difficult or impossible. Multiple correlation allows us to obtain the same information without making any changes whatsoever in the routine of normal operations.

We might define multiple correlation as being a method of mathematical analysis whereby the degree of true correlation is determined between several so-called independent variables and a dependent variable. Perhaps we should point out and emphasize the fact that mathematical correlation does not constitute conclusive proof of true cause-and-effect relationship. If the mathematical correlation is of a high degree, then we can say that there is strong indication of such relationship. If we make application of the adjustments in practice that are indicated by a multiple correlation analysis, and the desired results are consistently achieved, then, we have rather conclusive proof of true cause-and-effect relationship. We are unable to say who did the original work on mathematical procedures for doing multiple correlation, but the literature on the subject indicates that it had its origin among economic statisticians as a means of studying market fluctuations. The procedure demonstrated in this article is based on methods used by Richard H. Ede which are discussed in his article entitled "An Application of Multiple Correlation to a Problem in Basic Open Hearth Operating Rates" published in the March, 1948, issue of *Industrial Heating* (National Industrial Publishing Company, Pittsburgh, Pa.). Readers who are interested in further study of this subject are referred to "Methods of Correlation Analysis" by Ezekiel (2nd or 1941 edition, John Wiley & Sons, Inc.), and "Statistical Methods" by Snedecor (Iowa State College Press).

Demonstration of the Method

In order to demonstrate the mathematical procedure involved, we shall use multiple correlation to find the individual effects of carbon, manganese, and gauge on the tensile strength of plate steel. There are other factors, of course, which affect the tensile strength of steel, but in order to keep our example relatively simple we shall consider a set of data in which these other factors are constant. The method demonstrated works with any number of factors, and the expansion of its use to larger numbers of independent variables will be obvious after you have studied the example. It has become customary in this work to designate the "dependent" variable (or the "effect" being considered) as X_1 and the independent variables as X_2, X_3, etc. In our present example, of course, tensile strength is the dependent variable. The first step is to post the original data with which you are working as shown in Table 1, and figure the arithmetical average of the figures in each column. The deviations of the individual figures from their own average are then figured and posted with their proper algebraic signs in Table 2. I have found it convenient to designate the deviations of X_1 as D_1 and X_2 as D_2, etc. The squares and all possible products of these deviations are then figured and posted in Tables 3 and 4.

Table 1

Original Data

X_1 PSI Tensile Strength	X_2 % Carbon	X_3 % Manganese	X_4 Gauge (Inches)
39,820	0.05	0.31	1.000
49,180	0.07	0.60	0.375
59,160	0.22	0.45	0.750
76,410	0.34	0.55	0.125
81,280	0.40	0.57	0.250
76,460	0.39	0.35	0.500
66,710	0.28	0.55	0.625
51,780	0.16	0.37	0.875
62,600 Ave.	0.24 Ave.	0.47 Ave.	0.5625 Ave.

Table 2
Deviations

D_1	D_2	D_3	D_4
−22,780	−0.19	−0.16	+0.4375
−13,420	−0.17	+0.13	−0.1875
− 3,440	−0.02	−0.02	+0.1875
+13,810	+0.10	+0.08	−0.4375
+18,680	+0.16	+0.10	−0.3125
+13,860	+0.15	−0.12	−0.0625
+ 4,110	+0.04	+0.08	+0.0625
−10,820	−0.08	−0.10	+0.3125
0 Sum	−0.01 Sum	−0.01 Sum	0 Sum

The sum of the individual deviations from the average of each column should, of course, be zero. A slight departure from zero might occur due to the averages not being carried out to the point where there is no remainder, but the small departures from zero such as those above will not cause any appreciable error in results. The purpose of adding these deviations is merely to check the accuracy of the work to this point.

Table 3
Squares of Deviations

D_1^2	D_2^2	D_3^2	D_4^2
518,928,400	0.0361	0.0256	0.19141
180,096,400	0.0289	0.0169	0.03516
11,833,600	0.0004	0.0004	0.03516
190,716,100	0.0100	0.0064	0.19141
348,942,400	0.0256	0.0100	0.09766
192,099,600	0.0225	0.0144	0.00391
16,892,100	0.0016	0.0064	0.00391
117,072,400	0.0064	0.0100	0.09766
1,576,581,000 Sum	0.1315 Sum	0.0901 Sum	0.65628 Sum

Table 4
Products of Deviations

D_1D_2	D_1D_3	D_1D_4	D_2D_3	D_2D_4	D_3D_4
+ 4,328	+3,645	− 9,966	+0.0304	−0.08313	−0.07000
+ 2,281	−1,745	+ 2,516	−0.0221	+0.03188	−0.02438
+ 69	+ 69	− 645	+0.0004	−0.00375	−0.00375
+ 1,381	+1,105	− 6,042	+0.0080	−0.04375	−0.03500
+ 2,989	+1,868	− 5,838	+0.0160	−0.05000	−0.03125
+ 2,079	−1,663	− 866	−0.0180	−0.00938	+0.00750
+ 164	+ 329	+ 257	+0.0032	+0.00250	+0.00500
+ 866	+1,082	− 3,381	+0.0080	−0.02500	−0.03125
+14,157	+4,690	−23,965	+0.0259	−0.18063	−0.18313 Sums

We now have all of the figures necessary to go ahead and calculate our "coefficients of correlation." This coefficient is an index of how closely the relationship between two sets of figures fits their "line of least squares." It can be proven by calculus that the most probable straight line that can be drawn through a group of plotted points from the associated values of two variables is that line concerning which the sum of the squares of the deviations of the points from the line is a minimum. Perhaps a clearer understanding of the matter can be had if we first define the term "standard deviation," usually designated by the symbol δ. The "standard deviation" of a set of figures is obtained by adding the squares of the deviations of the individual figures from their own average, dividing this sum by the number of figures, and then extracting the square root. The "coefficient of correlation" is the decimal fraction of a standard deviation in the dependent variable that will be associated with a change of one standard deviation in the independent variable under consideration. If there is no correlation whatsoever, the coefficient will be zero; if the correlation is perfect and direct, the coefficient will be +1; if the correlation is perfect and inverse, the coefficient will be −1. In handling industrial data, of course, we usually find coefficients somewhere in between these values. Mathematically, the coefficient of correlation, always designated by the symbol "r," is expressed as follows:

$$r_{12} = \frac{\Sigma D_1 D_2}{\sqrt{\Sigma D_1^2 \Sigma D_2^2}}$$

The subscript "12" indicates that this coefficient is between X_1 and X_2. The coefficient of correlation merely shows the "apparent" relationship between the dependent variable and the independent variable being considered. This "apparent" relationship coefficient is obviously a composite effect of the true relationship of the independent variable under consideration with the dependent variable plus the effects of the true relationship of the other independent variables with the dependent variable to whatever extent each of these other variables happens to be correlated with the independent variable under consideration. It is apparent that if all of the other variables were at fixed values, all of the values of the variable under consideration would fall on one ordinate when plotted against each of the other independent variables, and the "inter" coefficients of correlation would each be zero. In this case the coefficient of correlation would be also the true correlation coefficient. These true correlation coefficients are generally designated by statisticians as "Beta" coefficients. From the foregoing explanation it can be seen that in the case of three independent variables such as we have in our present problem, the relationships between the coefficients of correlation and the Beta coefficients may be expressed mathematically according to the following three equations:

$$\begin{aligned}
\beta_2 x 1.00 &+ \beta_3 x r_{23} &+ \beta_4 x r_{24} &= r_{12}\\
\beta_2 x r_{23} &+ \beta_3 x 1.00 &+ \beta_4 x r_{34} &= r_{13}\\
\beta_2 x r_{24} &+ \beta_3 x r_{34} &+ \beta_4 x 1.00 &= r_{14}
\end{aligned}$$

Either a study of the above explanation or examination of these equations will make the method of expanding them for larger numbers of independent variables obvious to the reader. By using the figures we obtained in Tables 3 and 4 and substituting in our formula for coefficient of correlation we obtain the following values:

$$r_{12} = \frac{\Sigma D_1 D_2}{\sqrt{\Sigma D_1^2 \Sigma D_2^2}} = +0.9832$$

$$r_{13} = \frac{\Sigma D_1 D_3}{\sqrt{\Sigma D_1^2 \Sigma D_3^2}} = +0.3935$$

$$r_{14} = \frac{\Sigma D_1 D_4}{\sqrt{\Sigma D_1^2 \Sigma D_4^2}} = -0.7450$$

$$r_{23} = \frac{\Sigma D_2 D_3}{\sqrt{\Sigma D_2^2 \Sigma D_3^2}} = +0.2379$$

$$r_{24} = \frac{\Sigma D_2 D_4}{\sqrt{\Sigma D_2^2 \Sigma D_4^2}} = -0.6149$$

$$r_{34} = \frac{\Sigma D_3 D_4}{\sqrt{\Sigma D_3^2 \Sigma D_4^2}} = -0.7531$$

Substituting these values in our three equations giving the relationships between beta coefficients and coefficients of correlation, and solving them simultaneously, we obtain the following values for our betas:

$$\begin{aligned}
\beta_2 &= +0.8677\\
\beta_3 &= +0.0644\\
\beta_4 &= -0.1630
\end{aligned}$$

A shortcut method for solving the equations for beta coefficients known as the Doolittle method is explained by Ezekiel. Any standard method for solving simultaneous equations, of course, is satisfactory. When one is working with a fully automatic calculating machine, it is quite simple to divide all the way through each equation by the coefficient of the first beta, thus converting each of these first coefficients to 1.0000. Each pair of successive equations are then added or subtracted (according to whether the algebraic signs of the first terms are opposite or alike) to eliminate the first set of betas. The operation is then repeated until all of the betas but the last one have been eliminated, and its numerical value is found. The values of the others are then found by successive back substitution of the known values. These beta coefficients tell us the decimal fraction of a standard deviation in the dependent variable which is independently associated with a change of one standard deviation in each independent variable. They may therefore be converted to slope coefficients by multiplying each of them by the ratio of the standard deviations of the dependent variable and that independent variable. Thus:

$$b_2 = \beta_2 x \frac{\delta_1}{\delta_2} = +0.8677x \frac{14{,}038.2}{0.128208} = +95{,}009$$

$$b_3 = \beta_3 x \frac{\delta_1}{\delta_3} = +0.0644x \frac{14{,}038.2}{0.106124} = +\ 8{,}519$$

$$b_4 = \beta_4 x \frac{\delta_1}{\delta_4} = -0.1630x \frac{14{,}038.2}{0.286417} = -\ 7{,}989$$

Our ultimate object in this problem is to set up a linear equation of the type:

$$X_1 = a + b_2X_2 + b_3X_3 + b_4X_4$$

so that we can make predictions of the value of X_1 from the known values of the other variables. We already have the "b's" or slope coefficients, so it remains merely to find the value of "a" by substituting the average values of the X's from the original data from Table 1. We find the value of "a" is 40,418. Therefore:

Tens. Str. (PSI) = 40,418 + 95,009 x % Carbon + 8519 x % Manganese − 7989 x Gauge (In.)

It will be found that every set of data in Table 1 can be substituted back in the above formula, and the correct values of X_1 will be found practically on the head. The degree of accuracy with which the values of the dependent variable can be calculated from a prediction formula is known as the "coefficient of determination." It expresses the amount of the variance in the dependent variable which has been accounted for by variance in the independent variables. It is found by totaling the products of the coefficients of correlation with their corresponding beta coefficients. Thus:

$$\begin{aligned}
r_{12}x\beta_2 &= +0.9832 \text{ x} +0.8677 = +0.8531\\
r_{13}x\beta_3 &= +0.3935 \text{ x} +0.0644 = +0.0253\\
r_{14}x\beta_4 &= -0.7450 \text{ x} -0.1630 = +0.1214\\
\text{Coefficient of Determination:} & \qquad\qquad 0.9998
\end{aligned}$$

This figure may be changed to percentage by merely moving the decimal point two places to the right. So, in this case, we have accounted for 99.98% of the variation in the dependent variable by variation in the independent variables. A more specific description of the significance of the coefficient of determination can be given in terms of the statistical measure known as "variance" and which is mathematically the square of a "standard deviation." The coefficient of determination is the variance of the calculated values of the dependent variable divided by the variance of the actual values of the dependent variable. The part of the over-all coefficient of determination contributed by each independent variable is an index of its relative importance in contributing to variation in the dependent variable.

Because all industrial data are unavoidably subject to a certain amount of error above or below true values, and because it is probable that there will be as much variation on the high side as on the low side in any given set of data, one might logically expect to cancel out most errors by dividing his data into groups and averaging the items in each group. The multiple correlation can then be performed on this smaller number of items with the added advantage of reducing the great mass of calculations to be made. We have followed this procedure in our own work, and believe that it is highly advantageous on both scores.

It is interesting to speculate on why multiple correlation has not come into more general use. The only logical answer seems to be that people simply have not become familiar with it. Therefore, the readers of this paper are urged to try out this exceedingly useful tool insofar as it applies to their problems.

PERSONAL NOTES

(Continued from page 4)

Charles W. Rohler, '49, has moved his residence in Gary Indiana, to 468 Tyler, Apt. 23. He is serving as Junior Engineer for Cities Service Oil Company (Delaware).

William C. Rump, '33, Rancher, is addressed Apt. 16 Demerschman Gardens, Grand Junction, Colorado.

Paul R. Shanklin, '48, has moved his residence to 331—10th Street, South, Virginia, Minn. He is Mining Engineer for Oliver Iron Mining Company.

Craig R. Smith, '49, Petroleum Engineer for Sinclair Oil & Gas Company, is now being addressed Box 3386, Odessa, Texas, having been transferred from Bairoil, Wyoming.

George H. Speirs, '31, President of Seismograph Service Corporation of Delaware, is still in Caracas, Venezuela, but has a new address there, Apartado 3706.

Albert F. Trites, Jr., '46, Geologist for the U. S. Geological Survey, has been transferred from Parlin, Colorado, to the Denver Federal Center, Denver 14.

Carl W. Tuttle, '28, has moved his residence to 8850 So. Harper Avenue, Chicago 19, Illnois. He is Senior Service Metallurgist for Carnegie-Illnois Steel Corporation.

Cecil R. Walbridge, '29, Denver Sales Manager, Worthington Pump & Machinery Corporation, was on vacation recently in the Southwest where he renewed acquaintances with *Mines Men* in Texas and Oklahoma. While in Houston he spent three days at the new Shamrock Hotel and enjoyed the modernistic atmosphere of the 22 million dollar structure.

L. E. Wichmann, '21, Production Superintendent for Shell Oil Company, is now located in Houston, Texas, residing at 2918 Ruth Street, Houston 4.

Albert H. Wieder, '34, has been promoted to Exploitation Engineer for Shell Oil Company and is addressed in care of the company, Box 1191, Tulsa, Oklahoma.

James C. Woodruff, '48, Right of Way and Claims Agent for Ford, Bacon & Davis, Inc., is addressed Watervliet, Michigan.

James K. Ziegler, '41, is Canadian Supervisor for the Century Geophysical Corporation of Tulsa, Oklahoma. His mailing address is 215-A-8th Avenue E., Calgary, Alberta, Canada.

Captain Jerome Zohn, '47, is now stationed in Spokane, Washington, with office address 607 Empire State Building.

BIRTHS

Mr. and Mrs. Marvin E. Lane welcomed a daughter into their home on February 22, 1949, whom they have named Linda Beth. She weighed 6 lbs. 7 ounces at birth.

Mr. Lane, of the class of '44, is with the St. Joseph Lead Company at Balmat, St. Lawrence County, N. Y.

Mr. and Mrs. Lester B. Spencer are the proud parents of a daughter, Susan Elizabeth, born June 21 1949.

Mr. Spencer, '44, is associated with Sohio Petroleum Company in Edmond, Oklahoma.

(Continued on page 40)

PROGRESS NEWS
U. S. ATOMIC ENERGY COMMISSION

New AEC Report on Isotope Distribution. More than 300 universities, hospitals and research laboratories in 41 states and territories of the United States are using isotopes produced by the U. S. Atomic Energy Commission for medical, biological, industrial, agricultural and scientific research and medical diagnosis and treatment, the Commission stated in a report published recently.

The report, "Isotopes—A Three-Year Summary of U. S. Distribution," is available to the public from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. for a price of 45 cents.

The report provides a useful measure of the value of isotopes to peacetime research by listing more than 1850 publications that have been issued on work done with these valuable products of the atomic energy program.

The report also summarizes the growth of the isotope distribution program during the three years it has been in effect, outlines the various methods of isotope production, and describes the typical ways in which isotopes are used in the United States and 21 foreign nations.

Also described in the report are the participation of private companies in the preparation of isotope-labeled compounds and the program for training scientists in the proper methods for handling and using radioisotopes.

The appendixes to the report contain a chronological outline of the growth of the isotopes distribution program, a list of institutions using isotopes in the U. S. and abroad, outline of procedures for obtaining isotopes and lists of available isotopes and isotope-labeled compounds.

The appendixes also list the titles, authors and journal references of the 1850 published papers. A complete author index of over 1800 names has been included to facilitate use of this report as a reference guide.

AEC Raw Materials Manager Gustafson Resigns: Succeeded by Jesse C. Johnson. John K. Gustafson has completed the two-year period during which he agreed to serve as Manager of the Atomic Energy Commission's Raw Materials Operations Office, and has resigned effective January 1, 1950, General Manager Carroll L. Wilson of the AEC announced and said that Dr. Gustafson will be succeeded by his present deputy, Jesse C. Johnson.

Dr. Gustafson will become Consulting Geologist of the M. A. Hanna Company of Cleveland.

Dr. Gustafson will continue to work in the national atomic energy program as a consultant to the Commission.

Mr. Johnson, the new manager, has been with the AEC since January 1948, serving successively as assistant manager and deputy manager of the Raw Materials Operations Office.

New Appointments in G.E. Atomic Research. Rear Admiral Walter S. Macaulay, U.S.N. (Ret.) has been appointed assistant executive engineer in the Knolls Atomic Power Laboratory, it has been announced by Dr. C. G. Suits, vice president and director of research for the General Electric Company. The atomic laboratory is being operated for the Atomic Energy Commission, as part of the G-E Research Laboratory.

Dr. Suits said that Admiral Macaulay will be responsible for general administration in the atomic laboratory. At the same time he announced that Lawrence L. Ferguson, who is also assistant executive engineer, will take charge of the West Milton Area Project, where an experimental atomic power plant is under construction by the A.E.C., as part of the laboratory facilities. Mr. Ferguson will be responsible for co-ordinating all phases of design and construction for this project, said Dr. Suits.

AEC Issues Guide for Contracting of Construction and Related Engineering Services. A U. S. Atomic Energy Commission booklet entitled "A Guide for Contracting of Construction and Related Engineering Services," which describes how AEC construction and architect engineer contracts are awarded, was placed on sale recently by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. for a price of 10 cents.

The booklet contains information on the various types of contracts used by the AEC, including lump-sum, fixed-price and cost-plus-a-fixed-fee contracts, and describes the steps firms should take to be considered for those types of work where bids cannot be solicited by formal advertising.

Last August the AEC published a booklet entitled "Contracting and Purchasing Offices of the Commission and the Types of Commodities Purchased," which also provides information of interest to firms wishing to do business with the AEC. It is also available from the Superintendent of Documents for a price of 10 cents.

Engineering Advisory Committee Appointed for AEC Reactor Testing Station. The appointment of a three-man Engineering Advisory Committee to assist the Idaho Operations office, U. S. Atomic Energy Commission, on the planning and development of the Reactor Testing Station has been announced by L. E. Johnston, Manager of the Idaho office.

Members of the Committee are: General L. J. Sverdrup, Chairman; Dr. H. M. Crothers; and Mr. W. W. Horner. All three have long and distinguished records in the field of engineering.

The first meeting of the committee was held January 30 to February 1 in Idaho Falls, Idaho.

*The Hanford Works.** The Hanford Works is located on the Columbia River in southeastern Washington, Du Pont built it for the government during the war at a cost of $350,000,000. Currently additional funds of about $20,000,000 per month are being expended in a program of expansion and renovation. About 7500 workers are employed by the General Electric Company in operating the plant, supervising construction and running the city of Richland. The A.E.C. staff at Hanford is relatively small, numbering about 400, with Fred C. Schlemmer as manager.

*Size of Hanford.** The Hanford Works consist of several plants, scattered over an area of 620 square miles. The town of Hanford, about 25 miles up the river from Richland, before the war had a population of about 500, which increased to 51,000 late in 1944 when construction was at its peak. It has now been completely evacuated. Present construction workers live in North Richalnd, about five miles north of Richland.

*Hanford Operations.** In huge nuclear reactors or atomic "piles," consisting largely of graphite blocks surrounded by thick concrete shielding, are placed slugs of uranium, canned in aluminum. The chain reaction in the U-235 present liberates neutrons, which cause a transmutation in several stages of the more abundant and heavier isotope of uranium (U238), into a new element called plutonium. This can be used, like U-235, as an atomic fuel. After removal from the reactors, the uranium slugs are taken to separation plants, enormous canyons of concrete, where the plutonium is separated by remotely controlled processes. The uranium remaining is stored for future processing.

*Knolls Atomic Power Laboratory.** Center of the General Electric research activities on atomic energy is the Knolls Atomic Power Laboratory. Owned by the A.E.C., this is operated as a division of the G-E Research Laboratory, headed by Dr. C. G. Suits, G-E Vice President and Director of Research. Dr. Kenneth H. Kingdon, assistant director of the Research Laboratory, is in immediate charge of the atomic power laboratory. The General Engineering and Consulting Laboratory and other technical groups in the company are assisting in the program.

Since 1947 the staff of KAPL has been at work in temporary quarters in Schenectady, using a Commission-owned building on Peek Street, erected by the Army Engineers during the War and used by the American Locomotive Company for manufacturing tanks.

In the summer of 1947 construction began on the laboratory's permanent buildings. These are located on a 180-acre tract in Niskayuna, about five miles from the G-E works in Schenectady.

The Knolls Atomic Power Laboratory is now partially occupied although construction is not yet complete. It will involve a total expenditure of about $25,000,000 and will employ about 1,000 people.

*AEC Supervision.** A.E.C. supervision for the Knolls Atomic Power Laboratory comes from the Commission's Office of Schenectady Operations. J. C. Stewart is Manager of Schenectady Operations.

*Experimental Atomic Power Plant.** In Sept., 1948, the Atomic Energy Commission announced that it was acquiring a site of more than six square miles (about 4000 acres) in Saratoga County, N. Y., near the town of West Milton. This is about 18 miles north of The Knolls and will be used for the construction of an experimental atomic power plant constituting part of the facilities of KAPL. It will begin operations in three to five years. Some 200 persons will be permanently engaged in operating it.

*"Breeder" Reactor.** The heart of this West Milton area of KAPL will be a nuclear chain reactor, of a type quite different from those at Hanford, utilizing neutrons of higher energy. For efficient power production, it will have to operate at a considerably higher temperature.

(Continued on page 43)

* Items taken from "GE Atomic Energy Fact Sheet.

WITH THE *Manufacturers*

Equipment News

In these columns the latest in equipment of interest to our readers is reviewed. Many readers request additional information and prices. For their convenience each article is numbered. Fill in the number on the coupon at the bottom of the page and mail your request to Mines Magazine, checking information requested.

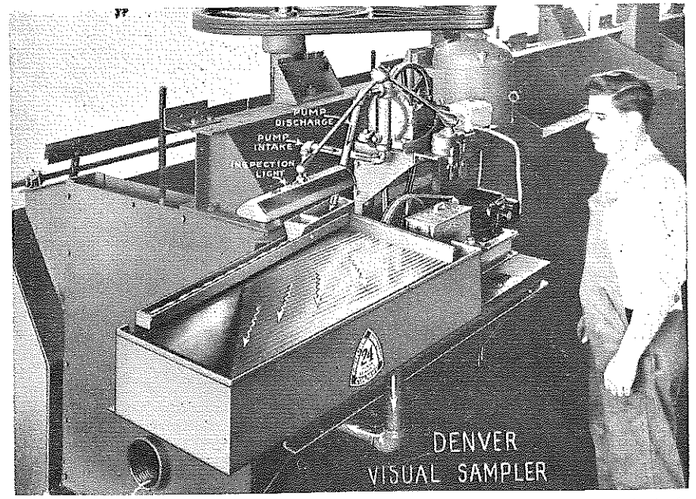
New Visual Sampler (678)

Denver Equipment Company announces production of a new Deco Visual Sampler which provides for instant, visual inspection of mineral concentrating efficiency.

The Deco Visual Sampler is a self-contained unit consisting of a ¾" Denver Suction-Pressure Pump and a Pilot size Denver-Wilfley Concentrating Table mounted on a structural steel base. Both pump and table are driven by V-belt drive from one only ½ h.p. electric motor. A lamp with flexible arm provides daylight illumination over the table. A mineralight lamp can also be used to detect fluorescing minerals or to identify or trace reagents having fluorescent qualities.

Denver Visual Sampler can be mounted on flotation machine or other concentrating equipment at any desired point in the circuit. It is especially adapted for constant inspection of tailings coming from last cell of a flotation machine where mineral values being lost in tailings can be detected immediately. The unit comes in 2 sizes, one with a table deck of 40"x18", the other with a table deck of 50"x24".

Additional information on the Denver Visual Sampler is available from Denver Equipment Company, Dept. 1313, Denver 17, Colorado.

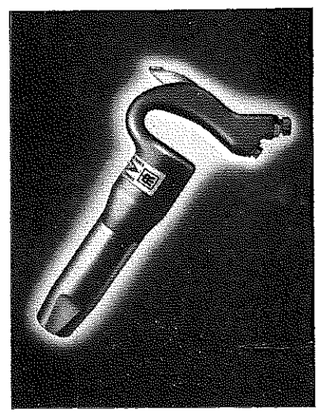


New Line of Chipping Hammers (679)

A line of chipping hammers based on a new design has been announced by Ingersoll-Rand Company of 11 Broadway New York, N. Y. Known as the CONTROLLED POWER CHIPPING HAMMER line, it has an exceptional performance range and offers a selection of 15 power sizes (with 5 basic hammer sizes) to meet the requirements of every job. Each basic hammer size is available in normal-cut, extra-cut, or supercut type, which is made possible by a design variation in one part interchangeable throughout the whole line.

Through the new hard-surfacing IRAMET process used exclusively by Ingersoll-Rand, piston life has been increased 12.3 times. Other important parts of CONTROLLED POWER CHIPPING HAMMERS subjected to wear are also plated with IRAMET. The new AIRITE valve accurately proportions the amount of air fed to the front and rear of the piston to maintain top cutting efficiency under all conditions, provides a smooth flow of full power, and eliminates short stroking and loss of power on heavy cuts.

CONTROLLED POWER CHIPPING HAMMERS are designed and streamlined for better weight distribution, and comfortable handles enable operators to do their work with greater speed and less effort than formerly possible. Three types of handles are available which all lock in place in a positive manner. Front-end design allows more chisel "play-off", which makes the Chipping Hammer easy to use and keeps operator fatigue to a minimum.



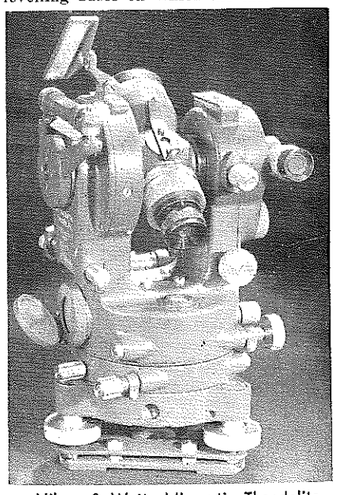
▽ New I-R Chipping Hammer.

New Microptic Theodolite (680)

The Watts Microptic Theodolite No. 1 Hilger & Watts Ltd., 48 Addington Square, London, S.E.S., with glass circles and optical micrometer represents the latest advance in theodolite design. It reads directly to 20 seconds with precision and combines accuracy of reading with simplicity of operation.

It is exceptionally compact, being only 8½ in. high, and is finished in green enamel with chrome fittings. The method of reading the circles is simple and direct, the scales being well illuminated and placed in line to avoid eyestrain.

The Microptic No. 1 is particularly suitable for mine survey, for which purpose it is fitted with a special base with centering motion above the footscrews and an optical plummet. Alternatively the theodolite is available with complete Mining Traverse Outfit, i.e. with two targets, separate optical plumbing unit, three levelling bases on which the instruments



▽ Hilger & Watts Microptic Theodolite.

MINES MAGAZINE,
734 Cooper Building,
Denver, Colorado

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Name..... Position.....

Company.....

Street.....

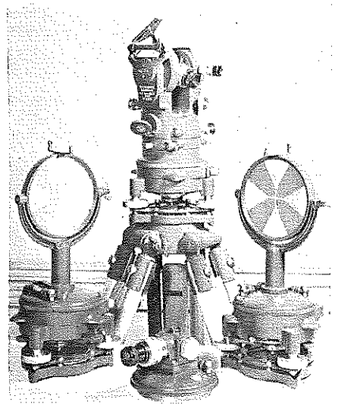
can be interchanged without upsetting their position, and three telescopic tripods with a circular spirit level mounted in the tripod head.

An important feature of the newly-designed extra-short internal focusing telescope is the special mounting of the lenses of the triple object glass, to ensure the maintenance of stability and good performance. The telescope aperture is 1.2 in., with magnification of 17.

Pointer sights, a screw-focusing eyepiece and glass stadia diaphragm are provided, and the telescope is arranged to transit both ends.

Separate optical systems for reading the horizontal and vertical circles direct to 20 secs. are brought together in a single screw-focusing eye-piece, which is reversible to enable reading to be taken from either side of the instrument.

Three illuminated scales are seen in the field of view, the reflected images of the vertical and horizontal scales, and the micrometer scale which is common to both circles.



▼ Microptic Theodolite with Mine Traverse Outfit.

The two main scales are graduated to 20 min. divisions numbered every degree, and the micrometer scale, which extends over a range of one 20 min. division on the main scale, is graduated in 60 divisions to give a direct reading to 20 seconds. Readings can be estimated to within 10 secs., and with practice to 5 secs.

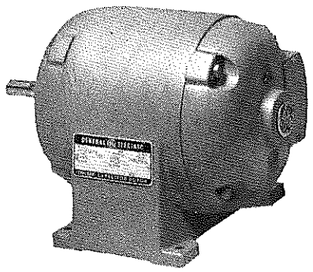
New Single-Phase Capacitor Motor (681)

A new integral-horsepower capacitor motor for use wherever power supply demands single-phase operation has been announced by General Electric's Small and Medium Motor Divisions.

To minimize over-all dimensions, capacitors are mounted in the base of the motor, and the conduit box has been replaced by a built-in terminal board inside the end shield.

The new Tri-Clad* capacitor motor weighs 15 to 20 per cent less than the old model and has a totally enclosed built-in starting switch.

In ratings from ½ to 5 hp, these high torque motors are available in two types: Type KCS, capacitor-start, and Type KCR, capacitor-run, which differ only in starting current. The Type KCS motor is designed for 115/230 volts, while the Type KCR motor is a single-voltage, 230-volt design. Being a capacitor motor, it has no brushes or commutators to interfere with radio or television reception. Also, capacitor motors are the only single-phase



motors with cast winding squirrel-cage rotors.

The motor is equipped with long-life lubricated ball bearings and readily accessible grease fittings make possible easy lubrication when it becomes necessary. For additional information on the new G-E Tri-Clad single-phase capacitor motor write for publication GEA-5401, from the General Electric Company, Schenectady 5, N. Y.

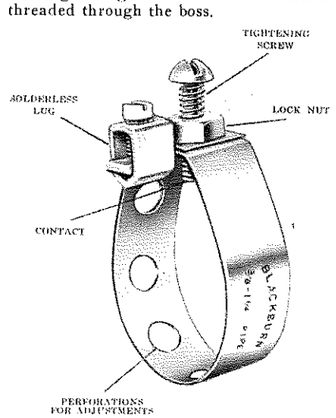
*Registered trade-mark.

Blackburn Adjustable Ground Clamp (682)

A Blackburn Adjustable Ground Clamp with an exclusive "Original Adjustable Idea" is now available in two sizes; one to fit ⅜" to 1¼" pipe, and the other ⅜" to 3" pipe. A tightening screw chafes the pipe, draws up slack, cuts through rust and dirt and at the same time contracts band around the pipe surface assuring a perfect ground.

Solder or solderless terminal types are available for low or high amperage grounding of electrical equipment, conduits, armored cable, metal surface wiring raceways, alarm systems, communications equipment, signaling devices, utilization equipment, appliances, electric fences, radios, telephones, enclosures and similar circuits.

The clamp consists of a flexible, perforated pure copper band which encircles the pipe. A boss raised on the flat end of a removable copper alloy terminal lug fits into band holes and is machined to give a clean and smooth contact surface. The tightening screw with a lock nut is threaded through the boss.



There is no nut to grip while screw is tightened. For ease in installation, band is properly tempered and formed at one end. Shown illustrated with optional Ilsco Solderless lug. Either lug takes up to No. 4 AWG Ground wire. Write for information. BLACKBURN SPECIALTY CO., 6541 Euclid Ave., Cleveland 3, Ohio.

New Concentration Table (683)

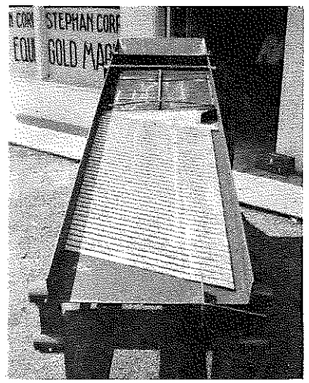
The Stephan Corporation of Sacramento, California, announces the invention by Joseph Stephan of a new concentrating table which is now available to the mining industry.

Elimination of "blocked grooves" and the yielding of concentrates of any desired specific gravity range are accomplished by certain new features according to the company.

The upper end of the table exhibits a "bullion compartment" where any native metal is held in view of the operator. This compartment can be cleaned of its collection without interference with the rest of the table.

Gold, so minute in size as to equal 3000 particles to one cent in value is retained without chemical or technical process, and the manufacturers expect the new table to be responsibile for the reactivation of many idle mines and tailing dumps.

Further information on this unit may be



obtained by writing to the Stephan Corporation, Rt. 8, Box 1782, Sacramento, California.

New X-ray Microscope (684)

An X-ray microscope, which makes visible internal details of materials through which light cannot pass, has been developed by scientists of the General Electric Company, Schenectady 5, N. Y.

Clear, sharp X-ray images, magnified ten times, have been produced in the laboratory, and these images have been magnified ten times further by photographic enlargement without serious loss of detail.

The X-ray microscope does not require that samples under study be in a high vacuum, as does the electron microscope, and it is believed that, because of this advantage, it may be possible to examine living materials at much higher magnifications than ever before.

The microscope operates on the principle that X-rays can be reflected from polished surfaces, as can visible light, provided that they strike the surfaces at very small angles, almost parallel to the surfaces. It consists of an X-ray tube and a pair of curved mirrors, which the X-rays strike at an angle of less than one-half degree, after having passed through the sample. The mirrors acting in a manner like that of a convex lens with a light beam, bend the rays in such a manner as to form a magnified X-ray image of the sample on a photographic film.

New Cast Iron Electrode (685)

All-State Welding Alloys Co., Inc., 273 Ferris Avenue, White Plains, N. Y., has announced a new cast iron electrode known as All-State No. 8 New Machinable Cast Iron Electrode.

This new electrode has a core that is more than 99% nickel and it is 15 inches long instead of the usual 14. The electrode is designed for AC or DC straight or reverse polarity and amperages ranging from 40 to 180 depending on diameter. It is recommended for general welding of cast iron and especially wherever free machinability and color match are required.

Welds made with this electrode are ductile and 100% machinable even at the bond. Tensile strength is 30,000 to 50,000 psi. Specific advantages claimed for it also include: Smooth deposit—a finish job practically free of spatter; Flux residue more easily removed; Welds cold; Avoids cracking, distortion; No fumes; All-purpose; All types of joints; And, all positions.

New Gas-Fume Respirator Features Comfort and Safety (686)

The new M.S.A. Gas-Fume Respirator for protection against mists, dusts, fumes,

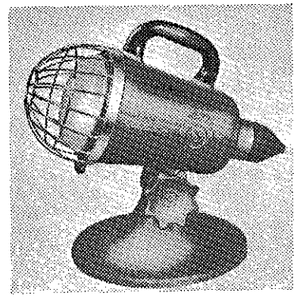
organic vapors and acid gases which occur in burning, spraying, pouring, welding, cutting and other industrial operations is fully described in an illustrated bulletin now available from Mine Safety Appliances Company.

Designed to combine protection with working comfort, the M.S.A. Gas-Fume Respirator employs twin replacable filters which are mounted on the wearer's back. Back-mounting removes the filters from areas of heavy contaminant concentrations, and also permits unobstructed vision and complete working freedom. Other comfort and safety features are the "Comfo" sure-seal facepiece, guarded exhalation valve, and inhalation check valve. The entire unit weighs only 2 lbs. 14 oz. and is equipped with comfortable all-rubber headbands and neckbands for well-balanced fit.

For a complete description of the features and uses of this multi-purpose respirator, write for M.S.A. Bulletin No. CR-23 to this publication, or direct to Mine Safety Appliances Company, Braddock, Thomas and Meade Streets, Pittsburgh 8, Pennsylvania.

New Emergency Portable Floodlight (687)

Natale Machine and Tool Company of Carlstadt, N. J., announces its new Circle D-150 all, weather portable floodlight.



Light in weight (app. 6 lbs.) compact, and easy to handle, this light is said to be adaptable for night constructions such as buildings, shipyards, docks, etc., and for emergencies, fire, storm, flood, emergency field and line work. Also portable airport lighting and tank work.

The light is constructed of strong alloy cast aluminum and comes wired ready for use and furnished with one Hubbell line cord twist-lock 2 wire 20 amp. plug body, cord grips and rubber cover.

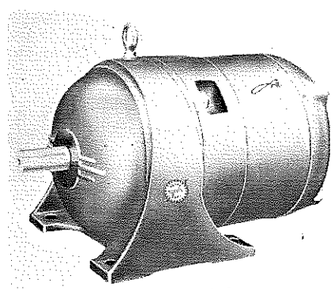
For further information write the Natale Machine and Tool Co., 339 State Highway, No. 17, Carlstadt, N. J.

New Line of Gearmotors (688)

Foote Bros. Gear and Machine Corporation of Chicago and the Louis Allis Company of Milwaukee have recently announced a joint program for the manufacture and sale of a complete line of gearmotors.

The new Foote Bros.-Louis Allis Gearmotor makes use of hard helical gears and other moving parts which have been processed and heat treated under new and improved methods of manufacturing control. These methods have produced new high standards of performance with regard to load carrying capacity, wear life, quietness of operation and compactness of design.

The new gearmotor, manufactured in 17 sizes, provides Single, Double and



Triple reduction units having output speeds from 780 R.P.M. down to 7.5 R.P.M. Integral horsepower ratings from 1 through 75 horsepower are available for practically any industrial application.

A wide selection of motor enclosures is offered, including the conventional open drip-proof, splash-proof, totally enclosed and explosion-proof construction. A.C. and D.C. motors of all types, as well as motors having special electrical characteristics, are available to meet unusual installation and application requirements.

Information on the Foote Bros.-Louis Allis Gearmotor is obtainable from either company.

International Nickel Develops New Cast Iron That Bends (689)

Industry now has available to it a new cast iron which, unlike ordinary cast iron, is not brittle but can be bent or twisted. This new material can be made readily and economically and can be used in a myriad of applications, thus affording countless economies throughout the industrial world. The novel product, popularly known as ductile cast iron, has several times greater strength than ordinary cast iron with greatly increased ductility and shock-resistance.

These facts were presented recently by Don Reese, well-known foundry expert and engineer, before the annual meeting of the Gray Iron Founders' Society, held at the Edgewater Beach Hotel here, in announcing that the United States Patent Office has recognized the meritorious nature of these inventions by granting Patent No. 2,485,760 and 2,485,761 to the International Nickel Company.

PLANT NEWS

Carl J. Setter Joins Western Air Lines

Carl J. Setter, 34 has joined Western Air Lines home office at Los Angeles

CARL J. SETTER, Ex-'37

International Airport as chief cost analyst, coming to the company from Denver where he had been with Continental Air Lines 10 years.

A native of Denver, he attended the *Colorado School of Mines* for two years and graduated as an accounting major from the University of Denver in 1939.

He served as a navigator in the Army Air Forces as a first lieutenant from 1942 through 1944. He makes his home at 11428 Felton avenue, Los Angeles with his wife and 2-year-old son. He is the son of Mrs. Rose Setter, 963 Logan street, Denver.

William P. Ridsdale

Raymond S. Wood

Richard E. Whinrey

Leslie J. Carson

Richard Moyer

Eugene P. Berg

Link-Belt Men Transferred

Link-Belt Company announces the following changes in plant management personnel:

Mr. Richard E. Whinrey, now Asst. General Manager at the company's Dodge plant, Indianapolis, will on May 1, 1950, assume the duties of Asst. General Manager at the Ewart plant Indianapolis.

Mr. Raymond S. Wood, General Manager at the Minneapolis plant, transferred to Indianapolis on Feb. 1 to become Asst. General Manager at the Dodge plant, replacing Mr. Whinrey.

Mr. Leslie J. Carson, at present Chief Engineer at the Caldwell plant in Chicago, moved to Minneapolis on Jan. 15 to assume the position of General Manager of the Minneapolis plant and the North Central sales division.

Mr. William P. Ridsdale, who has been Chief Engineer at Dallas and Houston since 1946, has returned to Chicago to become Chief Engineer of the Caldwell plant.

Link-Belt Announces Promotions in Pershing Road Plant, Chicago

Link-Belt Company announces that Mr. Eugene P. Berg, formerly general superintendent, has been appointed to the newly created position of assistant general manager of the Link-Belt Pershing Road plant in Chicago; and that Mr. Richard Moyer, formerly superintendent of the steel shop, has been appointed general superintendent, manufacturing department.

Other appointments at the Pershing Road plant include Stanley F. Zale as superintendent of the steel shop; Ray Witt, supervisor of time study and methods department; Harold Hartman, chief inspector.

Allis-Chalmers Manufacturing Co.

New Employee Security Plans. The Allis-Chalmers Manufacturing Company is preparing a proposed retirement plan for all of its 30,000 employes, it has been announced by the company. The company is studing improvements in its health and accident plan recently suggested by the West Allis works Mutual Aid Society, operated locally at each plant, with the company matching employe's contributions. The combined initial annual cost of the two programs, with other insurance benefits now in effect, was estimated to be approximately 11 cents per pay roll hour or between $6,000,000 and $7,000,000.

Albert I. Edwards has been named basic industries machinery specialist for Allis-Chalmers Mid-Atlantic region, and *William D. Busch,* former crusher sales application engineer in the company's basic industries machinery department has been appointed to the Youngstown, O., district office as a sales representative, according to an announcement by J. L. Singleton, vice president and director of sales of the firm's general machinery division.

Herman Schifflin, 81, who retired in 1942 as manager of the crushing, cement and mining machinery department at Allis-Chalmers Manufacturing Co., Milwaukee, Wis., died January 9.

Mr. Schifflin entered the employ of Fraser & Chalmers, Chicago, in November, 1886. In 1901 the company was merged with the Edward P. Allis Co., the Gates Iron Works, Chicago, and the Dickson Mfg. Co., Scranton, Pa., to form the Allis-Chalmers Company. Except for an absence of five months, he had been associated with Allis-Chalmers from then until his retirement.

A. B. Frost, formerly manager of the New Haven district office, has been named manager of the Boston office, which has been headed by W. F. Taylor as district office manager and manager of the company's New England region. Taylor will now devote all his time to his duties as regional manager.

J. E. Smet, formerly representative in the Boston office, is now manager of the New Haven office.*G. G. Fintak,* an assistant engineer handling hydraulic turbine applications at the West Allis Works for the last three years, has transferred to the Boston district office.

G. H. Hoffman, manager of Allis-Chalmers Knoxville office since 1943, has been named manager of the Birmingham district office succeeding J. J. Greagan, who has been manager there for more than 25 years and who is now eligible for retirement.

H. C. Sells, formerly a representative in the Knoxville office, is the new manager of the office, now a branch of Chattanooga.

I. K. Cox, who has been crushing, cement and mining sales representative in the New York district office, has been named to handle the products of the crushing and cement division of the company's basic industries machinery department for the Empire region.

Hendrie and Bolthoff Named Dealer for Allis-Chalmers Pumps

Hendrie & Bolthoff Co., 1635 Seventeenth St., Denver, has been named dealer for Allis-Chalmers centrifugal pumps in all of Colorado and Wyoming, and in portions of New Mexico, Nebraska and South Dakota.

Counties in New Mexico covered by the new dealership are San Juan, Rio Arriba, Taos and Colfax. The firm is also covering the state of Nebraska west of and including Sheridan, Garden and Deuel counties, and the state of South Dakota west of and including Corson, Dewey, Armstrong, Stanley, Lyman, and Gregory counties.

S. F. Smith is in charge of product sales for Hendrie & Bolthoff. The concern has been in business since 1861 and employs 35 salesmen.

Allis-Chalmers Statement of Earnings

The Allis-Chalmers Manufacturing Company announced November 2 that its net earnings for the third quarter of 1949 were $3,616,230 and, after deducting preferred dividends of $292,001, were equal to $1.32 a common share.

In the third quarter of 1948, the company's earnings were $3,562,854 or equivalent to $1.30 a common share after preferred dividend deductions. The company's earnings in the second quarter of 1949 amounted to $4,999,445, or $1.87 after preferred dividends.

Net earnings for the first three quarters of 1949 totaled $13,493,658 and after deducting preferred dividends of $876,001, were equal to $5.02 a common share. For the same period in 1948, the earnings were $9,869,512 or $3.58 a share after deducting preferred dividends.

American Optical Co. Opens New Research Lab

American Optical Company's new research laboratory in Stamford, Conn., was opened on Nov. 30 by the company's Board of Trustees which transferred its regular monthly meeting from the firm's Southbridge, Mass headquarters to the laboratory "as a symbol of industry's interest in scientific research."

At the same time, the new research facilities were inspected by the company's Executive Committee and a group of industrialists from the Stamford area. Joining them were U. S. Senator Brian McMahon of Connecticut, chairman of the Joint Congressional Committee on Atomic Energy; General Leslie R. Groves, wartime head of the Manhattan Project; Rep. John Davis Lodge, congressman from the Stamford district, and Mayor George Barrett of Stamford.

New Excavator Lift Capacity Ratings Released by Koehring

An increase in lift capacity ratings was recently announced by the Koehring Company of Milwaukee for three sizes of excavators currently produced by the firm. In published specification charts, maximum capacity of the Model 304 Koehring excavator has been established at 13.9 tons with crawler mounting and 25 tons on both the rubber tire mounted truck and cruiser cranes.

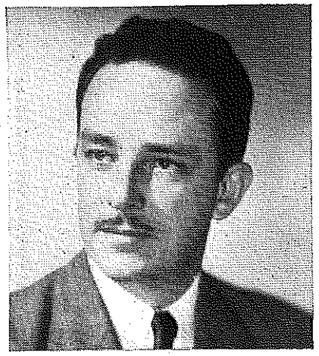
The new specifications also show an increase for the crawler mounted Model 605 machine which is now listed at 36 tons. The lifting capacity of the Model 1005, latest addition to the Koehring line of heavy-duty excavators, has been tabulated at 79-½ tons maximum.

Copies of these new specification charts may be obtained on request to the Koehring Company, Milwaukee 10, Wisconsin.

Paul M. Barlow Appointed Mining Sales Manager for Joy

The Joy Manufacturing Company, Oliver Building, Pittsburgh, Pa., has announced the appointment of Paul M. Barlow as Manager, Mining Sales, Mines Equipment Division of Joy.

Mr. Barlow, a 1932 graduate of Carnegie Institute of Technology, spent



PAUL M. BARLOW

eleven years as an electrical engineer with the West Virginia Engineering Company, the West Virginia Department of Mines, and the Carbide and Chemical Corporation. He then joined the Mines Equipment Division as a sales engineer, rising from this position to Manager, Mining Sales.

Mr. Barlow is a registered Professional Engineer with memberships in the A.I.E.E. and the A.I.M.E.

Joy Appoints Representative in Spokane

The appointment of Robert L. Frazer as Joy representative in Spokane has been announced by Joy Manufacturing Company, Pittsburgh, Pennsylvania.

A 1942 graduate of the Montana School of Mines, Mr. Frazer took his degree in Mining Engineering. He has been an engineer with U. P. Coal Company in Rock Springs, Wyoming, Potash Company of America in Carlsbad, New Mexico, and the Freeport Sulphur Company in Freeport, Texas, successively.

Pioneer Furnishes Conveyors for Big Tunnel Job

The Silas Mason Company of Shreveport, Louisiana, has a $8,548,718 contract for construction of 12 tunnels at the Fort Randall Dam and Reservoir Project in South Dakota. The tunnels will be bored in a solid wall of rock 100 feet high and 873 feet long. The stockpiling conveyor system and the underground conveyors used to handle aggregate for the concrete work were designed and built by Pioneer Engineering Works, 1515 Central Avenue, Minneapolis 13, Minnesota.

Dorr Executive Home from Australian Trip

Mr. Keith C. Stansmore, Assistant Manager of the Foreign Division of The Dorr Company, returned home on December 17 from a three month trip during which he visited many of the mining districts throughout Australia, and the firm of Hobart Duff Pty. Ltd., Melbourne—the Dorr Company's representative in Australia and New Zealand.

New Uses for "Ultrasonics"

One kilowatt of power, or nearly one horsepower, can be concentrated in an area the size of a postage stamp with sound that can't be heard, Norman F. Barnes, General Electric engineer, told a recent meeting of the American Institute of Chemical Engineers at Los Angeles.

Speaking on "ultrasonics," sounds pitched too high to be heard by human beings, Barnes said the high-frequency sound waves are certain to prove immensely useful in the near future.

Ultrasonics have already been used successfully in a number of ways, most notably in the detection of flaws in castings and other types of solids being tested for uniformity. Recent experiments indicate that sound waves may be useful in such diverse operations as the mixing of alloys, smoke precipitation, and the laundering of fabrics, according to Barnes. They have also been found to have an effect on certain types of chemical reactions.

New Sales Divisions Formed by G. E.

Effective January 1, 1950, the Apparatus Agency Division of General Electric's Industrial Divisions will be replaced by a newly-organized Agency and Distributor Division, it was announced by C. H. Lang, vice president and manager of sales of the company's Apparatus Department.

George L. Irvine has been appointed manager of the new division, and upon his recommendation R. D. Moore will be assistant manager. They will be responsible for the sale of all G-E Apparatus Department products through agents and to distributors, wholesalers, and dealers.

U. S. Motorists to Ride on Rubber Roads

In a recent release, P. W. Litchfield, Chairman of the Board of the Goodyear Tire and Rubber Company predicted that U. S. motorists would soon be riding on thousands of miles of rubber roads.

The idea of using solid rubber blocks for road paving is a quarter of a century old but roads built of this material proved to be too expensive.

Developments in road construction using an asphalt-rubber mixture since World War II appear promising and roads surfaced with this material show less tendency to become slippery in hot and wet weather and show a decided decrease in brittleness in cold weather.

The rubber-asphalt material also appears to be well adapted to surfacing playgrounds, tennis courts and other recreation areas, according to Mr. Litchfield.

HOWARD L. MONTGOMERY

Howard L. Montgomery Completes 25 Years at Goodyear

Howard L. Montgomery, district manager of mechanical goods sales for Goodyear Tire & Rubber Company in Cincinnati, recently completed 25 years' service. Next he entered sales training and in 1928 was appointed salesman at Saginaw, Mich.

Shortly after he was promoted to the position of mechanical goods field representative at Detroit, then subsequently was stationed in several other cities including Knoxville and Birmingham. Continuing in mechanical goods sales he returned to Detroit in 1938, remaining there until promoted to his present post in May of last year.

(Continued on page 39)

CATALOGS AND TRADE PUBLICATIONS

(5333) IMPACT WRENCHES, Form 5200 by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., 32 pages containing information and illustrations describing fourteen different sizes of impact wrenches with bolt capacities ranging from 7/32" to 1¾". Specifications, socket tables and examples of uses are given.

(5334) "MIN & CHEM," December 1949, by International Minerals and Chemical Corporation, 24 pages devoted mainly to material of interest to employees of the company and articles on stockholder's meeting, Plant Food Division conference, the Company's Finance Division and others.

(5335) INDUSTRIAL HOSE, January 1950, "Gates Industrial Hose Reporter" by Gates Rubber Company, 999 South Broadway, Denver, Colorado, a 4 page folder containing a list of standard types of hose, a list of Gates hose distributors in the Rocky Mountain area, and several illustrated examples of uses of industrial hose.

(5336) "LEAD," Vol. 17, Number 4, by Lead Industries Association, 420 Lexington Avenue, New York 17, N. Y., an 8 page publication containing illustrated articles on various uses of lead and lead products—water lines, snow melting cable, glass manufacture and others.

(5337) GRAIN HANDLING MACHINERY, Book No. 2305 by Link-Belt Company, 307 N. Michigan Avenue, Chicago 1, Illinois, contains 20 pages illustrating and describing materials handling and power transmission equipment for the grain and allied processing industries, such as conveyors, elevators and various drives.

(5338) "DECO TREFOIL," November, December 1949, by Denver Equipment Company, Denver, Colorado, a 16 page magazine containing illustrated articles of particular interest to metallurgists, engineers and millmen. The "Engineering Notebook" in this issue contains an article on flotation, its technical status, cost problems and applications in such operations as sizing, cleaning peas and wheat, separating fossil resin from coal and others.

(5339) "SWITCHGEAR FOR MINES," Bulletin GEA 5486 by Apparatus Department, General Electric Company, Schenectady, New York, contains 8 pages illustrating and describing sectionalizing and reclosing units and their application in mine power distribution systems. Information given on construction features, operation, dimensions and ratings.

(5340) "REDUCTION CRUSHERS," an 8 page bulletin by Allis-Chalmers Milwaukee 1, Wisconsin, containing information and illustrations describing the type "R" reduction crusher and giving capacities, dimensions and construction features.

(5341) "RARIN'-TO-GO," December 1949, a 12 page magazine by Frontier Refining Company, Cheyenne, Wyoming, containing illustrated articles and items of interest to company employees, distributors and customers. Covers company and industrywide operations and advances, promotions, employee, dealer and customer personal notes and other items.

(5342) "STORAGE BATTERY POWER," December 1949, by Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, New Jersey, a 16 page illustrated magazine describing use of storage battery power in fork truck loaders, portable balers, marine electrical systems, non-elevating platform trucks and others.

(5343) "DORR MANUFACTURING METHODS," a 16 page pictorial review by Dorr Company, Inc., 570 Lexington Avenue, New York, N. Y., illustrating the methods, equipment and facilities used in the manufacture of Dorrco equipment. There are views of the foundry, gear milling, casting assembly and all phases of manufacture.

(5344) "HEALTH AND RECREATION IN DENVER," a 16 page magazine by Denver Chamber of Commerce, Chamber of Commerce Building, Denver 2, Colorado, describes and illustrates the natural and man-made advantages of Denver as a place to live including scenery, climate and recreational facilities.

(5345) OFFICE SUPPLIES AND EQUIPMENT, Folder by W. H. Kistler Stationery Co., 1636 Champa St., Denver, Colorado, cataloging various items of office equipment and supply, including filing cabinets, storage boxes, folders, appointment books, columnar forms, ledger leaves, ledgers and binders illustrated.

(5346) SURVEYING, "The Grapevine," December 1949, by United Geophysical Co., Inc., 595 E. Colorado Street, Pasadena, California, a 12 page illustrated magazine largely devoted to news and reports from company field surveying parties. This issue contains interesting account of a gravity survey conducted in rough country by means of helicopters.

(5347) "PROGRESS NEWS," January 1950, by Gates Rubber Company, 999 South Broadway, Denver, Colorado, a 28 page plant magazine carrying news and items of interest to employees. Covers (with illustrations) sales, plant operations, recreation, employee organizations and personal items.

(5348) NICKEL, "The Nickel Industry in 1949," a 9 page report by Robert C. Stanley, Chairman of the Board of Directors of International Nickel Company of Canada, Ltd., Copper Cliff Ont. Gives a general picture of worldwide consumption of nickel and nickel alloys. Various alloys considered separately and production and consumption figures given for each.

(5349) "H & B BULLETIN," November, December 1949, by Hendrie & Bolthoff Co., P. O. Box 5110, Terminal Annex, Denver 17, Colorado, contains 32 pages describing and illustrating hardware products sold by the company. Wide variety of products containing such items as shop tools, shock absorbers, motor oil, padlocks and many others.

(5350) "PAY DIRT," December 16, 1949, by Arizona Small Mine Operator's Association, 528 Title and Trust Bldg., Phoenix, Arizona, a 16 page paper devoted to news and articles of particular interest to Arizona small mine owners. Legal article in this issue concerns proposed new laws for the control and regulation of securities transactions.

(5351) TARIFFS, a 28 page booklet by American Tariff League, 19 West 44th Street, New York 18, N. Y., covering the proceedings at the Leagues 64th Annual Meeting on October 26, 1949, in New York. Material, largely devoted to addresses delivered on such subjects as currency devaluation, balance of trade, American policy in Germany and others.

(5352) "NEW MEXICO MINER AND PROSPECTOR," December 1949, by New Mexico Miners and Prospectors Association, Albuquerque, New Mexico, contains 14 pages of news articles and items of interest to the mining industry of New Mexico, with articles in this issue on mine safety, zinc mining, tax aspects of mining and others.

(5353) "WELDING ARCS," December 1949, by Apparatus Department, General Electric Company, Schenectady 5, N. Y., contains 16 pages of illustrated articles and items on welding methods and equipment. This issue contains part XLIII in the series on the influence of production processes on design and other articles on "Balanced Waves for Inert-Arc Welding" and "Welding Tool Steels."

(5354) INDUSTRIAL CLEANING, "Oakite News Service," November, December 1949, by Oakite Products, Inc., 22 Thames Street, New York 6, N. Y., contains 24 pages describing and illustrating various applications of industrial cleaning materials, such as Diesel cooling systems, vacuum pans, aluminum pistons and others. Also included is a directory of Oakite Technical Service Representatives.

(5355) HARDINGE PLANT FACILITIES, Bulletin A.S.—400 by Hardinge Co., Inc., 240 Arch Street, York, Pa., contains 12 pages describing and illustrating Hardinge plant facilities and includes information on types of patterns, castings, machine work and plate steel work handled in the plant.

(5356) "THE BEACON," December 1949, by Ohio Oil Company, Findlay, Ohio, a 36 page magazine containing illustrated articles and items designed to be of interest to company employees. This issue contains the second in a series of articles on the Hoover report.

(5357) "EMULSION MUD," an 8 page bulletin by Baroid Sales Division of the National Lead Co., Los Angeles 12, California, illustrates and describes the uses, properties and advantages of a new emulsion mud. Results from field tests given.

(5358) MINE ROOF SUPPORTS, a 12 page bulletin, Number M-206 by Joy Mfg. Company, Henry W. Oliver Bldg., Pittsburgh 22, Pa., describing equipment required and methods of using bolts for mine roof support. Included is a section on requirements for drilling equipment under various conditions.

(5359) "FRACTIONING ABSORBERS IN THE PETROLEUM INDUSTRY," a paper by J. C. Hannah, Process Engineer, The Fluor Corporation, Ltd., Los Angeles, California, discusses the fractional absorber method of separating mixtures of low boiling hydrocarbons and associated compounds. Emphasis directed toward application in the natural gasoline industry.

(5360) "ADJUSTABLE SPEED DRIVES," Bulletin GEA-5337 by Apparatus Department of General Electric Co., Schenectady, N. Y., contains 20 pages describing and illustrating Thy-Mo-Trol adjustable speed drives and gives construction features, applications, advantages and dimensions.

(5361) "FLUOR-O-SCOPE," December 1949, by the Fluor Corporation, Los Angeles 22, California, a 16 page magazine devoted to material of interest to employees including company expansion, employee personals and recreational activities. This issue leads off with illustrated article on the new Fluor-built Carter Oil Company Refinery in Billings, Montana.

(5362) NOISE CONTROL, "Sound Business," Early Winter 1949, by United States Gypsum, 300 West Adams Street, Chicago 6, Illinois, an 8 page magazine describing and illustrating the use of acoustical material in club-rooms, churches, department stores, factories and offices.

(5363) "PRESSED STEEL TURNTABLES," Bulletin No. 48 by Hardinge Company, Inc., 240 Arch Street, York, Pa., a 4 page bulletin describing and illustrating pressed steel turntables. Gives dimensions of all standard sizes and describes operation and construction features. Enclosed throw-away list briefly describes units such as dryers, feeders, clarifiers and others.

(5364) V-BELTS, "Gates Industrial News," December 1949, by Gates Rubber Company, 999 South Broadway, Denver, Colorado, contains 4 pages describing and illustrating various applications of Vulco-rope drives, including in this issue, lifting magnet generator, paper stock beater, air compressor, gear bobber and others.

(5365) "MINERAL INFORMATION SERVICE," December 1949, by Division of Mines, California Department of Natural Resources, Ferry Bldg., San Francisco 11, Calif., a monthly news release concerning mineral industry and resources of California giving information on discoveries, operations, markets, statistics and new publications. This issue contains an interesting article on the uses of quartz.

(5366) "BRONZE AND COPPER BEARINGS AND CASTINGS," by National Bearing Division of American Brake Shoe Company, 4930 Manchester Avenue, St. Louis 10, Missouri, a 28 page illustrated booklet giving properties and specifications for 27 different bronze alloys and 5 aluminum and manganese bronzes. Contains information on bronze bars and babbitt metals.

(5367) "POPULAR HOME," Holiday issue 1949, by United States Gypsum, 300 W. Adams Street, Chicago, Illinois, contains 16 pages illustrating house renovation and interior decorating ideas accenting use of U. S. Gypsum products such as sheetrock wallboard, paint and insulating materials.

(5368) "WASHING THICKENER," Bulletin No. 3071 by The Dorr Company, 570 Lexington Avenue, New York 22, N. Y., contains 9 pages describing and illustrating the Dorr washing thickener for counter current decantation giving advantages over other types and operating data. Illustrations show construction features.

(Continued on page 40)

FOR YOUR CONVENIENCE

Send your publications to Mines Magazine 734 Cooper Building, Denver, for review in these columns. Readers will please mention Mines Magazine when requesting publications from the manufacturer. Readers may order publications from this office by giving index number. These publications are FREE.

MINES MAGAZINE
734 Cooper Building
Denver, Colorado

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Alumni Business

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Publications
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A. GEORGE SETTER, '32
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WILLIAM M. TRAVER, '16
Vice-Chairman
BERNARD M. BENCH, '30
HOWARD A. STORM, '29
CLYDE O. PENNEY, '36
MARVIN ESTES, '49

MEETINGS

Executive Committee Meetings
3rd Monday of each month, Alumni Office, 7:30 P. M.

Alumni Council Meetings
4th Thursday of each month, Argonaut Hotel, 6:30 P. M.

Publication Committee Meetings
2nd Monday of each month, Alumni Office, 5 P. M.

Magazine Staff Meetings, Alumni Office on call.

Committees for Year 1950

Athletic Committee
Addison B. Manning, '40, Chairman
Robert McMillan, '41, Vice-Chairman
Arthur G. Wood, '41
Otto Schmitt, '35
Rutt Volk, '26
E. J. Brook, '23
Harry D. Campbell, '42
Ernest M. Bond, '32

Alumni Endowment
Roger M. Schade, '21, Chairman
Henry P. Nagel, '04, Vice-Chairman
Walter G. Lofgren, '28
T. C. DeSollar, '04
Frederick S. McNicholas, '14

Budget & Finance
Malcolm E. Collier, '22, Chairman
George B. Clark, '01, Vice-Chairman
Frank J. Laverty, '25
James W. Dudgeon, '13
Keppel Brierly, '34

Nominations Committee
Charles O. Parker, '23, Chairman
Hugh M. Connors, '32, Vice-Chairman
John H. East, Jr., '10
Dave Gieskieng, '41
A. W. Cullen, '36

Capability Exchange Committee
Harry J. McMichael, '39, Chairman
Earl L. Durbin, '36, Vice-Chairman
Philip H. Stevenson, '23
Theodore F. Adams, '29
Bruce B. LaFollette, '22
Max E. Coats, '35
Claude L. Barker, '31

Publication Committee
Herbert W. Heckt, '36, Chairman
George O. Argall, Jr., '35, Vice-Chairman
Bernard M. Bench, '30
Howard A. Storm, '29
Clyde O. Penney, '36
Marvin Estes, '49

Research and Investigations Committee
Lynn W. Storm, '02, Chairman
Robert S. Spalding, '33, Vice-Chairman
Irvin T. Vaughan, '40
James G. Cox, '38
William H. Johnson, '34

Membership Committee
A. George Setter, '32, Chairman
R. Lee Scott, '42, Vice-Chairman
Edward F. Kingman, '34
Robert L. Stark, '31
Arthur W. Buell, '08
George W. Heim, '32

Public Relations Committee
Ed F. White, '36
Jerry F. Dieckman, '39
Col. Wendell Fertig, Ex-'27
Joe Ruth, Ex-'21
Frank Geib, '40
Donald J. Drinkwater, '42

(Continued on page 40)

BUDGET FOR THE YEAR 1950

RECEIPTS

	Actual 1949	1950 Budget Adopted
Accounts Receivable	$ 3,553.90	$ 3,494.89
Capability Exchange	3,780.49	4,500.00
Dues	5,707.00	6,224.00
Miscellaneous	139.21	100.00
Public Relations	537.65	800.00
Publications	28,929.56	35,301.00
	$42,647.81	$50,419.89

DISBURSEMENTS

Accounts Payable	$ 4,310.50	$ 3,672.52
Audit	190.00	190.00
Bank Charge	1.74	5.00
Capability Exchange	535.39	1,020.00
Furniture & Fixtures	77.25	200,00
Membership Committee	118.84	200.00
Miscellaneous	294.94	250.00
Postage	798.93	950.00
Printing & Multigraphing	323.04	300.00
Public Relations	608.86	800.00
Publications	22,653.83	27,782.40
Rent	1,080.00	1,110.00
Repairs and Renewals	23.65	75.00
Salaries	11,138.23	13,000.00
Social Security	105.40	195.00
Stationery and Supplies	420.19	400.00
Telephone and Telegraph	186.51	200.00
Traveling		
	$42,867.30	$50,349.92

RECAPITULATION

Cash on hand, January 1, 1950	$ 1,098.80
Estimated Receipts, 1950	50,419.89
	$51,518.69
Estimated Disbursements, 1950	50,349.92
Estimated Credit, December 31, 1950	$ 1,168.77

Approved by Budget and Finance Committee.
Adopted by Executive Committee.

ANNUAL BUSINESS MEETING

Colorado School of Mines Alumni Association

January 12, 1950

The Annual Meeting of the Colorado School of Mines Alumni Association was held on Thursday evening, January 12, 1950, in the dining room of Daniels & Fisher, Denver. Shortly after 6 o'clock "Miners" began to arrive. By 7:15 when the dinner call sounded, many classes were represented by those assembled. New acquaintances were made and many "old timers" welcomed each other for the first time in years.

All enjoyed the fine roast beef dinner during which many wild stories were exchanged. When Charles Parker and Rut Volk sit opposite each other at the same table—everyone listens — there is never a dull moment.

With a few welcoming remarks, President Ed Kingman opened the meeting and then introduced Ted Stockmar, '43, a member of the Board of Trustees. He then called upon Dr. Ben Parker, President of Colorado School of Mines to make a few remarks pertinent at this time. According to Dr. Parker, conditions at the school are good. A year ago alumni brought to the attention of the Colorado State Legislature the great need of the school for increased appropriations. Although the goal was not reached, the school did get fair treatment in appropriations. The funds provided allowed changes to be made in the teaching staff and the school. The school is the faculty: the faculty is the school. Alumni interest and help has been of great benefit.

Greater financial assistance was received by the school through donations in 1949 than in any previous year, excluding the Guggenheim gift, since the founding of the school. It is hoped that such gifts will continue to increase in the future as they will help the administration in meeting the many demands confronting them.

A new chemistry building is "in sight." Specifications are about completed and bids will be requested in February. It is expected that the building will be ready for occupancy by February 15, 1952. This will meet a long standing need.

The 75th Anniversary Celebration of the founding of the school was held in the fall of 1949 and was a great success from every standpoint. "Mines" was honored by guests from many of the great educational institutions of the world. Favorable comments have been heard from around the world.

Two important academic changes have been made in the past couple of years.

(1) A coal mining option has been added to meet the great demand for trained men in coal mining.

(2) A Geophysical engineering degree is now conferred instead of a Geological engineering degree with a geophysical as previously granted.

The Athletic Department has done well this past year and should do much better in the future.

President Kingman now called for reports from each standing committee and these are found in the following pages.

The Nominations Committee, through its chairman, Frank Geib, reported that 953 ballots were received and the committee certifies the election of the following officers for the year 1950:

President, James Colasanti, '35
Vice President, A. George Setter, '32
Secretary, Robert W. Evans, '36
Treasurer, Malcolm E. Collier, '22
Member of Executive Committee, Robert J. McGlone, '27
Director, C. S. M. Foundation, Edward J. Brook, '23

President Kingman thanked all who had helped make 1949 a successful year and paid especial honor to Frank C. Bowman, Executive Manager. He now called upon the president-elect to take over.

President James Colasanti expressed his appreciation of the great honor bestowed upon him and promised that every effort would be made to promote the best interests of the Association and the Colorado School of Mines.

Those present were:

Roger M. Schade, '21; H. J. McMichael, '39; E. F. White, '36; H. W. Heckt, '36; Ed Kingman, '34; Jim Colasanti, '35; A. George Setter, '32; Frank Geib, '40; Ben Parker, '24; C. W. Livingston, '33; Will H. Coghill, '03; Gordon Hurd, '41; A. W. Cullen, '36; Robert L. Bolmer, '44; Earl L. Durbin, '36; Albert M. Keenan, '35; Jack H. East, Jr., '10; John Winchell, '17; W. G. Howard, '36; W. A. Kyelberg, '35; A. R. Martin, '42; Dart Wantland, '36; Casper Hofmann, III, '36; Edward F. Taylor, Ex-'37; Douglas V. Watrous, '40; Jerry F. Dieckman, '08; David M. Evans, '36; Otto L. Schmitt, '35; Ted P. Stockmar, '43; Jack Coke, '28; B. M. Bench, '30; George O. Argall, Jr., '35; Hildreth Frost, Jr., '39; Wendell W. Fertig, Ex-'24; Tenny C. DeSollar, '04; A. F. Hewitt, '05; Arthur W. (Pop) Buell, '08; Bud Shanley, '15; Bruce B. LaFollette, '22; Alan L. Stedman, '48; Howard Storm, '29; M. A. Jorgensen, '28; Clyde O. Penney, '36; Allan E. Craig, '14; W. H. Bashor, Jr., '49; Tom Schalk, '49; John J. Flynn, '48; James R. Torpey, '49; Norman Domenico, '48; Earl L. Rau, '47; Dave Gieskieng, '41; Bill Manning, '40; Russell H. Volk, '26; C. O. Parker, '23; Harry McNeill, '24; Frank C. Bowman, '01; Robert W. Evans, '36.

REPORT OF COMMITTEES

Membership Committee by A. George Setter, Vice Chairman.

January 1, 1949, Total number of Graduates			3,426
Class 1949			279
December 31, 1949, Total Graduates			3,705
Deceased			479
			3,226
Life Members		195	
Annual Members		1,899	2,094
December 31, 1949, Possible Annual Members			1,132

Members 1949:	*Life*	*Annual*	*Associate*
January 1, 1949	198	1,744	132
New		36	11
Reinstatement		37	1
Junior, Class 1949		166	
	198	1,983	144
Dropped (Non-Payt.)		76	8
Deceased	3	8	1
December 31, 1949	195	1,899	135

Total Membership	*Jan. 1, 1949*	*Dec. 31, 1949*	*Gain or Loss*
Life	198	195	— 3
Annual	1,744	1,899	+ 155
Associate	132	135	+ 3
	2,074	2,229	+ 155

Report of Capability Exchange Committee by Harry J. McMichael, Chairman.

During the year 1949, 8,919 letters were written to employers and those seeking employment, both in the United States and foreign countries. This compares with 4,867 letters written in 1948.

Interest in Mines placement service continues to expand and many new employers have been added to our list. During the

(Continued on page 34)

OFFICERS "MINES" ALUMNI ASSOCIATION

1950

JAMES COLASANTI
President
Member of Executive Committee

ROBERT W. EVANS
Secretary
Member of Executive Committee

ROBERT J. McGLONE
Member of Executive Committee

President Colasanti's Message

Fellow Miners:

It is with deep appreciation that I accept the high honor you have bestowed upon me in electing me to direct the affairs of the "Mines" Alumni Association for the year 1950. In accepting this responsibility I am fully aware of the important part the Association plays in the well-being of the School of Mines and its graduates.

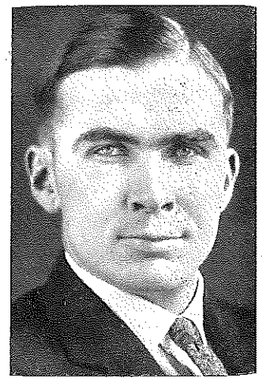
The fine record made by your Officers and Committees during the past year stands as a challenge to greater accomplishment. With the help of my associates you have elected, and the men who will direct newly appointed Committees, I have every confidence that the challenge will be met.

You can rest assured that suggestions you may have to help make the Alumni Association more effective or more useful to "Mines" Alumni, the School or its students, will be always welcome and receive every consideration.

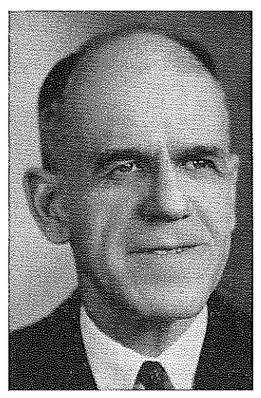
The work of the Placement Service is recognized as one of the most important activities of the Association. Through this Service every effort will be made to not only find proper employment for those who are in immediate need of it but also to assist those who desire to better their conditions and advance professionally. You are indeed fortunate in that the Capability Exchange Committee for 1949 have offered to continue their services for 1950. They have given a great deal of time and thought toward the

(Continued on page 43)

A. GEORGE SETTER
Vice-President
Member of Executive Committee



MALCOLM COLLIER
Treasurer
Member of Executive Committee



HARVEY MATHEWS
Member of Executive Committee

CARL I. DISMANT
Member of Executive Committee

TREASURER'S REPORT 1949
COLORADO SCHOOL OF MINES ALUMNI ASSOCIATION

RECEIPTS

From Accounts Receivable	$ 3,553.90
Capability Exchange	3,780.49
Dues	5,707.00
Miscellaneous	139.21
Public Relations	537.65
Publications	28,929.56
	$42,647.81

DISBURSEMENTS

For Accounts Payable	$ 4,310.50
Audit	190.00
Bank Charge	1.74
Capability Exchange	535.39
Furniture & Fixtures	77.25
Membership Committee	118.84
Miscellaneous	294.94
Postage	798.93
Printing & Multigraphing	323.04
Public Relations	608.86
Publications	22,653.83
Rent	1,080.00
Repairs & Renewals	23.65
Salaries	11,138.23
Social Security	105.40
Stationery and Supplies	420.19
Telephone & Telegraph	186.51
Traveling	.....
	$42,867.30

RECEIPTS

Balance beginning January 1, 1949	$ 1,318.29
Income to January 1, 1950	42,647.81
	$43,966.10

DISBURSEMENTS

Expenditures, Year 1949	$42,867.30
Balance on Hand	$ 1,098.80

RECAPITULATION

Cash in Bank	$ 816.39
Checks for Deposit	188.00
Petty Cash	50.00
Postage Deposit	44.41
Office Equipment	41.75
Furniture & Fixtures	329.28
	$ 1,469.83
Accounts Receivable	3,591.84
	$ 5,061.67
Accounts Payable	4,189.02
Net Worth, January 1, 1950	$ 872.65

Respectfully submitted,
MALCOLM E. COLLIER,
Treasurer.

Report of Publications Committee by Herbert W. Heckt, Chairman.

During 1949, Mines Magazine was published monthly and consisted of eight regular issues, four special issues and the Year Book and Directory of Mines Men. On account of the extra number of special issues, schedule of publication was rather irregular.

The total number of pages published during the year are shown as follows:

8 regular issues of 48 pages each	384
1 Mining Convention Number, March	64
1 Special Commencement Issue, 75th Anniversary, June	108
1 75th Anniversary Celebration Number, October	80
1 Special Petroleum Number, December	132
1 Year Book of Mines Men, 1948	116
	884

This makes a total of 884 pages which is 72 pages more than was published in 1948. During the year 1949, 43,118 magazines were published as against 37,273 during 1948. The number of pages in the Year Book was reduced in order to save a considerable amount in postage. It will be necessary to increase the number of pages in this publication for 1949.

Many delays were encountered in the publication of the 1948 Year Book, which was not mailed until about the middle of this year. Every attempt is being made to have the 1949 Year Book ready for mailing the early part of March.

Members of the Alumni Association and others could save a great deal of expense in the publication of this issue by mailing their Directory cards early. This would avoid a great many late changes which are expensive.

The 14th ANNUAL PETROLEUM NUMBER which has recently been mailed was probably the finest publication we have ever turned out and contained 132 pages. A mistake was made on the front cover of this issue in the price which should have been $1.50. Even at the price of $1.50, we will have to face a loss on this publication.

Beginning with January, the cost of printing of Mines Magazine was increased 22½% which made it difficult to keep within our estimated budget. This accounts for a drop in net income shown in the comparative figures for the past four years.

	1946	*1947*	*1948*	*1949*
Budget for receipts	$22,963.00	$26,740.00	$29,060.00	$35,319.00
Budget for Expenditures	16,354.00	20,205.00	22,824.00	28,674.40
Budget Receipts over Expenditures	$ 5,609.00	$ 6,535.00	$ 6,234.00	$ 6,644.60
Gross Income	$19,881.63	$22,951.91	$26,464.49	$34,387.18
Actual Expenditures	12,945.19	18,329.04	19,363.26	28,486.90
Net Income	$ 6,936.44	$ 4,622.87	$ 7,101.23	$ 5,900.28

CAPABILITY EXCHANGE COMMITTEE REPORT

(Continued from page 32)

year much time has been spent in building up the records of Mines men, and there are still a large number of records incomplete. Many top jobs have gone unfilled for the reason that we did not have complete records of men qualified for recommendation.

The Capability Exchange Committee has held regular meetings throughout the year with an attempt to improve on our placement service. This placement service is made possible through the voluntary contributions from a large number of Mines men and employers. Many Mines men contribute annually to this service even though they are not in search of employment. An important function of the placement service is to advance men both financially and professionally, who are already employed. A large amount of research is necessary to place men who are either unemployed or desire to make a change of employment. This placed a heavy additional load on the placement service which is reflected in the increased number of letters that were sent out to employers.

	Calls	*Referrals*	*Placements*
Administrative Engineers	8	2	1
Assayers	2	1	—
Chemists	11	2	—
Civil Engineers	1	1	—
College Dept. Head	—	—	—
College Instructors	—	—	—
Consulting Engineers	2	4	1
Construction	15	6	2
Drafting & Design	9	4	2
Electrical Engineers	4	2	—
Fuel Engineers	—	—	—
Geologist & Geological Engineers	20	28	3
Geophysics	10	23	4
Hydraulic Engineers	—	—	—
Industrial Field	4	1	—
Lubrication	—	—	—
Mechanical Engineer	5	1	—
Mechanics	2	4	—
Metallurgy (Pyro)	11	14	2
Metallurgy (Hydro)	13	24	1
Military Government	—	—	—
Mining (Coal)	10	2	—
Mining (Metal & Non-Metallics)	44	36	9
Petroleum Production	24	22	—
Petroleum Refining	1	4	—
Radio & Electronics	—	6	—
Research	8	22	1
Safety Engineers	—	—	—
Sales Engineers	22	36	6
Spectographer	—	—	—
Surveyors	20	13	4
	246	268	36

COMPARATIVE PROGRESS OF THE PLACEMENT SERVICE

Calls for Men 1948	512
Calls for Men 1949	246
Decrease	266
Percentage of decrease	52%
Placements 1948	54
Placements 1949	36

On December 31, 1949, there were 37 calls for men remaining unfilled as compared with 328 calls remaining unfilled, December 31, 1948. Our active list increased from 226 men at the end of 1948 to 415 men at the end of 1949.

The Capability Exchange Committee has published a circular covering the Mines placement service which has been distributed to all Mines men. The Committee had planned on publishing a job list for distribution twice a month. This plan was not carried out but will probably be put into effect this year. This publication would be distributed by air mail to both employees and employers who subscribe for the service.

AUDITOR'S REPORT

Mr. Malcolm Collier, Treasurer
Colorado School of Mines Alumni Association
Denver, Colorado
Dear Sir:

Acting on this assignment, your auditor has made an examination of the books of your Association for the month of December, 1949. The bank balance was found correct after adjustment for recorded outstanding checks. Returned checks were verified. Petty Cash was counted today and found on hand.

Receipts of the Association for December were checked against copies of receipts and all recorded receipts were found to have been deposited in the bank account.

Expenses for December were $5,630.87 while Receipts were $3,861.57 making a loss of $1,769.30 for the last month thus bringing the net profit for the year 1949 to $17.18 as shown in Schedule "A". Mr. Bowman was credited with $51.55 as a management fee. No depreciation was set up.

The following schedules are submitted:

"A"—Profit & Loss
Twelve Months Ending December 31, 1949
"B"—Balance Sheet
December 31, 1949
"C"—Analysis Alumni Endowment-Placement Fund
December, 1949

Sincerely yours,
(Signed) MONTGOMERY R. SMITH,
Certified Public Accountant.

MRS: JR

SCHEDULE "A"
PROFIT & LOSS STATEMENT

INCOME: Publication & Books		
Advertising	$12,947.58	
Subscriptions	9,995.34	
Books Sold	1,902.66	
Miscellaneous	558.15	
Directory	4,114.63	
Postage	104.30	
Copies	1,199.85	
Reprints	576.00	
Cuts	512.15	$31,910.66
Dues		5,619.00
Public Relations Committee		537.65
Miscellaneous		21.89
Capability Exchange—Net Income		3,245.10
Total Income		$41,334.30
EXPENSES:		
Publication (Schedule "A-1")	$26,154.46	
Salaries	11,138.23	
Public Relations Committee	608.86	
Rent	1,080.00	
Postage General	761.55	
Telephone & Telegraph	186.51	
Membership Committee	118.84	
Stationery & Supplies	410.67	
Printing-Multigraphing	315.24	
Audit	190.00	
Repairs	23.65	
Bank Charges	1.74	
Social Security Tax	105.40	
Clerical	114.54	
Management Fee	51.55	
Advertising	24.88	
Christmas Expense	31.00	
Total Expenses		$41,317.12
Net Profit		$ 17.18

SCHEDULE "A-1"
PUBLICATION EXPENSES

Books	$ 1,443.18
Commissions	365.87
Copyright	48.00
Cuts	1,645.11
Index	210.00
Magazine Printing	16,362.65
Magazine Postage	390.52
Miscellaneous	75.45
Postage	940.21
Printing	91.35
Reprints	460.72
Stationery	311.96
Stencils	78.42
W. K. Summers	120.00
Telegraph	28.19
Wrappers	54.40
Directory	3,193.68
Clerical	189.87
Multigraphing	127.38
Supplies	17.50
	$26,154.46

SCHEDULE "B"
BALANCE SHEET
ASSETS

Undeposited Cash		$ 188.00
Bank		816.39
Petty Cash		50.00
Accounts Receivable		3,494.89
Prepaid Postage and Expense		141.36
Cabinets & Shelves		41.75
Furniture & Fixtures		329.28
Total Assets		$ 5,061.57
Less:		
Accounts Payable	$ 3,672.52	
Deferred Income	516.50	4,189.02
NET WORTH		$ 872.65

SCHEDULE "C"
ALUMNI ENDOWMENT
PLACEMENT FUND

Balance, December 1, 1949		$ 430.20
Receipts:		
Contributions		157.25
		$ 587.45
Less: December Expenses		188.00
Bank & Cash Balance		$ 399.45
Less: Accounts Payable		1.66
Fund Balance, December 31, 1949		$ 397.79
Bank	$ 327.20	
Cash	72.25	
	$ 399.45	

Public Relations Committee by Edwin E. White, Chairman.

Annual Business Meeting, Jan. 14, 1949:			
Receipts—Sale of Tickets		$ 99.00	
Disbursements—Dinners served		121.00	
Deficit, Reservations made not taken		$ 22.00	$ 22.00
Annual Banquet, May 26, 1949:			
Receipts—Sale of Tickets		$454.50	
Disbursements—			
Dinners served	$441.88		
Entertainment	16.00		
Multigraphing	1.50		
Postage	35.09		
Printing	15.20	509.67	
Deficit		$ 55.17	55.17
			$ 77.17
Football Banquet, December 2, 1949:			
Receipts—Sale of Tickets		$302.00	
Disbursements—			
Dinners served	$212.96		
Multigraphing	11.20		
Postage	38.38		
Photographs	10.50		
Printing	1.50	274.54	
Profit		$ 27.46	27.46
Deficit for year			$ 49.71

Athletic Committee by Robert J. McGlone, Chairman.

ALUMNI LOAN FUND

January 1, 1949, Balance—			
Checking Account		$ 661.45	
Receipts—			
Contributions	$ 258.00		
Interest on Loans	11.00		
Payment on Loans	125.00	394.00	
		$1,055.45	
Disbursements—			
New Loan made		250.00	
December 31, 1949, Balance—			
Checking Account			$ 805.45
January 1, 1949, Balance—			
Savings Account		$4,414.61	
Receipts—			
Payment of Loan	300.00		
Bank interest	45.76	345.76	
December 31, 1949, Balance—			
Savings Account			4,760.37
January 1, 1949,			
Due on Notes		548.00	
Receipts—			
Checking Acct.—			
Payments	125.00		
Savings Acct.—			
Payments	300.00	425.00	
		$ 123.00	
New Note		250.00	
December 31, 1949,			
Due on Notes			373.00
December 31, 1949—			
Total Balance			$5,938.82

Alumni Endowment—Placement Service by Roger M. Schade, Chairman.

The receipts and disbursements for the Placement Service are shown in the following detailed statement. This shows a gain of $29.85 in the cash balance over the beginning of the year.

January 1, 1949, Balance		$ 369.60
Receipts—		
Contributions	$3,584.46	
Junior Memberships	267.00	3,851.46
		$4,221.06
Disbursements—		
Multigraphing	$ 24.75	
Postage	332.83	
Printing	98.00	
Rent	300.00	
Repair & Renewals	2.50	
Salaries	2,944.83	
Stationery	111.31	
Telephone	1.39	
Due Loan Fund from Contribution	6.00	3,821.61
December 31, 1949, Balance		$ 399.45

Alumni Endowment by Roger M. Schade, Chairman.

It is not clear in the mind of many as to the function of the Alumni Endowment Fund. This fund was created to provide a source of income to guarantee the continuance of essential activities of the Alumni Association, and to provide a foundation that would assure the expansion of these activities. The fund is built up from contributions, life memberships, initiation fees, interest on deposits and dividends from investments. Only the accumulated earnings can be drawn upon in the case of necessity to provide necessary funds to carry on the activities of the Alumni Association. The total assets of the fund on January 1, 1950, were $8,246.71 using recent market quotations for securities. Detailed figures are shown in the following statement.

January 1, 1949, Balance		$ 741.85
Receipts—		
Initiation Fees	$ 512.00	
Contributions	172.00	
Interest, Securities	434.50	
Bank Interest	8.99	1,127.49
		$1,869.34
Disbursements—		
Subscriptions to Magazine Members for life—24		96.00
December 31, 1949, Balance		$1,773.34

SECURITIES FROM WHICH INTEREST IS DERIVED—

11 shs General Electric, N. P., Common stock—
Div. Payable Jan., Apr., July, Oct., 50c.
18 shs The Texas Company, P. V., Capital stock—
Interest Payable Jan., Apr., July, Oct., 75c + Ex. 75c.
$1,000 U. S. A. Treasury Bond, Defense Ser., Dated 1/1/42
2½% Accumulative.
$600 U. S. Savings Bond, Ser. G, Dated 9/1/43
Interest Payable March, Sept.
20 shs Kennecott Corporation
Div. Payable Jan., Apr., July, Oct. 25c + Ex. $3.00.
10 shs Amer. Smelt. & Refin. Co., N. P., Common stock
Div. Payable Jan., Apr., July, Oct. 75c + Ex. $2.00.
20 shs Sperry Corporation, P. V., Common stock—
Div. Payable Jan., July, $1.00.
10 shs Phelps Dodge Corporation, P. V., Capital stock—
Div. Payable Feb., May, Aug., Nov., $1.00.
10 shs Standard Oil Company (N. J.), P. V., Capital stock—
Div. Payable June, Dec., $1.50 + $2.50 + 2% stock.

VALUE OF INVESTMENTS	
Stocks at Market Quotations 1/16/50	$4,873.37
U. S. Government Bonds	1,600.00
Cash in Bank, January 1, 1950	1,773.34
	$8,246.71

MINES BACKING—PARKER

(Continued from page 11)

tory and field equipment and the necessity for limiting instructional groups to smaller numbers than in most other types of education. In its cost, mineral-engineering training is probably most comparable to medical education. A realization of this fact by the state's legislators is necessary before a solution of the financial problems of the Colorado School of Mines can begin.

Not only has the official organization of the state been remiss in its support of the school, but industrial concerns of Colorado have largely left the provision of such support as scholarships, fellowships, and endowments to out-of-state corporations.

Private industry of the state could do well to consider the advisability of providing support for Colorado's world-famous educational institution which supplies much of the trained personnel required for the mineral industry.

It is impossible in the space at my disposal to do more than point to one of the major problems confronting the Colorado School of Mines. It is my sincere wish that in the years to come the state of Colorado may become aware of this problem and assist the school's administration in its solution.

LETTERS

(Continued from page 5)

WISHES MINES MAGAZINE WERE PRINTED OFTENER

From JOHN G. COWAN, '49, *706 Obie Sue, Worland, Wyoming. (Roustabout Engineer, Trigood Oil Co.)*

I am starting the New Year by asking you to change my address from Midwest, Wyoming to that given above, where I am currently receiving my mail.

I enjoy Mines Magazine a great deal; wish it were printed more often.

REPORTS ON SEVERAL "MINERS" IN ALASKA

From GARTH B. HARLAN, '49, *District Engineers Office, APO 942, c/o Postmaster, Seattle, Washington.*

Upon graduation from *Mines* I accepted a position as Geological Engineer with Corps of Engineers, Alaska District. I have spent the greatest part of the time, since my arrival in Alaska, in the field, from the Arctic Circle to the "chain."

Mines is well represented here. The Nutter brothers (John '49, and Dwain), J. M. McAnerney, '35, and I are employed by District. I happened on Hugh Matheson, '49, while in Ophir the middle of November; expect to see him in Anchorage soon.

To further erase a misconception which seems prevalent in the "States," we don't live in igloos up here.

Please forward *Mines Magazine* and all correspondence to the address given above.

NOW LOCATED IN HOUSTON, TEXAS

From SAMUEL C. SANDUSKY, '48, *Box 3128, c/o The Ohio Oil Co., Houston, Texas.*

Enclosed is check to cover my dues for 1950 and a small contribution to the Placement fund.

Please note the change of address and mail *Mines Magazine* thereto. My transfer to the Houston Division office from the Casper Division office was effective January 1. I will be engaged in reservoir engineering and routine division engineering connected with production and exploitation.

I wish to extend my best wishes for a prosperous New Year to all *"Mines"* men, and to especially say, "Hello," to all those close acquaintances with whom I have lost immediate contact.

The Colorado School of Mines Research Foundation

established early in 1949 and directed by Vernon L. Mattson, '26, has new activities and plans scheduled with the appointment of Merle N. Shaw, '25, as research metallurgist.

Mr. Shaw has had wide experience in the field of metallurgy and, until his appointment with the foundation, was general superintendent of the Pine Creek operations of the United States Vanadium corporation at Bishop, California.

Mr. Mattson returned recently from a tour which took him to Chicago, Milwaukee, Boston, New York City, Washington, D. C., Pittsburgh, Columbus, and St. Louis. He visited industrial and university research laboratories engaged in ore-dressing research for the purpose of observing new methods, equipment, and plans under which they operate.

V. L. Mattson

recently spoke at a meeting of Blue Key at which time he noted changes on *Mines* campus since his graduation from the school in 1926.

The most striking change noted by Mr. Mattson was the presence of Berthoud Hall. When he graduated the geology department was crowded in the basement of Guggenheim Hall, and the geophysics department was just being organized. He expressed surprise that the Chemistry building is still holding together after all these years and commented that Chauvenet Hall is probably the most needed addition to the campus.

Being the editor of The Oredigger occupied much of Mr. Mattson's spare time during his senior year. It took considerable effort, he said, to get regular contributions of written material. He was also one of the founders of the *Mines* chapter of Blue Key, known in those days as the "Vigilantes."

Mines' spirit and traditions have been little altered by 23 years, in Mr. Mattson's opinion. He believes that the drive and iniative of present *Mines'* students compare favorably with that of the 1926 *Miners*.

Construction Plans

continue at *Mines* with provisions for the completion of the fourth floor of Berthoud Hall, geology building.

Work will begin soon on the 15 offices and a large seminar - drafting room for additional space for graduate work. Graduate students in all departments will have access to the new rooms.

President Parker and Professor Van Tuyl

are co - authors of a 1,100 - word article on geological developments throughout the world during 1949 which has been submitted to the 1950 Britannica Book of the Year.

They wrote the section on geology in the last regular edition of the encyclopedia and have been asked each succeeding year to provide the supplement for this section.

Engineering Council Recognizes Petroleum Refining Department

Mines' petroleum refining department has received recognition from the Engineering Council for Professional Development as an accredited-granted option.

ECPD has for one of its basic objectives the "criteria for colleges of engineering which will insure to their graduates a sound educational foundation for the practice of engineering."

An accrediting agency for engineering schools, ECPD had its inception in 1932 when seven engineering bodies convened and formed the council which today is supported by four engineering societies, civil, electrical, mechanical, and mining and metallurgical.

Each year ECPD publishes ratings of schools it has inspected. Mines was first rated in 1937. A degree-granting school to be rated must first graduate someone. ECPD committees then study new curricula, salaries, faculty, finances, and inspect equipment and floorspace.

The petroleum refining department became a separate option in 1947 when the school began granting P. R. E., degree of petroleum refining engineer.

TECHNICAL SOCIETIES and ASSOCIATIONS MEETINGS

AMERICAN STANDARDS ASSOCIATION BOARD GETS NEW MEMBERS

The American Standards Association announces election of three new members of its Board of Directors effective January 1, 1950, for a term of three years. Maurice Stanley, Chairman of the Board of the Fafnir Bearing Company, represents the Anti-Friction Bearing Manufacturers Association, Inc.; B. S. Voorhees, vice-president of the New York Central System, represents the Association of American Railroads; and Colonel J. G. Vincent, vice-president, Packard Motor Car Company, represents the Automobile Manufacturers Association.

In addition, E. E. Potter, vice-president of the General Electric Company, has been named by the National Electrical Manufacturers Association to fill out the unexpired term of Clarence L. Collens, who has just retired as chairman of the Reliance Electric and Engineering Company. Miss Ardenia Chapman, Dean of the College of Home Economics, Drexel Institute of Technology, Philadelphia, is completing the unexpired term of Mrs. Carol Willis Moffett, well known for her work with the American Home Economics Association, as member-at-large.

Continuing on the Board for another three-year term are J. H. McElhinney, vice-president of the Wheeling Steel Corporation, representing the American Iron and Steel Institute, and Auguste G. Pratt, Chairman of the Board of Babcock & Wilcox Company, representing the American Society of Mechanical Engineers. R. Oakley Kennedy, formerly vice-president of Cluett, Peabody and Company, Incorporated, has been re-elected member-at-large for the next three years.

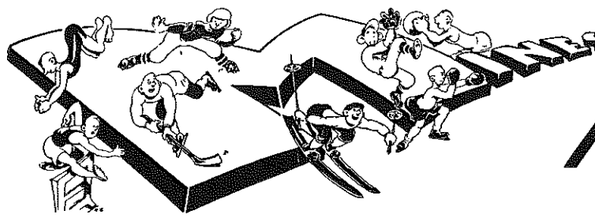
INTERSTATE OIL COMPACT COMMISSION HOLDS EXECUTIVE COMMITTEE MEETING

Executive Committee of the Interstate Oil Compact Commission met in Oklahoma City January 7 with Governor Roy J. Turner of Oklahoma presiding for the first time at an official session of the Commission since his election as 1950 chairman.

The following state representatives and officials were also in attendance: Norman V. Kinsey, Louisiana; Rex Belisle, Oklahoma; Clarence T. Smith, Illinois; Reford Bond, Oklahoma; and Weldon Hart, Texas.

It was decided by the Committee that "Oil and Gas Conservation and the Public

(Continued on page 44)



Sports MARCH

By HERB WATERMAN

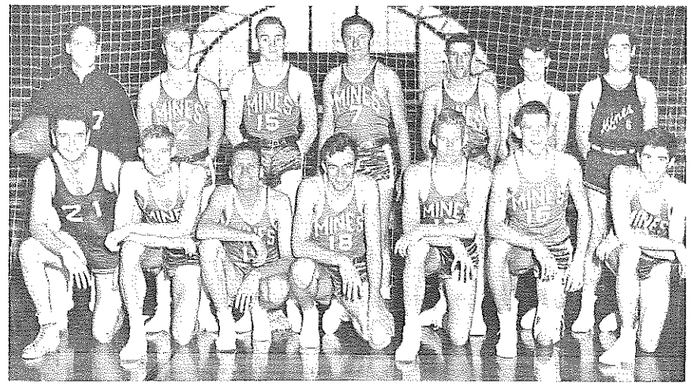
Basketball

Colorado Mines basketeers found no Santa Claus over the Christmas vacation as they dropped four games while winning one.

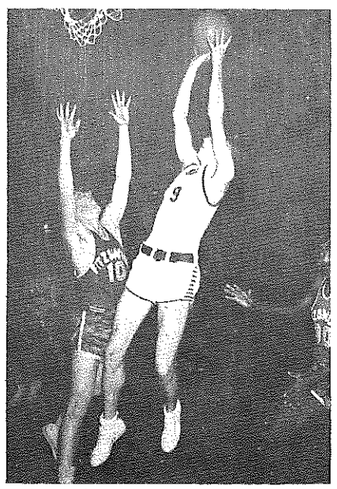
The team played poor ball in all except the Denver Chevrolet contest. In that fracas the Miners worked together and for the most part resembled a country fair ball club.

Fort Warren beat the Miners 50-46, Bethany college humbled them 56-43, Camp Carson won one 54-47, after losing a 49-38 decision, and the Chevs trounced the Blasters, 77-50.

Sparking the Blasters were their three big scorers, Clyde Kerns, Tom Johnson, and Doug Waterman. These men contributed a big share of the



▼ MINES basketball team; Back row, left to right: Coach Johnny Karamigios, Bob Einarsen, Jack Noll, Joe Oberst, Carl Bieniewski, Bill Ruehle, Paul Musgrove. Front row, left to right: Jim Taylor, Doug Waterman, Clyde Kerns, Jim Ault, Herb Waterman, John Lockridge, Tom Johnson, (Lou Landers and Jack Earl not pictured).



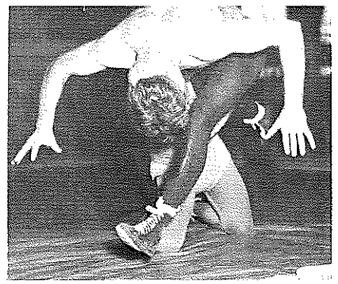
▼ Tom Johnson, MINES center, ready to drop one in.

CSM scoring during the vacation, just as they have done through the season.

January 14 and 15 the CSM basketballers suffered a double setback at the hands of the Western State Mountaineers, 77-72 on Friday night and a heart-breaking 75-74 defeat the following night.

Friday night's game was a see-saw affair with the score tied no less than five times. The Mountaineers grabbed a big lead early in the second quarter only to see the Miners, led by Clyde Kerns and Doug Waterman, catch fire and tie up the ball game at half time, 41 to 41. In the second half the Gunnison boys finally broke up the ball game with two minutes left to play being three points ahead. The Staters stalled out the remainder of the game. The Miners were led by Kerns, Waterman, Lou Landers, and Jack Earl.

The second game was all Mines in spite of the score. The Miners led by as much as 11 points at one time, only to have the Mountain boys erase the lead to one point at halftime. In the Second half, led by the point making of Tom Johnson and the all-around play of Lou Landers, the Orediggers built up a lead of five points at the two-minute mark. A basket and a free throw by Becker cut the lead to three points. Landers made a free throw with a minute to go. Al Tollis and Lou Mikkleson collaborated for a basket and two free throws to tie up the ball game. Lou Landers missed a set shot with 14 seconds to go. Doug Waterman and Becker came down off



▼ Action in the MINES—C. U. heavyweight match.

the backboard with a jump ball only to have the referee reverse his decision and call a foul on Waterman. The free throw won the ball game.

Tom Johnson put on the greatest scoring show ever seen at Gunnison; Long Tom wound up with 37 points for the evening. Doug Waterman, Lou Landers, and Jack Noll were also outstanding for the Orediggers.

The Miners suffered a tough blow when John Lockridge reinjured his knee in the first game. John will be out for the rest of the season.

Mines Hockey Team Wins

A small but spirited group of hockey fans watched the Orediggers beat the CU club twice, 13-5 and 10-4, at Boulder. The team, in its second year of existence since the war, is sponsored by the Reed Auto Sales of Denver.

Wrestlers Win

Coming through with their first victory of the season, Mines grapplers subdued Western State, 31-5, at Golden on January 13th.

The Orediggers showed superior conditioning as they won all but one of the eight matches of the evening.

▼ Lloyd Best of MINES in the process of pinning a Western States grappler.

PLANT NEWS

(Continued from page 29)

New Discoveries in "Teflon" Tetrafluoroethylene Resin

For a number of years widespread use of "Teflon" tetrafluoroethylene resin has been held up by difficulties encountered in fabricating it. The very properties that endowed it with great potential industrial value—outstanding heat and chemical resistance—made it difficult to work into readily usable forms.

Some time ago, Du Pont chemists came to realize that fabrication difficulties were lessened as the granules were made smaller. More recently, it was discovered that the material could be made as a suspensoid. In this form the "Teflon" particles are so fine that they remain suspended in the carrying liquid, with little or no settling, for considerable periods of time.

Using the suspensoid as raw material, chemists in the company's Fabrics and Finishes and Polychemicals departments discovered spray finishes that make it possible to give chemical tanks a tough "Teflon" lining; enamels for insulating fine electric wire; compounds for extruding heavier insulation onto wire; unsupported "Teflon" film and tapes superior to those previously available; and "Teflon"-coated glass fabrics and tapes.

Du Pont Announces $100,000 Grant to Universities

The Du Pont Company announced recently that it has authorized, for the second year, $100,000 for grants-in-aid to universities to "stock-pile" knowledge through the advancement of fundamental science.

The grants are for the 1950-51 academic year. They provide $10,000 for each of 10 universities, all of which received similar awards from the company for the present school year. The company also provided $20,000 to the University of Chicago for a calendar year 1950 membership in its Institute for the Study of Metals.

Institutions which will receive $10,000 grants each are: California Institute of Technology, Cornell University, Harvard University, Massachusetts Institute of Technology, The Ohio State University, Princeton University, Yale University, University of Illinois, University of Minnesota, and University of Wisconsin.

Joseph B. Dietz Succeeds Henry E. Lacky as Industrial Sales Manager of Du Pont's Finishes Division

Appointment of Joseph B. Dietz as manager of the industrial sales section of the Finishes Division of the Du Pont Company, was announced recently. He succeeds Henry E. Lackey, who is retiring after a career of nearly 43 years.

Mr. Dietz has been assistant industrial sales manager since 1945. A native of York, Pa., and a graduate in chemical engineering of Lehigh University, he joined the Du Pont Company in 1924 as a control chemist.

Jos. G. Broz New Sales Manager for Nordberg Four Cycle Diesel Engine Dept.

The appointment of Jos. G. Broz as sales manager of the Four Cycle Diesel Engine Dept. is announced by Nordberg Manufacturing Co., Milwaukee 7, Wis.

JOS. G. BROZ

Mr. Broz was vice-president in charge of sales of Busch-Sulzer Diesel Engine Company of St. Louis, Mo. at the time that company was purchased by Nordberg in December, 1946. Until his present appointment Broz was surveying South American market potentialities and establishing field sales and service organizations there for Nordberg.

Mr. H. M. Cahill will assist Broz in directing the sales activities of Nordberg's Four Cycle Diesel Engine Dept.

Nordberg Appoints New Distributors for Diesel Engines

Six new distributor appointments for the new Nordberg 4FS-1 Diesel Engine are announced by Harry M. Cahill, Sales Manager, Small Engine Department, Nordberg Manufacturing Co., Milwaukee, Wis.

These appointments are: Al-Pac Engine & Equipment Co., Seattle, Wash.; Atlantic Engine Supply, Inc., Boston, Mass.; Bolinders Co., Inc., New York, N. Y.; H. G. McKinney, & Co., Wilmington, Calif.; Northwest Distributors, Ltd., Vancouver, B. C., Canada, and J. N. Vernam Company, Miami, Fla.

Platinum Metals in 1949

"The revival of European markets for platinum metals was outstanding during 1949 as compared to other post-war years," Dr. Charles Engelhard, President of Baker & Company, Inc., world's leading dealer and refiner of platinum metals, stated in reviewing the platinum metals industry in 1949.

"The electrical industry continues to be an important consumer of platinum metals," Dr. Engelhard said. "Tiny contacts of platinum and palladium are used in great numbers in telephone equipment, thermostatic controls and other household conveniences, and in a wide variety of industrial devices.

"The use of rhodium, one of the six platinum metals, for decorative purposes has made much progress during the year, and the art of casting palladium into rings, settings, watchcase attachments and other articles is being practiced successfully.

"Another noteworthy development in the past year has been the use of platinum and palladium catalysts in new production processes, as in 'platforming,' a new refining method for producing high octane gasoline using platinum as a catalyst.

"Canada continues to be the leading source of the platinum metals, which are supplied also by South Africa, Colombia and Alaska. The production facilities in South Africa were expanded during 1949."

Hewitt-Robins Reports Earnings

Hewitt-Robins Inc., reported sales for the quarter ending September 30, 1949, of $4,677,258, with net earnings after all charges of $90,116, or 32 cents per share on the 278,714 shares of capital stock outstanding. Net earnings for third quarter 1948 were $155,469, or 56 cents per share.

For nine months ending September 30, 1949, sales were $14,648,272, with net earnings of $336,119, or $1.21 per share on capital stock outstanding. For the same period in 1948, sales were $13,859,782 and net earnings $390,186.

Clemmer Named Mines Bureau Regional Director in Southeast

J. Bruce Clemmer, mineral technologist and administrator with the Bureau of Mines for over 20 years, has been appointed Regional Director of Region VII of the Bureau, the Southeast, with headquarters at Tuscaloosa, Ala., it was announced by James Boyd, Bureau Director. The appointment becomes effective Nov. 15. Region VII includes the State of Tennessee, North and South Carolina, Georgia, Alabama, Mississippi, and Florida.

Chief of the Tucson, Ariz., Branch of the former Metallurgical Division since 1945, Clemmer becomes the ninth and last regional director to be named under a reorganization of the Bureau of Mines which began on Sept. 1, this year.

As regional director, Clemmer will report directly to the Director of the Bureau in Washington, D. C. He will be in charge of all Bureau activities in his region, including the stations at Tuscaloosa, Ala.,

Norris, Tenn., and Raleigh, N. C., and the district and subdistrict offices at Birmingham, Ala., and Jellico, Tenn. Mr. Clemmer will be serving his second tour of duty at Tuscaloosa, having been a metallurgist at this station during World War II.

Graduated from the South Dakota State School of Mines at Rapid City, S. Dak., in 1927, Mr. Clemmer first joined the Bureau at its Rolla, Mo., station in 1928, after completing work for his Master of Science degree at the Missouri School of Mines at Rolla.

John W. Rutland Appointed General Sales Manager of International Minerals Plant Food Division

The appointment of John W. Rutland as general sales manager of the plant food division of International Minerals & Chemical Corporation was announced recently by President Louis Ware.

Mr. Rutland joined the company in 1921. He had been general sales manager of the potash division since 1948, and previously had served as southern potash sales manager.

Mr. Rutland will have general supervision of plant food sales under Maurice H. Lockwood, vice president in charge of the plant food division. Mr. Rutland will exercise administrative direction of the division in Mr. Lockwood's absence.

International Minerals Announces Appointments of Directors

All directors of International Minerals and Chemical Corporation were re-elected at the annual meeting of stockholders of the corporation held in New York recently according to Louis Ware, President.

A subsequent announcement by Mr. Ware revealed the election of James P. Margeson, Jr., executive vice president of the company, to the Board. Mr. Margeson will fill the unexpired term of Francis M. Weld who was killed in an airplane accident recently.

Mr. Margeson has been associated with International Minerals since 1940 and has been executive vice president of the company since June 26, 1947.

International Minerals Declares Dividends

At a meeting recently, the board of directors of International Minerals and Chemical Corporation declared regular quarterly dividends of 50 cents per share on the common stock of the corporation and $1.00 per share on the 4% preferred stock, both dividends payable December 30, 1949, to stockholders of record December 9, 1949.

John S. Shaw Retires from Hercules

John S. Shaw, Director of Safety of Hercules Powder Company, retired January 1, the company announced recently.

Mr. Shaw, who is nationally known as a pioneer in the field of industrial safety joined Hercules in 1913 and received his present title in 1941.

During World War II, Mr. Shaw was a member of the Safety and Security Division of the U. S. Ordnance Department and at the end of the war received a certificate of appreciation attesting to his outstanding service. He is a member of many safety organizations and is known for his work in the standardization of chemical operating procedures and the use of safety equipment to prevent industrial accidents.

New Executives Appointed in Hercules Powder Experiment Station in Wilmington, Del.

Hercules Powder Company has created two new top posts at its Experiment Station in Wilmington, Delaware.

Dr. Peter VanWyck, formerly technical assistant in the Research Department, becomes assistant director of the Experiment Station responsible for the work done by the Cellulose Products, Explosives, and Virginia Cellulose research divisions.

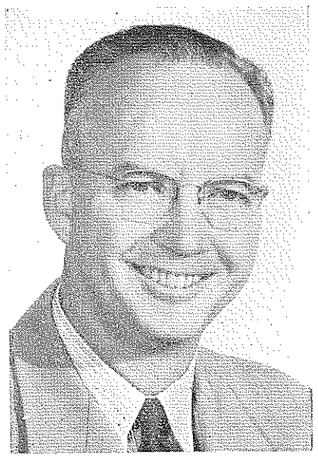
Dr. Richard S. George, formerly manager of the Naval Stores Research Division, will be assistant director of the Experiment Station responsible for the work done by the Naval Stores, Paper Makers Chemical, and Synthetics research divisions. Dr. Reginald W. Ivett succeeds Dr. George as manager of the Naval Stores Research Division.

The appointments were announced by Dr. Emil Ott, Hercules director of research, and Dr. Raymond F. Schultz, director of the Experiment Station.

The company also announced the transfer of two men from the home office to the Experiment Station research staff. They are: Edmund Winterbottom, who is appointed administrative assistant to Dr. Schultz; and Dr. John T. Hays, appointed special assistant in the Scouting Research Division. Dr. Hays also will continue his university contacts with prospective technical employes.

Newton R. Crum to Represent Flexible Steel Lacing Co. in California

Newton R. Crum, a native of Los Angeles and now a resident of Alhambra, is



NEWTON R. CRUM

the new representative for Flexible Steel Lacing Co. of Chicago, Ill. in California.

"Newt" is well known in California having had some fifteen years in selling mill and mine supplies to the industrial trade. For the past four years he was owner of the Western Industrial Supply Co. in Sacramento and for the two years before that he managed the northern division of The Republic Supply Co. in Oakland. For ten years before that he represented the same company in their southern California Oilfield Division.

CATALOGS AND TRADE PUBLICATIONS

(Continued from page 30)

(5369) "MECHANICAL TOPICS," Vol. 12, No. 1, by International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y., contains 12 pages describing and illustrating use of nickel and nickel alloys in castings, safety valves, pump shafts, cable shielding, welding rods, exhaust pipes and fittings. Included is a list of Inco nickel alloys and a list of distributors.

(5370) EYE SAFETY, "How to Set Up and Conduct a Safety RX Program," a 14 page booklet by American Optical Company, Southbridge, Massachusetts, giving information on how to set up a company eye safety program through the use of goggles. Includes suggestions on how to obtain necessary professional services to aid in program and step-by-step instructions in the use of a new Safety RX Order Book supplied by the company.

(5371) "TIE-IN," Third Quarter 1949, by H. C. Price Company, Bartlesville, Oklahoma, an 18 page employee magazine devoted to illustrated articles on company projects, employee personals and safety items. This issue carries an interesting article on laying of "Toughest Inch" pipeline from Cobb Station, West Virginia to Rockville, Md.

(5372) "NORDBERG PROGRESS," Third Quarter 1949, by Nordberg Mfg. Company, Milwaukee 7, Wisconsin, a 12 page illustrated magazine devoted to news of interest to employees and articles on application of Nordberg-made equipment. Lead article in this issue concerns the installation of Diesel engines in the power plant at Peabody, Mass.

(5373) "THE BUSINESS OF FARMING," Holiday issue 1949, by United States Gypsum, 300 W. Adams Street, Chicago 6, Illinois, a 16 page magazine carrying illustrated articles and items designed to be of particular interest to farm dwellers, including interior decorating ideas, recipes, market predictions and homemaking hints.

(5374) ELECTRICITY, "Allis-Chalmers Electrical Review," Third Quarter 1949, by Allis-Chalmers Mfg. Company, Milwaukee 1, Wisconsin, a 40 page magazine largely devoted to illustrated articles on the technical aspects of the industrial use of electricity and electrical equipment. Contains articles on high speed reclosing, dielectric strength of air, care of AC rotating equipment and system protection.

(5375) POWER SHOVELS, Bulletin 4840 by The Osgood Company, Marion, Ohio, describes and illustrates types 5 and 20 power shovels showing them in various operations and giving construction features and specifications.

(5376) "NICKEL TOPICS," November, December 1949, by International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y., contains 12 pages of illustrated articles describing various applications of nickel and nickel alloys. Lead article describes new ductile cast iron developed by the company.

(5377) OIL WELL DRILLING, "Tomorrow's Tools—Today" Fourth Quarter, 1949, by Lane-Wells Company, 5610 So. Soto Street, Los Angeles 11, California, 40 pages containing articles on shaped charges in well perforating, perforating the deepest well, Pacific Creek No. 1 in Wyoming, radioactivity well logging in Canada and others. Of particular interest is the "Packer Handbook," an extensive section on the use, types, parts, selecting and operation of oil well packers.

BIRTHS

(Continued from page 23)

A 7-pound son was born to Mr. and Mrs. Robert A. Lang, Jr. on July 31 whom they have named Doy for his god-father-to-be, Doy Neighbors of Golden. Victor, their other son, is 4 years old.

Mr. Lang, '41, is engineer for Mehring Hanson Company of Washington, D. C. The family home is 5732 Fourth Street, South Arlington, Virginia.

ALUMNI COMMITTEES

(Continued from page 31)

Legislation Committee
John H. Winchell, '17, Chairman
Malcolm E. Collier, '22, Vice-Chairman
Ben H. Parker, '24
Ted Stockmar, '43
Fred Jones, '00

Instruction Committee
Harry L. McNeill, '24, Chairman
Clifton W. Livingston, '33, Vice-Chairman
J. Harlan Johnson, '23
C. Lorimer Colburn, '07
O. W. Longan, '34

Book Reviews

These books may be obtained through the Book Department of The Mines Magazine.

Radiant Heating, Radiant Cooling and Snow Melting

2nd Edition. By T. Napier Adlam, Vice-President Sarco Mfg. Corp., and Consulting Engineer on Radiant Heating. The Industrial Press, New York, 13, N. Y., 1949. 504 pages, 337 illustrations. $6.00.

This volume represents the knowledge and experience of an engineer with a background of over thirty years in all phases of radiant heating. The author has been closely associated with many of the recent developments in the field and did pioneer work in the application of warm-air methods of floor heating.

In addition to the material on radiant heating, to which the major portion of the book is devoted, the author gives rather extensive consideration to the allied fields of radiant cooling and snow melting, which have attracted much attention in construction circles and in both of which the author has had wide practical experience.

The subjects are presented clearly, with the accent on the practical rather than the theoretical aspects. Of course the theoretical bases for these heating and cooling techniques are discussed, but, in the main, this volume was written for engineers and contractors who have jobs to do and for architects who have structures to design.

The author presents facts and figures and, with the aid of many easy-to-understand illustrations, describes methods and construction details, all of which are rendered more valuable from the fact that they are backed up by many years of actual working experience.

Radiant heating, radiant cooling, and snow melting, as considered in this treatise, are comparatively recent additions to the techniques of building, and, as is the case with all new developments in any field, they have evoked a considerable amount of controversy both as to their value and applications. This authoritative and straightforward book will dispel a lot of misinformation and will prove to be of great practical value to anyone faced with the heating and cooling problems which it considers.

Methods of Joining Pipe

By J. E. York, Building Service Engineer. The Industrial Press, New York 13, N. Y., 1949. 236 pages, 249 illustrations. $3.00.

This volume is as clearly written and to the point as its title would indicate. Engineers, contractors and others concerned with the design and installation of satisfactory piping systems for steam, hot or cold water, brine, refrigerants, gases, sanitary waste, distillates, chemical solutions, slurries, acids and other fluids, will find this book very useful. Written by a mechanical engineer of many years' experience, it describes the advantages and disadvantages of joints used for connecting both metallic and non-metallic pipe lines. Also included are data on joints designed to take up movement due to expansion and contraction of pipe.

All types of standard and special joints for pipe are considerad including joints for steel, cast iron, copper, brass, Duriron, lead, chemical tile, vitreous tile, stoneware, Transite, wood, glass, synthetic resin, plastic and concrete pipe.

The many illustrations accompanying the text are clear and accurate, aiding in a presentation of the material which is designed for practical use and for easy reference.

Quarterly of The Colorado School of Mines —"Economics of the Mineral Industry"

Number 1A of the Seventy-fifth Anniversary Volume, (Vol. 45). Edited by Harry M. Crain, Director of Publications. *Colorado School of Mines,* Golden, Colorado, January, 1950. 48 pages, five figures. $.50.

Beyond doubt one of the more important scientific conclaves in recent years was the series of conferences incident to the celebration of the 75th Anniversary of the founding of the *Colorado School of Mines,* held Sept. 29 and 30 and Oct. 1, 1949. These conferences, (which received full coverage in the Oct. '49 issue of *Mines Magazine*) were composed largely of papers prepared and read by some of the ablest men in the mineral industry and covering every phase of that industry.

Volume 45 of the CSM Quarterly is to be devoted to the publication, in their entirety, of the papers, speeches, and discussions presented in the conferences, and this first issue, Number 1A, reproduces those given at the first conference on Sept. 30th.

The theme of this first conference was "Economics of the Mineral Industry" and it was designed to present a broad, general picture of the industry's position and importance, in preparation for the more specialized conferences to follow.

Included in this issue of the Quarterly are the following papers: "Mineral Resources Appraisal by the United States Geological Survey" by S. G. Lasky, '22, chief of the Mineral Resources Section of the United States Geological Survey, Washington, D. C.; "Oil and Human Welfare" by Max W. Ball, '06, oil and Gas Consultant, Washington, D. C.; and "Gold, Our Most Strategic Mineral" by Donald H. McLaughlin, president of the Homestake Mining Company, San Francisco.

This issue of the Quarterly and the others to be published which will comprise the 75th Anniversary volume, will be of great interest not only to *Mines* Alumni (particularly those who were unable to be present at the conferences) but to anyone concerned with the progress and technologies of the mineral industry.

General Electric Review

December, 1949. Published monthly by the General Electric Company, 1 River Road, Schenectady 5, N. Y. 64 pages. Year's subscription $4.00.

Lead article in this issue of the well-known and highly respected GE Review is a forthright expression, by Charles E. Wilson, President of General Electric, of "What Industry Expects of the Engineer." Other articles included are "Co-ordination of Protective Devices for Control-power Circuits"; "New Laboratory Facilities to Improve Engineering Effort"; "Tuning of Ground-fault Neutralizers"; "Magnetic Fluid Clutch"; and Part XII in the excellent series of articles on "Protective Atmospheres in Industry."

This line-up of fine articles on widely varied subjects make the December issue of the GE Review a particularly fine one. Readers will be especially interested in the "Magnetic Fluid Clutch" article which outlines developments in a new clutching device which utilizes the force set up by a magnetic field to accomplish clutching or braking action.

The Minnesota Geologist

Official Bulletin of the Geological Society of Minnesota, Minneapolis, December 1949, 12 pages, free with membership in the Society.

This monthly bulletin carries announce-

(Continued on page 44)

FROM THE *Local Sections*

ARIZONA

Two meetings in year, second Saturday in April and October. H. Z. Stuart, '36, Bisbee, Vice-Pres.; C. A. Davis, '27, Phoenix, Vice-Pres.; W. W. Simon, '15, Superior, Vice-Pres.; B. G. Messer, '36, Secretary-Treasurer, Rt. 1, Box 40, Globe, Ariz.

BAGUIO

Frank E. Delahunty, '25, President; Luther W. Lennox, '05, Secretary-Treasurer, Benguet Consolidated Mining Co., Baguio, P. I. Meetings upon call of secretary.

BARTLESVILLE

Burt R. Kramer, '42, President; John W. Tynan, '41, Vice President; Richard M. Bradley, '36, Secretary, Cities Service Oil Co., Bartlesville. Luncheon meetings every Friday noon in the Burlingame Hotel Coffee Shop.

BAY CITIES

C. K. Viland, '29, President; E. C. Kinyon, '35. Vice President; D. J. Lyons, '30, Secretary; Wm. L. Burnham, '41, Treasurer. Visiting Miners contact Secretary, c/o Tide Water Associated Oil Co., Research Div., Associated, Calif.

BIRMINGHAM

Robert J. Blair, '39, President; Stanley M. Walker, Ex-'11, Vice President; Hubert E. Risser, '37, Secretary-Treasurer, Bradford Mine, Dixiana, Alabama. Meetings held upon call of secretary. Visiting "Miners" please contact secretary.

CENTRAL OHIO

Roland B. Fischer, '42, President; Frank M. Stephens, Jr., '42, Secretary-Treasurer, Battelle Memorial Institute, Columbus, Ohio.

CLEVELAND

Joseph R. Gilbert, '42, Secretary, 14513 Northfield Ave., East Cleveland 12, Ohio. Meetings last Friday of each month at the Carter Hotel, Cleveland.

COLORADO

E. S. Hanley, '34, President; Herbert W. Heckt, '36, Vice President; David Roberts, '40, Treasurer; William J. Holtman, '43, Secretary, 930 Downing St., Denver, Colo. Meetings upon call of Secretary.

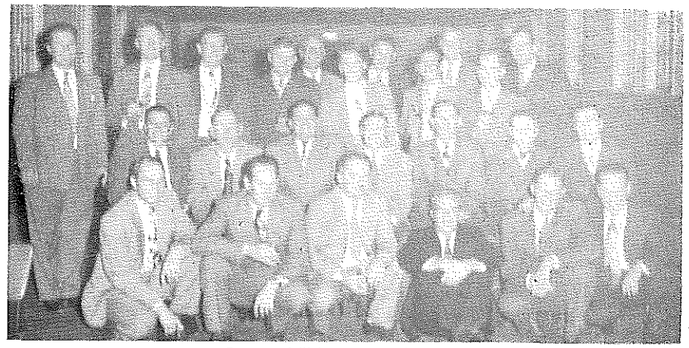
EASTERN PENNSYLVANIA

Names of Officers and notice of Meetings to be announced later.

A meeting of the Eastern Pennsylvania Section is planned for early in March. Anyone interested in joining the new section who has not been contacted can get full information from Samuel M. Hochberger, 1232 So. Ninth Street, Allentown, Pennsylvania.

GREAT LAKES

Francis W. Mann, '43, President; R. D. Fernald, '37, Vice President; Stanley Ohlswager, Secretary. Meetings: Third Friday, January, April, October. Visiting Miners contact President, c/o Standard Oil Co. (Ind.) Pipeline Dept., 910 So. Michigan Ave., Chicago 1.



▼ Group of "Miners," Midland, Texas.

HOUSTON

Albert L. Ladner, '27, President; McKay G. Donkin, '29, Vice President; W. Bruce Barbour, '37, Secretary, c/o The Second National Bank of Houston, Oil & Gas Div., Houston. Monthly luncheon meetings held on the first Tuesday at Noon, Tenth Floor of the Houston Club. Visitors please contact the secretary at The Second National Bank of Houston.

The regular monthly luncheon meeting of the Houston Section of the C.S.M. Alumni Association was held at the Houston Club on Tuesday, January 3. The following *"Miners"* were present:

Irwin M. Glasser, '43; James L. Ballard, '25; Vernon Redding, '40; Ernest W. Dissler, '40; Raymond A. Kerr, '36; Jack B. Ferguson, '30; Donald I. Gahagan, '27; M. L. Gilbreath, '33; K. Pat Hurley, '22; Albert L. Ladner, '27; Julian K. Pawley, '40; Albert G. Wolf, '07; Robert W. Harrison, '33; Howard K. Schmuck, '40; Lisle R. Van Burgh. '17; Charles E. Redmon, Jr., '39; Phil H. Garrison, '39; H. E. Treichler, Jr., '40; W. B. Barbour, '37; R. J. Arnold, '49.

KANSAS

All activities suspended.

MANILA

John R. Wagner, Jr., '40, President; Ernesto C. Bengzon, '21, Vice-President; M. M. Aycardo, Jr., '41, Secretary-Treasurer, 3rd Floor Soriano Bldg., Manila, P. I. Luncheon meetings second Saturday all even months of the year.

MONTANA

A. B. Martin, '23, President; M. R. Hoyt, Ex-'08, Vice-President; C. B. Hull, '09, Secretary, 854 W. Silver, Butte, Montana. Meetings upon call of Secretary.

NEW YORK

Russell J. Parker, '19, Rupert B. Lowe, '22, Co-Chairmen; Fred D. Kay, '21, Secretary-Treasurer. Room 2202, 120 Broadway, New York 5, N. Y. Telephone: Worth 2-6720. Monthly meetings. Next two: January 19, 1950; February 13, 1950, Cocktail party in honor of visiting "Miners" to be held at Statler Hotel, preceding the Smoker, A.I.M.E. Convention.

A meeting of the New York Section, Colorado School of Mines Alumni Association, was held at the Mining Club on the evening of December 8th, 1949.

The crowd started gathering early and by 6:40 P.M., dinner time, the following sat down:

Harry J. Wolf, '03; Donald Dyrenforth, '12; Alan Kissock, '12; Fred D. Kay, '21; G. F. Kaufmann, '21; Jack P. Bonardi, '21; Rupert B. Lowe, '22; A. K. Seeman, '22; Frank McKinless, '23; William Berry, '24; M. L. McCormack, '26; Arthur O'Toole, '26; Harold C. Harris, '32; Ben W. Geddes, '37; Al Tarbox, '37; Eugene E. Dawson, '38; Dick Buell, '41; David B. Mazer, '47.

On the previous Friday, December 2nd, 1949, some fifteen of the New York group got together for a luncheon to "Lec" Thomas, President of the Board of Trustees, for the purpose of discussing with "Lec" the scholastic rating of *Mines,* and the rating of the graduates of *Mines* in the mining world. There had been expressed to the secretary some little doubt as to the standing that we are attaining. The secretary gathered this meeting together in a hurry when he found that "Lec" was to be in New York.

Don Dyrenforth reported on this meeting and concluded by offering the following resolution:

RESOLVED, that the New York Section of the Colorado School of Mines Alumni Association express their confidence in the Board of Trustees, the President, Dr. Ben H. Parker, and the Administration of the Colorado School of Mines, in their having produced and their continuing to produce a graduate who has been and will be a leader in the fields of mining, metallurgy and petroleum.

The resolution offered by Don was passed unanimously.

"Buck" Kaufmann entertained us for about an hour with a group of Kodachrome slides of pictures taken on a geological trip into the Tibet area of China. Everybody enjoyed "Buck's" talk, along with the beautiful pictures, especially the three "strangers" who got into the series.

The next meeting will be held on January 19th, 1950, with the February meeting to be the cocktail party at the A.I.M.E. Convention.

NORTH CENTRAL TEXAS

E. J. Brook, '23, President; J. W. Peters, '38, Vice President; H. D. Thornton, '40, Secty.-Treas. (Ft. Worth) 506 Neil P. Anderson Bldg., Fort Worth, Texas, Telephone: 3-3058; Henry Rogatz, '26, Secty-Treas. (Dallas) 407 Southland Life Bldg., Dallas, Texas, Telephone: Riverside 4846. Four meetings during year, second Monday of month, February, May, September and November.

OKLAHOMA

Neil Whitmore, '29, President; George W. Reed, '35, Vice-President; Carl R. Holmgren, '38, Sec'y-Treas., 2612 East 13th St., Tulsa, Oklahoma. Luncheon meetings each and every Tuesday noon in the Hotel Tulsa Coffee Shop. Always glad to have fellow Miners when in Tulsa.

OKLAHOMA CITY

J. S. "Monty" Montgomery, '31, President; H. M. "Hugh" Rackets, '42, Vice President; M. O. "Shorty" Hegglund, '41, Secretary-Treasurer, c/o Stanolind Oil and Gas Co., First National Building, Oklahoma City, Okla. Meetings, first and third Thursdays of each month at the Oklahoma Club. Luncheon 12:00 Noon. All Mines Men are cordially invited to drop in.

PACIFIC NORTHWEST

A. R. Kesling, '40, President, 2915 Holgate, Seattle; Phone: PR-7392. W. I. Sedgely, '40, Secy-Treas., 6040-36th Ave., S. W. Seattle 6; Phone: AV-8641. Meetings upon call of Secretary.

PENNSYLVANIA-OHIO SECTION

William H. Sparr, '39, President; George G. Yeager, '40, Secretary, 3229 Circle Drive, Pittsburgh 27, Pa. Meetings upon call of officers.

SOUTHERN CALIFORNIA

John Biegel, '39, President; A. J. Heiser, '43, Vice President; C. J. Cerf, '41, Treasurer; Franklin S. Crane, '43, Secretary, c/o Oilwell Supply Co., 934 North Alameda St., Los Angeles. Telephone: MUtual 7311.
Scheduled meetings second Monday of each Quarter at Los Angeles Athletic Club, 431 West Seventh Street, Los Angeles, 6:30 P.M. Next meeting dates, April 10, July10, October 9, 1950, and Jan. 8, 1951. Phone Secretary for reservation.

A meeting of Southern California Section was held January 9, 1950 at 6:30 P.M. at the Los Angeles Athletic Club.

The meeting was called to order by President Brown. Committee reports were read and approved. The Nomination Committee presented the following names as candidates for officers for the current year:

President ..... John Biegel, '39
Vice President ..... Art Heiser, 43
Secretary ..... F. S. Crane, '43
Treasurer ..... Charlie Cerf, '41

No additional names were placed in nomination. A unanimous ballot was cast in favor of the above candidates.

The business meeting was adjourned and the speaker of the evening was introduced. Mr. Robert Simpson of the Pacific Telephone and Telegraph Company presented an unusually interesting program and demonstration on microwave transmission and its applications to the communications industry.

The meeting was attended by the following members:

H. A. Everest, '08; Sidney French, '08; H. C. Jennings, Guest; H. C. Armington, '07; H. J. Wallace, '04; Jordan Nathason, '36; John Biegel, '39; L. D. Wosk, '24; John Christopher, '25; Jack Ballagh, '10; R. F. White, '18; R. F. Rehtmeyer, '42; C. J. Cerf, '41; F. S. Crane, '43; Frank A. Brown, '21; John R. Slover; Stan Jackson, '36; Bill Beggs, '37; Henry E. King, '03; C. A. Spicer, Ex-'05; Ward Blackburn, '08; Frank A. Foley, '49; H. M. Deutsch, '29; Robert Bernstein, '42; Ralph G. Godfrey, '38; J. E. Warnecke; Gower Waters Ex-'09; W. R. Kilgore Ex-'08; J. P. Pinger; Sidney S. Small, '17; Russel H. Harris; Norman Whitmore, '26; E. J. Mayhew, '41; and E. F. Bladholm, '29.

ST. LOUIS

James E. O'Keefe, '37, President; Floyd M. Belleau, '23, Secretary-Treasurer, 955 Tuxedo Blvd., Webster Groves, Mo.

UTAH

H. J. Vander Veer, '30, President; Wallace W. Agey, '39, Secretary-Treasurer, 852 So. 19th East St., Salt Lake City 5, Utah.

WASHINGTON, D. C.

S. Power Warren, '13, President; Marcus G. Geiger, '37, Vice-President; Dale Kerstetter, '39, Secretary. Address, Bonifant Road, RFD No. 1, Silver Springs, Md. Phone: SH 7100, Exten. 209.
Scheduled evening meetings called for the third Thursday of every other month at the Continental Hotel, Washington, D. C. Special meetings arranged when warranted. Next scheduled meetings: December 15, 1949; February, 1950.

The regular bi-monthly meeting of the Washington, D. C. Section, Mines Alumni Association, was held 15 December 1949, with 15 members present.

We were glad to welcome into our section another *"Mines"* man, H. A. Stewart, '12, who is the new Director of the Oil and Gas Division, U. S. Department of the Interior.

A short film showing the Navy "Sofar" method of locating ditched aircraft at sea was shown by the secretary.

As the local section has no treasury, the vice president, M. G. Geiger, made a motion that a 25-cent charge be added to each meal so that a small working fund could be built up. The motion was seconded and passed.

The next meeting will be held on 16 February, 1950, at which time Warren Adams will be program chairman.

Those present for the 15 December meeting were:

S. G. Lasky, '22; H. D. Hoskins, '37; E. J. Ristedt, '09; T. C. Snedeker, '36; L. Otis, '14; W. Adams, '25; H. P. Coloney, '24; F. B. Hyder, '03; P. Webster, Ex-'94; J. A. Poulin, '21; H. A. Stewart, '12; James Boyd, '34; F. Johnson, '22; M. Geiger, '36; H. J. Joy, Jr., '25; D. D. Kerstetter, '39.

ALUMNI PRESIDENT'S MESSAGE

(Continued from page 33)

improvement of methods employed and the compiling of such records that have proven to be of great value. Much of the success of this important work can be credited to the efforts of members of this Committee. They will be given every encouragement.

There are eleven standing Committees. It is only by the combined effort of these Committees that the Association can expect to produce the greatest benefits for all "Mines" men. These Committees will be encouraged to plan for greater accomplishment.

Local Sections are recognized as an important part of the Alumni organization. Every effort will be made to bring about closer cooperation whereby greater mutual benefit will result. Your inquiries or suggestions will be welcome.

JAMES COLASANTI

AEC NEWS

(Continued from page 24)

The chain reaction in the nuclear fuel will generate heat, which will be carried by liquid metal to a heat exchanger, where water will be converted to steam. The steam, in turn, will operate turbine-generators producing electricity. It is planned that the West Milton installation will be used to investigate "breeding" of nuclear fuel. A "breeder" reactor will not only generate heat, but may also be able to produce as much or even more nuclear fuel than it uses in the chain reaction.

IN MEMORIAM

Harold H. Miller

of the class of '21, passed away suddenly on November 19, 1946, news of which only recently reached the Alumni office.

A native of Youngstown, Ohio, Mr. Miller entered *Mines* the fall of 1916, after graduation from high school. He was away from school for one year to serve with the U. S. Marines in World War I and returned, completing his work for degree of Engineer of Mines in 1921.

He entered the employ of the Youngstown Sheet and Tube Company upon his graduation and since then his experience had been mainly in the metallurgy of iron and steel, he also having been associated with Otis Steel Company at Cleveland, Ohio, and the Lackawanna Plant of Bethlehem Steel Company at Buffalo, N. Y.

Immediate survivors are his wife and four children, whose home address is Collins, N. Y.

Hugo Grautig

Ex-'16, assistant city engineer, Alhambra, California, died of a heart attack on December 5, 1949.

Mines Men who attended the services were his brother-in-law, R. M. Fullaway, '16; Sidney S. Small, '17; and Earl Jueck, formerly of Colorado School of Mines.

Brig. Gen. Dale D. Hinman

died at the U. S. Naval Hospital in Long Beach, California, December 26, 1949. He had attended a party on Christmas day where he was the life of the gathering but became ill that evening when he was taken to the hospital.

General Hinman graduated from *Mines* in 1915 and began his career in the U. S. Army when he volunteered his services in World War I. At the close of the war he continued in the army.

When in England during World War II he was at high altitude in an aeroplane when the oxygen supply cut off. He had heavy heart attacks and was unconscious for days. Later he was in hospitals and retired in 1944 with a serious heart condition. He then moved to Whittier, California, where he had since resided as a semi-invalid.

He is survived by his widow, Mrs. Elizabeth Hinman, and a son, Frank, both of Whittier; a daughter, Mrs. James F. Lancaster, of Philadelphia, Pa. and a stepson and stepdaughter, James Kirkpatrick and Betsy Kirkpatrick, of Whittier.

Services were held in Whittier with burial at Arlington National Cemetery, Arlington, Va.

George K. Kimball

passed away at his home in Idaho Springs, Colorado, January 3, 1950, where he had resided practically all the time since his graduation from *Mines* in 1892.

He began his mining experience while still a student, spending his summer vacations at mines in Colorado. Upon his graduation he went to Pioche, Nevada, and later to Pine Grove, Nevada, where he was employed in a cyanide mill.

Various mining activities occupied his time until 1900 when he and a partner opened up the Old Town mine in Russell Gulch, Colorado. He afterwards became general manager and part owner of the property which proved successful for a time but later, due to conditions beyond his control, operations did not prove profitable. It was the sole ambition of Mr. Kimball to have the property produce another fortune for it's owners.

He was always active in local affairs and served as mayor of Idaho Springs from 1909 to 1913. His organization affiliations were the local lodge of A. F. & A. M.; he became a Knight Templar and later a member of El Jebel Shrine.

Mr. Kimball was married in 1895 to Elizabeth Louise Blakie who died in 1932. He is survived by a daughter, Mrs. Margaret K. Mershon of Westminster, Colorado; a son, George Keith III of Palo Alto, Calif.; and a brother, Joseph S. Kimball (Mines '92) of Central City, Colo. Four grandchildren and two great- grandchildren also survive.

BOOK REVIEWS

(Continued from page 41)

ments of lectures and informative meetings and field trips sponsored by the Society, reports on the regular Society proceedings, and personal notes on the members.

In addition to these features, each issue generally contains an article of a technical or scientific nature dealing with some subject in the field of geology.

This issue contains Part Two of a Three-Part article entitled "The Search for Uranium," written by W. S. Savage of the Ontario Department of Mines.

Part Two, "Prospecting for Radioactive Minerals," is a concise, easy-to-understand description of the methods used in finding uranium. Technical terms and involved explanations are reduced to the bare minimum and the author sets forth in simple one, two, three fashion the methods of visual identification of uranium ores and of determination by radioactivity methods.

This latter category of discovery method contains a very good exposition on the use and care of the Geiger counter, which is a model of simplicity and clarity.

All in all, this bulletin reflects the interest and enthusiasm of the members of the Society, one of the more active geological societies in the country.

Operators of Concentrating Mills Treating Metallic Ores

Part 1 of "Milling Plants in Canada," Canadian Bureau of Mines, Mineral Resources Division, Ottawa, July 1949.

This publication provides a complete list of the mills in Canada which are concentrating metallic ores. The list is divided into sections according to the metals being concentrated. These sections are as follows: gold; copper-gold-silver; copper-zinc-gold-silver; nickel-copper; silver and silver-cobalt; silver-lead-zinc; mercury; molybdenum; tantalum; tungsten.

Given with the name of each company is its address, mill location, name of manager, daily capacity, date of first operation and type of process used.

Summary of Secondary Recovery Production Statistics and Estimated Water-Flood Reserves, Kansas, 1948

Compiled by Albert E. Sweeney, Jr., Director Secondary Recovery Division, Interstate Oil Compact Commission. Interstate Oil Compact Commission, Oklahoma City 5, Oklahoma, 1949.

This report, a joint project between agencies of the State of Kansas and the Interstate Oil Compact Commission contains a history of production from Eastern Kansas counties as well as statistics on production from all Kansas counties. In addition, tables summarizing the secondary recovery data on various Kansas counties are included. The production histories are presented graphically and nine maps of the producing areas of Eastern Kansas are included. Copies of this report may be obtained by writing the Interstate Oil Compact Commission, P. O. Box 3127, State Capitol, Oklahoma City 5, Okla.

TECHNICAL SOCIETIES

(Continued from page 37)

Interest" would be an appropriate theme for discussion at the meeting to be held in Biloxi, Miss., May 4, 5, and 6.

Members of standing committees for 1950 were appointed at this meeting. Except for a few changes, the committee members will remain the same as for 1949. The Executive Committee decided that, since several agencies and associations are summarizing production statistics, it would be an imposition upon the members of the Economics Advisory Committee and would not justify the time and expense consumed to ask them to duplicate this information. For this reason, it was voted to discontinue the work of the Economics Advisory Committee for this year.

The Executive Committee also discussed financial matters of the Commission and fixed the 1950 budget. Policies regarding any action to be taken up with the Congress now in session were discussed.

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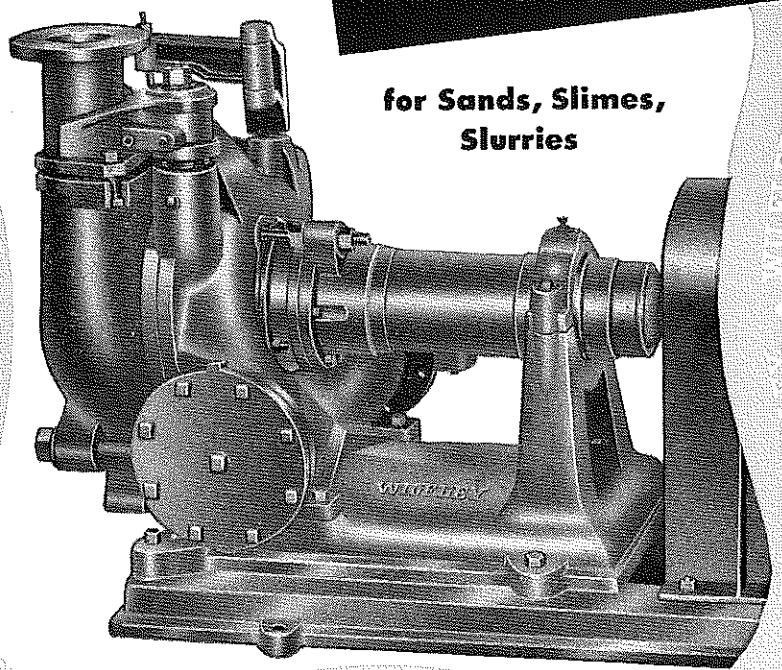

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