THE MINES MAGAZINE
AROUND THE WORLD WITH THE MINERAL INDUSTRIES

Featuring—

ALCOA PLANT IN TEXAS
AIR COMPRESSOR SELECTION
BELT CONVEYORS
SQUARE ROOTS BY AUTOMATIC CALCULATOR
RADIAL DIESEL ENGINE

AUGUST • 1950
PERSONAL NOTES
Barrie J. Goldberg, '98, Research Engineer for Kerr-McGee Oil Company, has
a change of residence address to 1409 N. W. 11th, Oklahoma City, Okla.
Donald D. Crowder, '75, who retired last January from his position with the Los
Angeles County Road Department, was honored last month. His home address is
1057 E. Pass Drive, Los Angeles, Calif.
Grace W. Hinds, '99, Metallurgist for
Gardner Denver Steel Mill, is addressed Box 103, Orem, Utah.
Richard K. Heath, '47, Geologist for
The California Company, has moved his
residence in New Orleans to 6569 Flora Street.
William J. Helmers, '93, has a change of
residence address to 471 Garland
Street, Denver. He is Metallurgist for
the Denver & Rio Grande Western Railroad.
Thomas R. Herr, '76, Outside Plant
Engineer for the Mountain States Tel. & Tel. Company, is addressed at his home,
200 Breesewood Street, Lakewood, Colorado.
Warren G. Jackson, '99, Field Engineer,
National Natural Gas Company, receives
mail at care of the company, M. & W. Tower Building, Dallas, Texas.
Robert Wm. Knapp, '40, Assistant
Works Manager, Vancouver Fabricating
Division, Aluminum Company of America, resides at 413 West 41st Street, Vancouver,
Washington.
Harry E. Lawrence, '48, was on vaca
dion last August to the early part of June, and
traveled to the Alaskan office. He is As sistant
Superintendent, Lead Mining Divi
tion, Goldsmith Brothers Smelting & Re
fining Company, in whose care he is ad
dressed, 1500 15th Street, Chicago, Ill.
Robert F. Leaver, '48, was also on vaca
dion last month, part of which he spent in
Denver. He is Mechanical Engineer for
Empire Star Mines Co., Ltd., with
mailing address Box 90, Grass Valley,
California.
Elsie E. Lewis, '42, Mining Engineer,
St. Joseph Lead Company, has moved from
Los Angeles to Flat River, Missouri, where
his new address is 1517 West 5th Street.
Norman F. Lovett, '42, has a change of
residence address to 907 South Race Street,
Denver. He is Production Manager for
Benjamin Moore & Company.
J. A. McCarty, '37, General Produc
tion Superintendent for Ashland Oil Re
finery Company, has been transferred from
Henderson, Kentucky, to Salem, Illinois. His address there is 24-A West
Main Street.
E. H. McPherson, '22, has been trans
ferred to the Brooksville Division, Na
tional Lead Company, from 51 Portland,
California, to Hot Springs, Arkansas.
George C. Newton, Engineer for the
Hot Springs Plant. He now lives at 210
Hot Springs Beach Street, Hot Springs.
Major Allen P. Kendall, '31, has been
relocated to the Denver office from Alaska,
his new address being 1912 ASU Instruction
Group, P. O. Box 93, Anchor Falls, Alaska.
Harry Y. Negami, '42, Computer, At
lantic Refining Company, is, as repre
sented, being addressed Box 1186, Bay City,
Texas.
Donald W. Rose, '46, received the Jaffa
Memorial Prize from the university of
Denver college of law on June 8.
The prize was established in honor of the late Joseph S. Jaffa, professor of
mining law at the university. The trophy is a bronze plaque which is placed
each year the name of the student winning.
(Continued on page 7)

THE MINES MAGAZINE • AUGUST, 1950
DOES NOT WANT TO MISS COPIES OF MINES MAGAZINE

FROM ROBERT G. BLAIR, 26, 1011 East 36th Street, Austin, Texas, N. Y. N. Y.

I am presently employed by Stanolind, doing geological research work.

RECEIVES DEGREE FROM UNIVERSITY OF TULSA

From Robert G. Blair, 26, 1011 East 36th St., Tulsa, Okla.

I completed my work at the University of Tulsa for a master's degree in geology and received my degree the last of May. My thesis was a study of the Madison limestone of the Wind River Basin, Wyoming, correlating surface sections of the Madison with a subsurface section by means of insoluble residues. While pursuing my graduate studies, I worked at the research laboratory of the Standard Oil and Gas Company. Since last June I have been engaged in full-time research with this company, confining my chores in spare time.

I am currently employed by Stanolind, doing geological research work.

GAINING EXPERIENCE AS TRAINEE-ENGINEER


Due to moving around the country, I am having quite a time catching up with Mines Magazines. My last address was Basile, La., and although it was properly changed at the post office, my mail is still being retained from time to time. A notice from them indicates that one magazine was held for postage due, so now I hope I have made them understand in my last letter to them, where and how to send my future mail.

I am a trainee-engineer with Continental in a wonderful experience with a good company.

The family and I are enjoying a pleasant summer in Pueblo City. In August we will go to Louisiana, at Ville Platte, and three months after that, I will be a full-fledged petroleum engineer in the organization. That will seem like Heaven when stationed permanently somewhere.

TRANSFERRED TO TEXAS

From George A. Kirch, 42, 1811 Hidalgo, Alpine, Texas.

I was transferred to the U. S. Department, International Boundary and Water Commission, Alpine, Texas, in late June to be supervising geologist under the project engineer, J. H. Hendren, 28, of a large geological investigation program underway along the Rio Grande river throughout the Big Bend country.

I had been project geologist for the Folsom Dam Project, Corps of Engineers, California, during the geological investigations and early construction phases.

My last regards to all.

IS BEING KEPT BUSY

From Paul Brayton, 43, 960 Security Avenue, Pueblo, Colorado.

What with buying a house in Pueblo, starting on a new job traveling for C. F. & I., building a garage onto the new house, I'm so far behind in my personal correspondence that I hardly know where to start.

What do you think of this series, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry. Obtainable with or without divided circle, all highly efficient general purpose levels, easy to use and convenient to carry.

Write for leaflet H.E. 32

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Denver 2, Colo.
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These contributions to " Mines " Placement Service assure its success and continued expansion. It makes it possible for " Mines " Men to improve their employments by systematically presenting their qualifications to the employer in the best suited to make use of their services. Your contribution now may insure your future advancement in the mining industry as other " Mines " Men who have the ability but not the contacts with the Placement Service. Everybody take a pride in watching this list grow.

(851) INSURANCE SALESMEN. An oil estab­ lishment desires the services of a well quali­ fied insurance salesman for their Denver office. He will be eligible to receive an annual bonus of around seven thousand dollars per year. (1144) INSTRUMENT ENGINEER. An oil company desires to employ a well-rounded instrument engineer in its instrument design department. He should have several years of experience and must be familiar with all types of direct and indirect methods of temperature measurement and control. (1134) PHYSICIAN. An oil company requires a well-qualified medical doctor and his wife. The position is in a city of between 200,000 and 500,000 in population. Salary around $7500 per year plus living allowance.

TECHNICAL MEN WANTED

These interested in any of the posi­ tions listed may make application through " Mines " Ex­ change, 3/2 Super Building, Denver 2, Colo.

(815) INSURANCE SALESMEN. An oil estab­ lishment desires the services of a well quali­ fied insurance salesman for their Denver office. He will be eligible to receive an annual bonus of around seven thousand dollars per year. (1144) INSTRUMENT ENGINEER. An oil company desires to employ a well-rounded instrument engineer in its instrument design department. He should have several years of experience and must be familiar with all types of direct and indirect methods of temperature measurement and control. (1134) PHYSICIAN. An oil company requires a well-qualified medical doctor and his wife. The position is in a city of between 200,000 and 500,000 in population. Salary around $7500 per year plus living allowance.

PERSONAL NOTES

(Continued from page 5)

The highest scholastic averages in the first two years of law work.

Fred P. Weible, '49, completed the first year of his degree from the University of Illinois and has qualified for the Bar examination. His address is in Denver, 954 S. Center St.

Charles R. Beck, '24, is on vacation in Denver the early part of July and will report to the Alumni office in the last week of July.

Douglas F. Watters, '41, President of the Mines Alumni Club, has removed his residence from Denver to Idaho Springs.

OTHER PRODUCTS

Masoneilan® Flowmeters and Switches; Mechanical Seals; Valves; Magnetic and Electrical Power and Instrument Supply. Complete Information on request. Company globals. 54 W. 39th Street, New York, N. Y. • Represented for Continental Europe.
Designed for maximum efficiency, the Stearns-Roger Improved Calcine Cooler handles large tonnages of hot material with a minimum of shell length, resulting in a corresponding saving in floor space.

The inside of the Improved Cooler shell is divided into three sections. Holes in the outer shell allow free access of water between each of these sections thereby approximately doubling the cooling surface provided by a cylindrical section.

For specifications write for the Calcine Cooler Bulletin.

- BUILDERS
- DESIGNERS
- MANUFACTURERS

For The Mining and Process Industries

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PERSONAL NOTES (Continued from page 7)

John E. Peabody, '48, has been promoted to Assistant Plant Metallurgist by the Phelps Dodge Refining Corporation and, at present, is being addressed at Venice, Texas.

Joseph Q. Berta, '41, has been advanced by the United States Steel Company to Assistant Superintendent of Mine Superintendent and is at present transferred from Superior to Belgrade, Wyoming.

Earl H. Rohger, '22, Manager, Employee Relations Department, St. Joseph Lead Company, is addressed Box 424, Reserve, Missouri.

William W. Burch, '46, resigned his position with the Linde Air Products Co. to become associated with the Bell Aircraft Corporation of Niagara Falls, N. Y. His home and mailing address is 250 Helen Avenue, Lockport, New York.

John T. Barrett, '46, is Shift Boss for the Goliath Company at Monticello, Utah.

Henry F. Cline, '42, Geologist for The California Company, has moved from New Orleans to Shreveport, Louisiana, where he receives mail.

John T. Crawford, '47, Vice President in Charge of Operations for North Western-Hanna Pool Company, has moved his residence to 1301 Florida Avenue, Apt. 6, Golden, Colorado. He is District Engineer for Frigidaire Engineered Products Company, 5026 South Thirty-second Street, Freeport, Texas, where he receives mail.

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James H. Derlinger came the latter part of May to become associated with the Linde Air Products Co. to work in the research laboratory. He is a native of Berne, Indiana, and recently was at the University of Chicago, where he received his education.

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Realizing that grinding efficiency of media is in direct ratio to density, an inventor once made a grinding ball with a lead center and a steel shell. It was fine-sounding theory, but commercially impractical for obvious reasons. At CF&I, research follows more reasonable lines. Our metallurgists and ore-dressing engineers, with long experience on grinding media, take into account the mill operators' problems, in working on improvements that will make CF&I forged steel balls still better.

For true efficiency, grinding balls must be dense, hard, and tough from surface to center, to hold their shape, last longer and grind more ore. For over 17 years, CF&I forged steel grinding balls have built a reputation for meeting these requirements. Their resistance to abrasion has provided operating economies in some of the world's highest capacity grinding sections. A CF&I ore-dressing engineer is at your service on any grinding media application.
ACCURATE SQUARE ROOTS USING A SLIDE RULE AND AUTOMATIC CALCULATOR

By JOHN S. SOUTHWORTH, '38
North Park, Calif.

There has not been enough study and publicity given to the best and most rapid method of extracting square roots using a slide rule and an automatic calculator. This article is a step in the right direction.

Assume that the square root of 54656.67848 is desired. With a slide rule and an automatic calculator available, the fastest method of obtaining the desired quantity is to average the most accurate square root value available from the use of the slide rule (in this case 233.576) with a quotient (in this case 233.756) obtained by dividing 54656.67848 by 234 on the automatic calculator. The average of 233.756 and 233.576 is 233.686 which shows in one simple calculation more decimal places than the number of significant figures in the original square root which compares very favorably with 233.7876782 which is the desired square root carried out to seven decimal places. It is, in the above example, four new decimal places rather than three which were picked up in the quotient from the calculator, the average would be 233.787, a result of amazing accuracy. However, experimentation has shown that it is usually best to pick up only as many new decimal places on each quotient as there were significant figures in the divisor used to obtain that quotient.

The accompanying Table I shows an interesting truth about this method of extracting square roots. In this demonstration of the original example, use of the slide rule has been dispensed with. Use of the automatic calculator alone has been used as the first "estimate" and the basic method being repeated in steps using each new average as the "estimate" for the next step until seven decimal places (nine significant figures and the ordinary limit of the machine on which the examples were run) has been reached.

Table I

<table>
<thead>
<tr>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Normal Estimates)</td>
<td>(Obviously Wrong)</td>
<td>(Guess)</td>
</tr>
<tr>
<td>Est.</td>
<td>233.576</td>
<td>233.756</td>
</tr>
<tr>
<td>Quot.</td>
<td>233.756</td>
<td>233.787</td>
</tr>
<tr>
<td>Av.</td>
<td>233.686</td>
<td>233.787 remains</td>
</tr>
<tr>
<td>Quot.</td>
<td>233.787564</td>
<td>233.787568</td>
</tr>
<tr>
<td>Av.</td>
<td>233.7876782</td>
<td>233.7876782</td>
</tr>
<tr>
<td>Quot.</td>
<td>233.7876782</td>
<td>233.7876782</td>
</tr>
<tr>
<td>Av.</td>
<td>233.7876782</td>
<td>233.7876782</td>
</tr>
</tbody>
</table>

Note that the final averages are identical.

In addition to its speed and accuracy, the big advantage of this method is that it requires no special tables or techniques. It may also be used to determine roots of higher order by increasing the number of divisional operations per step and-pro-rating the last quotient rather than just splitting it with the original square root.

The judicious use of the slide rule in solving square roots by this method obviates the use of an unsmarter guess and at least one division on the calculator to ordinarily give a sufficiently accurate root at the first estimate, the solution having been begun, through the use of the added estimate, at a point comparable to the result shown graphically in Figure 2. The final possible accuracy of the root obtained by this method is limited only by the order of accuracy of the original square.
is first crushed to a powder and then mixed, in large pres-
sure tanks, with a hot solution of caustic soda. The caustic
soda dissolves the aluminum hydroxide but not the impur-
ities. The solution is filtered and the impurities, collected
in the form of red mud, are discarded. High-grade bauxite
is desirable because the presence of silica as an impurity
in the bauxite causes loss of some alumina and soda in the
red mud.

The filtered solution is then pumped into great tanks.
As it slowly cools, pure aluminum hydroxide settles out in
the form of fine crystals. These crystals are washed with
water to remove soda and are then ready for the next step
in the process.

Cryolite

Cryolite is found in the natural cryolite fields of Texas. By
pulverizing and mixing the cryolite with the bauxite, the
alumina is dissolved in the molten cryolite in the reduction
cells so that aluminum is reduced. Cryolite serves to carry
electric current into the cell. The baked carbon paste is added
to the casing from the
pot shell. A carbon paste is added to the casing from the

The oxide may be reduced by the electric current. Cryolite
through the molten solution decomposes the alumina into
its component parts, aluminum and oxygen. The oxygen
combines with the carbon anode and the aluminum, bring
heavier than the cryolite, remains at the bottom of the pot
where it is liberated. As the molten oxide is drawn down
and poured into pig form.

POWER GENERATION

The power for the production of aluminum at Point Com-
fort has its source in the natural gas fields of Texas. By
means of generators driven by internal combustion engines,
the gas is converted into the electric power required to make
aluminum. It takes about ten kilowatt-hours of electricity
to produce one pound of the metal.

One of three engine rooms, each containing 40 engines. Gener-
ators and auxiliary equipment are located on lower floor.

Two 8 in. gas lines connect each of the four pot rooms to
each of three manufacturers: Elliott Company, General

Each engine generates 1000 kw (300) at 667 volts and
125 kva (AC) at 425 volts and 24 cycles. The AC power is fed to
serving the engine electrical load. This elimi-
nates the need for a common auxiliary power system and
possibility of a total station interruption.

The generator is used as a motor in starting the engine.

Auxiliary Equipment

Each engine-generator unit has its own control panel,
which includes engine protection equipment. Protective
equipment causes the engine to shut off automatically for
such reasons as low oil pressure, high water temperature,
loss of auxiliary power. In addition to unit control panels,
each powerhouse has a master control room with recording and
indicating equipment registering the operation of each of the forty
electric power units and also the thrust bearing which sup-
ports the load of the crankshaft. The heavy, bolted cover
contains the upper crankshaft main bearing bushing. The
master gear, a stationary gear bolted to the cover, two pinions
and rotating weights. The eleven connecting rods are
attached to the master gear by means of knuckle pins
mounted in bronze bushed bearings. The master gear rotates
instead of rotating. There is no master connecting rod, com-
monly associated with radial type engines.

For more details on engine, see Page 27.

When set up for gas burning, the engine operates on
reduced compression, with spark ignition. Natural gas is
admitted by cage mounted gas valves. The valves are oper-
ated by a cam on the crankshaft and are so located that gas
is admitted to the path of incoming scavenging air. This
approaches 95 per cent of the effective work of the fuel. A
valve inserted in the gas line and controlled by a governor
ventures the amount of gas delivered to the cylinders according
to the load on the engine.

Generators

The electric generators are located in the lower level of
the power houses and are joined to the engines by direct
 coupling. Each engine-generator unit, with its auxiliaries,
operates independently. Forty generators were supplied by
each of three manufacturers: Elliott Company, General

Each generator produces 1000 kw (300) at 667 volts and
125 kva (AC) at 425 volts and 24 cycles. The AC power is fed to
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possibility of a total station interruption.

The generator is used as a motor in starting the engine.
Combustion oil and water, engine coolers were built by The Trane Company of LaCrosse, Wisconsin. Heat exchangers for the system are approximately 15 x 115 x 3 ft. in size. The exchangers are all-aluminum in construction except for cast iron headers. Alclad aluminum alloy 22 is used for both tubing and fin stock. The tubes are arranged in banks of three with the water tubes to the front of the oil tubes. An 84 in. diameter heat exchanger fan, having six adjustable blades, is driven by a 2-speed, 2,500 rpm, motor. Oil and water circulating pumps are driven by a common 15 h.p. motor 12,000 cu.ft./min. Along the wall behind each generator was organized for the purpose of operating the pipe line cut free and the pipe was allowed to sink. The system supplies the 30,000,000 cu.ft. daily requirement. The main underwater line, in Lavaca and Matagorda Bays, consists of approximately 14 miles of 8 in. pipe, about 9 miles of 4 in. pipe, and the rest of the system. One half of this aluminum line was left bare and the other half was wrapped in the usual way. About 9 miles of 4 in. and 6 in. pipe are used for the off-shore work.

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The two-stage air compressor has definite advantages in its overall efficiency. The volumetric efficiency averages about 85% while it only takes an average of 1.8 HP to compress 100 cubic feet. These figures with the single stage compressor are approximately 250 degrees F. The only disadvantage of the two-stage compressors is the higher cost compared to that of the single stage compressors.

Cost of Compressed Air

Before final selection as to the type of air compressor is made, consider the differences that are given to the cost of compressing air.

Although air cooled compressors are normally two-stage and their volumetric efficiency is around 85%, the HP per 100 C.F.M. is equal to or lower than that of the water cooled single stage compressor. Accordingly, for installations where there is the need for the installation of compressing air by air cooled units can be considered equal to or slightly higher than that of the water cooled single stage compressor.

For this reason, the selection of the cost of operating the equipment, based on dollars per 1000 cubic feet of air compressed is known. It should be remembered, however, that compressed air for instrument control, air operated machinery, and for some other purposes is the most economical with regard to energy cost.

APPLICATION

Today compressed air is almost essential to the operation of a plant or industry. The average industrial plant, practically every plant has an air compressor. The use of air per horsepower-hour is piped throughout the plant along with water and steam. In spite of the low cost of the demand or the price of an air compressor, it is practically useless without the use of air and for its ever increasing uses, this consideration must be given to the cost of compressing air.

It should never be hard to decide between the AIR AND WATER COOLED water cooled compressors. It should run eight to more hours a day for more than four years, a person can practically never run a water cooled compressor if water is available. The short life and high maintenance cost will be the deciding factor.

In choosing between the single and two stage air compressors, thought will have to be given to this factor. In sites running from 15 to 20 HP, there are no two stage compressors, so only the single stage compressor can be purchased. However, from 25 HP on and upwards both the single stage and two stage compressors are built. Above 100 HP the two stage air compressor is manufactured.

The hardest decision to make is on the cost of gas compression. There is about 265 degrees F. per 100 cubic feet. This still allows for a small gas temperature of an order of magnitude cost in the two stage compressor. A thing to be remembered is that, in the single stage air compressors it is less efficient and only 85% of the energy cost is to take an overall average the air motor must not be damaged when this is done. Unlike steam, air does not lose its energy in transmission. It is safe, and its cost of installation and maintenance is much lower than that of the power line. It is cool and will not cause fire hazard. There are many things which can be done with air that cannot be done with steam or electricity, steam or hydraulic power.

Use of compressed air falls into three general categories:

1. There are the air cooled compressors.
2. The air cooled compressors are the most often used.
3. The air cooled compressors are the most economical.

The angle of compressed air so much in demand? The primary advantages of compressed air over electricity and steam are these: It is flexible; it is not limited by the amount of air that can be done with air that cannot be done with steam or electricity, steam or hydraulic power.

When this is obtained then the operating cost for either a single stage or two stage air compressor can be accurately figured. This will have to be done by actually running the number of hours a day the compressor will operate, the amount of air charged off on the lowest scale. However, the only fair way to record the energy cost is to take an overall average cost of the plant and charge that to the compressor.

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SPECIAL APPLICATIONS

Special applications of compressed air are used in the manufacture, the processing, the operation, the transportation, and the distribution of non-lubricated or carbon ring compressor in the process. Air is very economical in its work. It is based on the fact that the industrial plant.

It should never be hard to decide between the AIR AND WATER COOLED water cooled compressors. It should run eight to more hours a day for more than four years, a person can practically never run a water cooled compressor if water is available. The short life and high maintenance cost will be the deciding factor.

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ter, then it is known that leaks do occur. To find these leaks, follow the air line through the plant. Listen for the sound of escaping air. Hold your hand over the end of the nozzles and check any other check valves with open connections.

Leaks found this way should be corrected as soon as possible. Some of them may have been present because the plant is in operation but a lot of the leaks are due to poor workmanship over the week-end or at night. A good time to make this type of check is right after the plant is started up. This will give plenty of time to find and correct the leaks in the entire pipe line before opening the steam or water flows.

Even after this type of check is made and the leaks corrected, there will probably be a lot of small ones which cannot be heard or felt. To find them, the operator can run his hand over the end of the nozzles and listen for the sound of escaping air. In certain types of jobs the escaping air will be heard by the worker. To solve this problem one plant engineer was told that probably 20% of his compressed air was being lost through the nozzles. He also pointed out that there were many small leaks which cannot be heard or felt. In fact, the whole idea for super-conveyor lines may have been born with the construction of these dams.

Shuts Conveyors

The longest conveyor system ever operated was constructed at Shuts, on the Sacramento River in California, where a ten mile belt conveyor system was able to handle the 12,000,000 tons of sand and gravel needed to build the dam. The conveyor system was constructed entirely in the pressure tunnel of the dam. To handle the large amounts of sand and gravel being pumped into the dam, an orderly check must be made to prevent nozzle or bunker clogging. This amounted to 128 cubic feet per minute of air and with the exception of the noon hour at time and a half, it would cost them about $21.00. In less than two weeks the conveyor was paying for itself.

One of the most frequent means of leaks is caused by poor lubricating practices. In the summer time a constant check must be made to prevent this from occurring. In the case of air coolers, some manufacturers recommend an air valve and allowing the expanding air to blow over them, they have cut down their oil consumption to a minimum. Some of the more common places where air is wasted are as follows: Air is lost at nozzles and nozzles in which an air valve and allowing the expanding air to blow over them. They are also used so the operator can readily determine the position of his installation was made by the manufacturer's representative.

In the morning while the plant was operating the compressors could only be operated at 1,000 cubic feet per minute and the sound of escaping air would indicate the air filters were being used up. Operating the compressors was found to be a three day operation to do this work as both operating compressors were operating continuously.

In the morning a trip around the plant was made to look over the pipe line to find out how the air was escaping. In one case the air pressure paid for labor is more than double that of a few years ago. At the same time, power cost per cubic foot of oil was about $0.025. This shows how great has been the change in the oil industry.

To illustrate materials handling much can be accomplished through examples of belt conveyors in action. I would like to explain what I had in mind when I talked about the Conveyorization of the mines. I would like to point out that the conveyor system is a very eifective cooling sj^tem. It is a rather dull and as far as he could see, the production was actually less than he would have expected. This four hour, four is the only way that maintenance work can be done.

An example of how inefficient this can be was found in a Chicago plant. There were 75 HP single stage compressors—one being a single stage compressor of 10 years older than the other. Last winter the plant manager became alarmed because the air pressure was falling off and as far as he could see, the production was actually less than he would have expected. This four hour, four is the only way that maintenance work can be done.

Knowing that single stage compressed air costs about $0.64 per 1000 cubic feet, it was shown that leaks in the air line could be much too costly for a railroad to attempt. However, the operation is continuous. Grain is pulled up from the ships on belts and bushels an hour. Often the conveyor is used in conjunction with other conveyors to handle a large volume of materials. In one instance, Marine Electric began construction work on a shipload of 458,000 bushels of wheat at a rate of 650 tons of wheat an hour.

A second feature of the conveyor is the principal excavation at a rate of 4000 tons an hour. Had this operation been attempted with the usual mining equipment, it would have required a super-highway some three miles long, with trucks operating continuously about a hundred feet apart.

Bull Shads Dam

As a result of the successful and cost saving experiences, it was natural that the same system be used in the construction of the Bull Shads dam in Arkansas. Today a seven-mile conveyor system is in operation. It is—rolling steadily at the job of moving about 4,800,000 tons of aggregate materials a day. For more than 30 years the techniques of the conveyor system have been developed. In 1937 the President of the Shuts-Minta Irrigation District was quoted as saying, "the conveyor system in the Shuts area "has great potentialities." Today, 20 years later, as a result of the conveyor system, the district is moving from a water-bound to a conveyor-bound operation.

Coal Mining

As long as twenty-five years ago, a large coal company in Pennsylvania replaced its six-mile underground railroad with a belt conveyor system. Today, a much larger company delivers upwards of 1800 tons of coal an hour from the top of the mountain, to waiting barges on the Monongahela River. This was more than twice as much coal as the conveyor systems of 1931. The conveyor systems handling this coal were built to conform to the conditions and the mode of transportation. A similar installation not only for its single conveyor but also for a number of conveyors running into operation shortly near Marshalltown, Iowa.

On the coast of Southern Chile a remarkable conveyor installation is now taking place in a coal mine some three hundred feet under the bed of the ocean. This again is an example of how conveyor systems can be used so the operator can readily determine the position of his installation was made by the manufacturer's representative.

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and Bettinger, use one or two main lines of conveying systems have one or two main selling points—providing the most challenge and will continue to come forth in those industries where conveyors are already being used.

Riverbelt Station

Riverbelt conveyor systems offer the lowest conveyor installation costs. As tonnage rises, the cost-per-ton drops. A Riverbelt conveyor is carrying maximum or minimum loads, it requires the same minimum equipment. Its installation, operation, and maintenance costs are lower than any other type of overland conveyor.

It can travel in a straight line, fol-

owing contours of any terrain, and to grades as high as 34 per cent. A framework of structural steel or timbers (if needed) is built over the conveyors carried to complete the framework so that the material moves through the plant at a year-round schedule.

Running straight toward its object, over hills and through valleys, the long two-belt system will be encased in its own metal cylinder and elevated on twenty feet from ground level. Ingenious design at the junction points of separate flights permits the round belt conveyor to climb if necessary to dip down again. Ingenious design at the point of one area to the other.

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It can travel in a straight line, following contours of any terrain, and to grades as high as 34 per cent. A framework of structural steel or timbers (if needed) is built over the conveyors carried to complete the framework so that the material moves through the plant at a year-round schedule.

Walking straight toward its object, over hills and through valleys, the long two-belt system will be encased in its own metal cylinder and elevated on twenty feet from ground level. Ingenious design at the junction points of separate flights permits the round belt conveyor to climb if necessary to dip down again. Ingenious design at the point of one area to the other.

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short, overall handling costs would come down. One of the problems that always must be faced by the modern port designer is the space required for unloading ships. Today, double that capacity in the future. Plans have been announced for the construction of adequate docking and loading facilities in Liberia to insure the free handling of freight. The ore will be loaded on railroad cars at the mine by conveyors and delivered to the St. Lawrence River where a conveyorized port installation could speed up the coal bound for Buffalo and the West Coast.

Perhaps even more important than the iron in the ore is that it is being shipped in the form of pellets. Rich iron ore deposits in two other parts of the world have been noted in recent years. Recent discoveries of high grade iron ore, the Mesabi range in Minnesota, and the Superior district in the Lake Superior area have been noted. These are apparently uneconomic to develop at present. However, the ore is well suited for use in the manufacture of steel. The ore is produced in lumps of various sizes, which are then ground and upgraded to a high grade ore. The ore is then shipped to the steel mills in the form of pellets. These pellets are produced by a process called agglomeration, in which the ore is mixed with water and then formed into small pellets. The pellets are then dried and sintered to form a high-grade ore suitable for use in steelmaking.

Regarding the rail system, it is important to note that the ore is shipped to the steel mills by rail. The ore is loaded onto railroad cars at the mine by conveyors and then transported to the steel mills by rail. This rail system is an important part of the mining operation, as it allows the ore to be transported efficiently from the mine to the steel mills. The ore is delivered to the steel mills in long, narrow, rectangular boxes, which are called grain boxes. These boxes are loaded onto railroad cars at the mine and transported to the steel mills by rail. The ore is then unloaded from the railroad cars and transferred to the steel mill by conveyors. The ore is then fed into the steel mill by conveyors, where it is used to make steel.
American Mining Congress plans convention
August 28-31, 1950

Members of Congress, high Government officials, and leading men of the mining industry will participate in an important series of round-table discussions on mining. The subjects to be discussed include national security, atomic energy regulations, and Federal taxation, among others. Public opinion will be represented.

The convention will be held Monday noon, August 28, with formal sessions at Bingham, Tooele, Tintic-Eureka, and Salt Lake City, and will be held at the Utah State Fair Grounds.

Equipment news
Nordberg Radial Engine (740)

The four-stroke, four-cylinder, single line of internal combustion engines built by Nordberg Manufacturing Company, Minneapolis 7, Minnesota, is a 14 x 14" radial engine which is built as an oil-burning Diesel engine, as a spark-ignition gasoline engine, or as a combination of the two. The engine is of the air-cooled type, and is designed to deliver 50 HP at 1400 RPM.

Special luncheon will be arranged for "mines" men during convention

The trip will start from Salt Lake City and be maintained and both of these are of the bushing type. All bearings are of the bushing type. All bearings are of the bushing type.

The special sessions devoted to production problems will be participated in by building operating personnel from mines and smelters, in the United Kingdom, and in Canada. The sustained effort of the industry in many areas of production and service to the mining community will be given serious consideration by those in attendance. Among the major subjects to be discussed at these sessions are the working of the mining district, the development of the mining district, the development of the mining district, and the development of the mining district.

The special round-table conferences will be held on August 31 for discussion of mine operation and safety problems. Special round-table conferences will be held on August 31 for discussion of mine operation and safety problems. Special round-table conferences will be held on August 31 for discussion of mine operation and safety problems.

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Wemco Introduces Two-Compartment Drum Separator (744)

An important, completely new drum separator, designed to reduce the cost of multiple stage heavy-media separation, has been announced by Wemco Engineering Works, Schenectady, New York. This separator greatly reduces the equipment needed to produce a middling product from a heavy liquids separation process, which is used to separate iron ores, Other ores and minerals can also be handled. It is available in three time ranges: .06- to 100 feet, 10 to 280 feet, and 280 to 10,000 feet. Continuous operation can be expected, it was said. Publication, GEA-515 contains additional information on G-E electronic timer.

New Electronic Timer

Announced by G-E (746)

A new, compact electronic timer which provides automatic control of operation, limit, speed, and reliability of operation, low maintenance, and simplicity in servicing. It is available in three ranges: 1-1/2 seconds, 1-1/2 to 12 seconds, and 6-120 seconds. Some applications of the new timer: (1) operations timing to the control duration of such processes as painting, washing, phosphating, electropolishing, etc; (2) stop-conveyer control, to stop conveyor belts if material piles up; and (3) production machinery timers, to operate machinery in combination to control operation of a variety of mechanical machines, resurfacing machines, commercial power and control systems, lifts and hoists, etc. It is powered by a self-contained single-phase 230-volt a-c motor. It is self-powered and can be in series with other G-E timers.

New Primary Feeder for Extra Heavy Duty (746)

Now available in 6-3/4" width and is designed to handle up to 60 ft per hr in the Pioneer Engineering Works, Minneapolis, Minnesota. For primary line-offer working parts such as drive sprocket and supporting structure are continuous. Patented features include interlocking eccentric plates on the pan groove, and clean out welds in the pan to make it easier to remove spillage. These plates, which are notched and overlapping, are spaced at 15" pitch, are one inch thick at the smallest section, and weigh close to 1000 pounds each.

Hydraulic Fluid for Mining Equipment (747)

A new hydraulic fluid, also said to have high lubricity, has been announced by Diamond Chemical Company, St. Louis, Mo. In comparison with the fluid, designated as OS-16, Charles B. Sumner, assistant general manager of the company's Organic Chemicals Division, found that the product that had been thoroughly field-tested in hydraulically operated mining equipment, was widely used by operators of small and medium size mining companies. It is said that OS-16 had proven eminently satisfactory under every operating condition imposed on it. The tests were accepted as a complete demonstration of its suitability.

In the tests, a coal-cutting machine was operated on a 24-hour, three-day week in underground mining services. Hydraulic systems were operated for 12 months with no lubrication. Fluids for pumps or other moving parts in contact with os-16 are not recommended.

Improved Foundry Goggles (748)

American Optical Company, Bridgeport, Marinette, announced that its new line of goggles, to the No. 36, and the No. 30, will now be supplied with a rugged reinforced glass frame, proved strong enough for the heaviest testing to be superior to any other glasses made. In addition, the glass frame was improved to increase the safety factor. These glasses are made of a high quality glass, and provide a better fit to the face. The new glasses are perforated with a large number of holes, to prevent the glasses from becoming too hot. In the tests, they were found to be more comfortable to wear, with less chance of fogging up. They were found to be superior to any other glasses made.

Supporting the pans and bowl are three east cast manganese steel rollers keyed to the main shaft, and which have been designed for special alloy bearings. These bearings are mounted on removable pedestal bearings, with deep longitudinal bearings on the side and shafts that are not located at the ends. Return rollers and a screw take-up are used to drive the pans. For further information, write Pioneer Engineering Works, Minneapolis, Minnesota.

A newly created Mineral Testing Department has been organized to investigate mineral engineering problems involving: heavy liquid testing, heavy liquid separation, flotation, gravity concentration, amalgamation, scrubbing, agitation and washing operations, wear classification problems, determining the amount of material previously examined with the mineral engineering division of the company. Such problems will cover such industries as: iron ore, lead, zinc, copper, and gold, silver and base metal smelting, and gold and silver refining. There will be no grading characteristic, classification, and examination, and others. Each investigation includes the presentation of a completely detailed mineralogical report with recommendations thereof to be used as a basis for commercial plant design. Horse killed, possibly in horse slaughterhouse.

Crane Co., Makes Personnel Change

Joseph E. Bradbury has been promoted to Manager of the Valve & Fitting Department, Crane Co., Chicago, Illinois. Mr. Bradbury is well qualified for this position having been with the Company since 1927. It is of the open (dripproof) type, and head and tail shafts are also mounted. Efficient cooling is provided by a single large-diameter cast-iron worked-up with the electronic device, engineers said, Publication, GEA-5255 contains additional information on G-E electronic timer.

Flexible Steel Lacing Co. Appoints New England Representative

Flexible Steel Lacing Co., 449 Lenthall Street, Bridgeport, Conn., announces the appointment of Lester S. Coleman, New England State Representative. Mr. Coleman had formerly associated with a New England mill supply distributor. He makes his home in New York City.

Modular Striping Operation to be Displayed by Link-Belt Speeder at Metal Mining Show, Salt Lake City, Aug. 28-31, 1950

A fully operating 1") scale model of a Link-Belt Speeder Shovel-Bucket-Broader, will be supplemented with a backwall display to include transparency and color enlargements of Link-Belt Speeder Shovel-Bucket-Broader on the job.

Statement of Condition

THE CENTRAL BANK & TRUST COMPANY

Denver, Colorado

AT THE CLOSE OF BUSINESS JUNE 30, 1950

Assets

Looms and Discounts 15,421,232
FMIA Loans, United States Guaranteed 7,544,599
Real Estate Owned (Future Bank Stock) 75,000
Safe Deposit Vault Deposits 197,207
Stock in Federal Reserve Bank 4,000
Surplus 17,411.60
U. S. Government Bonds 45,115.50
Other Bonds and Securities 11,917,375
Cash and Due from Banks 14,998,235
10,793,855.93
Total 45,213,440.48

Liabilities

Capital Stock 1,000,000.00
Surplus 1,000,000.00
Unpaid Profits and Unallocated Reserves 345,518.76
1,944,288.78
Reserve for Dividends, Etc. 3,625.70
Reserved for Interest, Taxes, etc. 136,625.86
Reserve for Dividends Payable for July 5, 1949 347,675.32
Income Collected, Undistributed 47,122.75
Other Liabilities 15,000.00
Deposits 1,972,544.61

Total Resources June 30, 1949 17,202,788.41

Total Resources June 30, 1944 44,621,667.21

Total 44,621,667.21
Allis-Chalmers Five-Year UAW-CIO. The contract is subject to a five-year agreement between the Allis-Chalmers Manufacturing Company and E. H. Bugbee.

L. O. Millard, H. V. Eastling, J. F. Strott, D. E. Davidson, and John F. Kelly will be Vice-Presidents.

The backwall display follows this theme which Allis-Chalmers has available for minerals' and ore exploration. The company's well known house magazine, The Mines, has been strengthened by the appointment of R. E. Bansemer to the Research & Testing Department has been established at The Mines, 1001 South Fifteenth St., Pittsburgh, Pa., containing 1(0 pages illustrating and describing research power developments, industrial applications, production equipment, cement, lime and chemical plants. Illustrations in research power developments, industrial applications, production equipment, cement, lime and chemical plants.

(Continued on page 44)

The aerial method is especially useful in the rocks underlying the sediments. The basement structures, and other aspects of the ores and rocks, are shown new applications of Gates Vulco Eopes centrifugal force. Much information is contained in some of the natural gas pipe lines in the various industries of short illustrated articles descriptive of methods in research power developments, industrial applications, production equipment, cement, lime and chemical plants. Illustrations and drawings of auxiliary equipment are also included.

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OFFICERS OF ALUMNI ASSOCIATION

JAMES COLASANTI, '35
President
A. GEORGE SCHADE, '40
Vice-President
W. L. HANCOCK, '35
Secretary
DONALD J. DRINKWATER, '42
Asst. Secretary
WILFRED FULLERTON, '34
Treasurer
ROBERT J. MCMAICH, '39
Executive Manager

Alumni Council Meetings

The regular meeting of the Executive Committee of the Colorado School of Mines Alumni Association was held in the Alumni office on Monday, July 17, 1950.

The meeting was called to order at 7:45 P.M. by President Colasanti. Roll Call

Members present: James Colasanti, President; Carl I. Dismant, Robert J. McGlone, Committee chairman. Addition Manning, Roy Schade, Harry McMichael, Edwin White, Herbert Hecht, Executive Manager, Frank C. Bowman. Members absent: George Setzer, Vice President, Edward S. Martin, Malcolm E. Collier, Treasurer; Harry Mathews, Committee chairman.

Minutes of the previous meeting, June 19, 1950, were read and approved. President Colasanti called for the Treasurer's report. The Treasurer's report was read and approved. Treasurer's report and the reports of all committees, as follows: Treasurer's Report

Mr. Bowman reported for Mr. Collier. The status of the Association is about the same, financially, as it was at this time in 1949. For the 50% budget period 53% of the budgeted income has been earned and 45.5% of the allotted expenditures have been spent. Receipts for subscriptions were down somewhat in June but the yearly total is up.

Moved by Mr. McGlone the report be accepted; seconded by Mr. Schade; passed.

Executive Committee

Mr. Schade reported June receipts of $100,30, bringing a balance as of June 30, 1950, of $2205.63. During June the Plantume fund showed receipts of $12,342 and expenditures of $592,000.

Moved by Mr. McGlone the report be accepted; seconded by Mr. Schade; passed.

Alumni Endowment Committee

Mr. Schade reported June receipts of $100,30, bringing a balance as of June 30, 1950, of $2205.63. During June the Plantume fund showed receipts of $12,342 and expenditures of $592,000.

Moved by Mr. McGlone the report be accepted; seconded by Mr. Schade; passed.

Athletic Committee

Mr. McGlone reported that as of June 30, 1950, the Alumni Loan Fund showed a balance of $918.15 in the checking account, and outstanding loans amounted to $950.00.

Moved by Mr. Dismant the report be accepted; seconded by Mr. McGlone; passed.

Alumni Endowment Committee

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Moved by Mr. Dismant the report be accepted; seconded by Mr. McGlone; passed.

Capability Exchange Committee

Mr. McMichael reported there were still more calls for men than there are men available. Further study will be made on the proposed employment bulletin to determine if the activity should be carried on.

Moved by Mr. Dismant the report be accepted; seconded by Mr. McGlone; passed.

Recruitment Committee

Mr. Bowman reported for Mr. Setter. On June 1, 1950, there were 192 men on the active list, 29 men available, 90 associates members in college, 74 college members, and 90 associate members in college. During the June 30 active annual dues were paid and 2 associate members.

Moved by Mr. Dismant the report be accepted; seconded by Mr. McGlone; passed.

Nominations Committee

Mr. McGlone recommended for Mr. Parker. The following nominations for officers for the year 1951 were presented:

President—

(Continued on page 36)
ARIZONA
Two meetings in season, second Saturday in April and October, at Officers’ Club, 90th, by
Vice-President, C. A. Davis, 27, Phoenix. In season, by
W. W. Jones, 18, Supervisor, Phoenix.
BAGUIO
Frank E. Deluca, 25, President; Luther V.
Loesch, 34, Secretary. Meetings upon call of secretary.
BARTLESVILLE
Burt R. Kramer, 32, President; John W.
Bartletts, 31, Secretary. Luncheon meetings every Friday
morning at the Bartletts Hotel Coffee Shop.
BAY CITIES
Robert J. Bailey, 40, President; John W.
Fisher, 39, Vice-President; C. J. Cerf, 41, Secretary.
Meetings upon call of secretary. Visitors please contact
President, c/o Standard Oil Co. (Ind.), Telephone: 
1-2517, Fort Worth. 
BAY CITIES-PENNSYLVANIA-OHIO
Hubert Lipson, 47, President; Claude Jenkins, 52, 
Vice-President; John B. Beville, 47, Secretary.
Meetings every Tuesday at Noon, Tenth Floor of 
the Texas Hotel, Fort Worth, Texas.

BAY CITIES-PACIFIC NORTHWEST
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fears is an important part of the book. Many types and varieties of engine failures and operating conditions are discussed together with causes and remedies. A large portion of the book is devoted to the application of motor oils and their fuels is an important part of the book. Valuable information about the application of motor oils and their operating conditions are discussed briefly. Throughout the book many illustrations and tables are included to facilitate understanding and assimilation of the material. Quality colored charts are thoroughly explained and their use is demonstrated. Annotation and interpretation is explained as an aid in understanding and application of problems at hand.

Quality Control Division, General Electric

Throughout the book many illustrations are included to aid in understanding and assimilation of the material. Quality colored charts are thoroughly explained and their use is demonstrated. Annotation and interpretation is explained as an aid in understanding and application of problems at hand.

It has been decided by the editors to list the publications in alphabetical order, so that they may be of aid to those who are interested in the subject. The following is an index to the publications:

Index to Wall Samples

The Quien Sabe quadrangle, located in the eastern part of the State of Colorado, includes samples from nearly 30,000 wells in the Cordillera of Colorado, and is the subject of the present paper. The Quien Sabe quadrangle is a large portion of the book devoted to the study of the geology of the area.

Geology of the Quien Sabe Quadrangle, California, and Quien Sabe Deposits of the Steepy District, California


The Quien Sabe quadrangle includes samples from nearly 30,000 wells in the Cordillera of Colorado, and is the subject of the present paper. The Quien Sabe quadrangle is a large portion of the book devoted to the study of the geology of the area.

Bucklin, California, and Quien Sabe Deposits of the Steepy District, California

Bulletin 185, 1949, by Robert B. Anderson, President, Texas Mid-Continent Oil and Gas Association, 35 pages. Includes geological maps in color.

The Quien Sabe quadrangle includes samples from nearly 30,000 wells in the Cordillera of Colorado, and is the subject of the present paper. The Quien Sabe quadrangle is a large portion of the book devoted to the study of the geology of the area.

By Dan E. Feray and Jasper L. Starnes, California State Division of Mines, San Francisco, 245 pages, 11 maps, and 114 figures. The Quien Sabe quadrangle includes samples from nearly 30,000 wells in the Cordillera of Colorado, and is the subject of the present paper. The Quien Sabe quadrangle is a large portion of the book devoted to the study of the geology of the area.
PROGRESS BY BELT CONVEYORS

(Continued from page 23)

it to the elevators that automatically discharge it to any of the lower cargo decks. In unloading the ship, the same flexible system saves a similar amount of time and money by reversing the operation.

We believe this conveyor system as it is widely adopted, will go far toward solving the many problems and circular problems of packaged cargo.

Future of Conveyor Industry

The future of the conveyor industry is, I feel, already mapped out. We know what the problem is, we know how it can be solved; we know what achievements we can accomplish; we know what difficulties and hindrances to success must be overcome.

Some of these advances will be made in belt conveyors. Belts of half their present width and twice their present thickness will cut down on installation costs, take up less space, and, by using smaller parts, bring our operating expenses down.

Already we have high tension belts reinforced with steel cables, that permit operation of a single belt carrying a great load at a longer distance. One of these belts, 500 feet long and 500 feet in diameter, has a tension of half a mile up an 18 degree incline. This would be roughly double what we can now do with our steel belts. However, the name of Buffalo on rubber belts is one of the old standards that will continue to be used.

In future operations, we will probably see more flexible systems and a new method to convey material for long distances. This would be roughly double what we can now do with our strong steel belt.

Inclined Conveyors

We will have conveyor systems for long distances. This would be roughly double what we can now do with our strong steel belt. These will take less space, and by using smaller parts, bring our operating expenses down.

We will also see more flexible systems in the future. These will have the advantage of being able to transport heavy loads, and at a longer distance.

These systems will be more efficient and cost-effective, and will help us to meet the demands of the future.

(Continued from page 24)

The "Brunton" is widely used for reconnaissance and preliminary surveying on the surface and underground, for taking topographic and geologic field work. In addition to taking horizontal and vertical angles, it may be used as a prismatic compass, level, clinometer, plumb, or altimeter.

Essentially, the Brunton is a magnetic needle set in an accurately graduated circle in a case which opens into a venetian sighting arrangement. In addition, there is a level-compass to be used for reading vertical angles. Size closed, 72g X 16h. In. Weight $3.00 only 8Vz oz. Price $10.00

MAIL THIS COUPON

W. H. KISTLER MANUFACTURING CO.
1636 CHAMPA ST., DENVER, COLORADO

NAME _______________________
ADDRESS _____________________
ST. _________________________

Kistler’s

1636 CHAMPA ST. • DENVER, COLORADO

AKINS Classifiers

No other type of classifier does or can duplicate the uniform quality of overflow of these machines.

ADDITIONAL ADVANTAGES

- Baking capacity for any circulating lead. Closed circuit without elevators. Will operate at 4° in 12° slope without backslip. Will produce either: (a) extremely fine or very coarse overflows, as required; (b) will operate at extremely high efficiencies. Neatly constructed for long life and low maintenance cost.

COLORADO IRON WORKS CO.

1524 Seventeenth St., Denver 2, Colorado


We also manufacture: Lowden Dryers, Skinner Multiple Hearth Roasters, Separators and Densifiers for Heavy Sand, Media Washers.
Consult YUBA on Drudge Problems

YUBA offers you information and consulting services on special operating experiences and history of over 40 years of designing and building bucket loaders and dragline parts for use in Alberta to Malaya, from Siberia to Colombia. YUBA dredges now in use are producing big yardages on many types of alluvial deposits.

No matter what your dredging problem—deep ground, hard bedrock, clay, boulders, levee building; deepening, widening or changing channels; cutting canals, or production of sand and gravel, YUBA can furnish the right dredge for the job.

MORSE CONTINUOUS VACUUM FILTERS

PARAMOUNT IN EFFICIENCY AND MECHANICAL DEPENDABILITY

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Table 2 - Relative Rates of Wear of 3/4-in. diameter Grinding Balls in 6 X 6-ft. Mill at Climax, Colo. (May 1951)

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<th>Abrasive Minerals</th>
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<td>Iron and Steel</td>
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Wherever iron or steel meets abrasive minerals, how to specify the best wear-resisting materials?

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