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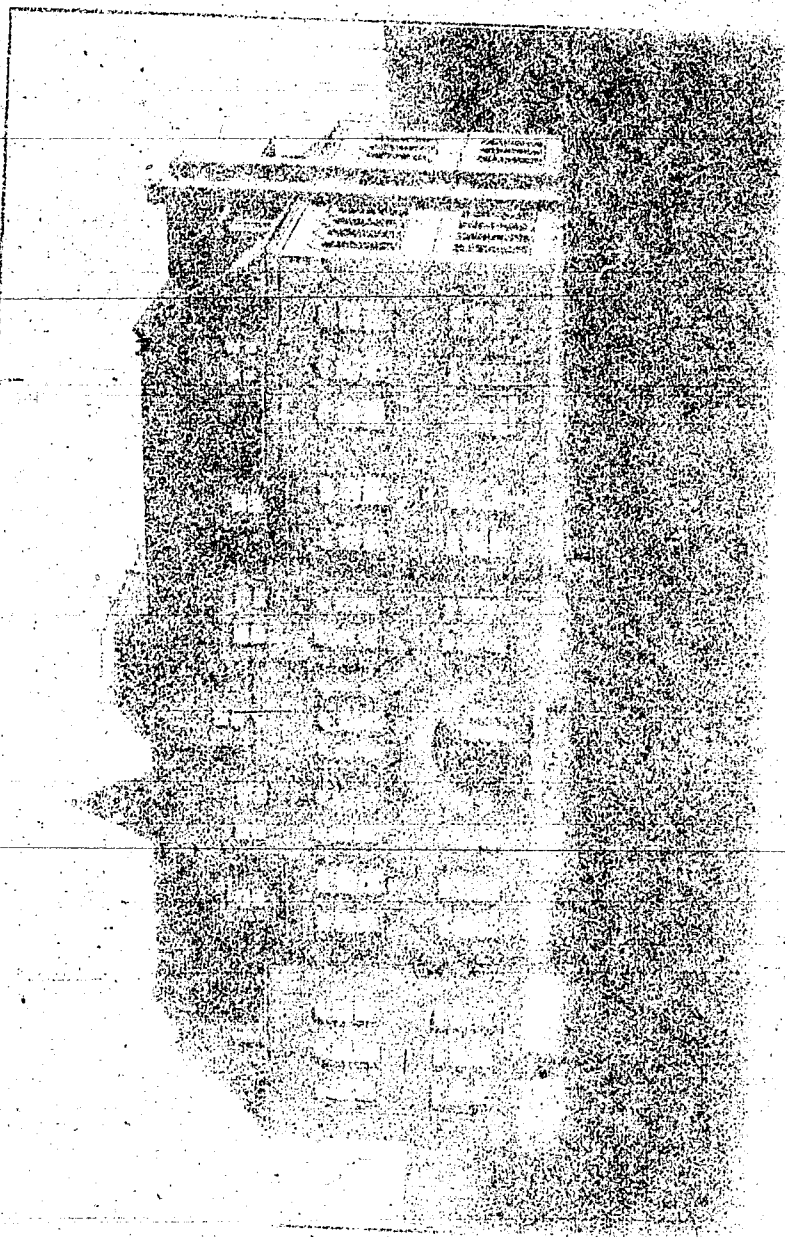
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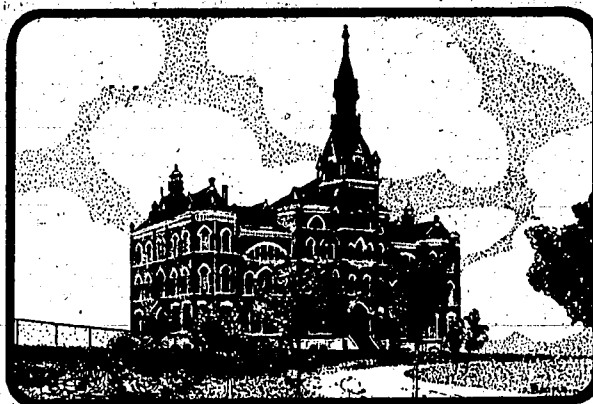
UNIVERSITY OF IDAHO



Moscow, Idaho, March, 1902

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The Mining Department

History and Equipment

History.

DURING the year of 1893-'94, the department of Mining and Metallurgy was created by resolution of the Board of Regents. In the fall of 1895, a professor of Mining and Metallurgy was appointed. Up to this time, the work of this department had been done by various members of the faculty. No students matriculated in this department before the school year of 1896-'97. There are no records available that show the number of students in this department during the year of 1896-'97; but, in Sept., 1897, when the present head of the department took charge of the work, two students reported, who had elected this work in the year of 1896-'97—one was in the first year and the other in the second year of the collegiate course. During the year of 1897-'98, 13 students matriculated for the four-year course. At present, 27 students have registered for the four-year course. In addition to the regular students, a number of special students are pursuing various lines of work in this department. Since 1899, 7 students have graduated with the degree of Bachelor of Engineer of Mines, and all have good positions in the various lines of their professional work.

Equipment.

In Sept., 1897, the department was assigned a room, 15x30 feet, in the basement of the main building, which was used for a classroom, a geological laboratory and museum, an office, a library and reading room, blow-pipe work, a drafting room, etc. The department also had a small corner in room 13, which had no outside window. This room was intended for a wet assay room. To this is attached a small fire assay room, which was not furnished with furnaces or tools by which an assay could be made. Since that time, the department has received, by donation and from appropriations made by the Board of Regents, about \$3,000 worth of supplies and apparatus.

The department of Geology and Mineralogy receives the leading geological journals, and has a library of the best books on geology and mineralogy, the reports of the United States geological survey, many reports of state geological surveys, geological maps, a petrographical microscope (having a circular revolving stage with silvered graduations and vernier, Bertrand's lens and quadrant eye-piece with revolving prism, quarter undulation mica plate, quartz wedge, gypsum plate red of the first order, eye-pieces fitted with cross hairs,

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and other accessories), prepared slides of typical American rocks, a hand machine for the preparation of microscopical sections of rocks, apparatus for blow-pipe work, crystal models, and glass cases containing mineralogical and geological specimens.

Among the geological and mineralogical collections are, a series illustrating the physical characters of minerals, the United States educational series of rocks, a collection of ores properly grouped, and a collection of fossils arranged according to the geological formations.

The department of Mining and Metallurgy has samples of battery screens, samples of drill steel, samples of wire rope, a library of the best technical books on mining and metallurgy, the leading mining and metallurgical journals, photographs of mining machinery, maps illustrating methods of mining, drawings of mining machinery and mine plants, mine maps made by mining students, the catalogues of the leading manufacturers of mining and metallurgical machinery, a clinometer, a mining transit, drawing tables and models of mines.

The fire assay room is furnished with rock crushers, samplers, sieves, a bucking board,

mortars, coke and hydro-carbon assay furnaces, and furnace tools. Adjoining the fire assay room is the wet assay room, furnished with a hood, working desks supplied with water and gas, a shaking frame, gravity cells for electrolytic work, a chlorination apparatus, tanks for normal solutions, apparatus for quantitative determinations, analytical, pulp and button balances, an Ingersoll-Sergeant steam drill, an air compressor, and a working model of a stamp and concentrating mill made by the students. This laboratory also contains a leaching plant, and a cyanide plant consisting of a solution tank, a leaching tank fitted with false bottom and duck filters, a zinc box with six compartments fitted with wire screens, and a sump tank,—all conveniently arranged and fitted with pipe connections.

The Board of Regents has recognized the progress and the importance of this department in erecting a new School of Mines building, in which 9 rooms have been assigned to the use of this department. The department now has a well lighted balance room, wet and dry assay rooms, a geological and mineralogical laboratory and museum, a lecture room, and a library and reading room.

Diamonds

By J. T. Wright
Student Mining Engineering



THE diamond, standing first among our precious stones and gems, crystallizes in the Isometric system. Dodecahedrons and octahedrons, or some modification by combinations, are the chief forms. Trisoctahedrons and a few hexoctahedrons have been found.

The stone, being pure carbon, has the great-

est refractive and dispersive power on light of all known gems. It is the only one that is combustible, and is the hardest of all stones, being number ten in the scale of hardness of which the common foliated variety of talc is number one. Its cleavage is octahedral, lustre adamantine, and the color varies greatly. In fact it is found in almost all shades of the

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spectrum, but the most common colors are white, yellow, brown, rose red, red, blue, and green.

The principal places of occurrence are: (I), The Kimberly mines, South Africa, which produce about 95 per cent of the diamonds used in the world; (II), Brazil; (III), Borneo; (IV), New South Wales; (V), India; (VI), the United States.

The Kimberly mines were first discovered by a Boer (O'Rielly) in 1867. Three thousand one hundred and forty-three claims were located in a short time, but these are now consolidated into a small number of large companies, all within a radius of $1\frac{1}{2}$ miles. The diamond bearing formation shows that the association is with an eruptive rock of ultra basic composition—the filling of an old volcano's crater. The ground is known by its color as "blue ground," and the mines are located in "pans," which are known as the "pipes", or "necks", of the former volcanoes, which are now worn down almost to their roots.

These "pipes", through which the lava reached the surface, are surrounded by a black shale containing a large percentage of carbon, out of which the diamonds are supposed to have been formed. Some mineralogists say these diamonds are the product of metamorphic action on the carbon-bearing rocks, while others say they are formed as an element of the eruptive rocks themselves.

The formation in which the diamonds are found near Kroonstadt, Orange Free State, differs from the Kimberly formation in that the ground is yellow and capped with basalt. This was first thought to be unfavorable for the formation of diamonds, but gems of good weight and quality have been found.

The apparent explanation of the genesis of these diamonds finds strong support in the

experiments of Moissan who obtained artificial diamonds by dissolving carbon in molten iron and immersing the mass in cold water until a firm surface crust had been formed. The "chilled" mass was then removed to allow its still molten core to solidify slowly, and this solidification developed an enormous pressure, because the natural expansion of the iron on passing into the solid condition is resisted by the strong shell of "chilled" metal. The diamond was then liberated from the iron by dissolving the latter in acid.

The British Guiana diamonds occur in a formation of sandy clay mixed with rounded and angular quartz, ironstone conglomerates, felsite, ilmenite sand, topaz, and colored corundum.

The U. S. diamond deposits are grouped into three regions: (I), the Southern States, Southeast of the Appalachian Mountains as Virginia and Georgia; (II), Western belt of the Sierra Nevada Mountains of California and Oregon; and (III), the region bordering the Great Lakes of the Laurentian system.

The diamonds of the Southern States occur in loose gravel, and these probably came from the disintegration of the crystalline rocks in the Appalachian ranges of Archaean and Cambrian ages, which include ultra basic igneous rocks and itacolumyte. The California and Oregon diamonds are principally found in connection with the placer mines and fragments of diamonds are often found in the tailings from stamp mills. Idaho produced a few small diamonds from near Boise City and Owyhee in 1865-66, found in connection with the placer mines as were those of California and Oregon. In all the localities in California and Oregon in which the diamonds are found, serpentine rocks seem to predominate, and these are of the mesozoic age. In the region

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of the Great Lakes the diamonds seem to have been deposited by the ice mantle at the time of its earliest invasion, and these are found on or near the edges of the moraines.

In Brazil the diamonds are almost invariably found free or attached to the other elements by a cement which is usually limestone. The associates of these diamonds are usually fragments of all the rocks that resist decay and wear of transportation, together with the isolated minerals resulting from the breaking down of these rocks. Such accompanying minerals as zircon, xenotime and monazite are classed as original acid, eruptive rocks, while the Kimberly eruptive rocks are ultra basic, and such as staurolite and disthene are classed as metamorphosed rocks, while the iron, tourmaline, and titanium oxides may be from either the metamorphosed or eruptive class, and may be from both classes.

The country rock of the Kimberly mines, and the Agua Suja mines of Brazil is horizontal, of approximately the same age (late palaeozoic), and with intercolated sills of trap of similar character and composition, and the diamonds seem to be distributed uniformly throughout the mass. While the country rock is the same these mines differ in that the Agua Suja deposit is a bed and the Kimberly deposit is a volcanic neck.

The physical characteristics of the New South Wales diamonds are more nearly allied with those of the Brazilian diamonds than any other country. These occur in a gravel containing cassiterite, and the pay streak varies from 2 to 7 feet thick and is from 30 to 50 feet below the surface. This gravel rests on granite, which can be traced entirely around the basalt.

The coarse diamonds, unfit for jewelry, are known as bort, and the black diamonds as carbonadoes. These carbonadoes occur in

masses as much as 1000 carats in weight and have a crystalline structure without cleavage. This class of diamonds is found chiefly in Brazil, in alluvial deposits of gravel, clay without quartz, sand, gold, platinum, zirconium, octahedrite, itabirite and itacolumite. These are used chiefly for abrasive purposes and diamond drill work.

In mining at the De Beers mine at Kimberly, the depth exceeds 1500 feet in some places. The clay is mined as galleries, dynamite being used to break the hard blue rock. This rock, after being brought to the surface, is spread upon a floor and left to the action of the weather until the lumps disintegrate. The diamonds are then collected and washed in large vats, by machinery.

About 12,000 colored men and 3,000 whites are employed to work this mine, and, when not at work, they are quartered in a large square, inclosed by a high fence, while armed guards watch over them. Before leaving the mine, a man is kept in a room by himself for a week. All clothing is taken from him, and every risk of theft carefully watched. The entire mines are surrounded by high fences, and armed guards keep watch that no diamonds are carried away. After washing, the diamonds are taken to the main office, and they are then ready to be made into forms suitable for their different use in jewelry, ornaments, etc. About 150 per cent of the world's production of diamonds are cut in Belgium, while the remainder is chiefly cut in London and Amsterdam. This cutting requires great skill as large and valuable diamonds may easily be destroyed by the ignorance or carelessness of the cutter.

The cleavage planes must be followed in cutting, and all flaws are removed by cleaving. The crystal is first fastened to the end of a stick of soft solder, leaving the part to be cut

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projecting from the solder. These diamonds are cut into the forms of brilliants, roses, and table diamonds. The brilliants have a crown of a large central octahedral facet, a series of facets around it, and a collet of pyramidal shape near the base. The depth is nearly equal to its breadth. The rose is only used for small stones and consists of a number of

triangular facets so arranged as to completely cover the front of the stone. The back being quite flat and not worked into an apex. The briolette is pear shaped and has no girdle or table, but is covered with facets like those on the front of the rose, and these are usually used for pendants.

Alumina Group of Precious Gems

By Henry M. Lancaster, *Student Mining Engineering*



IN any discussion on the mode of occurrence, production, and the general characteristics of a precious stone, or group of stones, the question naturally arises, as to what is required of a stone to entitle it to be classified as a precious stone. To answer this question in a mineralogical sense, is not always an easy matter. The commercial value of a gem does not always depend entirely upon its chemical, or mineralogical composition, nor upon any one function, but is subjected to many variables; some real, some fancied. Some of the essential qualities that are required before a stone can be classified as precious are hardness, beauty of color, scarcity and, in no small degree, the fancy of fashion.

Strictly speaking the list comprising our precious stones is not a large one, and when we have mentioned the diamond, sapphire, ruby, emerald, garnet and turquoise, our list is practically complete. The opal, while considered by many as one of our most beautiful gems, cannot properly be classified as one of our precious gems, because it lacks hardness, the most essential requirement. On the other

hand the pearl is excluded from this list for the reason that it is not considered a mineral product.

Excluding from our list the diamond, the remainder of all these gems have for their fundamental base some form of aluminium oxide, or aluminium silicate. The base of the sapphire group is corundum—pure alumina oxide—which is found displaying, more or less distinctly, all the colors of the rainbow. To be classified as a precious product, the corundum must have the requisite qualification as to transparency, and, at the same time, possess the pleasing colors.

These different colors, found in the gems of this group, all owe their origin to minute quantities of metallic oxides or minute quantities of other impurities which are impregnated in the base element.

The compounds of aluminium oxides and silicates are found distributed through many localities, and the manner of occurrence is as varied as the geographical distribution. In the United States, the principal regions are throughout the Southern States and in portions of Montana. In the former locality, cor-

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undum is found in a highly decomposed and altered chrysolite. The Granite Mountains "are fissured with large dykes of chrysolite and serpentine. The veins are filled with two varieties of chrysolite, known as ripidolite and jefferisite, in which the corundum is found massive and in crystalline form." In Montana the formation of the sapphire bearing region is different and will be discussed later.

The Sapphire.

Taking up the individual members of the group of gems briefly described, the first in point of value and interest is the sapphire. This gem, in many respects, stands next to the diamond, and is one of the most costly and most beautiful of all precious stones.

The sapphire crystallizes in the rhombohedral division of the hexagonal system, the most common form being the six sided double terminated prism. The composition varies somewhat, but is approximately 46.8 per cent oxygen, 53.2 per cent aluminium with some form of impurities which forms the coloring matter.

The hardness according to Moh's scale, in which the diamond is 10, is 9. "The sapphire has a great variety of colors and nine gems are distinguished according to these colors, namely: Oriental sapphire, ruby, emerald, asteria, topaz (sapphire), amethyst (sapphire), chatoyant, girasol, and white or colorless sapphire." The blue Oriental sapphire is the true jeweler's gem. Its color is probably due to the presence of protoxide of iron. When carmine red, this gem is called Oriental ruby; when deep green, Oriental emerald; when violet, Oriental amethyst, and when yellow, Oriental topaz. The color in each gem is due to the presence of chromium and iron in varying proportions.

To Burma, Siam, the world has looked for

its greatest supply of sapphires, while less amounts have come from India, Ceylon China, Armenia, Siberia and Bohemia.

In the United States, North Carolina has perhaps produced some of the finest cabinet gems in existence. It is said that single stones from that region show all the color characteristics of each of the nine sapphire gems enumerated.

Montana has in the last few years gained a reputation as a sapphire producing region. The gems are mined there on the bars of streams, the most important deposits being found a few miles east of Helena. A large company has recently been formed to work these deposits, and it is claimed that responsible mining engineers have estimated that 4000 acres owned by the company can be made to produce 2000 ounces per acre.

The origin of these deposits is still a matter for discussion. In 1889-90 dykes were discovered of eruptive rock cutting into slaty rock on which rests glacial gravel. It is now supposed that the sapphire bearing deposits have been eroded away from this exposed dyke.

Sapphires are often found loose in soil, but metamorphic rocks, especially gneissoid mica schist and granular limestone are the most common matrices.

The Garnet.

Leaving the sapphire, let us now take up the next most important gem of our group. There are several varieties of garnet, and like the sapphire, it has several colors due to impurities in its base. The general composition of the garnet may be expressed by the formula $R_1R_2O_{12}Si_3$, in which R_1 may be calcium, magnesium, iron, manganese, and R_2 may be aluminium, iron, chromium. Each variety owes its variation to these different elements, the different proportions and the

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substitution of one for the other.

There are three general series, namely: "*Alumina-garnet*, in which the sesquioxide base is chiefly aluminium; the second, that of *iron-garnet*, in which the sesquioxide base is chiefly iron instead of aluminium; and third, *chrome-garnet*, in which it is chromium."

Each of these divisions has several varieties of gems, the name, color and general characteristics depending upon the minute particles of impurities in the base.

Garnets are among the oldest known gems, and are the most widely distributed. They are found in mica schist, hornblende schist, also gneiss, granite and limestone.

The garnetiferous deposits of Bohemia, from which the world's supply of garnets was produced for many years, occurs in the hilly cretaceous portions of Northern Bohemia. The garnets of this district are a fine, rich, red color and are found in various shades and sizes.

They are classified as a magnesia-alumina garnet containing lime, iron, manganese and chromium oxides.

Turquoise

Passing to the turquoise we find a less varied, but very beautiful gem. In the mountain regions of Persia and Siberia, and, in the United States, in Arizona and Nevada, we find this much valued gem. The chemical composition of this stone is somewhat different from the rest of the group, it being classified as a hydrous phosphate of aluminium. The coloring matter is probably a salt of copper. S. L. Penfield regards it as a derivative of orthophosphoric acid in which the H atom is replaced by a univalent radical, while he regards the copper as a constituent rather than an impurity. Prof. W. P. Blake regards the turquoise as resulting from the decomposition of a trachyte.

In conclusion it might be said that systematic mining for precious gems in the United States has not yet fairly begun. The fact that precious gems of nearly all varieties have been found here is established. Whether or not they may be mined at a profit remains to be seen.

Opals

By W. M. Howland
Student Mining Engineering



THE opal is a species of silica differing from quartz in that it is never crystalline, and always contains from 3 per cent to 21 per cent of water.

The diamond, the hardest substance known, is called ten in the scale of hardness, all other substances ranging down to one. Quartz in this scale of hardness, is No. 7, while the opal is 5.5 to 6.5. The specific gravity of pure sil-

ica is 2.65, that of the opal being 1.9 to 2.3.

The opal is amorphous, sometimes reniform, stalactitic, or large tuberoses, also earthy. The lustre is vitreous, frequently subvitreous, often inclining to resinous and sometimes pearly. The color varies, as white, yellow, red, brown, green and gray, usually pale. The dark colors arise from foreign substances.

Some opals have a rich play of colors by re-

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fracted light. It is transparent to nearly opaque. The composition of the opal is silica like quartz, but in a different molecular state; it also contains water, as stated above, usually from 3 per cent to 9 per cent. The opal is easily soluble in a strong alkaline solution, especially if heated, while crystallized silica dissolves with difficulty. There is a great variety of opals: the precious opal, fire opal, common opal, hydrophane, opal agate, hyalite, menelite, jasper opal, siliceous, sinter or geyserite, tripolite and numerous others.

Precious Opal.

This opal exhibits a rich play of colors, or, as Pliny says, "presents various refulgent tints in succession, now one line and now another."

The Cause of the Play of Colors.

The opal being a natural form of hydrated silica, and having apparently hardened from a gelatinous state, during consolidation, it has suffered contraction unequally in different directions; and thus, though amorphous, behaves in polarized light like a double refractory body. According to Sir David Brewster the colors of the opal may be caused by a multitude of microscopic pores arranged in parallel lines, the difference of tints arising from differences in magnitude of these cavities. Behrens, however, has given it a thorough study, and has shown the explanation to be incorrect; he refers the play of colors to thin curved lamellæ of the opal, whose refractive power may differ by 0.1 from that of the mass. These are conceived to have been originally formed in parallel position, but have been changed, bent, and finally cracked and broken in the solidification of the ground mass. It is generally believed incapable of crystallization.

The Common or Semi-Opal.

The hardness is the same as the opal; it has

a waxy or resinous lustre, but no play of colors, though sometimes a milky opalescence. The colors are white, gray, red, yellow, bluish, green and dark green. It is translucent to nearly opaque. It occurs in the silicified woods of Arizona. A great deal of it retains the structure of the wood, and is known as wood-opal, the wood being replaced by hydrated silica instead of quartz.

Hydrophane.

Hydrophane is opaque, white or yellowish when dry, translucent and opalescent when immersed in water.

An opaque variety of hydrophane is found on Mt. Diablo, California, in round lumps from one fifth of an inch to one inch in diameter. These are quite remarkable for their power of absorbing water. When water is allowed to drop slowly on it, it first becomes white and chalky, and then gradually becomes perfectly transparent. The specific gravity of this specimen, when dry, is 1.056, when wet, 1.546. The increase in specific gravity is due to the replacement of the interstitial air of the mineral by water. From the above the specific gravity of the opal free from air is 2.14. When wet, this opal contains 47.75 per cent by weight of water, and 52.25 per cent by weight of silica.

Opal Agate.

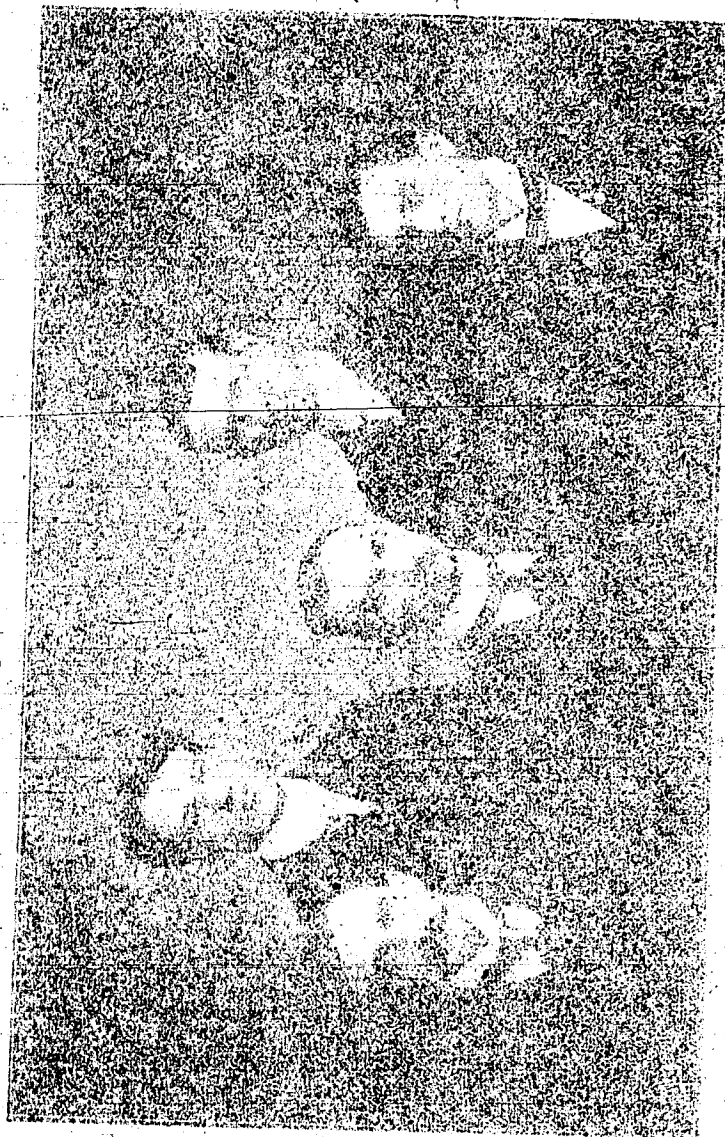
This variety is agate-like in structure, consisting of opal of different shades of color, and is found in Arizona.

Hyalite or Muller's Glass.

Is glassy and transparent, and is usually found in small concretions and sometimes stalactitic. It resembles transparent gum arabic.

Menelite.

Brown, opaque, compact, reniform, occasionally slaty. Is found in slate at Menil Montant, near Paris.



A MILLER 2. H. FOR A PHOTOGRAPH
OF THE HEAD OF LINDSEY OF MOUNTAIN

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Jasper Opal.

Resembles jasper in color, due to a little iron; but is resinous in lustre, but not as hard as jasper.

Siliceous, Sinter, Geyserite.

A loose, porous, siliceous rock, grayish to white in color, and is deposited around geysers in Yellowstone Park. It is cellular or compact, massive, sometimes stalactitic or cauliflower like in shape. There is also a variety known as floatstone, which is porous and fibrous in texture, and is so light as to float on water.

Tripolite.

Also known as Infusorial Earth, a white grayish earth, massive, laminated or slaty, composed mainly of the siliceous secretions of microscopic plants called Diatoms. It is found in Maine, New Hampshire, Nevada, California and Idaho.

The variety known as the precious opal is the only one of commercial value, and that as a gem. This variety is found near Cashaw, Hungary; in Honduras, South America; Faroe Islands; Esperanza and Zinapan, Mexico; Queensland, Australia; also in numerous localities in the United States.

The first opal found in the United States, showing a brilliant play of colors, was found near John Davis river, in Cook Co., Oregon. The specimen found there is transparent, grayish white in color, with red, green and yellow flames. The play in colors equals any of the Mexican variety.

A beautiful fire opal, without any opalescence, occurs in small veins about one fourth of an inch thick, and two inches square, in Washington Co., Georgia. At Prairie Basin Idaho, a discovery of beautiful opals was made a few years ago. These gems were of exceptional beauty and quality, of the hydrophane variety,

and worth \$10.00 per carat.

In August, 1890, the fire opal was found in Washington, and near Moscow, Idaho, on the farm of William Leisure. They were discovered by Mr. James Allen, a jeweler of Yonkers, New York, among some rocks taken from a well 22 feet deep. In the last 4 feet, the opals were found more or less plentiful in the cavities of the rock. The rock is a basalt in which most, if not all, of the felspar and pyroxene, as well as the green mass, appears to be altered. Some of the original constituents may have changed, but whether or not it is olivine, it is difficult to determine, because of the crystalline aggregate character of the pseudomorph. The pieces vary from the size of half a pea to that of a hen's egg. The material is found in a vesicular lava; the smaller nodules are very rich in color, but the larger ones often have little or no play of colors.

The quality of some of the specimens would compare well with the foreign variety. If the material is as abundant as supposed, and could be properly worked, this would likely be one of our precious stones, from a financial standpoint. The trouble seems to be in that the larger portion of them were broken or cracked in separating them from the matrix.

One opal, the largest taken from this mine, is about four inches long, two inches wide and three eighths of an inch thick, and at the time it was found, was estimated to be worth from \$1500 to \$2000, at the Moscow National Bank. It was on exhibition there for a few months from the time it was found. The mine did not pay, so it was abandoned. Last fall, a few small opals were found in some of the rock that was used in paving Main Street of Moscow. This rock was taken from the college farm about a mile west of town.

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Petroleum

By James Gibb
Student Mining Engineering



PETROLEUM in the form of bitumen seems to have been known from the earliest periods of history. It was used in the walls of Babylon and Nineveh. Perhaps the first mention of petroleum for illuminating purposes is the "Sicilian oil" described by Pliny, obtained near Agrigentum which was burned in lamps as early as the beginning of the Christian era.

It has been known from the earliest times in this country, by reason of its seepage to the surface in oil springs; but before the discovery of oil in a well in Titusville, Pennsylvania, in 1859, no petroleum was produced. This caused explorations elsewhere in Pennsylvania, and these have extended practically over the entire country, with the result of finding oil in the majority of states, although the profitable production has been confined to Pennsylvania, Ohio, West Virginia, Colorado, California and Texas.

The oil-bearing sands are undoubtedly of sedimentary origin, but when, where and how was formed the petroleum which they contain?

There are great variations of the character of petroleum, not only in different districts, but even in the same field some are dark and heavy, others comparatively light and clear. In some the solid base is paraffine, while those in California and Texas have asphaltum for a base.

The principal theories regarding the origin of petroleum are: (1), that it was produced by the distillation at a high temperature from bituminous coal by volcanic heat; (2), that it is the product of a peculiar decomposition of organic matter at ordinary temperature; (3),

that it is produced by chemical reaction at high temperature of water vapor on carbide of iron.

The theory of the chemical origin of petroleum, as advanced by Mendeljeff, is based upon the action of water upon metallic carbide at an elevated temperature and under high pressure. As a result, metallic oxides and hydrocarbons are formed, which, being transported by aqueous vapors, have reached those strata, where they would easily condense and impregnate beds of sandstone, which have the property of absorbing great quantities of mineral oil. Although this theory has been offered by an eminent chemist, to account for petroleum and gas, it has little to recommend it, aside from the fact that the changes, such as are named, would produce petroleum. The geology of the oil fields excludes the theory. Organic compounds similar to petroleum and natural gas, or identical with them, are easily derived by the process of destructive distillation from both animal and vegetable matter. But while the derivation of petroleum from vegetable and animal substances is accepted by nearly everyone whose opinion on the subject is entitled to consideration, yet there is considerable diversity of opinion as to the manner in which the work has gone forward.

Newberry holds that a slow and constant distillation is in progress at a low temperature. Peckham refers the distillation of the petroleum of the great American fields to the heat connected with the elevation and metamorphism of the Appalachian mountain system. In the case of the California oils, the petroleum is

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evidently derived from the animal remains with which the formation was originally filled.

From the fact that the chief bituminous accumulations of recent age belong to the Torrid zone, it seems necessary to conclude that a tropical climate, or a climate of 80° F., at least, is most favorable, if not necessary, for the production of this class of oils.

From the reports of different fields, we gather the following conclusions:

(1), Petroleum is derived from organic matter.

(2), It is much more largely derived from vegetable than animal substances.

(3), Petroleum of the Pennsylvania type is derived from organic matter of bituminous shales and is of vegetable origin.

(4), Petroleum of the Canada and Lima type is derived from limestone, and is of animal origin.

(5), Petroleum has been produced at normal rock temperatures in the Ohio fields and is not a product of destructive distillation of bituminous shales.

(6), The stock of petroleum is in the rock and is already practically complete. While petroleum has been found in nearly all the geological formations from the Silurian up to the Tertiary; it occurs principally in the rocks of the Silurian and Devonian ages, and to less extent in the Cretaceous and Tertiary. The deposits of Pennsylvania, Eastern Ohio, and West Virginia are in the Devonian. The oils of Western Ohio, Kentucky and Indiana, are found in the Trenton limestone of Silurian type. The Colorado is found in the Cretaceous.

It may be of interest to note that the Russian oils are found in the Tertiary, and occupy an intermediate position between the California oil, in which the base is asphaltum,

and the Pennsylvania oils, in which the base is paraffine.

The Canadian oils occur in the limestone of the Trenton group of the Silurian, and Coniferous formation of the Devonian. The distribution of oil, through the rocks, presents many interesting features. At first it was supposed to be confined to the rocks beneath the valley, the theory of the well drillers being that the surface topography influenced the distribution of the oil, but there is of course no such association. Although petroleum is found in many geological ages, that of one field is confined to a single strata, whose depth from the surface may be predicted with considerable accuracy. When such a strata is reached by a drilled well, gas sometimes escapes, then oil and finally salt water; but at times this order is reversed. If these three substances are accumulated in a strata, it is natural to suppose that they will be found according to their specific gravities, gas on top and salt water at the bottom. One of the first theories advanced for the accumulation and variation of flow of these substances, was the cavern theory. The order of flow depends upon the portion of cavern pierced by the drill.

Recently, on account of the West Virginia fields, the anticlinal theory has been brought into prominence. It is, briefly, that these fields have been thrown into waves and folds by mountain formation, and that the oil tending to accumulate in porous strata, found it possible to accumulate in the highest part of this formation, namely, in the crests. This theory also accounts for the general parallelism of these fields to the Appalachian fields.

Some of the oil pools appear to be due to irregularities in the oil bearing strata. This is probably due to the manner in which the

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sediment was deposited, sandy near shore, clayey offshore, moreover the sediment deposited near the mouth of rivers differs from those in the intervening area. Therefore a horizon, such as one of the oil bearing sands, may vary greatly in a small area, thus causing accumulations into limited areas of pools or pockets; this is known as the pocket theory.

The essential features of an oil field are, a source of supply, and a porous strata bounded above and below by an impervious strata. The porous strata has been proven by experiments to be capable of absorbing from one-fifth to one-tenth its own bulk of oil. Assuming only fifteen inches of good rock, means 1500 barrels per acre or nearly 10,000,000 per square mile.

Looking toward the past, we find that petroleum has been used for illuminating purposes, as a lubricator, for fuel and the manufacture of gas. For fuel it has been the subject of many elaborate experiments, and voluminous reports from the government engineers of this and other countries, many of which have been highly favorable. Several

furnaces have been invented for its combustion for steam and other purposes, yet it has been but little used as a fuel. The reason for this apparent neglect of such an abundant, and cheap source of artificial heat is, no doubt, thus far to be attributed to its comparatively dangerous properties, and to other difficulties attending its transportation and storage. These difficulties, and the prejudices attending them are gradually disappearing; and we seem to be rapidly approaching a time, when the consumption of crude petroleum, especially for steam purposes, will be enormous.

Looking toward the future, what assurance have we that these varied wants, the creation of a quarter of a century, will be supplied? While it is not probable that the deposits of petroleum are being practically increased, at the present time, there is reason to believe that the supply is ample for an indefinite period. Yet the fact is worthy of serious consideration that the production of petroleum, as at present conducted, is wasteful in the extreme.

Observations for the Meridian

By R. L. Ghormley, Student Bachelor of Science



In all surveying work there is a base to which all the workings are referred. In the survey of public or mineral lands this base is the meridian, or the true north and south line. From this fact it is evident that the establishment of this line is one of the most important parts of surveying work.

There are several different methods of ob-

taining this meridian by means of observations on the sun or the north star, (Polaris.) We will first consider the observations on the sun. This is done by two distinct methods. First: By means of the Saegmuller solar attachment which is performed as follows: Take the declination of the sun as given in the Nautical Almanac for the given day and year and correct this for refraction and hourly change.

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Incline the transit telescope this amount, if the declination is north, depress it, if south elevate it. Now without changing the telescope, level the solar adjustment bringing its axis and the axis of the main telescope in the same vertical plane. The telescopes now make with each other an equal angle to the declination angle. Without disturbing the relative positions of the telescopes set the vernier of the vertical circle of the transit to read the co-latitude of the station. By moving the transit alidade, and the solar adjustment around their respective vertical axes the sun is brought into the field of the solar telescope and bisected. The telescope of the transit is now in the meridian and a point set in front of the telescope makes, with the stake under the transit, a line in the meridian.

The method with the solar compass, which is slowly going out of use, is essentially the same as the above.

The second method is performed with the transit without the solar attachment. A piece of dark red glass is placed in the eye piece and the telescope pointed on the sun so that the sun is tangent to two of the upper cross wires. The telescope is then brought to a position so that the sun is tangent to the opposite lower cross wires. The mean of these vertical angles will then be the true altitude of the sun. The horizontal circle is read and the telescope pointed on the azimuth mark and the angle between the sun and this mark is noted. The declination is obtained as in the first method from the almanac, the altitude has been found, and the latitude of the station is known. With this data given the Z P S triangle, or the triangle of the zenith, pole, and sun is solved for the angle between the sun and the pole. Call this angle A. This may be obtained from the formula:

$$\text{Cosine } \frac{1}{2} A = \sqrt{\frac{\text{sine } S \times \text{sine } (S - \text{co-declination})}{\text{sine co-latitude} \times \text{sine co-altitude}}}$$

Where $S = \frac{1}{2}$ the sum of the three sides. Then the addition or subtraction of the angle between the sun and the mark (as the mark is north or south of the sun) gives the angle that the station and azimuth mark make with the meridian. From which the meridian can be readily found.

The observations on Polaris are performed in about the same way but with different instruments. First, by the compass. About an half hour before the time for the elongation of Polaris has arrived, fix a plumb line to some high support and set a stake under this line. Now suspend a heavy weight to this line and let it be kept from vibrating by being placed in a bucket of water. Set the compass on a table near this line and have it in perfect adjustment. Then with the sight nearest the observer align Polaris and the plumb line, then line in the other sight on the plumb line. Repeat this operation till the two sights, the plumb line and Polaris, are in one plane. To perform this the line must be illuminated by a lantern. When the star has reached its elongation the compass is re-adjusted and the plumb line removed. A stake is now set some distance from the instrument in the line of sight as given by the compass. In the top of the stake set a tack on the line. This is done by holding a board with a small slit cut in it, behind which a lamp is held, over the stake. The work is now complete for the night. The next day from the north stake a line is laid off at right angles to the line between the north and south stakes (to the west if eastern elongation or to the east if western elongation has been observed.) Carefully measure the distance between the north and south stakes. Find from the table the azimuth of the star at elongation

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for the given time and place, multiply the tangent of this angle by the distance between the two stakes and lay off the distance thus obtained from the north stake on the set line. This point and the south stake will give the true meridian.

A board with a narrow slit cut in it at right angles to its lower edge may be used in place

of the compass if the compass is not available.

The transit may also be used. The method is the same for the transit except that the transit is set up over the south stake. The cross wires must be illuminated but care must be taken not to get the light shining too brightly into the telescope.

Tests of Local Materials

By J. W. Shepperd, *Student Civil Engineering*



TESTS were made on granite, sandstone, and basalt. The granite was quarried at Taylor's quarry near Moscow. The sandstone is supposed to be Tenine sandstone from Western Washington. The two stones were used in the dormitory and the "School of Mines" building. The basalt was quarried on the University farm and was used in paving Main Street.

Crushing Strength of the Stone.

For determining the crushing strength, one and one half-inch cubes were made, by chiseling and filing and smoothing the faces with emery powder. Each of the sandstone and basalt cubes required about twelve hours time. After four attempts to make a granite cube it had to be given up as it was too hard for the tools at hand.

The cubes were crushed between steel plates in the Olsen testing machine. The sandstone stood a final test of 14000 pounds, with a first failure of 7800 pounds. The basalt crushed at 8000 pounds with a first failure of 8000 pounds

Brard's Test.

The effect on the stone of Brard's test and

actual freezing was small in the sandstone and granite but relatively high in the basalt, which shows that either the granite or the sandstone would be much better road metal. For comparison between Brard's test and actual frost action, see table I. The chemical test for atmospheric action is also very high in the basalt.

In determining the specific gravity and absorption, several tests were made and averaged. The absorption of water by the granite and sandstone was inconsiderable, but the basalt varied between 10 per cent. and 50 per cent. depending on the porousness. See table I.

Brick.

The Spokane brick used in the new buildings, the Moscow brick used in the Spicer Block, and the Moscow brick made during the summer of 1901, were tested for crushing strength, specific gravity, and frost. In comparing the results from Table I, we find the Moscow brick nearly uniform, nearly 100 per cent stronger than the Spokane brick, and about thirty five pounds lighter.

In crushing, quarter bricks were used.

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These were stood on end and plaster of Pa is put on one end to make them strike the plates evenly over the entire surface.

Composition.

The Moscow brick are red colored, homogeneous in texture, and machine made. The Spokane brick are machine made, light colored and not very homogeneous in texture. They also contain considerable quartz, which makes them relatively heavy. The weights were determined by multiplying the specific gravity by 62.5 pounds. To check this we measured the cubical contents of a quarter brick and weighed it dry. This checked the above result within two pounds to the cubic foot.

Local Woods.

In the course of the investigation now under way in the civil engineering laboratory of the strength of local timber, the following tests have been made on yellow pine, tama-

rack, red, and white fir, spruce, and cedar: Transverse, shearing, endwise compression, and compression across the grain. The transverse tests were made on specimens $2 \times 2 \times 16$ in. The distance between the knife edges was twelve inches, and the stress was applied at the middle of the bar. A short piece of wood was placed under the center knife edge to prevent the fibers from being cut.

For shearing tests, mortises $\frac{1}{2} \times 2$ in. were cut one and two inches from the ends of the specimens which were $2 \times 2 \times 16$ in. To determine the stress, iron bars $\frac{1}{2} \times \frac{1}{2} \times 4$ in. were inserted in the mortises and pulled out. The number of pounds required to pull them out divided by twice the product of the thickness of the specimens and distance of the mortise from the end, gives the stress in pounds per square inch. For the endwise compression test, blocks $2 \times 2 \times 4$ in. were compressed end-

TABLE I.

Kind of Material	No of Tests	Specific Gravity	Weight per cubic foot in pounds	Water absorption	Loss by frost expansion	Hard's test	Chemical test	Crushing strength, per square inch
				Per Ct.	Per Ct.	Per Ct.	Per Ct.	
Tenine Sandstone	1	*2.38	149		0.71	0.36	1.1	6200
Basalt	1	*2.41	150	*10-50	1.66	1.50	3.9	5300
Granite	1	*2.67	167		0.30	0.33	0.4	
Spokane Brick	5	2.52	157	18-20				1470
Old Moscow Brick	5	1.90	119	7-8	0.15			2750
New Moscow Brick	5	1.90	119	8-10.5	0.08			2400

* Five tests

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wise until they failed. Nor compression across the grain, blocks $2 \times 2 \times 3$ in were used. Two results were recorded, one when the specimen had been compressed three per cent of its total height, and the other when compressed fifteen per cent. The majority of the blocks failed before reaching the latter limit.

These results are all recorded in Table II, and the strengths given are in pounds per square inch. The capacity of the testing machine is forty thousand pounds which was not sufficient to crush the tamarack endwise.

The increase with the increased section of the unit shearing stress is noteworthy.

TABLE II.

Kind of wood	No of Tests	Modulus of Rupture [R] = $\frac{3wl}{bd^2}$ bd ² in lbs per sq in	Shearing Stress lbs per sq inch		Endwise Compression lbs. per sq inch.	Compression across the grain lbs. per sq inch.	
			Holes one inch from end	Holes two inches from end		3 per cent	15 per cent
Yellow Pine	2	15000	450	900	8000	1000	1050
Red Fir	2	10500	450	900	8500	800	850
White Fir	2	6400	200	400	6500	550	700
Tamarack	2	12000	550	1050	10000	900	950
Spruce	3	8300	325	750	8000	500	600
Coast Cedar	2	5200	300	550	5000	200	*350

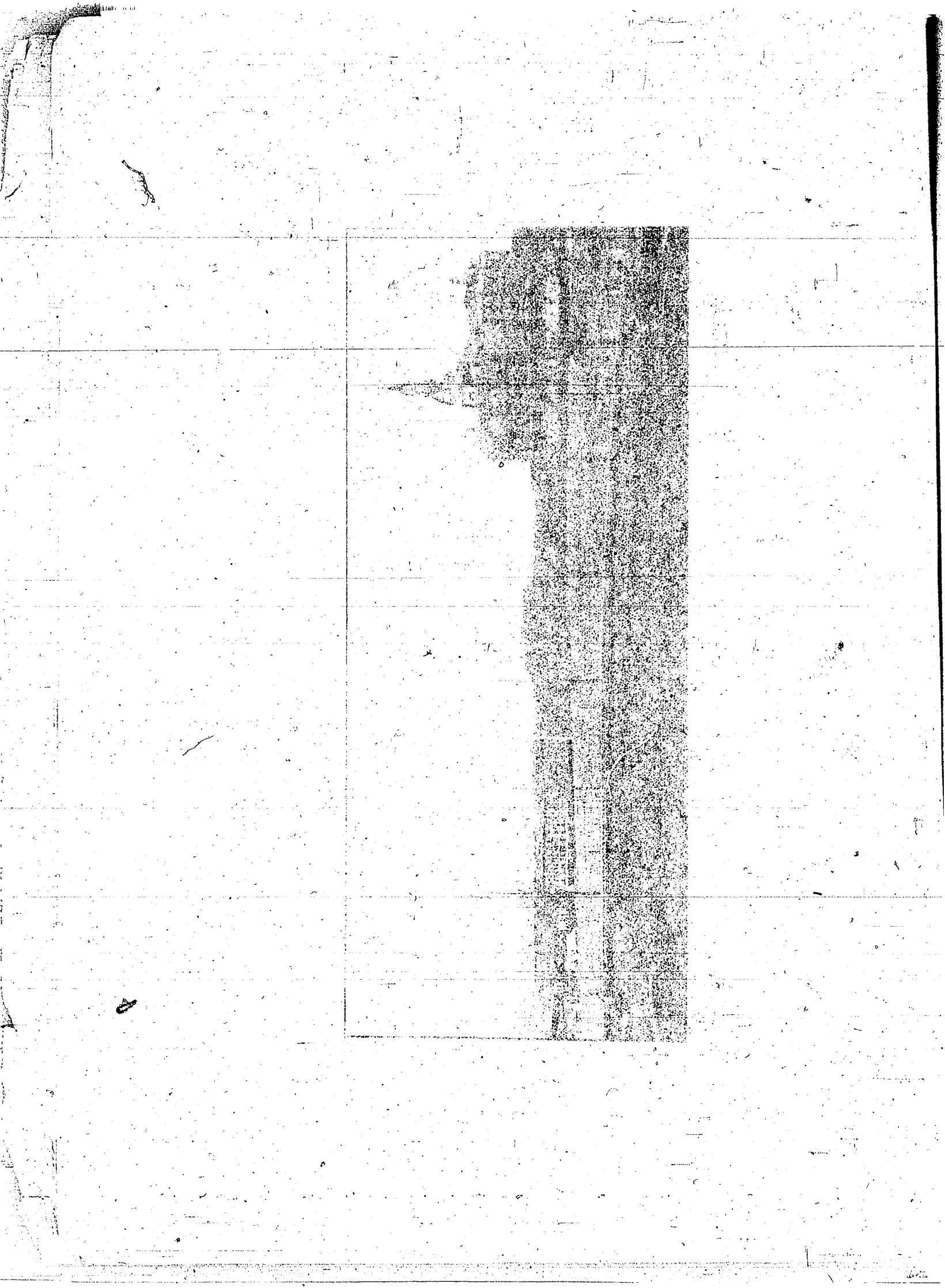
*Not crushed

Laboratory Tests on Ore

By the Cyanide Process

In the Senior year of the Mining course, all students are required to do practical work on ore by the Cyanide process. The results given here show part of the work done by the present Senior class. The ore treated came from the White Cross mine, and had a silicious gangue carrying iron pyrites partly oxidized. Part of

the ore was crushed to pass a 40-mesh screen, and part to pass a 20-mesh screen. The former assayed 1.22 ozs. gold per ton of 2000 lbs., and the latter, 0.81 oz. The soluble and latent acidity of the ore was determined by a standard solution of potassium hydrate, and the results calculated in terms of lime. The



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proper amount of lime, to neutralize the acidity of the ore, was thoroughly mixed with the ore. To determine the best treatment for this ore, the following experiments were made on 1/2-lb. samples of the ore, with the results as here indicated:

No. of Ore Sample	Crushed to	Strength of Cyanide Solution, Per Cent.	Time of Contact, Hours.	Consumption of Cyanide, Per Cent.	Extraction of Gold, Per Cent.
1	40-mesh	0.15	120	0.1370	87
2	"	"	48	0.1370	80
3	"	"	48	0.1357	50
4	20-mesh	"	120	0.1357	64
5	"	0.25	48	0.2266	38
6	"	"	120	0.2266	71
7	40 mesh	"	48	0.2330	91
8	"	"	120	0.2269	82
9	20-mesh	"	72	0.2269	75
10	"	"	168	0.2253	84
11	40-mesh	0.15	168	0.1357	84
12	20-mesh	"	168	0.1344	93
13	40-mesh	0.25	168	0.2279	73
14	"	0.15	72	0.1344	85
15	"	0.25	72	0.2279	75
16	20-mesh	0.15	72	0.1344	69

These experiments indicated that sample, No. 7, gave the best results for the ore crushed to pass a 40-mesh screen, and sample, No. 12, gave the best results for the ore crushed to pass a 20-mesh screen.

Larger samples of the ore were then treated, under conditions that would be found in a large mill, with the following results:

Weight of Sample, Pounds.	Strength of Cyanide Solution, Per Ct.	Time of Contact, Hours.	Consumption of Cyanide, Per Ct.	Extraction of Gold, Per Ct.	Extraction in the Zinc Boxes, Per Ct.	Rate of Leaching per Inch, Min.
(40-mesh) 28.25	0.25	48	0.2320	72.95	80.3	30
(20-mesh) 31.5	0.15	168	0.1357	69.13	67.3	26.87

The low extraction in the zinc boxes is due mostly to two causes: (1), the zinc shavings used were 4 or 5 years old; no freshly turned zinc shavings were at hand; (2), the solution was in contact with these shavings only from

25 to 30 minutes.

What the Miner Wants.

He wants a "false-set" of teeth for the "mouth of the tunnel," and a girl of experience to paint and powder the "face of the drift."

He wants a four in-hand tie for the "collar of the shaft," and a boot for the "foot of the incline."

He needs a jockey who can ride a "perphyry horse" and use the "spur of the ledge" on a "bucking donkey" (pump) and "drive a crosscut."

He wants an "expert" burglar to "tap the ledge," a detective to "follow the vein" and a watchman to guard the "silver plate."

He wants a hat that will fit a "head of water," and a man who can wear the "cap of a tunnel-set."

He wants a soldier who has been "drilled" to handle "gun" and to "shoot" and work a "battery;" also a painter who can distinguish a "color."

He wants a "square set" of men to work for him, some feed for his "giraffe," a bird for the the "cage," a hunter to hunt the "gopher," and the "grizzly" and a sprinter to "run a drift" against time.

He wants a tidy man who will put an "apron" on and "clean up" the mill, sweep up the "dust" and wash "dirt."

He would also like to have the government furnish him with "stamps" free of charge.

And when he "dies" he wants to go to the "upper level" and play on a silver "horn" and have his "slapjacks" baked in a "gold pan."—*Mining and Engineering Review.*

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It is with a mingled feeling of pride and hesitation that the editor of THE ARGONAUT presents this issue as the result of the efforts of the engineering students of the University of Idaho. This is the first issue of THE ARGONAUT, devoted to the work of the students of any department. It was the plan of the editor at the beginning of the year, to have the students of different departments, or the different classes, take this work up through the year; but it appears that the students do not care to do so. Now that the work has started, it is to be hoped that the students will at least take interest enough in their work and the work of their department, to let the editor know what they are doing.

In presenting this special engineering number of THE ARGONAUT, the editor presumes that it will be more or less severely criticised by different ones. The criticism will be partly from those who are competent to pass judgment; partly from those who are not qualified

to do so. To the former we would only suggest that they, in passing their judgment, remember that we are only college students; and that in writing on the various topics, we have not that most valuable information gained by years of experience in a chosen line of work. To the latter class of critics, we have nothing to say that would give them relief. They were created that way, and we do not care to discuss Divine Wisdom. Neither is it our purpose to discuss the relative merits of a college course in applied science, as compared with other courses of study. However, a few words in regard to our engineering possibilities may be of interest to our readers.

The importance of technical colleges, where instruction in the applied sciences is given, is becoming more recognized, as the people come to realize that in this industrial age of the world the well trained, technical engineer is an important factor. Engineering instruction not only prepares one for a chosen line of work, but qualifies one for other duties. The trained engineering mind is an executive mind, and it is a recognised fact that vast commercial enterprises are being placed in the hands of the engineer. Speaking on this point Mr. Wm. D. Ennis, writing in The "Engineering Magazine" says:

"These methods of successful management are not dependent upon unusual talents or abilities, but rather upon high and rigidly-adhered-to ideals of conduct and usefulness. They involve a patience with, and command of, details; the ability to grasp salient points, to analyze and classify data; readiness, for emergencies and unfamiliar conditions; a progressive spirit; resourcefulness, of self and in subordinates; and, more than all, the faculty (and desire) to use men of ability by gaining their interest and cooperation, and, having ascertained their most efficient field, by trusting them without interference."

Recent investigations have shown that every

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graduate of West Point and Annapolis, who has resigned his army commission to enter private life, has been successful.

The value of engineering training is well expressed in the following extract from the article referred to in the Engineering Magazine:

"It gives thoroughness first of all, for no progress is possible in mechanical operations without thorough mastery of each step. It gives a command of details. It develops a graphic habit of thought, and ability to picture abstract things, and to make mere conceptions real. It emphasizes the necessity of recording, transcribing, comparing, and perfecting one's observations until the elementary facts have been clearly sifted out and the basic principles mastered. And at no stage, especially if coupled with rational and competent scientific study, is it other than broadening to every faculty of the mind. More than all these, it creates the courage and ability to grapple with new conditions with a confidence born of a thorough understanding of the natural laws involved, that unerringly define, limit, and control even uninvestigated phenomena.

The greatest tribute that can be paid to a profession has been paid to the engineering fraternity of our country in the recognized fact that no profession enjoys a higher standard of honor and integrity. Opportunities for dishonesty are many; the responsibility entrusted upon the honor of engineer may be great, but records show that cases of abuse of this confidence are indeed rare.

The world may easily forget the errors made in other professions; but in the engineering profession success must be attained; errors and failures are never forgiven. If a dam breaks, causing loss of life and property, a bridge falls down, a mine proves a failure, the blunder, if the fault of the engineer, is ever before the eyes of a critical public. To attain success, the engineer must be properly trained for his work. The time is past when the world wants

the so called "self made man." The successful engineer of today, is the man whose practical experience is based upon a thorough, practical, technical training.

Where can the young engineer of the West look for a more promising field for a successful application of his training than at home, in the new and comparatively undeveloped country? Or to limit still more the scope of our field, in Idaho, "The Gem of the Mountains," with her crown whose jewels comprise the treasures of wealth which man is ever seeking? Yet all that is expressed in her grand architecture can only be disclosed, when her hidden treasures, through the guidance of the engineer, are uncovered.

Mines and Mining.

In the call for an International Mining Congress which met in Milwaukee in June, 1900, the committee said: "The greatest factor in promoting the wealth, the growth and power of this country is the mining industry. It is the mining industry that will most easily, naturally and permanently build up our foreign trade, restore prosperity among the people and lay a firm financial foundation for the present and future generations."

This statement is an indication of the wonderful growth that the mining industry is making.

In Idaho mining interests are of primary importance. In 1899 we produced \$13,623,488.00 worth of gold, silver, lead and copper. A state so richly favored with minerals should afford the most generous help in meeting the liberality of the Federal aid. * * * *

The department was founded in 1895 and during the year 1897-98 thirteen students

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matriculated in the work. In 1899 the first student graduated from the department and in June, 1900, the department had three graduates. During the present year twenty-two students have registered for the full four years' course, and beside these are several who have applied each year for a short course in mining. All of the graduates of this department are holding excellent positions, and the undergraduates have during their vacation readily secured lucrative employment in the practical work of the mines. Many valuable pieces of apparatus have been donated to the department by practical mining men living in Idaho and in other states.

The department of mining and metallurgy occupies three rooms in the basement of the main building, and has an excellent equipment, consisting of a choice collection of minerals, maps, charts, models, muffle-furnaces, cyanide vats, and numerous other pieces of apparatus for teaching the various processes of assaying as well as for doing the practical work.

The fire assay room is furnished with rock crushers, samplers, sieves, a bucking board, mortars, coke and hydro-carbon furnaces, and furnace tools.

Among the Geological and Mineralogical collections are a series illustrating the physical characters of minerals, the United States educational series of rocks, a collection of ores properly grouped, and a collection of fossils arranged according to the geological formations. — *Eleventh Annual Report President Board of Regents.*

With the Mineral Exhibit at Buffalo—Idaho

Idaho, the Gem of the Mountains, has contributed to the wealth of the nation since 1860,

\$250,000,000 in metals. Output for 1900: Gold, \$2,076,036; silver, \$8,468,839; lead, \$7,689,974; copper, \$2,124,603; miscellaneous, \$499,760. Total, \$20,859,212. Idaho has 1,250,000 acres of rich mining lands, the greater part of which is unexplored or unclaimed.

Such is the legend which was posted in the alcove behind the Idaho Mineral exhibit, at the left of the broad main entrance to the Mines building at the Pan-American Exposition.

Those who know anything about the lead production of the world know that the famous Coeur d'Alene mines of Idaho produce more annually than any other district in the world, and with this lead silver having a value slightly in excess of the lead contents. Not tons, nor carloads, but train loads, are carried away to the smelters and refineries from these great mines, and millions of dollars are paid out annually to the men who toil in the mines.

In a pyramid in the center of the exhibit was piled huge chunks of silver-lead ore from some of the greatest mines of this great mining camp, and mines from other parts of the state were represented, for be it known, that although the Coeur d'Alene is the greatest silver-lead camp in the world, it is by no means the only one in Idaho.

It has been said of Idaho, and with truth, we believe, that there is not a county in the state but has producing mines.

Of gold mines, Idaho can boast of many, some of which are wonderfully rich and others which pay regular dividends. That portion of the state which is drained by Snake river and its tributaries, and this is by far more than half of its total area, is dotted with mining camps where gold is the principal source of revenue. The heavy resonance of the stamp-mill is the most common sound, and the thun-

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dering, reverberating intonation which greets one just before noon, and 6 o'clock indicates where the miners are wresting the gold from the bosom of mother earth with which they feed the ever hungry mills, which in turn send out the bullion to be minted by those who can not produce it.

Gold, like the lead and silver of the state, has been lavishly and equitably distributed from the southern boundary to the north line, and from the eastern to the western limits of the state.

The copper ores of the Seven Devils had a prominent place in the exhibit also. Several cases were filled with rare and valuable specimens gathered from every part of the state, a large variety of building stones occupied a central position, marble, kaolin, potters' clay, mica, ochre, silicified wood and opals were shown.

A model stamp mill, complete, the product of students of the mining department of the Idaho State University, was running steadily. Rifles, sluices and other metallurgical appliances were there to occupy the attention of the visitor, as did the large pictures on the walls.—*Mining.*

A Miner's Letter.

My darling, I know you'll be anxious
To hear from your truant once more;
I've now just returned from the mountains;
Been sorting and sacking my ore.

At last I have struck a bonanza,
I'll send you a sample of ore;
It assays way up in the thousands,
And is worth a cool million or more.

If the pay-streak don't pinch in the workings,
And will furnish its average yield

of gray copper, galena and ruby,
We'll both be eternally heeled.

We'll have suppers, receptions and parties,
And night shirts with laces, and wine,
And fashion will come in its grandeur
And humbly kneel at our shrine.

Then look out for a check for a thousand,
And prepare for a change in life;
Take the sign off your laundry and burn it,
For now you're a millionaire's wife.

—Anon.

HER ANSWER.

Dear John. I received your kind letter,
And am glad we're eternally heeled,
Provided the pay streak continues
To furnish its average yield;

But as for the suppers and parties,
The night shirts with laces, and wine—
Are you sure that these are sufficient
To make "fashion kneel at our shrine?"

While we revel in costliest splendor
Will nobody say, "They look green"?
Can I go from the wash tub and laundry,
And reign a society queen?
They say that it isn't so easy
To learn the society talk,
And fashion, I'm told is quite heartless
When rich people make any balk.

At the best could we be more than shoddy—
Rich people with nothing to say,
Poor wretches whom no one regardeth
Except for the bills they can pay?
Then think of the money required
For suppers, receptions and wine,
And how little profit, though fashion
Ironically knelt at our shrine.

She would sit at our suppers and dinners
And sneer at the talk that we had,

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And say with her eyebrows uplifted
 That really our cook wasn't bad.
 I'm sure she would "pinch in the workings,"
 And furnish a pitiful yield;
 This fashion on which you are counting,
 Because we're "eternally healed."
 But I've thought of a pay streak, dear husband,
 More precious than rubies or gold;
 Its riches and pleasure and honor
 Have never by mortal been told;
 And to work it we need not be fearing
 We'll make any laughable balk,
 By showing the world our conception
 Of genteel society talk.
 This pay is finding the needy
 The invalid dying for care;
 The orphaned and homeless and wretched,
 And lighting their nights of despair.
 This never can "pinch in the workings,"
 For 'tis part of the glory revealed,
 That can make us of sin and of sorrow,
 In truth, John, eternally healed.

—Agnes Leonard Hill

Ravinla, III.

The Hang-Up Stick.

(By Matt Waite, millman at the Gold Bank
 mine, Forbestown, Cal.)

How dear to my heart my remembrance of
 milling,
 Reproduced are the scenes in my fancy so
 true;
 The leaky ore feeders that always were spilling
 More rock on the floor than they ever fed
 through.
 The wobbly old pulley, our cam-shaft adorning,
 The menacing ore bin that threatened to kill;
 The two old cracked cams that were keyed
 every morning,

And the grease-reeking hang-up stick used
 in the mill.
 That grease-garnished weapon I've grasped
 with a feeling,
 When often at noon from my luncheon I flew,
 What a gift of profanity I was revealing,
 As I hung up a stamp that had broken a
 shoe!
 The greasy old "cam-post," the chain blocks
 hung near it,
 The sledge and the drifts and the shims that
 don't fill;
 And George's shrill whistle—a dead man
 could hear it—
 As we rushed for the hang-up stick used in
 the mill.
 But now far removed from that grease-smeared
 condition,
 No tears of regret do my eyes ever fill;
 Yet I hail as an old friend this pigmy edition
 Of the grease-festooned hang-up stick used
 in the mill.

"Oh Charley! See what a fine specimen
 I've found out here in the yard. I wonder
 what it is. It looks like ferruginous quartz."
 Form—Geode.
 Structure—Crypto, Crystalline.
 Cleavage and fracture—? (Can't break it.)
 Hardness—About eight. (Will scratch
 quartz.)
 Tenacity—Tough. (Most certainly.)
 Color—Brick red.
 Luster—Sub-metallic. Rather dull.
 Diaphaneity—Opaque.
 Taste— — —? — — —!!! — — —?
 "Here, let me take it — — — Aw! That's
 one of sister's doughnuts!!"—The Aurum

THE UNIVERSITY ARGONAUT

Minor Events

Daisie Booth has joined the senior class.

The dormitory will probably be opened next week.

Registrar Condon returned from his Portland trip Friday.

Dr. Little spoke in assembly last Wednesday on German student life.

H. E. French, of the W. A. C. was a visitor at the college yesterday.

Hal Orland is said to have been present at Leanora Jackson's recital.

Willard Hales visited his many 'Varsity friends a few days last week.

L. G. Nichols, '04, has quit school for the year. He will return next year.

The bible study class meets with Prof. Morley, in his room, Mondays at 4:15.

E. C. Boles has quit school, and has accepted a position in Hodgins' drug store.

Miss Fern Headley was compelled to leave school for the year, on account of poor health.

Architect Ritchie was looking after the work at the new buildings the first of the week.

Mr. Cox, assistant secretary of the Y. M. C. A., visited our association the first of the month.

Miss Florence, cousin of the Misses Kneppers, has registered in the preparatory department.

President MacLean was in Spokane Tuesday evening, and attended the banquet given by the Harvard Club.

The faculty have granted credits to the

students of THE ARGONAUT staff for work done during the first semester.

The annual will soon be ready for publication. The junior class deserve much credit for the excellent work they have done.

A snake that was not a snake, got loose in the "Zool, Lab." a few days ago, much to the dismay of the young ladies in the class.

The ball game between the 'Varsity nine and the Lewiston Normal team resulted in a victory for the 'Varsity boys by a score of 5 to 4.

The Portland Oregonian of Wednesday publishes a large halftone picture of the new school of mines building of the University of Idaho.

The class of '04, it is reported, gave a party in the armory. Taffy pulling was the principal amusement. The president will see them later.

The following dates have been set for the oratorical contests: Brake contest, April 12th; Watkins' contest, April 18th; Intercollegiate contest, April 25th.

A very enjoyable musicale recital was given by the students of the musical department on Wednesday, March 19th. The numbers on the program were all well received.

The prospect for track athletics is improving. Manager Tweedt, Captian McConnel, and Mr. Tilly are doing good work, and will no doubt put a winning team in the field.

The Freshmen gave a party at the "frat hall" Friday evening. Games and dancing were indulged in, and dainty refreshments

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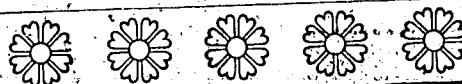
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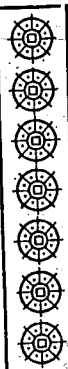
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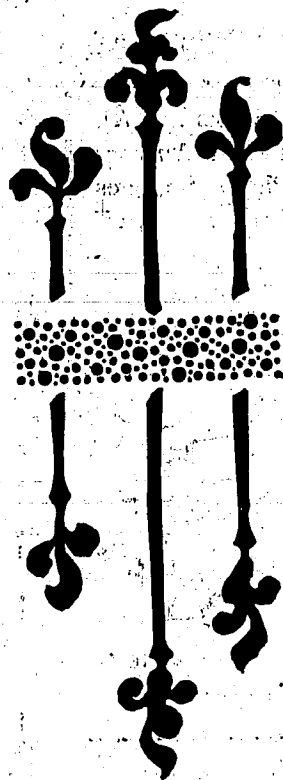
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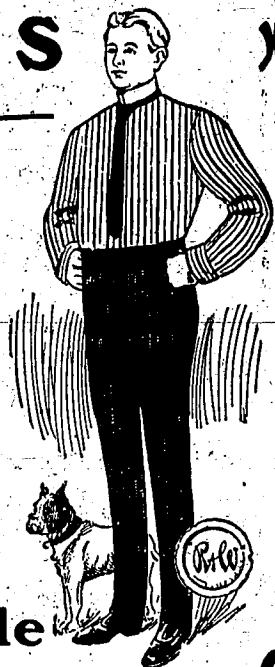
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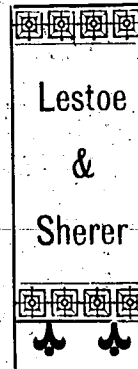
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Announcement

To prevent any misunderstanding on the part of any member of THE ARGONAUT Association, or anyone interested in the matter of the appropriation of the funds of the Association, for this issue of the paper, the editor wishes to state that extra expense for half-tone cuts, etc., all extra material and labor required, and all expense whatever, above the usual monthly expense of the paper, will be paid for by the students in Mining Engineering. The editor invites, and will be very willing to co-operate with, the students of any department, or of any college class, to issue similar editions of the paper, at any time; provided, the students interested will incur all necessary extra expense.