ENGINEERING ABSTRACTS

MECHANICAL ENGINEERS SALARIES

THE A.S.M.E., in answer to the questionnaire sent out to its members regarding their 1930 incomes and other personal matters, received close to ten thousand replies. These were tabulated in several different classifications and the results charted for this article, which should be of great interest to the embryo mechanical engineer. The earnings are classified according to geographical areas, vocation, the amount of technical education, and the various industries. These earnings are professional incomes only and do not include earnings from other sources. Not only the average income is charted but the top of the lowest 10 per cent, the top of the lowest 25 per cent, the bottom of the highest 25 per cent, and the bottom of the highest 10 per cent are also on the graphs. This gives the reader a very clear idea as to the range in salaries.

From the charts it is learned that the New York Metropolitan district pays the highest salaries and the Far West the lowest, with the exception of railroads and academic work. It seems to make little difference as to the particular industry the engineer is in. Those with B.S. degrees in engineering from leading technical schools, it is noted, receive the highest incomes on the whole.

The differences in incomes are great, and the earnings are largely determined by the individual's ability to manage men and affairs. The maximum income of the typical engineer is $7500 per year at the age of 55. The incomes do not decline appreciably after that age. Other incomes ranged from $3600 to $25,000 per year, showing that there are ample financial rewards for the deserving in this profession.

—*Mechanical Engineering,* Sept., 1931.

RUSSIA'S GARY, INDIANA

One of the projects in Russia's five-year plan is the building of an enormous iron and steel works. This is to be situated at Magnetogorski, in the remote Asiatic Urals. Last May there was not a soul in the place. Now 35,000 men are toiling there day and night, to construct Russia's "Gary, Indiana."

With an output of 3,000,000 tons of iron and steel a year, it will be a close second to Gary, which turns out 3,400,000 tons a year. Eight huge blast furnaces are being built so that eventually they will be able to produce 4,000,000 tons a year.

The outlook for success for this project is bright. Magnetogorski lies at the foot of a mountain 3 miles long, 2 miles wide and 1,000 feet high, that contains 275,000,000 tons of 62 per cent pure magnetic iron ore. The Soviet government has invested $400,000,000 in this project.

As in the case of the Dnieper Dam project and all the other big jobs now under way, American engineers from the Arthur G. McKee Co., engineering contractors of Cleveland, Ohio, with Max MacMurry in command, have taken over the enterprise. It involves the biggest contract of engineering in history.

Russia also throws some light upon the human engineering question. This is the question of how best to handle workers so as to get the most labor from them. Recently, at the iron works, 1500 men completed a dam across the Ural River. Though it was three-quarters of a mile long and contained 52,000 cubic yards of concrete, it was completed in four months. The morning the job was done, each laborer received two weeks' extra pay. Fifty of the workmen, who had set personal records, were rewarded with free trips to the "Red Riveria." This method is generally opposed to the principle of Sovietism, but as long as it gets the desired results, the Russian government feels that it is right in breaking such rules.

—*Popular Science,* April, 1931

NEW SUBWAY FOR BUENOS AIRES

On October 18, 1930, the new Lacroze Subway was opened to the public of Buenos Aires. The opening of this subway brought to a close one of the most remarkable engineering projects of recent times, giving Buenos Aires over four miles of double-track subway which is of the most modern design. The project was completed in twenty-one months. Actual tunnel excavation was begun in December, 1928, and in August, 1930, the first section of the subway was ready for operation.

The subway was excavated by two different methods. In the less populated sections of the city the open-cut method was used, and in the downtown district the tunnel method was necessary.

Three thousand men of forty-four different nationalities were employed during the construction period.

—*The Pure Iron Era,* First Quarter, 1931.

REJUVENATING OIL WELLS

Pumping perfectly good oil into apparently dry oil wells seems like a poor way to make money. However, that is exactly what engineers in the California oil fields are doing.

At the Brea Olinda field of the Union Oil Company, engineers shut in all the wells except four. Into three of these wells they pumped 500,000 barrels of oil. Into the fourth, they pumped 600 million cubic feet of natural gas. These operations were carried on at a pressure of nine hundred pounds per square inch.

When the wells were opened, oil rushed out at the rate of several hundred feet per day. That which had been pumped into the well had a gravity of 34 degrees, but the outflowing oil was found to be 32-degree oil. Thus, some of the heavy 17-degree oil which had been imprisoned underground had been absorbed by the lighter oil. This 17-degree oil had formerly been considered non-recoverable.

Engineers predict from the success of this experiment, that a large part of the oil which has formerly been left in the ground may be recovered. The use of steam under great pressure may help in scouring the shale which holds the valuable product.

Another use has also been found for dry wells. By using them as storage tanks for natural gas, the cost of constructing large containers can be eliminated and the heavy demands of peak load hours can be easily met. This will result in a saving of seventy-five dollars for each 1,000 cubic feet of space and will render obsolete the extensive tank farms now in use.—*Science and Invention.*

NEW PIPE LINES POINT TO GAS HEATING ERA

San Francisco recently received its first supply of natural gas from gas fields located one hundred and ninety miles from that city. This was made possible by laying down high pressure transmission lines which will carry the gas under an enormous pressure.

Hundreds of miles of such lines are now being constructed from the various gas fields to many cities throughout the country. The high pressure at which engineers have learned to confine and pump the gas in the pipes make the lines possible. Often the pressure of the gas in the wells is not sufficient to send it through the pipes. This is remedied by establishing a compressor station at each well; there are also other compressor stations along the lines to help maintain the pressure. These pumps supply a pressure of from 200 to 400 pounds to the square inch.

No storage tank is needed by this natural gas system as the gas is so tightly compressed into the lines that a 22-inch pipe becomes a real reservoir. If a line should break it could be shut down for repairs without affecting the city's supply of gas as there would be enough gas in the pipes to supply the city with gas for two or three days.

The lines are laid under the ground and the breaks or leaks in the pipes are discovered by line walkers who make daily inspections over the different sections of the lines. Since natural gas gives twice as much heat as manufactured gas this new method will be much cheaper for the consumer even though the price rates remain the same.

BATTERIES TO RUN TRAIN

Electrical Engineers have been unsuccessful in their past attempts to run a train by means of a battery because they have been unable to develop one that will give the high rate of current discharge for the length of time required by modern rail transportation.

James J. Drumn of Dublin, Ireland, has discovered a new powerful alkaline storage battery that has successfully operated a train. The positive electrode of the battery consists of a mixture of metallic silver and ceric oxide, and the negative electrode contains the oxides of iron or cadmium, an accumulator permitting a very rapid rate of charge and discharge because of its low internal resistance, thus aiding the energy capacity of the battery to develop a very high power to the unit of weight employed.

This battery was recently connected to a train, having a weight of 1300 tons and was operated from 9:35 A. M. to 5:30 P. M. During this test the train developed a maximum speed of fifty miles per hour and at the end of each run the batteries were recharged at the rate of 600 amperes in ten minutes. At the end of the day the temperature of the cells was 30 degrees Centigrade. The results so obtained were so successful that the Irish government appropriated money for further experiments.

A Drumn Electrical Train is now being constructed to run in regular operation carrying passengers. —*Popular Mechanics,* May, 1931

STREAMLINED AUTO CAN ALMOST FLY

Sir Dennis Burney, who planned and built the gigantic English airship R-100, is the designer of the new auto which he claims will cut the fuel consumption in half. This fuel consumption is reduced by streamlining his auto. Practically every wind resisting object has been streamlined; even the lenses of the headlights are sunk flush with the body.

Located in the rear of this car is an eight cylinder, twenty-two horse-power motor capable of giving the auto a speed of eighty miles per hour. At this speed the wheels barely touch the ground, consequently saving tire wear. Each wheel has independent springs, assuring smooth riding at this speed. The eight-cylinder, water-cooled motor is covered with a hood whose vents look somewhat like the tail fin of a dirigible or airplane. Two models of the car have been built and the inventor plans to put this car on the market in the near future.

INDOOR ICE-HOCKEY

Anyone who has watched an indoor ice-hockey game has no doubt wondered how the ice was made. In most places it is made by running ammonia in pipes under a large tank of water.

However, when they decided to build an ice rink in the Madison Square Gardens, there was an entirely new and difficult problem to overcome. It was necessary that they be able to form the ice on short notice and to melt it quickly, to make way for other shows in the Gardens.

This was solved by the following method. A floor seven-eighths of an inch in thickness was laid. This floor was composed of materials to make it elastic to prevent cracking from expansion and contraction of the ice. Underneath was laid twelve miles of piping. When ice is desired, cold brine is run through the pipes and water sprayed on the floor. When the first coating of ice is formed another is added until the film is an inch thick.

When the ice must be removed, steam is run through the pipes. This loosens the ice and it can be taken off the floor by a scraper. Then the base of the scraper is fitted with strips of sponge rubber and the floor thoroughly dried. A coat of polishing is added and the floor is ready for an auto show, boxing match, or whatever is scheduled.

The cost of installing the apparatus was $80,000. By means of it ice may be formed, melted, and removed in two hours. Removing the ice takes only 30 minutes. On one occasion ice was removed and apparatus for a boxing match, including spectators' seats, set up in three hours. —*Popular Science,* April, 1931

ENGINEERING ABSTRACTS

SOME RECENT ASPECTS OF RIGID AIRSHIPS

Lieutenant Settle of the U. S. Navy describes the new developments in rigid airship design since 1926, in this very interesting and highly illuminating article. It concerns the Graf Zeppelin, the R-100 and R-101, the Los Angeles, the Akron, and its sister ship to be built, the ZRS-5. However, since the Akron entails the greatest divergence from conventional airship construction, the other ships receive very little comment.

The most radical departure from conventional construction is the inside engine room used on the Akron. There are six of these. This design is possible through the use of Helium for lifting power which is non-inflammable. The chief advantages are increased aerodynamic efficiency and better access to the engines while in flight.

All metal parts are prevented from corrosion by anodizing before fabrication. Fabric is still used for covering, but the present-day cloth is much stronger than that used a few years back. There has been some work done on all-metal ships, but as yet little progress has been made on the larger ships. The Goodyear Company has developed two new types of gas cells both of which are used in the Akron. These are made of rubberized fabric and a fabric known as gelatin latex. Both are slightly heavier than goldbeater's skin, but quite satisfactory.

In spite of the length of time since airships have come into use, there is only one motor that has been fully developed and tested. This is the Maybach engine made in Germany. The fuel consumption is low and it will run for thousands of hours between major overhauls. The Diesel seems to be the airship motor of the future, and the British have done considerable work toward making it so. The R-101 was equipped with Diesel engines. The Akron uses the Maybach engine, which is reversible. The propellors, by an ingenious arrangement, can rotate through ninety degrees, thus enabling the ship to be driven up, forward, down, or backward, with the engine. Water recovery through the exhaust gases, a process developed by the Navy, permits additional weight to be carried where formerly water ballast would have been necessary. It is said that 85 to 100 pounds of water vapor can be recovered from 100 pounds of gas. Dr. Eckener of the Graf Zeppelin has experimented considerably with gaseous fuels of about the same weight as air, but, because of the fire hazard, the U. S. Navy has not used them.

The author states that the Akron has the most powerful and efficient radio equipment of any recent airship. In conclusion he discusses the military uses of the airship and its commercial possibilities—*Mechanical Engineering,* August, 1931

ELECTRICAL EQUIPMENT FOR THE "NAUTILUS" ARCTIC SUBMARINE

The *Nautilus,* a submarine in which Sir Hubert Wilkins, noted explorer, hopes to travel beneath the ice to the North Pole, will contain many electrical devices.

The submarine, although it will be in the frigid zone most of the time, will have an interior temperature warm enough to cause the food to spoil, so an electric refrigerator will be used to preserve the food. Ultra-violet lamps will also be installed to keep the crew in a good physical condition, since they will have very little sunlight on this under-sea journey. Besides a radio for providing entertainment, there will also be an electric stove, an electric vacuum cleaner, an electric washing machine, and electric fans which will keep the air in circulation.

A large storage battery that is used to start the Diesel propulsion engines will also supply the electric current for these various electrical devices. The storage batteries will be recharged by an auxiliary Diesel operating electric generators.

—*Scientific American,*
May, 1931

STANDARDIZATION OF MACHINING FINISHES

In spite of all the progress made in engineering, shop practice, and methods of manufacturing in the last twenty-five years, the majority of plants do not specify on the drawings the type of finish desired for a particular piece. The nature of the finish is usually left to the judgment of the men in the shop, and too often this results in wasted time spent in conferring with foremen and designers as to the proper finish to apply. Often the machinist will apply what he believes to be the proper finish only to discover later, to his chagrin and the wrath of his superiors, that the part must be scrapped because of the improper type of finish. The author feels that this expense is needless and can be entirely avoided by the adoption of standard conventional symbols for various types of finishing. He proposes for ordinary practice that finishes be divided into three classes, high finish, medium or commercial finish, and rough finish for appearance only, with the suggestion that each department of the shop be supplied with a set of samples of the type of finish that it applies. The symbols which he suggests closely follow those in use in Germany and Sweden.

The adoption of these or similar symbols would greatly facilitate that choice of finish for the man in the shop and unquestionably would result in a saving of quite a sum of money. Drawings could then be sent out of the plant for manufacture of parts in other plants, with the assurance that the right finish would be used. Of course, for special types of work there would have to be modifications of the standard.

—*Mechanical Engineering,* October, 1931

A.S.M.E. MEETING

The Student Branch of the American Society of Mechanical Engineers held its first meeting of the year on Friday, October 2, at 4 P. M., Room 166, Robinson Laboratory. This meeting was presided over by Paul F. Lockett, who was elected chairman for the fall quarter at the last meeting in the spring. Dues for the year were set at $1.50, a reduction of fifty cents from last year. Professor Magruder spent the rest of the time in explaining, for the benefit of the new members, the work of the A.S.M.E. and of the student branch. He also explained how membership in the student branch makes it less expensive to join the regular society after graduation and also makes it possible to secure *Mechanical Engineering,* the magazine published by the A.S.M.E., at reduced rates.

The second meeting, held Friday, October 9, at 4:00 P. M., opened with the election of a Junior Representative to the Engineers' Council. This position went to Lewis Mussman, M.E. 3. Following this the members were entertained with a moving picture on the "Romance of Paper." Another picture was scheduled but was cut from the program for lack of time.

ALUMNI NEWS

ELECTRICAL ENGINEERING

Frank L. Evans, '87, is now with the Indianapolis Power and Light Company, 48 Monument Circle, Indianapolis.

Lloyd M. Grow, '25, formerly with the engineering department of Stevens and Wood, Inc., and later with the Detroit Edison Company, is now with the Wooster Electric Company, electric light and power, of Wooster, Ohio, as electrical engineer.

Hilding F. Gidlund, '23, is chief draftsman, transmission and station engineering department, Frueauff Station, Public Service Company of Colorado, Third and Lipan Streets, Denver, Colo.

MECHANICAL ENGINEERING

Alfred David Benson, '25, on test at Schenectady with General Electric until September, 1926, and after that with the Akron and Cleveland offices of General Electric, is now with the Cleveland Crane and Engineering, Wickliffe, Ohio.