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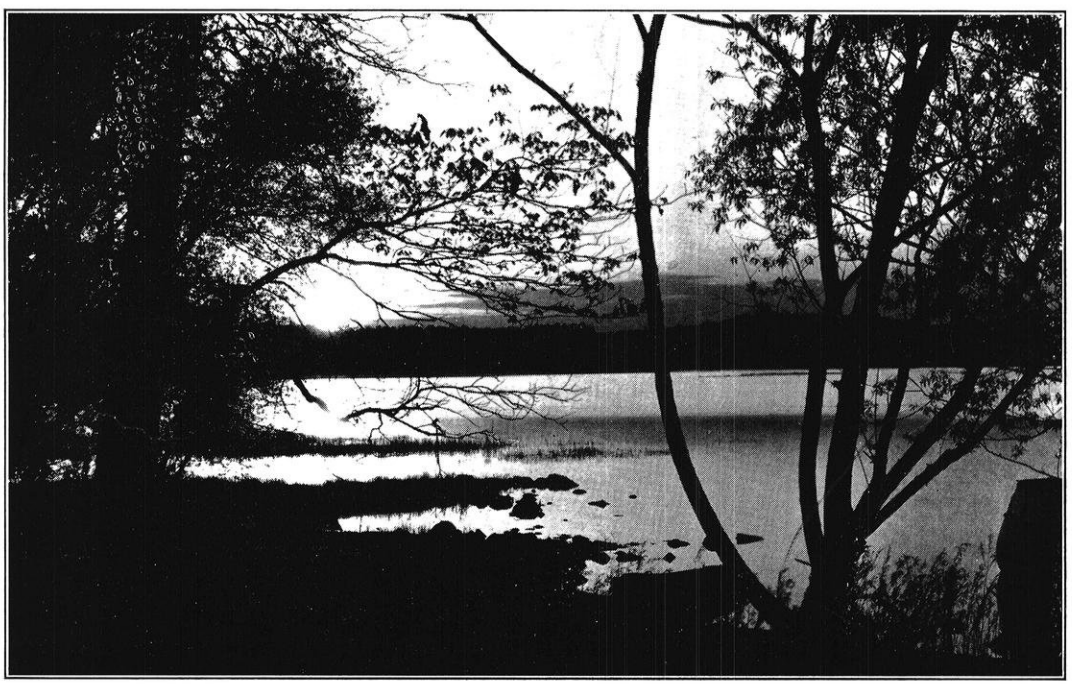
VOLUME XXXIII NUMBER VII



LAKE MENDOTA FROM THE DRIVE

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The Wisconsin Engineer

VOLUME 33, NO. 7 APRIL, 1929

Industry's Greatest Servant
In This Modern Age of Power Is

Industrial Control

By H. H. Watson,
General Electric Company

ELECTRIC POWER — what a picture flashes into our imagination at the mention of this tremendously important factor in our 20th century industrial mechanism! Huge power houses are each sending out hundreds of thousands of kilowatts of electric power over an almost nation-wide network of distribution systems. Inside of industrial establishments — the steel mills of Youngstown, the tire factories at Akron, the lumber mills in Seattle, the oil fields of Texas, paper mills on the St. Lawrence — in these, and a host of others, are electric motors accomplishing tasks that make Aladdin's lamp seem commonplace. But these motors are at the same time brutes of wonderful power and infants demanding most careful attention.

Let us look at a motor — for example, the little three-horsepower squirrel-cage induction motor that is driving a dough mixer in a bakery. The baker having loaded the mixer pushes a little button on the frame of the machine and the motor instantly starts up. A few minutes later, the power fails; the baker opens the mixer and has his hands down in the machine when the power returns. But the baker's hands are not injured for the motor did not restart. He again pushes the button and the mixer once more is in operation. Being a new man, the baker has put too much dough in the mixer and the mixer is severely overloaded. Presently, before the motor becomes too warm, the power supply is opened and can not be re-established until the motor has cooled off. Having the load properly adjusted and with the dough mixed, the baker pushes the "stop" button, and the equipment comes to rest.

Let us look at some other motors — this time we are in a steel mill — the motors are high up on a crane which handles huge buckets of molten steel. The bucket filled almost to the top is picked up with hardly a stir on the surface and is swiftly carried one hundred, two hundred, maybe three hundred feet down the mill, dodging in and out between obstacles. Then at the exact spot where the metal is wanted, the crane stops as accurately as a modern motor car with four wheel brakes. With almost imperceptible movements, the bucket is tipped just the exactly correct amount to deliver the required quantity of metal. Once empty, the bucket is rushed back again for another load — careening from side to side like a runaway horse and wagon. Yet, it is spotted at just the proper place in a most uncanny fashion. What is happening here? Up in the crane cab is a single operator with three or four small master switches. One man is handling fifty tons of molten steel with the mere motion of his hands.

We realize by this time that the baker and the craneman had at their command not just motors, but *controlled* motors. The genii that makes the electric motor sit up and roll over and turn flips is Industrial Control. The baker's motor would mix his dough, and the craneman's

I AM THE MACHINE
AND I KNOW MY FUNCTION:

To emancipate Man; to conserve and extend his strength; to release him from drudgery, so that he may know his divinity and learn to love work and to enjoy leisure; to develop his constructive power; to help Man conquer the earth and subdue it, so that this planet may be filled with happy, healthy, creative men and women and with welcomed, joyous children.

motors would hoist and carry his steel as long as mixing and hoisting and carrying were the only desired activities. But these motors must be stopped, and often they must be stopped quickly and certainly. Again the speed may have to be adjusted. Sudden overloads will have to be cared for — power failures occur — all of these and many more are the tricks which Industrial Control has taught the electric motor.

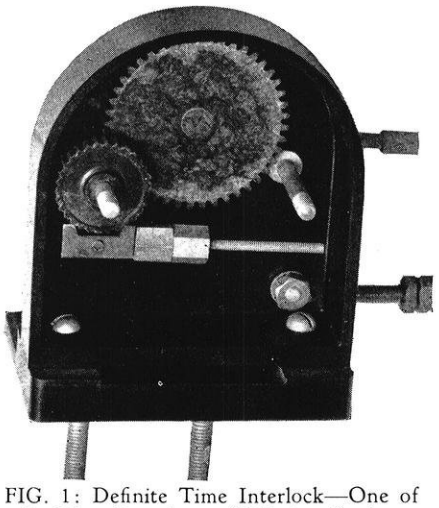

FIG. 1: Definite Time Interlock—One of the Most Ingenious of Timing Devices.

Manual controllers are familiar to almost everyone. The dial switch on the wall that spits and sputters every time it is used and the old clumsy drum controller are still doing faithful work on many motors, but they are old — as out of place as an automobile with acetylene lights and a starting crank.

Modern Industrial controllers are built up around two things — devices and schemes for using these devices. (Let it be understood that the American Standards Committee appointed by Congress has stated that a controller is a collection of devices necessary for the complete manipulation of a motor, and is not to be confused with the drum switch which occupies such a prominent position in steam railway considerations). The fundamental job of the controller is to establish and interrupt the power supply to the motor. To do this are contactors which are electromagnetically actuated switches. A small electromagnet is employed to operate the contactor which carries hundreds and thousands of times the energy used in its coil. This contactor coil can be energized from any conceivable device which is capable of closing a circuit. It may be controlled from any distance — even distances measured in miles. Reference to Fig. 2 shows one type of contactor in use today. The things to remember about a contactor are these: —

1. All currents, even the largest in use in industrial plants, can be controlled by the small current of the magnet coil.

2. The contactor can be operated from considerable distances.

3. The operation is positive, accurate, and safe.

Ordinarily when a motor is started, a series resistance is used to limit the current which flows as the motor is being accelerated. This resistance is cut out of the circuit in stepwise fashion by contactors. A number of different schemes have been used to make this stepwise operation of the accelerating contactors an automatic process. The present practice is towards the use of definite time devices to give the proper sequence of operation.

One of the most ingenious of timing devices is the pendulum and escapement shown in Fig. 1. When a contactor closes to short-circuit a section of resistance, it simultaneously compresses a spring. This spring then exerts its force on a wheel whose rotation is retarded by a pendulum and escapement mechanism. At the end of travel of the wheel, the driving rachet is allowed to jump to give a snap action to a set of contacts. These contacts, upon closing, complete the circuit for the next accelerating contactor, which in turn closes and repeats the same sequence. The time of each of these relays is independently adjustable. Since the mechanism is purely mechanical, it is equally applicable to a-c. or d-c. contactors of any voltage.

Not only responsible for starting and stopping motors, industrial control has also been called upon to be watchman over the motor while it is in operation. The limiting factor in a motor's ability to carry any load is the temperature attained by the copper and iron in the electric and magnetic circuits while carrying that load. Since temperature is the danger signal, the modern industrial controller uses overload protective relays operating on a temperature or thermal principal. Briefly, the temperature overload relay consists of a heating element which carries the motor current or a current proportional to it and a set of contacts actuated by a mechanism sensitive to changes in temperature. The most common type of temperature relay is made up of a heater and a bi-metallic strip, which deflects when heated. The heater is so designed that a heater current corresponding to a dangerous temperature rise in the motor will heat the thermostatic strip sufficiently to open the relay contacts. Actually the procedure is more

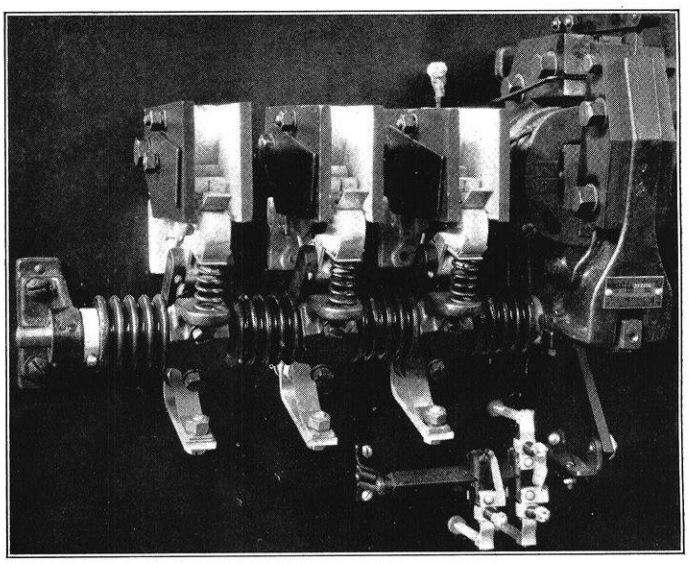

FIG. 2: One Type of Contactor in Use Today.

complex than this. The relay heater and the thermostatic strip constitute a thermal replica of the motor so that the actual thermal condition of the motor is reflected in the relay. A cold motor is protected by a cold relay. If the motor has been running at full load all day, and is quite warm a sudden overload may cause it to burn out very quickly. However, the relay has also been heated up and the additional heating of the overload will trip the relay

(Continued on page 268)

The Harris Process of Lead Refining

By T. D. JONES, m'22
American Smelting & Refining Company

THE HARRIS PROCESS used for refining of lead bullions and scrap metals is named after its inventor, Henry Harris of London, England, who with several associates patented the process in 1919. It is a complete departure from the old fire or furnace oxidation process which has been standard practice for many years in all parts of the world.

The process is divided into two parts, first the dry treatment or pumping lead bullion through a molten mixture of sodium hydroxide and sodium chloride, and secondly the subsequent treatment of the salts by wet process. The dry process is carried on in large kettles 140 to 185 ton capacity, on which rests a triangular frame, which supports several cylinders and pumps. This comprises the Harris Softening Unit.

The pumps lift the molten lead from the kettle below and allow it to fall through the molten salt in the cylinders. arsenic, tin and antimony are oxidized first by the oxygen in the air and further hastened by the gradual addition of nitre (Na No3) as the softening progresses.

The impurities are removed in the order named and by very careful manipulation selective softening can be made to take place. When the molten salts become thick or saturated, they are decanted from the cylinder through a spout by gradually raising the level of the lead in the cylinder. This is brought about by closing a valve in the bottom of the cylinder and allowing the lead level to gradually raise by controlling the discharge from the pump. Great care must be taken not to allow any lead to decant over with the salts, as this means additional treatment in the wet process to remove the so called lead prills. Thus it can be readily seen that the process is adaptable to the scrap metal business in that a salt containing sodium antimoniate can be used to remove tin or arsenic from any bath of impure alloy containing these impurities. The tin and arsenic will replace the antimony and enter the salt, and the antimony will enter the alloy. The salts of tin or arsenic are then put through the wet process which will be described later.

The amount of salts made from any one operation depends entirely on the amount of impurity in the original bullion; therefore a relatively hard bullion requires more time to soften and also requires an additional amount of sodium hydroxide and sodium chloride, while a bullion having a low amount of impurity requires less time and a less amount of reagent. (By hardness is meant % As. + % Sn. + % Sb.) The final softened product contains the following impurities in regular practice:— As. nil — Sn. nil — Sb. .008% to .01%.

The second part of the process or wet treatment becomes very complicated when arsenic, tin, and antimony are present in any one bullion because it is only by careful manipulation that the separation of the above named impurities can be brought about. The most complex case will be considered in order to fully explain the process.

The salts, when they become saturated, are decanted from the Harris cylinders into ladles and are transported

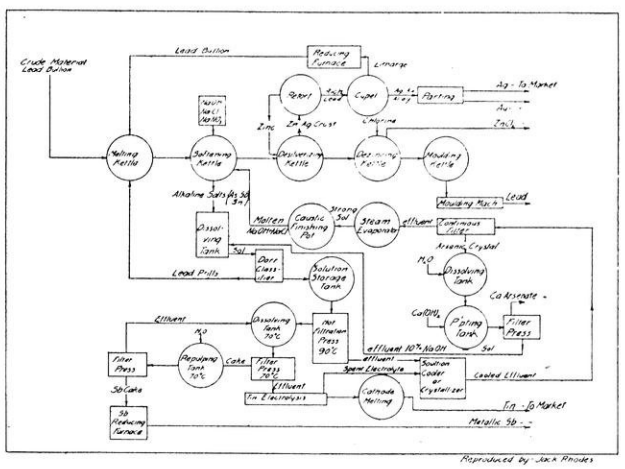

FIG. 1: Flow Sheet Showing Harris Process of Lead Refining at Perth Amboy.

to the wet plant in a molten condition or at a temperature of 775° F. Here the molten salt is first granulated by tilting the ladle gradually, allowing the hot molten salt to discharge into a stream of water. The salt then goes into solution and by the constant addition of granulated salts to any given volume of water, a certain specified gravity is arrived at, which in this particular case is 1.50 to 1.55. The solution and pulp is maintained at a temperature of 100° C. and is classified over a Dorr Classifier in order to remove any lead prills which may have been in the saturated salt. This is done in order to remove any lead at the head of the system thereby eliminating lead from the subsequent salts.

The classified material at a temperature of 100° C. and gravity of 1.50 to 1.55 is then filtered through a filter press, the arsenic being soluble at this temperature as sodium arsenate and is filtered out with the free caustic. This filtrate is cooled to 20° C. at which temperature the sodium arsenate crystallizes out of the solution and is again filtered. The sodium arsenate is again put in solution at a temperature of 100° C. and at a gravity of 1.12; calcium hydrate is added and calcium arsenate precipitates out of solution and is again filtered off. This product is then ready for market.

(Contnued on page 266)

One of The Most Startling Developments In Modern Industry Is

The Televox

By WILLIAM H. TEARE, e'31

UNLEASHED by the sight of two mechanisms carrying on a telephonic conversation with each other, the vivid imaginations of newspaper reporters and writers have run riot and many remarkable attributes have been thrust upon the Televox. However, at present there is no home

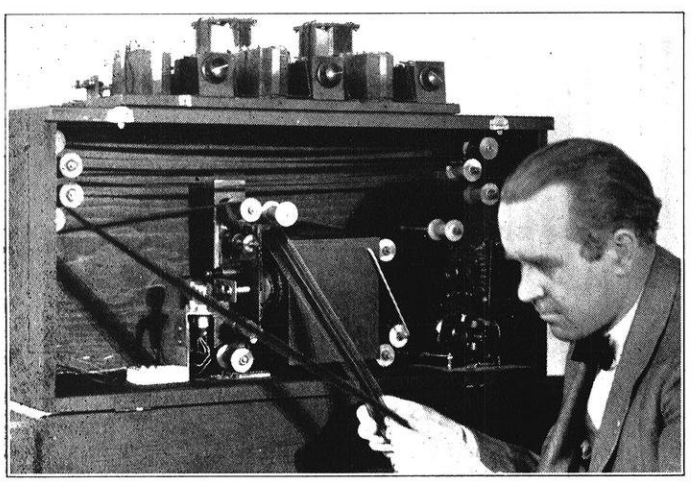

FIG. 1: Examining the Vocal Chord of the Televox, Which is Nothing but a Movie Film of Voice Oscillations.

model on the market which, when given the proper code of signals from the afternoon bridge club, will prepare the soup for dinner.

The Televox was invented by R. J. Wensley of the Westinghouse Company. The first three members of this mechanical race are on duty in Washington D. C., as employees of the War Department. "Adam", "Cain", and "Abel", as they are familiarly known furnish daily bulletins on the amount of water in the city reservoirs. Evolution asserts itself even in the case of these mechanical men, for the latest editions are able to talk back. In place of the vocal cords, the Televox has been endowed with a talking film introduced into the physiology of this man born in the laboratory.

The Televox was originally invented to supplement the supervisory control systems which have come into general use within the past few years. The use of small distributing substations is becoming more and more the accepted method of supplying the electrical needs of large cities, and to carry this plan to its logical conclusion these substations must be unattended. Reliable means have been developed for the periodic reclosing of the local distribution feeders, but it is not as simple to control the incoming high tension feeders. It is desirable that the system operator be able to give instructions to the unattended stations and receive replies that his instructions have been obeyed.

For large and important substations, methods of supervisory control circuits are used which require from two to four wires for each circuit. These wires may be leased from the telephone company or specially installed, but in either case there is considerable expense. For important stations this expense is warranted, but in smaller or less important stations, where human attendance is not warranted, and the cost of installed or leased wires is prohibitive, the Televox comes into its own.

This device is literally a machine endowed with enough apparent intelligence to carry on a conversation over a telephone in the same manner as would a human operator. The Televox does not transgress the rules put down by the telephone company regarding attachments to their lines and instruments. For this reason, it is necessary that the Televox be able to listen to the receiver, and "talk" into the transmitter. The tone frequencies used must stay within the limits of transmission of the standard telephone systems, between 300 and 2800 cycles. For the first of the species, frequencies of 600, 900, and 1400 cycles were used. It is necessary to choose frequencies such that the harmonics of the lower tones do not correspond to the upper tones, or false operation of the Televox is liable to result.

The dispatcher's equipment consists of three tuning fork oscillators, a two stage audio amplifier, a loud speaker unit and three push buttons. A standard desk telephone is placed in front of the loud speaker unit.

At the substation, there is a large cabinet which contains a two stage amplifier, three ladder type filters and three individual frequency amplifiers. Relays in the plate circuits of the output tubes in these final amplifiers operate the selective portion of the equipment. A set of telephone relays and selector switches comprise the selective equipment. On the side of the box is a shelf on which the standard desk telephone is placed. The receiver is left off the hook and is placed on a microphone which forms the electrical "ear" of the unit. A weighted arm projects from the side of the box to depress the hook switch in

the phone. This is arranged to be lifted by a magnet inside the cabinet. The telephone may be lifted from the shelf and used in the ordinary manner without any necessity for detaching or disconnecting any device. When finished with its use as an ordinary telephone, the instrument is replaced on the shelf and is immediately in readiness for automatic operation.

A scene in the dispatcher's office equipped with the Televox may be visioned thus:

The telephone rings. "Dispatcher speaking."

"This is the service department. We have three calls from 2th and Y Streets."

"All right. We'll investigate and call you back."

The Dispatcher hangs up and turns to his system map. "Let's see. That will be feeder 16-S-5 out of Sub. 16."

The dispatcher consults his telephone index and picks up his telephone receiver. "A line please." This to the private branch operator.

"Number, please."

"Valley 6000."

"Thank you --- --- --- 6000."

And then the dispatcher hears in the telephone receiver "Buzz ------- buzz -- buzz -- buzz -- buzz -- buzz" which, translated from Telvoxanto into English says, "This is the Televox at Sub-station 16 speaking. What can we do for you?"

The dispatcher places his phone in front of the speaker unit on the front of his Televox cabinet and pushes the

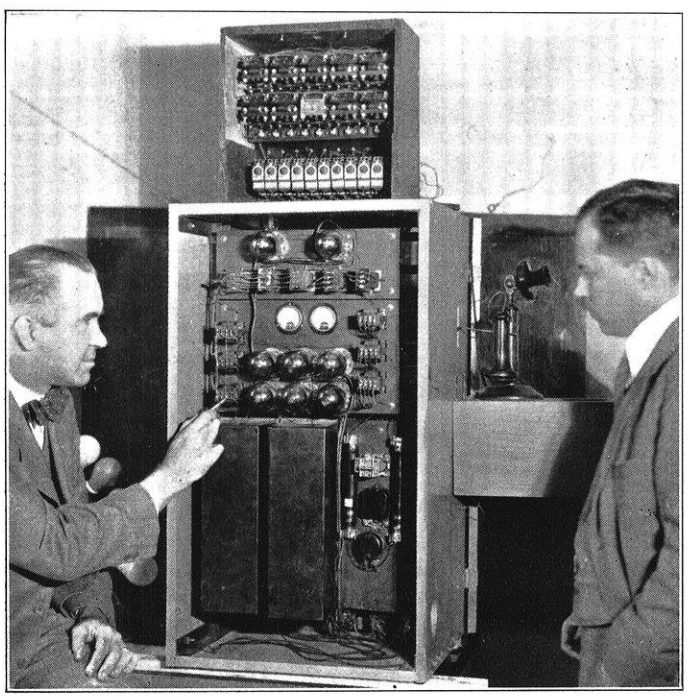

FIG. 2: Anomatical Construction of the Mechanical Man, Mr. Teleox.

button marked 1400 five times. The loud speaker says "Tweet -- tweet -- tweet -- tweet -- tweet," which says to the substation, "Connect me with breaker number five and tell me if it is open or closed."

And then the buzzer at the substation buzzes out the information that breaker number five is open. The dispatcher pushes the button marked 900, and the loud-speaker says "Toot" which is short for "Close it." The buzzer then says that the breaker closed but opened again almost immediately. "Close it again." This time the buzzer says that the breaker stays in.

The 600 cycle button causes the speaker to say "Whoop" which is the Televox way of saying, "That is all. Good-bye." The substation hangs up; the dispatcher hangs up but immediately calls the service department and asks them to call the persons making the complaint to see if service has been satisfactorily restored, also to send out a man to patrol the line and locate the trouble if possible.

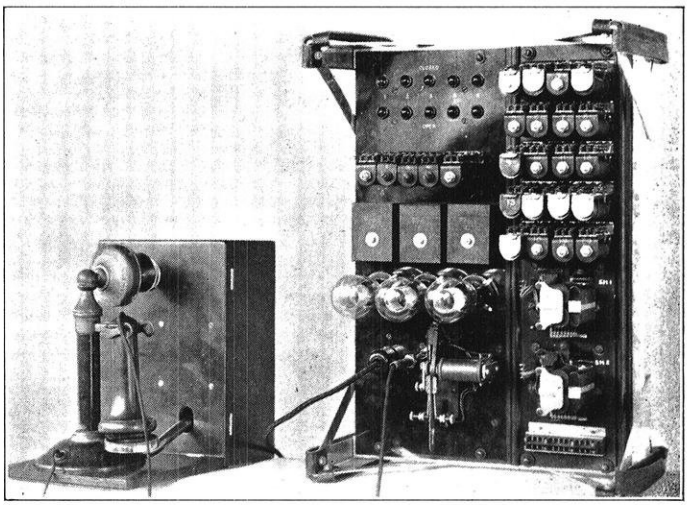

FIG. 3: The Televox as it Would Appear in a Modern Office.

An ordinary ringing signal relay of the type used for operating special loud gongs or signal devices is installed by the telephone company and furnishes the initiating means for the rest of the substation equipment. The relay makes contact when the bell rings, thus energizing the magnet which lifts the weight from the hook switch and completes the circuit to the amplifying tube filaments. After an interval of about thirty seconds during which the substation buzzer sends out the station code at intervals, the actuating circuits will be opened by a timing device unless the dispatcher sends one or more 1400 cycle tones. This is to take care of wrong numbers which are inevitable as long as human beings use the telephone.

There will be many uses for the Televox that are not apparent at this time. At present it can be used for reading meters, ascertaining the height of water in reservoirs, reading the temperature of transformers or other devices or in fact doing almost anything that needs to be done in the controlling of a distant substation. Some have been adjusted so that they can call up headquarters and report on the weather; "It's hot," or "It's cold." Such information is of value as a warning because too much heat or cold may be dangerous to the machinery at that particular substation.

But it is doubtful if ever there will be a time when such mechanical men are introduced in a home model which will do the things that some the more imaginative writers have predicted.

Patents—Law and Practice

By MARVIN HERSH, c'29

THE importance of a fundamental knowledge of what constitutes a patent, who may apply for one, and what is the usual procedure in patent application is indeed great to the engineering student to whom information of the laws involved — patent laws — is limited and remote. Since the field of patent law embraces all of the arts and sciences as well as the branches of engineering, it is hardly conceivable that one will not need recourse, at some time or other, to patent office rules and procedure. Such information will be given here.

The student engineer, and no doubt the practicing engineer, will find the information in this article on "Patents — Law and Practice" of sufficient interest and importance that it may be desirable to file the article for future reference.

Even though not contemplating the making of any inventions, often times, in his work for others, the engineer has to co-operate with a patent attorney; that their joint work may have the greatest value, the engineer must have some conception of the basic patent law.

—THE EDITOR

The authority for the granting of patents to inventors and the institution of our present patent system is found in the Constitution of the United States which provides that: "Congress shall have the power . . . to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries." It is by virtue of this clause that Congress has granted patents and has formed agreements with foreign countries regarding them.

The first patent laws of the United States were enacted in 1790 under Thomas Jefferson's supervision. The present patent laws in existance today are those of 1836 plus the Revised Statutes established by the act of 1879. The jurisdiction of the United States Courts in patent matters is defined in various sections of the Revised Statutes which are given in the Patent Laws, furnished upon request, without charge, by the Patent Office.

WHAT IS A PATENT?

Patents are documents issued by the Government consisting of the patent grant, the specifications, and drawing if any, the specification and drawing containing a complete and full disclosure of the invention. Primarily, the patent is to make known the new invention and its uses and advantages; secondarily, it confers upon the patentee, not the exclusive right to make, use or sell the invention but the right to exclude others from making, using, or selling. The three rights named in the grant are separate and disjunctive, and infringement may be committed by an invasion of any one of these rights.

Out of a long struggle in the English Courts prior to the institution of the present system of patents, the contract theory of a patent was gradually evolved. Briefly stated, it is that a patent is in the nature of a contract between the government representing the public, and the inventor who agrees to disclose his invention to the public and in return the government grants him the right to exclude others from making, using, or selling the invention for a term of years and places the Federal Courts at his disposal to aid him in punishing any invasion of this right.

It is essential to this right to exclude others that the invention be new and also that the intangible something called invention, and not mere mechanical skill, be involved, otherwise the patent will be declared invalid by the courts.

The patent dates from the day of its issue, and its term is seventeen years counting from the day given in the grant.

WHO MAY OBTAIN A PATENT

The patentee must declare upon oath:

"(1) that he believes himself to be the true and original inventor and discoverer of the thing for which he solicits a patent,

(2) that he does not know and does not believe that the same was ever before known or used,

(3) that the invention has not been in public use or on sale in the United State for more than two years before application was filed, and

(4) that the invention has not been described in any

FIG. 1: He Places the Matter in the Hands of a Patent Attorney.

printed publication for more than two years prior to filing the application."

Anyone, male or female, minor or adult, citizen or alien (except a member of the Patent Office force during a term of employment) may obtain a patent for an invention or a discovery provided the above conditions are subscribed to. The patent is forfeited if the time of

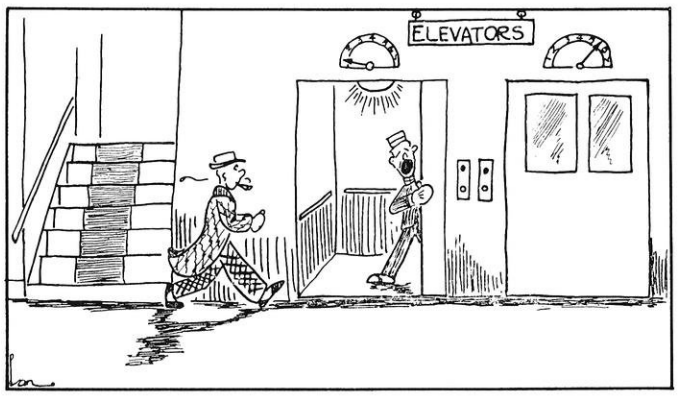

FIG. 2: An Art is a Process Whereby a Number of Steps is Reduced to a Single Operation.

lapse between the application and the completion of the invention is greater than a year. A patent may be obtained by the executor or administrator of the estate of a deceased inventor.

While all applications for patents must be made and signed by the actual inventor, the patent will be issued jointly to the inventor and anybody he assigns the patent to, or in the name of the person to whom the patent is assigned, if proper request is made in the application.

It often happens that an employer or a financially interested party, thinking to safeguard his interests, has joined his name with the real inventor as a joint inventor, and then finds out later that the patent is declared void and the entire rights of both parties lost because the courts will hold invalid any patent granted to joint inventors when in reality the inventive act was entirely on the part of only one person. This type of ruling also holds when the patent is listed as a sole patent when in reality it was invented jointly by several parties.

WHAT MAY BE PATENTED

Any new and useful invention or discovery relating to the following is patentable:

1. An art, including a new and useful process.
2. A machine.
3. A manufacture, such as a new article of manufacture.
4. A composition of matter.
5. Any new and useful improvement in any one of the preceding items.

The thing to be patented must be new and useful. The degree of usefulness does not matter so long as the article is not absolutely useless. The burden of proof to show that a thing is not new rests upon the Patent Office and its work is to search through old records of patents and any literature upon the subject. If any old records are found which tend to disprove the claims, the patentee is informed and allowed to restrict his claims and still have the thing patentable.

An art is defined as a process, such as any new method of manufacturing an article whereby the number of steps is reduced to a single operation. A machine is some useful apparatus or mechanical device that has movable parts. A manufacture is something that has no movable parts; included in this are designs or patterns. A composition of matter refers to such things as chemicals, paints, compounds, alloys, dyes, or kindred items.

An improvement is any change or addition to an invention which tends to simplify the operation or widen the scope of the machine, art, or article patented. An improvement is itself patentable, but the inventor of an improvement has no right to make the thing improved upon if it is patented and the patent still in force. Nor will the original patentee have any right to the improvement because he holds the original patent.

The court defines a patent by telling what *does not constitute* a patent:

"A mental conception of a device. It must be reduced to practice before it can be made the subject of a patent grant.

A force of nature or a scientific principle or property of matter. However, machines making use of these principles are patentable.

A result or a function. It is for the discovery or invention of some practical method of producing a beneficial result or effect that the patent is granted, not for the result or effect itself.

For an aggregation of parts, each of which is used for an old process. Also the duplication of a patented article will not be allowed.

For the simplification of a patented article or process

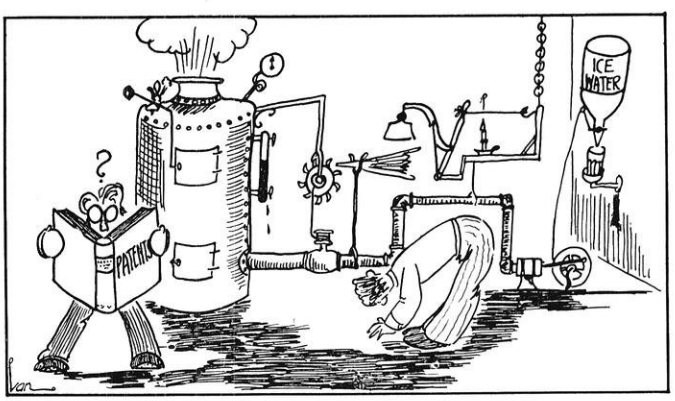

FIG. 3: What may be Patented?

unless it is found that by the simplification a new device or process has really been evolved.

A double use of a device already patented or a transposition, since it is not an invention.

An immoral object may be new and ingenious, but it would be detrimental to public morals and the general welfare, and so would lack one of the requisites of the statutes: usefulness. It would therefore not be patentable."

(Contnued on page 266)

Can You Sell Yourself?

By J. D. LEVIN, c'27
Engineer, Wells Brothers Construction Company, Chicago

THE old saying that success comes to him who waits has no place in this Twentieth Century of humming activity. Today it is the go-getter, the man with enthusiasm and energy, — with capacity, of course, — that achieves results in the professional and commercial worlds.

Have you ever considered that selling your services to the best advantage in the highly competitive job market of today demands all of the attributes of the go-getter plus the intuition of the salesman? Getting a job *is* a sales problem first and last. Imagine yourself for a minute a salesman of commodities. Obviously, you must possess a thorough knowledge of your product and the ability to capitalize that knowledge into sales. The job salesman must possess these essential requisites no less than the commodity salesman.

Do you *know* what kind of a job you want? Can you properly evaluate your qualifications for that position, and do you appreciate your shortcomings? If so, you have negotiated the first step in selling yourself to the world — you have begun to know yourself. Your final step is to capitalize that knowledge of self into a job.

Graham Wood, in the *Boston Commercial,* has expressed two "commandments" which form the basis of successful personal salesmanship.

I. "Thou shalt not wait for something to turn up, but thou shalt pull off thy coat and go to work that thou mayst prosper in thy affairs and make the word "failure" spell success."

II. "Thou shalt not be afraid to blow thine own horn, for he who failest to blow his own horn at the proper occasion findeth nobody standing ready to blow it for him."

With this perspective view of job salesmanship before us, let us investigate the mechanics of landing the particular job you want. Assuming that you have determined the kind of a position you want, your problem has simmered down to this: (1) decide who can give you that job; and (2) formulate a systematic plan to get that job. Work your plan to the limit, for half-hearted attempts at landing a job are worse than none at all! If your first attempts to sell yourself are not wholly successful, remember that every refusal brings you closer to the job you will eventually get.

Your scholarship at college, your participation in extra-curricular activities and in athletics, your work during summer vacations — all these may provide material for your job campaign. Start your campaign among the people you know best. Your friends and acquaintances, your college professors, and even relatives may often be able to give you the clue to the job you want, providing you have impressed upon them that you are looking for a position and have made clear to them exactly what you want.

"Positions Open" advertisements in newspapers and in trade periodicals are well known to the average job-seeker. During the last decade the employment departments of the four national engineering societies have been rendering an indispensable service to engineers. The four founder societies have a combined employment service with branches in the larger cities, New York, Chicago, San Francisco, which for a nominal sum sends to engineers weekly bulletins of "Positions Open" in the various divisions of engineering. The American Association of Engineers is another organization that has contributed much to relieve unemployment among engineers. In addition to these engineering society bureaus, there are many high-grade private employment agencies that cater to a technical clientele. Many colleges throughout the country maintain employment bureaus for their graduates, and place an ever-increasing number of young graduates every year.

News items and magazine articles keep you in touch with new projects and new developments in your chosen work. A prompt application to the principles in charge of such work may frequently mean a job. To the average young engineer a reading of the "Contracts Awarded" column in an engineering magazine is uninteresting and uninstructive; but to the alert-minded job-seeker such a reading reveals many opportunities and possibilities for employment.

As a general rule "Situation-Wanted" advertisements in the newspapers or in engineering periodicals are advisable only for men of wide experience, rarely for young graduates. The following is a typical advertisement taken at random from the "Situation-Wanted" columns of the Engineering News-Record:

> CIVIL ENGINEER, university graduate, age 23, now employed, wishes permanent position in East where hard work and ability merit advancement; references. PW-647, Eng. News-Record, Tenth Avenue at 36th Street, New York City.

Even though engineers are bound to a certain extent by professional conventionality, this copy could have been re-worded and arranged as a display advertisement with a decided gain in effectiveness.

Elbert Hubbard, who became famous over night as the

(Continued on page 262)

A Report Which Offers
A Complete Solution to the Problem of

The Breakage of Five Dollar Bills by Cranberries

By Otto H. Wehrle, c'29

Introduction

THE study of five dollar bill breakage by cranberries necessarily required original research as no data could be found in the Law School Library on that subject. Knowing that the number of pancakes needed to shingle a day is twenty-five, provided a basis for my research. Further search for records on the physical properties of cranberries and legal five dollar bills produced no information and it was therefore necessary that tests be made to obtain these properties. Tensile, compression, crossbending, hardness and impact tests were performed on each of the materials. A characteristic of cranberries noted by the author was the intensity of breakage in relation to the season. It is generally known that more bills are broken during the fall and early winter than during spring and summer, but that bills subjected to cranberry exposure during the spring and summer are less strong and the salvage value of the remains decidedly less is a matter of not common knowledge. Again the total breakage in fall and winter exceeded the spring and summer destruction.

Run	Temp	Weather	Time?	Results	Probable Error
100	Hot	Canoeing	Leap Year	Disasterous	$\frac{1}{6}bd^2$
10	-20°F	Warm	13 Shopping Days	Nil	Terrible +
9	No	Fishing	1928	Long	600%
(a)18	xxx?$\frac{?}{R}$!-	Rain	Late	Improbable	Consoling
36	Just Right	Wonderful-	$\frac{Me}{T}$ (Low)	Deadly	1 Date
4(a)	Yes	Sweltering	Second Round	1 Black Eye	1 Black Eye
2	Why	Its Dry, Too	Soon To Be	Possible	Yes!

FIG. 1: Tabulated Data and Conclusions.

The nature of the tests necessitated a change in the units to facilitate computation and interpretation of data. The units used were furlongs, perches, and tons for linear, cubical and weight measurements respectively.

Acknowledgments

The cranberries were supplied by the Cranberry Research Association of Middleton and the five dollar bills by L. S. Jones and Company, Printers and Engravers, Inc., of Verona. The tests were made in the University of Wisconsin laboratories with the testing equipment contained therein.

Test Procedure

Hardness tests were made in the Brinelloscope by measuring the indentation made by a pith ball under the impact of a drop of water falling from an icicle placed 0.00000½ furlongs above the ball which is in contact with the material to be tested.

Tension and compression tests were made in the Million Pound testing machine at the Forest Products Laboratory.

Cross bending and impact tests were secured by the use of the equipment in the Mechanics Laboratory of the University of Wisconsin.

Procedure

All physical tests were made and the data studied to obtain characteristics of the edible and creditable materials. Uniformity of results was insured by requesting that we be supplied with cranberries of the same taste, age, size, color and weight, and with bills of the same series, thickness, width, length and appearance; such bills to resemble the original government product which we see occasionally.

The next step after determination of characteristic properties was to obtain the energy absorbed by a bill during impact and to calculate that height from which a cranberry must be dropped to impact the same energy to a bill by virtue of its potential energy of position in relation to the cranberry. The calculated heights checked very closely with the test heights, from which the berry was dropped, throughout the test.

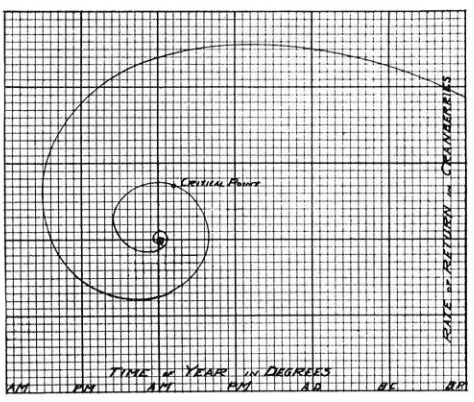

FIG. 2: Establishing the Critical Point Between the Time of Year in Degrees and Rate of Return in Cranberries.

EDITOR'S NOTE: This is one of a series of research problems studied by seniors and submitted as a Tau Beta Pi article at the initiation last winter. It does not fall within the regular curriculum of the college. The seniors are to be commended for their interest in pure intellectual research and thtir resourcefulness in making their studies.

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Alumni Notes

MECHANICALS

Tinkering with new-fangled machines in 1896 won for C. H. Paar, m'96, and C. W. Hart, m'96, many a laugh or snicker of disdain; today the giant merger of three large implement manufacturing companies again brings the names of these men before the engineering world, this time as the leaders of a great company. The corporation which is capitalized at $300,000,000 is the first of its kind to rival the supremacy of the International Harvester Company. The Oliver Chilled Plow Company, the Nichols-Shepard Company, and the Hart-Parr Company are the members of the big combine.

During the year 1896, Hart and Parr completed three successful motors, the first of which is still in operation at the Sinaiko Feed Company of Madison. After their graduation in 1896, the men returned to their homes in Charles City, Iowa, where they interested two lawyers and a banker in their new machines. In 1901 they completed their first tractor after which they entered this branch of farm implement manufacture. Incidentally the third machine they built is still in use on an Iowa farm.

Baker, Gordon J., m'28, who is with the Westinghouse Company at East Pittsburgh, recently visited Wisconsin to interview the seniors relative to employment with the Westinghouse Company. At present Baker is taking the training course of the Westinghouse Company and enjoys the problems very much.

Bickelhaupt, Ivan A., m'14, is now president of Bickelhaupt, Incorporated, located at 311 Amercian National Bank Building, Richmond, Virginia. His residence address is Windsor Farms, Richmond, Virginia.

Campbell, Don, m'28, formerly with the Case Company of Racine, is now taking a pilot course with the Aircraft division of the United States army. He is situated at March Field, Los Angeles, California.

Greve, Frederick W., m'08, M. E.'08, who is Professor of Hydraulic Engineering at Purdue University, is now living at 105 Fowler Avenue, West Lafayette, Indiana.

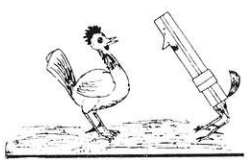
Hadfield, Ray H., m'03, is now sales engineer for the Continental Corporation of Chicago. His residence address is 2009 Irving Park Boulevard, Chicago, Illinois.

Larson, G. L., M. E.'15, who is professor of Steam Engineering and Gas Engineering at the University of Wisconsin, was recently elected to membership on the Council of the American Society of Heating and Ventilating Engineers. Professor Larson is the third Wisconsin man to be elected to the council which consists of only fifteen men. **McIntosh, Fabian C.**, c'13, at present district manager for the Johnson Service Company at Pittsburgh; and **Rowley, Frank B.**, m'05, M. E.'06, now professor of mechanical engineering and director of the Experimental Engineering Laboratories at the University of Minnesota, are the other Wisconsin members of the Council.

Mackay, Scott M., M. S. in Metallurgy '26, at present associate professor of Metallurgy in the University, was recently appointed chairman of the Malleable Iron committee of the American Foundrymen's Association, which is an organization of the foundrymen of the United States and Canada. This committee is one of the larger standing committees having general supervision for the Association of all aspects of malleable iron, its development, uses, manufacture, and research.

Naujoks, Waldemar, m'26, who is with the Steel Improvement and Forge Company of Cleveland, is now making a few improvements on the stationary and rotary types of forge furnaces which he designed last summer. The present furnaces are working out splendidly, and the changes are only minor.

Perry, Russel L., m'26, is now in the Agricultural Engineering Division of the University of California at University farm, Davis, California. At present Mr. Perry is spending half time instructing and half time in research work. Previous to this he had been occupied with farm machinery, but on the resignation of one of the men in the Dairy Machinery department, Mr. Perry acquired this department.



Rand, Alfred Emil, m'24, is now assistant superintendant for the Central Scientific Company of Chicago. He is living at 7324 Lunt Avenue, Edison Park, Chicago, Illinois.

Stein, E. A., m'26, is now residing at 608 Woodlawn Avenue, Rockford, Illinois.

Shaw, Ralph m'23, M. S.'24, is assistant hydro-electric engineer for the Interstate Public Service Company of Indianapolis. He is living at 14th and Pennsylvania, Indianapolis, Indiana.

Swetting, J. R., m'16, M. E.'22, is now vice-president and operating manager of the Haynes Corporation of Chicago. Mr. Swetting has been with the Haynes Company as staff engineer installing Haynes Manit System of labor incentives for the past five years. His present office is at 1545 First National Bank Building, Chicago, Illinois.

CHEMICALS

Demmon, N. K., ch'29, has been employed by the Engineering Department of the Theramatomic Carbon Company of Sterlington, Louisiana. The Company is concerned with the production of carbon black from natural gas.

Donkle, M. C., ch'25, is now in the employ of the Carbon Products Company of Lancaster, Ohio. He is working on the development and production of dry batteries.

Edwards, David H., ch'23, has discontinued his connection with the Western Electric Company in Chicago and is now employed as experimental engineer with the DuPont Rayon Company, Buffalo, New York. His address is 125 Eiseman Street, Kenmore, New York.

Elfers, P. A., ch'26, is at present development engineer for the Fisher Governor Company at Marshalltown, Ia.

Kellett, William R., ch'22, has rceently been promoted to Assistant Technical Superintendant of the Kimberly-Clark Corporation of Neenah, Wisconsin.

Kieweg, H. E., ch'29, has obtained employment with the Thermatomic Carbon Company in their engineering department.

Plewke, Walter H., ch'24, is at present sales engineer for the Graver Corporation of Chicago. His address is 342 Pine Avenue, Chicago, Illinois.

ELECTRICALS

Selecting Malcom P. Hanson, e ex'18, as chief radioman for his arctic expedition, Commander Richard E. Byrd honored one of the best known radio expets in the United States. Mr. Hanson has been identified with the Naval Research laboratories since he left the Univesity of Wisconsin. He has been particularly interested in aircraft radio research, and is thoroughly acquainted with all types of radio aircraft equipment. His design of the receiving and transmitting outfits for the Byrd South Pole airplanes is his latest achievement. While enrolled in the University, Hanson helped construct WHA which was one of the first radio stations constructed in a United States University.

The transmitter is of the short wave variety and is said to send radio signals two and one-half times around the world. It is equipped with two 20-kilowatt water cooled vacuum tubes, and its wave length is controlled by a so-called magic mineral quartz crystal. The power used to transmit signals to the South Pole will vary from 16,000 to 20,000 watts.

Ackerman, Adolph J., e'26, who is located with the Aluminum Company of America as designing engineer on two 175,000 Horsepower Hydro-electric developments, was recently host to an eight pound baby boy who has already started to reach for his father's slide rule. Mr. Ackerman's residence address is 3315 Eastmont Avenue, Dormont, Pennsylvania.

Butz, Charles H., E. E.'14, is now chief engineer for the Denver Fire Clay Company. His residence address is 1250 Lafayette, Apartment 20, Denver, Colorado.

Holmquist, Arthur S., e'25, and **Carpenter, Earl F.,** e'27, are both employed by the Cities Service Corporation at Warren, Ohio. Holmquist is results engineer and Carpenter has charge of the construction work.

Millspaugh, J. W., e'14, is no longer connected with the Chain Belt Company. He is located with the Danly Machine Specialty Company located at 2104 South 52 Street, Chicago, Illinois.

Mott, William R., e'03, Ch. E.'07, died on January 3, 1929. His death, which took place at his home in Decorah, Iowa, was caused by pneumonia. Mr. Mott studied at Cornell during 1904 and 1905 and was employed as research chemist for the Carborundum Company at Niagra Falls during 1905 and 1906. He returned to the University in 1907 and instructed in chemistry for two years. During the years 1909 to 1923 he was employed by the National Carbon Company. Mr. Mott during his life published many papers, most of which had to do with the production of white light from arc lamps. He is survived by Mrs. Mott and one daughter.

Prideaux, Donald W., e'26, is now illuminating engineer for the Edison Lamp Works of the General Electric Company at Harrison, New Jersey. His residence address is 29 Benson Street, Bloomfield, New Jersey.

Sharratt, C. W., e'25, was one of the Bell System recruit delegation which visited the University recently. His present position is with the employment department of the Wisconsin Telephone Company at 418 Broadway, Milwaukee, Wisconsin.

Streeter, P. R., e'25, has recently been transferred from the Milwakee office of the Allen Bradley Company to the Company's New York Office where he holds the title of Sales Engineer. His address is 179 Hicks Street, Brooklyn, New York.

Thayer, Neal B., e'27, is still in the training course of the Doherty Operating Company of Denver, Colorado. This company is organized as a Public Service Corporation.

Tweet, Noel T., e'27, is now assistant to the General Superintendant of the City Light and Traction Company of Sedalia, Missouri. The company has artificial gas, ice, street railway, and electric divisions. Mr. Tweet writes that he is very well satisfied with his work, and that the experience offered by these various branches of the service is exceptionally good.

Walthers, W. K., e'16, is now president of the Findex Company, manufacturers of a special type of indexing and sorting system. Mr. Walthers is now the father of three children, Bruce 10, Bill 8, and Nannette 5. His present address is 49 East Wells Street, Milwaukee, Wisconsin.

CIVILS

W. F. Baumgartner, c'12, division engineer of the Eau Claire division of the Wisconsin Highway Commission, and a student in engineering at this college during 1910-1912, is the author of a paper on "Important Considerations in Planning Detours" that appears in the March number of Roads and Streets. The dictionary definition of "detour", he laments, has been pushed out of the picture by more picturesque and sulphurous definitions invented by irate motorists. "In planning our detours," he says, "results should be sought that will bring the world back to its proper definition." How to finance the detour, he intimates, is always a major problem, and how much money is available will determine the road that is to be used as a detour.

Brigham, Robert H., c'28, is now located with the Bureau of Public Roads, Department of Tests. His address is 1950 L Street North East, Washington, D. C.

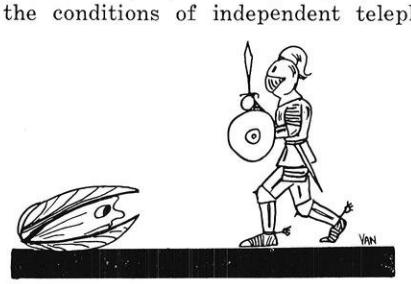
Ronald E. Copeland, c'28, left the employ of Consoer, Older and Quinlan on March 1 to take a position with the Portland Cement Association at Chicago. His address is 1614 South 4th Ave., Maywood, Ill.

Jensen, Harold W., c'25, has moved from 9 South Chester Avenue, Park Ridge, Illinois, to 411 Park Avenue, River Forest, Illinois.

Martin, George W., c'26, formerly with the Jerry Donohue Engineering Company of Sheboygan, Wisconsin, has changed his address to Mount Horeb, Wisconsin.

Newing, William B., c'22, has changed his address from 440—19th Avenue, Milwaukee, to 2001 Michigan Street, Milwaukee, Wisconsin.

Post, F. E., c ex'08, is now located with the United Telephone Company. He is employed in the investigation of the conditions of independent telephone companies.



Reinke, Richard E., c'28, who had a temporary appointment as government sanitary inspector at the Zoo during the summer, has been appointed state sanitary engineer for Georgia with headquarters at Atlanta. His new duties began on March 15. Shell fish will be the big problem he will be forced to combat.

Schad James A., c'16, is at present an engineer with the United States Gypsum Company of Chicago. He is at present employed to promote the use of gypsum products.

Stevens, H. L., c'03, president of the H. L. Stevens and Company, architectural engineers of Chicago, in a recent letter to a member of the faculty expresses himself as follows: "I am sure that the time is coming when it will

(Continued on page 260)

Engineering Review

TESTING LABORATORY TO BE BUILT ON BRIDGE CONSTRUCTION JOB

Due to the large amount of testing necessary during the construction of the Hudson River and the Kill Van Kull bridges, the Port of New York Authority is considering the construction of a modern laboratory building to house the testing machinery of latest approved design for testing all materials used. This material will range from gravel for concrete, to steel girders and cables. Bids were opened on Dec. 3d for the proposed Building. It would be of concrete, with concrete floors supported on steel beams. Alternative proposals were considered on a two-story and a four-story building, although one portion of the building will have to be four-stories in height to accommodate a large steel testing machine.

The building will cover about 5000 sq. feet and will be located in Jersey City.

RECORD FABRICATING JOB

A record fabricating job was recently completed on an apartment house structure covering a block front on Madison Ave., between 70th and 71st Streets, in New York City.

The building is 11 stories in height, and the steel work represents assembling of 9762 pieces of steel and the placing of 36,000 rivets in the field. The plot occupied by the building is 30,000 sq. ft., and approximately 2,200 tons of steel were used. Work was started on Sept. 17th and completed on Oct. 11, 1928.

—*Engineering Contracting*

LARGE ROLLER BEARING INSTALLATION

What is believed to be the largest roller bearing herring-bone gear reducing units ever built, has recently been installed in a rolling mill in Canton, Ohio.

This represents a distinct step forward, for it demonstrates the practicability of roller bearings on equipment of this type. It is completely equipped with tapered roller bearings on both pinion and gear shafts.

It was designed to transmit power from a 1500 hp. (4000 hp. peak load) ac. motor at 350 rpm., to two stands of 28 in. bar mills. It is interesting to note that two 8 ft. flywheels, each weighing 16,000 lbs. are mounted on the pinion shaft to take care of peaks resulting from momentary loads from the mill operation.

—*Iron Age*

LUMINOUS PRESSURE WAVES

Photography of the phenomena taking place when a cartridge of dynamite is detonated, has shown the existence of luminous waves propagated at high speed in the air surrounding the explosion.

It was, at first, thought by the United States Bureau of Mines engineers, conducting these experiments, that these waves were merely reacting gasses projected from the explosive, but further work, in which the air around the explosive was replaced by carbon-dioxide, has made it seem that these are really pressure waves at such high temperatures that the gas actually radiates in the visible spectrum. This work is a part of the program of experiments being carried on by the United States Bureau of Mines on the sensitivity of explosives to detonation by influence.

LONG CONCRETE RUNWAY — FEATURE OF NEW AIRPORT

At the Grand Central Air Terminal, now nearing completion at Los Angeles, Calif., a concrete take-off runway, 72 feet wide and 3000 feet long, has been laid. On either side of the concrete strip is 10 feet of asphalt paving as a shoulder, giving a total width of 92 feet.

Great stress has been placed on the elimination of dust in the design of the air-port.

—*Engineering News-Record*

HOUSTON'S NEW ARC-WELDED AIRPLANE HANGARS

The city of Houston, Texas, has recently erected three large hangars at its new airport for the convenience of its guests. The hangars are of the all-metal type, corrugated iron sheeting used to cover the arc-welded steel superstructure, rendering the hangars absolutely fireproof.

The greater rigidity and strength of this type of this construction coupled with its low cost were the deciding factors.

Although these hangars were the first to be built employing the new method of construction, ample proof of the greater strength and rigidity of the arc-welded steel fabrication was offered the owners, in the large commercial and industrial buildings which have been erected in various parts of the country. In all of these buildings the entire framework of steel was arc-welded.

Each of the three hangars is 75 feet wide, 125 feet long, and 50 feet high. The arches are made up from channel sections, cut to form an arch when welded together. The entire fabrication of the arches was performed on the ground, an arch being raised to position and held in place by the welding of the channel purlins to the arches. The columns at the closed end are also channel sections. The framework of the monitors are composed of angles and channels. The steel sash in the sides and end wall were arc-welded in place; in fact there are no bolts or rivets in the framework of the three hangars.

All of the fabricating work of these three hangars was done in the field, all connections being made by a portable field welding outfit.

The simplicity of the novel design due to the elimination of all trusses and other forms of roof bracing is an economic factor which should favor arc-welded steel construction for future hangars. Another advantage of this design, due to its clear ceiling, is its practicability for hangars for blimps and similar lighter-than-air craft.

CONQUERING PULPWOOD FIRES

Monitor nozzles are a recent development in fire protection as applied to the huge piles of pulpwood logs held in outdoor storage at paper mills. Distributed at frequent intervals

around the edges of each pyramid of timbers, the nozzles afford a means of flooding the fire with water the instant the outbreak is discovered.

The new form of the equipment is superseding portable hose lines which had to be dragged to position and coupled to fire plugs with a serious loss of time. The monitor is always ready for use. Located in a fixed position, on the ground or on a tower, and connected with high pressure mains, the nozzle may be placed in action in 60 seconds. If a second stream proves necessary it can be started from another nozzle nearby. When the stream is turned on, the water flow is about a thousand gallons per minute. Each nozzle is adjustable as to slant and direction. The whole process is completed in less time than would be required for a watchman to summon aid and drag a hose line to a hydrant.

When ordinary fire hose is used, the fighting of fire is a pile of pulpwood is a difficult proposition. The loosely piled logs prevent fireman from scaling the sides of the pyramid, and the streams must be directed from the ground. In the case of a fire near the summit of the pile, the water does not reach the blaze because of the height and the slope of the sides. A single pyramid is likely to cover a full acre of ground and reach a height of 80 feet or more. The contents may be as much as 20,000 cords of wood, valued at 300,000 dollars.

The air-dried surface of a pulpwood pile is easily ignited and set on fire by a spark. When the blaze is once started it is carried into the heart of the pile through the agency of members dropping through the crevices between the loosely piled logs. Water thrown on the surface is shed from the sloping sides and little of the flood reaches the center of the pile. Paper makers feel that the fire getting a good start before water is applied presents a hopeless task for the fire fighters.

The quick action permitted by the monitor nozzles enables one man to fight much more effectively than a small army equipped with hose, since the one man fire brigade does not waste time waiting for other workers to answer his alarm. His nozzle is at work before assistance could possibly reach him. Several incipient pulpwood fires have been stopped by this new type of installation.

AN ICE WARNING INDICATOR

The formation of ice on the wings of airplanes still remains one of the greatest hazards of flying. So far all methods of combating such ice formation have proved unsuccessful. The best plan is to provide the airman with some indicator to warn him of such a formation of ice, and complete weather service. There has been devised an instrument which will give the flyer warning of the formation of ice on the wings of his ship, and permit him to fly at a lower altitude to combat this danger. The indicator is similar to the strut thermometers used in the army planes. The bulbs of the thermometer is filled completely with Zylene under pressure. Any application of heat or cold on the bulb causes the entire column of liquid to expand or contract. The bulb is connected by a fine cappilary tube to a Bourdon spring, which coils or uncoils as the liquid contracts or expands. The movement of the spring causes an attached pointer to travel across a dial placed in the pilot's cockpit. On the upper scale of the dial, there are graduations from 40 to 100 degrees Fahrenheit. Mounted below the mechanism described above is a secondary device similar to that employed in the ordinary pressure gage. When the pointer of the upper scale comes down to 42 degrees, the lower mechanism is engaged. This moves a large conspicuous pointer across the lower scale, thus warning the airman.

SYNTHETIC TANNIN NEEDED

Aside from the regrettable loss of beautiful trees, and toothsome nuts, the blight which has doomed the chestnut tree in America, strikes close to the leather industry. C. R. Oberfell, writing in Chemical and Metallurgical Engineering surveys the future of this material:

"The chestnut tree is doomed, which is a national calamity; but we do not think that this will affect the supply of tannin for tanning for about 20 to 30 years. The disease does not damage the wood — it simply girdles the tree between the bark and the wood, thus throttling the tree. As long as the wood is sound, it is suitable for extract.

Chestnut wood does not decay rapidly, so aside from the fire hazard in dead timber, it is believed by many that most of the trees now dead will stand and be available for extract for from 15 to 20 years. Although the blight is now progressing, there are still large stands of timber not affected from which one will see that there will be chestnut extract for some time to come.

Naturally the situation is serious from the long-range viewpoint. Combination sole-leather tannages, that is chrome and vegetable liquors in which the amount of vegetable tannin required is less than the full vegetable tannage, gives much more promise of relieving the situation than straight chrome. It might be said that the disadvantages of chrome leather are particularly offset by this combination process. However, the United States might as well be dependent of imported extract as well as upon imported chrome salts during a national emergency. During peace times the vegetable extracts will always be obtainable, though not as cheap as our domestic chestnut.

There is another possibility which may eventually provide the final solution — that is, synthetic tanning materials. We have had them for only 14 years, most of them bad, and only a few partially successful, but the possibility exists. The problem has not been received in the research laboratories with the attitude which makes for success. These materials do not "fill" or pack in between the fibres giving firmness, wear, and water resisting properties to sole-leathers, but it is possible that a suitable synthetic tanning material will be developed for the preliminary or pre-tannage, and the filling in process can be accomplished by the use of the so-called "spruce-extracts" made from the refined liquors from the pulp mills. Sufficient study along this line has been done to demonstrate that when the economic pressure comes this will be the nature of the final solution."

FOG PENETRATION — FEATURE OF NEW AIRPORT BEACON

A new form of airport beacon has been erected by the Cleveland Municipal Airport, the beams of which are said to penetrate fog.

It is a multi-light unit incorporating several new features. It provides a fan of light which when rotated reaches a pilot at any angle at which he may approach the field. One half of the

(Continued on page 254)

Campus Notes

AIDES FOR ST. PAT PARADE ANNOUNCED; FLOATS ARE SOUGHT

Committees for St. Pat's parade, to be held April 27, were announced by Jack M. Lacher '30, general chairman of the event, as follows:

Assistant general chairman, Harland Rex '29; advisory chairman, Lawrence Beck '29; finance chairman, Edwin Freyburger '30; chairman of judges, Edwin Freyburger '30; parade arrangement: Rezin Plotz '30, chairman; assisted by Francis McGourty '29, Wesley Bliffret '29, Theodore Tiemann '30.

Floats: George Brown '30, chairman; assisted by Duncan Baillies '29, Franklin T. Matthias '30; prizes, Carl Schmedemann '30, chairman, and Robert Garlock '29; publicity, Marvin Hersch '29, chairman, and Theodore Perry '31.

Police: Lester Ludwigson '29, chairman; assisted by Edward Rusch '29; band: John Kulp '29, chairman; Walter Wilson '30, William Teare '31; Royal Guard: John Cullinane '29, chairman; Stanley Binish '29, and Clifford Conry '29.

Floats for the parade, which may be entered by any campus group, should be registered with the float committee. Descriptions are to be submitted and approved to prevent duplication of ideas.

AVIATION OFFERED AT MILWAUKEE EXTENSION

Two courses in aviation have recently been included in the curriculum offered by the University extension at Milwaukee. One is a course in fundamental principals of flight, airplane construction design, and operation taught by E. J. Englebert of the Hamilton Metal-plane Co. The other is a course in aircraft engines and is taught by Prof. L. A. Wilson.

CULLINANE ELECTED ST. PAT

With the sterling support of the civils, chemicals, and miners, "Speed King" John Cullinane successfully carried the annual St. Pat election by a majority of almost 80,000 votes. At the close of the poll Friday, March 15, the vote stood: Cullinane, 180,200; Ludwigsen, the electricals' candidate, 107,300; McGourty, mechanicals' candidate, 5,360.

The balloting was again characterized by a last minute rush in which over 90% of the votes were cast. Ludwigsen had been leading up till the last minute, when the civils added a few shiny pennies good for 5000 votes. The thick dollar bill was not in evidence this year.

INSTALL CHI EPSILON CHAPTERS

Prof. R. S. Owen, national secretary of the honorary civil engineering fraternity Chi Epsilon, was present at the installation of a Chapter at Purdue University April 11. Chi Epsilon replaces the local honorary fraternity "The Contour Club," which had a membership of 40.

Mr. Gerald C. Ward, senior in civil engineering, installed a chapter of the organization at the University of Colorado April 7.

Chi Epsilon is an honorary civil engineering fraternity. Election is based on scholarship and interest in civil engineering activities. The first chapter was organized at the University of Illinois in 1922. Today it has 11 chapters and an active membership of over 700.

ENGINEERS IN R. O. T. C. ACTIVITIES

The local department of R. O. T. C. announces the promotion of R. Kraut, m'30, to first sergeant; R. S. Plotz, c'30, to platoon sergeant; and F. T. Matthias, c'30, B. Kastein, c'30, and A. Wickesberg, c'30, to sergeants.

The following men served on the Military Ball committee: R. S. Plotz, c'30, F. T. Matthias, c'30, G. Jentz, c'30, B. Kastein, c'30, and S. K. Guth, e'30.

On the rifle team which closed a successful season, winning 9 out of 16 matches, are three engineers, G. Markel, e'31, H. Thrapp, c'31, and T. Wisniewski, ch'30.

ANNUAL CEMENT SCHOOL WELL ATTENDED

Eighty-two contractors and students were enrolled in the annual cement school held in the evenings of March 5 and 6. This course is given yearly by the extension division to acquaint contractors and mixer men with the water-cement-ratio method of proportioning concrete. In addition, the subject of high-early-strength cements was discussed.

FOUR STAFF MEMBERS HONORED

At the regular monthly staff meeting held Wednesday, March 7, *Wisconsin Engineer* Keys were presented to John Kulp, Franklin Matthias, Ernest Wegner, and J. D. Horsfall. The keys are presented by the Board of the Wisconsin Engineer to the members of the staff who have done exceptional work on the magazine.

ENGINEERS GO ON INSPECTION TRIPS

The annual spring inspection trips for students of the College of Engineering began on April 8, when the civils went to Chicago. The chemicals went to Milwaukee and the Fox River Valley, and the miners spent a week in the lead-zinc regions of the southeastern part of Wisconsin.

STUDENT SOCIETIES SHOW TECHNICAL MOVIES

Technical movies sponsored by the student engineering societies, are popular this semester. The miners showed "The Story of Steel," a picture taken in the steel mills of Gary, Indiana, and furnished by the Bureau of Mines at Washington. The mechanical society showed a modern machine shop in operation, while the civils had a picture which demonstrated the use of the steel-weld joint in building construction.

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Editorials

ARE WE OVERDOING IT? Dr. Harvey N. Davis, president of Stevens Institute of Technology, coolly tossed a boulder through the greenhouse of engineering education methods, when he severly criticized undergraduate specialization, on the occasion of his inaugural address.

Dr. Davis' issues which are curiously interesting to follow, and possibly as true as they are interesting, are based on the fact that a large percentage of men graduating with elaborate specialization in a field, immediately take up another field as their vocation.

Furthermore, he claims that an engineer entering a field in which he has received specialized technical education, becomes sluggish in this field, and instead of trying to solve problems ahead of him by thinking them out, he relies upon his undergraduate education to carry him along. In other words, the young graduate is coasting along with little or no effort on his own part whereas his classmates who have received identical instruction but who have entered other fields, are forced to set the wheels going and to cultivate the gray matter to keep afloat. That this stagnant condition induced by specialized instruction is the cause of many failures, is Dr. Davis' main issue.

The curriculum at Stevens Tech is planned to furnish the student with a broad fundamental education. The engineers here receive but one degree, the M. E. Their instruction is a most liberal one, firmly hitting the fundamentals, and lightly touching the details of specialization.

Whether or not this method is actually superior to the conventional methods, will be solved only by experiment. However it may be, the institute stands interestingly unique among the engineering schools of the country.

A PROPHECY A Madison construction engineer donned the garments of a prophet, before a recent meeting of the American Society of Civil Engineers, to outline the probable future developments in highway construction and maintenance. Mr. Arthur R. Hirst, though not vocationally a historian, supports the theory that history repeats itself.

Our great-grandfathers of the colonial period solved the pike situation by establishing toll-roads. In this way the needs of transportation were adequately met by private investment rather than by public funds.

Mr. Hirst believes that the public is unwilling to finance the extensive projects that will be necessary to meet the present highway situation. As examples of this he mentions the crowded boulevards and slowly moving traffic prevalent in most of our larger cities. The funds necessary to meet this condition are not available through taxes.

As a result of this inadequacy on the part of the public to support their highways in a suitable manner, private financial interests are beginning to step in to seize this opportunity of making money. They will sell mileage and right of way to the passing motorist of the future. The gas tax and the other heavy property taxes will be decreased and the colonial solution of highway financial problems, toll-roads and toll-bridges, will return.

It is for the public to decide whether or not this condition returns. But why should we pay enough for our roads to allow a large profit to be reaped from their construction when it is totally unnecessary?

POWER

Power, its efficient generation, control and utilization, has long been the goal of men. The primitive savage saw Power in the restless tossing of the waves, felt it in the tearing winds, heard it in the rumble of a distant volcano, but knew not its meaning or its usefulness.

Today Power is synonymous with Progress. It is the answer to the eternal demands of expanding industry. It flings the human voice in thousand league strides around the world, yet adapts itself to the glow of a single lamp! It lights the humble cottage and the stately mansion. It is universal in its application.

Power moves the mountains, bores into the depths of the earth, probes the wastes of sea and air. No man knows its limits, its possibilities lie far beyond the bounds of human dreams.

Mighty is Power, but mightier the brain of Man who moulds it to his purpose!

R. DeWITT JORDAN, e'27,
General Electric Co.

SIGNS OF PROGRESS In the code of ethics adopted by the Industrial Conference at Pennsylvania State College, there appears an item regarding the position of the engineering school with reference to their students, which states, — "The Engineering School should not accept fees for continued instruction of students who obviously will not later qualify for engineering work."

This item sounds one of the grave faults in the educational system of the country. There is no reason why colleges should keep students at school when there is little or no possibility that they will ever be successful in future work. It is an injustice to the public who are supporting the schools; it is an injustice to the employers who employ these superficially educated misfits; and, lastly, it is an injustice to the students themselves, who might have made good as nonprofessional men.

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CAMPUS NOTES

(Continued from page 250)

SUCH POPULARITY MUST BE DESERVED

The fame of the University of Wisconsin surveying camp at Devils Lake has spread far and wide. Last year S. S. Orman of Tulsa, Oklahoma, enrolled for a short course in plane table mapping This year, John M. Budd, a senior at the Sheffield Scientific School of Yale University, has registered in the regular four weeks' course in topographic surveying and one week in the course in rapid topography given by Mr. C. H. Nelson, of the United States Geological Survey.

MEAD SPEAKS ON BOULDER CANYON PROJECT

Prof. D. W. Mead, of the hydraulics department, attended the annual meeting of the Western Society of Engineers held in Chicago, March 11. He gave an address before the society on the subject of "The Boulder Canyon Dam."

FOURTEEN ELECTED TO PHI ETA SIGMA

Phi Eta Sigma announces the initiation of the following engineers: Karl Peters, J. A. Strand, R. L. Van Hagan, H. H. Darbo, Charles C. Watson, H. G. Dever, L. L. Berg, Ralph H. Kehl, H. L. Hoyle, Henry M. Haase, E. R. Dodge, R. W. Rummele, A. J. Wagner, Olaf F. Vea, and Wm. H. Teare. Teare is a sophomore who entered too late in the fall to be initiated with the fall group.

Phi Eta Sigma is the honorary freshman fraternity. The grade required for election is 2.5 grade points per credit.

The pitot tube used in measuring velocity of a gas or liquid was developed in the laboratories of the University of Wisconsin.

ENGINEERING REVIEW

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fan of light is white, the other half, red. The rotation produces alternate red and white flashes, enabling the aviator to distinguish the airport from the brightly lighted parks, railroad yards, and streets.

The high intensity beams are projected by a lower set of drum-shaped units, of which there are four, two red and two clear — identical in design with those used to mark airways. The upper unit, set to produce a less intense beam of light at higher angles, are standard narrow-beam floodlight projectors. With the increasing number of airports, and because of the fact that on clear nights several of these beacons may be visible at a given time from a plane, it is believed that the proper selection of colors for the several units will assist in ready identification of landing areas.

—*Engineering News-Record.*

SILVER BRAZING AND SOLDERING IN AIRPLANE CONSTRUCTION

An interesting example of the degree to which airplane manufacturers subordinate everything to the safety factor, is the manner in which they use silver solders in brazing parts of their ships and motors that are subject to vibration or are likely to encounter relatively high operating temperatures.

Inquiry on this subject at the recent Aeronautic Exposition at Chicago developed some interesting facts.

For instance, the Siemans and Halske attendant showed that the great German firm used silver solder in its airplane motors. Push rods, steel bushing on the steering bridge, as well as all copper pipe connections on both fuel and oil lines were brazed with silver. This metal was employed because of its resistance to shock and vibration as well as because it stands relatively high operating temperatures.

The Wright Aero Company attendant showed how silver solder was used in brazing external oil lines and push rod bushings on their motors. The joints on the water pipes on the Wright Marine motor also are silver welded.

It was learned from another source that silver solder is used in attaching flanges at several places in the motors and for soldering the thermocouples.

C. H. Day, a veteran airplane designer, says, "Gas and oil lines on airplanes are subject to tremendous vibration. For this reason silver solder should be used in the brass couplings of the oil and fuel lines. Silver seems to be the only welding material that will not be affected by such vibration."

In some makes of motors, silver solder is used in joining the fuel lines to the carburator. Some employ it in connections of control wires and cables needing strong joints.

The Curtis Aeroplane and Motor Company uses silver solder in soldering brass connections to fuel and oil pipe lines.

The United States Army specifications makes the use of silver solder mandatory for certain work in the construction of airplanes for the government.

Silver solder fuses at from 1600° F. to 1325° F. according to the silver content, the lower the fusing point.

In addition to the strength, toughness and resistance to high temperatures, they are described as having even a higher electrical conductivity than copper, explaining their use in securing resistance wire to terminals and leads to radion resistors, or in any other place where it is important that the resistivity be kept at a certain value.

Commercial silver solders have recently been standarized to a dozen definite formulas. The richest has a silver content of about 80% and the poorest about 10%, with various intermediate proportions of silver with base metals.

Silver solders are usually applied by means of oxy-acetylene or other welding or brazing torches. Though called solders, their function is usually that of a brazing medium.

—*The Metal Industry.*

SHORT HAUL PASSENGER TRANSPORTATION

The difference between short haul and long haul business is that a short haul averages three miles in heavy traffic at a slow speed with many stops.

Ten years ago the bus was a passenger body on a truck chassis. This was neither comfortable nor safe. Attempts to improve them resulted in reducing the height of the chassis, floating springs, six cylinder engines, four-wheel brakes, and improvements in lighting and ventilating.

The introduction of the gas-electric bus has eliminated gear-shifting, which occurs much too frequently in short haul transportation. Having to shift so often tempts the driver to abuse the clutch, damaging the equipment and shaking up the passengers. The use

of the gas-electric bus means a saving in maintenance and an increase in comfort. It is not particularly efficient in long hauls.

Buses must often carry large standing loads. Cross seats are therefore placed in the rear, and longitudinal seats in front, forming a well in which passengers may change around quickly. This puts a bad seat over the rear-wheel housing, but if the longitudinal seats are put in the rear it takes more time to get passengers shifted around.

Six-cylinder engines were needed. Power brakes are now used, giving the operator three brakes, making buses safer.

Fleets are operated and maintained in the same manner as a street railway, and the system seems to work all right. The same men as operate and maintain a street car system, operate and maintain the bus system.

Business has grown remarkably. Some rail service has been entirely eliminated. Bus service seems to be very popular.

One reason the bus is preferred is because it is safer to stop at the curb and let the passenger out than it is to have the passenger get off in the middle of the street as he has to do when alighting from a street car. A bus can be guided around obstructions, which is both a good and a bad point. The motorman of a trolley is always

sure where his car will go next, but the bus driver is not always sure.

Bus companies receive cooperation from the police, in regard to keeping spaces open for stops, and operating at high speed. Of course it is natural that they should have more rights than private vehicles.

It is true that the street car carries more people, but there have been so many improvements made in the motor coach, and so many more are being made at the present time that the field of bus opreation is broadening fast.

—*S. A. E. Journal.*

CORNSTALK PAPER

The last weeks of 1928 record an event which is of great importance to printing, engineering, and agricultural circles—the successful manufacture of paper from cornstalks.

This process was not discovered by accident but is the result of many years of experimental work, both in this country and abroad. Experimentation along this line started in this country some years ago. The results obtained were not gratifying, they were nothing of a practicable nature, and so further work was abandoned. In the meantime, Mr. Bela Dorner, a Hungarian chemist, after a dozen years of work, finally brought his experiments to a successful conclusion.

About two years ago, an American chemist, Mr. Frank K. Gardner, who was traveling in Europe, met Mr. Dorner, and learned of his success in producing a cornstalk paper. On his return to America, Mr. Dorner interested a New York capitalist in the project. A company was formed and test laboratories established in New Jersey.

The first mill run of cornstalk paper was produced by the Kalamazoo Vegetable Parchment Company in December 1928.

Between the establishing of the first experimental laboratories in 1926 and the producing of the paper in December 1928, several other events of importance took place. Chief of these was the establishing of the Cornstalk Products Company of Danville, Ill., early in 1928. This concern is equipped to turn out cornstalk pulp in large quantities and supplied the pulp for the first run of paper. This plant cost about $750,000 to build and turns out pulp at the rate of ten tons a day. The plant is considering an additional water supply which will increase its output to about forty tons a day.

The cornstalk produces a shorter fibre than wood, yet it makes a paper of good strength. The first paper made was a forty pound machine-finish paper of good appearance, harder than machine-finish wood-pulp papers and somewhat transparent. It is claimed that pulp can be made from cornstalk in six hours, whereas the manufacture of wood pulp requires more expensive machinery and about eighteen hours for the process.

For several years there has been considerable concern among paper manufacturers and users as to how long the rapidly diminishing forests of this country could be expected to supply pulp for paper making. An acre of

corn will produce about 800 pounds of pulp, and as there are about 100,000,000 acres of cornstalks going to waste in the corn belt each year, it would seem that another problem had been solved by chemists and engineers.

—*The Printing Industry.*

Since the above abstract was written we have received the February issue of Mechanical Engineering, which contains a supplement printed on cornstalk paper. We quote the following from this issue of Mechanical Engineering:

"In the manufacturing process, the shredded cornstalk is placed in digesters or cooking tanks, together with cooking liquors. After the shredded cornstalk has passed through the cooking process the resultant pulp is a soft, brownish material. This is then bleached to give it a white color.

"Pulp made from cornstalks, bagasse, straw and similar fibrous plants has characteristics different from those of pulp made from wood. The cornstalk pulp has a shorter fiber and is much more easily hydrated than wood or rag pulps. This particular characteristic lends itself well to some grades of paper, such as glassine or other transparent or semi-transparent papers. Paper made with a certain proportion of cornstalk tends to be stiff and brittle.

"Cornstalk pulp as a material for the manufacture of paper has some valuable properties, but also certain limitations. It is probable that a certain small percentage will be used in the manufacture of printing papers. It is doubtful if this will ever exceed 20 per cent if the same quality of paper is desired that is used at the present time. . . . This pulp in limited percentages may also be used in the manufacture of a stiff cardboard.

"Another development of the utilization of cornstalks is being tried out at Ames, Iowa. Experiments in making board from a disintegrated cornstalk pulp indicate that there are some possibilities in this line. Such a board would be thick and similar to some of the present wall boards on the market. The work so far has not been carried on sufficiently long to pass judgment on the possibilities of the cornstalk-board process."

PUTTING SOUND TO WORK

With the increasing public interest in the photo-electric cell and its spectacular applications, the parallel development in the use of *sound*-operated relays deserves equal recognition and interest.

Twenty years ago it was jokingly said of the Chicago meat packers that they had learned to make a profit out of every part of the pig excepting the squeal. Engineering has now arrived at the point where a squeal is becoming quite useful, and from its point of view, particularly in the control of apparatus, sound presents certain important advantages. Sound has the advantage over light that it travels readily either through or around almost any ordinary obstacle much more readily than light. Modern devices developed particularly in connection with the transmission of sound make it quite possible to transmit from New York

to San Francisco the heart beats of a newborn babe and make them sound at the Pacific end like pistol shots.

The Televox is a commercial application of the sound-operated relay. By means of this mechanism, a certain sound effect produces a given reaction, and means may be provided to make a report of the reaction by means of another sound. For example, a certain sound causes Televox to connect with a water-level indicator at a reservoir and report the reading by another easily decodable sound. More recently, devices have been installed on landing fields which enable a flier to light the field at night by merely sounding his siren. Closely related to this is the apparatus being tested in Baltimore by which the traffic signal at the intersection of a boulevard and a small street can be turned from its usual position of green for the boulevard to the temporary position of green for the small street by the blowing of a horn by a car wishing to cross the boulevard. There is no reason why railroads could not employ this method for protecting unguarded crossings; the locomotive whistle operating gates. Anti-aircraft guns can now be automatically and precisely aimed at an air-plane by means of relays responsive to the whir of the propeller.

We are rapidly approaching a time when complicated physical structures will be tested by the pitch of the sound emitted. In fact, Professor Howe of Columbia University predicted sixteen years ago that an architect would some day report, "The skyscraper emits a clear 'C' tone, but is defective in the third harmonic."

—*Mechanical Engineering.*

THE CHICAGO TUNNEL SYSTEM

Below the sewers, below the mazes of pipes, wires, cable, and conduits, below the level of any subway that may be built, and silent and unseen, a freight tunnel system serves Chicago. The tunnels are forty feet under the surface, are reached only by elevators, and end against blank walls of concrete. Apparently they are known to few beyond the ranks of those whom they serve.

A network of these tunnels, connecting with all freight terminals and with many large buildings, covers downtown Chicago. The Chicago River is crossed at a dozen or more points. Over the sixty-two miles of twenty-four inch gauge track are hauled coal, ashes, excavated material, and freight of all kinds, to the extent of three thousand cars or more daily. The cars themselves are of three types. For handling freight a car four feet wide, twelve feet long, and of six tons capacity is used; ash and clay handling cars are of three and a half cubic yards capacity; and the coal cars are of four tons capacity. One hundred fifty electric locomotives (250 v. d-c.) and thirty-three hundred cars comprise the rolling stock.

The bores are made through a stratum of blue clay and are ruoghly six feet wide and seven and one-half feet high. Each tunnel has but a single track and trolley. A facing of concrete one foot in thickness and an extensive pumping system keep the tunnels dry. Waterproof and fireproof doors are provided to isolate connections with

buildings and commercial terminals in case of fire or water from above. Pure air at a year round temperature of fifty-five degrees F. is provided by the ventilation system. Illumination is provided at all intersections and elsewhere when other than the train lights are needed. Glass reflectors at all intersections give warning of an approaching train. Despite the unfavorable conditions of operation, there has never been a major accident in the tunnels.

The chief business of the Chicago Tunnel Terminal Corporation is the handling of package freight, the tremendous volume of whcih traffic is created by trade and manufacturing in the Chicago district. From the various companies served, the merchandise is collected and delivered to warehouses or freight terminals as required. As one hundred thousand cars are loaded annually by this underground system, the surface is relieved of considerable traffic. Incoming goods are either distributed to Chicago firms or transferred to other railroad terminals for reshipment.

ICE ENGINEERING

The field of ice engineering is the most recent member in the field of engineering sciences. The tremendous loss in property, and the shutting down of power plants due to the formation of ice in rivers and lakes, and the ice jams present to the engineer a problem that will indeed try his mettle. In addition, there must be considered the loss of life entailed by ice jams and icebergs, and the great hindrance it is to navigation.

The method to be adopted for the solution of a particular problem depends upon the nature of the results desired, the relative economy of the method, and the judgment of the ice engineer. The aim of the engineer is not to melt large masses of ice; rather it is to assist the removal of the ice by using the natural forces of air, sun, and water to the best possible advantage. The problem of the ice engineer then becomes the selection of the method by which the natural disintegration of the ice can be obtained most readily, and most economically on one hand, or the prevention of this ice formation on the other hand.

The best method for handling ice situations, such as opening ship channels and keeping them open to navigation, is the use of ice-breaking ships. There is no method as quick nor as economical as this. However, in those situations where ice breakers cannot work, the use of chemicals has reached the point of economic feasibility.

The most important and effective of these chemicals is thermit. Thermit is not an explosive; it is perfectly safe to handle and requires a special means of starting when it is to do its work. Thermit is a mixture of iron oxide and aluminum. When the mixture is raised to a temperature sufficiently high for the reaction to begin, an exchange of oxygen takes place, the iron oxide being reduced and the aluminum oxidized. The liberation of metallic iron and the formation of the aluminum oxide is accompanied by an extremely rapid evolution of a great amount of heat. The result is that the white hot, molten iron not only causes great strain in the ice but also decomposes it into its constituent hydrogen and oxygen with explosive violence. It is, therefore, not the thermit reaction but the ice itself that causes the explosion, the heat of the thermit being the means for setting it off. The use of thermit has been quite extensive for destroying ice bergs, ice jams, and preventing flood conditions due to ice formations, and in each case it has proven successful.

EDITORIALS

(Continued from page 252)

If there could be some workable, practical method of weeding out these men in or before college, it would work for the betterment of the profession and the increased satisfaction of employers with the graduates that they employ.

BREAKAGE OF FIVE-DOLLAR BILLS

(Continued from page 245)

Conclusions

CROSSBENDING TESTS:

The results clearly indicate that five dollar bills reinforced for compression by silk fibers are considerably stronger than those subjected to compression without reinforcing. This can be readily seen by a minute inspection of the table of tabulated data shown in Fig. 2.

Slab tests with a dead load of ten cranberries per square furlong, revealed the amusing fact that the strength was considerably greater than was expected.

Some tests were made supporting the bills along one side only and others with four sides supported, all of which indicated that the radial and tangential reinforcing increased the value to seven dollars and above. (Plane bills averaged from about from ninety-six cents to three dollars and one cent.) It was also noticed that new crisp bills were more in demand at Christmas time than on Sunday.

To more nearly approach the physical conditions attending the usual breaking of the bills it was necessary to provide the suitable background for the tests by reproducing the same weather as exists in practice. The results are tabulated in Fig. 2.

P. S.—A failure was noticed at the grocers after mentioning roast duck. Collapse occurred immediately,—change \$4.3% causing increased bulging due to change in purse. The final conclusions must be withheld from publication until they are fully analyzed by the officials of the Cranberries Association of the Middle West.

ALUMNI NOTES

(Continued from page 247)

be recognized that a man must be trained in the fundamentals rather than be crammed full of a lot of facts and figures, most of which he will never have any use for after leaving school. Not one engineer in a hundred has the ability to express himself with any dgeree of conciseness and understanding, and, because of that, he is constantly

forced into the background by other men who have had better training in this respect."

Whinery, R. H., c'05, has changed his address from 512 Grosse Building, Los Angeles, to 4527 St. Charles Road, Los Angeles, California.

Williams, Sidney J., g'08, C. E.'15, is the author of "A Manual of Industrial Safety" recently received in the Engineering Library. Mr. Williams is an authority on this subject having served in this department for the state of Wisconsin. He was one of the most brilliant men who ever attended the University, being honored with Tau Beta Pi and Phi Beta Kappa by virtue of his work both in the Engineering School and upon the hill.

MINERS

Hymer, H. G., min'20, E. M.'22, has recently been appointed District Engineer with the M. A. Hanna Company at Hibbing, Minnesota. Previous to this appointment Mr. Hymer was employed on a two years' exploration program for the Rhodesian Congo Border Concession, Ltd., in northern Rhodesia.

Kashin, G. L., min'29, who finished his course at the close of the first semester is now employed by the Bunker Hill and Sullivan Mining and Concentration Company at Kellog, Colorado.

Lorig, C. H., min'24, M. S.'25, who has been with the Ladish Drop Forge Company of Cudahy, Wisconsin, is now doing research work at the University. His topics are Physical Properties of Blast Furnace Slag, and the Viscosity and Electrical Conductivity of Blast Furnace Slag. He is living at 29 West Dayton Street, Madison, Wis.

Merrill, Pomeroy C., min'09, is now connected with the Eastern Iron Ore Company of Rockaway, New Jersey.

Slaker, Donald V., min'20, is assistant chief engineer for the Western Wheeled Scraper Company and lives at 604 Garfield Avenue, Aurora, Illinois.

White, R. F., min'27, is now doing geophysical prospecting for the Gulf Oil Company. His work at present is benig conducted in the laboratories of the Carnegie Institute.

Zoellner, A. M., min'28, is at present employed in the research department of the A. O. Smith Company of Milwaukee, Wisconsin.

CAN YOU SELL YOURSELF?

(Continued from page 244)

author of *A Message of Garcia,* has aptly said: "The difference in our estimates of men lies in the fact that one man is able to get his Goods in the Show Window and the other is neither aware that he has either Show Window or Goods."

If you really have the "Goods" the direct-by-mail campaign is one of the most effective ways to place your Goods in the "Show Window." With your Goods properly displayed in the proper channels it will be only a matter of time before the Buyers appear on the scene to verify your credentials.

The purpose of any direct-by-mail campaign is to ascertain whether your prospect has an opening or to get an interview. Both of these objects have been achieved in the illustrative letter accompanying this article. As a bit of practical psychology bear in mind that the worst days for a prospective employer to receive an application or grant an interview are Monday and Saturday.

In general the personal sales letter consists of a first or contact paragraph, the body of the letter, and the clincher.

The contact paragraph is the most important part of the letter, for there you gain the attention of your would-be employer or lose it. You have the difficult task of making a good impression without being too conspicuous. Show your prospect how you can serve him. Be sincere! The following contact paragraphs have been taken from successful letters:

"Dear Sir:

I wish to apply for the position of assistant engineer, advertised in the Engineering News-Record of March 15, 1927.

* * * * * *

"Dear Sir:

I write to ask if there is a place in your organization for a young engineer who is not afraid of hard work. If such be the case, I hope you will consider my application for a position with your Company.

* * * * * *

"Dear Sir:

Prof. John Doe, of the department of civil engineering at the University of Hard Knocks, has mentioned to me that there is an opening in your firm for a young civil engineer. I should like to be considered an applicant for that position."

* * * * * *

The body of your letter should contain a concise and definite account of experience germane to the position for which you are applying. Do not speak in generalities. Give specific instances of what you have done, what you can do, and what you want to do. Above all, be sincere and modest. Confidence in one's self is an asset, but conceit is a liability.

Except for the man of tried experience, it is best not to state a salary in a letter of application. If that point is specifically asked for, one may state a salary or make a tactful detour around the question by a statement somewhat like the following:

"As an employer of engineers, Mr. Jones, you are better qualified to know what I would be worth to your organization," or,

"I hesitate to name a salary, Mr. Smith, for I seek a position with a future, rather than a job."

Next to the contact paragraph, the concluding paragraph or clincher is the most vital one in the letter. The following clinchers from successful letters are indicative of the end to be achieved:

"Give me an opportunity to tell you in person why I am the man you need."

* * * * * *

"I shall be in Chicago May 15 and 16, and shall appreciate an interview with you at that time if it is convenient for you."

* * * * * *

"May I have the pleasure of an interview at your convenience?"

* * * * * *

In an interview that has been paved by a letter setting forth one's qualification the point of contact has already been established. With the interview achieved half your battle is won, for your letter has piqued your prospective employer with a desire to see the personality behind the letter.

During the interview act cool and dignified. Even if you feel somewhat nervous and ill at ease remember the purpose of the interview: to convince your prospective boss that you are the man he wants for the job. Note the wall mottoes and pictures in your interviewer's office and other tell-tale signs of his interests. When you have achieved your end, get out. Do not wait for an anti-climax.

A favorite device of the salesman which can be applied to the clinching of an interview is to get your would-be employer's decision on a minor point which when achieved carries with it the job. For example, when you approach the critical point in the interview, ask the man behind the desk whether it is all right for you to start work Monday morning. An affirmative answer to that indirect question carries the job with it by implication.

The following is a letter which was successful in obtaining over fifty per cent favorable replies; one of the interviews obtained through it resulted in a job:

1313 Easy Street,
Yourtown, Wisconsin.
March 15, 1928.

MR. P. A. KING, President,
Century Construction Company,
Monadnock Block,
Chicago, Illinois.

Dear Sir:

Is there a place in your organization for a young engineer
who is capable of intelligent loyalty to your organization;
who is accurate in whatever work he is assigned;
who understands fundamental construction methods;
who keeps up with his job through home study;
who is willing to "pitch in" and help wherever he can on the job?

If such be the case, I hope you will consider my application for a position with your company.

Before being graduated from the civil engineering course at the University of Wisconsin in June, 1927, I worked during summer vacations as timekeeper and cost clerk in an industrial plant employing 200 men, where I was responsible for the entire payroll; as carpenter's helper on reinforced concrete construction, as retail salesman, and as tutor in engineering subjects.

For nine months following graduation I have been employed by the Sturdy Construction Company, General Contractors, Milwaukee, Wisconsin, successively as timekeeper, labor foreman on steel reinforcing work, and as form carpenter. While timekeeper I served as a sort of handy man on a job employing 150 men, being responsible for the payroll, ordering and checking materials, expediting the arrival of future materials, giving elevations, and helping in layout work. As carpenter I have worked with both wood and metal forms.

If it has any bearing upon the matter, I might mention that while at the university I took part to some extent in the extra-curricular activities. For three years I was one of the editors of the Wisconsin Engineer, official monthly of

the College of Engineering; I have also served as president of the student chapter of the American Society of Civil Engineers.

I am 22 years old, 5 feet 6 inches tall, and weight 150 pounds. My health is excellent. I am unmarried.

Upon qualities of character, personality, capacity for work, I refer you to Prof. J. R. Doe, College of Engineering, University of Wisconsin, Madison, Wisconsin; and to Mr. Hall Thaer, estimator, Sturdy Construction Company, 599 Our Street, Milwaukee, Wisconsin.

Respectfully yours,
J. D. LEVIN.

PATENTS — LAW AND PRACTICE

(Continued from page 243)

APPLYING FOR A PATENT

An application for a patent consists of (1) a letter of transmittal which gives the name of the applicant, the title of the invention, and includes the initial fee of $20.00 plus $1.00 for each claim in excess of twenty; (2) a specification signed by the inventor giving full details of the invention; (3) an oath signed by the inventor before a notary public that he "verily believes himself to be the original, first, and sole (or joint) inventor of the device or process described; and (4) drawings or models as may be required.

The actual obtaining of a patent may occupy a few months or several years. The course of procedure would be somewhat as follows:

After making what he believes to be a patentable invention, a man will place the matter in the hands of an experienced patent attorney who will institute a "novelty" search through the Official Gazette of the Patent Office, the classified Patent Office records, or through American and foreign literature on the matter. The matter of discovering an intereference is very important.

If it is decided that intereference does not exist, the papers are prepared and sent to the Patent Office with the necessary fees. If the invention is acceptable, the claim will be allowed; or if it is not, will be sent back for additions or corrections.

The Patent Office issues several pamphlets giving the necessary procedure to obtain a patent for a nominal price. These booklets plus any of the patent books on the market are valuable additions to any library. "Patents — Law and Practice" by O. A. Geier, which is a very complete treatise on the subject, may be obtained free of charge by writing to Richards and Geier, 274 Madison Avenue, New York City.

HARRIS PROCESS OF LEAD REFINING

(Continued from page 239)

We will return to the sodium stannate and sodium antimonate cake. The cake is discharged from the press and repulped at 100° C. and at a gravity of 1.20. Under these conditions the sodium stannate becomes soluble and by additional filtration is separated from the sodium anti-

moniate which again remains as a filter cake in the press. (Note that the filter cakes are slightly contaminated with the out going soluble material but by each additional filtration the contamination becomes less. Thus a small amount of sodium arsenate remain with the sodium antimoniate and sodium stannate, etc.) The resultant filtrate of sodium stannate is electrolyzed using insoluble anodes and a tin cathode. The resultant merchant tin produced from the cathode is sold on the market in competition with imported brands.

The sodium antimonate which remains in the filter press after the separating out the sodium stannate is removed to a smelting furnace and turned out as metallic antimony alloy. It is also possible to produce sodium antimonate suitable for the ceramic trade, to be manufactured into the finest enamels. Thus the three impurities originally in the bullion as arsenic, tin and antimony are turned out as calcium arsenate which is used as an insecticide, bar tin and metallic antimony or sodium antimoniate.

All the caustic originally used with the exception of the amount theoretically combined with sodium antimoniate, plus 47% of the nitre used, which becomes sodium hydroxide through chemical reaction, is returned in solutions to an evaporating plant where it is evaporated to a product practically equal to the sodium hydroxide purchased on the market. It is then again used in the process.

One great advantage which is brought about by the process is elasticity of operation. In the fire process using huge furnaces it is not possible to start and stop without a great expense and loss of time, sometimes as great as 24 to 48 hours, while in a process using kettles only it is a very simple matter to interchange without loss of time or money.

In this process, metal tie up is reduced to a minimum, each kettle can be pumped out to within five hundred pounds or less, while it is always necessary in the large furnaces to carry at times, one hundred tons in order to protect the brick work. It also has the singular advantage of turning out a marketable product from each impurity which, at the present time, is not possible in the furnace process.

In any new process there are many metallurgical refinements to be worked out and we never do arrive at a stage in any process where improvements cannot be made. It is only through the medium of research that we can approach that refinement whereby it is possible to turn out the finest products at the lowest cost.

INDUSTRIAL CONTROL

(Continued from page 238)

very quickly and hence protect the motor. Had this overload come on a cold motor, the tripping would be deferred until both motor and relay were heated. Hence, the ultimate in useful work up to the maximum is obtained from the motor with the assurance of protection from burnout.

The foregoing sketchy presentation of contactors, accelerating relays, and overload relays can only indicate what is

available in the way of industrial control devices. Some of the interesting accomplishments of industrial control are described below. The striking feature of magnetic controllers to the layman is push-button operation. To stand before a group of small push-button stations and have at his finger tips the entire operation of a large cement mill is an experience which will not fail to thrill a mechanically minded man. A multiplicity of "safety stop" buttons located around the huge presses of a modern newspaper are insurance against any sort of mishap that might damage these intricate devices. The little push-button station which starts and stops the sausage-grinder motor in the corner butcher shop is no less important than that push-button station which starts and stops the pump motors for a municipal water works. To be able to control machinery by pushing a button is a tremendous advance in the application of electric power.

With industrial controllers, motors can be stopped as readily and as precisely as they are started. For example, the many rolls incident to the handling of steel as it is worked must be repeatedly reversed as the steel is passed back and forth through the mill. The operator with a group of master switches before him throws one to the reverse position. Instantly, the power supply to the motor is reversed, and the rolls come to rest and accelerate in the opposite direction or they are stopped by moving the master switch to the "off" position just as standstill is reached. The operator selects the direction he desires, and the controller executes the desire in a far better manner than the operator himself could do.

At tens of thousands of service stations, there is an apparent unending supply of air waiting for automobile tires. No one ever seems to pay any attention to the compressor motor, yet day after day, the pump starts and stops as the air is needed. The automatic pumping of coal mines is a positive factor in maintaining tonnage schedules. When the water rises in the pump, a priming pump starts. The main pump, upon being primed, starts and forces water out of the mine until the water level has properly receded. Automatic controllers working without attention accomplish tremendous economies, and work in 24-hour shifts seven days a week.

This list could be extended for pages, but let it be concluded with this idea — one of the foremost factors in America's industrial affluence is the extensive use of electric power. No inconsiderable amount of the application of electric-power has been made possible by this faithful servant — industrial control.

A FATHER'S ADVICE:

A successful grad, my son, can always be recognized by the seat of his pants. The successful grad's pants are shiny from sitting down.

—*Exchange.*

Thenthere'stheScotchmanwhoalwayswriteslikethistosavethespaceusuallywastedbetweenwords.